Graphic Design & Illustration

First edition | 10 units | 50 lessons | A video for every lesson

FIRST EDITION

Course guide

This course is a job pathway. Graphic design and illustration are real trades — the people who design the cereal box, the church bulletin, the book cover, the app screen and the county-fair poster are paid craftsmen — and this year teaches the skills those trades actually hire for. Ten units move from the pencil up: drawing and composition first, because every strong designer can draw; then typography, color, layout and print production; then the digital studio (painting in Krita, vector work in Inkscape, pages in Scribus, interfaces in Penpot — all free); then the professional fields of illustration, branding and screen design; and finally the business itself — portfolio, copyright, contracts, pricing, and getting hired.

Every lesson follows the same path. **The story** is a real moment in the trade: Gutenberg setting the 42-line Bible, Nicolas Jenson cutting the first great roman, Howard Pyle opening his school on the Brandywine, N.C. Wyeth painting *Treasure Island* for Scribner's, Paul Rand showing IBM a striped logo, the Knoll brothers writing Photoshop. Then **how they figured it out**, then **the craft** — the teachable rules, with worked examples where the craft is mathematical (type scales, grid arithmetic, resolution and bleed, contrast ratios, freelance pricing) — and finally **in the studio**: how working designers and illustrators do the job today, and what clients and art directors expect.

Every lesson ends in work: a studio brief written like a real client job, a sketchbook assignment, practice problems with answers, and a picture study of a public-domain masterwork — Dürer and Leonardo, Gutenberg and Caslon, Hokusai, Mucha, Pyle, Wyeth and Rackham. Each unit closes with a 100-point test and a portfolio piece; the midterm and final cover the year. By the last week the student holds what the trade actually asks to see: a ten-piece portfolio, a resume, a price sheet and a presentation — made entirely with free tools.

> Videos were chosen lesson by lesson from working designers, illustrators and teachers with clean channels: drawing teachers like Proko and Jake Parker, typography essays by Linus Boman, design teachers like Satori Graphics, Dansky and Will Paterson, Logos By Nick for Inkscape, Davies Media Design for GIMP, UI teachers like Jesse Showalter, business-of-design talks from The Futur, and museum and printing-history films. Every video was checked for content. Some open with a sponsor message; skip it. A video shows how a professional works; your own work happens in the studio brief.

Start with Lesson 1.1 →

Who it is for

Written for students in grades 9–12; no prior art course is required, though the School Launch Art K–8 sequence is a natural runway. Students work fairly independently, with a parent or mentor who reviews finished briefs, sits in on the critique lessons and approves anything done online. Needed: pencils and paper, and a computer that can run free software (Krita, Inkscape, GIMP, Scribus, Penpot in the browser). A drawing tablet is optional and nothing in the course requires buying software or fonts.

How to use this course

1. **The weekly rhythm.** The course has 50 lessons in ten units, each taught in three sessions of about 50 minutes: (1) the video, the story and core ideas, and the worked examples; (2) the studio brief and sketchbook; (3) the practice set and corrections. After each unit comes a test day; review days and exams follow Units 5 and 10. At five sessions a week the course fills about 33 weeks.
2. **Story, craft, studio.** Read the core ideas carefully, then close the page and explain to a parent what problem the designer or illustrator faced, what they worked out and how the trade does it today. Work every worked example on paper before looking at the steps.
3. **The studio brief is the job.** Each brief is written like a real client assignment, with a client, a deliverable and specs. Treat it that way: read it twice, sketch before you polish, meet the specs exactly, and finish. Finished work — not talent — is what builds the portfolio.

4. **Practice sets and corrections.** Each lesson has 8–12 practice problems from easy to challenge, with answers, including critique questions where you play the art director. Do them without looking, check, and rework every miss in the correction session.
5. **Picture study.** Each lesson has one public-domain picture chosen for that lesson's craft. Look at it quietly for two minutes before reading the questions; designers are trained by what they look at.
6. **Keep everything.** The sketchbook and the unit portfolio pieces are the course's product. By the final week they become the ten-piece portfolio that Unit 10 assembles, so date every piece and keep the files organized from week one.

Scope and sequence

UNIT 1 · WEEKS 1–4

Seeing and Drawing: The Foundation of Every Image

What the jobs actually are — designer, illustrator, production artist, art director — and the drawing skills every one of them is built on: measurement, value, perspective and the clothed figure.

1.1 Two Trades, One Craft: What Designers and Illustrators Do

1.2 Drawing What You See: Line, Measurement and Proportion

1.3 Light and Shadow: Value, Form and Rendering

1.4 Perspective and Construction: Making Space Believable

1.5 People on the Page: Gesture, Heads and Hands

UNIT 2 · WEEKS 4–7

Composition: The Rules of a Strong Picture

The elements and principles of design, visual hierarchy, negative space, and the professional critique: how working artists judge a picture and make it stronger.

2.1 The Elements: Line, Shape, Value, Texture, Space

2.2 The Principles: Balance, Contrast, Emphasis, Rhythm, Unity

2.3 Hierarchy and the Eye's Path: Directing the Viewer

2.4 The Power of Empty Space: Negative Space and Simplicity

2.5 The Critique: How Professionals Judge and Improve Work

UNIT 3 · WEEKS 7–10

Typography: The Designer's Voice

Five centuries of type from Gutenberg to Helvetica, letterform anatomy and classification, choosing and pairing typefaces, the mathematics of setting text, and hand lettering.

3.1 The Story of Letters: Gutenberg, Jenson and Five Centuries of Type

3.2 The Anatomy of a Letter: Classification from Garamond to Helvetica

3.3 Choosing and Pairing Typefaces

3.4 Setting Text Well: Size, Leading, Measure and the Type Scale

3.5 Display Type and Hand Lettering

UNIT 4 · WEEKS 10–13

Color: Theory, Systems and Craft

Color wheels, harmony and palettes; the number systems of screen and press (RGB, hex, CMYK, spot color); what color communicates; and contrast every reader can see.

4.1 How Color Works: Wheels, Mixing and Harmony

4.2 Building a Palette: Value First, Then Color

4.3 Color by the Numbers: RGB, Hex, CMYK and Spot Color

4.4 What Color Says: Meaning, Branding and Convention

4.5 Color Everyone Can Read: Contrast and Color-Blind-Safe Design

UNIT 5 · WEEKS 13–17

Layout and Print Production

Grids and page arithmetic, posters that read at a glance, multi-page layout, and real prepress: resolution, bleed, file formats, and how a printing press puts ink on paper.

5.1 The Grid: Margins, Columns and Alignment

5.2 The Poster: One Message at a Glance

5.3 Pages That Flow: Books, Magazines and Multi-Page Layout

5.4 Ready for the Press: Resolution, Bleed and File Formats

5.5 Ink on Paper: How Printing Actually Works

UNIT 6 · WEEKS 17–20

The Digital Studio: Raster and Vector

Raster and vector from the file format up: digital painting in Krita, vector drawing in Inkscape, the scan-ink-color pipeline, and an honest tour of the professional toolkit.

6.1 Pixels and Paths: How a Computer Stores a Picture

6.2 Painting with Pixels: Krita and the Raster Workflow

6.3 Drawing with Curves: Inkscape and the Vector Workflow

6.4 From Sketch to Finish: Scan, Clean, Ink and Color Your Drawing

6.5 The Professional's Toolkit: Adobe, Affinity, Procreate and Yours

UNIT 7 · WEEKS 20–23

Illustration as a Profession

The business of pictures: the Golden Age studios, children's books, today's editorial, cover and concept-art markets, finding a style, and running an illustration job from brief to final.

7.1 The Golden Age: Howard Pyle, N.C. Wyeth and the Magazine Era

7.2 Pictures for Children: Crane, Caldecott, Rackham and the Picture Book

7.3 Today's Markets: Editorial, Advertising, Covers and Concept Art

7.4 Finding Your Style: Influences, Practice and Consistency

7.5 From Brief to Final: The Illustration Job, Start to Finish

UNIT 8 · WEEKS 23–26

Branding and Logo Design

Identity design end to end: what makes a mark work, the fifty-sketches discipline, building a brand system and guide, and presenting finished work to a client.

8.1 Marks That Mean Something: From Maker's Marks to Modern Identity

8.2 What Makes a Logo Good: Simple, Memorable, Versatile

8.3 The Logo Process: Brief, Research, Sketches, Refinement

8.4 More Than a Logo: Color, Type and the Brand Guide

8.5 Presenting and Defending the Work

UNIT 9 · WEEKS 27–30

Designing for Screens

Screen design for real jobs: enough HTML and CSS to talk to developers, interface fundamentals, responsive layout, social graphics that survive the feed, and prototype handoff.

9.1 How the Web Shows Your Work: Browsers, HTML and CSS Basics

9.2 Buttons, Forms and Flows: User Interface Fundamentals

9.3 One Design, Every Screen: Responsive Layout

9.4 Design in the Feed: Social Graphics, Thumbnails and Email

9.5 Prototype and Handoff: Penpot, Figma and Working with Developers

UNIT 10 · WEEKS 30–33

The Working Designer: Portfolio, Clients and Career

The career itself: building and showing the ten-piece portfolio, copyright and contracts, pricing the work, landing clients and jobs, and the habits of a long, honest career.

10.1 The Portfolio: Ten Strong Pieces and Where to Show Them

10.2 Who Owns the Picture: Copyright, Licensing and Contracts

10.3 Pricing the Work: Rates, Quotes and the Freelance Math

10.4 Getting Hired: Clients, Studios, Applications and Interviews

10.5 A Craftsman's Career: Habits, Ethics and the Long Game

Weekly pacing calendar

WEEK	PLAN
1	• Day 1: Lesson 1.1 Two Trades, One Craft: What Designers and Illustrators Do: video, teaching and worked examples • Day 2: Lesson 1.1: studio brief and sketchbook • Day 3: Lesson 1.1: practice set and corrections • Day 4: Lesson 1.2 Drawing What You See: Line, Measurement and Proportion: video, teaching and worked examples • Day 5: Lesson 1.2: studio brief and sketchbook *Five sessions a week of about 50 minutes. Families on a four-day week can combine the practice day of one lesson with the teaching day of the next.*
2	• Day 1: Lesson 1.2: practice set and corrections • Day 2: Lesson 1.3 Light and Shadow: Value, Form and Rendering: video, teaching and worked examples • Day 3: Lesson 1.3: studio brief and sketchbook • Day 4: Lesson 1.3: practice set and corrections • Day 5: Lesson 1.4 Perspective and Construction: Making Space Believable: video, teaching and worked examples
3	• Day 1: Lesson 1.4: studio brief and sketchbook • Day 2: Lesson 1.4: practice set and corrections • Day 3: Lesson 1.5 People on the Page: Gesture, Heads and Hands: video, teaching and worked examples • Day 4: Lesson 1.5: studio brief and sketchbook • Day 5: Lesson 1.5: practice set and corrections
4	• Day 1: Unit 1 test • Day 2: Lesson 2.1 The Elements: Line, Shape, Value, Texture, Space: video, teaching and worked examples • Day 3: Lesson 2.1: studio brief and sketchbook • Day 4: Lesson 2.1: practice set and corrections • Day 5: Lesson 2.2 The Principles: Balance, Contrast, Emphasis, Rhythm, Unity: video, teaching and worked examples
5	• Day 1: Lesson 2.2: studio brief and sketchbook • Day 2: Lesson 2.2: practice set and corrections

WEEK	PLAN
	• Day 3: Lesson 2.3 Hierarchy and the Eye's Path: Directing the Viewer: video, teaching and worked examples • Day 4: Lesson 2.3: studio brief and sketchbook • Day 5: Lesson 2.3: practice set and corrections
6	• Day 1: Lesson 2.4 The Power of Empty Space: Negative Space and Simplicity: video, teaching and worked examples • Day 2: Lesson 2.4: studio brief and sketchbook • Day 3: Lesson 2.4: practice set and corrections • Day 4: Lesson 2.5 The Critique: How Professionals Judge and Improve Work: video, teaching and worked examples • Day 5: Lesson 2.5: studio brief and sketchbook
7	• Day 1: Lesson 2.5: practice set and corrections • Day 2: Unit 2 test • Day 3: Lesson 3.1 The Story of Letters: Gutenberg, Jenson and Five Centuries of Type: video, teaching and worked examples • Day 4: Lesson 3.1: studio brief and sketchbook • Day 5: Lesson 3.1: practice set and corrections
8	• Day 1: Lesson 3.2 The Anatomy of a Letter: Classification from Garamond to Helvetica: video, teaching and worked examples • Day 2: Lesson 3.2: studio brief and sketchbook • Day 3: Lesson 3.2: practice set and corrections • Day 4: Lesson 3.3 Choosing and Pairing Typefaces: video, teaching and worked examples • Day 5: Lesson 3.3: studio brief and sketchbook
9	• Day 1: Lesson 3.3: practice set and corrections • Day 2: Lesson 3.4 Setting Text Well: Size, Leading, Measure and the Type Scale: video, teaching and worked examples • Day 3: Lesson 3.4: studio brief and sketchbook • Day 4: Lesson 3.4: practice set and corrections • Day 5: Lesson 3.5 Display Type and Hand Lettering: video, teaching and worked examples
10	• Day 1: Lesson 3.5: studio brief and sketchbook • Day 2: Lesson 3.5: practice set and corrections

WEEK	PLAN
	• Day 3: Unit 3 test • Day 4: Lesson 4.1 How Color Works: Wheels, Mixing and Harmony: video, teaching and worked examples • Day 5: Lesson 4.1: studio brief and sketchbook
11	• Day 1: Lesson 4.1: practice set and corrections • Day 2: Lesson 4.2 Building a Palette: Value First, Then Color: video, teaching and worked examples • Day 3: Lesson 4.2: studio brief and sketchbook • Day 4: Lesson 4.2: practice set and corrections • Day 5: Lesson 4.3 Color by the Numbers: RGB, Hex, CMYK and Spot Color: video, teaching and worked examples
12	• Day 1: Lesson 4.3: studio brief and sketchbook • Day 2: Lesson 4.3: practice set and corrections • Day 3: Lesson 4.4 What Color Says: Meaning, Branding and Convention: video, teaching and worked examples • Day 4: Lesson 4.4: studio brief and sketchbook • Day 5: Lesson 4.4: practice set and corrections
13	• Day 1: Lesson 4.5 Color Everyone Can Read: Contrast and Color-Blind-Safe Design: video, teaching and worked examples • Day 2: Lesson 4.5: studio brief and sketchbook • Day 3: Lesson 4.5: practice set and corrections • Day 4: Unit 4 test • Day 5: Lesson 5.1 The Grid: Margins, Columns and Alignment: video, teaching and worked examples
14	• Day 1: Lesson 5.1: studio brief and sketchbook • Day 2: Lesson 5.1: practice set and corrections • Day 3: Lesson 5.2 The Poster: One Message at a Glance: video, teaching and worked examples • Day 4: Lesson 5.2: studio brief and sketchbook • Day 5: Lesson 5.2: practice set and corrections
15	• Day 1: Lesson 5.3 Pages That Flow: Books, Magazines and Multi-Page Layout: video, teaching and worked examples • Day 2: Lesson 5.3: studio brief and sketchbook

WEEK	PLAN
	• Day 3: Lesson 5.3: practice set and corrections • Day 4: Lesson 5.4 Ready for the Press: Resolution, Bleed and File Formats: video, teaching and worked examples • Day 5: Lesson 5.4: studio brief and sketchbook
16	• Day 1: Lesson 5.4: practice set and corrections • Day 2: Lesson 5.5 Ink on Paper: How Printing Actually Works: video, teaching and worked examples • Day 3: Lesson 5.5: studio brief and sketchbook • Day 4: Lesson 5.5: practice set and corrections • Day 5: Unit 5 test
17	• Day 1: Review day for the midterm • Day 2: Midterm exam • Day 3: Lesson 6.1 Pixels and Paths: How a Computer Stores a Picture: video, teaching and worked examples • Day 4: Lesson 6.1: studio brief and sketchbook • Day 5: Lesson 6.1: practice set and corrections
18	• Day 1: Lesson 6.2 Painting with Pixels: Krita and the Raster Workflow: video, teaching and worked examples • Day 2: Lesson 6.2: studio brief and sketchbook • Day 3: Lesson 6.2: practice set and corrections • Day 4: Lesson 6.3 Drawing with Curves: Inkscape and the Vector Workflow: video, teaching and worked examples • Day 5: Lesson 6.3: studio brief and sketchbook
19	• Day 1: Lesson 6.3: practice set and corrections • Day 2: Lesson 6.4 From Sketch to Finish: Scan, Clean, Ink and Color Your Drawing: video, teaching and worked examples • Day 3: Lesson 6.4: studio brief and sketchbook • Day 4: Lesson 6.4: practice set and corrections • Day 5: Lesson 6.5 The Professional's Toolkit: Adobe, Affinity, Procreate and Yours: video, teaching and worked examples
20	• Day 1: Lesson 6.5: studio brief and sketchbook • Day 2: Lesson 6.5: practice set and corrections • Day 3: Unit 6 test

WEEK	PLAN
	• Day 4: Lesson 7.1 The Golden Age: Howard Pyle, N.C. Wyeth and the Magazine Era: video, teaching and worked examples • Day 5: Lesson 7.1: studio brief and sketchbook
21	• Day 1: Lesson 7.1: practice set and corrections • Day 2: Lesson 7.2 Pictures for Children: Crane, Caldecott, Rackham and the Picture Book: video, teaching and worked examples • Day 3: Lesson 7.2: studio brief and sketchbook • Day 4: Lesson 7.2: practice set and corrections • Day 5: Lesson 7.3 Today's Markets: Editorial, Advertising, Covers and Concept Art: video, teaching and worked examples
22	• Day 1: Lesson 7.3: studio brief and sketchbook • Day 2: Lesson 7.3: practice set and corrections • Day 3: Lesson 7.4 Finding Your Style: Influences, Practice and Consistency: video, teaching and worked examples • Day 4: Lesson 7.4: studio brief and sketchbook • Day 5: Lesson 7.4: practice set and corrections
23	• Day 1: Lesson 7.5 From Brief to Final: The Illustration Job, Start to Finish: video, teaching and worked examples • Day 2: Lesson 7.5: studio brief and sketchbook • Day 3: Lesson 7.5: practice set and corrections • Day 4: Unit 7 test • Day 5: Lesson 8.1 Marks That Mean Something: From Maker's Marks to Modern Identity: video, teaching and worked examples
24	• Day 1: Lesson 8.1: studio brief and sketchbook • Day 2: Lesson 8.1: practice set and corrections • Day 3: Lesson 8.2 What Makes a Logo Good: Simple, Memorable, Versatile: video, teaching and worked examples • Day 4: Lesson 8.2: studio brief and sketchbook • Day 5: Lesson 8.2: practice set and corrections
25	• Day 1: Lesson 8.3 The Logo Process: Brief, Research, Sketches, Refinement: video, teaching and worked examples • Day 2: Lesson 8.3: studio brief and sketchbook • Day 3: Lesson 8.3: practice set and corrections

WEEK	PLAN
	• Day 4: Lesson 8.4 More Than a Logo: Color, Type and the Brand Guide: video, teaching and worked examples • Day 5: Lesson 8.4: studio brief and sketchbook
26	• Day 1: Lesson 8.4: practice set and corrections • Day 2: Lesson 8.5 Presenting and Defending the Work: video, teaching and worked examples • Day 3: Lesson 8.5: studio brief and sketchbook • Day 4: Lesson 8.5: practice set and corrections • Day 5: Unit 8 test
27	• Day 1: Lesson 9.1 How the Web Shows Your Work: Browsers, HTML and CSS Basics: video, teaching and worked examples • Day 2: Lesson 9.1: studio brief and sketchbook • Day 3: Lesson 9.1: practice set and corrections • Day 4: Lesson 9.2 Buttons, Forms and Flows: User Interface Fundamentals: video, teaching and worked examples • Day 5: Lesson 9.2: studio brief and sketchbook
28	• Day 1: Lesson 9.2: practice set and corrections • Day 2: Lesson 9.3 One Design, Every Screen: Responsive Layout: video, teaching and worked examples • Day 3: Lesson 9.3: studio brief and sketchbook • Day 4: Lesson 9.3: practice set and corrections • Day 5: Lesson 9.4 Design in the Feed: Social Graphics, Thumbnails and Email: video, teaching and worked examples
29	• Day 1: Lesson 9.4: studio brief and sketchbook • Day 2: Lesson 9.4: practice set and corrections • Day 3: Lesson 9.5 Prototype and Handoff: Penpot, Figma and Working with Developers: video, teaching and worked examples • Day 4: Lesson 9.5: studio brief and sketchbook • Day 5: Lesson 9.5: practice set and corrections
30	• Day 1: Unit 9 test • Day 2: Lesson 10.1 The Portfolio: Ten Strong Pieces and Where to Show Them: video, teaching and worked examples • Day 3: Lesson 10.1: studio brief and sketchbook

WEEK	PLAN
	• Day 4: Lesson 10.1: practice set and corrections • Day 5: Lesson 10.2 Who Owns the Picture: Copyright, Licensing and Contracts: video, teaching and worked examples
31	• Day 1: Lesson 10.2: studio brief and sketchbook • Day 2: Lesson 10.2: practice set and corrections • Day 3: Lesson 10.3 Pricing the Work: Rates, Quotes and the Freelance Math: video, teaching and worked examples • Day 4: Lesson 10.3: studio brief and sketchbook • Day 5: Lesson 10.3: practice set and corrections
32	• Day 1: Lesson 10.4 Getting Hired: Clients, Studios, Applications and Interviews: video, teaching and worked examples • Day 2: Lesson 10.4: studio brief and sketchbook • Day 3: Lesson 10.4: practice set and corrections • Day 4: Lesson 10.5 A Craftsman's Career: Habits, Ethics and the Long Game: video, teaching and worked examples • Day 5: Lesson 10.5: studio brief and sketchbook
33	• Day 1: Lesson 10.5: practice set and corrections • Day 2: Unit 10 test • Day 3: Review day for the final • Day 4: Final exam

Materials

Sketchbook (at least A5, plain paper), graphite pencils (2H, HB, 2B, 4B), a kneaded eraser and a ruler

Used every week, all year. The sketchbook is part of the grade and becomes evidence of growth in the final portfolio.

Black fineliner pens (e.g. 0.3 and 0.8), a few sheets of bristol or cardstock, and a glue stick

Inking, paste-up exercises and physical mockups.

A computer (Windows, Mac or Linux) able to run free creative software, with a mouse

Krita (painting), Inkscape (vector), GIMP (photo), Scribus (layout) are free downloads; Penpot (interface design) runs free in the browser. Install happens in Unit 6, with a parent.

A phone camera or flatbed scanner

For digitizing drawings in Unit 6 and photographing portfolio pieces.

Craft knife, cutting mat and a metal ruler

Trimming printed work in Unit 5. Used only with the safety rules in the lesson.

Optional: a pen drawing tablet

Helpful from Unit 6 on, never required; every digital brief can be done with a mouse, and the course says so where it matters.

A 'flat file': one folder or box for finished work, and one folder on the computer, organized by unit

The portfolio is assembled from this in Unit 10. Back up the computer folder monthly.

Grading

Grades come from practice sets, studio briefs, the sketchbook, unit tests, the midterm and the final. A calculation earns full credit when the setup, the numbers with units and the answer are all shown. A studio brief earns full credit when it meets the client's specs exactly, is finished on time and is presented cleanly.

PART	%
Practice sets and corrections	**15**
Studio briefs (met the spec, finished, presented)	**25**
Sketchbook	**10**
Unit tests	**30**
Midterm exam	**10**
Final exam	**10**

Scale: A 90–100, B 80–89, C 70–79, D 60–69. Below 60: review and retake the test or redo the brief with help.

- Grade practice sets on completion and corrections: every missed problem reworked correctly earns back its credit.

- Grade briefs the way a client would: did it meet the spec, was it on time, is it clean? A beautiful piece that ignores the spec is a failed job — say so kindly and have it revised, because revision is the trade's daily bread.
- In tests, give partial credit for a correct setup even if the arithmetic slips.
- Keep each unit's portfolio piece; together with the Unit 10 capstone they make a transcript portfolio an employer or art school can actually review.
- For a transcript, this course is a full-year, one-credit elective in fine arts or career and technical education.

A NOTE TO PARENTS

You do not need to be an artist to guide this course. Read the story with your student, ask them to explain the craft back to you, hold the line on finishing every brief to spec, and play the client in the critique and presentation lessons — an honest 'I don't understand this poster' is exactly the training a young designer needs.

The course is deliberately honest about the trade. It teaches the free tools that build real skill and tells students plainly which commercial tools studios use; it practices drawing people from clothed models, as the great illustration schools did with costumed models; it treats copyright as a matter of honesty, pricing as a matter of just weights, and modern image generators factually, as tools with legal and ethical limits a professional must know. Anything done online — downloads, fonts, portfolio hosting — happens with your approval, and a minor's portfolio goes on a parent-managed account.

Throughout, the course treats design and illustration as a vocation of service. Bezaleel was filled with the Spirit of God 'in wisdom, and in understanding, and in knowledge, and in all manner of workmanship' to make things both useful and beautiful. A bulletin a grandmother can read, a label that tells the truth and a picture that feeds a child's imagination are ways of loving our neighbors. *Fabricando fit faber*: by making, one becomes a maker.

UNIT 1

Seeing and Drawing: The Foundation of Every Image

Every career in graphic design and illustration stands on one skill: drawing what you actually see. Not drawing "well" in some vague sense, but seeing honestly — measuring proportions, judging values, constructing space, and putting people on the page convincingly. In this unit you will learn what designers and illustrators actually do for a living and what employers hire for, and then you will begin building the hand and eye that every one of those jobs depends on: line and measurement, light and shadow, perspective, and the human figure drawn from clothed models, in the tradition of Howard Pyle and N. C. Wyeth.

The stories are of working artists who treated seeing as a craft to be learned: Albrecht Dürer, who drew a rhinoceros he had never seen and a hare he had studied for days; Filippo Brunelleschi, who proved with a mirror and a peephole that space on a flat panel could be made believable; and the students in Pyle's Wilmington studio, who drew costumed models by day and took hard critiques by night, and went on to paint the pictures a whole country remembered. You will fill pages the way they did — measured studies, value scales, boxes in perspective, gesture drawings — and finish the unit with the first piece of your professional portfolio: a fully rendered still life in graphite.

PREREQUISITES

- Pre-algebra: ratios and proportions, fractions, percents, and solving $\frac{a}{b} = \frac{c}{d}$ for one unknown
- Basic supplies: an HB and a 2B (or softer) pencil, an eraser, and a sketchbook or a stack of plain paper — no art experience and no computer are needed for this unit
- A willingness to fill pages with honest, imperfect practice drawings; the motto of this course is the school's motto: Fabricando fit faber — the maker is made by making

MASTERY CHECKLIST

- ☐ I can name the main jobs in graphic design and illustration, what each one makes, and what employers and clients actually hire for.
- ☐ I can measure a subject with a pencil at arm's length, state its proportions as ratios, and transfer them to paper at any scale.
- ☐ I can draw a contour that follows the real edge of a thing, not the symbol of it my memory offers.
- ☐ I can build a 9-step value scale, name the five zones of light on a sphere, and render a sphere, cube and cylinder under one light.
- ☐ I can set an eye level, place vanishing points, and draw boxes, simple objects and a room interior in one- and two-point perspective.
- ☐ I can capture a clothed figure's gesture in under two minutes, construct a head with the Loomis method, and draw a believable hand.
- ☐ I can use head-unit proportions (an adult is about 7½ heads tall) to keep a figure's parts in scale.
- ☐ I can explain why professionals from Pyle and Wyeth to today's studios built full figure skill from clothed and costumed models.

FREE RESOURCES FOR THIS UNIT

- **The Metropolitan Museum of Art — Open Access collection**: Hundreds of thousands of free, high-resolution images, including Dürer's prints and master drawings. Search "Dürer drawing" or "study of hands" and download pieces to copy in your sketchbook. Free, no account needed.
- **Smithsonian Open Access**: Millions of free images from the Smithsonian's collections, useful all course long for reference and picture study. A drawing tablet is NOT needed for this unit — or this course; everything here is done with pencil and paper, and later units use free software.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

1.1	**Two Trades, One Craft: What Designers and Illustrators Do**	3 sessions of 50 minutes
1.2	**Drawing What You See: Line, Measurement and Proportion**	3 sessions of 50 minutes
1.3	**Light and Shadow: Value, Form and Rendering**	3 sessions of 50 minutes
1.4	**Perspective and Construction: Making Space Believable**	3 sessions of 50 minutes
1.5	**People on the Page: Gesture, Heads and Hands**	3 sessions of 50 minutes

Unit 1 Test

Time allowed: 50 minutes. A calculator is allowed; a ruler and two pencils (HB and soft) are required for the drawing problems. Show your work and units for every calculation. The test is worth 100 points.

1. **5 pts**
   Name the five main jobs of this field and one deliverable each makes.

2. **6 pts**

   What three things do employers and clients consistently hire for in design and illustration, and which single item is the door into the field?

3. **8 pts**

   You sight a pitcher at 3½ units tall and 2 units wide. Your unit on paper is 4 cm. Give the drawn height and width. Then: the real pitcher is 28 cm tall — what scale factor is your drawing using?

4. **6 pts**

   Explain the difference between drawing from the symbol system and drawing from observation, using Dürer's Rhinoceros (1515) and his Young Hare (1502) as the two examples.

5. **8 pts**

   Compute the digital gray levels (0–255) of a 5-step value scale, and state the step size of a 9-step scale.

6. **6 pts**

   Name the five zones of light on a sphere in order, plus the two shadows that are not on the sphere itself.

7. **8 pts**

   A student's sphere drawing has reflected light at value 3 (of 9) and lit halftones at value 3. State the rule being broken, why it breaks the form, and the fix.

8. **6 pts**

   Where is the horizon line in any picture, by definition? What happens to it when the viewer kneels, and what does it tell you about every drawn box that shows its top surface?

9. **8 pts**

   A fence post 12 ft away draws 6 cm tall. How tall do you draw matching posts at 24 ft and at 36 ft, and what law are you using?

10. **7 pts**

    Your eye level is 5 ft. Explain how the horizon line lets you place a 6-ft figure correctly anywhere on the ground plane of your drawing.

11. **8 pts**

    A standing figure is drawn 12 cm tall. Give the head size, the location of the figure's halfway point (in cm from the top, and the body landmark), and the knee height from the top.

12. **8 pts**

    Explain the costumed-model tradition of the Pyle school and what it proves about building figure skill. Name one artist trained in it and one published result.

13. **8 pts**

    PRODUCTION TASK. Draw a box in two-point perspective sitting below your eye level, and label: horizon line, both vanishing points, and one vertical edge. Then find the perspective center of its top face with diagonals.

14. **8 pts**

    PRODUCTION TASK. Shade a sphere under a light from upper left, with cast shadow, using no more than four planned values. Label all five zones plus the cast and occlusion shadows.

ANSWER KEY

1. Graphic/brand designer — logos, posters, packaging; illustrator — commissioned pictures (covers, book art); production artist — press/publish-ready files; UI designer — app and web screens; art director — directs projects and approves artists' work.
2. A portfolio of strong finished work, reliability with briefs and deadlines, and professional communication (explaining decisions, taking revisions). The portfolio is the door — roughly ten excellent pieces.
3. Height $3.5 \times 4 = 14$ cm; width $2 \times 4 = 8$ cm; $k = 14/28 = 0.5$.
4. Symbol drawing records what the brain knows or assumes (the Rhinoceros: invented armor plates and a shoulder horn, from a description, never checked by sight); observational drawing records what the eye measures (the Hare: each hair and proportion studied from life). The fix for symbol drawing is procedure — sighting and measuring — not talent.
5. 5-step: 0, 64, 128, 191, 255 (steps of $255/4 \approx 64$). A 9-step scale uses steps of $255/8 \approx 32$ levels.
6. Highlight, light, halftone, core shadow, reflected light; plus the cast shadow on the surface below and the occlusion shadow at the contact point.
7. Reflected light belongs to the shadow family, and every shadow value must stay darker than every lit value. At equal values, the shadow side competes with the lit side and the sphere flattens. Fix: push reflected light down to about value 6–7, between halftone and core shadow in darkness.
8. At the viewer's eye level; it drops when the viewer kneels; any box showing its top sits below the eye level.
9. 3 cm and 2 cm; apparent size is inversely proportional to distance ($h_1/h_2 = d_2/d_1$).
10. The horizon cuts everything on the ground plane at exactly 5 ft; on a 6-ft person that is upper-chest height. Anchor each figure's feet to the ground plane and chest to the horizon and the figure is automatically the right size at any distance.
11. Head $= 12/7.5 = 1.6$ cm; midpoint at 6 cm, which is the crotch/hip level (3¾ heads), not the waist; knees at about 5½ heads $= 8.8$ cm from the top.
12. Pyle's students (Wilmington school from 1900, Chadds Ford summers) drew clothed, costumed models — pirates, soldiers, farm wives — learning gesture, construction and drapery entirely from dressed figures. It proves complete

professional figure skill can be built from clothed models. N. C. Wyeth; Scribner's Treasure Island (1911), seventeen canvases.

13. Model answer: horizon ruled high on the paper; two vanishing points near the paper's edges; box started from its nearest vertical edge, both families of horizontal edges converging to their points; verticals truly vertical; top face visible (box below eye level); diagonals of the top face drawn, X marked as its perspective center.
14. Model answer: highlight upper left; halftones darkening toward a curved terminator; core shadow band just past it; reflected light inside the shadow but darker than every lit value; cast shadow to the lower right, darkest and sharpest at contact (occlusion), softer at its far edge; four distinct values identifiable when squinting.

PORTFOLIO PIECE: PORTFOLIO PIECE 1: A STILL LIFE IN GRAPHITE

Your first professional portfolio piece: a finished graphite still life of three to five household objects — at least one rounded form, one boxy form, and one object with a handle or spout — arranged under a single strong light. Work at 9 × 12 in or larger. Sight and measure the whole arrangement first (ratios written on a separate process sheet), construct the forms from boxes and cylinders in correct perspective, then render with a planned value scheme of four to five values, shadows kept in their family.

Deliver like a professional: the finished drawing, clean-edged and signed, plus a one-page process sheet showing your thumbnails, measurements and value plan. Photograph or scan both in even light. This is the first of the ten pieces this course builds — the one that proves to any future reviewer that you can see, measure, construct and render. Keep every stage; Unit 2's lesson on critique will send you back to this piece with fresh eyes.

LOOK FOR	WHAT IT MEANS
Proportion	Objects' ratios match the sighted measurements on the process sheet; one consistent scale factor throughout; plumb-line relationships hold.
Construction	Forms are built from boxes, cylinders and ellipses with a consistent eye level; ellipses and receding edges obey the perspective of the setup.
Value and light	A planned scheme of 4–5 values; all five zones present on rounded forms; shadow family consistently darker than lit family; cast shadows darkest at contact.
Craftsmanship	Clean edges and surface, controlled gradations, no shiny pressed graphite, thoughtful margins; signed and dated.
Process documentation	Process sheet shows thumbnails, written ratios, and the value plan — evidence of professional method, not luck.
Presentation	Photographed or scanned square and evenly lit, titled and ready to show a reviewer.

1.1 Two Trades, One Craft: What Designers and Illustrators Do

OBJECTIVES

- Name the main jobs in the field — graphic/brand designer, illustrator, production artist, UI designer and art director — and tell what each one makes and who pays for it.
- Explain what employers and clients actually hire for: a portfolio of finished work, reliability with deadlines, and the ability to take direction — and why a portfolio outweighs a diploma in this field.
- Describe how this course builds that portfolio: ten units, ten finished pieces, all made with pencil, paper and free professional software.

> **Warm-up.** Gather five designed things from around your house: a cereal box, a book cover, a church bulletin, a can label, an app icon on a phone. For each, write one sentence: what was this made to DO (sell, inform, invite, decorate)? Then guess: did one person make it, or several? Keep the list; you will sort it again at the end of the lesson.

WATCH

How Would I learn to design (If I had to start over)

Flux Academy · 12:46

https://www.youtube.com/watch?v=PkI1jCSwWZ4

> **WHEN TO WATCH**
> After the third core idea. A working designer lays out the order in which design skills are actually learned — notice how closely his list matches this course's units.

Note: Ran is a professional designer and teacher. Notice that his starting point is fundamentals, not software, and that he keeps returning to building a body of work. Skip past the course promotion at the start.

BACKUP VIDEO

Should You Be an Illustrator?

Jake Parker · 9:12

https://www.youtube.com/watch?v=ECZkS3-Qwbc

With the illustration half of the lesson. Jake Parker has illustrated picture books and comics for 20 years; he walks through a real commissioned piece from brief to final while he talks about the trade.

KEY TERMS

graphic design

The craft of arranging type, image and space to communicate a message for a client — a poster, a logo, a package, a page.

illustration

A picture made to serve a text or a product: a book cover, a magazine piece, a character, a label. Art with a job to do.

art director

The experienced designer or illustrator who sets the visual direction of a project, hires artists, and approves or revises their work.

client brief

The written description of a job: who the client is, what must be made, for whom, by when, and within what limits.

portfolio

A curated set of your best finished pieces — usually about ten — that shows an employer or client what you can be hired to do.

production artist

The specialist who prepares approved designs for printing or publishing: correct files, sizes, colors and formats, with no errors.

UI designer

A designer of user interfaces — the screens, buttons and menus of apps and websites — where layout decisions must also work when touched and clicked.

CORE IDEAS

The story. Around 1450, in Mainz, Germany, Johannes Gutenberg set up a workshop that had to solve every problem this course teaches: he needed letterforms (his assistant Peter Schöffer was a trained calligrapher), page layout (the famous 42-line Bible, printed about 1455, set its text in two measured columns with margins a modern designer still admires), production (metal type, ink, presses, about 180 copies), and even marketing — his partner Johann Fust sold the Bibles. Four hundred and fifty years later, in 1900, the American illustrator Howard Pyle opened a school in Wilmington, Delaware, that trained the artists of the "Golden Age of Illustration." Magazines like The Saturday Evening Post reached over two million subscribers in the 1920s, and every issue needed covers and story pictures. Pyle's student N. C. Wyeth painted seventeen canvases for Scribner's 1911 edition of Treasure Island, was paid about $2,500 — serious money then — and bought the Pennsylvania property where he raised a family of artists. Design and illustration have been paying trades for five centuries.

How they figured it out. For most of that time nobody called it "graphic design." A printer set type; an engraver cut pictures; a "commercial artist" drew advertisements. The jobs slowly split apart as printing grew: by the 1890s a magazine like Harper's employed an art editor (Edward Penfield held the job from 1891 to 1901) who commissioned artists, planned covers and drew posters himself — the first modern art director. In 1922 the American book designer William Addison Dwiggins coined the term *graphic design* to cover the whole craft of designing for reproduction,

and the name stuck. The lesson in the history is important for your career: the tools change constantly — woodblock, lithograph, phototype, desktop computer, tablet — but the craft underneath (seeing, drawing, arranging, communicating) carries over every time. People who learned only a tool were stranded at every change; people who learned the craft moved straight across.

The craft. Here are the jobs, in plain terms. A *graphic designer* (or *brand designer*) arranges type, image and space to carry a message: logos, posters, packaging, publications. An *illustrator* makes pictures to order: book and magazine art, product art, characters, covers. A *production artist* takes approved designs and makes them print- and publish-ready — exacting, detail work that is many designers' first job. A *UI designer* designs app and web screens. An *art director* — usually a designer or illustrator with ten or more years of experience — runs projects and other artists. The U.S. Bureau of Labor Statistics counted roughly 270,000 graphic-design jobs in the United States at a median pay of about $59,000 a year (2023); illustrators are counted among fine artists at a similar median, with wide variation — beginners earn less, and strong specialists earn far more. What gets a person hired is remarkably consistent across the whole field, and employers say it openly: a portfolio of about ten excellent finished pieces; evidence you can take a brief and hit a deadline; and the ability to explain your decisions and accept revisions without sulking. A diploma can help; a portfolio is required. That is good news for a homeschool student: the door is the work itself.

In the studio. A real job runs like this. The client (or an art director) sends a brief. The designer or illustrator sends back rough ideas — thumbnails and sketches — and the client picks one. The artist refines it, the client asks for revisions (two or three rounds is normal and is written into the agreement), and the final files are delivered by the deadline. Today's studios do this work in Adobe Photoshop, Illustrator and InDesign, which are the industry standards, alongside Affinity's apps and Procreate on the iPad. This course uses free professional tools instead — Krita for painting, Inkscape for vector work, GIMP for photos, Scribus for layout, Penpot for interfaces — and you should know, honestly, that the skills transfer directly: layers are layers, curves are curves, and when you are job-hunting you can learn Adobe's menus and shortcuts in a week of free trial. No purchase is ever required in this course. Each of the ten units ends with a portfolio piece built to professional standards, so that when

you finish, you are not holding a certificate — you are holding the ten pieces an employer actually asks to see.

In the studio, continued. One more honest word about the two trades in this course's title. Design and illustration overlap — many professionals do both — but they sell differently. Designers are mostly hired for ongoing business needs (every company needs a logo, a website, packaging), so design employment is steadier. Illustration is mostly freelance and commissioned piece by piece, so illustrators live by their style, their reliability and their relationships with art directors. The foundation, though, is one craft: every art director who hires either one is asking the same silent questions — can this person see, draw, compose, and finish? Unit 1 starts on exactly those skills.

PICTURE STUDY



Harper's August, Edward Penfield, 1897 · Color lithograph poster · Library of Congress, Washington, D.C.
Image: Wikimedia Commons, public domain

Edward Penfield was the art editor of Harper's Magazine from 1891 to 1901 — commissioning artists, planning covers, and drawing a new poster himself nearly every month. He is often called the father of the American poster, and he is also the first clear example of the modern art director: an artist whose job was both making pictures and directing them.

This poster had one job: make a passerby want the August issue. Study how few things Penfield needed to do it.

Look closely

- Count the colors. How many did the printer need for this poster?
- Find the magazine in the picture. Why would Penfield put the product itself in the lady's hands?
- Look at the outlines. Are these shapes shaded and rounded, or flat like cut paper?
- Where is your eye meant to go first — the figure or the lettering? What makes you sure?
- What tells you it is August without reading a word?

Talk about it

1. Penfield was artist and art director at once. Which decisions here feel like an artist's, and which like a director's?
2. A poster is read in about two seconds from across a street. What did Penfield leave out to make that possible?
3. Is this design, illustration, or both? Defend your answer using this lesson's definitions.

STUDIO BRIEF

Studio Brief: A Field Guide to the Trade

Your client is a homeschool co-op that wants a clear, hand-made reference poster answering one question for students and parents: "What jobs are there in design and illustration, and how do you get one?" Deliverable: one poster, pencil and pen on paper, 11 × 17 in or two letter sheets side by side. Deadline feel: one week, three working sessions. This brief is also for you — the finished poster will hang over your desk for the rest of the course.

You will need

- Two letter sheets or one 11 × 17 sheet, plus scrap paper for roughs
- Pencil, eraser, and a dark pen or fine marker for final lines
- A ruler
- Your notes from the lesson videos and core ideas
- Optional: colored pencils for headings

Steps

1. **Read the brief twice.** Underline what must be on the poster: the five jobs, what each makes, what employers hire for, and the path in (a ten-piece portfolio).
2. Research like a professional: from the lesson and the two videos, write one plain sentence per job and three bullet points on hiring. No sentence longer than twelve words.
3. Thumbnail first: on scrap paper, sketch three different layouts for the poster, each no bigger than a playing card — a column chart, a map with branching paths, a 'family tree' of jobs. Three minutes each.
4. Pick the clearest thumbnail (ask someone to point at the one they understand fastest).
5. Rule light pencil guidelines on the final sheet: a title zone, five job zones, one hiring zone. Keep margins of at least one inch.
6. Letter the title large and the job names medium — pencil first, checking spelling before pen.

7. Add one small drawing beside each job: a logo sketch for the designer, a book for the illustrator, a screen for the UI designer, and so on.
8. Ink the final lines, erase the pencil, and sign and date the corner like a working artist.
9. **Deliver.** Present the poster to your family in two minutes: the jobs, the hiring rules, and which job currently interests you most and why.
10. **Check your work** against the brief: is every required item on the sheet, readable from six feet away?

Tips

- Fewer words, larger: a poster is not an essay.
- If two zones look equally important, the poster has no order — make the title clearly biggest.
- Professionals never skip thumbnails; the cheap, fast version of a mistake costs three minutes instead of three hours.

Check your work

- ☐ All five jobs appear with an accurate one-line description each.
- ☐ The three hiring points (portfolio, reliability, communication) are on the poster.
- ☐ A stranger can find and read the title, the jobs, and the path in, in under thirty seconds.

SKETCHBOOK

1. Copy the little drawings you invented for each job onto one page, labeled — your first icon set.
2. Write the brief you drafted in Practice 11 at the top of a page, and thumbnail two ideas for it underneath.
3. A timeline across one spread: Gutenberg's workshop (c. 1455), Penfield at Harper's (1891), Pyle's school (1900), Wyeth's Treasure Island (1911), Dwiggins coins "graphic design" (1922), desktop publishing (1985), and today — with you penciled in at the end.

> **From history.** The Golden Age of Illustration (roughly 1880–1930) was created by a technology and a business model: photomechanical printing made reproducing paintings cheap, and national magazines sold advertising against huge circulations — The Saturday Evening Post passed two million copies a week in the 1920s. Publishers competed for star illustrators the way studios later competed for movie stars; Pyle's students — N. C. Wyeth, Frank Schoonover, Harvey Dunn and dozens more — filled those pages. When photography displaced illustrated fiction after mid-century, illustrators moved to book covers, advertising, children's books and, later, film and game studios: the craft moved house again, as it always has.

PRACTICE

1. Easy Match the maker to the deliverable: (a) logo and brand colors for a new bakery; (b) cover painting for a novel; (c) press-ready files for a magazine ad; (d) the checkout screens of an app.

   Show answer

   (a) graphic/brand designer; (b) illustrator; (c) production artist; (d) UI designer.

2. Easy Who is the art director, and name two things one does on a project.

   Show answer

   The senior artist who sets visual direction; typical duties: writes or interprets the brief, hires the designer/illustrator, reviews sketches, requests revisions, approves the final.

3. Easy What three things do employers and clients consistently hire for in this field?

   Show answer

   A portfolio of strong finished work; reliability with briefs and deadlines; the ability to explain decisions and take revisions professionally.

4. Easy What did William Addison Dwiggins contribute in 1922?

   Show answer

   He coined the term "graphic design" to name the whole craft of designing for reproduction.

5. **Medium** Take your warm-up list of five designed things. For each, name which job most likely made it and one decision that person had to get right.

Show answer

Example: cereal box — graphic designer (with an illustrator for the mascot); had to make the name readable across a store aisle. Any reasonable pairing of job and decision counts.

6. **Medium** Gutenberg's workshop (about 1450–1455) already contained the main jobs of this field. Match: letterforms, page layout, press-ready production, selling the finished Bibles.

Show answer

Letterforms — type design (Schöffer's calligraphy); layout — graphic design (the two-column 42-line page); production — production artist (type, ink, presswork); selling — the client/business side (Fust).

7. **Medium** Why is design employment generally steadier than illustration, and what do successful freelance illustrators depend on instead?

Show answer

Businesses need design continuously (logos, sites, packaging), so staff jobs exist; illustration is commissioned piece by piece, so illustrators depend on a recognizable style, reliability, and relationships with art directors.

8. **Medium** A friend says: "I can't start learning design — I can't afford Photoshop." Give the honest two-part answer this lesson teaches.

Show answer

First, fundamentals are learned with pencil and paper, and free professional tools (Krita, Inkscape, GIMP, Scribus, Penpot) cover real work. Second, Adobe is the industry standard and the skills transfer; learn its names and shortcuts with a free trial when job-hunting.

9. Hard You are the art director. Two applicants want an illustration job: one has a design-school diploma and six unfinished "someday" projects; one is self-taught with ten finished pieces, three done to real briefs with deadlines met. Who do you interview first, and what does that tell you about this course's plan?

Show answer

The second: the portfolio proves seeing, drawing, finishing and reliability, which is what the job needs. The course therefore ends every unit with a finished portfolio piece done to a brief — ten by the end.

10. Hard The tools of this trade changed from woodblock to lithograph to phototype to computer. State the career rule this history teaches, and give one example of a skill that survived every change.

Show answer

Learn the craft, not just the tool; tool-only workers are stranded at each change. Surviving skills: drawing, composing a page, choosing and arranging type, judging value and color.

11. Challenge Write a one-paragraph client brief for something your own family actually needs (a bulletin cover, a yard-sale poster, a label for grandma's jam). Include: client, deliverable, audience, message, size, deadline.

Show answer

Model: "Client: Shoemaker family. Deliverable: one jam-jar label, 3 in × 2 in. Audience: church bake-sale shoppers. Message: homemade blackberry jam, made this summer. Must include name and date. Deadline: Friday." Any brief with all six parts is correct.

COMMON MISTAKES

- Thinking the trade starts with software. It starts with seeing and drawing; studios test for fundamentals, not menus.
- Treating "talent" as the entry ticket. The entry ticket is a portfolio, and portfolios are built by ordinary, scheduled practice.
- Confusing fine art with commercial art. A gallery painter pleases himself first; a designer or illustrator serves a client's message — and that service, done excellently, is honorable craft, not compromise.

Make it a game · Name That Job. A parent reads out deliverables one at a time: "a cereal-box mascot," "press-ready files for a church cookbook," "the menu screens of a game," "a brand's logo and colors," "the person who rejects your first sketch." You name the job in five seconds and one skill it needs. Ten rounds; then swap — you invent deliverables and the parent answers. Beat your score tomorrow.

Scripture. “Them hath he filled with wisdom of heart, to work all manner of work, of the engraver, and of the cunning workman, and of the embroiderer, in blue, and in purple, in scarlet, and in fine linen, and of the weaver, even of them that do any work, and of them that devise cunning work.” (Exodus 35:35, KJV)

When God commissioned the tabernacle, He filled Bezaleel and Aholiab with wisdom for visual work — engraving, color, pattern, and "devising cunning work," which is design. Making images and arrangements that serve others is a calling God has equipped people for from the beginning.

1.2 Drawing What You See: Line, Measurement and Proportion

OBJECTIVES

- Measure any subject with a pencil held at arm's length — units, plumb lines and angle sighting — and state its proportions as ratios.
- Transfer measured proportions to paper at any scale using the scale factor $k = \frac{\text{drawing size}}{\text{actual (or sighted) size}}$.
- Draw slow contour and blind-contour studies that follow the real edge of the subject instead of the remembered symbol of it.

> **Warm-up.** Without looking at your hand, draw it from memory in two minutes. Now look at your hand and draw it again for two minutes, eyes moving between hand and paper. Put the two side by side and write one sentence: what did your memory get wrong that your eyes got right?

WATCH

How to Draw Accurate Proportions

Proko · 12:04

https://www.youtube.com/watch?v=1J7RQvKnWf4

> **WHEN TO WATCH**
> After the third core idea. Pause each time Stan introduces a technique — unit measuring, plumb lines, angles — and try it immediately on a mug in front of you.

Note: Stan Prokopenko teaches the exact measuring toolkit in this lesson: choosing a unit, comparing everything to it, and checking with vertical and horizontal sight lines. Keep a pencil in hand while you watch.

BACKUP VIDEO

Learn to Draw in Minutes: 5 Essential Principles That Actually Work

Brent Eviston | Drawing & Creativity · 14:16

https://www.youtube.com/watch?v=VKwakmbFCVg

Any time in the lesson. Eviston, author of The Art & Science of Drawing, demonstrates the beginner principles — drawing from the shoulder, light lines first, basic shapes before details — that make the measuring techniques work.

KEY TERMS

sighting
Measuring a subject by holding a pencil at arm's length with a locked elbow and marking lengths and angles against it with your thumb.

unit measurement
Choosing one part of the subject (a mug's width, a head's height) as the unit, and stating every other length as so-many units.

proportion
The size relationship between parts, written as a ratio — a pitcher might be 2½ times as tall as it is wide, whatever size you draw it.

plumb line
A true vertical (from "plumb bob") sighted through the subject to check what lines up above what.

contour drawing

A slow line drawing that follows the subject's real edges and surface edges, eye and hand moving together.

blind contour

A contour drawn without looking at the paper at all — the strongest exercise for forcing the eye to lead the hand.

scale factor

The number every measurement is multiplied by to change size: k = drawing/actual. The same k must be used for every part, or the drawing is out of proportion.

CORE IDEAS

The story. In 1515 a live Indian rhinoceros — the first in Europe in over a thousand years — arrived in Lisbon as a gift to King Manuel I of Portugal. Albrecht Dürer, in Nuremberg, never saw it. Working from a merchant's letter and a secondhand sketch, he cut a woodblock print of the beast, armored in riveted plates like a knight, with a small spare horn on its shoulders that no real rhinoceros has. The print was magnificent, confident — and wrong. It sold an estimated four to five thousand copies in his lifetime and defined what Europeans "knew" a rhinoceros looked like for two centuries. Yet the same Dürer, when he could observe, was devastatingly honest: his 1502 watercolor *Young Hare* renders each stiff guard hair and the glassy eye from patient study, and his 1508 *Praying Hands* was drawn from a live model. One artist, two kinds of drawing: drawing what you *know*, and drawing what you *see*. This lesson is about learning to tell them apart in your own hand.

How they figured it out. Why do beginners draw eyes on the top of the head and mugs with impossible openings? Because the brain stores quick symbols — an eye is an almond, a mug is a cylinder-with-a-C — and under time pressure the hand draws the symbol instead of the thing. Art teachers have attacked this for a century. Kimon Nicolaïdes, who taught at New York's Art Students League, built his book *The Natural Way to Draw* (published 1941) around contour and gesture exercises that force the eye to crawl along the actual edge. In 1979 Betty Edwards's *Drawing on the Right Side of the Brain* showed beginners improving dramatically in days once exercises (like copying a picture upside-down) stopped the symbol system from interfering. And long before either, atelier students learned *sight-size* and comparative measurement:

don't trust the brain's labels; measure. The fix for symbolic drawing is not talent. It is procedure.

The craft. The procedure is sighting. Hold your pencil at arm's length, elbow locked (a bent elbow changes the measuring distance and ruins every comparison), close one eye, and lay the pencil against the subject. Choose a *unit* — the width of the mug, the height of the apple — marking it with your thumb on the pencil. Now compare: the mug's height is one-and-a-half widths; the pitcher beside it is three units tall; the gap between them is half a unit. Write proportions as ratios: height : width = 3 : 2. Check alignments with a *plumb line* — hold the pencil truly vertical: does the spout line up above the foot of the pitcher? Check angles by rotating the pencil to match a tilting edge, then carrying that angle carefully to the paper. Work from big to small: place the largest proportions first, because an error in a small detail costs an eraser, but an error in a big proportion costs the whole drawing.

The craft, continued. Ratios free you from size: once you know the pitcher is 3 units tall and 2 wide, you can draw it two inches tall or two feet tall. The scale factor does the arithmetic. If the real pitcher is 24 cm tall and your drawing is 12 cm, then $k = 12/24 = 1/2$, and every other measurement must be multiplied by the same $\frac{1}{2}$: the 16 cm width becomes 8 cm, the 6 cm handle becomes 3 cm. Mixed scale factors are exactly what "out of proportion" means. The companion skill is *contour drawing*: pick a starting point on the subject's edge and move your eye along it at a snail's pace, letting the pencil record every bump and turn, as if the pencil point were touching the object itself. Do some contours *blind* — never looking at the paper. The results look strange, and that is fine; the exercise is for the eye, not the refrigerator door.

In the studio. Professionals never stop doing this. A children's-book illustrator keeps a sketchbook of drawn-from-life chairs, boots and bicycles, because invented objects drawn from symbols look rubbery and false on the page. Concept artists in game and film studios do "studies" — measured drawings of machines, animals, drapery — and share them in portfolio reviews precisely because art directors read them as proof of a trained eye. And in design work the same discipline appears as craftsmanship: noticing that a logo's two circles are not quite concentric, that a margin is 3 mm off — seeing what is actually there, not what you assume is there. Ten minutes of measured drawing a day builds this faster than three hours on Saturday; put it in your schedule like practice scales.

PICTURE STUDY



Young Hare, Albrecht Dürer, 1502 · Watercolor and gouache on paper · Albertina, Vienna

Image: Wikimedia Commons, public domain

In 1502, in his Nuremberg workshop, Albrecht Dürer sat down in front of a living hare and drew exactly what he saw. He built the coat in layers — a wash of warm brown, then hundreds of individual strokes laid in the direction the fur actually grows, lighter over the shoulders, darker in the ear's hollow — and finished with whiskers and single guard hairs flicked in white. Look closely at the eye: Dürer painted the reflection of his studio's window in it. That is not decoration; it is evidence. The animal was there, the light was real, and the artist measured everything against the thing itself.

Thirteen years later the same man drew his famous Rhinoceros — an animal he never saw — from a written description, and invented armor plates that fooled Europe for two centuries. The two pictures are this lesson's whole argument standing side by side: knowledge can carry a drawing a long way, but only sighting, measuring and comparing against the subject in front of you can make it true. The Young Hare is what drawing what you see looks like when it is done as well as it has ever been done.

Look closely

- Check the proportions the way this lesson teaches: how long are the ears compared with the head? Compare the haunch mass with the head mass.

- Follow the fur. Where do the strokes run long and flat, and where do they shorten and curl? What does each change tell you about the form underneath?
- Find the window reflected in the eye. What does that single detail prove about how this picture was made?
- Where is the light coming from? Find the shadow the hare sits in and the lit edge along its back, and test whether they agree.
- Find the monogram and date. Why might Dürer have signed a study of a hare as proudly as a commissioned painting?

Talk about it

1. Dürer drew the hare from life in 1502 and the Rhinoceros from a letter in 1515. What could the second picture have gotten right if he had been able to sight and measure the real animal for even an hour?
2. The fur looks effortless, but it is thousands of decisions about direction, length and value. How does careful measurement make that kind of patience possible rather than overwhelming?
3. A photograph records a hare in a millisecond. What does a measured drawing like this one record that a photograph does not?

Safety first. Drawing is physically light work, but long sessions strain eyes, neck and hand. Work in good light, sit upright with the page angled toward you, and every 25 minutes stand, stretch your fingers backward gently, and focus your eyes on something across the room for twenty seconds.

STUDIO BRIEF

Studio Brief: Twelve Honest Objects

Your client is a publisher of nature and household field guides who hires artists by one test: "Send us drawn-from-life object studies; we can tell in ten seconds who actually looks." Deliverable: a portfolio insert of twelve measured object drawings plus three blind contours, pencil on paper, each labeled with its sighted ratios. Deadline feel: three sessions.

You will need

- Sketchbook or twelve sheets of plain paper
- HB and 2B pencils, eraser
- One pencil reserved as your measuring stick
- Twelve household objects of increasing difficulty: mug, spoon, jar, book, shoe, pitcher, scissors, hammer or trowel, a plant, a chair, a kettle, and one of your own choosing
- Good steady light from one side

Steps

1. Set up the first object at arm's-length-plus distance, light from one side.
2. **Sight before you draw.** Choose a unit, measure height, width and one internal landmark, and write the ratios in the page corner.
3. Block in the big proportions lightly — largest shapes first, no details.
4. Check two plumb lines and one angle against the subject; correct before continuing.
5. Finish with a slow contour pass over your block-in, following real edges.
6. Repeat for all twelve objects across the three sessions — four per session is a professional pace.
7. After each session's objects, do one five-minute **blind contour** of your non-drawing hand. Label it "blind" and date it.
8. On the last session, lay out all fifteen drawings. Mark your best three with a star, your most honest failure with an X.

9. **Deliver:** write the client a four-sentence cover note: what you measured, what improved from object 1 to object 12, and which study you would send first.
10. **Check your work** against the brief: ratios written on every measured study, one consistent scale per drawing.

Tips

- If a drawing goes wrong, finish the measuring anyway and start the object again on a fresh page; professionals restate, they don't polish a wrong block-in.
- Draw the spaces between things (the triangle inside a scissors' handles) when the object itself confuses you — negative shapes don't carry symbols.
- Date every page. In Unit 10 you will be glad you can prove how far you came.

Check your work

- ☐ Twelve measured studies, each with sighted ratios written beside it.
- ☐ Three dated blind contours.
- ☐ I can show where I used a plumb line and an angle check, and what each one corrected.

SKETCHBOOK

1. Your warm-up pair (memory hand vs. observed hand) taped or redrawn side by side, with three sentences on what the symbol system invented.
2. A page of pure ratios: ten household objects sighted and recorded as height : width, no drawings — measurement as its own skill.
3. One object drawn three times at three scale factors (k = 0.5, 1, 2 of your first drawing), proving the ratios survive every size.

KEY FORMULAS

proportion: $\frac{a}{b} = \frac{c}{d}$ (cross-multiply to solve: $ad = bc$)

$k = \frac{\text{drawing measurement}}{\text{sighted or actual measurement}}$, the same k for every part

$\text{new size} = \text{old size} \times \frac{\text{percent}}{100}$

From history. Dürer took measurement further than any artist of his age: his Four Books on Human Proportion (published 1528, just after his death) records years of measuring real people and stating their proportions as ratios of total height. He also drew with mechanical aids — gridded frames and sighting devices — and published them so other artists could build their own. The measuring habit you learned today with a pencil and thumb is five hundred years old, and it has outlived every fancier tool because it travels in your pocket.

WORKED EXAMPLES

Example 1. You sight a water pitcher: it is 3½ mug-widths tall. On paper your mug-width unit is 4 cm. How tall must the pitcher be in the drawing?

Show solution

1. The unit on paper is 4 cm; the pitcher is 3.5 units.
2. $3.5 \times 4 \text{ cm} = 14 \text{ cm}$.
3. Check with a plumb line that the spout sits above the foot before rendering anything.

Answer: 14 cm tall.

Example 2. A real watering can is 24 cm tall and 16 cm wide. You draw it 9 cm tall. What scale factor are you using, and how wide must the drawing be?

Show solution

1. $k = 9/24 = 0.375$.
2. Width: $16 \times 0.375 = 6$ cm.
3. If you had drawn the width 8 cm "because it looked right," the can would be too fat by a third — two scale factors in one drawing.

Answer: $k = 0.375$; the drawn width is 6 cm.

Example 3. In your sighting, a bottle is 5 thumbs tall and its neck is 2 thumbs. In the drawing the bottle is 12 cm tall. How long is the neck? Solve with a proportion.

Show solution

1. Set up $\frac{\text{neck}}{12} = \frac{2}{5}$.
2. Cross-multiply: $5 \times \text{neck} = 24$, so neck $= 4.8$ cm.

Answer: 4.8 cm.

Example 4. A client asks you to enlarge a 10 cm × 15 cm sketch by 150% for a flyer. What are the new dimensions, and does the shape of the rectangle change?

Show solution

1. 150% means $k = 1.5$.
2. $10 \times 1.5 = 15$ cm; $15 \times 1.5 = 22.5$ cm.
3. The ratio 10 : 15 = 2 : 3 and 15 : 22.5 = 2 : 3 — the same. Uniform scaling never changes proportions; that is the whole point of using one k.

Answer: 15 cm × 22.5 cm; the proportions (2 : 3) are unchanged.

PRACTICE

1. Easy Why must your elbow be locked when sighting with a pencil?

   Show answer

   Measurements are compared against each other; a bending elbow changes the pencil's distance from your eye between measurements, so the comparisons are no longer fair.

2. Easy A jar is 2 units tall and 1½ units wide. Write its height-to-width ratio two ways.

   Show answer

   2 : 1.5, which simplifies to 4 : 3 (or $h/w = 4/3 \approx 1.33$).

3. Easy Sight three objects on your table using one of them as the unit. Record each as a ratio.

Show answer

Any honest set of measurements counts, e.g., mug = 1 unit wide, 1¼ tall; cereal box = 2 wide, 3¼ tall; spoon = 1¾ long.

4. Easy What is a blind contour for, if the drawing itself usually looks wrong?

Show answer

It trains the eye to travel the real edge and the hand to follow the eye; the drawing is a by-product, the seeing is the product.

5. Medium A lamp sights 4.5 units tall; your unit on paper is 3 cm. Drawn height?

Show answer

$4.5 \times 3 = 13.5$ cm.

6. Medium A 30 cm tall plant is drawn 12 cm tall. Find k, and the drawn width of its 20 cm pot.

Show answer

$k = 12/30 = 0.4$; pot $= 20 \times 0.4 = 8$ cm.

7. Medium You drew a teapot 10 cm wide and 9 cm tall. Sighting says the real ratio of width to height is 5 : 4. Is your drawing in proportion? If not, what should the height be?

Show answer

5 : 4 means height = width × 4/5 = 8 cm. At 9 cm the pot is drawn 1 cm too tall — out of proportion.

8. Medium Explain Dürer's rhinoceros in this lesson's terms: what kind of drawing was it, and why was it both wrong and magnificent?

Show answer

It was drawn from knowledge and description, not observation — a symbol drawing executed with masterly craft. Magnificent construction, but the armor plates and shoulder horn came from his imagination, and no measuring eye ever checked them.

9. Hard A client wants your 8 in × 10 in drawing reduced to fit a 6 in tall space. What k, what new width, and what percent is this reduction?

Show answer

$k = 6/10 = 0.6$; width $= 8 \times 0.6 = 4.8$ in; it is a reduction to 60%.

10. Hard Your still life drawing looks subtly wrong. You check: the mug is drawn at k = 0.5 but the pitcher behind it at k = 0.4. The real pitcher is 24 cm tall and you drew it 9.6 cm. How tall should it be to match the mug's scale, and what is this error called?

Show answer

At $k = 0.5$ it should be $24 \times 0.5 = 12$ cm, not 9.6 cm. The drawing is out of proportion — two scale factors in one picture.

11. Hard Set up a two-object still life. Measure five relationships (two heights, two widths, one gap) in units and draw the arrangement at k chosen so it fills most of your page. Submit measurements and drawing.

Show answer

Graded by the check: all five recorded as ratios; one consistent k; plumb-line check noted. The drawing need not be pretty — it must be measured.

12. Challenge Draw your own hand twice: a five-minute slow contour (looking at the paper as needed) and a five-minute blind contour. Then write three honest sentences comparing them to your warm-up memory drawing.

Show answer

Expected finding: the memory drawing used symbols (almond nails, sausage fingers); the contours found knuckle wrinkles, uneven finger lengths and foreshortening the symbol system never offers.

COMMON MISTAKES

- Measuring with a bent elbow or two open eyes — both change the comparison and quietly ruin every ratio.
- Starting with details (the mug's logo, the plant's leaves) before the big proportions are placed. Big to small, always.
- Using different scale factors for different parts of one drawing — the signature error called "out of proportion," and the first thing a trained eye sees.

Make it a game · One Unit, Everything. Hold up a pencil and pick a unit — the width of the kitchen window. Family members call out objects in the room ("the door!", "the table!") and you sight each one in window-widths within ten seconds, writing your answer before checking with a tape measure where possible. Score a point for every estimate within half a unit. Five points wins; then someone else takes the pencil.

Scripture. “The hearing ear, and the seeing eye, the LORD hath made even both of them.” (Proverbs 20:12, KJV)

Seeing is a created gift, and like every gift it can be trained and stewarded. An artist who learns to see honestly is exercising the instrument God made — and honest seeing, like honest hearing, is the beginning of truthful work.

1.3 Light and Shadow: Value, Form and Rendering

OBJECTIVES

- Build an even 9-step value scale and match values in the world to steps on the scale by squinting.
- Name and place the five zones of light on a form — highlight, light, halftone, core shadow, reflected light — plus the cast shadow and occlusion shadow.
- Render a sphere, cube and cylinder under a single light so they read as solid, and explain the difference between form shadow and cast shadow.

> **Warm-up.** Put a white cup on white paper near a lamp, turn off other lights, and squint at it until the details blur. Count how many distinctly different darknesses you can see — on the cup, under the cup, behind the cup. Write the number down. Most people find five to seven; by the end of this lesson you will be able to name them.

WATCH

Shading Light and Form - Basics

Proko · 7:15

https://www.youtube.com/watch?v=V3WmrWUEIJo

> **WHEN TO WATCH**
> After the third core idea. Pause on the lit sphere diagram and copy it, labeling all five zones plus the cast shadow before you continue.

Note: Stan Prokopenko's classic introduction to how light describes form: the terminator, halftones, core shadow and reflected light, demonstrated on simple forms. Short and dense — plan to watch it twice.

BACKUP VIDEO

The 5-Step Shading Process That Will Transform Your Drawings

Brent Eviston | Drawing & Creativity · 37:51

https://www.youtube.com/watch?v=v3MsfZ-wjzA

As a full demonstration before the studio brief. It is long; watch the first half in one sitting and the rendering passes in another, drawing along with his still-life subject.

KEY TERMS

value

How light or dark something is, independent of its color. Value, not color, is what makes a drawing read as solid.

value scale

An evenly stepped strip from white to black — classically 9 steps — used to measure and limit the values in a drawing.

halftone

The middle values on the lit side of a form, where the surface turns gradually away from the light.

core shadow

The darkest band of the form shadow, just past the terminator where the surface stops facing the light.

reflected light

Light bounced back into the shadow side from nearby surfaces; it lightens the shadow but almost never as light as any lit halftone.

cast shadow

The shadow a form throws onto other surfaces — darkest and sharpest where the object meets the surface, softer as it stretches away.

terminator

The line (on a sphere, a curve) where the surface turns from lit to unlit; the boundary where the form shadow begins.

CORE IDEAS

The story. In 1514 Albrecht Dürer engraved *Saint Jerome in His Study*, one of his three "master engravings" of 1513–1514, and set himself a problem no one had solved so completely: fill a whole room with believable sunlight, using nothing but black lines on white paper. Light pours through the bullseye windows, pools on the floor, turns around the rounded ceiling beams, glows in the saint's halo, and leaves the lion and the dog dozing in soft half-shadow. There is no gray ink in an engraving. Every tone is an illusion built from line spacing: lines packed tight read dark, lines spread apart read light, crossed layers go darker still. Dürer was manufacturing *values* — and proving that if you control value, you control light, space and mood, with the humblest materials there are.

How they figured it out. Artists talked about light and dark for centuries (the Italians called it *chiaroscuro*, "light-dark"), but the measuring tools are surprisingly recent. In 1905 the Boston art teacher Albert Munsell published *A Color Notation*, which separated color into hue, value and chroma and numbered value from black to white — the system still used in industry today. In 1907 Harvard's Denman Ross published *A Theory of Pure Design*, organizing painting around a stepped value scale, and generations of American illustrators — including the students in Howard Pyle's orbit — planned pictures as arrangements of a few flat values before any rendering began. The practical discoveries stuck: the eye judges value *relative to neighbors*, not absolutely, which is why the same gray looks dark on white paper and light on black; and squinting works because it blurs detail and lets you compare raw values honestly. Measure values the way you measured proportions in Lesson 1.2 — against a standard, not against your assumptions.

The craft. Light on a simple form is lawful, and the law has five zones. On a sphere under one lamp: the **highlight** (the brightest spot, where light bounces straight to your eye), the **light** (surfaces facing the lamp), the **halftones** (surfaces turning away, getting gradually darker), the **core shadow** (the dark band just past the *terminator*, where light no longer reaches), and **reflected light** (bounce from the table lightening the shadow's underside). Below the form sits the **cast shadow**, darkest and sharpest-edged where the sphere meets the table (that deepest contact line is the *occlusion shadow*), softer at its far edge. Two rules save every beginner's drawing. First: *form shadow and cast shadow are different things* — one is the object turning from the light, one is the object blocking light from something else — and they behave differently: form shadows have soft, gradual edges; cast shadows are harder-edged, especially near the object. Second: *reflected light belongs to the shadow family.* The classic beginner error is making bounce light as bright as the lit side, which breaks the form; keep every shadow value darker than every lit value and the drawing will hold together from across the room.

The craft, continued — the math of the scale. A value scale is just an even division of the distance from white to black. A 9-step scale has 8 equal jumps; a 5-step scale has 4. Later in this course you will meet the digital version: screens store gray as a number from 0 (black) to 255 (white), so a 9-step scale uses levels $0, 32, 64, 96, 128, 159, 191, 223, 255$ — each step about $255/8 \approx 32$ levels apart. Working artists deliberately *limit* their values: a drawing planned in just three or

four values (light, halftone, shadow, dark accent) reads instantly, while a drawing using thirty timid grays reads as mud. Plan the big value shapes first — squint at your subject, sort everything you see into light, mid, dark — then render inside that plan. Hatching, cross-hatching and smooth graphite tone are merely different ways to make a value; the value itself is the decision that matters.

In the studio. Professionals test with value first. Illustrators make small "value comps" — postage-stamp paintings in three grays — before committing to a final; art directors routinely judge a cover sketch by converting it to grayscale, because if the composition fails in black and white, no amount of color will rescue it. Game and film concept artists speak of "value structure" in every portfolio review. And designers live by it too: a poster readable from a moving car and a webpage readable on a dim phone are both value problems — dark-enough type on light-enough ground. In Unit 4 you will put numbers on that (contrast ratios); the eye you build this week on a sphere and a mug is the same eye that will pass those checks.

PICTURE STUDY



Saint Jerome in His Study, Albrecht Dürer, 1514 · Engraving · National Gallery of Art, Washington, D.C. (Rosenwald Collection)

Image: Wikimedia Commons, public domain

This is one of Dürer's three master engravings of 1513–1514, and the friendliest of them: a scholar at work in perfect, ordered peace. Every tone you see — the pooled sunlight, the glowing window reveals, the soft dark under the desk — is made of black lines on white paper, spaced and crossed to manufacture value.

Study it with this lesson's vocabulary. Light through the windows is doing exactly what your lamp does to a sphere, only across an entire room.

Look closely

- Find the lightest light and the darkest dark in the picture. Where did Dürer put them, and what sits between?
- Follow the sunlight: where does it fall directly, and where does it turn around a rounded beam as halftone?
- Find a cast shadow with a hard edge and a form shadow with a soft one.
- Look closely at a mid-gray area: can you see the line spacing that manufactures it?
- The lion's mane and the cushion on the window seat: how does line direction follow the form?

Talk about it

1. Dürer controlled where your eye goes using value alone. Where does your eye land first, and which value decision put it there?
2. Why do the big quiet areas (the ceiling, the floor) matter as much as the detailed ones?
3. What does this engraving prove about expensive tools? What were Dürer's materials?

STUDIO BRIEF

Studio Brief: The Form Set

Your client is a drawing-course publisher preparing a chapter on light, and needs the standard demonstration plate every art book contains: a rendered sphere, cube and cylinder under one light, plus a 9-step value scale, clean enough to print. Deliverable: one plate (or two sheets) in graphite, all zones labeled on a tracing-paper or margin overlay. Deadline feel: three sessions.

You will need

- An egg or ball, a small box, a mug or can — your sphere, cube and cylinder
- One lamp you can move; other lights off
- HB, 2B and 4B (or softest available) pencils, eraser
- Three sheets of plain paper plus one for the scale
- An index card with a small hole for value-checking

Steps

1. **Build the scale first.** Rule a strip of nine 1-inch squares. Fill square 9 as black as your softest pencil goes and leave 1 white; then fill 5 as true middle; then split the remaining differences. Even steps matter more than dark darks.
2. Set the lamp high and to one side of the ball so you can see all five zones plus a cast shadow.
3. Squint and map the big masses lightly: lit side, shadow side, cast shadow — three shapes, no rendering.
4. Render the sphere: halftones darkening toward the terminator, core shadow just past it, reflected light kept in the shadow family, cast shadow darkest at contact.
5. Spot-check with the hole card against your scale: lit side values 1–4 only, shadow side 5–9 only. Correct before continuing.
6. Render the cube: each face is one value (light, halftone, shadow) with crisp edges between — no gradients across a flat face.

7. Render the cylinder: the sphere's zones stretched into vertical bands, with an ellipse top.
8. Label every zone on all three forms in neat small lettering, as for print.
9. **Deliver:** shoot or scan the plate in even light and write the publisher two sentences on which form taught you most.
10. **Check your work:** squint from across the room — do all three forms still read as solid? Does every shadow stay darker than every light?

Tips

- Keep one consistent light direction for all three forms, as a real book plate would.
- Build dark values in layers with a soft pencil rather than pressing hard — pressed graphite goes shiny and won't darken further.
- If the sphere looks like a flat disc with a dark rim, the halftone transition is too abrupt — walk it down in smaller steps.

Check your work

- ☐ My value scale has nine distinguishable, reasonably even steps.
- ☐ All five zones plus cast and occlusion shadows are present and labeled on the sphere.
- ☐ Lit-family and shadow-family values never cross anywhere on the plate.

SKETCHBOOK

1. Your labeled copy of the lit-sphere diagram from the video, drawn large, with the two rules written beneath it (form vs. cast shadow; reflected light stays in the shadow family).
2. Five "value spots": squares where you matched real surfaces in your house to scale steps using the hole card, labeled with object and step number.
3. A three-value notan-style study of one corner of your room done with a soft pencil in ten minutes — light, mid, dark only.

KEY FORMULAS

$$\text{step size} = \frac{\text{value range}}{\text{steps} - 1} \quad \text{(a 9-step scale spans 8 equal jumps)}$$

$$\text{digital gray levels: } 0 \text{ (black) to } 255 \text{ (white)}, \quad \text{level}_i = i \times \frac{255}{n - 1}$$

From history. Denman Ross's stepped value scale (1907) and Munsell's value notation (1905) arrived just as American illustration boomed, and the teaching stuck: Howard Pyle's students planned pictures as a few flat value masses — Harvey Dunn, who carried Pyle's teaching to his own students, called the big value arrangement the picture's "pattern." A century later, concept artists at film and game studios still begin with three-value thumbnails, and an art director can still kill a cover sketch with one sentence: "It doesn't read in grayscale."

WORKED EXAMPLES

Example 1. Build a 5-step value scale in digital gray levels (0–255). What level is each step?

Show solution

1. A 5-step scale has $5 - 1 = 4$ jumps.
2. Step size: $255/4 = 63.75 \approx 64$.
3. Levels: 0, 64, 128, 191, 255 (rounding the arithmetic 63.75, 127.5, 191.25).

Answer: 0, 64, 128, 191, 255 — black, dark gray, middle gray, light gray, white.

Example 2. On a 9-step scale (1 = white, 9 = black), an artist plans a drawing using only values 2, 5 and 8. What fraction of the full range separates each chosen value, and why is this a strong plan?

Show solution

1. The scale has 8 jumps; from 2 to 5 is 3 jumps, from 5 to 8 is 3 jumps.
2. Each gap is $3/8$ of the full range — large, even separations.
3. Big, even value gaps keep light, halftone and shadow unmistakably distinct when squinting — the drawing reads at any size and distance.

Answer: Each gap is 3/8 of the range; the three values are far enough apart to read instantly.

Example 3. Your sphere drawing uses value 3 (of 9) for the lit halftone and value 3 for the reflected light in the shadow. A teacher says the form is broken. Why, and what is the fix?

Show solution

1. Reflected light belongs to the shadow family: every shadow value must stay darker than every lit value.
2. With both at value 3, the shadow side competes with the light side and the sphere flattens.
3. Fix: push the reflected light down to about value 6–7 — lighter than the core shadow (8–9), darker than any halftone.

Answer: Equal values on lit and shadow sides destroy the light logic; darken the reflected light to roughly value 6–7.

Example 4. A drawing is planned with 4 values on a 9-step scale, spaced as evenly as possible starting at 1 (white) and ending at 9 (black). Which steps should be used?

Show solution

1. From 1 to 9 is 8 jumps split into 3 gaps: $8/3 \approx 2.67$ per gap.
2. Rounded to whole steps: 1, 4, 6, 9 (gaps of 3, 2, 3) — or 1, 4, 7, 9.
3. Either keeps the gaps large and nearly even; pick one and stay inside it.

Answer: 1, 4, 6, 9 (or 1, 4, 7, 9) — four well-separated values.

PRACTICE

1. Easy Define value in one sentence, without using the word "color."

   Show answer

   Value is how light or dark a surface appears, from white to black.

2. Easy List the five zones of light on a sphere in order from the light source around to the shadow.

   Show answer

   Highlight, light, halftone, core shadow, reflected light (with the cast shadow on the surface below).

3. Easy What is the difference between a form shadow and a cast shadow?

Show answer

A form shadow is the object's own unlit side (soft-edged); a cast shadow is light blocked by the object falling on another surface (harder-edged, sharpest near the object).

4. Easy Why does squinting help you judge values?

Show answer

It blurs detail and color interest, leaving only masses of light and dark to compare honestly.

5. Medium Compute the digital gray levels of a 3-step scale (0–255).

Show answer

Step size $255/2 = 127.5$: levels 0, 128, 255.

6. Medium A 9-step scale: what size is each jump in digital levels, and what level is step 5 (middle gray)?

Show answer

$255/8 \approx 32$ levels per jump; step 5 is 4 jumps up: $4 \times 31.9 \approx 128$.

7. Medium Draw the same egg twice: once using every gray you can make, once using only three planned values. Squint at both from across the room. Which reads as more solid, and why?

Show answer

Almost always the three-value egg: big, separated value shapes read as light-logic; thirty timid grays average into mud.

8. Medium In Dürer's engraving there is no gray ink. How did he make sixteen apparent values with black lines?

Show answer

By spacing: tighter line spacing and crossed layers of hatching read darker; wider spacing reads lighter — value as line density.

9. Hard The cast shadow of a mug is darkest and sharpest right at the mug's base and lighter and softer at its far end. Explain both changes.

Show answer

At the base, almost all light is blocked and no bounce reaches in (occlusion), and the shadow edge is near the object so it stays sharp; farther out, scattered and reflected light fills the shadow, and the partial blocking of a broad light source feathers the edge (penumbra).

10. Hard You photograph your drawing and the app reports your shadow mass at level 150 and your lit halftones at level 140. What has gone wrong, in this lesson's terms?

Show answer

The shadow (150) is lighter than the lit side (140): the value families have crossed. Shadows must stay darker than every lit value; darken the whole shadow family.

11. Hard Plan a drawing of a white cup on dark cloth using exactly four values from a 9-step scale. Assign a value to: cup lit side, cup shadow side, cloth, cast shadow. Defend your spacing.

Show answer

Example: cup light = 1–2, cup shadow = 5, cloth = 7, cast shadow = 9. Any set works if lit values stay lighter than all shadow values and gaps are big enough to read when squinting.

12. Challenge Make a 9-step scale in graphite, cut a small hole in an index card, and "spot-meter" five surfaces in your room by holding the hole beside each and matching the step. Record object, guessed value, measured value.

Show answer

Expected finding: guesses cluster toward the middle; real surfaces are lighter and darker than assumed (white walls near 1–2, shadows under furniture near 8–9). The card defeats the brain's auto-correction.

COMMON MISTAKES

- Making reflected light as bright as the lit side — the single most common beginner error; it flattens the form instantly.

- Outlining the cast shadow and filling it with one flat gray. Cast shadows are darkest at contact and soften with distance.
- Rendering details (texture, logos, wood grain) before the big value masses are correct. Value structure first; texture is a tenant, not the landlord.

Make it a game · Value Scavenger Hunt. Tear your 9-step scale into its nine squares and deal them out. On "go," family members race through the house to lay each square on a surface that matches it (step 2 on the windowsill, step 8 under the couch). You judge each match by squinting; a successful match scores a point, a disputed one goes to the hole-card test. Most points wins. Play again swapping judge and hunters.

Scripture. “And God said, Let there be light: and there was light. And God saw the light, that it was good: and God divided the light from the darkness.” (Genesis 1:3–4, KJV)

The first recorded act of creation is light, and the first recorded judgment is that it was good — and then light was divided from darkness. Every drawing in this lesson repeats that division in miniature: the artist's craft of separating light from dark is practiced inside a world built that way on day one.

1.4 Perspective and Construction: Making Space Believable

OBJECTIVES

- Set an eye level (horizon line), place vanishing points, and draw boxes above, below and at eye level in one- and two-point perspective.
- Construct simple objects and a room interior from perspective boxes, and divide surfaces into equal parts using the diagonal trick.
- Use the law that apparent size shrinks in proportion to distance — twice as far means half as tall — to scale repeated objects and figures on a ground plane.

> **Warm-up.** Stand at one end of a hallway or look down your street. Hold your pencil vertically at arm's length and measure the apparent height of the nearest doorway (or fence post), then one about twice as far away. Write both measurements. Divide the first by the second. Keep the number for the lesson.

WATCH

Perspective for Beginners

Proko · 13:56

https://www.youtube.com/watch?v=BYlW8XC0MlI

> **WHEN TO WATCH**
> After the second core idea. Draw along: pause after the horizon-line setup and after each box position (above, on, below eye level) and build the same boxes on your own page.

Note: A clear beginner's guide to one-point perspective: the axes, the horizon line, vanishing points, and boxes in every position. The boxes feel humble; they are the skeleton of every room, vehicle and building you will ever draw.

BACKUP VIDEO

Two-Point Perspective Drawing Made Simple

Proko · 13:33

https://www.youtube.com/watch?v=9-Y4K4hqZwo

After you are comfortable with one-point boxes — this continues directly into two-point: rotating the box, placing the second vanishing point, and what happens when the points sit too close together.

KEY TERMS

horizon line (eye level)

The horizontal line at the height of the viewer's eye; in a drawing the two terms mean the same line, whether or not a real horizon is visible.

vanishing point

The point on (or off) the page where a family of parallel lines receding from the viewer appears to converge.

one-point perspective

A view facing a scene straight on, so one family of lines recedes to a single vanishing point on the horizon.

two-point perspective

A view of forms turned at an angle, so two families of horizontal lines recede to two vanishing points, left and right.

orthogonal

Any receding line that aims at a vanishing point — the floor edges, rooflines and rails of the drawing's space.

ground plane

The flat surface the scene stands on; objects on it shrink lawfully with distance, which lets you scale figures correctly.

foreshortening

The apparent compression of a form that points toward the viewer — a circle becomes an ellipse, a long box becomes a short shape.

CORE IDEAS

The story. Around 1413, the Florentine architect Filippo Brunelleschi stood just inside the doorway of the city's cathedral and painted a small panel of the Baptistery across the square — then drilled a peephole through the panel at the exact point opposite his eye. A viewer held the panel's back against his face, looked through the hole, and held up a mirror: the painted Baptistery, seen in reflection, matched the real one line for line. Lower the mirror, and the building itself stood there, identical. It was a public, repeatable demonstration that believable space obeys geometry — that the look of depth can be *constructed*, not guessed. His friend Leon Battista Alberti wrote the method down in *De pictura* (1435), the first how-to manual of perspective, and painters devoured it. Ninety years later Albrecht Dürer traveled to learn the Italian methods and published them north of the Alps in his 1525 *Underweysung der Messung* ("Course in the Art of Measurement"), complete with woodcuts of drawing machines — one of which is this lesson's picture study.

How they figured it out. The core insight fits in one sentence: light travels in straight lines, so a picture is what you get when the rays from scene to eye are cut by a flat pane — Alberti called the picture plane an "open window." Everything else follows. Parallel lines receding from the viewer cut the pane at points that crowd together with distance, so they appear to converge at a *vanishing point*. All vanishing points for horizontal lines land on the *horizon line*, which sits exactly at the viewer's eye level — stand on a ladder and the horizon rises with you; kneel and it kneels. And apparent size obeys an inverse law: an object twice as far away spans half the angle

at your eye, so it draws half as tall. Your warm-up measured exactly that; most people get a ratio near 2.

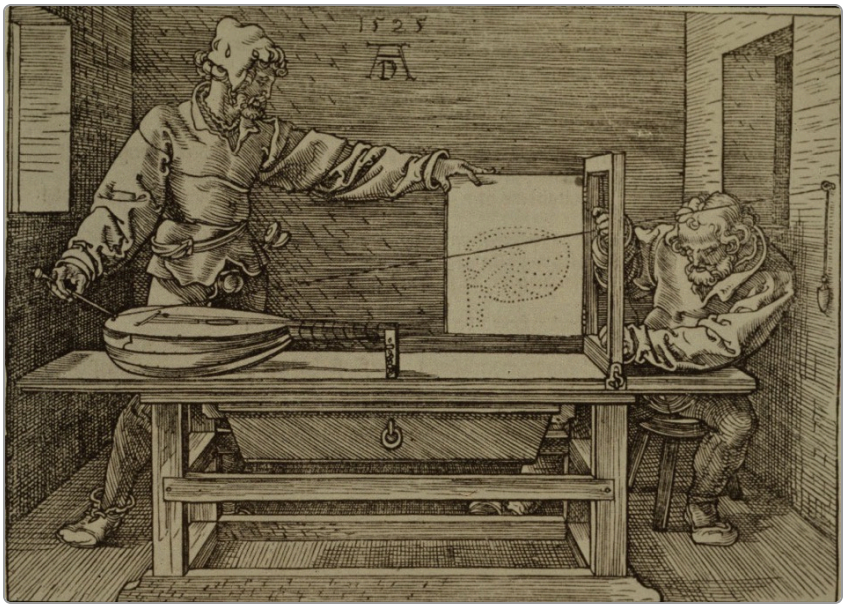
The craft. The working method is boxes first. Rule the horizon at your chosen eye level. For *one-point* (facing a scene straight on — a hallway, railroad tracks, the front of a building): place one vanishing point on the horizon, draw each box's front face flat, and send its depth edges — the orthogonals — to the point. For *two-point* (looking at a corner): place a left and a right vanishing point far apart on the horizon — too close together and the box bulges with fisheye distortion — start each box from its nearest vertical edge, and send the two families of horizontal edges to their points. Boxes above the horizon show their undersides, boxes below show their tops, boxes straddling it show neither. Then carve: a mug is a cylinder in a box, a house is a box with a wedge roof, a bed, a bookcase, a pickup truck — box, then carve. Three-point perspective merely adds a third point far above or below for tall verticals seen from a worm's or bird's eye; mention it, master it later.

The craft, continued — dividing and repeating. You cannot measure receding distances with a ruler, because perspective compresses them — equal real lengths draw shorter and shorter. The classical tools: to find the *center* of any perspective rectangle (to place a door knob, a window, a roof peak), draw its two diagonals; the X marks the true perspective center even though it is not the measured middle. To *duplicate* a spacing (fence posts, arches, sidewalk slabs): draw the first two posts, find the midpoint of the second with diagonals, then draw a line from the top of the first post through the middle of the second and extend it to the ground line — it lands where the third post stands. Repeat forever. To scale *figures*: everyone standing on the same ground plane is cut by the horizon at the same body height. If your eye level is 5 feet and a man is 6 feet tall, the horizon crosses him at his chest — near and far alike; slide him anywhere along the ground plane and size him by that rule and he will always belong in the scene.

In the studio. Perspective is daily bread in the trades this course serves. Storyboard artists set an eye level in the first panel and hold it, because a wandering horizon makes an audience seasick without knowing why. Concept artists block entire environments from boxes before any rendering. Children's-book illustrators keep interiors in gentle one-point so small readers feel inside the room. Even flat graphic design uses the law: a product shot, a mockup of a box or book cover, a billboard drawn into a photo — all must sit on the photo's existing eye level or the composite

screams fake. Perspective errors are the easiest flaw for any art director to spot and the cheapest for you to prevent: two lines and a point before you draw, instead of an unfixable drawing after.

PICTURE STUDY



Man Drawing a Lute, Albrecht Dürer, 1525 · Woodcut (from Underweysung der Messung) · The Metropolitan Museum of Art, New York

Image: Wikimedia Commons, public domain

This woodcut comes from Dürer's 1525 geometry manual for artists, the Underweysung der Messung. The string runs from a hook on the wall (standing in for the artist's eye) to points on the lute; where the string passes through the wooden frame — Alberti's "open window" made of real wood — an assistant marks the crossing point on a hinged panel. Point by point, a perfectly foreshortened lute appears.

It is perspective theory turned into carpentry: proof that the picture is the set of points where sight lines cut the picture plane.

Look closely

- Trace the string's path: eye-hook, frame, lute. Which part plays the role of a light ray?
- Find the hinged panel where the points are marked. Why must it swing exactly into the frame's plane?
- Why a lute? What about its shape makes it a hard test for foreshortening?
- The room itself is drawn in perspective: find the orthogonals of the table and window and chase them toward their vanishing point.

- Two men are needed for the machine. What does the one at the wall contribute that the one at the frame cannot see?

Talk about it

1. The machine draws one point at a time, perfectly but slowly. What did artists keep from the machine and what did they replace with the horizon-and-vanishing-point shorthand you learned today?
2. How does this image demonstrate that a picture is a window cut by sight lines?
3. Dürer published his methods instead of guarding them. What did the next generation of artists gain, and what did he?

STUDIO BRIEF

Studio Brief: The Believable Room

Your client is a board-game publisher illustrating a family mystery game and needs a believable room interior — a study, kitchen or workshop — that players will examine closely for clues. Deliverable: one finished one-point interior in pencil with at least six furnishings constructed from boxes, plus a two-point exterior sketch of the house it belongs to. Deadline feel: three sessions.

You will need

- Two or three sheets of plain paper (11 × 17 if available) plus scrap for thumbnails
- Pencil, eraser, and a ruler or straightedge
- A long straightedge or a second sheet's edge for off-page vanishing points
- Your own room as reference for believable furniture sizes

Steps

1. Thumbnail three room ideas the size of playing cards, choosing eye level deliberately: seated height (about 4 ft) makes the room feel intimate; child height makes it loom.
2. On the final sheet, rule the horizon at your chosen eye level and place the vanishing point off-center — dead center feels mechanical.
3. Draw the back wall as a flat rectangle, then run orthogonals to the point for floor, ceiling and side walls.
4. Box in six furnishings — table, chair, bookcase, rug, lamp, window or door — every receding edge aimed at the point. Keep heights honest against your figure rule: a table about half eye level, doors taller than people.
5. Use diagonals to center at least two things (a picture on a wall, a knob on a door) and to space one repeated element (floorboards, shelf books, windows) equally in perspective.
6. Carve the boxes: round the lamp, slot the bookcase shelves, give the table legs thickness.

7. Add one value pass (Lesson 1.3): choose the light's direction, shade each form's planes consistently, and cast at least two shadows.
8. On a second sheet, sketch the house exterior in two-point: corner-first box, two well-separated points, roof peak found by diagonals.
9. **Deliver:** present both drawings and point out, like a professional, where the eye level is, where the points are, and two places diagonals saved you.
10. **Check your work** with the straightedge: pick five receding edges at random and verify each truly aims at its vanishing point.

Tips

- Draw construction lines lightly and leave them faintly visible in the final — clients and teachers alike read them as competence, not mess.
- If something looks subtly wrong, check verticals first: in one- and two-point perspective, verticals must be truly vertical.
- Furniture floating off the ground plane is the giveaway of guessed construction: every leg lands on a line you can trace to the point.

Check your work

- ☐ Every receding edge in the room passes the straightedge test to its vanishing point.
- ☐ At least two diagonal-centerings and one equal-spacing construction are visible in the work.
- ☐ The two-point exterior uses well-separated points and truly vertical verticals.

SKETCHBOOK

1. Ten boxes in two-point perspective: above, below and straddling the horizon, long and thin, near and far — a daily warm-up professionals never outgrow.
2. Your hallway warm-up measurement written as a proportion, with a two-sentence note on how close it came to the inverse-distance law.
3. One object on your desk drawn twice: first as the box that contains it, then carved to its real shape — label it "box first, carve second."

KEY FORMULAS

$$\text{apparent size} \propto \frac{1}{\text{distance}}: \qquad \frac{h_1}{h_2} = \frac{d_2}{d_1}$$

$$\text{perspective center of a rectangle} = \text{intersection of its diagonals}$$

From history. Brunelleschi's panel demonstration (c. 1413) survives only in descriptions — the panel itself is lost — but its effect is everywhere: within a generation, Masaccio's fresco The Holy Trinity (c. 1427) stunned Florence with a painted chapel so convincing viewers felt the wall had been opened. Alberti's De pictura (1435) spread the method as text, Dürer's 1525 manual carried it north as pictures, and five centuries later the same constructions run under every film storyboard, game environment and architectural rendering — now often inside 3D software that is, at bottom, Brunelleschi's geometry done fast.

WORKED EXAMPLES

Example 1. A fence post 10 ft from you draws 6 cm tall. How tall do you draw identical posts at 20 ft and at 30 ft?

Show solution

1. Apparent size is inversely proportional to distance: $h_2 = h_1 \times \dfrac{d_1}{d_2}$.
2. At 20 ft: $6 \times \frac{10}{20} = 3$ cm.
3. At 30 ft: $6 \times \frac{10}{30} = 2$ cm.

Answer: 3 cm and 2 cm.

Example 2. Your eye level (and so the horizon) is 5 ft above the ground. You draw a 6-ft-tall mail carrier near the viewer and again far away. Where does the horizon cross him, and why does this scale him automatically?

Show solution

1. The horizon cuts everything on the ground plane at exactly eye height: 5 ft above the ground.
2. On a 6-ft man, 5 ft is at upper-chest/shoulder height — so the horizon crosses his chest, near or far.
3. Wherever he stands, draw his feet on the ground plane and fix his chest at the horizon: the 1 ft above eye level stays one-sixth of his height, so his size is forced to be correct.

Answer: At his upper chest (5 of his 6 feet), in every position; anchoring feet-to-ground and chest-to-horizon sizes him lawfully.

Example 3. You have drawn the front wall of a barn as a perspective rectangle and need the peak of the roof centered on it, and a door exactly halfway along the wall. How do you find both without a ruler?

Show solution

1. Draw the rectangle's two diagonals; their intersection is the perspective center.
2. A vertical line through that X locates the roof peak above and the door's centerline below.
3. A ruler would put both too far toward the far end — perspective compresses the far half, so the true middle looks off-center but is right.

Answer: Diagonals of the wall rectangle; vertical through the X places peak and door.

Example 4. A doorway measures 4 pencil-widths at 3 m. Approximately how far away is a matching doorway that measures 1 pencil-width?

Show solution

1. $\frac{h_1}{h_2} = \frac{d_2}{d_1} \Rightarrow \frac{4}{1} = \frac{d_2}{3}$.
2. $d_2 = 12$ m.

Answer: About 12 m — four times the size means a quarter the distance, and vice versa.

PRACTICE

1. Easy Where is the horizon line in any drawing, by definition?

   Show answer

   At the viewer's eye level — it rises and falls with the eye, regardless of whether a real horizon is visible.

2. Easy You see a box's top surface. Is the box above or below your eye level?

   Show answer

   Below — tops are visible below eye level, undersides above it.

3. Easy When do you choose one-point rather than two-point perspective?

   Show answer

   One-point when facing the scene straight on (hallway, room's facing wall, straight road); two-point when looking at forms corner-first.

4. Easy A post at 8 ft draws 4 cm. How tall at 16 ft?

   Show answer

   2 cm — double the distance, half the apparent size.

5. Medium Draw a one-point room: horizon, one vanishing point, back wall, and at least a door, a window and a rug, using orthogonals for every receding edge. (Production task.)

   Show answer

   Check: back wall is a flat rectangle; every receding edge (floor lines, door top, window top and sill, rug sides) aims at the single vanishing point; verticals stay vertical.

6. **Medium** A sign 5 m away draws 8 cm wide. Your client wants a matching sign drawn at 2 m. Width?

Show answer

$8 \times \frac{5}{2} = 20$ cm.

7. **Medium** Why do the two vanishing points of a two-point drawing need to sit far apart — often off the page?

Show answer

The points' spread corresponds to a normal viewing angle; placed close together they force extreme convergence and the boxes distort like a fisheye photo.

8. **Medium** Your eye level is 1.5 m. A drawn figure stands with the horizon crossing her at the top of her head. How tall is she, and how do you know?

Show answer

About 1.5 m — the horizon cuts everyone on the ground plane at exactly eye height, so a head level with it marks a person as eye-level tall.

9. **Hard** Using diagonals only, explain the steps to draw five equally spaced fence posts receding in perspective after the first two are placed.

Show answer

Find the second post's midpoint with its diagonals (or mark it directly); draw a line from the top of post 1 through the midpoint of post 2 and extend to the ground line — the intersection places post 3's base; repeat the top-through-midpoint line from each new pair for posts 4 and 5.

10. **Hard** An illustrator pastes a drawn figure into a street photo. The photo's horizon crosses parked cars at their windows, but the horizon crosses the pasted 6-ft figure at his knees. What is wrong and what does it imply about his drawn size?

Show answer

A 6-ft figure with eye-level at his knees would have to be a giant standing far below the camera — he is drawn far too large for his position. His chest-to-head region should relate to the horizon like the real pedestrians'; shrink him until the horizon crosses him at a believable body height.

11. Hard Your warm-up ratio: the near doorway measured 4 units, the one at double distance measured 2.2 units, not 2. Give two honest reasons real measurements drift from the ideal law.

Show answer

The far object wasn't exactly double the distance (pacing error), and sighting error — a bent elbow, pencil not vertical, thumb slip; also real doorways vary slightly in size. The law holds; the measuring is human.

12. Challenge Construct a two-point box, then carve it into a simple house: find the front wall's perspective center with diagonals, raise the roof peak above it, and add a centered door and two windows. (Production task.)

Show answer

Check: verticals vertical; both wall directions converge to their points; peak stands on the diagonal-X vertical of its gable wall; door and window tops recede to the correct vanishing points.

COMMON MISTAKES

- Letting verticals lean. In one- and two-point perspective every vertical edge stays plumb vertical; leaning verticals belong only to three-point views.
- Placing two-point vanishing points close together on the page, which bulges every box into fisheye distortion.
- Measuring receding spaces with a ruler — equal real spacings must compress with distance; use the diagonal constructions instead.

> **Make it a game · Vanishing Point I-Spy.** Sit as a family where you can see down a hallway, street or long room. Taking turns, each person points out a pair of receding parallel edges (ceiling line and floor line, two shelf edges, road sides) and traces them in the air to where they would meet. Others confirm or challenge; a straightedge held up settles disputes. One point per correct convergence, minus one for any "parallel" pair that actually isn't. First to seven wins.

> **Scripture.** “Through wisdom is an house builded; and by understanding it is established: And by knowledge shall the chambers be filled with all precious and pleasant riches.” (Proverbs 24:3–4, KJV)
>
> A drawn room and a real house are built the same way: wisdom lays the structure first, and only then are the chambers filled. Construction before decoration is a proverb before it is an art rule.

1.5 People on the Page: Gesture, Heads and Hands

OBJECTIVES

- Capture the gesture of a clothed figure — the line of action and the big tilts — in drawings of thirty seconds to two minutes.
- Construct a head at any angle with the Loomis method (ball, side planes, facial thirds) and keep an adult figure in proportion at about 7½ heads tall.
- Draw hands that read believably by building the palm mass first and the fingers in groups, and explain the costumed-model tradition this course follows.

> **Warm-up.** Ask a family member to hold a simple action pose, fully dressed — reaching for a shelf, leaning on a broom, mid-stride — for sixty seconds while you draw only ONE line: the single curve that runs from head through spine to the weight-bearing leg. Do this for three different poses. No faces, no fingers, no clothes. Three lines, three poses.

WATCH

How to Draw the Head from Any Angle

Proko · 5:12

https://www.youtube.com/watch?v=1EPNYWeEf1U

> **WHEN TO WATCH**
> After the third core idea. It is only five minutes; watch it once through, then watch again pausing at each construction step — ball, side plane, thirds — and build the same head on your page.

Note: Stan Prokopenko summarizes Andrew Loomis's head construction, the standard studio method for seventy years. Five minutes of video, but plan a full session of practicing what it shows.

BACKUP VIDEO

How to Draw Expressive Hands

Proko · 17:13

https://www.youtube.com/watch?v=wmajV4zcXeA

With the hands section of the lesson. Gesture applied to hands: the palm as one simple mass, fingers in groups, and why a hand should be drawn as an expression, not an inventory of knuckles.

KEY TERMS

gesture

The action and flow of a pose caught in the fewest possible lines — what the figure is doing, before what the figure looks like.

line of action

The single long curve through a pose — head to spine to weight-bearing leg — that everything else hangs on.

Loomis method

Andrew Loomis's head construction: a ball for the cranium, flattened side planes, a jaw attached, and the face divided into thirds.

facial thirds

The equal thirds of the face: hairline to brow, brow to base of nose, nose to chin.

head unit

The height of the head used as the figure's measuring unit; a standing adult is about 7½ heads tall.

costumed model

A clothed, often historically dressed model — the standard working reference of the Pyle school and of this course.

drapery

How cloth hangs and folds over a form; folds radiate from points of tension and reveal the body beneath.

CORE IDEAS

The story. When Howard Pyle taught illustration — at Drexel from 1894, then at his own school in Wilmington from 1900, with famous summer sessions at Chadds Ford — his students drew from *costumed models*: neighbors and classmates dressed as pirates, Continental soldiers, colonial farm wives. Pyle sent students to study how a coat actually creases at a bent elbow, how boots break at the ankle, how a cloak swings when a man turns. N. C. Wyeth, who arrived in 1902 at age twenty, posed friends in pirate gear for the Treasure Island canvases of 1911; the menace of Israel Hands climbing the mast (the picture study of Lesson 7.1) was painted from a clothed man on a prop in a Chadds Ford studio. Here is the point for this course, stated plainly: **this course practices figure drawing entirely from clothed models** — family members, athletes and dancers in modest dress, historical photographs, your

own hand and your own face in a mirror — and the Pyle tradition is the proof that complete professional figure skill can be built that way. The men and women who filled the Golden Age magazines did it; so can you.

How they figured it out. The modern teaching order — gesture first, construction second, detail last — was hammered out in American studios and correspondence courses in the first half of the twentieth century. Andrew Loomis, a Chicago advertising illustrator, published it in a series of books beginning with *Fun with a Pencil* (1939) and ending with *Drawing the Head and Hands* (1956); his construction diagrams were so clear that studios still teach "the Loomis head" by name, and his books, long out of print, were reissued in the 2010s because working concept artists kept photocopying them. The insight behind gesture-first is about time: in a thirty-second drawing you cannot render anything, so you are forced to record only what matters — the action. Students who polish details on a stiff, dead pose produce stiff, dead figures with excellent buttons. Students who learn to catch the action in six lines can hang any amount of detail on it later, and it lives.

The craft — gesture and proportion. Start every figure with the *line of action*: one long curve from the head down the spine into the supporting leg. Add the tilts — shoulders and hips almost always tip in opposite directions when weight is on one leg — then simple masses: an egg for the ribcage, a bowl for the pelvis, tubes for limbs. Thirty seconds to two minutes per pose; dozens of poses, not one precious one. For proportion, use the head as the unit, exactly as you measured mugs in Lesson 1.2: a standing adult is about 7½ heads tall — chin at 1, nipples at 2, navel near 3, crotch at 4 (the halfway point of the whole figure), fingertips at mid-thigh, knees at 5½, soles at 7½. Children are fewer heads tall: a toddler about 4, a ten-year-old about 6½ — which is why drawing a child as a shrunken adult always looks wrong. Fashion drawing stretches figures to 8 or 9 heads; know the real ratio before you stylize it.

The craft — heads and hands. The Loomis head: draw a ball (the cranium), slice a flattened plane on each side (skulls are narrower than they are deep), mark the centerline of the face, divide it by the *facial thirds* — hairline to brow, brow to nose, nose to chin — and hang the jaw from the ball. The eyes sit on the brow-to-nose band, roughly one eye-width apart; the ears occupy the middle third on the side planes. Turn the ball and the whole face turns lawfully with it — that is the method's power: any angle from the same construction. Hands: draw the *palm first* as a simple

shape — roughly a squared-off slab, about as long as the face from chin to hairline (a handy check: your own hand covers your face) — then attach the thumb's triangular mass, then the fingers in groups of two or three before separating them. A mitten that gestures beats five perfect sausages that don't. Drapery, the clothed figure's constant companion, is lawful too: folds radiate from points of tension — a bent elbow, a belt, a gripping fist — and the cloth between hangs in simple catenary curves. Draw the body's action first, then let the cloth report it.

In the studio. Figure skill is the sharpest divider in hiring for illustration. Children's-book publishers, game studios and animation houses all flip a portfolio straight to the figures, and art directors say the same thing: they can teach software in a month, but not drawing. The professional habit is daily gesture practice — ten poses, two minutes each, from life at the kitchen table, from sports photographs, from the park bench — logged like a musician's scales. Your own left hand (or right, if you draw left-handed) is the most patient model you will ever have, and the mirror gives you a head at every angle for free. Twenty minutes a day for the rest of this course will do more for your employability than any other single habit in these ten units.

PICTURE STUDY



Snap the Whip, Winslow Homer, 1872 · Oil on canvas · Butler Institute of American Art, Youngstown, Ohio

Image: Wikimedia Commons, public domain

In 1872 Winslow Homer painted a game every schoolyard knew: the boys join hands, run hard, and the line snaps — flinging the boys on the end off their feet. Homer, who had learned figures as a magazine illustrator covering the Civil War, catches the instant of the crack. Read each boy as this lesson taught you to read a figure: a single line of action first. The anchor boys lean back against the pull; the runners drive forward; the two at the tail are pure diagonal, arms flung, feet gone from under them. Nine figures, nine different gestures, one connected force running down the line.

Every figure is clothed, and nothing about the drawing is diminished by it — the action lives in the tilts of spines and shoulders and the push of legs, exactly where gesture drawing looks for it. This is the painting to copy in thirty-second studies: ignore the faces, ignore the buttons, and catch the line of action in each boy before the whip stops cracking.

Look closely

- Find the line of action in each boy — one long curve from feet to head. Which figure has the most extreme line, and which the most braced?
- Where is the force in the picture? Follow the pull from the anchor boys on the left through the clasped hands to the two flying off at the right.

- Look at the two falling boys. What do their arms and hands do that no standing pose ever shows, and why is that gold for a gesture study?
- Check the big tilts this lesson names: shoulders against hips. Find the boy whose shoulders and hips tilt in opposite directions the most.
- The figures are fully clothed. Where exactly do you still read the action — which folds, tilts and weight-bearing legs carry it?

Talk about it

1. If you had thirty seconds per boy, what single line would you put down first for each — and what would you leave out entirely?
2. Homer worked from memory, sketches and observation of real boys at play. What must he have trained himself to see in motion that a posed model never shows?
3. Why does a connected group action like this teach more about gesture than nine separate standing poses would?

STUDIO BRIEF

Studio Brief: The Character Sheet

Your client is a publisher of historical adventure stories for young readers, assembling an artist bench. The test brief sent to every candidate: "Submit a character study sheet for a frontier scout, a sea captain, or a colonial blacksmith — gestures, head construction, hands, and one costumed pose — all drawn from clothed reference." Deliverable: one or two sheets, pencil. Deadline feel: three sessions, exactly like a real tryout.

You will need

- Sketchbook or four sheets of plain paper
- HB and 2B pencils, eraser
- A cooperative, fully dressed family member for timed poses (or clean photo reference of athletes, farmers or historical reenactors)
- A mirror for head angles; a hat, coat, apron or boots as costume props
- A timer

Steps

1. Choose your character and gather costume props — a hat and a work coat transform any patient family member.
2. **Session 1 — gesture bank:** twelve timed poses (30 s, 60 s, 120 s mix) of your model doing the character's work: hauling a rope, swinging a hammer, shading eyes to scan a horizon. Line of action and masses only.
3. Pick your three strongest gestures and re-draw each at five minutes, adding tilts, proportion check (7½ heads), and first drapery folds.
4. **Session 2 — heads:** build four Loomis heads of your character: front, three-quarter, profile, and one looking up or down. Use the mirror for the hard angle. Keep construction lines.
5. Hands: six studies of your own hand doing the character's grips — around a tool handle, a rope, a hat brim. Palm mass first.
6. **Session 3 — the money pose:** one ten-to-fifteen-minute costumed drawing combining everything: gesture first, head constructed, at least one visible

hand, drapery reporting the body. Add a light value pass from Lesson 1.3.

7. Arrange everything on your sheet(s) the way character sheets are really laid out: gestures small around the edges, heads in a row, the money pose large.
8. Title the sheet with the character's name and sign it.
9. **Deliver:** present the sheet in two minutes — which gesture is strongest, which head angle fought you, what you would draw more of with another week.
10. **Check your work** against the brief: all four required elements present, all from clothed reference.

Tips

- Keep every gesture, even the failures — a tryout sheet full of honest attempts reads better to an art director than three overworked poses.
- If your model tires, swap in your mirror and your own free hand; Wyeth posed for himself constantly.
- The money pose goes dead if you skip straight to it; the gesture bank is what makes it live.

Check your work

- ☐ Twelve gestures with visible lines of action; three developed to five minutes.
- ☐ Four constructed heads at four angles with thirds marked; six grip studies, palm-first.
- ☐ One finished costumed pose at 7½-head proportion with drapery folds radiating from real tension points.

SKETCHBOOK

1. Your three warm-up action lines, redrawn larger, each labeled with the pose it came from — the simplest figure drawings you will ever make, and the most important.
2. A proportion strip: a ruled 7½-head adult beside a 6½-head child and a 4-head toddler, landmarks labeled (chin 1, nipples 2, navel 3, crotch 3¾, knees 5½).
3. One page of daily hands, dated — start the habit today: your own hand in a new position every day for the rest of the unit.

KEY FORMULAS

figure height $\approx 7.5 \times$ head height (standing adult)
facial thirds: hairline $\rightarrow$ brow $\rightarrow$ nose $\rightarrow$ chin, each $= \frac{1}{3}$ of the face
hand length $\approx$ face length (chin to hairline)

From history. Pyle's school charged no tuition — he chose a handful of students a year and taught free, counting it his legacy; his roughly 110 students included N. C. Wyeth, Frank Schoonover, Stanley Arthurs and Harvey Dunn, and through Dunn's own teaching the line runs to hundreds more. The costumed-model tradition they worked in never ended: today's historical illustrators and film concept artists photograph reenactors and costumed friends for reference, and figure skill is still tested the same way Pyle tested it — hand an artist a brief and see whether the people on the page live.

WORKED EXAMPLES

Example 1. You are drawing a standing man 9 inches tall on the page. How big is his head, and where is the halfway point of the figure?

Show solution

1. Head unit: $9 \div 7.5 = 1.2$ in.
2. The halfway point of a 7½-head figure is at 3.75 heads — the crotch/hip level, NOT the waist.
3. On the page: 4.5 in from either end. Beginners put the halfway point at the waist and get short, stumpy legs.

Answer: Head = 1.2 in; the figure's midpoint (4.5 in) falls at the hips, not the waist.

Example 2. A drawn face measures 6 cm from hairline to chin. Place the brow and the base of the nose, and estimate the correct hand length for this character.

Show solution

1. Thirds: $6/3 = 2$ cm per third.
2. Brow at 2 cm below the hairline; nose base at 4 cm; chin at 6 cm.
3. Hand ≈ face length: about 6 cm from wrist crease to fingertip.

Answer: Brow 2 cm down, nose 4 cm down; hand about 6 cm long.

Example 3. You drew a father (7.5 heads, 9 in tall) holding a toddler. Using the toddler ratio of about 4 heads with a head nearly as large as an adult's — say 1 in — how tall should the toddler be, and what mistake does this prevent?

Show solution

1. Toddler height: $4 \times 1 = 4$ in against the father's 9 in.
2. A toddler's head is proportionally huge — nearly adult-sized on a small body.
3. Scaling an adult down to 4 in would give a 0.53 in head: the "tiny man" error that makes drawn children look like shrunken adults.

Answer: About 4 in tall with the nearly full-size head; it prevents the shrunken-adult error.

Example 4. In a two-minute gesture, how should you spend the time? Give a professional budget.

Show solution

1. 0:00–0:15 — look only: find the action and the weight-bearing leg.
2. 0:15–0:30 — line of action, one curve.
3. 0:30–1:15 — shoulder and hip tilts, ribcage egg, pelvis bowl, limb tubes to the ground.
4. 1:15–2:00 — the one or two details that tell the story (the reaching hand, the turned head). Stop on time; the next pose teaches more than polishing this one.

Answer: Look, line of action, masses and tilts, one storytelling detail — in that order, and stop when time is called.

PRACTICE

1. Easy What is drawn first in every figure drawing, and what single question does it answer?

   Show answer

   The gesture / line of action; it answers "what is this figure DOING?"

2. **Easy** How many heads tall is a standing adult, a ten-year-old, and a toddler, roughly?

   Show answer

   About 7½, about 6½, and about 4.

3. **Easy** Name the facial thirds.

   Show answer

   Hairline to brow, brow to base of nose, nose to chin — equal thirds.

4. **Easy** What everyday check tells you whether you've drawn a character's hand the right size?

   Show answer

   A hand is about as long as the face (chin to hairline) — your own hand covers your face.

5. **Medium** A figure is drawn 15 cm tall. Head size? Where do the knees fall?

   Show answer

   Head $= 15/7.5 = 2$ cm; knees at about 5½ heads = 11 cm from the top.

6. **Medium** When weight is on one leg, what do the shoulders and hips do, and why does drawing both level kill a pose?

   Show answer

   They tilt in opposite directions (the hip rises over the weight-bearing leg, the shoulders counter); level shoulders and hips read as standing at attention — stiff and weightless.

7. **Medium** Do ten one-minute gestures of clothed figures from a sports or farm photograph collection (or family members posing). Submit the page.

   Show answer

   Check: each pose shows a visible line of action and opposing tilts; no faces, buttons or shoe details; all ten attempted — quantity is the assignment.

8. Medium Where do drapery folds come from, and what should be drawn before any fold?

Show answer

Folds radiate from points of tension (bent joints, belts, grips) and hang in simple curves between; the body's action is drawn first, then cloth reports it.

9. Hard Build three Loomis heads: front view, three-quarter view, profile — ball, side plane, thirds, jaw. Submit the construction lines unerased.

Show answer

Check: side planes flattened (head deeper than wide); thirds equal; eyes on the brow–nose band about one eye-width apart; ears in the middle third; features move with the ball's turn.

10. Hard Your drawn figure's midpoint lands at the waist. The figure looks stumpy. Diagnose with head units and give the fix.

Show answer

On a 7½-head adult, the midpoint (3¾ heads) is at the hips; a waist midpoint means the legs are nearly a head too short. Lengthen the legs so the crotch sits at half the total height.

11. Hard Draw your own non-drawing hand three ways: flat palm toward you, gripping a pencil, half-closed. Palm mass first, fingers in groups. Submit with construction visible.

Show answer

Check: palm drawn as one slab before any finger; thumb mass triangular from the palm's corner; fingers grouped before separated; each hand ≈ your face length.

12. **Challenge** Explain, as if to a skeptical fellow student, why this course draws only clothed figures — and why that is not a limitation for professional training. Use Pyle and Wyeth as evidence.

Show answer

Model answer: the working illustrator's actual subject is the clothed, costumed figure in action; Pyle's school trained on costumed models, and its graduates — Wyeth's Treasure Island pirates among the most reproduced figures in American art — demonstrate full professional mastery built that way. Gesture, construction, heads, hands and drapery are all learned completely from clothed models.

COMMON MISTAKES

- Starting with the face and polishing it while the pose dies underneath. Gesture first, always; a living pose with a blank face beats a portrait on a mannequin.
- Putting the figure's halfway point at the waist. It is at the hips — legs are half the figure.
- Drawing fingers one at a time from the first knuckle. Palm mass, thumb mass, finger groups, then separation — or the hand becomes five arguing sausages.

Make it a game · Sixty-Second Statues. One family member is the statue and strikes a working pose, fully dressed — chopping wood, casting a line, carrying a basket. You have sixty seconds to catch the line of action and masses. Then everyone judges: can they guess the action from the drawing alone? A correct guess scores the artist a point; then rotate statue and artist. Five rounds. Faces and fingers score nothing — action is everything.

Scripture. “I will praise thee; for I am fearfully and wonderfully made: marvellous are thy works; and that my soul knoweth right well.” (Psalm 139:14, KJV)

The figure is the hardest subject in drawing because it is the most wonderfully made thing the artist ever faces. Drawing people with care — their weight, their work, their hands — is a way of studying, and honoring, the Maker's craftsmanship.

UNIT 1

Seeing and Drawing: The Foundation of Every Image

Every career in graphic design and illustration stands on one skill: drawing what you actually see. Not drawing "well" in some vague sense, but seeing honestly — measuring proportions, judging values, constructing space, and putting people on the page convincingly. In this unit you will learn what designers and illustrators actually do for a living and what employers hire for, and then you will begin building the hand and eye that every one of those jobs depends on: line and measurement, light and shadow, perspective, and the human figure drawn from clothed models, in the tradition of Howard Pyle and N. C. Wyeth.

The stories are of working artists who treated seeing as a craft to be learned: Albrecht Dürer, who drew a rhinoceros he had never seen and a hare he had studied for days; Filippo Brunelleschi, who proved with a mirror and a peephole that space on a flat panel could be made believable; and the students in Pyle's Wilmington studio, who drew costumed models by day and took hard critiques by night, and went on to paint the pictures a whole country remembered. You will fill pages the way they did — measured studies, value scales, boxes in perspective, gesture drawings — and finish the unit with the first piece of your professional portfolio: a fully rendered still life in graphite.

PREREQUISITES

- Pre-algebra: ratios and proportions, fractions, percents, and solving $\frac{a}{b} = \frac{c}{d}$ for one unknown
- Basic supplies: an HB and a 2B (or softer) pencil, an eraser, and a sketchbook or a stack of plain paper — no art experience and no computer are needed for this unit
- A willingness to fill pages with honest, imperfect practice drawings; the motto of this course is the school's motto: Fabricando fit faber — the maker is made by making

MASTERY CHECKLIST

- ☐ I can name the main jobs in graphic design and illustration, what each one makes, and what employers and clients actually hire for.
- ☐ I can measure a subject with a pencil at arm's length, state its proportions as ratios, and transfer them to paper at any scale.
- ☐ I can draw a contour that follows the real edge of a thing, not the symbol of it my memory offers.
- ☐ I can build a 9-step value scale, name the five zones of light on a sphere, and render a sphere, cube and cylinder under one light.
- ☐ I can set an eye level, place vanishing points, and draw boxes, simple objects and a room interior in one- and two-point perspective.
- ☐ I can capture a clothed figure's gesture in under two minutes, construct a head with the Loomis method, and draw a believable hand.
- ☐ I can use head-unit proportions (an adult is about 7½ heads tall) to keep a figure's parts in scale.
- ☐ I can explain why professionals from Pyle and Wyeth to today's studios built full figure skill from clothed and costumed models.

FREE RESOURCES FOR THIS UNIT

- **The Metropolitan Museum of Art — Open Access collection**: Hundreds of thousands of free, high-resolution images, including Dürer's prints and master drawings. Search "Dürer drawing" or "study of hands" and download pieces to copy in your sketchbook. Free, no account needed.
- **Smithsonian Open Access**: Millions of free images from the Smithsonian's collections, useful all course long for reference and picture study. A drawing tablet is NOT needed for this unit — or this course; everything here is done with pencil and paper, and later units use free software.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

1.1	**Two Trades, One Craft: What Designers and Illustrators Do**	3 sessions of 50 minutes
1.2	**Drawing What You See: Line, Measurement and Proportion**	3 sessions of 50 minutes
1.3	**Light and Shadow: Value, Form and Rendering**	3 sessions of 50 minutes
1.4	**Perspective and Construction: Making Space Believable**	3 sessions of 50 minutes
1.5	**People on the Page: Gesture, Heads and Hands**	3 sessions of 50 minutes

Unit 1 test

Time allowed: 50 minutes. A calculator is allowed; a ruler and two pencils (HB and soft) are required for the drawing problems. Show your work and units for every calculation. The test is worth 100 points.

1. **5 pts**
   Name the five main jobs of this field and one deliverable each makes.

2. **6 pts**

   What three things do employers and clients consistently hire for in design and illustration, and which single item is the door into the field?

3. **8 pts**

   You sight a pitcher at 3½ units tall and 2 units wide. Your unit on paper is 4 cm. Give the drawn height and width. Then: the real pitcher is 28 cm tall — what scale factor is your drawing using?

4. **6 pts**

   Explain the difference between drawing from the symbol system and drawing from observation, using Dürer's Rhinoceros (1515) and his Young Hare (1502) as the two examples.

5. **8 pts**

   Compute the digital gray levels (0–255) of a 5-step value scale, and state the step size of a 9-step scale.

6. **6 pts**

   Name the five zones of light on a sphere in order, plus the two shadows that are not on the sphere itself.

7. **8 pts**

   A student's sphere drawing has reflected light at value 3 (of 9) and lit halftones at value 3. State the rule being broken, why it breaks the form, and the fix.

8. **6 pts**

   Where is the horizon line in any picture, by definition? What happens to it when the viewer kneels, and what does it tell you about every drawn box that shows its top surface?

9. **8 pts**

   A fence post 12 ft away draws 6 cm tall. How tall do you draw matching posts at 24 ft and at 36 ft, and what law are you using?

10. **7 pts**

    Your eye level is 5 ft. Explain how the horizon line lets you place a 6-ft figure correctly anywhere on the ground plane of your drawing.

11. **8 pts**

    A standing figure is drawn 12 cm tall. Give the head size, the location of the figure's halfway point (in cm from the top, and the body landmark), and the knee height from the top.

12. **8 pts**

    Explain the costumed-model tradition of the Pyle school and what it proves about building figure skill. Name one artist trained in it and one published result.

13. **8 pts**

    PRODUCTION TASK. Draw a box in two-point perspective sitting below your eye level, and label: horizon line, both vanishing points, and one vertical edge. Then find the perspective center of its top face with diagonals.

14. **8 pts**

    PRODUCTION TASK. Shade a sphere under a light from upper left, with cast shadow, using no more than four planned values. Label all five zones plus the cast and occlusion shadows.

ANSWER KEY

1. Graphic/brand designer — logos, posters, packaging; illustrator — commissioned pictures (covers, book art); production artist — press/publish-ready files; UI designer — app and web screens; art director — directs projects and approves artists' work.
2. A portfolio of strong finished work, reliability with briefs and deadlines, and professional communication (explaining decisions, taking revisions). The portfolio is the door — roughly ten excellent pieces.
3. Height $3.5 \times 4 = 14$ cm; width $2 \times 4 = 8$ cm; $k = 14/28 = 0.5$.
4. Symbol drawing records what the brain knows or assumes (the Rhinoceros: invented armor plates and a shoulder horn, from a description, never checked by sight); observational drawing records what the eye measures (the Hare: each hair and proportion studied from life). The fix for symbol drawing is procedure — sighting and measuring — not talent.
5. 5-step: 0, 64, 128, 191, 255 (steps of $255/4 \approx 64$). A 9-step scale uses steps of $255/8 \approx 32$ levels.
6. Highlight, light, halftone, core shadow, reflected light; plus the cast shadow on the surface below and the occlusion shadow at the contact point.
7. Reflected light belongs to the shadow family, and every shadow value must stay darker than every lit value. At equal values, the shadow side competes with the lit side and the sphere flattens. Fix: push reflected light down to about value 6–7, between halftone and core shadow in darkness.
8. At the viewer's eye level; it drops when the viewer kneels; any box showing its top sits below the eye level.
9. 3 cm and 2 cm; apparent size is inversely proportional to distance ($h_1/h_2 = d_2/d_1$).
10. The horizon cuts everything on the ground plane at exactly 5 ft; on a 6-ft person that is upper-chest height. Anchor each figure's feet to the ground plane and chest to the horizon and the figure is automatically the right size at any distance.
11. Head $= 12/7.5 = 1.6$ cm; midpoint at 6 cm, which is the crotch/hip level (3¾ heads), not the waist; knees at about 5½ heads $= 8.8$ cm from the top.
12. Pyle's students (Wilmington school from 1900, Chadds Ford summers) drew clothed, costumed models — pirates, soldiers, farm wives — learning gesture, construction and drapery entirely from dressed figures. It proves complete

professional figure skill can be built from clothed models. N. C. Wyeth; Scribner's Treasure Island (1911), seventeen canvases.

13. Model answer: horizon ruled high on the paper; two vanishing points near the paper's edges; box started from its nearest vertical edge, both families of horizontal edges converging to their points; verticals truly vertical; top face visible (box below eye level); diagonals of the top face drawn, X marked as its perspective center.
14. Model answer: highlight upper left; halftones darkening toward a curved terminator; core shadow band just past it; reflected light inside the shadow but darker than every lit value; cast shadow to the lower right, darkest and sharpest at contact (occlusion), softer at its far edge; four distinct values identifiable when squinting.

PORTFOLIO PIECE: PORTFOLIO PIECE 1: A STILL LIFE IN GRAPHITE

Your first professional portfolio piece: a finished graphite still life of three to five household objects — at least one rounded form, one boxy form, and one object with a handle or spout — arranged under a single strong light. Work at 9 × 12 in or larger. Sight and measure the whole arrangement first (ratios written on a separate process sheet), construct the forms from boxes and cylinders in correct perspective, then render with a planned value scheme of four to five values, shadows kept in their family.

Deliver like a professional: the finished drawing, clean-edged and signed, plus a one-page process sheet showing your thumbnails, measurements and value plan. Photograph or scan both in even light. This is the first of the ten pieces this course builds — the one that proves to any future reviewer that you can see, measure, construct and render. Keep every stage; Unit 2's lesson on critique will send you back to this piece with fresh eyes.

LOOK FOR	WHAT IT MEANS
Proportion	Objects' ratios match the sighted measurements on the process sheet; one consistent scale factor throughout; plumb-line relationships hold.
Construction	Forms are built from boxes, cylinders and ellipses with a consistent eye level; ellipses and receding edges obey the perspective of the setup.
Value and light	A planned scheme of 4–5 values; all five zones present on rounded forms; shadow family consistently darker than lit family; cast shadows darkest at contact.
Craftsmanship	Clean edges and surface, controlled gradations, no shiny pressed graphite, thoughtful margins; signed and dated.
Process documentation	Process sheet shows thumbnails, written ratios, and the value plan — evidence of professional method, not luck.
Presentation	Photographed or scanned square and evenly lit, titled and ready to show a reviewer.

UNIT 2

Composition: The Rules of a Strong Picture

A drawing can be accurate in every part and still fail, because the parts were never arranged into a picture. Composition is the craft of arrangement: the elements an image is built from (line, shape, value, texture, space), the principles that organize them (balance, contrast, emphasis, rhythm, unity), the hierarchy that steers a viewer's eye along a planned path, and the discipline of empty space — knowing what to leave out. These are the rules working designers and art directors use every day, out loud, in exactly these words; learning them is learning the language of the trade.

The stories are of picture-makers whose arrangements conquered the world: Hokusai, whose Great Wave is built on a handful of shapes and two colors; Hiroshige, whose rain is pure rhythm, and whose prints changed Western art when they reached Paris; Alphonse Mucha, who designed a poster over Christmas week of 1894 and woke up famous on New Year's Day; Will Bradley, a printer's apprentice from Michigan who showed America what empty space could do; and Howard Pyle, whose Monday-night critiques trained the greatest generation of American illustrators. You will finish the unit able to compose deliberately — and able to critique your own work with a professional's vocabulary, which is the skill that makes every other skill improvable. Portfolio piece 2 puts it all on one sheet.

PREREQUISITES

- Unit 1: sighting and proportion, the 9-step value scale, basic perspective, and gesture — composition arranges what Unit 1 taught you to draw
- Pre-algebra: ratios, simple equations, and plotting points on a grid (for the rule of thirds and the balance arithmetic)
- Supplies: pencils and paper as before, plus scissors, a glue stick, and some gray or black construction paper for cut-shape studies

MASTERY CHECKLIST

- ☐ I can name and point out the five elements — line, shape, value, texture, space — in any image put in front of me.
- ☐ I can name the five principles — balance, contrast, emphasis, rhythm, unity — and say which ones a given picture leans on.
- ☐ I can balance an asymmetric composition using the visual-weight rule (a small shape far from center balances a big shape near it).
- ☐ I can place focal points with the rule of thirds, compute the third lines and power points for any canvas size, and use the golden ratio deliberately.
- ☐ I can plan the eye's path through a composition with size, value contrast, lines and gaze direction, and set three clear levels of hierarchy.
- ☐ I can use negative space as a drawn shape — including leaving things out on purpose — and explain why restraint reads as confidence.
- ☐ I can critique a picture in four professional steps (describe, analyze, interpret, judge) and revise my own work from written notes without defending it.
- ☐ I can take an art director's feedback, restate it accurately, and

deliver a revision that answers every note.

FREE RESOURCES FOR THIS UNIT

- **Library of Congress — Free to Use and Reuse sets**: Curated sets of rights-clear images, including the classic American poster collections this unit draws on (Penfield, Bradley and their era). Download posters and mark them up with tracing paper to study hierarchy and eye path. Free, no account.
- **Rijksmuseum — Rijksstudio**: High-resolution downloads of hundreds of thousands of public-domain artworks, with superb Dutch prints and Japanese woodblocks for composition study. A free account unlocks full-size downloads; nothing to buy.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

2.1	**The Elements: Line, Shape, Value, Texture, Space**	3 sessions of 50 minutes
2.2	**The Principles: Balance, Contrast, Emphasis, Rhythm, Unity**	3 sessions of 50 minutes
2.3	**Hierarchy and the Eye's Path: Directing the Viewer**	3 sessions of 50 minutes
2.4	**The Power of Empty Space: Negative Space and Simplicity**	3 sessions of 50 minutes
2.5	**The Critique: How Professionals Judge and Improve Work**	3 sessions of 50 minutes

Unit 2 test

Time allowed: 50 minutes. A calculator and ruler are allowed; two pencils (HB and soft) are required for the drawing problems. Show your work for every calculation. The test is worth 100 points.

1. **5 pts**

   Name the five elements and the five principles this unit uses.

2. **6 pts**

   What is a notan, who carried the idea into American art teaching, and in what book and year?

3. **8 pts**

   A dark mass of visual weight 8 sits 1.5 in left of center. (a) How far right must a weight-4 accent sit to balance it? (b) State the rule's name and write the formula.

4. **6 pts**

   Name four things that increase a shape's visual weight, and state what "everything medium" does to a composition even though it balances.

5. **8 pts**

   Compute the third lines and the four power points of a 15 × 9 in canvas.

6. **7 pts**

   A golden rectangle is 20 in wide. Find its height, and verify the ratio chain whole : larger = larger : smaller for a 20 in line divided at the golden section.

7. **8 pts**

   Define hierarchy and name the four tools that enforce it. Then diagnose: a poster where viewers report seeing the decorative border first, the picture second, and never the event name.

8. **6 pts**

   Describe reading gravity and the Z- and F-patterns, and give one design consequence of each pattern.

9. **8 pts**

   Negative space: (a) define it; (b) explain why drawing the gaps defeats the symbol system; (c) name the famous 1994 wordmark whose empty space carries its message, and the designer.

10. **6 pts**

    Give the three rules of professional feedback, and rewrite this note to obey them: "The poster is kind of a mess."

11. **8 pts**

    List the four critique steps in order with one sentence each, and explain why the order itself is the technology.

12. **8 pts**

    Hiroshige's Sudden Shower (1857): name the principle doing the most work in the rain, the bridge pilings, the dark far shore, and the single evening palette — and name the painter who copied the print in oils in 1887.

13. **8 pts**

    PRODUCTION TASK. Thumbnail a poster (any event) at playing-card size: mark the thirds, place rank 1 on a power point, draw the eye path as an arrowed loop, and label your three hierarchy ranks.

14. **8 pts**

    PRODUCTION TASK. Draw a simple object (mug, pine tree, scissors) entirely from its negative spaces: outline or fill only the gaps and ground shapes until the object appears. Label two of the negative shapes.

ANSWER KEY

1. Elements: line, shape, value, texture, space. Principles: balance, contrast, emphasis, rhythm, unity.
2. A flat study of the arrangement of dark and light masses (two values); Arthur Wesley Dow, in Composition (1899), built art teaching on line, notan and color.
3. (a) $8 \times 1.5 = 4 \times d$, so $d = 3$ in. (b) The steelyard (lever) rule of asymmetric balance: $w_1 d_1 = w_2 d_2$.
4. Size, darkness/contrast with surroundings, amount of detail or texture, color saturation (faces also pull). Everything-medium kills contrast: nothing is distinct, no emphasis is possible — balanced and boring.
5. Verticals at x = 5 and 10; horizontals at y = 3 and 6; power points (5,3), (10,3), (5,6), (10,6).
6. Height $= 20/1.618 \approx 12.4$ in. Section at 12.4 in leaves 7.6: $20/12.4 \approx 1.61$ and $12.4/7.6 \approx 1.63$ — both $\approx \varphi$.
7. Hierarchy is the planned order of first/second/third reads; tools: size, value contrast, placement on the eye's path, and pointers (lines/gazes). Diagnosis: the border outranks the name — likely higher contrast and frame-wide size; quiet the border, enlarge the name, give it the strongest contrast, and place it in the upper third.
8. Western-trained eyes enter top-left and drift right and down. Z: sparse layouts are scanned corner to corner — put the first read on the top stroke and the call-to-action near the exit (lower right). F (Nielsen Norman Group eye-tracking, 2006): text-heavy pages get one full top read then left-edge skims — front-load first lines and left edges.
9. (a) The shapes of what is not the subject — holes, gaps, ground. (b) The brain has symbols for objects but none for the arbitrary shapes of air between them, so the eye must measure. (c) FedEx — the arrow in the E-x gap; Lindon Leader, 1994.
10. Specific; about the work, not the worker; actionable and tied to the goal. Rewrite (example): "The date block and the title compete — equal size and contrast — so the three-second read fails; shrink the date block and move it to the exit path."
11. Describe — inventory what is literally present, no opinions; analyze — how elements and principles arrange it (balance, hierarchy, path); interpret — what it communicates; judge — whether it succeeds at its goal. Judging first triggers

defense and stops looking; describing first surfaces most flaws as shared discoveries the maker can hear.

12. Rain — rhythm (repetition with variation); pilings — rhythm/repetition; dark far shore against pale water — contrast (and counterweight in the asymmetric balance); single palette — unity. Vincent van Gogh copied it in 1887.
13. Model answer: thirds ruled; rank 1 (title) biggest at a power point with the note "strongest contrast here"; rank 2 on the path toward lower right; rank 3 small and quiet; arrows enter top-left, loop through ranks 1–2–3 and return — no arrow exits the frame.
14. Model answer: no outline of the object itself drawn first; gap shapes (handle hole, space under branches, triangle between blades) drawn as measured shapes and filled; the subject reads clearly; two negative shapes labeled as shapes (e.g., "trapped air of handle").

PORTFOLIO PIECE: PORTFOLIO PIECE 2: A COMPOSED PICTURE

Your second professional portfolio piece: one finished composition in graphite or ink — a scene of your choosing (a corner of your home, a working figure, a landscape with buildings, a still life with a story) — built the way this unit taught: written hierarchy first, six thumbnails with drawn eye paths, a two-value notan of the winner, focal point placed by the thirds or golden section (compute and note the coordinates), balance checked by the steelyard rule, negative spaces designed on purpose, and values spent to enforce the ranks. Work at 9 × 12 in or larger.

Then prove the Unit 2 difference: put the finished piece through one full critique-and-revision cycle (Lesson 2.5) — panel notes in four-step order, ranked to-do list, visible revision, response memo. Deliver the final with its process sheet (hierarchy list, thumbnails, notan, balance arithmetic) and the critique documents. Two pieces down, eight to go — and from here forward, every piece in this course ships critiqued and revised, because that is how professional work ships.

LOOK FOR	WHAT IT MEANS
Hierarchy and eye path	A written 1-2-3 hierarchy exists from before the thumbnails; the glance test on a fresh viewer returns that order; the eye path loops and never exits the frame.
Composition arithmetic	Focal point coordinates computed (thirds or golden section) and noted; steelyard balance estimated with weights and distances that roughly cancel; horizon/major divisions off center.
Elements and principles	Big shapes distinct in a working notan; one dominant contrast with the rest quieted; rhythm with variation where elements repeat; unity by limited, consistent means.
Negative space	Empty areas are varied, designed shapes — margins and gaps deliberate, breathing room around the focal point, nothing filled out of fear.
Critique cycle	Four-step panel critique recorded verbatim; ranked to-do list; every note answered in the revision or declined with a tested reason; response memo pairs note to fix.
Craftsmanship and presentation	Drawing skills from Unit 1 hold up (proportion, construction, value families); clean surface and edges; signed, dated,

LOOK FOR	WHAT IT MEANS
	photographed square, and delivered with the complete process packet.

2.1 The Elements: Line, Shape, Value, Texture, Space

OBJECTIVES

- Define the five elements — line, shape, value, texture, space — and identify each one at work in any image.
- Analyze a picture by isolating one element at a time: a line map, a shape map, a two-value notan.
- Explain why professionals audit designs element by element, and use the elements as a shared vocabulary when talking about pictures.

> **Warm-up.** Take any picture in your house — a framed print, a cereal box, a book cover — and lay tracing paper or a torn-open grocery bag over it (or just look hard). Answer in writing: What is the single biggest SHAPE? Where is the darkest VALUE? Find one real LINE. What part reads as empty SPACE? One minute per question.

WATCH

Beginning Graphic Design: Fundamentals

LearnFree · 6:26

https://www.youtube.com/watch?v=YqQx75OPRa0

> **WHEN TO WATCH**
> After the second core idea. Six tight minutes on the building blocks of design — watch once through, then once more pausing to name which of this lesson's five elements each example leans on.

Note: GCF's free design series is the cleanest short introduction to the elements in use. Notice how every example is an ordinary workplace design — flyers, pages, posters — not gallery art: the elements are a working vocabulary.

BACKUP VIDEO

The Basic Elements of Design | FREE COURSE

Envato Tuts+ · 18:48

https://www.youtube.com/watch?v=MshxnTQW4qU

As a fuller tour after the core ideas: each element demonstrated with design examples. Keep a list as you watch — one example per element in your own words.

KEY TERMS

element

A raw ingredient an image is built from. This course uses the working five: line, shape, value, texture and space.

line

A mark that leads the eye along a path — drawn, implied by edges, or implied by things pointing.

shape

A flat, enclosed area. Every picture reads first as a few big shapes, long before details register.

texture

The surface quality of an area — rough, smooth, grainy, woven — real or drawn.

space

The room in and around things: the illusion of depth, and the flat areas where nothing is — which are shapes too.

notan

A Japanese term for the arrangement of light and dark as flat masses; a two-value study that tests whether a composition's shapes work.

CORE IDEAS

The story. Around 1830–1832, the printmaker Katsushika Hokusai — past seventy, signing himself "the old man mad about painting" — published *Under the Wave off Kanagawa*, first of his series Thirty-six Views of Mount Fuji. It is probably the most reproduced image ever made, and it is almost nothing: one enormous claw-curved wave shape, three boat shapes, one small triangle of Fuji, a sky, and a newly affordable imported pigment — Prussian blue, which had just reached Japan through Dutch and Chinese traders and set off a craze for blue-printed pictures. A print sold for about the price of a bowl of noodles; thousands were pulled from the cherry-wood blocks. When Japan's ports opened after 1854 and these prints reached Paris — famously as packing paper around ceramics, then in shops that artists haunted — Western picture-making changed course. Monet collected them; van Gogh copied them. What the West was staring at was not exotic subject matter. It was the naked power of the elements: huge flat shapes, decisive line, two or three values, and empty space allowed to stay empty.

How they figured it out. The man who turned that lesson into a teachable system was an American: Arthur Wesley Dow, a painter from Ipswich, Massachusetts, who

studied Hokusai's prints in the Boston Museum of Fine Arts and concluded that Western art teaching had it backwards — students copied nature for years and never learned arrangement. His 1899 book *Composition* rebuilt art education on three foundations: line, *notan* (the Japanese term he borrowed for the pattern of dark and light), and color, practiced through exercises in dividing a rectangle beautifully. The book went through twenty editions and trained a generation of American teachers and artists — Georgia O'Keeffe, who studied under Dow's methods at Teachers College around 1914–1915, said he gave her the idea of filling a space in a beautiful way. The five-element vocabulary in this lesson is the modern descendant of Dow's revolution: before you ask "what is it a picture of?", ask "what lines, shapes, values, textures and spaces is it built from?"

The craft. Learn the five as tools of analysis first. **Line**: not only drawn strokes — the horizon is a line, a row of fence posts is a line, an outstretched arm is a line; lines aim the eye, and you will steer with them in Lesson 2.3. **Shape**: squint at any strong picture and it collapses into three to six big flat shapes; if those shapes are handsome and distinct, the picture holds from across a room (the Great Wave is the eternal proof). **Value**: Unit 1's scale, now used as arrangement — the pattern of light and dark masses, Dow's notan, is the composition's skeleton. **Texture**: rough against smooth gives the eye a change of pace and tells the hand what things are; too much texture everywhere is noise. **Space**: both the depth illusion from Lesson 1.4 and the flat "empty" areas — which are not leftovers but drawn shapes, as Lesson 2.4 will insist. The professional exercise is the *element audit*: take one picture and make three fast studies — a line map (just the movement lines), a shape map (the big flats, outlined), and a two-value notan (everything sorted to black or white). Ten minutes total, and you will know the picture better than an hour of staring.

In the studio. Working designers run the same audit on their own drafts. A layout feels wrong; the designer squints and checks elements one at a time — are the big shapes distinct? Is there one value pattern or mush? Is any line leading off the page? Is there anywhere for the eye to rest (space)? The vocabulary is also how teams talk: an art director will say "the shapes aren't reading" or "there's no value structure" and expect you to know exactly which fix drawer to open. That is why this unit teaches the words so firmly — critique (Lesson 2.5) is conducted in them. And the five elements are a complete checklist: when a picture fails, the cause lives in at least one of them, and element-by-element checking finds it faster than staring at the whole.

In the studio, continued. One honest note on lists: some books teach six or seven elements (adding color and form). Color gets its own full unit in this course (Unit 4), and form — the 3-D version of shape — you already built in Lessons 1.3 and 1.4. Different trades trim the list differently; what never changes is the method: name the ingredients, isolate them one at a time, and fix the one that is broken. A cook tastes for salt, acid and heat separately; a designer squints for shape, value and line separately. That is the whole trick, and it is learnable this week.

PICTURE STUDY



Fine Wind, Clear Morning (Red Fuji), Katsushika Hokusai, c. 1830–1832 · Color woodblock print · From the series Thirty-six Views of Mount Fuji (impressions in many museums)

Image: Wikimedia Commons, public domain

This lesson's story told how Hokusai, past seventy, opened his Thirty-six Views of Mount Fuji with the Great Wave. This print is the Wave's quiet sister from the same series, and it may be the simplest great picture ever made. On an early autumn morning, when a south wind clears the sky, Fuji catches the dawn and turns red. Hokusai gives the whole event three shapes: the mountain's triangle, the sky, and the dark fringe of forest at its base. Nothing else.

That is why it belongs to this lesson: every element you just learned is here at its barest. Line — the mountain's two long edges, the rows of combed clouds, the white veins of snow. Shape — one triangle so handsome it carries the entire design. Value — dark forest, mid mountain, pale sky. Texture — the woodgrain-fine trees against smooth sky. Space — a mountain miles away, built with no perspective lines at all. Count the shapes in this print; you will not need a second hand.

Look closely

- Count the big shapes. How many does the whole picture use — and is any one of them clumsy?
- Find every line in the print that is actually drawn, and every edge that is just two shapes meeting. Which kind does most of the work?

- Squint until the detail disappears. What value pattern is left — where is the darkest dark, and where the lightest light?
- Find the texture: the forest band and the snow veins. Why does the picture need them against all that smoothness?
- How does Hokusai make the mountain feel enormous and far away with no roads, figures or perspective lines to measure by?

Talk about it

1. The Great Wave is drama and this print is stillness, yet both are built from a handful of flat shapes. What does that tell you about where a picture's power actually comes from?
2. If you removed the cloud rows, what would the sky lose? Name the element they supply.
3. Design one 'view' of a subject you know — your street, your school — in exactly three shapes. Which three do you keep?

STUDIO BRIEF

Studio Brief: One Subject, Five Ways

Your client is an art-book publisher planning a chapter opener called "The Elements." The brief: take one ordinary subject — a tree, a lighthouse, a rooster, a teapot — and present it five times on one sheet, each study dominated by a different element, so a reader grasps all five at a glance. Deliverable: one sheet, five labeled studies plus a title. Pencil, soft pencil or marker, and cut paper allowed. Deadline feel: three sessions.

You will need

- One large sheet (11 × 17) or five small sheets to mount together
- HB and soft pencils, a dark marker if available, eraser
- Scissors and glue stick with black/gray construction paper (for the shape study)
- A real subject or clear photo reference of it

Steps

1. Choose a subject with a strong silhouette and a mix of surfaces — a pine tree beats a lawn, a rooster beats an egg.
2. **LINE study:** draw the subject using only line — contour and movement lines, no shading, no fills. Vary line weight deliberately.
3. **SHAPE study:** cut the subject's three to six big shapes from construction paper and glue them down flat. No drawing allowed — scissors force shape honesty.
4. **VALUE study:** a notan or three-value version: masses only, filled solid.
5. **TEXTURE study:** describe the subject with surface alone — bark strokes, feather marks, woven hatching — keeping the big values from study 3 underneath.
6. **SPACE study:** place the subject small in a large empty field, or crop it radically so emptiness and depth do the talking. Decide where the eye rests.
7. Arrange the five on the sheet with even margins; label each study in small neat capitals; add the chapter title.

8. **Deliver:** present to your family: one sentence per study on what its element is doing.
9. **Check your work** against the brief: could a reader who knows nothing name all five elements from your sheet alone?

Tips

- If two studies look alike, one is leaning on the wrong element — the shape study with shading in it is the usual offender.
- The scissors are the teacher: what survives cutting is what the eye actually needs.
- Keep each study under twenty minutes; crispness beats polish for a chapter opener.

Check your work

- ☐ Five studies, one element clearly dominant in each, labeled.
- ☐ The shape study is cut paper (or flat fills) with no internal detail.
- ☐ The sheet reads as one designed page — margins even, labels consistent, title placed deliberately.

SKETCHBOOK

1. Your element audit of a picture you love: line map, shape map, notan, dated and labeled with the picture's title.
2. Four Dow rectangles: a 3 × 4 in rectangle divided beautifully four different ways with a few lines, best one starred.
3. A "found elements" page: five tiny sketches of element sightings around your house — the line of a stair rail, the shape of a window's light on the floor, the texture of a towel.

> **From history.** Dow's Composition (1899) carried Hokusai's lessons into every American classroom, but the traffic ran both ways: Hokusai himself studied European perspective prints that reached Japan through the Dutch trading post at Nagasaki, and the Great Wave's low horizon and deep space show it. The two traditions had been trading element lessons for a century before Paris noticed. Good arrangement has never belonged to one nation; it is craft knowledge, and craft travels.

PRACTICE

1. Easy Name the five elements this course uses, each with a six-word-or-shorter definition.

Show answer

Line — a path the eye follows. Shape — a flat enclosed area. Value — lightness or darkness. Texture — the surface quality of areas. Space — room in and around things.

2. Easy What is a notan, and what question does it answer about a composition?

Show answer

A flat two-value (dark/light) study of the picture's masses; it answers whether the big shape arrangement works before any detail exists.

3. Easy Give three examples of lines in a picture that are not drawn strokes.

Show answer

A horizon, the edge of a shadow, a row of objects, a pointing arm, a road or river, a gaze direction — any three.

4. Easy In the Great Wave, roughly how many big shapes carry the whole picture? Name them.

Show answer

About four to six: the great wave claw, the secondary waves, the three boats, Fuji's triangle, and the sky.

5. Medium Run a full element audit on a cereal box or book cover: line map, shape map, two-value notan — three small studies. Submit all three.

Show answer

Check: line map shows only movement lines; shape map has 3–6 outlined flats; notan forces every area to black or white with no grays; each study took under five minutes.

6. Medium A friend's drawing is accurate but "feels like nothing." Using the elements as a checklist, write the four questions you would ask while squinting at it.

Show answer

Are there a few big, distinct shapes (or is it all medium bits)? Is there one clear value pattern (or mush)? Do any lines lead the eye in — and none out? Is there any empty space to rest in (or is every area busy)? (Texture: is it noise everywhere?)

7. Medium Why did Japanese prints hit Western artists so hard in the 1860s–1880s? Answer in element terms, not subject terms.

Show answer

They showed huge flat shapes, bold line, few values and unapologetic empty space — elements used nakedly, where Western academic pictures buried them under rendering and detail.

8. Medium What did Arthur Wesley Dow change about art teaching, and in what book and year?

Show answer

Composition (1899): he put arrangement first — line, notan, color exercises in dividing a rectangle beautifully — instead of years of copying nature before ever composing.

9. Hard Texture is the element most often overused by beginners. Explain the failure, in value terms, when texture is applied evenly over a whole drawing.

Show answer

Uniform texture breaks every large value mass into busy small contrasts, so the notan pattern dissolves; nothing is distinct, nothing rests, and the picture reads as even gray noise from a distance.

10. Hard Make a 4 × 6 in notan of the view through a doorway in your house: every area sorted to black or white, filled solid with soft pencil or marker. No lines, only masses.

Show answer

Check: exactly two values; the doorway view reads as recognizable from across the room; neither black nor white exceeds roughly three-quarters of the area (both must act as shapes).

11. Challenge Dow's core exercise: divide a 3 × 4 in rectangle with three to five lines into a beautiful arrangement of shapes — no subject at all. Do it four times, then mark the best and write two sentences on why it wins.

Show answer

Graded on the attempt and the reasoning: typical winning answers cite unequal divisions (no halves), variety of shape sizes, and one dominant shape — which is next lesson's subject, emerging on its own.

COMMON MISTAKES

- Treating the elements as decoration to add rather than ingredients already present — every picture already has all five; the question is whether they are controlled.
- Letting texture eat the value structure: render the big masses first, and let texture live inside them.
- Treating empty space as leftover background instead of a shape you drew on purpose — the error Lesson 2.4 exists to cure.

> **Make it a game · Element I-Spy.** One player calls an element — "texture!" — and everyone has thirty seconds to point at the strongest example of it in the room; the caller awards the point to the best find and must say why. Rotate callers through all five elements twice. Tie-breaker round: the caller holds up any picture book cover, and players must name which single element it leans on hardest, defending their answer in one sentence.

> **Scripture.** “The heavens declare the glory of God; and the firmament sheweth his handywork.” (Psalm 19:1, KJV)
>
> Before a single word of Scripture was written, the visual creation was already declaring glory — by line of horizon, shapes of cloud and mountain, values of day and night, textures of field and sea, and the deep space of the heavens. The elements are the vocabulary of that first declaration, and the artist who learns them is reading God's handwriting.

2.2 The Principles: Balance, Contrast, Emphasis, Rhythm, Unity

OBJECTIVES

- Define the five principles — balance, contrast, emphasis, rhythm, unity — and identify which ones any given picture leans on.
- Balance asymmetric compositions using the visual-weight rule, $w_1 d_1 = w_2 d_2$: a small weight far from the fulcrum balances a large weight near it.
- Use repetition-with-variation to create rhythm, and the squint, flip and thumbnail tests to check balance and unity in your own work.

> **Warm-up.** Set a ruler across a pencil like a see-saw. Put two coins on one side close to the pencil, one coin on the other side, and slide the single coin until the ruler balances. Measure both distances and write them down, with the coin counts. You have just performed this lesson's main formula with hardware.

WATCH

Master 5 Design Principles With This Course! (MUST WATCH)

Satori Graphics · 29:36

https://www.youtube.com/watch?v=FpwZTl3dCZE

> **WHEN TO WATCH**
> Split across two sessions: hierarchy/contrast/balance with the first three core ideas, repetition and space with the rest. Pause at each real-world example and name the principle yourself before he does.

Note: A full tour of the working principles — hierarchy, contrast, balance, repetition, space — by a professional designer using real layouts, not abstractions. His list overlaps this lesson's five with slightly different names; mapping his terms onto ours is itself good practice.

BACKUP VIDEO

Alignment, Balance, and Grids (Principles of Layout: Pt 3 of 3)

Flux Academy · 17:10

https://www.youtube.com/watch?v=DP9Bzd4_-NM

After the balance core idea: symmetric and asymmetric balance demonstrated on page layouts, which is exactly where you will use them in later units.

KEY TERMS

balance

The distribution of visual weight so a composition feels stable — symmetric (mirror-like) or asymmetric (unequal shapes equalized by placement).

contrast

Difference set against difference — big/small, dark/light, rough/smooth. Contrast creates interest and makes things distinct.

visual weight

How strongly an area pulls the eye: bigger, darker, more contrasting, more detailed and more saturated things weigh more.

emphasis

Making one thing unmistakably most important — the focal point the whole composition serves.

rhythm

Repetition with variation that carries the eye — repeated shapes, strokes or spacings, like a drumbeat with fills.

unity

The sense that everything in the picture belongs together — shared handling, limited means, nothing orphaned.

fulcrum

The balance point of a see-saw — in a picture, roughly the center, around which visual weights trade off.

CORE IDEAS

The story. In 1857 the Japanese printmaker Utagawa Hiroshige published *Sudden Shower over Shin-Ōhashi Bridge and Atake*, one of his Hundred Famous Views of Edo: hurrying figures caught mid-bridge under a slate evening sky, the rain cut as dozens of near-parallel lines driven at a slant across the whole sheet. It is a composition built almost entirely on the principles: the *rhythm* of the rain strokes and the bridge pilings; the *contrast* of the dark far shore against the pale water; the *asymmetric balance* of the great bridge running out of the frame low-right against the quiet weight of the distant bank upper-left; the *unity* of one gray-blue evening holding every part. Thirty years later in Paris, a young Vincent van Gogh was so seized by it that in 1887 he painted a full-size oil copy, border and all. Hiroshige died in 1858 believing himself a maker of cheap popular prints; his arrangement principles conquered the painters of Europe within a generation.

How they figured it out. Why does a picture "feel" balanced or lopsided? The modern answer came from perception research: the psychologist Rudolf Arnheim's *Art and Visual Perception* (1954) showed that viewers respond to pictures as fields of forces — every shape pulls with a strength depending on its size, darkness, contrast and distance from the center, and the eye sums the pulls the way a scale sums weights. That confirmed what artists had practiced for centuries as the *steelyard* principle, named for the Roman market scale with unequal arms: a heavy object near a fulcrum balances a light object far from it. Painters stated it as a rule of thumb — a large mass near the center is balanced by a small mass near the edge — and Japanese artists like Hiroshige were its great masters, balancing a massive foreground bridge with a wisp of far shore. The arithmetic you did with coins on a ruler is genuinely

the arithmetic of pictorial balance; what changes is only that "weight" in a picture means pull on the eye.

The craft — balance and contrast. *Symmetric balance* (mirror-image around a center line) reads as formal, stable, ceremonial: cathedrals, wedding invitations, government seals. *Asymmetric balance* reads as alive and modern, and it is the working designer's default: unequal things equalized by placement. Use the steelyard rule — $w_1 d_1 = w_2 d_2$ — treating visual weight as a product of size and darkness/contrast, and distance as distance from the picture's center. A big pale shape slightly off-center balances a small dark accent far out on the other side. Then *contrast*, the principle that powers all the others: things read only against their opposites. Dark reads against light (your Unit 1 value families), big against small, detailed against plain, rough against smooth. The classic beginner failure is timid, even-handed sameness — everything medium-sized, medium-dark, medium-busy — which balances perfectly and interests no one. Professionals push one contrast hard and quiet the rest.

The craft — emphasis, rhythm, unity. *Emphasis*: every composition needs one boss — a single focal point that wins by size, by sharpest value contrast, by placement, or by every line pointing at it (next lesson is entirely about this). Two equal bosses split the picture; none leaves it wandering. *Rhythm*: repetition carries the eye — Hiroshige's rain strokes, a colonnade, a row of buttons — but exact repetition is a machine's beat; vary the spacing or size slightly and it becomes music. Test: does the eye travel along the repeats, or stall? *Unity*: the hardest to define, easiest to feel. It comes from limited means (one light source, one pencil, three values, two shape families), consistent handling (every edge treated by the same hand), and nothing orphaned (every element echoed at least once somewhere else). The working tests for all five principles cost nothing: **squint** (does the value structure hold? is one thing boss?), **flip** the drawing upside down or look at it in a mirror (imbalance leaps out when the subject stops distracting you), and **thumbnail** (if the arrangement fails at postage-stamp size, it fails).

In the studio. These five words are daily speech in every studio. An art director marks a layout: "top-heavy" (balance), "nothing pops" (contrast), "what am I supposed to look at?" (emphasis), "it's monotonous" (rhythm — the repeats have no variation), "it fights itself" (unity). You will hear and say them for the rest of your career, so attach each to a physical check now: balance → flip it; contrast → squint;

emphasis → the three-second glance test (ask someone what they saw first); rhythm → trace the repeats with a finger; unity → list the means used, and cut anything used only once for no reason. In Lesson 2.5 these become the backbone of formal critique, and in Unit 5 the same principles run page layouts, where balance and emphasis stop being art talk and become whether a poster sells the concert.

PICTURE STUDY



Sudden Shower over Shin-Ōhashi Bridge and Atake, Utagawa Hiroshige, 1857 · Polychrome woodblock print (from One Hundred Famous Views of Edo) · The Metropolitan Museum of Art, New York

Image: Wikimedia Commons, CC0 public domain dedication

Hiroshige cut this sudden downpour in 1857 for his Hundred Famous Views of Edo, and died the following year. The rain is nothing but ruled lines driven at a slant across the block — rhythm made visible — and the whole evening holds together in one gray-blue chord.

Thirty years later Vincent van Gogh admired this print so much he painted a full-size oil copy of it (1887). Study what the principles are doing here, because a great painter once studied exactly that.

Look closely

- Trace the rain: are the lines perfectly parallel and evenly spaced, or varied? Look closely — there are two directions.
- Find the rhythm of the bridge pilings. How does their spacing change, and what does that do?
- Where is the strongest value contrast? Is that where your eye goes first?
- Map the balance: the heavy bridge runs low and right — what answers it on the upper left?
- What unifies the sheet — name the one weather, one palette, one hour of day doing the work.

Talk about it

1. The figures' faces are hidden under hats and umbrellas. How do rhythm and gesture tell the story anyway?
2. Why would van Gogh — a painter of oils in Paris — copy a cheap Japanese commercial print stroke by stroke? What was he trying to learn?
3. Hiroshige shows the storm at its hardest moment, not the view at its prettiest. What does that choice teach about emphasis?

STUDIO BRIEF

Studio Brief: Four Postcards, Five Principles

Your client is a stationery company launching a line of art postcards and wants a candidate set that demonstrates compositional range: four postcard designs, same subject family, each built to showcase a named pair of principles. Deliverable: four 4 × 6 in compositions in cut gray/black paper and pencil, mounted on one board with the principle pairs labeled. Deadline feel: three sessions.

You will need

- Four 4 × 6 in cards or rectangles ruled on heavier paper
- Black, gray and white construction paper, scissors, glue stick
- Pencils and eraser for added line work
- A simple subject family: birds on wires, sailboats, teacups, pine trees — your choice
- A mirror for the flip test

Steps

1. Choose the subject family and cut a small stock of its shapes in three sizes and three values — your composing ingredients.
2. **Card 1 — Balance + Emphasis:** an asymmetric arrangement with one unmistakable focal point, balanced by the steelyard rule. Compute your weights-times-distances roughly in the margin.
3. **Card 2 — Contrast + Emphasis:** let one value contrast dominate (darkest dark against lightest light at the focal point) and quiet every other difference.
4. **Card 3 — Rhythm + Unity:** a repeated element with varied spacing or size carrying the eye across the card, everything in one limited palette of means.
5. **Card 4 — your call:** pick the pair you understand least and prove you don't. Label it honestly.
6. Run the tests on every card: squint, flip in the mirror, and the three-second glance test on a family member.

7. Revise the weakest card once — move, don't add; composition problems are usually placement problems.
8. Mount all four on a board with neat labels naming each card's principle pair.
9. **Deliver:** a two-minute client presentation: which card should lead the product line and why, in principle vocabulary.
10. **Check your work** against the brief: four cards, pairs labeled, margin arithmetic visible on card 1.

Tips

- Cut paper beats drawing here: shapes can be slid around for minutes before gluing — composition as a verb.
- If a card needs explaining, it failed the postcard test; a postcard is understood at mail-sorting speed.
- Steal structure honorably: let Hiroshige's bridge or Hokusai's wave suggest an armature, then build it from your own subject.

Check your work

- ☐ Each card demonstrably leans on its labeled pair — a family member can match labels to cards unaided.
- ☐ Card 1's balance arithmetic is written in the margin and roughly cancels.
- ☐ All four survive the squint and flip tests without tipping or going mushy.

SKETCHBOOK

1. Your coin-and-ruler warm-up recorded as a labeled diagram, with the steelyard formula and the sentence "visual weight works the same way" beneath it.
2. Five thumbnail "weight maps" of pictures around your house: big masses sketched as gray blobs on a beam over a fulcrum, with your verdict — balanced or tipping?
3. A rhythm page: one row of identical marks (dead beat), one row varied in spacing, one varied in size — labeled machine, music, music.

KEY FORMULAS

$w_1 d_1 = w_2 d_2$ (steelyard balance: visual weight × distance from center, each side)
$\text{visual weight} \approx \text{size} \times \text{contrast with surroundings}$ (a working approximation, not a law)

From history. When Japan's ports opened after 1854, ukiyo-e prints flooded into Paris — sold in tea shops and, by the 1870s, in dedicated galleries. The enthusiasm got a name, Japonisme, in 1872. Van Gogh owned hundreds of prints and copied Hiroshige twice in oils in 1887; Whistler, Degas, Cassatt and Toulouse-Lautrec rebuilt their compositions on asymmetric balance, cropped forms and flat pattern learned from sheets that had sold in Edo for pocket change. It is the great proof that composition is a transferable technology: the principles crossed an ocean, a language and a medium without losing a thing.

WORKED EXAMPLES

Example 1. A dark shape of visual weight 6 sits 2 in left of a composition's center. How far right of center must a shape of weight 3 sit to balance it?

Show solution

1. Steelyard: $w_1 d_1 = w_2 d_2$.
2. $6 \times 2 = 3 \times d_2$.
3. $d_2 = 4$ in right of center — the lighter thing sits farther out, exactly like the lone coin on your ruler.

Answer: 4 in right of center.

Example 2. In your warm-up, two coins sat 4 cm from the pencil and one coin balanced them on the other side. Where did the single coin end up, and what picture rule does this model?

Show solution

1. $2 \times 4 = 1 \times d$, so $d = 8$ cm.
2. The small force balances by sitting twice as far out.
3. Picture rule: a small accent near the edge balances a large mass near the center — asymmetric balance.

Answer: 8 cm out; small-far balances big-near.

Example 3. Treat visual weight as size × contrast. A pale barn (size 8, contrast 1 against a pale sky) sits 1 unit from center. A crow (size 1) sits on a fence 4 units out on the other side. How much contrast must the crow carry to balance the barn, and how would you draw that?

Show solution

1. Barn weight: $8 \times 1 = 8$; moment $8 \times 1 = 8$.
2. Crow must supply moment 8 at distance 4: weight needed $= 8/4 = 2$.
3. Weight 2 from size 1 needs contrast 2 — draw the crow nearly black against the palest part of the sky, the strongest value contrast in the picture.

Answer: Contrast about 2 (double the barn's): a small, very dark accent against light — the classic far-out counterweight.

Example 4. A student's drawing repeats seven identical fence posts at identical spacing and it reads as dead. Prescribe a rhythm fix using repetition-with-variation, and say what must NOT change.

Show solution

1. Keep the repeat itself — seven posts remain posts (unity needs the family resemblance).
2. Vary the beat: let spacing compress with perspective distance, tilt one post, break one, let grass hide another's base.
3. The eye now travels pole to pole reading differences, like melody over a drumbeat.

Answer: Vary spacing, height or condition of the posts while keeping them recognizably one family; the repetition stays, the sameness goes.

PRACTICE

1. Easy Name the five principles and give a four-word-or-less working test for each.

   Show answer

   Balance — flip it, feel the tilt. Contrast — squint for differences. Emphasis — what's seen first? Rhythm — trace the repeats. Unity — does everything belong?

2. Easy When would you deliberately choose symmetric balance over asymmetric? Give two uses.

Show answer

When formality and stability are the message: a wedding invitation, a church program, a government seal, a classical title page.

3. Easy List four things that increase a shape's visual weight.

Show answer

Larger size, darker value / stronger contrast with surroundings, more detail or texture, stronger color saturation (and, for faces and figures, simply being a face).

4. Easy Weight 4 at distance 3 on the left. What distance balances weight 6 on the right?

Show answer

$4 \times 3 = 6 \times d$; $d = 2$.

5. Medium A composition has a large pale haystack just right of center. Using the steelyard rule, give two different counterweights that would balance it from the left — one near, one far.

Show answer

Near: a medium-dark mass (tree, shed) a little left of center. Far: a small, high-contrast accent (dark bird, figure, fence post) close to the left edge. Both satisfy small-far / big-near.

6. Medium Why does "everything medium" — medium sizes, values, detail — fail even though it balances perfectly? Which principle is missing?

Show answer

Contrast. With no differences, nothing is distinct, no emphasis is possible and the eye has nothing to compare; perfect balance of sameness is perfectly boring.

7. Medium Cut three gray-paper shapes — one large, one medium, one small — and arrange them on a white sheet three ways: symmetric, asymmetric-balanced, deliberately unbalanced. Glue or photograph all three and label them.

Show answer

Check: the symmetric version mirrors around a center line; the asymmetric version places smaller shapes farther from center; the unbalanced version visibly tips (and you can say toward which corner).

8. Medium In Hiroshige's Sudden Shower, name one concrete instance of each: rhythm, contrast, asymmetric balance, unity.

Show answer

Rhythm — the slanted rain lines and bridge pilings; contrast — dark far shore and figures against pale water; asymmetric balance — the massive bridge low-right against the distant bank upper-left; unity — the single gray-blue evening palette and one rain direction over everything.

9. Hard Your poster draft has two equal focal points: a big dark title top-left and a big dark drawing bottom-right. Viewers say it "bounces." Diagnose by principle and give two different fixes.

Show answer

Emphasis is split — two bosses of equal weight. Fixes: subordinate one (shrink, lighten or simplify the drawing so the title leads), or merge them into one visual unit so the eye reads them as a single focal group; either restores a hierarchy.

10. Hard Unity by limited means: redraw any previous sketch of yours allowing yourself exactly three values, one pencil, and two shape families (e.g., rounds and rectangles). Compare with the original in two sentences.

Show answer

Expected finding: the restricted version feels more "together" — shared means read as one hand and one world; the original's variety reads as clutter. Restriction is a unity machine.

11. Hard A mirror or an upside-down flip reveals imbalance that staring did not. Why does the trick work?

Show answer

Flipping defeats the brain's subject-reading: names and stories stop masking the abstract field of weights, so the raw pulls of shape, value and placement — the actual balance — are seen fresh.

12. Challenge Design a see-saw diagram of any favorite picture (a picture study from this course works well): sketch its big masses on a beam over a fulcrum, estimate each mass's weight 1–10 and distance from center, and compute whether the moments roughly cancel.

Show answer

Graded on method: masses identified, weights argued from size × contrast, moments multiplied and compared. Most masterworks land surprisingly close to canceling — which is the lesson.

COMMON MISTAKES

- Centering everything. Dead-center placement balances trivially and bores instantly; asymmetry with the steelyard rule is the professional default.
- Splitting emphasis between two equal focal points, which makes the viewer's eye bounce — one boss per picture.
- Confusing unity with sameness. Unity is family resemblance among varied things; sameness is the contrast failure wearing unity's coat.

> **Make it a game · Tip the Picture.** Players take turns laying out a quick composition from cut shapes (or spoons, coasters and napkins on the table). The composer secretly aims for balanced or tipping. Everyone else gets one squint and one upside-down look, then votes: balanced, tips left, tips right. Composer reveals the intent; correct votes score a point, and anyone who can FIX a tipping layout by moving exactly one object scores two. First to six.

> **Scripture.** “He hath made every thing beautiful in his time: also he hath set the world in their heart, so that no man can find out the work that God maketh from the beginning to the end.” (Ecclesiastes 3:11, KJV)
>
> Beauty in its time and place — each thing set where it belongs — is God's own arrangement of the world. The composer of pictures works in a small way at what Ecclesiastes describes in the large: placing every part so the whole is beautiful, even while the full design exceeds the viewer's finding out.

2.3 Hierarchy and the Eye's Path: Directing the Viewer

OBJECTIVES

- Plan three levels of hierarchy — what is seen first, second, third — and enforce them with size, value contrast, placement and pointing lines.
- Compute rule-of-thirds lines and power points for any canvas, and construct a golden rectangle using $\varphi \approx 1.618$.
- Design for reading gravity and the Z- and F-patterns — the paths Western eyes default to — and test a composition with the three-second glance test.

> **Warm-up.** Hand any magazine page, poster or book cover to a family member for exactly three seconds, then take it away. Ask: "What did you see?" Write their answers in order. That order IS the page's hierarchy — whether or not its designer planned it. Repeat with a second page and compare.

WATCH

The ONLY Video On Visual Hierarchy ANY Graphic Designer Needs

Satori Graphics · 17:12

https://www.youtube.com/watch?v=4QNEDhrsRLo

> **WHEN TO WATCH**
> After the third core idea. Pause at each example layout and rank its hierarchy yourself — first, second, third read — before he explains it.

Note: A full working course on hierarchy: size, weight, color, spacing and position as ranking tools, shown on real layouts. Note how often the fix is making something SMALLER or quieter, not louder.

BACKUP VIDEO

How Designers Control Where You Look

Flux Academy · 18:53

https://www.youtube.com/watch?v=vExfs13rZIo

With the eye-path core ideas: focal points and guided eye movement demonstrated first on classic pictures, then on modern pages — exactly this lesson's span, picture to layout.

KEY TERMS

hierarchy

The planned ranking of a composition's parts: what is seen first, second and third. If the designer doesn't set it, accident will.

focal point

The spot the eye lands on first — created by contrast, size, placement, pointing lines or a face.

eye path

The route a viewer's gaze travels through a picture; good compositions steer it in a planned loop that stays inside the frame.

reading gravity

The habit of eyes trained on Western text: enter top-left, drift left-to-right and downward, exit bottom-right.

Z-pattern and F-pattern

Default scanning paths: a Z across sparse layouts (posters, ads); an F down text-heavy pages — top line read, then shorter and shorter leftward skims.

rule of thirds

Dividing the canvas in thirds both ways and placing key items on the lines and their four intersections (power points) rather than dead center.

golden ratio

The proportion $\varphi = \frac{1+\sqrt{5}}{2} \approx 1.618$, where the whole relates to the larger part as the larger part relates to the smaller; used to proportion rectangles and divisions.

CORE IDEAS

The story. On December 26, 1894, the actress Sarah Bernhardt — the most famous woman in Europe — telephoned the Lemercier printing house in Paris demanding a new poster for her play *Gismonda* by New Year's Day. The staff artists were away for Christmas. The only artist on hand was an unknown thirty-four-year-old Czech named Alphonse Mucha, who happened to be at the shop correcting proofs for a friend. He got the job by default, worked through the week, and on January 1, 1895 Paris woke to something nobody had seen: a poster taller than a person — nearly life-size at over two meters — with Bernhardt standing like a Byzantine saint in an

arch, her name arched above her in letters built into the design. Parisians bribed bill-stickers and cut the posters off the walls the first night. Bernhardt signed Mucha to a six-year contract within the week. The poster works because every device in this lesson is in it: one towering figure (size), her head haloed by the arch at the top (placement), the title arched exactly where the entering eye lands, and every line of the gown running the gaze down to the play's name and back up. Hierarchy made a career overnight.

How they figured it out. Artists steered eyes by craft intuition for centuries; the measurements came later. Eye-tracking research in the twentieth century confirmed the big habits: eyes trained on Western text enter a page at the top-left and drift rightward and down — *reading gravity* — scanning sparse layouts in a rough **Z** and text-heavy pages in an **F** (the F was documented in a famous 2006 eye-tracking study of web readers by the Nielsen Norman Group, watching hundreds of users: a full read across the top, a shorter skim lower down, then a vertical scan down the left edge). Other findings held no surprises for illustrators: the eye goes to the highest contrast first, to faces above almost everything (and then to where the drawn face is *looking*), to the sharpest detail, and to any arrow-like line. None of this is a cage — it is the prevailing wind. A designer who knows where the eye wants to go can either place cargo along that route or spend contrast deliberately to pull the eye somewhere better.

The craft — setting the ranks. Before composing anything, write the hierarchy as a list: 1st read, 2nd read, 3rd read. (For a church concert poster: 1st — "HANDEL'S MESSIAH"; 2nd — date, time, place; 3rd — everything else.) Then enforce the ranks with the four tools. **Size**: the first read should usually be unmistakably biggest — not 10% bigger, obviously bigger. **Value contrast**: spend your darkest-dark-against-lightest-light at rank 1 (Unit 1's value families are now a steering wheel). **Placement**: ranks live where the path visits — top-left and the upper third get found free of charge; bottom corners cost extra. **Pointers**: lines, gazes, and shapes that aim — a drawn figure looking at the title will drag every viewer's eye there within a quarter second. The classic test is your warm-up, known in studios as the glance test (or "the squint across the room"): three seconds, then ask what was seen and in what order. If the report matches your written list, the hierarchy works. If everything "pops," nothing does — emphasis is a budget, and rank 1 spends most of it.

The craft — placing by the numbers. Dead center is the weakest interesting position: it balances trivially and steers nowhere. The *rule of thirds* is the working alternative: divide the canvas in thirds both ways — for a 12 × 9 in sheet, vertical lines at 4 and 8 in, horizontals at 3 and 6 in — and place key items on the lines, with the focal point at one of the four intersections (the *power points*: (4,3), (8,3), (4,6), (8,6) on that sheet). Horizons go on a third line, never halving the picture. The older, richer cousin is the *golden ratio*, $\varphi = (1+\sqrt{5})/2 \approx 1.618$: a golden rectangle 10 in wide stands $10/1.618 \approx 6.18$ in tall, and dividing a 10-in line at the golden section puts the mark at $10/1.618 \approx 6.18$ in — the whole-to-larger ratio equals larger-to-smaller. The Fibonacci numbers 3, 5, 8, 13 approximate it (5:8 = 1.6), handy for quick layout math. Treat both as tested starting positions, not magic: masters deviate constantly, but they deviate *from* somewhere.

In the studio. Hierarchy is the most commercial skill in this unit because it is measurable in money: a poster that surrenders its message in three seconds sells tickets, and one that doesn't, doesn't. Studio practice runs on it. Designers write the ranking into the brief before sketching ("logo first? no — offer first, logo second"); editorial illustrators thumbnail the eye path as an actual drawn loop with arrows; UI designers A/B test button hierarchies and watch the click numbers move. Art directors speak the vocabulary constantly: "What's the first read?" "The eye leaks out the lower right — turn that line." "You've got three things shouting; pick one." And the discipline is permanent: in Unit 3 hierarchy becomes type sizes, in Unit 5 the poster, in Unit 9 the webpage. The three-second glance test you ran at the kitchen table today is run, in some form, on nearly everything professionally designed around you.

PICTURE STUDY



Harper's, February, Edward Penfield, 1896 · Color lithograph poster · Metropolitan Museum of Art, New York

Image: Wikimedia Commons, public domain (CC0, Metropolitan Museum of Art)

Every month from 1893 to 1898, Edward Penfield — art editor of Harper's Magazine — designed one poster to sell that month's issue, and in doing so he taught America what visual hierarchy means. This is February 1896, and you can rank its message with a stopwatch. First read: HARPER'S, cream against deep blue, the biggest and highest thing on the sheet. Second read: the couple out walking in winter clothes — the month's mood, drawn in Penfield's flat, poster-perfect shapes. Third read: FEBRUARY, in red, catching you at the bottom of the page. Name, picture, date: one, two, three, done.

This lesson's story was Mucha's Gismonda, a poster that steers the eye down two meters of ornament. Penfield is the American answer: the same control of the eye's path with a fraction of the means. Size makes HARPER'S first; contrast makes FEBRUARY loud; placement walks you top to bottom with no detours. When a design of yours muddles its ranks, come back to this poster and count to three.

Look closely

- Rank the reads: what does your eye get first, second, third? Now name the device that sets each rank — size, contrast, color or placement.

- Trace your eye's actual path through the poster. Does it ever leave the page or double back confused?
- Why cream letters on blue at the top but red letters on pale ground at the bottom? What would happen if the two were swapped?
- The figures look at neither word. Where do their angles and walking direction send your eye?
- Count everything in the design — words, figures, background shapes. How many elements carry this whole message?

Talk about it

1. Penfield had one second of a passerby's attention; a thumbnail in a search result gets less. Which of his ranking devices translate directly to screens?
2. The picture answers 'why buy this month's issue?' without a single word of copy. What is it saying about February, and how?
3. Take a cluttered flyer you have seen recently and redesign it mentally as a Penfield: what are the only three things that survive?

STUDIO BRIEF

Studio Brief: The Three-Second Poster

Your client is your own church or homeschool co-op announcing a real upcoming event — a concert, a pie supper, a field day. The brief: one poster, readable at a glance from across a room, with a written hierarchy delivered before the sketching starts and proven by glance tests before delivery. Deliverable: final poster in pencil and marker at 11 × 17 or letter size, plus the thumbnail sheet and test notes. Deadline feel: three sessions — and if the event is real, the poster actually ships.

You will need

- Letter or 11 × 17 paper for the final; scrap for thumbnails
- Pencils, eraser, ruler, and a dark marker or soft pencil for final contrast
- Tracing paper (or a window) for the thirds grid
- Three patient family members for staggered glance tests

Steps

1. Write the brief: event, audience, and the one thing a passerby must retain (usually the event name or the date). Then write the hierarchy list: 1st, 2nd, 3rd read.
2. Compute your thirds: for your sheet size, calculate the third lines and power points and rule them lightly.
3. Thumbnail six layouts the size of playing cards, trying the focal point at different power points, with the eye path drawn as an arrowed loop on each.
4. Glance-test the best two thumbnails (three seconds each, one viewer each): does the reported order match your written list? Pick the winner.
5. Draw the final at full size: rank 1 biggest and highest-contrast, on a thirds line; rank 2 on the exit path (reading gravity runs toward lower-right); rank 3 quiet.
6. Spend values deliberately: darkest-against-lightest at rank 1 only. Squint to verify nothing else competes.

7. Check the leaks: trace your own eye path — does any line, gaze or shape aim out of the frame? Turn it.
8. Glance-test the final on your third (fresh) viewer and record the report verbatim.
9. **Deliver:** the poster plus a half-page of process: your hierarchy list, the thumbnails, and all three test reports.
10. **Check your work** against the brief: did the final test report match your written hierarchy, rank for rank?

Tips

- Fewer words win: every word added to a poster taxes rank 1.
- If the glance test fails, resist adding things — remove or shrink the usurper that stole the first read.
- Hang the poster across the room overnight; morning eyes run the most honest glance test you own.

Check your work

- ☐ The written hierarchy existed before the first thumbnail, and the final glance test matched it.
- ☐ The focal point sits on a computed thirds line or power point (coordinates written in the margin).
- ☐ No line, gaze or shape leads the eye out of the frame.

SKETCHBOOK

1. The thirds grid and power points computed and ruled for three paper sizes you actually use (letter, 9 × 12, 11 × 17), kept as a reference page.
2. A golden rectangle constructed at 5 × 8 in with the ratio check (8/5 = 1.6) written beside it, plus one object or scene sketched inside it with the focal point at the golden section.
3. Eye-path traces of two pictures in this course so far (arrowed loops with numbered stops), labeled with the device that creates each stop.

KEY FORMULAS

third lines: $\frac{w}{3}$, $\frac{2w}{3}$ and $\frac{h}{3}$, $\frac{2h}{3}$; power points at their four intersections

$$\varphi = \frac{1+\sqrt{5}}{2} \approx 1.618, \qquad \frac{\text{whole}}{\text{larger}} = \frac{\text{larger}}{\text{smaller}} = \varphi$$

$$\text{golden rectangle: height} = \frac{\text{width}}{\varphi}$$

From history. The poster craze Mucha ignited had an unlikely archivist: the printer Jules Chéret, whose Paris workshops had made the color poster an art form through the 1880s, and whose series Les Maîtres de l'Affiche (1895–1900) reprinted the era's best posters at collector size each month — the reason so many, including Gismonda, survive in fine copies today. Eye-tracking science caught up with the poster artists only decades later: the paths Chéret and Mucha steered by craft are the same ones the Nielsen Norman Group's cameras mapped on web readers in 2006. The eye did not change; the page did.

WORKED EXAMPLES

Example 1. Find the third lines and the four power points of a 12 × 9 in drawing.

Show solution

1. Verticals: $12/3 = 4$ and 8 in from the left.
2. Horizontals: $9/3 = 3$ and 6 in from the top.
3. Power points: (4, 3), (8, 3), (4, 6), (8, 6).

Answer: Lines at x = 4, 8 and y = 3, 6; power points (4,3), (8,3), (4,6), (8,6).

Example 2. A client wants a golden-rectangle poster 24 in wide. How tall is it? And where is the golden section of its width?

Show solution

1. Height: $24/1.618 \approx 14.8$ in.
2. Golden section of the width: $24/1.618 \approx 14.8$ in from one edge (leaving 9.2 in).
3. Check the ratio chain: $24/14.8 \approx 1.62$ and $14.8/9.2 \approx 1.61$ — whole-to-larger ≈ larger-to-smaller.

Answer: About 24 × 14.8 in; the golden section falls about 14.8 in from an edge.

Example 3. Verify that neighboring Fibonacci numbers approximate the golden ratio, using 5:8 and 8:13, and state why that is useful at the drawing board.

Show solution

1. $8/5 = 1.6$; $13/8 = 1.625$ — both near 1.618.
2. So a 5×8 in card or an 8×13 unit grid is a near-golden rectangle with whole-number sides.
3. Whole numbers divide evenly into grids and rulers; you get golden proportions without decimals.

Answer: 8/5 = 1.6 and 13/8 ≈ 1.63, both ≈ ϕ; Fibonacci pairs give golden proportions in ruler-friendly whole numbers.

Example 4. Your concert poster's glance test comes back: "I saw the pretty border, then the picture of the choir... was there a date?" Your written hierarchy was 1: concert name, 2: date/place, 3: choir picture. Prescribe fixes with all four ranking tools.

Show solution

1. Size: enlarge the concert name until clearly biggest; shrink the border to a quiet frame.
2. Value: give the name the poster's strongest value contrast; soften the choir photo's contrast so it reads second-or-third.
3. Placement: move the name into the upper third, on a thirds line where reading gravity enters.
4. Pointers: if any figure in the picture has a gaze or line, aim it at the date block; never let the border's lines loop the eye around the margin and out.

Answer: Biggest + highest-contrast + upper-third placement for the name; subdued picture; gaze/lines re-aimed at the date — then re-run the glance test.

PRACTICE

1. Easy What is hierarchy, and what happens to a composition that has none?

   Show answer

   The planned order of first, second and third reads; without it the eye wanders, the viewer takes away whatever accident emphasized, and the message is lost.

2. Easy Name the four main tools for enforcing hierarchy.

Show answer

Size, value contrast, placement (on the eye's path), and pointers (lines, gazes, aiming shapes).

3. Easy Compute the third lines of an 18 × 12 in sheet and list its power points.

Show answer

x = 6, 12; y = 4, 8; power points (6,4), (12,4), (6,8), (12,8).

4. Easy Where do Western-trained eyes enter a layout, and what two scan patterns do they default to?

Show answer

Top-left (reading gravity); the Z-pattern on sparse layouts, the F-pattern on text-heavy ones.

5. Medium A golden rectangle is 10 cm wide. Find its height, and the golden section of a 10 cm line.

Show answer

Height $= 10/1.618 \approx 6.18$ cm; golden section at about 6.18 cm (leaving 3.82).

6. Medium Why is dead center the weakest interesting position for a focal point, and what do the thirds offer instead?

Show answer

Center is static — it balances trivially, steers nowhere and divides the picture into equal, monotonous halves; thirds positions create unequal, livelier divisions while staying near the paths the eye already travels.

7. Medium Run the three-second glance test on two posters or covers in your house, recording the report order. Then rank what the designer probably INTENDED and note any mismatch.

Show answer

Check: both reports recorded in order; intended ranks argued from size/contrast/placement; mismatches identified as hierarchy failures (or your misreading — say which).

8. Medium In Mucha's Gismonda, name the device that performs each: (a) first read, (b) the eye's route downward, (c) the return path to the title.

Show answer

(a) The near-life-size figure with her haloed head in the arch — size plus placement; (b) the gown's lines and the staff of palms running the gaze down; (c) the arched lettering and the arch shape carrying the eye back up to the title. (Reasonable variants accepted if argued from the tools.)

9. Hard A drawn portrait subject gazes out of the frame to the left on a page where the headline sits to the right. Readers keep missing the headline. Explain the failure and two fixes.

Show answer

Viewers follow the drawn gaze — it is the strongest pointer — so the eye exits left, away from the headline. Fixes: flip the portrait so the gaze aims at the headline, or move the headline into the gaze's path; (also acceptable: reduce the portrait's contrast so the headline wins the first read).

10. Hard Thumbnail the same simple poster (title, picture, date) three times: focal point at dead center, at a power point, at a bottom corner. Glance-test all three on someone and record which delivered the title fastest.

Show answer

Expected: the power-point version wins or ties; center feels static; the bottom corner loses — it sits past the exit of reading gravity. Any honest data accepted with the reasoning.

11. Hard The F-pattern (Nielsen Norman Group, 2006) describes how people scan text-heavy pages. State the pattern and one concrete design consequence for anything with paragraphs.

Show answer

A full read across the top, a shorter skim partway down, then a vertical scan down the left edge. Consequence: front-load the first line and left edge — key words first; headings and starts of lines carry the message, because the lower right of a text block is barely seen.

12. **Challenge** Draw the eye path of any picture study from this course as an actual arrowed loop on a tracing or copy: entry, stops 1–2–3, return. Then write two sentences on what keeps the eye from leaving the frame.

Show answer

Graded on the trace: entry near top-left or at the dominant contrast; numbered stops matching size/contrast ranks; the return device named (an arch, a curve, a gaze, a dark corner blocking exit).

COMMON MISTAKES

- Making everything big and bold. Emphasis is a budget: when every item shouts, rank 1 does not exist and the glance test returns noise.
- Centering the focal point and halving the picture with the horizon — the two commonest wastes of the thirds.
- Letting a figure's gaze or a strong line point out of the frame, which walks the viewer's eye off your page and onto someone else's.

Make it a game · Three-Second Showdown. Collect five posters, covers or packages from around the house. The dealer flashes each to the players for three seconds; players write the first three things they saw, in order. Compare lists: players score a point for each item other players also listed in the same rank (proof the hierarchy, not the viewer, decided). Then, as a panel, give each design a verdict: planned hierarchy or lucky accident — and name the tool (size, contrast, placement, pointer) doing the most work.

Scripture. “Let thine eyes look right on, and let thine eyelids look straight before thee.” (Proverbs 4:25, KJV)

Scripture treats the direction of the eyes as a moral matter — where the gaze goes, the person follows. The designer's craft of directing eyes is stewardship of that same truth in miniature, and it carries the same responsibility: lead the viewer's eye honestly, to what you truly have to say.

2.4 The Power of Empty Space: Negative Space and Simplicity

OBJECTIVES

- Draw negative space as a positive shape — the holes, gaps and grounds — and use it to correct drawings the symbol system has fooled.
- Use white space deliberately in layout: breathing room around a focal point, generous margins, and the restraint to leave things out.
- Explain figure–ground relationships, including deliberate figure–ground reversal in logo design, with real examples.

> **Warm-up.** Set a kitchen chair where you can see it. Do NOT draw the chair. Draw only the shapes of the air: the openings between the back slats, the trapezoid under the seat, the triangles between the legs. Ten minutes. When you finish, look: a chair has appeared on your page, drawn entirely out of nothing.

WATCH

Graphic Design Principles Master-Class! (Ep 1 White Space)

Satori Graphics · 10:14

https://www.youtube.com/watch?v=FDFD2-poyGw

> **WHEN TO WATCH**
> After the third core idea. Pause at each before/after layout and say out loud what was REMOVED — the lesson is always in the removals.

Note: A working designer on white space as an active tool: breathing room, grouping, and why empty areas make the full areas legible. There is a brief sponsor mention near the start; skip ahead.

BACKUP VIDEO

Negative Space Logo Design - Easy Method! 👊

Will Paterson · 10:16

https://www.youtube.com/watch?v=trNhWcigxIA

With the figure–ground reversal core idea: a logo designer demonstrates building a second image into the empty counters of a mark — the professional trick this lesson explains.

KEY TERMS

negative space

The shapes of what is NOT the subject: the holes, gaps and background areas. To the picture, they are shapes like any other.

positive space

The shapes of the subject itself — the figure rather than the ground.

figure–ground

The eye's sorting of a picture into subject (figure) and background (ground); designers can stabilize it, or deliberately flip it.

figure–ground reversal

A design where the ground reads as a second figure — the arrow hidden between letterforms, the profile in a goblet's sides.

white space

The deliberately empty areas of a layout (whatever their color): margins, gaps and breathing room that make the full areas readable.

counter

The enclosed or partly enclosed empty space inside a letterform — the hole in an o, the trapped air of an e — a preview of Unit 3.

silhouette

The single flat shape of a subject's outline; strong design reads from the silhouette alone, which negative-space drawing tests.

CORE IDEAS

The story. In 1894 the Chicago literary magazine The Chap-Book needed a poster, and the job went to Will Bradley, a twenty-six-year-old who had been earning his living in print shops since age twelve as a printer's devil in Ishpeming, Michigan — no art school, trained entirely at the type case. His poster, called *The Twins*, is often named the first American Art Nouveau poster, and what stunned printers was what Bradley left out: two nearly identical figures drawn as flat interlocking shapes, no shading, no background scenery, no modeled faces — just figure and ground trading places, with the empty paper doing half the drawing. Crowds of imitators followed; Bradley went on to design for the great magazines and become art editor of Collier's, among the highest-paid graphic artists of his era. At the same moment in London,

the brothers-in-law James Pryde and William Nicholson, working as "the Beggarstaffs" (1894–1899), pushed further — posters built of two or three flat silhouettes with faces and details simply omitted, the viewer's eye completing everything. Their work sold poorly then; designers have studied it ever since. Emptiness, both groups proved, is not absence of design. It is design.

How they figured it out. The underlying perception is figure–ground sorting: the eye instantly divides any image into subject and background, and — here is the tool — it can be made to flip. Both groups had studied the Japanese prints of Lesson 2.1 (Bradley absorbed them through the English Arts and Crafts movement and his idol William Morris) and saw that ukiyo-e masters treated the ground as drawn shape: the sky around Fuji is cut as carefully as Fuji. The craft discovery was that negative space is also a *diagnostic*: your symbol system (Lesson 1.2) stores chairs, hands and letters as symbols, but it has no symbol for the trapezoid of air under a chair seat. Draw the air, and symbols cannot interfere — which is why your warm-up chair came out truer than the chair you would have drawn directly. Sighting the gaps is measurement by other means, and every atelier teaches it.

The craft — in drawing. Use negative space three ways. *To see*: when a drawing fights you — a foreshortened arm, clasped hands, a bicycle — stop drawing the thing and draw the shapes of the spaces around and through it; the thing assembles itself from its gaps. *To check*: compare the negative shapes in your drawing against those on the subject; a wrong gap is easier to spot than a wrong limb, because no symbol defends it. *To compose*: the empty areas of a picture are shapes in the composition — Lesson 2.1's element of space — and they need the same variety as the full ones. A figure centered in a field leaves four near-identical corner spaces (dull); shifted to a thirds line, the spaces become unequal and alive. Professional rule of thumb: design the silhouette and the gaps first; if the subject reads as a flat silhouette with interesting negative shapes, it will survive rendering. If not, no rendering will save it.

The craft — in design. In layout, empty space is called *white space*, and spending it is a mark of confidence. Generous margins, air around the focal point, gaps that group related items (things near each other read as belonging together) — these make small content read as important and busy content read at all. The temptation is always to fill: the client wants the logo bigger, three more photos, a starburst — and the poster drowns. The masters' answer is the 1959 Volkswagen "Think Small" campaign (art director Helmut Krone at Doyle Dane Bernbach): a small car in an

ocean of empty page, which became one of the most celebrated advertisements of the century precisely because the emptiness shouted taste while every competitor shouted. The sharpest professional form of the skill is *figure–ground reversal*: the FedEx wordmark (designed by Lindon Leader, 1994) hides a forward-pointing arrow in the gap between the E and the x — empty space carrying the brand's entire message of motion. Logo designers prize such marks because they work at any size, in one color, and reward the viewer who finds the second reading.

In the studio. Watch a professional critique and count how often the advice is subtraction: "give it room," "let it breathe," "what can we lose?" Art directors mean white space when they say a layout feels "cheap" (crowded) or "premium" (airy) — compare a discount flyer to a jeweler's advertisement and the difference is mostly emptiness. Illustrators thumbnail silhouettes-first for exactly the same reason; animation studios famously test character designs by silhouette alone. And the habit of mind matters beyond the page: knowing what to leave out — of a picture, a poster, a paragraph — is the difference between a beginner who shows everything he can do and a professional who shows only what the job needs. Restraint reads as mastery because it is.

PICTURE STUDY



The Twins (poster for The Chap-Book), Will Bradley, 1894 · Color lithograph poster · Library of Congress, Washington, D.C.

Image: Wikimedia Commons, public domain

Will Bradley set type in print shops from age twelve and never attended art school; by 1894 he was drawing posters that made printers rub their eyes. This one, for the Chicago literary magazine The Chap-Book, is often called the first American Art Nouveau poster.

Look at how much is simply not there: no shading, no scenery, no faces to speak of — flat figure and flat ground trading places, with the empty areas drawn as carefully as the full ones. It was printed cheaply in two or three flat colors, which is exactly why the shapes had to carry everything.

Look closely

- Find a place where you cannot be sure which shape is figure and which is ground. What flips it?
- Trace one negative shape — a gap between the figures or inside the drapery — with your finger. Is it a designed shape or leftover accident?
- Where is the lettering? How does it share space with the figures instead of sitting on top?
- Count the values/colors. How few does the whole poster use?

- Squint: does the design still read across the room? What survives — and what was never there to lose?

Talk about it

1. Bradley trained at a type case, where every letter is a shape surrounded by measured space. How might that trade have taught him this kind of seeing?
2. The poster was a cheap commercial job in flat inks. How did its limitations — few colors, no gradients — produce its strengths?
3. Why do you think designers still study this poster and the Beggarstaffs' work, while most heavily rendered posters of 1894 are forgotten?

STUDIO BRIEF

Studio Brief: The Farm Mark

Your client is "Swallow's Nest Farm," a family farm selling eggs and honey at a weekend market, and they need a mark (a simple logo) for their stall sign, egg cartons and jar labels. The brief's hard requirements: it must work in ONE color, read at postage-stamp size, and — the reason they hired you — use negative space cleverly, ideally hiding a second reading (a swallow, a nest, an egg) in the empty areas. Deliverable: one final mark plus the thumbnail sheet that led to it. Pencil and marker. Deadline feel: three sessions.

You will need

- Plenty of cheap paper for thumbnails; two good sheets for finals
- Pencils, eraser, and a black marker or brush pen
- Tracing paper (or a bright window) for refining
- Reference: look at real swallows, nests and eggs — simple photos or the yard

Steps

1. Research the subject's silhouettes: fill half a page with tiny flat silhouettes of swallows (forked tail!), nests and eggs until you can draw each from memory as ONE shape.
2. **Thirty thumbnails.** Yes, thirty — the professional logo discipline. Each one inch tall, marker-only so shading is impossible. Hunt combinations: a swallow whose body is the gap in a nest; an egg whose highlight is a tiny swallow; the farm's initial letter with a bird in its counter.
3. Mark the five thumbnails where the negative space genuinely works (the hidden figure lives in empty area, not drawn on top). Show the sheet to someone: which second readings do they find unaided?
4. Refine the best two at 3 in on tracing paper: simplify every curve, close or open gaps deliberately, keep the silhouette clean.
5. Run the brief's tests on both: redraw each at postage-stamp size (does it survive?) and in solid black only (does it still read both ways?).

6. Choose the winner and draw the final at 4 in, cleanest lines you own, with the farm name hand-lettered simply beneath.
7. Mount final and thumbnail sheet together — clients and art directors always want to see the thirty behind the one.
8. **Deliver:** present to the "client" (your family): the mark at full size, at stamp size, and the hidden reading — do they find it before you point?
9. **Check your work** against the brief: one color, stamp-size legible, negative space doing real work.

Tips

- If a thumbnail needs gray or outline tricks to read, it fails the one-color rule — fix the shapes, not the shading.
- The hidden figure should be found, not explained; if nobody finds it, enlarge or simplify the gap until someone does.
- Thumbnails 1–10 will be the obvious ideas everyone has; the good ones usually start around 15. That is why the number is thirty.

Check your work

- ☐ Thirty genuine thumbnails exist, dated, with the shortlist marked.
- ☐ The final reads correctly in solid black at postage-stamp size.
- ☐ At least one tester found the negative-space reading without prompting.

SKETCHBOOK

1. Your warm-up chair-of-air, labeled "drawn entirely from negative space," with a one-sentence note on where it beat your expectations.
2. A counters page: write a large lowercase alphabet in marker and shade every counter — the trapped air — in pencil; circle the three most beautiful empties.
3. A "found reversals" hunt: sketch two figure–ground flips from the world around you — tree branches against sky, fence pickets and their gaps, the space between two buildings.

> **From history.** Bradley's later career kept proving that print-shop craft and design are one trade: he ran his own Wayside Press in Springfield, Massachusetts (its motto a bell and the sign of the dandelion), designed typefaces and magazine formats, and ended as art supervisor across the Hearst magazines. The Beggarstaffs, commercial failures in their own day, were canonized by later designers; nearly every modern logo course teaches their silhouettes beside the FedEx arrow (1994) — a straight line of craft from two frustrated Londoners' cut paper to the trailer of every delivery truck on your street.

PRACTICE

1. Easy Define negative space and give three examples of it on a kitchen chair.

   Show answer

   The shapes of what is not the subject: the gaps between back slats, the trapezoid of air under the seat, the triangles between the legs.

2. Easy Why does drawing the gaps defeat the symbol system when drawing the object does not?

   Show answer

   The brain stores symbols for objects (chair, hand, letter) but has none for the arbitrary shapes of air between them, so the eye must actually measure.

3. Easy What is figure–ground reversal? Name the most famous corporate example and its hidden figure.

   Show answer

   A design where the background reads as a second figure; the FedEx wordmark (Lindon Leader, 1994), whose E-x gap forms a forward arrow.

4. Easy What is a counter, and in which letters can you find one?

   Show answer

   The enclosed or partly enclosed empty space inside a letterform — in o, e, a, d, b, g, p, q (and partly in c, n, u).

5. Medium Draw a pair of scissors, open, using ONLY negative space: the triangle between the blades, the loops of the handles, the ground around the silhouette. Submit the drawing.

Show answer

Check: no scissors outline was drawn first; the gap shapes are filled or outlined as shapes; the scissors nonetheless read clearly — proof the negatives carried the drawing.

6. Medium A student's drawing of clasped hands keeps failing. Prescribe this lesson's remedy, step by step.

Show answer

Stop drawing fingers; find and draw the small gaps between and around them (the dark triangles and slivers), sighting their shapes like any other shapes; the hands assemble from the measured negatives, which no finger-symbol can corrupt.

7. Medium Why does a centered figure make duller negative space than a figure on a thirds line? Answer with shapes.

Show answer

Centered, the four surrounding spaces are nearly equal and symmetric — four of the same shape, no variety; on a thirds line the surrounding spaces become unequal in size and shape, giving the composition's 'empty' element the same contrast the full shapes enjoy.

8. Medium The 1959 Volkswagen "Think Small" ad placed a small car in a nearly empty page. Explain why the emptiness worked, in white-space terms, against the crowded ads beside it.

Show answer

The white space isolated and emphasized the one focal point (contrast of empty against every crowded neighbor), signaled confidence and taste rather than shouting, and made the modest message itself — think small — visible in the form of the layout.

9. Hard Grouping by proximity: a poster lists a concert's date, time and place scattered evenly across the sheet. Viewers remember none of it. What should the white space do, and why does it work?

Show answer

Close the gaps WITHIN the information (date/time/place clustered into one block) and widen the gap AROUND the block: things near each other read as one unit, and the surrounding emptiness frames the block as a single, findable second read.

10. Hard Sketch a simple figure–ground reversal mark: a letterform or simple silhouette whose counter or gap forms a second, meaningful shape (a bird in a B's counter, an arrow between two shapes). Three thumbnail attempts, best one circled.

Show answer

Check: the hidden figure sits in genuinely empty space (not drawn on top); the mark reads correctly both ways; it survives being drawn small and in one color.

11. Hard Your client keeps asking to fill the poster's margins ("we paid for the whole page"). Give the professional's two-sentence defense of the white space, with one example from this lesson as evidence.

Show answer

Model: "Empty space is what makes the message findable and the brand look confident — crowded pages read as cheap. The most celebrated ad of the century, VW's Think Small (1959), was mostly empty page, and it outsold every crowded competitor beside it."

12. Challenge Take your Unit 1 portfolio still life (or any finished drawing) and trace only its negative shapes onto a fresh sheet, filling them flat. Judge: do the empties have variety and interest? Write three sentences on what you would rearrange, knowing this.

Show answer

Graded on the trace plus honest findings; typical discovery: background gaps are accidental and samey, and shifting one object would have given the empty shapes the same designed quality as the objects.

COMMON MISTAKES

- Treating background as leftovers. Every empty area in the frame is a shape you are responsible for designing.
- Filling silence out of fear: adding borders, bursts and clip-art to 'finish' a layout that needed margins, not more things.
- Drawing the hidden figure ON the mark instead of IN its gaps — a figure–ground reversal only counts when the empty space does the work.

Make it a game · Find the Hidden Figure. Round 1: hunt the house for negative space doing real work — the arrow on a FedEx box or label, counters in cereal-box lettering, shapes between fence boards out the window; one point per find others missed. Round 2: each player takes two minutes to sketch a letter or simple silhouette hiding a second shape in its empty space, then passes it around — a point to the maker for every player who finds the hidden figure unaided, zero if it had to be explained. Two rounds each; highest total wins.

Scripture. “In the multitude of words there wanteth not sin: but he that refraineth his lips is wise.” (Proverbs 10:19, KJV)

Scripture praises restraint in words, and the designer learns the visual form of the same wisdom: the multitude of marks does not make a message, and knowing what to leave out — refraining — is where wisdom shows. White space is the page holding its tongue.

2.5 The Critique: How Professionals Judge and Improve Work

OBJECTIVES

- Critique a picture in the four professional steps — describe, analyze, interpret, judge — using the vocabulary of Units 1 and 2.
- Give useful critique (specific, about the work, actionable) and receive it like a professional: take notes, restate, don't defend.
- Run a revision cycle: turn written notes into a to-do list, revise the work, and verify every note was answered.

> **Warm-up.** Put your Unit 1 portfolio still life where you can see it, set a timer for three minutes, and write everything you see — not whether it is good, just what is there: objects, biggest shape, darkest value, where your eye goes first. When the timer rings, underline the one sentence that surprised you. Describing before judging is today's whole lesson in miniature.

WATCH

Reacting to 50 Design Portfolios in 25 Minutes

Flux Academy · 26:10

https://www.youtube.com/watch?v=NhR5hV1zC-Q

> **WHEN TO WATCH**
> After the fourth core idea. Watch with a notebook: for every portfolio, write the FIRST thing the reviewer mentions. Tally the list afterward — you will have a map of what professional eyes check first.

Note: A professional designer reviews real submitted portfolios at speed. Notice the pattern: he describes what he sees, names the strongest piece, and gives one actionable fix — a compressed version of the four steps, and exactly how fast real reviews run.

BACKUP VIDEO

UX Design Critiques: 3 Tips for Effective Feedback

NNgroup · 3:38

https://www.youtube.com/watch?v=CBm9gdwshf8

Before your first practice critique: three and a half minutes from the Nielsen Norman Group on giving feedback that helps — specific, about the work, tied to the goal.

KEY TERMS

critique

A structured, professional examination of a work against its goals — not an insult and not a compliment, but an inspection.

describe–analyze–interpret–judge

The four-step critique order: what is literally there; how its elements and principles work; what it communicates; and only then, how well it succeeds.

actionable

The test of useful feedback: it names a change the artist could actually make. "The focal point loses to the border" is actionable; "I don't like it" is not.

art director's notes

The written or spoken change requests that come back on professional work — the normal mechanism of the trade, not a verdict on the artist.

revision

The new version produced in answer to notes; professional agreements typically include two or three rounds.

iteration

The cycle of make, review, revise, repeat — the engine by which all professional work gets good.

morgue file

The illustrator's traditional name for a collection of reference and inspiration clippings; today usually a folder of saved images, kept and studied.

CORE IDEAS

The story. The best art school America ever had ran on critique. Howard Pyle taught composition at Drexel from 1894, then opened his own school in Wilmington in 1900 — no tuition, a handful of students chosen by portfolio, and the center of the week was the composition lecture and critique, where Pyle went through student work in front of everyone. His students remembered the evenings as electric and merciless: he demanded that a picture tell its story instantly, that the student *live* in the scene ("throw your heart into the picture and jump in after it" is how students recorded his constant refrain), and he would put his finger on the one dead spot in a composition the student had been avoiding for a week. It worked: from a schoolroom of perhaps a hundred-odd students came N. C. Wyeth, Frank Schoonover, Stanley Arthurs, Jessie Willcox Smith, Elizabeth Shippen Green and Harvey Dunn — the artists who filled America's magazines for forty years. Dunn carried the critique method to his own students, repeating that he taught not picture-making but "the art of living," with pictures as the evidence. The lineage is the point: drawing can be practiced alone, but artists get *good* in rooms where work is examined honestly.

How they figured it out. Critique stayed an apprenticeship art — you learned it by being in Pyle's room — until teachers systematized it. The version used in studios and classrooms everywhere descends from the art educator Edmund Feldman (around 1970), who fixed the order of operations: **describe** (inventory what is literally present — no opinions allowed yet), **analyze** (how are the elements arranged? where is the hierarchy, the balance, the eye path? — Unit 1 and 2 vocabulary does this work), **interpret** (what does it communicate — mood, story, message?), and only then **judge** (does it succeed at what it attempts?). The order is

the technology. Judging first — everyone's instinct — slams every door: the maker defends, the viewer entrenches, and nobody learns what is actually on the paper. Describing first does something almost magical: half of all flaws announce themselves during honest description ("...and there's a bright red shape in the corner that — oh. That's the problem"), and the maker hears them as discoveries, not accusations.

The craft — giving critique. Three rules make feedback professional. *Specific*: name the spot and the mechanism — "the fence's bright pickets contrast harder than the face, so they win the first read" beats "it's busy." *About the work, never the worker*: "the values are close" not "you're bad at values"; critique examines the piece on the table. *Actionable and goal-tied*: every judgment points at a possible change and refers to what the piece is FOR — a poster is critiqued as a poster (three-second message), a portfolio still life as a still life (form, light, craft). Structure to use, always in order: one sentence of description; the strongest thing in the piece and why it works (real, named — not a courtesy cushion); the one or two changes that would most improve it; and nothing else. A critique that lists nine flaws fixes none of them; professionals ration their notes to what the next revision can actually absorb.

The craft — receiving critique and revising. Receiving is the harder skill and the more valuable one; art directors remember forever which artists take notes well. The protocol: *write everything down* (memory edits out the painful notes first); *don't defend* — explanation of what you meant is proof it isn't on the page yet; *restate* each note back in your own words ("so the date block is getting lost — you want it winning the second read?") because half of all revision failures are misheard notes; *ask which note matters most* if you got several; and *thank the reviewer*, because they just worked for you for free. Then the revision cycle: turn the notes into a written to-do list, revise the work item by item, and check each off only when the fix is visible at arm's length. Deliver the revision with the list ("note 1 — enlarged the title; note 2 — quieted the border"), which is how working illustrators answer an art director's email. One more professional honesty: a note you disagree with gets tried before it gets argued — on tracing paper over the original, cheaply — because the reviewer saw something even when their prescription is wrong.

In the studio. This cycle IS the job. A real illustration assignment (Unit 7 walks through one) is brief → thumbnails → art director's notes → sketch → notes → final → notes → delivery; a designer's week is standups and design reviews; even solo

freelancers manufacture critique — they join artist communities, trade reviews, keep a *morgue file* of work better than theirs and ask "what is this doing that mine isn't?", and critique their own pieces with the four steps after a night's sleep (the cheapest fresh eyes there are: time). The habit that separates professionals is unglamorous: they collect critique the way craftsmen collect tools, because every accurate note is a free shortcut past a year of unguided practice. From this unit on, every portfolio piece in this course goes through one full critique-and-revision cycle before it counts as done — starting today, with the still life you described in the warm-up.

PICTURE STUDY



Syndics of the Drapers' Guild (De Staalmeesters), Rembrandt van Rijn, 1662 · Oil on canvas · Rijksmuseum, Amsterdam

Image: Wikimedia Commons, public domain

These five men had one of the most trusted jobs in Amsterdam: they were the staalmeesters, the sampling officials of the drapers' guild, elected each year to judge the quality of dyed cloth against the guild's standard samples. Bolt after bolt came before this table, was examined against the standard, and was approved or rejected — and the city's reputation for honest cloth rode on their verdicts. In 1662 the guild hired Rembrandt to paint them, and he caught them mid-session: the ledger open, one syndic half-risen, every face turned up as if you had just walked in with work to be judged.

That is why this painting belongs to the lesson on critique. These are professionals judging work against a standard — not by whim, not by taste, but against the sample book on the table. Their faces are neither hostile nor flattering; they are attentive, which is what a good critique is. When you bring work to an art director, you are walking into this room, and the lesson's four steps are how you make the ledger's verdict useful instead of merely survivable.

Look closely

- Look at each of the six faces in turn. Is any of them hostile? What word would you choose for their shared expression, and what does that teach about the spirit of professional critique?

- Find the open ledger and the rich carpet. What do the tools on the table say about judgment by recorded standard rather than by personal taste?
- One syndic is half-risen from his chair. What does that single pose do to the picture's story — what has just happened in the room?
- Rembrandt put the eye level low, so the men look down at us slightly. How does that choice make you feel as the person whose work is on the table?
- Five heads in a row could be monotonous. Trace how Rembrandt varies their heights and angles — and find the eye path those heads make.

Talk about it

1. The syndics judged cloth against a physical standard sample. What is the equivalent 'standard on the table' when professionals critique a design — and what happens to a critique when there isn't one?
2. Their verdicts could cost a weaver a season's work, yet the system made Amsterdam cloth trusted across Europe. How does honest judgment serve the maker being judged?
3. Rembrandt painted his judges as dignified and attentive, not fearsome. After this lesson's four steps, how should you walk into their room — and how should you run the table when it is your turn to judge?

STUDIO BRIEF

Studio Brief: The Revision Round

Your client is an art director preparing a group show of student work, and the acceptance email reads: "Your Unit 1 still life is shortlisted. Enclosed are our notes. Revised work is due in one week with a response memo answering each note." Your job: run the full professional cycle — obtain real critique on your Unit 1 portfolio piece, revise it (or re-execute it better), and deliver revision plus memo. This revised still life, with its documented critique cycle, becomes the finished version of Portfolio Piece 1 — and the cycle itself is practice for Portfolio Piece 2, due at this unit's end.

You will need

- Your Unit 1 portfolio still life and its process sheet
- Tracing paper, pencils, eraser; fresh paper if you choose to re-execute
- A critique panel: at least two viewers (parent, sibling, friend) plus yourself-after-a-day's-rest as the third
- The looking questions from this unit's picture studies, as coaching material for your panel
- A notebook page titled NOTES and another titled TO-DO

Steps

1. Prepare the panel: give each viewer the four steps on a card (describe, analyze, interpret, judge) and two minutes of coaching — "inventory first, opinions last, name spots not feelings."
2. Hold critique one viewer at a time, you silent except to restate notes ("so the background value is crowding the mug — yes?"). Write every note verbatim on the NOTES page.
3. Add the third reviewer: yourself, next day, running the four steps cold on your own piece. Fresh-eye notes go on the same page.
4. Rank all notes: mark the two or three that would most improve the piece; ask your panel to confirm the ranking if it isn't obvious.
5. Convert to the TO-DO page: each note becomes one concrete action ("darken cast-shadow family two steps," "crop left margin to kill dead space").

6. Test the big fixes cheaply first on tracing-paper overlays; then revise the drawing — or re-execute it entirely if the block-in itself was the flaw (professionals restate; they don't polish a wrong foundation).
7. Check off each to-do only when the fix is visible at arm's length — the distance a reviewer actually stands at.
8. Write the response memo: one line per note — the note, your action, done. Exactly the email a working illustrator sends an art director.
9. **Deliver:** revised piece, memo, and the NOTES page side by side to your panel; ask the one-question follow-up: "is each note answered?"
10. **Check your work** against the brief: every note written, ranked, actioned or consciously declined (with the tracing-paper test that justified declining).

Tips

- Coach your panel to point AT the paper — a finger on the dead spot is worth three adjectives.
- Date the before and after; the pair, shown together, is itself portfolio material (art directors love artists who revise well).
- If every reviewer trips over the same spot, believe the spot even if you love it. Pyle's finger found the place the student was avoiding; so will your panel's.

Check your work

- ☐ At least three critiques held in four-step order, with verbatim NOTES and nothing defended.
- ☐ A ranked TO-DO list where every item traces to a note, and every fix is visible at arm's length.
- ☐ A response memo pairing each note to its action — delivered with the revision, like a professional.

SKETCHBOOK

1. The four steps written large on one page as a permanent reference card, with your own one-line example of each from this week's critiques.
2. The before/after of your revised still life (photos or small copies) mounted side by side with the ranked note list between them.
3. The start of your morgue file: three images you wish you had made (printed, sketched or listed with sources), each with one sentence — "what this is doing that

mine isn't yet."

> **From history.** Pyle's school cost nothing — he refused tuition, believing he was repaying a debt to the craft — and admitted by portfolio and dedication; women trained there as professionals equal to the men, decades before most fields allowed it, and Jessie Willcox Smith and Elizabeth Shippen Green built major careers from that room. Harvey Dunn re-created the critique nights for the next generation in his own classes; his student Dean Cornwell taught more still. When working illustrators today trade portfolio reviews in online communities, they are running Pyle's Monday nights at global scale — the room got bigger; the method never changed.

PRACTICE

1. Easy Name the four critique steps in order, with one clause on what each does.

   Show answer

   Describe — inventory what is literally there; analyze — how the elements and principles are working; interpret — what it communicates; judge — whether it succeeds at its goal.

2. Easy Why does the order forbid judging first?

   Show answer

   Judgment first triggers defense and ends looking; description first surfaces most flaws as shared discoveries and keeps maker and reviewer examining the same facts.

3. Easy Rewrite these useless notes as actionable ones: (a) "I don't like the poster." (b) "The drawing feels off."

   Show answer

   (a) "The event name reads third — the border's contrast beats it; quiet the border and enlarge the name." (b) "The mug's ellipse is flatter than the bowl's at the same eye level — match them." (Any specific, mechanism-naming rewrites count.)

4. Easy List the five receiving-critique protocol steps.

   Show answer

   Write everything down; don't defend; restate each note in your own words; ask which note matters most; thank the reviewer.

5. **Medium** Write a full four-step critique (one short paragraph per step) of this lesson's picture study, Rembrandt's Syndics of the Drapers' Guild.

Show answer

Check: step 1 contains zero opinions; step 2 uses element/principle vocabulary (shape, value masses, eye path, emphasis); step 3 names the story told (cloth judges caught mid-session, looking up as one at whoever has just entered with work to be judged); step 4 judges the picture against a group portrait's job: six individual, living likenesses that still read as one unified group.

6. **Medium** A reviewer tells you: "The focal point is fighting the border, the values are samey in the midground, and honestly the lettering wobbles, the margins are uneven, the cast shadows disagree, and the paper's smudged." What should the reviewer have done, and what do you do now?

Show answer

Ration notes to what one revision can absorb — two or three, ranked. You: write all six down anyway, ask which matters most, fix in rank order, and treat smudges/margins as craftsmanship cleanup on the same pass.

7. **Medium** Why does defending your work during critique cost you, even when your explanation is true?

Show answer

The viewer can only see the page; if the intent isn't readable there, the work has failed for every future viewer who won't hear the explanation. Defending also spends the session's time on the old version instead of the next one — and teaches reviewers to stop telling you things.

8. **Medium** What is a morgue file, and give two ways a self-taught artist uses one as a critique substitute.

Show answer

A kept collection of reference and admired work. Uses: compare your piece against a master's solving the same problem ("what is theirs doing that mine isn't?"), and pull three files to define the standard before starting a new piece — critique in advance.

9. Hard Give a family member the looking questions from any picture study in this unit and have them critique YOUR Unit 1 still life using the four steps (coach them through the order). Record their notes verbatim.

Show answer

Check: notes written down word for word; at least one note restated back and confirmed; the maker (you) said nothing in defense; the session produced a ranked to-do list of 1–3 items.

10. Hard You disagree with a note ("make the sky darker" — you're sure it will crush the mood). What is the professional move, and why does it work even when the note is wrong?

Show answer

Try it cheaply first — tracing paper or a small copy — before arguing. The reviewer detected something real even if the prescription is off; the test either reveals what they saw or gives you evidence (not just opinion) for the conversation.

11. Hard Run the revision cycle on your Unit 1 still life from Practice 9's notes: to-do list, the revision (rework the drawing or a tracing-paper overlay), and the delivery sentence per note. Submit all three.

Show answer

Check: every note appears on the list; every list item is visibly answered in the revision; the delivery lines pair note to fix ("note 1 — darkened the cast shadow family"), exactly like answering an art director's email.

12. Challenge Write the critique you would most dread receiving on your own current work — four steps, honest, specific. Then answer it with a to-do list, and note which was harder to write and why.

Show answer

Graded on honesty and structure: the dreaded critique names real weaknesses in element/principle vocabulary; the to-do list converts each into an action; most students report the describe step hardest — seeing one's own page without flinching is the skill.

COMMON MISTAKES

- Judging first. The verdict slams the door on looking; description opens it. Hold the order even when the flaw seems obvious.
- Softening critique into uselessness ("it's nice!") or sharpening it into cruelty ("you can't draw"). Both fail the same test: neither names a spot, a mechanism, or an action.
- Receiving notes as a verdict on yourself rather than a work order on the piece. Notes are the trade's normal machinery — the artists who last are the ones who learned to love the free labor.

Make it a game · Describe Before You Judge. Hold up any picture in the house. The player must talk about it for sixty seconds using ONLY description and analysis — what is there, how it is arranged — and the family buzzes any opinion word (good, bad, pretty, boring, like, ugly). Three buzzes and you're out; survive the minute and you earn a ten-second judgment, which must cite one thing you described. Rotate players and pictures. Hardest and best variant: play it on your own drawings.

Scripture. “Iron sharpeneth iron; so a man sharpeneth the countenance of his friend.” (Proverbs 27:17, KJV)

Sharpening is friction by design: two blades meeting edge to edge, both the better for it. Honest critique between artists is that proverb practiced on paper — and notice that Scripture calls the sharpener a friend. The reviewer who tells you the truth about your picture is doing you a friend's service.

UNIT 2

Composition: The Rules of a Strong Picture

A drawing can be accurate in every part and still fail, because the parts were never arranged into a picture. Composition is the craft of arrangement: the elements an image is built from (line, shape, value, texture, space), the principles that organize them (balance, contrast, emphasis, rhythm, unity), the hierarchy that steers a viewer's eye along a planned path, and the discipline of empty space — knowing what to leave out. These are the rules working designers and art directors use every day, out loud, in exactly these words; learning them is learning the language of the trade.

The stories are of picture-makers whose arrangements conquered the world: Hokusai, whose Great Wave is built on a handful of shapes and two colors; Hiroshige, whose rain is pure rhythm, and whose prints changed Western art when they reached Paris; Alphonse Mucha, who designed a poster over Christmas week of 1894 and woke up famous on New Year's Day; Will Bradley, a printer's apprentice from Michigan who showed America what empty space could do; and Howard Pyle, whose Monday-night critiques trained the greatest generation of American illustrators. You will finish the unit able to compose deliberately — and able to critique your own work with a professional's vocabulary, which is the skill that makes every other skill improvable. Portfolio piece 2 puts it all on one sheet.

PREREQUISITES

- Unit 1: sighting and proportion, the 9-step value scale, basic perspective, and gesture — composition arranges what Unit 1 taught you to draw
- Pre-algebra: ratios, simple equations, and plotting points on a grid (for the rule of thirds and the balance arithmetic)
- Supplies: pencils and paper as before, plus scissors, a glue stick, and some gray or black construction paper for cut-shape studies

MASTERY CHECKLIST

- ☐ I can name and point out the five elements — line, shape, value, texture, space — in any image put in front of me.
- ☐ I can name the five principles — balance, contrast, emphasis, rhythm, unity — and say which ones a given picture leans on.
- ☐ I can balance an asymmetric composition using the visual-weight rule (a small shape far from center balances a big shape near it).
- ☐ I can place focal points with the rule of thirds, compute the third lines and power points for any canvas size, and use the golden ratio deliberately.
- ☐ I can plan the eye's path through a composition with size, value contrast, lines and gaze direction, and set three clear levels of hierarchy.
- ☐ I can use negative space as a drawn shape — including leaving things out on purpose — and explain why restraint reads as confidence.
- ☐ I can critique a picture in four professional steps (describe, analyze, interpret, judge) and revise my own work from written notes without defending it.
- ☐ I can take an art director's feedback, restate it accurately, and

deliver a revision that answers every note.

FREE RESOURCES FOR THIS UNIT

- **Library of Congress — Free to Use and Reuse sets**: Curated sets of rights-clear images, including the classic American poster collections this unit draws on (Penfield, Bradley and their era). Download posters and mark them up with tracing paper to study hierarchy and eye path. Free, no account.
- **Rijksmuseum — Rijksstudio**: High-resolution downloads of hundreds of thousands of public-domain artworks, with superb Dutch prints and Japanese woodblocks for composition study. A free account unlocks full-size downloads; nothing to buy.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

2.1	**The Elements: Line, Shape, Value, Texture, Space**	3 sessions of 50 minutes
2.2	**The Principles: Balance, Contrast, Emphasis, Rhythm, Unity**	3 sessions of 50 minutes
2.3	**Hierarchy and the Eye's Path: Directing the Viewer**	3 sessions of 50 minutes
2.4	**The Power of Empty Space: Negative Space and Simplicity**	3 sessions of 50 minutes
2.5	**The Critique: How Professionals Judge and Improve Work**	3 sessions of 50 minutes

Unit 2 test

Time allowed: 50 minutes. A calculator and ruler are allowed; two pencils (HB and soft) are required for the drawing problems. Show your work for every calculation. The test is worth 100 points.

1. **5 pts**

   Name the five elements and the five principles this unit uses.

2. **6 pts**

   What is a notan, who carried the idea into American art teaching, and in what book and year?

3. **8 pts**

   A dark mass of visual weight 8 sits 1.5 in left of center. (a) How far right must a weight-4 accent sit to balance it? (b) State the rule's name and write the formula.

4. **6 pts**

   Name four things that increase a shape's visual weight, and state what "everything medium" does to a composition even though it balances.

5. **8 pts**

   Compute the third lines and the four power points of a 15 × 9 in canvas.

6. **7 pts**

   A golden rectangle is 20 in wide. Find its height, and verify the ratio chain whole : larger = larger : smaller for a 20 in line divided at the golden section.

7. **8 pts**

   Define hierarchy and name the four tools that enforce it. Then diagnose: a poster where viewers report seeing the decorative border first, the picture second, and never the event name.

8. **6 pts**

   Describe reading gravity and the Z- and F-patterns, and give one design consequence of each pattern.

9. **8 pts**

   Negative space: (a) define it; (b) explain why drawing the gaps defeats the symbol system; (c) name the famous 1994 wordmark whose empty space carries its message, and the designer.

10. **6 pts**

    Give the three rules of professional feedback, and rewrite this note to obey them: "The poster is kind of a mess."

11. **8 pts**

    List the four critique steps in order with one sentence each, and explain why the order itself is the technology.

12. **8 pts**

    Hiroshige's Sudden Shower (1857): name the principle doing the most work in the rain, the bridge pilings, the dark far shore, and the single evening palette — and name the painter who copied the print in oils in 1887.

13. **8 pts**

    PRODUCTION TASK. Thumbnail a poster (any event) at playing-card size: mark the thirds, place rank 1 on a power point, draw the eye path as an arrowed loop, and label your three hierarchy ranks.

14. **8 pts**

    PRODUCTION TASK. Draw a simple object (mug, pine tree, scissors) entirely from its negative spaces: outline or fill only the gaps and ground shapes until the object appears. Label two of the negative shapes.

ANSWER KEY

1. Elements: line, shape, value, texture, space. Principles: balance, contrast, emphasis, rhythm, unity.
2. A flat study of the arrangement of dark and light masses (two values); Arthur Wesley Dow, in Composition (1899), built art teaching on line, notan and color.
3. (a) $8 \times 1.5 = 4 \times d$, so $d = 3$ in. (b) The steelyard (lever) rule of asymmetric balance: $w_1 d_1 = w_2 d_2$.
4. Size, darkness/contrast with surroundings, amount of detail or texture, color saturation (faces also pull). Everything-medium kills contrast: nothing is distinct, no emphasis is possible — balanced and boring.
5. Verticals at x = 5 and 10; horizontals at y = 3 and 6; power points (5,3), (10,3), (5,6), (10,6).
6. Height $= 20/1.618 \approx 12.4$ in. Section at 12.4 in leaves 7.6: $20/12.4 \approx 1.61$ and $12.4/7.6 \approx 1.63$ — both $\approx \varphi$.
7. Hierarchy is the planned order of first/second/third reads; tools: size, value contrast, placement on the eye's path, and pointers (lines/gazes). Diagnosis: the border outranks the name — likely higher contrast and frame-wide size; quiet the border, enlarge the name, give it the strongest contrast, and place it in the upper third.
8. Western-trained eyes enter top-left and drift right and down. Z: sparse layouts are scanned corner to corner — put the first read on the top stroke and the call-to-action near the exit (lower right). F (Nielsen Norman Group eye-tracking, 2006): text-heavy pages get one full top read then left-edge skims — front-load first lines and left edges.
9. (a) The shapes of what is not the subject — holes, gaps, ground. (b) The brain has symbols for objects but none for the arbitrary shapes of air between them, so the eye must measure. (c) FedEx — the arrow in the E-x gap; Lindon Leader, 1994.
10. Specific; about the work, not the worker; actionable and tied to the goal. Rewrite (example): "The date block and the title compete — equal size and contrast — so the three-second read fails; shrink the date block and move it to the exit path."
11. Describe — inventory what is literally present, no opinions; analyze — how elements and principles arrange it (balance, hierarchy, path); interpret — what it communicates; judge — whether it succeeds at its goal. Judging first triggers

defense and stops looking; describing first surfaces most flaws as shared discoveries the maker can hear.

12. Rain — rhythm (repetition with variation); pilings — rhythm/repetition; dark far shore against pale water — contrast (and counterweight in the asymmetric balance); single palette — unity. Vincent van Gogh copied it in 1887.
13. Model answer: thirds ruled; rank 1 (title) biggest at a power point with the note "strongest contrast here"; rank 2 on the path toward lower right; rank 3 small and quiet; arrows enter top-left, loop through ranks 1–2–3 and return — no arrow exits the frame.
14. Model answer: no outline of the object itself drawn first; gap shapes (handle hole, space under branches, triangle between blades) drawn as measured shapes and filled; the subject reads clearly; two negative shapes labeled as shapes (e.g., "trapped air of handle").

PORTFOLIO PIECE: PORTFOLIO PIECE 2: A COMPOSED PICTURE

Your second professional portfolio piece: one finished composition in graphite or ink — a scene of your choosing (a corner of your home, a working figure, a landscape with buildings, a still life with a story) — built the way this unit taught: written hierarchy first, six thumbnails with drawn eye paths, a two-value notan of the winner, focal point placed by the thirds or golden section (compute and note the coordinates), balance checked by the steelyard rule, negative spaces designed on purpose, and values spent to enforce the ranks. Work at 9 × 12 in or larger.

Then prove the Unit 2 difference: put the finished piece through one full critique-and-revision cycle (Lesson 2.5) — panel notes in four-step order, ranked to-do list, visible revision, response memo. Deliver the final with its process sheet (hierarchy list, thumbnails, notan, balance arithmetic) and the critique documents. Two pieces down, eight to go — and from here forward, every piece in this course ships critiqued and revised, because that is how professional work ships.

LOOK FOR	WHAT IT MEANS
Hierarchy and eye path	A written 1-2-3 hierarchy exists from before the thumbnails; the glance test on a fresh viewer returns that order; the eye path loops and never exits the frame.
Composition arithmetic	Focal point coordinates computed (thirds or golden section) and noted; steelyard balance estimated with weights and distances that roughly cancel; horizon/major divisions off center.
Elements and principles	Big shapes distinct in a working notan; one dominant contrast with the rest quieted; rhythm with variation where elements repeat; unity by limited, consistent means.
Negative space	Empty areas are varied, designed shapes — margins and gaps deliberate, breathing room around the focal point, nothing filled out of fear.
Critique cycle	Four-step panel critique recorded verbatim; ranked to-do list; every note answered in the revision or declined with a tested reason; response memo pairs note to fix.
Craftsmanship and presentation	Drawing skills from Unit 1 hold up (proportion, construction, value families); clean surface and edges; signed, dated,

LOOK FOR	WHAT IT MEANS
	photographed square, and delivered with the complete process packet.

UNIT 3

Typography: The Designer's Voice

Nearly everything a graphic designer makes has words in it, and typography is how those words speak. A wedding invitation whispers; a highway sign shouts; a bank statement speaks plainly and gets out of the way. In this unit you will learn where our letters came from, what the parts of a letter are called, how professionals choose and pair typefaces, and the quiet arithmetic that makes a page of text comfortable to read: sizes, scales, leading and line length. You will finish by drawing letters yourself, because every great typographer began as someone who could draw an alphabet.

The stories run five centuries deep: Johannes Gutenberg casting the first metal type in Mainz around 1450 and finishing his great Bible by 1455; Nicolas Jenson cutting the first great roman letter in Venice in 1470; William Caslon publishing the specimen sheet in 1734 that would later dress the Declaration of Independence; Giambattista Bodoni polishing letters to a razor edge in Parma; Stanley Morison launching Times New Roman in London on October 3, 1932; and Max Miedinger and Eduard Hoffmann drawing Helvetica in a Swiss foundry in 1957. Each of these letters is still on your computer, and by the end of the unit you will be able to tell them apart at a glance and explain what job each one does best.

Typography is also where design's math begins in earnest. You will convert points, pixels and ems; build a modular type scale from a ratio; calculate characters per line; and set leading as a percentage of type size. None of it is harder than the arithmetic you already know, and all of it is used daily by working designers. Every exercise can be done with pencil, paper, a ruler and free tools: Google Fonts, Inkscape and Scribus.

PREREQUISITES

- Units 1 and 2 of this course: measuring and drawing what you see, and the principles of composition, hierarchy and critique
- Arithmetic with fractions, decimals, percentages and ratios; powers such as 1.25^3 (a calculator is fine)
- A computer with a web browser for Google Fonts, and Inkscape or Scribus installed (both free); pencil, ruler and paper

MASTERY CHECKLIST

- ☐ I can tell the story of type from Gutenberg (1455) through Jenson (1470), Caslon (1734), Bodoni, Times New Roman (1932) and Helvetica (1957), with the right names and dates.
- ☐ I can label the anatomy of a letter: baseline, x-height, cap height, ascender, descender, serif, stem, bowl, counter and aperture.
- ☐ I can classify a typeface by sight as humanist, old-style, transitional, Didone, slab serif, grotesque sans, geometric sans or humanist sans, and name a classic example of each.
- ☐ I can pair two typefaces using the contrast principle, check their x-heights, and defend the pairing in a sentence a client would understand.
- ☐ I can convert among points, pixels and ems, and build a modular type scale from a base size and a ratio such as 1.25.
- ☐ I can set body text with a sensible size, leading of about 120–145%, and a measure of 45–75 characters per line, and check all three with a ruler and a count.
- ☐ I can explain the difference between lettering and type, and draw a word of display lettering from skeleton to finished weight.

- ☐ I can find, test and download fonts on Google Fonts and explain what its open licenses let a designer do.

FREE RESOURCES FOR THIS UNIT

- **Google Fonts**: More than 1,500 professionally made font families, free for personal and commercial work. Used in Lessons 3.3 and 3.4 to test pairings and download fonts; the Type tester and the filters by classification are the tools to learn. No purchase needed.
- **Typescale (modular scale calculator)**: A free calculator that builds a type scale from a base size and ratio and shows real text at every step. Use it in Lesson 3.4 to check the scales you calculate by hand first.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

3.1 The Story of Letters: Gutenberg, Jenson and Five Centuries of Type
3 sessions of 50 minutes

3.2 The Anatomy of a Letter: Classification from Garamond to Helvetica
3 sessions of 50 minutes

3.3 Choosing and Pairing Typefaces 3 sessions of 50 minutes

3.4 Setting Text Well: Size, Leading, Measure and the Type Scale
3 sessions of 50 minutes

3.5 Display Type and Hand Lettering 3 sessions of 50 minutes

Unit 3 test

Time allowed: 50 minutes. A calculator and scratch paper are allowed; a ruler is needed for problem 14. Show your work and units for every calculation. Useful numbers: 1 pt = 1/72 in = 0.3528 mm; 1 px = 0.75 pt; leading band 120–145%; measure

band 45–75 CPL; CPL $\approx$ line length$/(0.5 \times \text{size})$; capital height ≈ 1 in per 10 ft of viewing distance. The test is worth 100 points.

1. **8 pts**

   Put in order with dates (within 10 years counts): Helvetica, Jenson's roman, Times New Roman, Gutenberg's Bible, Caslon's specimen sheet, Aldus's first italic.

2. **6 pts**

   Name the three tools of type founding in order and what each produces.

3. **6 pts**

   Sketch a lowercase g at least 5 cm tall and label six parts: baseline, x-height, descender, bowl, counter, ear or link.

4. **8 pts**

   Classify each with one anatomy clue: (a) hairline serifs, vertical axis, extreme contrast; (b) sturdy bracketed serifs, tilted axis; (c) no serifs, nearly circular o; (d) no serifs, closed apertures, flat horizontal terminals.

5. **6 pts**

   Face A has x-height ratio 0.52 and is set at 12 pt. What size makes face B (ratio 0.44) match its apparent size?

6. **6 pts**

   State the contrast principle of pairing, and explain in one sentence why Helvetica + Arial fails it while Playfair Display + Source Sans passes.

7. **6 pts**

   A shortlist has 5 typefaces. How many pairings could be tested, and what does the answer teach about professional workflow?

8. **8 pts**

   Convert: (a) 16 px to pt; (b) 21 pt to px; (c) at 18 px text, how many px is 1.25 em; (d) 1.5 in to pt.

9. **8 pts**

   Build a modular scale: base 11 pt, ratio 1.25, one step down and three steps up, rounded to halves. Assign caption, body, subhead, heading, title.

10. **8 pts**

    A column is 26 picas wide and the type is 10.5 pt. Estimate the CPL, judge it against the band, and prescribe a leading with one-phrase justification.

11. **6 pts**

    A justified column 12 picas wide at 11 pt shows rivers. Show with arithmetic why, and give the standard fix.

12. **6 pts**

    Define lettering, calligraphy and type in one sentence each, and name the famous 1886 wordmark that is lettering, not type.

13. **6 pts**

    A banner must read from 70 feet. Minimum capital height? If the word has 10 characters averaging 0.75 of cap height in width, how long is the word?

14. **6 pts**

    Production task. Letter the word TYPE twice, about 3 cm tall: once spaced with equal distances between letters, once spaced by eye (equal volumes of white). Circle the pair of letters that most needed correction and say why.

15. **6 pts**

    Critique task. A flyer uses five typefaces, 100% leading on the body, and a 95-CPL measure. Write a three-sentence professional critique naming each fault and its fix.

ANSWER KEY

1. Gutenberg's Bible c. 1455; Jenson's roman 1470; Aldus's italic 1501; Caslon's specimen 1734; Times New Roman 1932; Helvetica 1957.
2. Steel punch (carries the cut letter), struck into copper to make the matrix (the mould of one letter), which drops into the adjustable hand mould (casts fresh type in metal, same body height, adjustable width).
3. Model answer: any legible g with the baseline under the bowl, x-height at the bowl's top, descender below the baseline, bowl the upper round form, counter the space inside it, and the ear (single-story) or link (double-story) correctly pointed out.
4. (a) Didone/modern (Bodoni, Didot). (b) Old-style (Garamond, Caslon). (c) Geometric sans (Futura). (d) Grotesque sans (Helvetica).
5. $S_B = 12 \times 0.52/0.44 \approx 14.2$ pt: about 14 pt.
6. Pair faces that are clearly different in classification and role, or do not pair. Helvetica and Arial are two near-identical grotesques (a clash); Playfair (Didone display) with Source Sans (humanist text sans) crosses classifications with clear roles.
7. $\binom{5}{2} = 10$ pairs. Pair-testing grows roughly with the square of the list, so eliminate hard (by voice, weights, roles, licensing) before pairing.
8. (a) $16 \times 0.75 = 12$ pt. (b) $21/0.75 = 28$ px. (c) $1.25 \times 18 = 22.5$ px. (d) $1.5 \times 72 = 108$ pt.
9. Down: $11/1.25 = 8.8 \approx 9$. Up: $13.75 \approx 14$, $17.2 \approx 17$, 21.5. Caption 9, body 11, subhead 14, heading 17, title 21.5 pt (sensible rounding accepted).
10. Line $= 312$ pt; CPL $\approx 312/5.25 \approx 59$: comfortably in the 45–75 band. Leading about $1.3 \times 10.5 \approx 13.5 \rightarrow 10.5/13.5$, a mid-band choice for a mid-length measure.
11. CPL $\approx 144/5.5 \approx 26$, far below the minimum needed for justification, so word spaces stretch into rivers. Set flush left ragged right (or widen the measure substantially).
12. Lettering: letters drawn once for one use. Calligraphy: letters written in live pen or brush strokes. Type: a reusable system of cast or digital letters. The Coca-Cola script (Frank Mason Robinson, 1886, Spencerian).
13. Caps $\approx 70/10 = 7$ in. Length $\approx 10 \times 0.75 \times 7 = 52.5$ in, about 4.4 ft.

14. Model answer: in TYPE, the T–Y pair (two open letters) must tuck closer, while P–E (stem against stem) needs the widest gap; the eye-spaced version shows TY tightened and PE opened. Any correct reasoning about open versus straight-sided pairs earns full credit.
15. Model answer: Five faces give the page no single voice; cut to two with clear roles (or one family by weight). Solid leading chokes the body text; open it to 120–145%. A 95-character measure loses the reader's return sweep; narrow the column or split it to bring CPL to 45–75.

PORTFOLIO PIECE: A TYPE SPECIMEN POSTER

Design and produce a specimen poster for one Google Fonts family you have come to know well, in the tradition of Caslon's 1734 sheet: the family's name large in its own letters, an anatomy callout on at least one big character, its classification with a one-line history (designer, date), a full character set or alphabet, and sample settings that prove it works: a headline, a paragraph of body text set to your own spec (size, leading, measure stated on the poster in small print), and one line at caption size.

Build it with your whole unit: pick the family and a role for it (3.1–3.3), set every size from one modular scale and state the scale (3.4), and letter or carefully compose the poster's title (3.5). Finish at tabloid size (11 × 17 in) if you can print it, letter size if not: digital assembly in Inkscape or Scribus, or clean paste-up, both acceptable. This is piece three of the ten-piece professional portfolio this course builds; photograph it well.

LOOK FOR	WHAT IT MEANS
Typographic accuracy	Classification, designer and date are correct; anatomy labels are right; the stated scale, leading and measure match what is actually on the poster.
Hierarchy and layout	A clear reading order from name to samples; sizes come from one modular scale; alignment is disciplined and margins are generous.
Craft of the text settings	Body sample sits in the leading and CPL bands; quotes, italics and spacing are policed; no widows, rivers or ragged errors.
Display quality	The large setting or lettering of the family name is well spaced by eye and strong at arm's length and across the room.
Process documentation	Thumbnails, the spec card and one corrected proof are attached, showing decisions, not luck.
Presentation	Clean edges and surface; a colophon with your name and date; photographed or scanned straight and evenly lit for the portfolio.

3.1 The Story of Letters: Gutenberg, Jenson and Five Centuries of Type

OBJECTIVES

- Tell how Gutenberg's movable type worked (punch, matrix, hand mould, type metal, press) and why his 42-line Bible of about 1455 changed the world.
- Place the landmark letters in order with dates: Jenson's roman (1470), Aldus's italic (1501), Caslon (1734), Baskerville (1757), Bodoni and Didot (1780s–90s), the Linotype (1886), Times New Roman (1932), Helvetica (1957) and digital type (1984).
- Explain why a designer needs this history: every typeface menu is a five-hundred-year toolbox, and each era's letters still carry that era's voice.

> **Warm-up.** Collect five pieces of printed or packaged text from around the house: a cereal box, a book page, a receipt, a label, a magazine or mail piece. Line them up and rank them from most old-fashioned-looking to most modern-looking. Write one sentence on what visual clues you used. Keep the pile; you will classify these same letters properly in Lesson 3.2.

WATCH

The History of Typography - Animated Short

Ben Barrett-Forrest · 5:10

https://www.youtube.com/watch?v=wOgIkxAfJsk

> **WHEN TO WATCH**
> After the story paragraphs. It compresses the whole five centuries into five minutes of stop-motion paper letters; pause at each named face and say its date aloud before he does.

Note: Made from 291 hand-cut paper letters and 2,454 photographs, which is itself a lesson in craftsmanship. Watch it twice: once for fun, once taking timeline notes.

BACKUP VIDEO

International Printing Museum Tour: The Gutenberg Press

International Printing Museum · 13:56

https://www.youtube.com/watch?v=lbV7Y8NddNg

With the first story paragraph. A curator demonstrates a working replica of Gutenberg's press, from setting type to pulling a printed sheet.

KEY TERMS

movable type

Individual cast-metal letters that can be arranged into any text, printed, then cleaned and rearranged to print something else.

punch, matrix and mould

The three-step system of type founding: a hardened steel punch carries the letter, it is struck into soft copper to make a matrix, and the matrix drops into an adjustable hand mould where molten metal casts a fresh piece of type.

blackletter

The dense, angular letter style of medieval manuscripts, which Gutenberg's type imitated; also called textura or gothic.

italic

A slanted, flowing letter style introduced by Aldus Manutius and his punchcutter Francesco Griffo in 1501, originally to fit more words on a page.

specimen sheet

A printed sheet or book showing everything a type foundry offers, used by printers to choose and buy type; Caslon's 1734 sheet is the most famous.

roman

The upright letterform we still read today, modeled on ancient Roman capitals and humanist handwriting; perfected in type by Nicolas Jenson in 1470.

serif

The small finishing stroke at the end of a letter's main strokes; typefaces without them are called sans serif.

CORE IDEAS

The story. Around 1450 in Mainz, Germany, a goldsmith named Johannes Gutenberg put together four inventions into one system: steel punches carrying letters, copper matrices struck from them, an adjustable hand mould that could cast any letter in metal (a lead alloy with tin and antimony, chosen because it melts low and casts sharp), and a converted wine press that pressed inked type onto paper. None of the pieces was entirely new; the system was. By about 1455 his shop had finished its masterpiece, a Latin Bible set in two columns of 42 lines per page, about 1,280 pages in two volumes, in an edition of roughly 180 copies. A scribe needed about three years to copy one Bible by hand; Gutenberg's shop made 180 in roughly the same time. The letters imitated the dense blackletter handwriting of German manuscripts so well that buyers could hardly tell the difference, and his type case held around 270 different characters to copy the scribes' joined letters and abbreviations. Gutenberg did not get rich. His investor, the lawyer Johann Fust, had lent him 1,600 guilders, sued in 1455 just as the Bibles were being finished, and took over much of the operation with Gutenberg's own assistant Peter Schöffer, whose 1457 Mainz Psalter became the first printed book to name its printers and date.

How they figured it out. Printing spread down the Rhine and over the Alps, and the next great step happened in Venice. Nicolas Jenson, a Frenchman who had been master of the royal mint at Tours (and who, tradition says, was sent to Mainz in 1458 by King Charles VII to learn the secret), set up a press in Venice and in 1470 printed Eusebius's *De evangelica praeparatione* in a new kind of letter: not blackletter but a *roman*, modeled on the clear humanist handwriting Italian scholars used, which itself looked back to ancient Roman capitals. Jenson's roman was so even, open and readable that type designers still copy it; William Morris based his Golden Type on it in 1890, and Adobe revived it digitally in 1996. In 1501 another Venetian, the scholar-printer Aldus Manutius, had his punchcutter Francesco Griffo cut the first *italic*, a slanted letter based on chancery handwriting, and used it to print small, affordable classics that students could carry in a pocket. Within fifty years of Gutenberg, the two letterforms you use every day, roman and *italic*, were both on the page.

The craft. The centuries after Venice are a story of slow refinement, and a designer should know its landmarks the way a carpenter knows wood species. William Caslon, a London engraver of gun locks turned punchcutter, issued his great specimen sheet in 1734; his sturdy, warm old-style letters so dominated English printing that the first printed copies of the Declaration of Independence in 1776 were set in Caslon. John Baskerville of Birmingham (1757) sharpened the contrast and polished the page with smoother paper, a *transitional* step toward the *modern* letters of Firmin Didot in Paris and Giambattista Bodoni in Parma (1780s–90s), whose hairline serifs and vertical stress still say fashion and luxury on magazine covers today. The industrial nineteenth century invented advertising letters: fat faces, slab serifs (from 1815) and the first sans serif type (1816), plus huge wood letters for posters after Darius Wells's router of 1827. In 1886 Ottmar Mergenthaler's Linotype machine let one operator cast whole lines of type from a keyboard, and newspapers exploded in size. In 1932 the historian Stanley Morison, having told *The Times* of London its printing was unworthy of it, oversaw Victor Lardent's drawings for Times New Roman, first used on October 3, 1932. In 1957 Max Miedinger and Eduard Hoffmann of the Haas foundry in Switzerland drew Neue Haas Grotesk, renamed *Helvetica* in 1960, the plainspoken sans serif that became the voice of corporations and signage worldwide. And in 1984 Adobe's PostScript made letters into math (curves a computer could scale to any size), which is why your laptop carries Caslon, Bodoni and Helvetica side by side.

In the studio. Why does a working designer care? Because clients buy voices, and the history is the catalog of voices. A law firm asking for trustworthy and established is usually asking for an old-style serif, Caslon's family tree. A perfume brand asking for elegant is asking for a Didone, Bodoni's. A tech startup asking for clean and neutral is asking for a grotesque sans, Helvetica's. Art directors talk in these names daily, and job interviews for design positions routinely include identify this typeface. When this course reaches branding (Unit 8), you will choose type for real briefs, and the choice will be an argument from history: this letter has carried this kind of message for two hundred years, so it will carry yours. Designers who know the stories choose on purpose; designers who do not are only shopping by mood.

PICTURE STUDY



The Gutenberg Bible: Opening of St. Jerome's Epistle, Johannes Gutenberg's workshop, Mainz, c. 1454–55 · Letterpress on paper with hand-painted decoration · Harry Ransom Center, University of Texas at Austin

Image: Wikimedia Commons, public domain

This is the first page of Volume 1 of the Gutenberg Bible, from the copy at the University of Texas: St. Jerome's letter introducing the Old Testament. The black text is printed from metal type, but the great initial and the vine border were painted in afterward by hand, copy by copy, which is why no two Gutenberg Bibles look alike.

Look at it the way a printer of 1455 would: could you tell this from an expensive manuscript? That was exactly Gutenberg's business plan.

Look closely

- Count the lines in one column. This page carries 40 lines; most of the book carries 42. Why might the shop have squeezed in more lines as work went on? (Paper and vellum were expensive.)
- Find three places where two letters are joined into one piece of type, or a word is abbreviated with a stroke over it. Why did the type case need about 270 characters instead of 26?
- Follow the right-hand edge of a column. It is perfectly straight (justified). What does that tell you about the spacing work the compositor did in every single line?

- Compare the printed black letter with the painted initial. Which parts of the page does the machine own, and which parts still belonged to the artist?
- Squint until you cannot read it. Notice how even in tone the text block is, like woven cloth. Typographers still call this quality the color of the page.

Talk about it

1. Gutenberg imitated handwriting so well that buyers could hardly tell. When a new technology imitates the old form (printed type imitating script, or e-books imitating pages), what is gained and what is lost?
2. The text was mass-produced but the decoration was custom. Where do you see that same split today, in printing, housing or furniture?
3. Was Gutenberg's shop doing art, craft or engineering? Defend your answer using details from the page.

STUDIO BRIEF

Studio brief: A Timeline of Type for the Library Wall

Client: your local library (real or imagined) wants a hand-drawn poster, 'Five Centuries of Letters,' for the wall by the history shelves. Deliverable: one sheet, at least 11 × 17 in if you have it (two taped letter sheets work), showing 8–10 dated landmarks of type history, each with a drawn sample letter in that style. Deadline feel: the librarian wants to approve a pencil rough first, then the finished poster.

You will need

- Paper at least 11 × 17 in (or two letter sheets taped), pencil, eraser, ruler
- A black fineliner or marker, plus one accent color (red is traditional in printing history)
- Your notes from the video and the core ideas; Google Fonts open in a browser to study letter samples (search Caslon, Bodoni, Helvetica and a blackletter such as UnifrakturMaguntia)
- Sketchbook for thumbnails

Steps

1. List your landmarks with dates. Required: Gutenberg c. 1455, Jenson 1470, Aldus's italic 1501, Caslon 1734, Bodoni c. 1790s, the first sans 1816 or wood type 1827, Linotype 1886, Times New Roman 1932, Helvetica 1957, digital type 1984. Choose 8–10.
2. Thumbnail three layouts in your sketchbook: a vertical ladder, a horizontal river, a winding road. Pick the one with the clearest reading order (Unit 2's eye-path rules apply).
3. Rule a light pencil grid: a baseline for the timeline, even slots for each landmark, margins of at least 1 in all around.
4. For each landmark, draw one large sample letter (an a or R shows style well) in that era's style by eye, copying from Google Fonts samples. Draw the skeleton first, then thicken the strokes; do not trace.
5. Letter each date and a 3–6 word caption by hand in small, plain capitals. Keep all captions the same size: that is your first type scale decision.

6. Show the pencil rough to a parent or sibling playing the librarian. Ask: what is the first thing you read? Where do you get lost? Take notes like a professional, without defending yourself (Lesson 2.5).
7. Make the approved corrections, then ink the letters and captions. Use your accent color for dates only, so the eye can hop from date to date.
8. Erase the grid, title the poster, and sign and date it in small letters at the bottom edge: your colophon, in the tradition of 1457.

Tips

- Big letters first, captions last; if a sample letter fails, you want to find out before the small work is done.
- A blackletter sample is easiest with a chisel-cut marker or two pencil lines filled in; it is strokes, not outlines.
- Keep captions boring on purpose. The sample letters are the show; the captions are the ushers.

Check your work

- ☐ All landmarks are in correct order with correct dates.
- ☐ Each sample letter is recognizably in its era's style at arm's length.
- ☐ A stranger can follow the timeline without being guided.
- ☐ The poster carries your name and date as a colophon.

SKETCHBOOK

1. A labeled diagram of the type-founding chain: punch, matrix, hand mould, cast type, composed line, inked impression.
2. One letter (your choice) drawn four ways: blackletter, Jenson-style roman, Bodoni-style modern, Helvetica-style sans; label the dates.
3. Three sentences: which era's letters you like best and what job you would give them.

From history. What happened to Gutenberg? After losing the lawsuit to Fust in 1455 he kept a smaller shop, and in 1465 the Archbishop of Mainz granted him a court pension: grain, wine and clothing for life. He died in 1468, just before printing conquered Europe; by 1500, presses in some 270 towns had printed millions of books, more than all the scribes of the previous thousand years combined. The craftsman rarely captures all the value of his invention, which is worth remembering when you price your own work in Unit 10.

WORKED EXAMPLES

Example 1. A scribe copies one complete Bible in about 3 years. Gutenberg's shop, with about 20 workers, produced roughly 180 Bibles in about 3 years. How many times more productive per worker was the print shop than the scribe?

Show solution

1. The shop's output per worker: $180 \div 20 = 9$ Bibles per worker in 3 years.
2. The scribe's output: 1 Bible in 3 years.
3. Ratio: $9 \div 1 = 9$ times more productive per worker, and the printed copies matched each other exactly, which no team of scribes could promise.

Answer: About 9 times more output per worker, with perfect consistency; that consistency is the real revolution.

Example 2. The 42-line Bible has about 1,280 pages. Each page carries 2 columns of 42 lines. About how many lines of type did the shop set for one complete Bible?

Show solution

1. Lines per page: $2 \times 42 = 84$.
2. Total: $1{,}280 \times 84 = 107{,}520$ lines, every one assembled by hand, letter by letter.

Answer: About 108,000 lines of hand-set type.

Example 3. A compositor sets about 1,200 characters per hour by hand. A Linotype operator of 1890 could set about 6,000 per hour. A daily newspaper page holds about 50,000 characters. How many hours of setting did one page cost before and after the Linotype?

Show solution

1. By hand: $50{,}000 \div 1{,}200 \approx 42$ hours per page.
2. By Linotype: $50{,}000 \div 6{,}000 \approx 8.3$ hours per page.
3. That is roughly a five-fold saving, which is why newspapers jumped from 8 pages to 48 within a generation.

Answer: About 42 hours by hand versus about 8 hours by machine, roughly 5 times faster.

PRACTICE

1. Easy Put these in date order and give each a date: Helvetica, Gutenberg's Bible, Caslon's specimen, Jenson's roman, Times New Roman.

   Show answer

   Gutenberg's Bible (c. 1455), Jenson's roman (1470), Caslon's specimen (1734), Times New Roman (1932), Helvetica (1957).

2. Easy Name the three metal-working steps that turn a letter drawing into a piece of type.

   Show answer

   Cut a steel punch, strike it into copper to make a matrix, and cast type from the matrix in the adjustable hand mould.

3. Easy Why did Gutenberg's Bible type look like handwriting instead of like this page?

   Show answer

   His customers bought manuscript Bibles, so the type imitated German blackletter handwriting, including its joined pairs and abbreviations (about 270 characters), to equal what buyers expected.

4. Easy What did Aldus Manutius and Francesco Griffo introduce in 1501, and what practical problem did it solve?

Show answer

The first italic type. Its narrow, flowing letters fit more words per page, so Aldus could print small, inexpensive pocket editions of the classics.

5. Medium If a scribe earned his keep copying 1 Bible every 3 years, how many scribe-years of work did Gutenberg's edition of 180 Bibles replace?

Show answer

$180 \times 3 = 540$ scribe-years, done by one shop in about three years.

6. Medium Match each typeface to the voice a client would hear, and say why: Caslon, Bodoni, Helvetica. Client requests: (a) a luxury perfume box, (b) a city wayfinding sign, (c) a classic clothbound novel.

Show answer

(a) Bodoni: hairline serifs and high contrast have meant fashion and luxury since the 1790s. (b) Helvetica: neutral, sturdy, highly legible sans built for signage. (c) Caslon: warm old-style serif that has dressed English-language books since the 1700s.

7. Medium The Mainz Psalter of 1457 was the first book to carry a printed colophon (its printers' names and the date). Why does a designer today still put a name and date on work?

Show answer

A colophon claims responsibility and builds reputation. Fust and Schöffer were advertising their craftsmanship; a modern designer's portfolio credit or signature does the same, and honest credit is also how clients find you again.

8. Medium Times New Roman was commissioned after Stanley Morison criticized The Times in 1929 for poor printing. It appeared October 3, 1932. What does this episode teach about how professional design work actually arrives?

Show answer

Serious work comes from a brief and a criticism honestly made and received: the client admitted a weakness, hired a specialist, and gave him time (about three years) to research, draw and test before launch.

9. Hard Gutenberg's hand mould had to cast every letter the same height from the press bed (type height) while letting widths vary (an i is narrower than a w). Why was the adjustable mould the key invention rather than the press itself?

Show answer

Presses already existed (wine and paper presses). Printing from type only works if thousands of separate letters lock into perfectly even lines; the mould guaranteed identical body height and depth while adjusting width per letter, so any letter could stand beside any other. It made letters interchangeable parts, four hundred years before interchangeable gun parts.

10. Hard You are the designer. A museum asks for a poster about the 1470s Venetian book trade and insists on using blackletter because it is old. Make the historical case for a Jenson-style roman instead, in two or three sentences.

Show answer

Venice in 1470 is precisely where printing left blackletter behind: Jenson's roman of 1470 was cut there for Eusebius's De evangelica praeparatione and defined the Venetian book. Blackletter says fifteenth-century Germany; a humanist roman says fifteenth-century Venice. Using Jenson's letter is the more accurate and the more readable choice.

11. Hard A Linotype operator sets 6,000 characters per hour. A modern typist at 60 words per minute sets about 18,000 characters per hour, and the text flows into a layout instantly. List two jobs that disappeared between 1886 and today, and two design jobs that replaced them.

Show answer

Gone: hand compositor and Linotype operator (and the type founder casting metal). Arrived: the typesetter's judgment moved into the graphic designer and production artist, who now choose faces, sizes, spacing and page layout in software; type design itself became a digital profession.

COMMON MISTAKES

- Saying Gutenberg invented printing. Woodblock printing is centuries older (and older still in Asia); his invention was the system of cast movable metal type, especially the adjustable hand mould.
- Confusing typeface eras: blackletter is not just old-fashioned decoration, it is a specific fifteenth-century form; roman and italic are separate inventions (1470

and 1501), not variations that always existed.

- Writing dates from memory without checking. Designers are expected to get Caslon 1734 and Helvetica 1957 right the way a mechanic gets torque specs right.

Make it a game · Type Timeline Showdown. Write these on ten slips: Gutenberg Bible, Jenson roman, Aldus italic, Caslon specimen, Baskerville, Bodoni, Linotype, Times New Roman, Helvetica, PostScript. Shuffle. You have 60 seconds to lay them in order, then 60 more to add dates from memory (within 10 years counts). Score one point per correct position, one per date. Play three rounds and beat your own score; then flip it and let a parent quiz you with just the dates while you answer with names.

Scripture. “The Lord gave the word: great was the company of those that published it.” (Psalm 68:11, KJV)

The first large books off Europe's first presses were Bibles and psalters. Printing multiplied the company of them that published the word, and many early printers saw their trade exactly that way: Gutenberg's Bible, Fust and Schöffer's Psalter, and thousands of Scripture editions within a generation.

3.2 The Anatomy of a Letter: Classification from Garamond to Helvetica

OBJECTIVES

- Label the anatomy of letters: baseline, x-height, cap height, ascender, descender, serif, stem, bowl, counter, aperture, axis and stroke contrast.
- Classify typefaces by sight into the working groups designers use: humanist, old-style, transitional, Didone (modern), slab serif, grotesque sans, geometric sans and humanist sans, naming a classic example and date for each.
- Measure x-height as a fraction of type size and use it to compare the apparent size of two typefaces set at the same point size.

> **Warm-up.** Print or write the word 'Reading' large, then trace just the invisible horizontal lines the letters sit on and reach to: the line under everything, the line the small letters reach, the line the capitals reach, the lines the tails hang to. You have just discovered the baseline, x-height line, cap line and descender line. Now look at your warm-up pile from Lesson 3.1 and find the typeface with the tallest-looking small letters.

WATCH

Typography: Anatomy of a Letter

Envato Tuts+ · 3:31

https://www.youtube.com/watch?v=NrBF-ebM4uE

> **WHEN TO WATCH**
> After the craft paragraph. It is short and dense; pause it at each term and point to the same part on a printed page in front of you.

Note: A clean three-minute tour of the vocabulary in this lesson. Watch it once through, then a second time with your pencil labeling a large printed R and g as it goes.

BACKUP VIDEO

Times New Roman— Graphic Design History 101

The Futur Academy · 9:07

https://www.youtube.com/watch?v=MK6VC_JxtE4

With the story paragraph. The 1932 Times New Roman episode shows how one famous face was shaped by measurable anatomy decisions: large x-height, tight fit, sturdy serifs.

KEY TERMS

baseline

The invisible line all letters sit on; the foundation of every measurement in typography.

x-height

The height of the lowercase x (and most small letters' bodies) above the baseline; the main driver of how big a typeface looks.

ascender / descender

The stroke of b, d, h, k, l rising above the x-height; the tail of g, j, p, q, y dropping below the baseline.

counter and aperture

The enclosed or partly enclosed space inside a letter (the hole in o, the opening of c); open apertures generally read better at small sizes.

stroke contrast and axis

How much a letter's strokes vary from thick to thin, and the angle of that variation; old-style letters have a tilted axis like a broad pen, Didones a vertical one.

Didone (modern)

The high-contrast, vertical-axis, hairline-serif style of Didot and Bodoni, from the 1780s–90s.

grotesque / geometric / humanist sans

The three working families of sans serifs: nineteenth-century plainness refined into Helvetica (1957); compass-and-ruler shapes like Futura (1927); and sans letters with calligraphic bones like Gill Sans (1928).

em

A square as wide as the type size; the unit letters are designed on. At 12 pt type, one em is 12 pt.

CORE IDEAS

The story. In 1957, at the small Haas type foundry in Münchenstein, Switzerland, the manager Eduard Hoffmann decided the foundry needed a cleaner version of the nineteenth-century grotesque sans serifs that Swiss designers loved, especially Akzidenz-Grotesk of 1896. He hired a freelance designer, Max Miedinger, and directed the work in detail by letter and sketch: a touch more x-height, closed-up apertures, strokes ending flat and horizontal, an even gray texture. They called it Neue Haas Grotesk; when the German parent company Stempel took it worldwide in 1960 it was renamed *Helvetica*, from the Latin for Switzerland. It became the default voice of corporations, airlines and governments: so neutral it seemed to have no style at all, which was itself the style. The lesson for a young designer is that Helvetica was not a lightning bolt of inspiration; it was two craftsmen adjusting anatomy, millimeter by millimeter, toward a stated goal.

How they figured it out. With thousands of typefaces in the world, printers needed a way to sort them, and the sorting is done by anatomy. In 1954 the French historian Maximilien Vox proposed the classification that (in revised forms) the industry still uses, and the international type association ATypI adopted a version of it in 1962. The groups follow history because each era built letters with different tools and tastes. Hold a broad-edged pen at a steady angle and write an o: the thick and thin parts fall on a tilted axis. That is the skeleton of *humanist* and *old-style* faces (Jenson

1470; Garamond, cut by Claude Garamont in Paris before 1561; Caslon 1734): moderate contrast, tilted axis, sturdy bracketed serifs. *Transitional* faces (Baskerville 1757) straighten the axis and sharpen contrast. *Didones* (Didot c. 1784, Bodoni's mature work by the 1790s) push to vertical axis, extreme contrast and hairline serifs: letters made with pointed pens, smooth paper and better presses. *Slab serifs* (from Vincent Figgins's specimens of 1815) weld on heavy rectangular serifs for advertising. Sans serifs drop serifs entirely: *grotesques* (Akzidenz-Grotesk 1896, Helvetica 1957), *geometrics* (Paul Renner's Futura, 1927, drawn from circles and straight lines), and *humanist sans* (Gill Sans 1928; Edward Johnston's London Underground lettering of 1916 is the granddad), which keep the old calligraphic proportions without the serifs.

The craft. Anatomy is also arithmetic, because point size does not tell you how big a typeface looks. Type is measured on the *em*, the invisible body the letters sit on: 12 pt type sits on a 12 pt body. But how much of that body the lowercase letters fill is the x-height, and it varies widely. A classic old-style like Garamond has an x-height around 42–45% of the em; Times New Roman is about 45–46%; Helvetica about 52%; many screen faces run 52–55%. Two faces at 12 pt can differ in apparent size by ten percent or more. The working rule: apparent size $\propto$ point size $\times$ x-height ratio, so to make face B look the size of face A, set $S_B = S_A \times \dfrac{x_A}{x_B}$. Large x-heights and open counters survive small sizes and cheap paper; that is why Morison specified a large x-height for a newspaper face in 1932, and why phone-screen faces do the same today. High-contrast Didones, beautiful at 60 pt on a poster, sparkle and then disintegrate at 9 pt as their hairlines drop below what the printer or screen can hold.

In the studio. Professionals identify faces by interrogating anatomy, not by memorizing pictures. The checklist: serifs or not? If serifs: bracketed and sturdy (old-style), thin and flat (Didone), or slab? Where is the axis of the o: tilted or vertical? How high is the x-height? Is the aperture of c and e open or pinched? Single-story or double-story a and g? Run the checklist on the lowercase g and the capital R and you can place almost anything in its group in thirty seconds. Google Fonts lets you filter by Serif, Sans Serif, Display and more, then compare candidates side by side in the type tester; designers do exactly this when shortlisting for a client. Learn the group names cold: a creative director who says make it more humanist, less geometric is giving precise instructions, and you will be expected to hear them precisely.

PICTURE STUDY



A Specimen by William Caslon, Letter Founder, William Caslon I, 1734 (as reproduced in Chambers's Cyclopaedia) · Letterpress broadside specimen sheet · Specimen issued in London; this scan from the Cyclopaedia

Image: Wikimedia Commons, public domain

This is the most famous advertisement in type history: William Caslon's 1734 specimen sheet, displaying his foundry's wares from huge display sizes down to tiny text sizes, in roman and italic, plus Hebrew, Greek, Arabic and blackletter. Printers chose and ordered type from sheets like this the way a builder orders lumber from a catalog.

Forty-two years later, Caslon's letters were chosen for the first printed copies of the Declaration of Independence. A good letter outlives its maker.

Look closely

- Find the largest and the smallest sizes on the sheet. What stays the same about the letters' design as they shrink? What has to change?
- Compare a roman line with the italic line beside it. List two anatomical differences beyond the slant.
- Most sample lines begin with the same Latin text (Quousque tandem abutere, Catilina..., from Cicero). Why would a founder repeat one familiar text at every size?

- Look at the sheet as a whole composition: columns, headings, hierarchy. Is this itself a well-designed page? What rules from Unit 2 does it follow?
- Find the exotic scripts (Hebrew, Greek, Arabic). What does their presence tell you about a London printer's customers in 1734?

Talk about it

1. A specimen sheet is a portfolio: it must sell the work by showing the work. What would the equivalent be for you at the end of this course?
2. Caslon was a gun-lock engraver before he cut letters. What skills would transfer? Can you name a modern career change that works the same way?
3. Why do you think American printers kept using Caslon for official documents long after newer faces existed?

STUDIO BRIEF

Studio brief: An Anatomy Poster for a Classroom

Client: a homeschool co-op teacher wants a 'Parts of a Letter' reference poster for the classroom wall, clear enough that a ten-year-old can use it. Deliverable: one letter-size or tabloid-size sheet built around 2–3 very large letters with at least ten anatomy labels, plus a small classification strip along the bottom showing four groups. Pencil rough for approval first; finished poster after corrections.

You will need

- Paper, pencil, ruler, eraser; black fineliner and one accent color
- A computer with Google Fonts to print or trace source letters: choose one old-style (EB Garamond), one Didone (Playfair Display or Bodoni Moda) and one sans (Inter or Futura-like Jost)
- Optional: Inkscape, if you prefer to assemble the poster digitally; hand-drawn is equally acceptable

Steps

1. Print or carefully trace a lowercase g, a capital R and a lowercase e at least 10 cm tall from your chosen text face.
2. Rule the four horizontal lines across them: descender line, baseline, x-height line, cap line. Label each at the margin.
3. Add callout labels with thin leader lines: serif, stem, bowl, counter, aperture, terminal, ascender, descender, axis (draw the tilt through the o or e), spur or ear if your g has one. Minimum ten labels.
4. Letter the labels in small plain capitals, all the same size; the giant letters are the picture, the labels are the text.
5. Build the classification strip: four boxes along the bottom, each with one word ('Readable') set in an old-style, a Didone, a slab or grotesque, and a geometric or humanist sans, with group name and a classic example and date beneath.
6. Client check: ask your 'teacher' to find the counter and the aperture using only your poster. If they hesitate, your labels or leader lines need work; fix

them.

7. Ink, erase construction lines, add a title and your colophon.

Tips

- Leader lines should never cross each other; route them like a tidy wiring diagram.
- Trace from printouts without shame: type designers study letters by drawing them, and tracing a master's curves teaches your hand what 'correct' feels like.
- The axis label impresses clients most: draw a line through the thinnest parts of the o and watch the tilt change between Garamond and Bodoni.

Check your work

- ☐ At least ten correct anatomy labels with tidy leader lines.
- ☐ The four classification samples are visibly different and correctly named with dates.
- ☐ A ten-year-old (or a sibling standing in for one) can find any labeled part in five seconds.
- ☐ Rough was reviewed, corrections were made, and the final is signed.

SKETCHBOOK

1. The same word ('quality' works well, it has ascenders, descenders and round letters) traced or copied from an old-style, a Didone and a grotesque sans, with the axis drawn through each o.
2. Your x-height measurements: three faces measured at a large printed size, with the ratios worked out beside them.
3. A half-page of 'letter spotting' from real life: sketch and classify three letters you found on packages, signs or books today.

KEY FORMULAS

$$\text{x-height ratio} = \frac{\text{x-height}}{\text{type size (em)}}$$

$S_B = S_A \times \frac{x_A}{x_B}$ (size of face B that matches the apparent size of face A)

From history. Classification has a famous trap: most faces sold as 'Garamond' in the twentieth century were actually based on type cut by Jean Jannon around 1621, sixty years after Claude Garamont died in 1561. The error was uncovered in 1926 by the historian Beatrice Warde, publishing under the pen name Paul Beaujon because she doubted a woman's byline would be taken seriously in the trade; the next year she became editor of the Monotype Recorder in London. Her essay 'The Crystal Goblet' (1930) remains the classic statement that printing should serve the text the way a clear glass serves what fills it.

WORKED EXAMPLES

Example 1. You print the word 'home' at 100 pt in Garamond and measure from the baseline to the top of the lowercase m: 15.5 mm. One point is 0.3528 mm. What is Garamond's x-height ratio?

Show solution

1. The em at 100 pt is $100 \times 0.3528 = 35.28$ mm.
2. The x-height ratio is x-height over em: $15.5 \div 35.28 \approx 0.44$.
3. Check the measurement habit: measure to the top of a flat letter like x or m, not a round letter like o (round letters overshoot slightly) and never to an ascender like h.

Answer: About 0.44, a typical old-style x-height of 44% of the em.

Example 2. Helvetica's x-height ratio is about 0.52; Garamond's is about 0.44. A client's brochure is set in 11 pt Helvetica. You are switching the body text to Garamond. What size keeps the same apparent size?

Show solution

1. Use $S_B = S_A \times \dfrac{x_A}{x_B} = 11 \times \dfrac{0.52}{0.44}$.
2. $0.52 \div 0.44 = 1.18$, so $S_B = 11 \times 1.18 \approx 13$ pt.

Answer: Set the Garamond at about 13 pt; at 11 pt it would look noticeably smaller than the Helvetica it replaced.

Example 3. At 9 pt, a Didone's hairline strokes are about 1/60 of the em. A desktop laser printer reliably holds details down to about 0.08 mm. Will the hairlines survive? (1 pt = 0.3528 mm.)

Show solution

1. The em at 9 pt is $9 \times 0.3528 = 3.18$ mm.
2. Hairline width: $3.18 \div 60 \approx 0.053$ mm.
3. 0.053 mm is thinner than the 0.08 mm the printer can hold, so hairlines will break up or vanish.

Answer: No: about 0.05 mm versus the printer's 0.08 mm limit. Didones are display faces; use a sturdier text face at 9 pt.

PRACTICE

1. Easy Draw a lowercase 'dog' large and label: baseline, x-height, ascender, descender, bowl, counter.

   Show answer

   Baseline under all three; x-height at the top of o and the bowls of d and g; ascender on d; descender on g; bowls are the round closed strokes of d, o, g; counters are the enclosed spaces inside them.

2. Easy Name the classification group and a date: (a) hairline serifs, vertical axis; (b) no serifs, drawn from near-perfect circles; (c) sturdy bracketed serifs, tilted axis.

   Show answer

   (a) Didone / modern, 1780s–90s (Didot, Bodoni). (b) Geometric sans, 1927 (Futura). (c) Old-style, 1470–1734 (Jenson, Garamond, Caslon).

3. Easy Two typefaces are both set at 12 pt. One looks clearly bigger. What single measurement explains it?

   Show answer

   X-height. Point size measures the em body, not the letters; the face with the larger x-height ratio looks bigger.

4. **Easy** What is one em at 18 pt type? At 10 pt?

   Show answer

   18 pt and 10 pt: the em always equals the type size.

5. **Medium** At 72 pt, a face's lowercase x measures 13.0 mm. Find the x-height ratio (1 pt = 0.3528 mm) and say whether the face will look large or small at text sizes.

   Show answer

   $\text{Em} = 72 \times 0.3528 = 25.4$ mm; ratio $13.0/25.4 \approx 0.51$. A 51% x-height is on the large side: it will look big and sturdy at text sizes.

6. **Medium** A heading is 24 pt in a face with x-height ratio 0.45. You want a sans with ratio 0.53 beside it at matching apparent size. What size?

   Show answer

   $24 \times 0.45/0.53 \approx 20.4$, so set the sans at about 20–20.5 pt.

7. **Medium** Why did Morison specify a large x-height and sturdy serifs for Times New Roman in 1932? Give two reasons rooted in newspaper production.

   Show answer

   Newsprint is rough and absorbent and the type is small, so large x-heights stay readable and sturdy serifs do not break; and a slightly condensed, large-bodied face packs more words per line, which saves column space.

8. **Medium** Sort into grotesque, geometric and humanist sans, with one anatomy clue each: Futura, Helvetica, Gill Sans.

   Show answer

   Futura: geometric, its o is nearly a perfect circle. Helvetica: grotesque, closed apertures and flat, horizontal stroke endings. Gill Sans: humanist, letters keep calligraphic proportions (compare its two-story a and g).

9. Hard Your client's logo uses a Didone and they want the website body text to match the brand. Explain the anatomy problem and offer the professional compromise.

Show answer

Didone hairlines collapse at body sizes on screens (strokes thinner than a pixel or the renderer's hinting). Keep the Didone for headlines and the logo, and pair it with a compatible text face (a transitional or sturdy old-style) for body copy; the brand voice survives in the display sizes where the Didone can actually be seen.

10. Hard Using the lowercase g and capital R as witnesses, write the 30-second identification checklist you would run on an unknown typeface.

Show answer

Serifs present? If yes: bracketed/tilted axis (old-style), sharpened/straighter (transitional), hairline/vertical (Didone), rectangular slabs (slab). If no serifs: near-geometric circles (geometric), plain with closed apertures and flat terminals (grotesque), calligraphic skeleton and open apertures (humanist). Then: single- or double-story g, leg of the R straight or curved, x-height large or small; those details narrow it to a family.

11. Hard A printer tells you their press holds 0.1 mm details. The invitation is set at 10 pt in a face whose hairlines are 1/70 of the em. Safe? Show the arithmetic.

Show answer

$\text{Em} = 10 \times 0.3528 = 3.53$ mm; hairline $3.53/70 \approx 0.05$ mm, half the press's 0.1 mm limit. Not safe: choose a lower-contrast face or a larger size.

COMMON MISTAKES

- Measuring x-height to the top of an o or e. Round letters overshoot the x-height line slightly so they look the same size as flat ones; measure to the top of the x.
- Calling every serif face 'Times' and every sans 'Helvetica.' Run the checklist; the axis, aperture and g will disagree with you.
- Treating classification as trivia. It is a working vocabulary: 'a humanist sans, large x-height, open apertures' is a precise order a colleague can fill, 'something clean' is not.

Make it a game · Serif Detective. Pull six books, boxes or printed pieces from around the house. For each, you get 30 seconds to classify the main typeface (old-style, transitional, Didone, slab, grotesque, geometric, humanist sans) and name one anatomy clue out loud ('tilted axis', 'hairline serifs', 'circular o'). A parent holds the answers sheet you made from Google Fonts lookups beforehand. Five of six with clues stated is a win; then swap and teach the parent the checklist.

Scripture. “There are, it may be, so many kinds of voices in the world, and none of them is without signification.” (1 Corinthians 14:10, KJV)

Paul's point is about intelligible speech, and it is the typographer's rule too: every typeface is a voice with a meaning, and the craft is matching the voice to the message so the hearer understands.

3.3 Choosing and Pairing Typefaces

OBJECTIVES

- Choose a typeface for a job by voice, classification, available weights and licensing, using Google Fonts filters and the type tester.
- Pair two typefaces by the contrast principle (clearly different classifications, compatible proportions), check x-heights, and assign clear roles to each.
- Explain what a family and a superfamily are, and why one well-built family is often better than any pairing.

> **Warm-up.** Open Google Fonts and type your own name into the search box's preview field (Type something). Scroll and pick the typeface that feels most like you, and the one that feels least like you. Write one sentence for each: what the letters are doing that creates that feeling. You have just done, informally, what this lesson teaches you to do professionally.

WATCH

PAIR FONTS LIKE A PRO - 1 Simple Technique That Works!

Satori Graphics · 6:50

https://www.youtube.com/watch?v=pbv78zGoVC8

> **WHEN TO WATCH**
> After the craft paragraph. Pause at each example pair and say which face is leading and which is serving before he tells you.

Note: A working designer demonstrates contrast-based pairing with live examples. Notice how often the answer is a serif display face with a quiet sans for text, or the reverse.

BACKUP VIDEO

How To Choose Fonts

Flux Academy · 9:42

https://www.youtube.com/watch?v=obZX8oIjia4

With the 'In the studio' paragraph: how a professional narrows thousands of candidates to a shortlist by brief, voice and practical checks.

KEY TERMS

type family

All the related styles of one design: weights (light to black), widths, italics. Inter, for example, ships in nine weights plus italics.

superfamily

A family built in several classifications on shared bones, such as a serif, a sans and a mono that match: Source Serif, Source Sans and Source Code, or IBM Plex.

contrast principle

Pair typefaces that are clearly different (different classifications, different jobs) or do not pair at all; near-twins clash like two radios tuned a half-station apart.

display face / text face

A face designed for large sizes and short bursts (headlines, posters) versus one designed to be read comfortably for pages at 9–12 pt.

weight and style

The darkness of a face (Regular 400, Bold 700, and so on) and its variants (italic, condensed); hierarchy within one family is built from these.

open license (OFL)

The SIL Open Font License used by most Google Fonts: free to use, embed and sell work with, even commercially; the font files themselves may not be resold.

CORE IDEAS

The story. The idea that typefaces come in coordinated families is younger than you would guess, and much of it comes from one quiet man in New Jersey. When 23 American type foundries merged into American Type Founders (ATF) in 1892, the head of its design department from 1900 was Morris Fuller Benton, an engineer's son who treated letters like an engineering product line. Benton designed or directed some 220 faces, and his great insight was the family: Century Schoolbook (1919) for children's textbooks came with related weights; Franklin Gothic (1902) and News Gothic (1908) gave American advertising a whole wardrobe of matched sans serifs; Cheltenham grew to over twenty coordinated styles. Before Benton, a printer mixed whatever was in the cases; after him, a designer could build a whole hierarchy (headline, subhead, caption) inside one family and know every piece belonged. The twenty-first century extended the idea to the superfamily: Adobe's Source Serif,

Source Sans and Source Code, or IBM's Plex, are serif, sans and monospace drawn on shared skeletons so that they pair perfectly by construction.

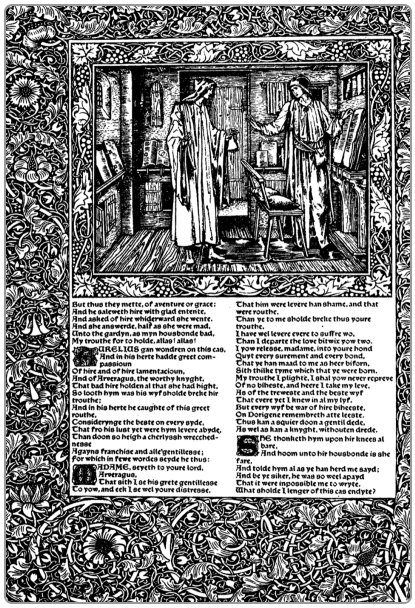
How they figured it out. The modern free-font world has its own founding date: in 2010 Google launched Google Fonts, open-licensed families served free to any website, because font licensing was the bottleneck keeping web typography stuck in a handful of system faces. Today it hosts over 1,500 families, including professional-grade workhorses: Inter (Rasmus Andersson, begun 2017) for interfaces, EB Garamond (Georg Duffner's revival of the 1592 Egenolff-Berner specimen of Garamont's types), Playfair Display, Lora, Merriweather, Open Sans and Roboto. The license that makes this work, the SIL Open Font License, lets you use the fonts in commercial client work without fees. For a student with no budget this is not a consolation prize; it is a professional library, and knowing your way around it (filters by classification, the type tester, the Pairings tab on each family page) is a marketable skill in itself.

The craft. Pairing runs on one principle: *contrast with compatibility*. Two faces must differ enough to have separate jobs, and agree enough to sit on the same page. The reliable recipe: cross classifications (a serif with a sans, a Didone display with a humanist text face), never pair near-neighbors (two grotesques, two old-styles); give each face a role and keep it (one leads in headlines, one serves in text); and check compatibility with three tests. First, x-height: set both at the same size and compare; apparent sizes should be within about 10%, or plan to compensate with the $S_B = S_A \times x_A / x_B$ rule from Lesson 3.2. Second, proportion and skeleton: a round, wide geometric sans fights a narrow old-style; faces with similar letter widths and similar a/g constructions agree better. Third, mood: letter a short real headline and a real paragraph, print them, and read them cold the next day. Two faces are usually plenty; three is a maximum (display, text, and perhaps a mono or script for a special job); more than three is noise. And remember the null option: a large family like Inter or Source Serif can carry an entire document alone with weights and sizes doing the work, which is why many of the best-dressed publications use exactly one family.

In the studio. Here is how a working designer actually chooses type for a client, say a veterinary clinic's brochure. Reread the brief and write three voice words (warm, competent, calm). Translate to classification: warm suggests humanist or old-style forms; competent and calm suggest moderate contrast, open apertures, nothing

fashionable. Filter Google Fonts to Serif and Sans Serif, shortlist six candidates, and test them with *real words from the job*, never 'the quick brown fox': the clinic's name, a headline ('Gentle care for old dogs'), a paragraph of services. Eliminate anything missing a true italic or a usable bold (hierarchy needs them). Pair the survivors, run the three compatibility tests, and present the client *one* recommendation with one alternate, each shown in a realistic mockup. Clients choose between finished sentences, not between font menus. File this workflow; you will use it verbatim in the Unit 8 branding briefs.

PICTURE STUDY



A Page from the Kelmscott Chaucer, William Morris (design and type), after illustration by Edward Burne-Jones, 1896 · Letterpress on handmade paper, woodcut border and type designed by Morris · Kelmscott Press, Hammersmith, London

Image: Wikimedia Commons, public domain

William Morris spent the last years of his life printing 'the book beautiful.' For his edition of Chaucer, finished in 1896 just months before he died, he designed the Chaucer type himself (a blackletter-flavored letter based on fifteenth-century models; his earlier Golden Type copied Jenson's 1470 roman), drew the vine borders, and had Edward Burne-Jones draw the illustrations. The edition was 425 copies, and it is often called the most beautiful printed book of its century.

Study it as a pairing problem: a dense, dark type, an even denser border, and white paper, all made to agree. Morris proved that even extreme ingredients can pair if their proportions, color and construction are matched on purpose.

Look closely

- Squint at the page. The type block and the border are nearly the same darkness (typographic color). What would happen to the page if the border were dark and the type light gray?
- Morris's type is based on medieval models, and the vines are medieval too. Find three details where the letterforms and the ornament share the same spirit or stroke weight.

- Where does your eye enter the page, and what path does it take? Does the decoration serve the reading or fight it? Be honest; critics have argued both.
- Look at the margins: the inner margin is smallest, the bottom margin largest, in the medieval manner. Measure the proportions by eye.
- Find one place where Morris left emptiness. Why is there so little of it, and is that a flaw or the point?

Talk about it

1. Morris matched type and ornament by designing both himself. When you pair two typefaces by two different designers, what stands in for that unity, and which of this lesson's tests checks it?
2. The Kelmscott Chaucer is gorgeous and hard to read for long stretches. When is it right to spend readability on beauty, and what kinds of jobs forbid that trade?
3. Morris revived Jenson's 1470 roman for his Golden Type. Why would a nineteenth-century reformer reach four hundred years backward for a model?

STUDIO BRIEF

Studio brief: Type for the Corner Bakery

Client: 'Miller & Daughters Bakery' is opening in your town. They need typefaces chosen for their window sign, menu board and price cards, and they have no font budget: everything must come from Google Fonts. Deliverable: a one-page 'type recommendation sheet' showing the chosen pairing in realistic use, plus a one-paragraph defense in plain English. The owner is practical, warm and suspicious of anything trendy.

You will need

- Computer with Google Fonts; paper and pencil for roughs
- Optional: Inkscape or Scribus to assemble the sheet digitally, or do it as a careful paste-up of printed samples
- The three voice words you will write from the brief

Steps

1. Write three voice words for this client (for example: warm, honest, established). Keep them visible while you work.
2. Translate the voice to classifications and filter Google Fonts accordingly; shortlist five or six families. Record each family's name, classification and available weights in a table.
3. Eliminate to three using professional rules: must have a real bold; text candidates must read well at small sizes (test at 10–11 pt, printed); nothing that fights the voice words.
4. Pair: test your three finalists in combinations using real words only: the bakery name, 'Fresh bread daily', a menu line with a price ('Sourdough loaf … 6.50'), and two sentences about the family. Print the candidates.
5. Run the three compatibility tests (x-height, proportion, cold read next day) and pick one pairing plus one alternate.
6. Assemble the recommendation sheet: bakery name large in the display face, a menu section mocked up, a price line, the body paragraph, each labeled with family name and weight. Show the alternate small in a corner.

7. Write the defense paragraph a baker can understand: no jargon, three or four sentences, tied to the voice words.
8. Present to a parent playing the owner. Answer one objection ('Could the headline be fancier?') the professional way: hear it, restate it, show or explain the consequence, and offer a tested alternative.

Tips

- Realistic words beat lorem ipsum every time; a price with digits will expose a font with weak numerals immediately.
- If every pairing looks wrong, try the one-family solution with weights doing the work, and present that with confidence.
- Keep your table of candidates; it goes in your process documentation for the Unit 10 portfolio.

Check your work

- ☐ The shortlist table shows real filtering by voice, classification, weights and small-size readability.
- ☐ The final sheet shows the pairing in realistic use at realistic sizes, labeled.
- ☐ The defense paragraph is jargon-free and tied to the brief.
- ☐ You presented, took one note, and responded without defensiveness.

SKETCHBOOK

1. The pairing recipe in your own words as a flowchart: voice words, classifications, shortlist, eliminate, test pairs, decide.
2. Letter by hand your favorite rejected candidate large, with one sentence on why it lost: write honest critique of your own choices.
3. Three pairings spotted in the wild (cereal box, book cover and title page, shop sign) with a verdict each: contrast or clash?

> **From history.** Benton's ATF did one more thing that changed design practice: its 1923 specimen book ran to over 1,100 pages and showed faces in realistic layouts (ads, letterheads, menus) instead of bare alphabets, effectively teaching American printers how to pair and use what they bought. The best font-shopping pages today, including each Google Fonts family's Pairings tab, are the same idea: never choose a letter in isolation; choose it doing its job.

Example 1. You shortlist 6 typefaces for a brochure. How many different pairs could you test? If each pair takes 10 minutes to letter and judge honestly, how long is the full test, and what does that tell you about shortlisting?

Show solution

1. Pairs from 6 faces: $\binom{6}{2} = \dfrac{6 \times 5}{2} = 15$.
2. Time: $15 \times 10 = 150$ minutes, two and a half hours.
3. With 10 faces it would be $\binom{10}{2} = 45$ pairs, seven and a half hours. Testing grows roughly with the square of the shortlist, so professionals cut hard before pairing: classification and role decisions first, pairing last.

Answer: 15 pairs, about 2.5 hours; shortlist ruthlessly because pair-testing grows with the square of the list.

Example 2. Playfair Display (x-height ratio about 0.51) will be your headline face; EB Garamond (about 0.40) your text face. Body text is 12 pt. A small-caps line in Playfair must sit inside the text block looking the same apparent size as the Garamond around it. What size Playfair?

Show solution

1. Match apparent sizes with $S_B = S_A \times \dfrac{x_A}{x_B} = 12 \times \dfrac{0.40}{0.51}$.
2. $0.40 \div 0.51 = 0.78$, so $S_B \approx 9.4$ pt.
3. Set the Playfair line at about 9.5 pt and check by eye; the arithmetic gets you to the neighborhood, the eye makes the final call.

Answer: About 9.5 pt; the large-x-height face must be set smaller to match the small-x-height face.

Example 3. A client's one-page menu needs: restaurant name, 4 section headings, 16 dish names with prices, 16 descriptions. Using one family (Inter: weights 300–900 plus italics), assign a complete hierarchy with no second typeface.

Show solution

1. Name: Inter Black (900) large, possibly letterspaced caps.
2. Section headings: Inter Bold (700), one scale step up from dish names, letterspaced small caps or caps.
3. Dish names: Inter SemiBold (600) at text size; prices in Regular (400) tabular figures so they align.
4. Descriptions: Inter Regular (400) or Light (300) italic, same size as dish names or one step down.
5. Four levels, one family: contrast comes from weight and size, so nothing can clash.

Answer: 900 / 700 / 600 / 400-italic with two or three sizes: a full hierarchy from a single family.

PRACTICE

1. Easy State the contrast principle of pairing in one sentence.

   Show answer

   Pair typefaces that are clearly different in classification and role, or do not pair at all; near-twins clash.

2. Easy Which pairing is safer and why: Helvetica with Arial, or Playfair Display with Source Sans?

   Show answer

   Playfair with Source Sans: a Didone display with a clean sans crosses classifications. Helvetica and Arial are two grotesques so alike they look like a mistake.

3. **Easy** What does the SIL Open Font License let you do with a Google Font in client work, and what does it forbid?

Show answer

Use, embed and print it in commercial work for free, including client jobs; you may not sell the font files themselves.

4. **Easy** How many pairs can be made from a shortlist of 4 faces?

Show answer

$\binom{4}{2} = 6$ pairs.

5. **Medium** Your headline face has x-height ratio 0.54; your text face 0.45; text is 11 pt. What headline-face size looks equal to the text if you ever need them side by side in a caption?

Show answer

$11 \times 0.45/0.54 \approx 9.2$ pt.

6. **Medium** Name the three compatibility tests for a candidate pair and what each catches.

Show answer

X-height comparison (catches mismatched apparent sizes), proportion/skeleton comparison (catches width and construction fights, like geometric vs narrow old-style), and the real-words print test read cold (catches mood clashes no rule predicts).

7. **Medium** A wedding invitation uses a script face for the names. What should the second face do, and what classifications are good candidates?

Show answer

The second face should be quiet and highly readable for the details (date, place, RSVP): a small-size old-style or transitional serif, or a restrained humanist sans, set in caps or small caps. The script performs; the partner informs.

8. Medium Why might a designer choose one superfamily (such as IBM Plex or Source) instead of a pairing for a software company's brand?

Show answer

The serif, sans and mono are drawn on shared skeletons, so they pair perfectly at any size, cover code samples (mono) as well as marketing (serif/sans), and the brand stays coherent with zero compatibility risk.

9. Hard You are the designer. The client loves two fonts they found: both are geometric sans serifs. Write the two or three sentences you would actually say to them, offering a fix without scolding.

Show answer

Something like: 'These two are so similar that side by side they'll read as a small mistake rather than a choice. Let's keep your favorite of the two for all the headings, and give it a partner with real contrast, a warm serif for the text, so each has a clear job. I'll mock up both options so you can see the difference.'

10. Hard Build a hierarchy for a church bulletin using only EB Garamond (Regular, Italic, Bold, SemiBold): title, section heads, body, scripture quotations, page footer. Assign a style to each level.

Show answer

Title: Bold, large, possibly caps. Section heads: SemiBold, one scale step above body, small caps work well. Body: Regular 10.5–11.5 pt. Scripture quotations: Italic, same size as body, indented. Footer: Regular at a small size, letterspaced caps. One family, five clear levels.

11. Hard Your shortlist of 8 must be cut before pairing. Invent three elimination rules a professional would apply before any pair is lettered, and apply the idea: how many pairs remain if the rules cut the list to 4?

Show answer

Example rules: eliminate faces missing a true italic or sufficient weights; eliminate faces whose classification duplicates a stronger candidate; eliminate display-only faces if the job is text-heavy (or vice versa). Cutting 8 to 4 drops the pairs to test from $\binom{8}{2} = 28$ to $\binom{4}{2} = 6$.

COMMON MISTAKES

- Pairing two faces from the same classification. Two grotesques or two old-styles side by side read as an error, not a design.
- Testing with 'The quick brown fox' or lorem ipsum. Only the job's real words reveal how the face handles its actual letters, digits and lengths.
- Collecting fonts instead of deciding: a page with four or five faces has no voice at all. Two faces with firm roles, or one family used well, beats any collection.

Make it a game · Pair or Beware. Make ten cards, each naming two Google Fonts you have actually looked at (write the classification under each name). Draw a card, and within 15 seconds rule 'pair' or 'beware' and give the reason out loud using this lesson's vocabulary ('two grotesques: beware'; 'Didone display over humanist text: pair'). A parent checks reasons against your notes. Eight of ten with correct reasons is a win; make three new cards from real sites or packages for tomorrow.

Scripture. “A word fitly spoken is like apples of gold in pictures of silver.” (Proverbs 25:11, KJV)

The proverb praises not just the right word but the right setting for it: gold shown against silver. Pairing type is exactly this craft of fit settings, the quiet face making the speaking face shine.

3.4 Setting Text Well: Size, Leading, Measure and the Type Scale

OBJECTIVES

- Convert among points, pixels and ems (1 pt = 1/72 in; 1 px = 3/4 pt at the 96-per-inch standard; ems are relative to the current size).
- Build a modular type scale from a base size and ratio with $s_n = b \cdot r^n$, and use it to size a document's hierarchy.
- Set leading at 120–145% of type size and measure at 45–75 characters per line, and check both on a real page.

> **Warm-up.** Open any well-made book and count the characters (letters, spaces, punctuation) in three full lines; average them. Then count lines in 10 cm of column and work out the baseline-to-baseline distance. Write both numbers down: you have just measured a professional's measure and leading, and by the end of the lesson you will know whether the book keeps the rules.

WATCH

Typography Tutorial - 10 rules to help you rule type

The Futur · 3:34

https://www.youtube.com/watch?v=QrNi9FmdlxY

> **WHEN TO WATCH**
> After the craft paragraphs. It is rapid-fire; pause after each rule and restate it in your own words before moving on.

Note: Ten compact rules from a design educator, several of which (alignment, grouping, spacing) are this lesson in miniature. You will disagree with none of them after doing the worked examples.

BACKUP VIDEO

Beginning Graphic Design: Typography

LearnFree · 6:24

https://www.youtube.com/watch?v=sByzHoiYFX0

Before the core ideas if the vocabulary still feels new: a gentle tour of size, leading, tracking and hierarchy.

KEY TERMS

point (pt)

The printer's unit of type size: exactly 1/72 inch since digital type (1984), about 0.3528 mm.

pixel (px)

The CSS unit for screens, defined at 96 per inch, so 1 px $=$ 0.75 pt and 16 px = 12 pt.

em (relative)

A unit equal to the current type size: at 14 px text, 1 em is 14 px and 1.5 em is 21 px; used so layouts scale when the base size changes.

leading (line height)

The baseline-to-baseline distance, named for the strips of lead compositors slid between lines; healthy body text runs about 120–145% of the type size.

measure

The length of a line of text, best counted in characters per line (CPL); comfortable book text runs 45–75 CPL, with about 66 a classic ideal.

modular scale

A set of sizes generated from a base and a constant ratio, $s_n = b\,r^n$, so every size in a document is musically related to every other.

widow and orphan

A paragraph's last line stranded at the top of a column (widow) or its first line stranded at the bottom (orphan); both are fixed by editing or spacing, not ignored.

CORE IDEAS

The story. For three hundred years after Gutenberg, every foundry's type sizes were its own secret recipe with guild names: brevier, long primer, pica. A Paris punchcutter, Pierre-Simon Fournier, proposed a numbered point system in 1737, and his rival François-Ambroise Didot tied a slightly larger point to the royal foot in the 1770s, which is why Europe's Didot point (0.376 mm) differed from everyone else's. America standardized only after a catastrophe: the great Chicago fire of 1871 destroyed the Marder, Luse foundry, and when it rebuilt to a precise pica, the industry followed; in 1886 the United States Type Founders' Association adopted the American point of about 0.3514 mm, 72.27 to the inch. The odd remainder annoyed

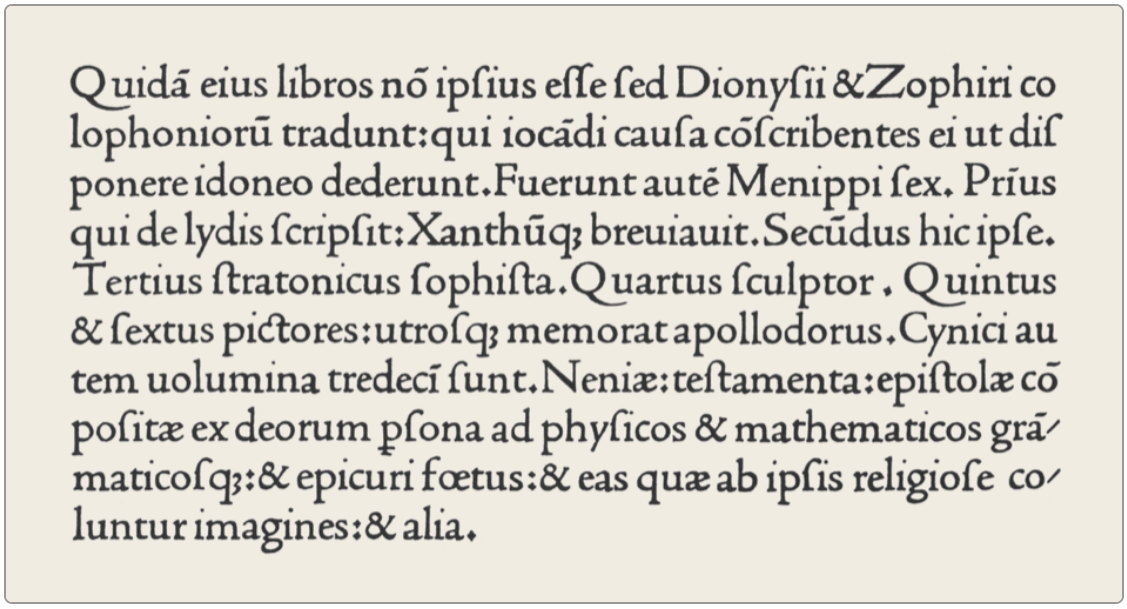
engineers for a century until 1984, when Adobe's John Warnock and Charles Geschke, writing the PostScript language that would drive laser printers, simply declared the point to be exactly 1/72 inch. Desktop publishing inherited that point, and the web added one more layer in CSS: a reference pixel at 96 to the inch. Hence the conversions every designer knows cold: 1 px $= 0.75$ pt, 16 px = 12 pt, and one em equals whatever size you are currently set in.

How they figured it out. The rules for comfortable text came from printers' accumulated judgment, later confirmed by reading research, and they are stated crisply in the book every young designer eventually buys, Robert Bringhurst's *The Elements of Typographic Style* (1992). Size: printed body text lives around 9–12 pt; screens, read farther from the eye, default to 16 px for good reason. Leading: lines need air so the eye can find the next line's start; 120–145% of the size is the working band (Bringhurst's classic example is 10 pt type on 12 pt leading, written 10/12), with more leading for long measures, large x-heights or sans serifs, less for short lines and headings, and headlines often at 100–110% because their lines are few and tight. Measure: 45–75 characters per line, around 66 for book comfort; shorter and the eye shuttles exhaustingly, longer and it loses the way back (doubling, reading the same line twice). The quick estimate: an average character is about half the type size wide, so $\mathrm{CPL} \approx \dfrac{\text{line length}}{0.5 \times \text{size}}$. A 4.5-inch line (324 pt) of 11 pt type carries about $324/(0.5 \times 11) \approx 59$ characters: right in the pocket.

The craft. A document's sizes should be a family, not a crowd, and the tool is the modular scale: choose a base b (your body size) and a ratio r, and take sizes from $s_n = b\,r^n$. The ratios have musical names because the idea is borrowed from harmony: 1.2 (minor third), 1.25 (major third), 1.333 (perfect fourth), 1.5 (perfect fifth), 1.618 (the golden ratio). From a 16 px base at $r = 1.25$: 16, 20, 25, 31.25, 39.06, rounded in practice to 16 / 20 / 25 / 31 / 39 for body, subhead, heading, title and display. A gentle ratio (1.2) suits dense documents with many levels; a dramatic one (1.5 or 1.618) suits posters with few levels. Then set the supporting rules: one alignment per document (flush left, ragged right is the default; justify only when the measure is generous and hyphenation is on, or rivers of white will crawl down the column); real italics, never slanted type; one space after a period; quotation marks that curl. Finally police the page: no widows or orphans, no rivers, consistent paragraph signals (first-line indent *or* space between paragraphs, never both).

In the studio. Professionals bake these numbers into styles, not into individual acts of formatting. In Scribus or any layout program you define paragraph styles (Body: 10.5/14 × 27 pica measure; Heading 2: 20/24; Caption: 8.5/11) once, and every paragraph obeys; change the style and the document reflows everywhere. On the web the same thinking becomes CSS custom properties: a base of 1 rem = 16 px, line-height 1.4, a scale of 1.25 stored as variables. When an art director reviews your layout, the first checks are exactly this lesson's numbers: What is your scale? Why is this line 92 characters long? Why is the leading tighter on page 4? Having answers in numbers, not vibes, is what separates a designer from a decorator. It is also the fastest path to consistency across a 24-page booklet, which you will meet in Unit 5.

PICTURE STUDY


Quidā eius libros nō ipſius eſſe ſed Dionyſii &Zophiri co
lophoniorū tradunt:qui iocādi cauſa cōſcribentes ei ut diſ
ponere idoneo dederunt.Fuerunt autē Menippi ſex. Prīus
qui de lydis ſcripſit:Xanthūq; breuiauit.Secūdus hic ipſe.
Tertius ſtratonicus ſophiſta.Quartus ſculptor . Quintus
& ſextus pictores:utroſq; memorat apollodorus.Cynici au
tem uolumina tredecī ſunt.Neniæ:teſtamenta:epiſtolæ cō
poſitæ ex deorum ꝑſona ad phyſicos & mathematicos grā-
maticoſq;:& epicuri fœtus:& eas quæ ab ipſis religioſe co-
luntur imagines:& alia.

Jenson's Roman Type: a Page from Venice, 1475, Nicolas Jenson (type and printing), 1475 · Letterpress; a specimen of Jenson's roman from an edition of Diogenes Laertius · Printed in Venice
Image: Wikimedia Commons, public domain

This is the letter that taught Europe to read roman type: Nicolas Jenson's, printed in Venice in 1475, five years after he introduced it in the 1470 Eusebius. Designers have returned to it for five hundred years (William Morris's Golden Type, 1890; Bruce Rogers's Centaur, 1914; Adobe Jenson, 1996) because the page simply works.

Study it with this lesson's tools: do not admire it, measure it. The comfort you feel reading a block of text this old is made of numbers Jenson chose.

Look closely

- Estimate the characters per line: count three lines and average. Does Jenson sit inside the 45–75 band?
- Look at the channel of white between lines. Estimate the leading as a percentage: closer to 120% or 145%?
- The right edge: justified or ragged? Can you find any rivers? What does that say about the compositor's word spacing?
- Squint: how even is the typographic color? Find the one or two spots where the tone clumps or lightens.

- Compare the letter shapes with a modern book: what has changed in 550 years, and what has Jenson already settled?

Talk about it

1. Jenson had no reading research, only a goldsmith's eye and scribal tradition. Why do his numbers land inside our modern comfort bands anyway?
2. If the comfort of text is mostly invisible craft, how do you show a client (or a portfolio reviewer) that you did it well?
3. Which would you rather inherit: Jenson's letterforms or Jenson's page proportions? What is the difference in what each gives you?

Safety first. Typesetting means long screen sessions. Follow the 20-20-20 rule: every 20 minutes, look at something 20 feet away for 20 seconds. Keep the top of the screen at eye height and your forearms level, and stand and stretch between sessions. Eyes, neck and wrists are a designer's tools; protect them like a tradesman protects his hands.

STUDIO BRIEF

Studio brief: A Broadsheet Poem, Properly Set

Client: a small press is producing letter-size keepsake broadsheets of public-domain poems and psalms for framing, and wants one from you, set to professional text standards with a documented spec. Deliverable: the finished broadsheet (print or careful paste-up), plus a spec card listing base size, scale ratio, every size used, leadings and measure with CPL. The press owner will check your numbers.

You will need

- A public-domain text you love: a psalm (KJV), a sonnet, or a hymn text; about 12–24 lines
- Scribus or Inkscape (free) and a chosen Google Fonts text family with true italics; or, for a hand version, pencil, ruler and pen with ruled guidelines
- Ruler and calculator for the spec card

Steps

1. Choose the text and mark its structure: title, body lines or stanzas, attribution line.
2. Choose one family (this is a one-family job; Lesson 3.3's null option) with regular, italic and a strong weight.
3. Set the spec by arithmetic before touching software: base size for the poem lines, scale ratio, title and attribution sizes from the scale, leading in the 120–145% band (poetry tolerates up to 150%), and a measure: for poetry, the longest line sets the measure, so find the longest line and size so it fits with comfortable margins.
4. Build paragraph styles from the spec (or rule pencil guidelines at the computed leading for a hand-lettered version). Do not freelance sizes as you go; change the spec if the spec is wrong.
5. Set the text. Police it: curly quotation marks, true italics for the attribution, small caps if your family has them for the title, no stranded single words where a line break can be improved.

6. Print at full size and pin it at reading distance overnight. Read it cold in the morning and note three faults.
7. Fix the faults by adjusting the spec (not one-off tweaks), re-print, and complete the spec card: base, ratio, sizes, leadings, measure and CPL, family and weights used.
8. Deliver both to your 'press owner' (parent) and walk them through the spec card in two minutes.

Tips

- Center-set poetry is harder than it looks; flush left with a generous left margin is the professional default for verse.
- If the longest line forces tiny type, turn the sheet to landscape: changing the page beats breaking the poem.
- The overnight cold read is the single most professional habit in this unit; schedule for it.

Check your work

- ☐ The spec card's arithmetic is correct and every number on the sheet comes from it.
- ☐ CPL and leading are inside (or deliberately and defensibly outside) the bands.
- ☐ Quotes, italics and line breaks pass the policing list.
- ☐ The final was corrected after a genuine cold read.

SKETCHBOOK

1. Your conversion crib sheet, hand-lettered for your studio wall: pt/px/em, the scale formula, the leading band, the CPL band and estimate formula.
2. The warm-up book's numbers worked out in full, with a verdict.
3. Two thumbnails of the broadsheet (one portrait, one landscape) with measure and margins ruled, and a note on which you chose and why.

KEY FORMULAS

$1\text{ pt} = \frac{1}{72}\text{ in} = 0.3528\text{ mm}, \qquad 1\text{ px} = \frac{3}{4}\text{ pt}$

$\text{em} = \text{current size}; \quad x\text{ em at } s = x \cdot s$

$s_n = b \cdot r^n$ (modular scale)

$\text{leading} = (1.20 \text{ to } 1.45) \times \text{size}$

$\text{CPL} \approx \dfrac{\text{line length}}{0.5 \times \text{size}}$

From history. Leading is named for real lead: strips of type metal, cast in point thicknesses, that compositors slipped between lines of type to open the page. 'Set solid' meant no strips at all. The strips survive in software as the line-height box, and in the shorthand professionals still speak: 10 on 12, written 10/12, four hundred years of shop language in two numbers.

WORKED EXAMPLES

Example 1. A web page's body text is 16 px. Convert to points. Its headings are 2 em and its line height is 1.4. Give the heading size in px and the body leading in px and pt.

Show solution

1. Points: $16 \times 0.75 = 12$ pt, the classic book body size: the 16 px default is not arbitrary.
2. Heading: $2\text{ em} = 2 \times 16 = 32$ px.
3. Leading: $1.4 \times 16 = 22.4$ px, and in points $22.4 \times 0.75 = 16.8$ pt.

Answer: 12 pt body; 32 px headings; leading 22.4 px = 16.8 pt (set 16/22.4, i.e. 140%).

Example 2. Build a five-step modular scale from a 12 pt base with ratio 1.25, rounding sensibly, and assign the steps to caption, body, subhead, heading, title. (Captions sit one step below the base.)

Show solution

1. Down one step: $12 \div 1.25 = 9.6 \approx 9.5$ pt (caption).
2. Up the scale: $12 \times 1.25 = 15$; $15 \times 1.25 = 18.75 \approx 19$; $18.75 \times 1.25 = 23.4 \approx 23$.
3. Assign: caption 9.5, body 12, subhead 15, heading 19, title 23. Every jump is the same proportional step, so the page sounds like one chord.

Answer: 9.5 / 12 / 15 / 19 / 23 pt.

Example 3. A flyer column is 21 picas wide (1 pica = 12 pt). The text is 11 pt. Estimate CPL. Is the measure comfortable, and what leading would you set?

Show solution

1. Line length: $21 \times 12 = 252$ pt.
2. CPL: $252 \div (0.5 \times 11) = 252 \div 5.5 \approx 46$.
3. 46 CPL is at the short end of the 45–75 band: acceptable for a flyer, and short lines want modest leading: about $1.25 \times 11 \approx 13.75 \to 11/14$.

Answer: About 46 CPL, acceptable; set roughly 11/14.

Example 4. A client's newsletter column gives 95 characters per line at 10 pt. List the two professional fixes and compute one of them: what type size brings the measure to about 70 CPL in the same column?

Show solution

1. Fixes: narrow the column (or split to two columns), or enlarge the type; never just ask readers to cope.
2. The column width is fixed: $\text{width} = 95 \times 0.5 \times 10 = 475$ pt.
3. Solve for size at 70 CPL: $70 = \dfrac{475}{0.5\,s} \Rightarrow s = \dfrac{475}{35} \approx 13.6$ pt.
4. 13.6 pt body is large for a newsletter, which tells you the honest fix is the column, not the size: split it in two.

Answer: About 13.5–14 pt would be needed, which is oversized; the better fix is two columns. The arithmetic is how you prove it to the client.

PRACTICE

1. Easy Convert: 18 pt to px; 24 px to pt; 0.5 in to pt.

   Show answer

   $18 \div 0.75 = 24$ px; $24 \times 0.75 = 18$ pt; $0.5 \times 72 = 36$ pt.

2. Easy At 14 px text, how big is 1.5 em? At 11 pt text, how big is 0.75 em?

   Show answer

   $1.5 \times 14 = 21$ px; $0.75 \times 11 = 8.25$ pt.

3. Easy What does 10/12 mean, and what leading percentage is it?

   Show answer

   10 pt type on 12 pt leading (baseline to baseline); $12/10 = 120\%$.

4. Easy Give the comfortable band for characters per line and the classic ideal.

   Show answer

   45–75 CPL; about 66 is the classic book ideal.

5. Medium Build a scale: base 16 px, ratio 1.2, two steps up and one step down, rounded to halves.

   Show answer

   Down: $16/1.2 \approx 13.5$. Up: 19 (19.2) and 23 (23.04). Scale: 13.5 / 16 / 19 / 23 px.

6. **Medium** Your body is 11 pt on a 30-pica measure. Estimate CPL and prescribe a leading.

   Show answer

   Line $= 360$ pt; CPL $\approx 360/5.5 \approx 65$: ideal. A fairly long measure wants generous leading: about $1.35 \times 11 \approx 15 \rightarrow 11/15$.

7. **Medium** Why does a sans serif with a big x-height usually need more leading than an old-style serif at the same size?

   Show answer

   Its lowercase bodies fill more of the em, so the visual gap between lines is smaller; extra leading restores the white channel the eye uses to track lines.

8. **Medium** A 3-step golden-ratio scale (r = 1.618) from a 14 px base gives what sizes? When would so dramatic a scale be right?

   Show answer

   $14,\ 22.7 \approx 23,\ 36.7 \approx 37$ px. Right for a poster or landing page with few levels and a need for drama; wrong for a dense manual.

9. **Hard** A justified church bulletin column shows rivers of white space. Diagnose with this lesson's numbers (the column is 13 picas, type 11 pt) and give two fixes.

   Show answer

   CPL $\approx 156/5.5 \approx 28$: far too short a measure to justify, so word spaces stretch and rivers form. Fixes: set flush left ragged right, or drop to about 9 pt (CPL ≈ 35, still short) and better, widen the column or reduce to one column; justification needs a generous measure plus hyphenation.

10. **Hard** Your book page is 10.5/14. The baseline-to-baseline distance in mm? How many lines fit in a 190 mm text block height?

    Show answer

    Leading $14 \times 0.3528 \approx 4.94$ mm; lines $\approx 190/4.94 \approx 38$ (38 full lines, since the first line's ascent also needs room: 38 is the safe count).

11. Hard Write the complete type spec, in professional shorthand, for a one-page handout: body, two heading levels and captions, from a 12 pt base at ratio 1.25, with leadings. Justify each leading in a few words.

Show answer

Example: Body 12/16.5 (137%, generous for a 70 CPL measure); H2 15/18 (120%, short lines); H1 19/21 (110%, single lines); Caption 9.5/13 (137%, small type wants air). Any consistent spec in the 120–145% band with scale sizes 9.5/12/15/19 earns full credit.

12. Hard Check the book you measured in the warm-up against this lesson: CPL in band? Leading percentage in band? Write a two-sentence verdict as if reviewing a colleague's work.

Show answer

Answers vary. Full credit for correct CPL and leading arithmetic from the measured numbers and a verdict that cites the 45–75 CPL and 120–145% bands.

COMMON MISTAKES

- Setting solid (100% leading) because it fits more text. Body text needs 120–145%; cramped leading is the most common amateur tell on a page.
- Choosing sizes by nudging until it looks right. Without a scale, a document drifts into five nearly-equal sizes that read as sloppiness; pick a ratio and obey it.
- Justifying a narrow column. Justification without a generous measure and hyphenation makes rivers; flush left is not a compromise, it is the default of fine typography.
- Measuring line length in inches and forgetting the type size. Measure is only meaningful as characters per line.

> **Make it a game · Spec Sprint.** A parent names a base size and ratio from this set: (10 pt, 1.2), (12 pt, 1.25), (16 px, 1.333), (14 px, 1.5). You have 90 seconds with a calculator to produce a four-size scale, a leading for the base in the 120–145% band, and the px or pt conversion of the base. Three rounds; a perfect round is 3 points, an arithmetic slip costs 1. Beat yesterday's total, then trade places and check the parent's math.

> **Scripture.** “For precept must be upon precept, precept upon precept; line upon line, line upon line; here a little, and there a little:” (Isaiah 28:10, KJV)
>
> Isaiah's picture of patient teaching is literally line upon line, a little at a time. Good typesetting works the same way: comfort is built from many small, correct distances, each one almost nothing by itself.

3.5 Display Type and Hand Lettering

OBJECTIVES

- Distinguish lettering (letters drawn once, for one use) from type (a reusable system) and from calligraphy (letters written in strokes), and say what each is for.
- Draw a word of display lettering by the professional sequence: skeleton, weight, details, spacing by eye.
- Size display type for distance with the legibility rule of thumb (about 1 inch of capital height per 10 feet of viewing distance) and explain where custom lettering earns money in today's market.

> **Warm-up.** Write your first name three ways: fast ordinary handwriting; carefully in plain capitals; then drawn, outlining each letter's shape and filling it in. Time each. The third one took far longer, and that difference is this whole lesson: writing is performed, lettering is built.

WATCH

Calligraphy vs Hand Lettering vs Fonts – What's the difference?

The Happy Ever Crafter · 6:09

https://www.youtube.com/watch?v=a-72X53ZGZI

> **WHEN TO WATCH**
> After the first craft paragraph, to nail the vocabulary. Pause and name one example of each from around your house.

Note: A working lettering artist sorts out the three terms beginners mix up. The distinction matters commercially: clients hire the three skills for different jobs at different prices.

BACKUP VIDEO

5 AMAZING Tips For Hand Lettering

Will Paterson · 4:41

https://www.youtube.com/watch?v=lrgPmaHyV-8

Before you start the studio brief: practical habits (guidelines, skeletons, spacing by eye) from a designer who letters logos for a living.

KEY TERMS

lettering

Letters drawn as a one-time piece of artwork for a specific word and use, like a logo or book cover; not reusable as a font.

calligraphy

Letters written in live strokes with a broad or pointed pen or brush; the shape comes from the tool held at an angle.

display type

Type designed for large sizes and short texts: posters, headlines, packaging; often higher contrast, tighter spacing and stronger personality than text faces.

skeleton

The single-line structure of a letter before any weight is added; lettering lives or dies by its skeleton.

optical spacing

Spacing letters so the areas between them look equal rather than measuring equal distances; straight-sided pairs need more room than round or open pairs.

logotype (wordmark)

A name set or drawn as a fixed piece of lettering that serves as a company's mark, such as the Coca-Cola script.

Spencerian script

The dominant American handwriting style of the 1800s, taught by Platt Rogers Spencer; the Coca-Cola wordmark is Spencerian.

CORE IDEAS

The story. On the night of January 1, 1895, Paris got new street posters for Sarah Bernhardt's play *Gismonda,* and by morning the artist was famous. Alphonse Mucha, a Czech illustrator who took the rush job over the Christmas holidays in 1894 because no one else was in the studio, had done something radical: a poster two meters tall, in quiet golds and olives instead of circus colors, with the title lettering drawn by hand as part of the artwork, arching over the actress like mosaic in a church. Bernhardt signed him to a six-year contract; collectors bribed the bill-stickers and cut posters off the walls. The same decade saw lettering conquer

commerce in America: in 1886 the bookkeeper Frank Mason Robinson wrote out 'Coca-Cola' in the Spencerian script every clerk then learned, and that drawn signature, polished but never replaced, remains possibly the most valuable piece of lettering on earth. The lesson of both: when the word itself is drawn for the message, the word becomes the picture, and nobody else can own it.

How they figured it out. Big letters have their own technology. Posters and broadsides needed letters far larger than metal type could be cast (large metal bodies cool unevenly and are brutally heavy), so in 1827 a New York printer, Darius Wells, invented a lateral router to cut letters from end-grain maple, and in 1834 William Leavenworth added the pantograph, letting one master pattern cut any size. Wood type made the circus poster, the wanted poster and the political broadside possible, and its bold slabs, fat faces and tall condensed gothics are still the voice of display: when a modern designer reaches for a chunky slab for a headline, they are quoting the 1830s. The sorting principle the Victorians discovered by trade is still ours: text faces are engineered for immersion (invisible, even, comfortable at 10 pt), display faces for impact (personality, contrast, tight fit at 60 pt and up), and the skills are different enough that type designers usually specialize in one or the other.

The craft. Professional lettering is built in strict order, and the order is the secret. First the *skeleton*: draw the word's single-line structure lightly, between ruled guidelines (baseline, x-height, cap height), until the letterforms and their rhythm are right; fix every awkward joint now, because no amount of polish saves a bad skeleton. Second, *weight*: thicken the skeleton into strokes, deciding where thick and thin go; if you imitate a broad pen (thick on the downstrokes, thin on the way up), the result will look naturally constructed, because five centuries of letters descend from that pen. Third, *details*: serifs, terminals, swashes, an ink trap or a flourish, always fewer than you want. Fourth, *spacing by eye*: look at the volumes of white between letters and make the volumes feel equal: straight-straight pairs (HI) need the most distance, round-round (OO) less, and open combinations (LA, Ty) may need to tuck together or even touch. The old shop test still works: look at the word upside down, or squint, and the uneven gaps jump out. For sizing display work, carry the sign-painter's rule: about 1 inch of capital height per 10 feet of comfortable reading distance, so a poster read across a 40-foot foyer wants capitals about 4 inches tall, and a title read at arm's length (about 2 feet) is comfortable well under an inch.

In the studio. Custom lettering is one of the healthiest freelance markets in design, precisely because a font anyone can license cannot be exclusive. Where it sells: logotypes and wordmarks (a bakery, a band, a podcast); book covers and movie titles; packaging (hot sauce, coffee, preserves live on lettering); murals, chalkboards and window glass for shops; wedding and event work. The professional pipeline runs: thumbnails (ten tiny versions), pencil skeleton at working size, refined pencil with weight, ink or scan into Inkscape and redraw the outlines as clean vector curves, then present two or three directions to the client, never twenty. A lettering artist's sketchbook is the portfolio: art directors hiring for covers and packaging ask to see process pages (skeletons, corrections, spacing studies) because process proves the finals were not luck. Start that sketchbook habit this week; by Unit 8 you will letter real logotypes, and by Unit 10 the process pages go in your portfolio.

PICTURE STUDY



Gismonda (Poster for Sarah Bernhardt), Alphonse Mucha, 1894 (posted January 1, 1895); this printing from Les Maîtres de l'Affiche · Color lithograph · Paris; Théâtre de la Renaissance

Image: Wikimedia Commons, public domain

This is the poster that made Alphonse Mucha famous overnight: a rush Christmas-break job in December 1894, posted across Paris on New Year's Day 1895. Collectors bribed bill-stickers to steal it off the walls, and Sarah Bernhardt signed Mucha to a six-year contract.

Look at it as a lettering lesson: the title is not type placed on a picture; it is drawn letterforms designed as part of the picture, sharing its arcs, colors and mosaic texture.

Look closely

- Study the GISMONDA letters: find three ways they match the artwork (color, texture, the arch's curve, stroke weight).
- The poster is over two meters tall but mostly quiet golds and olives. How does it win attention on a loud street without loud color?
- Trace the eye's path: title, face, palm branch, the name at the bottom. What geometry steers you?
- Where would metal type have been cheaper and faster? What would the poster lose?

- Measure the hierarchy: how many distinct text sizes are there, and how does each relate to viewing distance?

Talk about it

1. Mucha took a rush job nobody wanted and did it at full strength. What does that say about how reputations actually start?
2. Drawn-in-the-art lettering cannot be reused for next season's play. When is that cost worth it, and what is the modern equivalent of that decision?
3. The poster treats an actress with dignity, robed like a Byzantine empress. How does respect for the subject change design choices? Compare with posters you see today.

STUDIO BRIEF

Studio brief: A Lettered Window Card for the Bakery

Client: Miller & Daughters Bakery again (Lesson 3.3). They loved your type recommendation; now they want a hand-lettered window card, 11 × 14 in, that says 'FRESH BREAD DAILY' with 'Miller & Daughters' small beneath. It must be readable from across the street (about 40 feet) and feel warm and handmade, not rustic-sloppy. Deliverable: the finished card plus your process sheet (thumbnails, skeleton, spacing pass) stapled behind it.

You will need

- Bristol or cardstock 11 × 14 in (or the largest you have), layout paper or printer paper for process work
- Pencils (HB and 2H), eraser, ruler, T-square or straightedge; black brush pen, chisel marker or paint marker
- Optional: scan and finish in Inkscape as a second deliverable

Steps

1. Arithmetic first: 40 feet of viewing distance means capitals of about 4 in for the main line. Check fit: will 'FRESH BREAD DAILY' fit an 11 × 14 card at 4 in caps on one line? (It will not.) Decide the professional compromise: stack the three words, or set 'FRESH BREAD' as the hero and 'DAILY' smaller, and note the decision on the process sheet.
2. Thumbnails: ten tiny layouts in ten minutes. Pick two.
3. Rule guidelines at final size for the chosen layout: baseline, cap height for each line, a vertical center line.
4. Skeleton pass in light pencil. Judge it upside down and at 10 feet. Fix joints, widths and rhythm now.
5. Weight pass: thicken with broad-pen logic (thick downstrokes). Keep counters open; this card must read at distance.
6. Spacing pass: equalize the volumes between letters; mark and fix the three worst gaps. Squint test, upside-down test, 10-foot test.

7. Details: modest serifs or a small flourish on the ampersand at most. Letter 'Miller & Daughters' small and plain beneath.
8. Ink, erase, and test for real: tape it in a window and walk 40 feet (across the yard or street). If any word hesitates, fix the spacing or weight and re-test.
9. Assemble the process sheet behind the card: thumbnails, skeleton, one correction note, the distance-test result.

Tips

- Letter the skeleton of the whole line before perfecting any single letter; rhythm first, portraits second.
- Open counters survive distance; tight ones close up. When in doubt, open the aperture.
- The 40-foot walk is the client's test whether you do it or not; do it first.

Check your work

- ☐ Main line capitals are sized by the distance rule and the card really reads at 40 feet.
- ☐ Process sheet shows skeleton, weight and spacing as separate passes.
- ☐ The warm-but-crafted voice survived inking (no sloppy wobble, no sterile tracing).
- ☐ The small line is quiet and correctly subordinate.

SKETCHBOOK

1. One word ('Bread' is fine) taken through all four stages on one page: skeleton, weight, details, spacing marks; label the stages.
2. Spacing studies: LIMIT, DOOR and your own name, with the white volumes shaded in a second pass so you can see what you equalized.
3. A collection page: sketch three pieces of lettering from packages or shop windows you admire, each with one note on its skeleton or spacing.

KEY FORMULAS

$$\text{capital height (in)} \approx \frac{\text{viewing distance (ft)}}{10}$$

$$\text{scale factor} = \frac{\text{final size}}{\text{sketch size}}$$

From history. The poster era Mucha crowned was already roaring in America: Edward Penfield's monthly Harper's posters (from 1893) and Will Bradley's work for The Chap-Book made the 1890s 'poster craze,' with collectors' clubs and exhibitions on both continents. Lithography made it possible: drawing on stone freed artists from type and let lettering, figure and ornament become one artwork, exactly the freedom digital tools returned to designers a century later.

WORKED EXAMPLES

Example 1. A church's fall festival banner will be read from across a parking lot, about 80 feet. How tall must the main word's capitals be? If the banner word has 12 characters and letters average 0.7 of their height in width (plus 0.15 height per letter space), roughly how long is the banner word?

Show solution

1. Height: $80 \div 10 = 8$ inches minimum; 10–12 in is safer for moving viewers.
2. Average advance per letter: $(0.7 + 0.15) \times 8 = 6.8$ in.
3. Word length: $12 \times 6.8 \approx 82$ in, about 6.8 feet: so the banner needs to be roughly 8 feet long with margins.

Answer: Capitals at least 8 in (10–12 in better); the word runs about 7 feet, so order an 8-foot banner.

Example 2. You letter a logotype in pencil with capitals 3 cm tall. The client needs it on a shop sign with capitals 45 cm tall and on a business card at 0.6 cm. What are the scale factors, and what detail problem does each extreme create?

Show solution

1. Sign: $45 \div 3 = 15\times$. Every wobble in your curves is magnified 15 times, so the vector redraw must be flawless.
2. Card: $0.6 \div 3 = 0.2\times$. Fine details (thin strokes, tight counters) will clog or vanish at one-fifth size.
3. This is why professional lettering is tested at both extremes before delivery, and why logotypes avoid hairlines and tiny openings.

Answer: 15× up and 0.2× down; big reveals wobbles, small swallows details: design for both.

Example 3. A poster title must be readable at 15 feet, and the poster is 18 in wide with 2 in total side margins. The title has 9 characters averaging 0.75 of cap height in width including spacing. Does it fit on one line?

Show solution

1. Required cap height: $15/10 = 1.5$ in.
2. Title length: $9 \times 0.75 \times 1.5 \approx 10.1$ in.
3. Available width: $18 - 2 = 16$ in: it fits with nearly 6 in to spare, so you could even enlarge to about 2 in capitals ($9 \times 0.75 \times 2 = 13.5$ in) for drama.

Answer: Yes: 10.1 in needed of 16 in available; capitals could grow to about 2 in.

PRACTICE

1. Easy Define lettering, calligraphy and type in one sentence each, with an example use of each.

   Show answer

   Lettering: letters drawn once for one piece (a logo, a book cover). Calligraphy: letters written in live strokes (a wedding invitation's names). Type: a reusable system of letters (the body text of a book).

2. Easy What capital height does a sign need at 30 feet? At 120 feet?

   Show answer

   About 3 in and about 12 in, by the 1-inch-per-10-feet rule.

3. Easy Why can't the Coca-Cola company's competitors use a font to get the same effect as its wordmark?

   Show answer

   The wordmark is a drawn, one-of-a-kind piece of Spencerian lettering (Frank Mason Robinson, 1886), owned as a trademark; a font anyone can license can never be exclusive to one brand.

4. Easy Name the four stages of professional lettering in order.

   Show answer

   Skeleton, weight, details, optical spacing (then clean vector redraw for delivery).

5. **Medium** Why did wood type (1827) exist at all, when metal type had been standard for 370 years?

Show answer

Poster-size letters in metal were too heavy and cast badly (large bodies cool unevenly and warp); Wells's router (1827) and Leavenworth's pantograph (1834) cut light, stable, cheap letters from end-grain maple at any size.

6. **Medium** Space the word 'LIMIT' versus the word 'DOOR'. Which needs more total letterspacing and why?

Show answer

'LIMIT' is all straight-sided pairs, which read as closed fences and need generous, equal gaps. 'DOOR' is mostly round pairs whose curves already admit white space between them, so they sit closer. Spacing equalizes the volumes of white, not the distances.

7. **Medium** A client wants their cafe's name lettered 'like a font but warmer.' Translate that into the craft decisions you would make at the skeleton and weight stages.

Show answer

Skeleton: keep conventional, highly legible letterforms (font-like structure) with slight irregularities of rhythm. Weight: broad-pen logic with soft, slightly convex strokes and gentle terminals; perhaps a hand-drawn wobble kept subtle. Warmth comes from humanist construction and softness, not from distortion.

8. **Medium** Your pencil comp has capitals 40 mm tall. The final mural needs 1.2 m capitals. Scale factor? Name two steps a professional adds before painting at that scale.

Show answer

$1200/40 = 30\times$. Redraw as clean vectors (or a tight large cartoon), then grid or project the artwork onto the wall and snap guidelines before painting; test the spacing at distance from across the street.

9. Hard A poster will be seen first at 60 feet and read fully at 10 feet. Design the size hierarchy: what capital heights do the headline and the detail text need, and what ratio is that?

Show answer

Headline for 60 ft: about 6 in capitals. Details for 10 ft: about 1 in. The ratio is 6:1, which is why poster hierarchies are far more dramatic than book hierarchies (compare a 1.25 modular scale's gentle steps).

10. Hard Turn-of-the-century shops paid sign painters by the letter. A painter letters 'MILLER & DAUGHTERS BAKERY' (24 characters including spaces counted as half) at 30 cents per letter in 1900. Estimate the bill, then explain why 'per letter' pricing made sense for that trade.

Show answer

Chargeable letters: about $22 + 2(0.5) = 23$, so about $23 \times 0.30 \approx \$6.90$ (roughly $250 today). Per-letter pricing tracked the real labor (each letter is drawn, outlined and filled individually) and let any shopkeeper predict the cost: clear pricing is good client service, a Unit 10 theme.

11. Hard You are the art director. A student's lettered logotype has beautiful weight and serifs but the word is hard to read. Diagnose in one sentence and prescribe the fix in one sentence, using this lesson's stage names.

Show answer

The skeleton was wrong (structure and rhythm) and was polished instead of fixed. Strip the piece back to a new skeleton until the bare single-line word reads instantly, then re-apply weight and details.

COMMON MISTAKES

- Polishing a bad skeleton. If the single-line word does not read instantly, no weight or serif will save it; go back, not forward.
- Spacing by ruler instead of by eye. Equal distances make unequal-looking gaps; equalize the white volumes.
- Flourishing first. Details are the last five percent, added to letters that already work; swashes on a weak word are frosting on a fallen cake.
- Ignoring viewing distance. A card that is handsome at arm's length and mute from the sidewalk has failed its one job.

Make it a game · Ten-Foot Type Critic. Letter one word in two versions: one spaced by ruler (equal distances) and one spaced by eye (equal volumes). Tape both at 10 feet. A parent or sibling picks which reads better and must say why in their own words; then reveal which was which. Swap roles with a word they letter. Two rounds each; you win a round when the eye-spaced version is chosen and the reason mentions the gaps.

Scripture. “Moreover the LORD said unto me, Take thee a great roll, and write in it with a man's pen concerning Maher-shalal-hash-baz.” (Isaiah 8:1, KJV)

God commissions display writing: a great roll, an ordinary man's pen, and words set down large enough that none could miss them. Hand lettering is this same old assignment — take up the pen you have and make the message impossible to overlook.

UNIT 3

Typography: The Designer's Voice

Nearly everything a graphic designer makes has words in it, and typography is how those words speak. A wedding invitation whispers; a highway sign shouts; a bank statement speaks plainly and gets out of the way. In this unit you will learn where our letters came from, what the parts of a letter are called, how professionals choose and pair typefaces, and the quiet arithmetic that makes a page of text comfortable to read: sizes, scales, leading and line length. You will finish by drawing letters yourself, because every great typographer began as someone who could draw an alphabet.

The stories run five centuries deep: Johannes Gutenberg casting the first metal type in Mainz around 1450 and finishing his great Bible by 1455; Nicolas Jenson cutting the first great roman letter in Venice in 1470; William Caslon publishing the specimen sheet in 1734 that would later dress the Declaration of Independence; Giambattista Bodoni polishing letters to a razor edge in Parma; Stanley Morison launching Times New Roman in London on October 3, 1932; and Max Miedinger and Eduard Hoffmann drawing Helvetica in a Swiss foundry in 1957. Each of these letters is still on your computer, and by the end of the unit you will be able to tell them apart at a glance and explain what job each one does best.

Typography is also where design's math begins in earnest. You will convert points, pixels and ems; build a modular type scale from a ratio; calculate characters per line; and set leading as a percentage of type size. None of it is harder than the arithmetic you already know, and all of it is used daily by working designers. Every exercise can be done with pencil, paper, a ruler and free tools: Google Fonts, Inkscape and Scribus.

PREREQUISITES

- Units 1 and 2 of this course: measuring and drawing what you see, and the principles of composition, hierarchy and critique
- Arithmetic with fractions, decimals, percentages and ratios; powers such as 1.25^3 (a calculator is fine)
- A computer with a web browser for Google Fonts, and Inkscape or Scribus installed (both free); pencil, ruler and paper

MASTERY CHECKLIST

- ☐ I can tell the story of type from Gutenberg (1455) through Jenson (1470), Caslon (1734), Bodoni, Times New Roman (1932) and Helvetica (1957), with the right names and dates.
- ☐ I can label the anatomy of a letter: baseline, x-height, cap height, ascender, descender, serif, stem, bowl, counter and aperture.
- ☐ I can classify a typeface by sight as humanist, old-style, transitional, Didone, slab serif, grotesque sans, geometric sans or humanist sans, and name a classic example of each.
- ☐ I can pair two typefaces using the contrast principle, check their x-heights, and defend the pairing in a sentence a client would understand.
- ☐ I can convert among points, pixels and ems, and build a modular type scale from a base size and a ratio such as 1.25.
- ☐ I can set body text with a sensible size, leading of about 120–145%, and a measure of 45–75 characters per line, and check all three with a ruler and a count.
- ☐ I can explain the difference between lettering and type, and draw a word of display lettering from skeleton to finished weight.

- ☐ I can find, test and download fonts on Google Fonts and explain what its open licenses let a designer do.

FREE RESOURCES FOR THIS UNIT

- **Google Fonts**: More than 1,500 professionally made font families, free for personal and commercial work. Used in Lessons 3.3 and 3.4 to test pairings and download fonts; the Type tester and the filters by classification are the tools to learn. No purchase needed.
- **Typescale (modular scale calculator)**: A free calculator that builds a type scale from a base size and ratio and shows real text at every step. Use it in Lesson 3.4 to check the scales you calculate by hand first.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

3.1 The Story of Letters: Gutenberg, Jenson and Five Centuries of Type
3 sessions of 50 minutes

3.2 The Anatomy of a Letter: Classification from Garamond to Helvetica
3 sessions of 50 minutes

3.3 Choosing and Pairing Typefaces — 3 sessions of 50 minutes

3.4 Setting Text Well: Size, Leading, Measure and the Type Scale
3 sessions of 50 minutes

3.5 Display Type and Hand Lettering — 3 sessions of 50 minutes

Unit 3 test

Time allowed: 50 minutes. A calculator and scratch paper are allowed; a ruler is needed for problem 14. Show your work and units for every calculation. Useful numbers: 1 pt = 1/72 in = 0.3528 mm; 1 px = 0.75 pt; leading band 120–145%; measure

band 45–75 CPL; CPL $\approx$ line length$/(0.5 \times$ size); capital height $\approx$ 1 in per 10 ft of viewing distance. The test is worth 100 points.

1. **8 pts**

   Put in order with dates (within 10 years counts): Helvetica, Jenson's roman, Times New Roman, Gutenberg's Bible, Caslon's specimen sheet, Aldus's first italic.

2. **6 pts**

   Name the three tools of type founding in order and what each produces.

3. **6 pts**

   Sketch a lowercase g at least 5 cm tall and label six parts: baseline, x-height, descender, bowl, counter, ear or link.

4. **8 pts**

   Classify each with one anatomy clue: (a) hairline serifs, vertical axis, extreme contrast; (b) sturdy bracketed serifs, tilted axis; (c) no serifs, nearly circular o; (d) no serifs, closed apertures, flat horizontal terminals.

5. **6 pts**

   Face A has x-height ratio 0.52 and is set at 12 pt. What size makes face B (ratio 0.44) match its apparent size?

6. **6 pts**

   State the contrast principle of pairing, and explain in one sentence why Helvetica + Arial fails it while Playfair Display + Source Sans passes.

7. **6 pts**

   A shortlist has 5 typefaces. How many pairings could be tested, and what does the answer teach about professional workflow?

8. **8 pts**

   Convert: (a) 16 px to pt; (b) 21 pt to px; (c) at 18 px text, how many px is 1.25 em; (d) 1.5 in to pt.

9. **8 pts**

   Build a modular scale: base 11 pt, ratio 1.25, one step down and three steps up, rounded to halves. Assign caption, body, subhead, heading, title.

10. **8 pts**

    A column is 26 picas wide and the type is 10.5 pt. Estimate the CPL, judge it against the band, and prescribe a leading with one-phrase justification.

11. **6 pts**

    A justified column 12 picas wide at 11 pt shows rivers. Show with arithmetic why, and give the standard fix.

12. **6 pts**

    Define lettering, calligraphy and type in one sentence each, and name the famous 1886 wordmark that is lettering, not type.

13. **6 pts**

    A banner must read from 70 feet. Minimum capital height? If the word has 10 characters averaging 0.75 of cap height in width, how long is the word?

14. **6 pts**

    Production task. Letter the word TYPE twice, about 3 cm tall: once spaced with equal distances between letters, once spaced by eye (equal volumes of white). Circle the pair of letters that most needed correction and say why.

15. **6 pts**

    Critique task. A flyer uses five typefaces, 100% leading on the body, and a 95-CPL measure. Write a three-sentence professional critique naming each fault and its fix.

ANSWER KEY

1. Gutenberg's Bible c. 1455; Jenson's roman 1470; Aldus's italic 1501; Caslon's specimen 1734; Times New Roman 1932; Helvetica 1957.
2. Steel punch (carries the cut letter), struck into copper to make the matrix (the mould of one letter), which drops into the adjustable hand mould (casts fresh type in metal, same body height, adjustable width).
3. Model answer: any legible g with the baseline under the bowl, x-height at the bowl's top, descender below the baseline, bowl the upper round form, counter the space inside it, and the ear (single-story) or link (double-story) correctly pointed out.
4. (a) Didone/modern (Bodoni, Didot). (b) Old-style (Garamond, Caslon). (c) Geometric sans (Futura). (d) Grotesque sans (Helvetica).
5. $S_B = 12 \times 0.52/0.44 \approx 14.2$ pt: about 14 pt.
6. Pair faces that are clearly different in classification and role, or do not pair. Helvetica and Arial are two near-identical grotesques (a clash); Playfair (Didone display) with Source Sans (humanist text sans) crosses classifications with clear roles.
7. $\binom{5}{2} = 10$ pairs. Pair-testing grows roughly with the square of the list, so eliminate hard (by voice, weights, roles, licensing) before pairing.
8. (a) $16 \times 0.75 = 12$ pt. (b) $21/0.75 = 28$ px. (c) $1.25 \times 18 = 22.5$ px. (d) $1.5 \times 72 = 108$ pt.
9. Down: $11/1.25 = 8.8 \approx 9$. Up: $13.75 \approx 14$, $17.2 \approx 17$, 21.5. Caption 9, body 11, subhead 14, heading 17, title 21.5 pt (sensible rounding accepted).
10. Line $= 312$ pt; CPL $\approx 312/5.25 \approx 59$: comfortably in the 45–75 band. Leading about $1.3 \times 10.5 \approx 13.5 \rightarrow 10.5/13.5$, a mid-band choice for a mid-length measure.
11. CPL $\approx 144/5.5 \approx 26$, far below the minimum needed for justification, so word spaces stretch into rivers. Set flush left ragged right (or widen the measure substantially).
12. Lettering: letters drawn once for one use. Calligraphy: letters written in live pen or brush strokes. Type: a reusable system of cast or digital letters. The Coca-Cola script (Frank Mason Robinson, 1886, Spencerian).
13. Caps $\approx 70/10 = 7$ in. Length $\approx 10 \times 0.75 \times 7 = 52.5$ in, about 4.4 ft.

14. Model answer: in TYPE, the T–Y pair (two open letters) must tuck closer, while P–E (stem against stem) needs the widest gap; the eye-spaced version shows TY tightened and PE opened. Any correct reasoning about open versus straight-sided pairs earns full credit.
15. Model answer: Five faces give the page no single voice; cut to two with clear roles (or one family by weight). Solid leading chokes the body text; open it to 120–145%. A 95-character measure loses the reader's return sweep; narrow the column or split it to bring CPL to 45–75.

PORTFOLIO PIECE: A TYPE SPECIMEN POSTER

Design and produce a specimen poster for one Google Fonts family you have come to know well, in the tradition of Caslon's 1734 sheet: the family's name large in its own letters, an anatomy callout on at least one big character, its classification with a one-line history (designer, date), a full character set or alphabet, and sample settings that prove it works: a headline, a paragraph of body text set to your own spec (size, leading, measure stated on the poster in small print), and one line at caption size.

Build it with your whole unit: pick the family and a role for it (3.1–3.3), set every size from one modular scale and state the scale (3.4), and letter or carefully compose the poster's title (3.5). Finish at tabloid size (11 × 17 in) if you can print it, letter size if not: digital assembly in Inkscape or Scribus, or clean paste-up, both acceptable. This is piece three of the ten-piece professional portfolio this course builds; photograph it well.

LOOK FOR	WHAT IT MEANS
Typographic accuracy	Classification, designer and date are correct; anatomy labels are right; the stated scale, leading and measure match what is actually on the poster.
Hierarchy and layout	A clear reading order from name to samples; sizes come from one modular scale; alignment is disciplined and margins are generous.
Craft of the text settings	Body sample sits in the leading and CPL bands; quotes, italics and spacing are policed; no widows, rivers or ragged errors.
Display quality	The large setting or lettering of the family name is well spaced by eye and strong at arm's length and across the room.
Process documentation	Thumbnails, the spec card and one corrected proof are attached, showing decisions, not luck.
Presentation	Clean edges and surface; a colophon with your name and date; photographed or scanned straight and evenly lit for the portfolio.

UNIT 4

Color: Theory, Systems and Craft

Color is the fastest tool in design: a viewer feels a poster's color before reading a single word. It is also the most mismanaged, because beginners treat it as taste when professionals treat it as craft. In this unit you learn how color actually works (hue, value and chroma, and why value does most of the heavy lifting), how to build palettes on purpose, how the three color systems of the working designer (RGB on screens, CMYK on press, spot inks like Pantone) describe and deliver color, what colors conventionally say in branding, and how to make color that everyone can read, including the roughly one man in twelve with red-green color blindness.

The stories belong to careful people: Isaac Newton splitting sunlight with a prism in 1666 and closing the spectrum into the first color circle; Michel Eugène Chevreul, the dye chemist of the Gobelins works, discovering in the 1830s that a color's apparent change is caused by its neighbors and publishing the law of simultaneous contrast in 1839; Albert Munsell building a fair, numbered color system (hue, value, chroma) in 1905; Jacob Christoph Le Blon printing full-color pictures from three plates in the 1720s, the ancestor of CMYK; and Lawrence Herbert, who in 1963 turned a printer's ink-mixing chaos into the Pantone Matching System. Their tools are on your computer today, with the same numbers attached.

Color is numerical here, as it is in the trade: hex codes and their base-16 arithmetic, the 256 levels of each RGB channel, the simple intuition connecting RGB and CMYK, wheel geometry in degrees, and the WCAG contrast ratios (4.5:1 and 3:1) that decide whether text can be read. Everything is done with free tools: paint or colored pencils when mixing matters, Krita and GIMP when pixels do, and the free WebAIM contrast checker when legibility must be proved.

PREREQUISITES

- Units 1–3 of this course, especially value drawing (Lesson 1.3) and typography (Unit 3), since color will be applied to type throughout
- Arithmetic with percentages and ratios; place value (base-16 is taught in Lesson 4.3); reading simple formulas
- Any paints or colored pencils you have (a dollar-store watercolor set is enough), plus Krita or GIMP installed (free) and a browser

MASTERY CHECKLIST

- ☐ I can define hue, value and chroma (Munsell's three dimensions) and judge any color by all three.
- ☐ I can explain additive light (RGB) versus subtractive pigment (CMY/CMYK) mixing and tell which applies to a given job.
- ☐ I can build a 12-step color wheel and name the harmonies on it by geometry: complementary, split-complementary, analogous, triadic and monochrome.
- ☐ I can plan a picture or layout value-first, then build a limited palette with stated proportions (such as 60-30-10) and defend its mood.
- ☐ I can convert hex codes to decimal RGB and back by hand, and explain why screen color and press color cannot match exactly.
- ☐ I can explain what a spot color is, what Pantone standardized in 1963, and when a client job needs spot ink instead of CMYK.
- ☐ I can state the WCAG contrast thresholds (4.5:1 body text, 3:1 large text), compute a contrast ratio from luminances, and check a palette with free tools.
- ☐ I can design graphics that still work for red-green color-blind viewers and in grayscale, and explain why that is craftsmanship, not decoration.

FREE RESOURCES FOR THIS UNIT

- **Krita (free digital painting)**: Professional free painting software; its color picker shows HSV, RGB and hex side by side, which makes it a working laboratory for Lessons 4.1–4.3. A drawing tablet is nice but entirely optional; mouse and keyboard work for every exercise.
- **WebAIM Contrast Checker**: The industry-standard free checker for WCAG contrast ratios. Used throughout Lesson 4.5 to test the palettes you build in 4.2–4.4; paste two hex codes and it computes the ratio and pass/fail instantly.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

4.1	**How Color Works: Wheels, Mixing and Harmony**	3 sessions of 50 minutes
4.2	**Building a Palette: Value First, Then Color**	3 sessions of 50 minutes
4.3	**Color by the Numbers: RGB, Hex, CMYK and Spot Color**	3 sessions of 50 minutes
4.4	**What Color Says: Meaning, Branding and Convention**	3 sessions of 50 minutes
4.5	**Color Everyone Can Read: Contrast and Color-Blind-Safe Design**	3 sessions of 50 minutes

Unit 4 test

Time allowed: 50 minutes. A calculator is allowed; show your work and units. Useful numbers: hex digits A=10 … F=15; a hex pair is $16d_1 + d_0$; $C \approx 1 - R/255$ (and likewise M, Y); contrast ratio $(L_1 + 0.05)/(L_2 + 0.05)$ with thresholds 4.5:1 (normal text) and 3:1 (large text); wheel arithmetic is mod 360°. The test is worth 100 points.

1. **6 pts**

   Define Munsell's three dimensions of color and state which one carries a design's hierarchy and legibility.

2. **6 pts**

   Explain additive versus subtractive mixing in one sentence each, with the device or material that obeys each.

3. **6 pts**

   Find the complement of a hue at 140°, its two triad partners, and its split-complements.

4. **6 pts**

   Name the discovery, the man and the approximate date: (a) white light is a mixture, sorted (not stained) by a prism; (b) colors side by side change each other's appearance; (c) a numbered system of hue, value and chroma; (d) numbered spot-ink matching for printers.

5. **6 pts**

   A 16 × 20 in poster uses the 60-30-10 rule. Compute the three areas, and state which role gets the highest-chroma color and where it belongs.

6. **6 pts**

   A five-color palette looks like porridge; a grayscale photo shows all five colors at nearly the same gray. Diagnose and prescribe.

7. **6 pts**

   Convert #8C3F1E to decimal RGB and describe the color in Munsell terms.

8. **6 pts**

   Convert RGB (0, 168, 255) to hex.

9. **6 pts**

   Give the first-approximation CMY percentages for RGB (90, 180, 60), and name the dominant ink.

10. **6 pts**

    Why does process printing add a black (K) plate, and when does a job call for a spot ink instead of or beside CMYK? Give two spot cases.

11. **6 pts**

A client approves a swatch on white; on the final navy packaging the same color looks lighter and warmer. Name the law and the professional habit that prevents the surprise.

12. **6 pts**

An audit of 12 competing brands finds 8 blue, 2 green, 2 red. Chart the percentages and write one sentence each for the follow strategy and the break strategy.

13. **8 pts**

Compute the contrast ratios and give verdicts (body text and large text): (a) text $L = 0.08$ on field $L = 0.90$; (b) text $L = 0.35$ on field $L = 0.90$.

14. **6 pts**

About 8% of men and 0.5% of women have red-green CVD. In an audience of 150 men and 150 women, how many people are expected to be affected, and what design rule follows?

15. **8 pts**

Production task. Sketch a 3-value notan thumbnail (light, mid, dark) for a produce-stand poster with a headline, one large apple and a price, then mark where the single high-chroma accent goes and why.

16. **6 pts**

Critique task. A flyer sets equal-value full-chroma red headline type on a green field. Write a three-sentence professional critique naming the two distinct failures and the repair that keeps both hues.

ANSWER KEY

1. Hue (color family on the wheel), value (light/dark), chroma (intensity). Value carries hierarchy and legibility.
2. Additive: overlapping light adds toward white (screens, stage lights, RGB). Subtractive: each pigment or ink absorbs light so mixtures darken (paint, printing inks, CMY/CMYK).
3. Complement $320°$; triad $260°$ and $20°$; split-complements $290°$ and $350°$.
4. (a) Isaac Newton, 1666 (published 1672; Opticks 1704). (b) Michel Eugène Chevreul, law of simultaneous contrast, 1839. (c) Albert Munsell, A Color Notation, 1905. (d) Lawrence Herbert, Pantone Matching System, 1963.
5. Area 320 in^2: 192 / 96 / 32 in^2. The 10% accent takes the highest chroma and belongs at the focal point.
6. No value plan: hue variety without value separation. Reassign values (push at least one light and one dark, per a 3-value plan); hues may stay.
7. $R = 8 \times 16 + 12 = 140$; $G = 3 \times 16 + 15 = 63$; $B = 16 + 14 = 30$: (140, 63, 30), a dark, moderately muted red-orange (rust/brick).
8. 0 = 00; 168 = A8; 255 = FF: #00A8FF, a vivid sky blue.
9. $C = 1 - 90/255 \approx 65\%$; $M = 1 - 180/255 \approx 29\%$; $Y = 1 - 60/255 \approx 76\%$. Yellow dominates (with cyan close), fitting a green.
10. CMY inks mix to muddy brown, and triple-ink darks are expensive and blur detail, so K gives crisp, cheap true blacks. Spot cases: a brand color that must match exactly across runs, and colors outside the CMYK gamut (vivid orange, metallics), or cheap one/two-color jobs.
11. Chevreul's simultaneous contrast (1839): the navy ground pushes the color's apparent value and hue. Habit: approve colors only in context: mocked on the real background at real proportions.
12. Blue 67%, green 17%, red 17%. Follow: adopt blue to inherit the category's instant recognition and differentiate by value and typography. Break: claim the warm/empty region of the wheel to be findable at a glance, building trust by other means.
13. (a) $0.95/0.13 \approx 7.3$: passes 4.5:1 and even AAA. (b) $0.95/0.40 \approx 2.4$: fails both body (4.5:1) and large (3:1) thresholds.
14. $150 \times 0.08 + 150 \times 0.005 = 12 + 0.75 \approx 13$ people. Rule: never let color alone carry meaning: double-code with value, labels, shapes or patterns, and prefer

blue/orange oppositions to red/green.

15. Model answer: light field (60%), mid-value apple mass anchoring the lower two-thirds, dark headline and price for legibility; the accent (highest chroma) on or beside the apple at the focal point, small (about 10%), so hierarchy runs value-first with one controlled shout. Any thumbnail with three distinct values, dark type on light (or inverse) and a small, purposeful accent earns full credit.
16. Model answer: The equal-value complementary edge vibrates, so even normal vision gets shimmer instead of a readable headline. For roughly one man in twelve the red and green also collapse toward brown-on-brown and the headline can vanish. Keep the hues but move value: deepen the green field well down and lighten or outline the type so the pair passes 4.5:1 (verify in a contrast checker).

PORTFOLIO PIECE: A BRAND COLOR SYSTEM, AUDITED AND PRESENTED

Assemble the Orchard Lane Market color work of this unit into one portfolio-grade brand color board: the final 5-swatch palette with every color in all notations you can supply (hex, RGB, intuition CMYK, a spot-style note), the value plan, 60-30-10 roles, the category-audit wheel chart with your follow-or-break decision in one sentence, the tested-pairs card with WCAG ratios, and two small applications (produce label and shelf sign) shown in context: one in full color, one in grayscale, proving the system runs on value.

Finish it as a single composed board (tabloid print, or a clean digital sheet from Krita/Inkscape/Scribus), typeset to Unit 3 standards: one family or one tested pairing, sizes from a stated scale. This is piece four of the ten-piece professional portfolio this course builds, and it is the piece that shows employers something rare in student work: color decisions with evidence, numbers and repairs behind them. Photograph or export it cleanly.

LOOK FOR	WHAT IT MEANS
Color accuracy	Hex, RGB and intuition-CMYK notations are correct and mutually consistent; harmony geometry and value assignments are as labeled.
Palette craft	The palette passes the grayscale check with three distinct values; proportions follow the stated 60-30-10 roles; one controlled accent.
Evidence and audit	The category wheel chart reflects real sampled brands; the follow-or-break decision is stated and defensible from the chart.
Accessibility	Every text/background pair on the board and in the applications carries a recorded ratio meeting 4.5:1 (or 3:1 for large text); no meaning is carried by color alone.
Typography and layout	The board itself is set to Unit 3 standards: scale, leading, measure and alignment disciplined; hierarchy clear at arm's length.
Presentation and process	Clean execution, labeled sections, a colophon; before/after audit evidence attached, showing repairs as decisions rather than luck.

4.1 How Color Works: Wheels, Mixing and Harmony

OBJECTIVES

- Describe any color by Munsell's three dimensions: hue (which color), value (how light or dark) and chroma (how intense), and explain why value matters most to a design.
- Explain additive mixing of light (RGB, where all three make white) versus subtractive mixing of pigment (CMY and the painter's wheel, where mixing darkens), and say which rules a screen, a printed page and a paint box each obey.
- Build a 12-step color wheel and locate the harmonies on it by geometry: complementary (180°), split-complementary, analogous, triadic (120°) and monochrome.

> **Warm-up.** Gather five colored objects from one color family (five different blues work well: a book, a sock, a mug, a toy, a jar lid). Line them up from lightest to darkest, ignoring everything but lightness. Then re-rank them from dullest to most intense. You have just separated value from chroma, which most adults have never consciously done.

WATCH

Color Theory Basics for Digital Painters

Proko · 6:41

https://www.youtube.com/watch?v=P0P8iGs2jWI

> **WHEN TO WATCH**
> After the craft paragraph. The presenter is the painter Marco Bucci; pause when he isolates hue, saturation and value and repeat the demonstration in Krita's color picker.

Note: The clearest short tour of the three dimensions of color, with live digital examples. His 'saturation' is Munsell's chroma; note both words, the trade uses each.

BACKUP VIDEO

Colour Harmony - 10 Minutes To Better Painting - Episode 5

Marco Bucci · 10:21

https://www.youtube.com/watch?v=4LhcNbFMkTw

With the harmony paragraph: the wheel's harmony schemes shown working inside real paintings, not just as diagrams.

KEY TERMS

hue

The color's family name on the wheel: red, yellow-green, blue; measured in degrees around the circle in digital pickers.

value

How light or dark a color is, independent of its hue; the dimension your eye uses to read form and text.

chroma (saturation)

How intense or muted a color is, from vivid down to gray; Munsell's word is chroma, digital pickers usually say saturation.

additive color (RGB)

Mixing light: red, green and blue beams add to make lighter colors, and all three at full strength make white. Screens work this way.

subtractive color (CMY)

Mixing pigments or inks, each of which absorbs (subtracts) part of the light; mixing makes darker colors. Paint and print work this way.

complementary colors

A pair across the wheel (180° apart), such as blue and orange; they intensify each other side by side and dull each other when mixed.

color harmony

A scheme for choosing hues by their geometry on the wheel: analogous (neighbors), complementary (opposites), split-complementary, triadic (an even triangle), monochrome (one hue, varied value and chroma).

CORE IDEAS

The story. In 1665–66, with Cambridge closed by the plague, a young Isaac Newton worked at his mother's farmhouse at Woolsthorpe with a glass prism he had bought at the Stourbridge Fair. Everyone knew a prism made colors; the accepted story was that the glass stained the light. Newton darkened his room, let a narrow sunbeam through a hole in the shutter, and spread a band of color across the wall: red, orange, yellow, green, blue, indigo, violet (he named seven, deliberately matching the seven notes of a musical scale). Then came the decisive move, his *experimentum crucis*: he isolated one color from the spread with a slit and passed it through a second prism. It bent, but it did not change color. White light, he concluded, is not pure; it is a mixture, and the prism merely sorts it. He reported the work to the Royal Society in 1672 and gave the full account in his book *Opticks* in 1704, where he also drew the spectrum bent around into a circle so that mixing could be reasoned about geometrically: the first color wheel. Within a few years painters' manuals (such as the 1708 treatise printed in The Hague, from which our picture study comes) were printing color circles for artists, and every color picker on your computer is Newton's circle still.

How they figured it out. Newton's wheel describes light, but painters mix pigments, and the two obey opposite arithmetic. Light is *additive*: overlapping red, green and blue beams gives lighter results, and all three together make white; that is precisely how your screen works, with each pixel carrying a red, a green and a blue sub-pixel

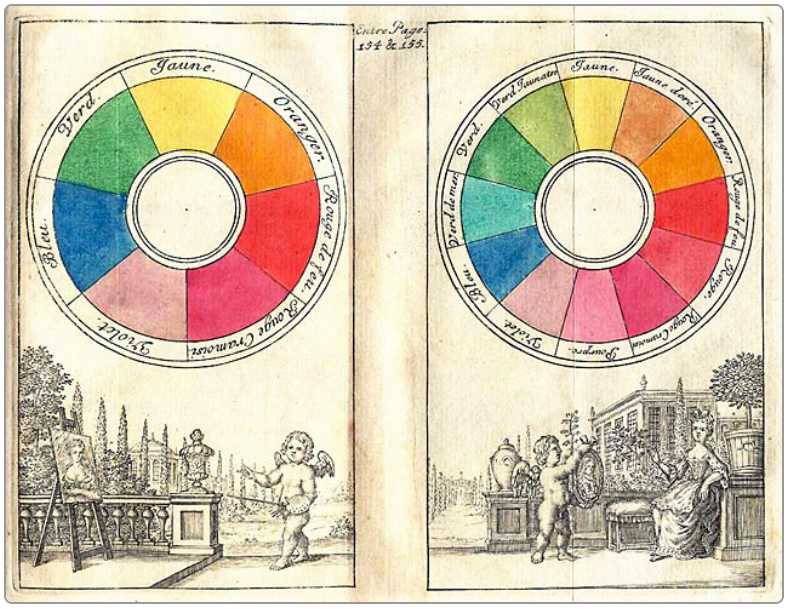
whose brightnesses are set independently. Pigment is *subtractive*: each pigment absorbs part of the light falling on it and reflects the rest, so every added pigment subtracts more light and the mixture darkens; the painter's traditional primaries are red, yellow and blue, and the printer's more efficient modern set is cyan, magenta and yellow (Lesson 4.3 tells that story). This is why mixing all your paints makes mud while mixing all your screen's light makes white, and why a designer must always ask first: is this job made of light or of ink? The craft consequences are immediate: colors chosen on screen will print darker and duller unless planned for, and a palette built for a glowing screen needs re-checking the day it becomes a printed flyer.

The craft. The working designer's model of a single color comes from the Boston art teacher Albert Munsell (his *A Color Notation*, 1905): every color has **hue** (where on the wheel), **value** (how light or dark) and **chroma** (how intense or muted), and the three can be adjusted independently. Train yourself to read all three, in that order of importance. *Value does the work*: squint at any good poster or painting and the color disappears before the composition does, because the eye reads form, hierarchy and text by value contrast first. *Hue carries the mood*, warm against cool. *Chroma is the volume knob*: full-chroma color shouts, and a page where everything shouts says nothing, so professionals mute most of a palette and spend high chroma in one or two places, exactly as Unit 2 taught you to spend emphasis. In Krita's or GIMP's picker you can hold hue constant and move value and chroma separately; fifteen minutes of that is worth an hour of reading.

The craft, continued: harmonies. Harmonies are hue-choosing schemes defined by wheel geometry, and since the wheel is 360°, you can state them in degrees. *Complementary*: two hues 180° apart (blue 240° and orange–yellow 60°); maximum hue contrast, and each makes the other look more intense beside it. *Split-complementary*: a hue plus the two neighbors of its complement (at 180° ± 30°); nearly the punch, easier to balance. *Analogous*: three or four neighbors within about 60–90°; naturally unified, needs value contrast to avoid flatness. *Triadic*: three hues 120° apart; lively and hard to balance, so professionals usually let one lead and mute the other two. *Monochrome*: one hue, with value and chroma doing all the work, and it is the most underrated scheme in design: it cannot clash. A harmony names only the hues; every scheme still needs its values planned (Lesson 4.2) or it fails in grayscale.

In the studio. Illustrators and designers use the wheel daily but rarely at full strength: the complementary scheme in a real movie poster is usually a muted teal against a warm skin-orange, not pure blue against pure orange. The professional habits to copy: pick harmonies on the wheel, then immediately drop most chroma and set values; test every scheme in grayscale (one keystroke in Krita: desaturate a copy); and name your colors by the three dimensions when you talk to clients and art directors ('a deep, muted blue' says hue, value, chroma; 'navy-ish' says nothing). In Unit 8 you will present palettes to clients, and the vocabulary of this lesson is how those conversations are conducted.

PICTURE STUDY



Color Circles from a Painter's Manual, Attributed to Claude Boutet (printer Christophe Ballard), 1708 · Hand-colored engraving from Traité de la peinture en mignature (The Hague) · From the 1708 edition of the treatise

Image: Wikimedia Commons, public domain

Four years after Newton's Opticks closed the spectrum into a circle, this painter's manual printed what are likely the first color wheels made for artists: a seven-color circle honoring Newton's seven spectrum names, and a twelve-color circle, the practical division painters and designers still use.

Every color picker you will ever open descends from this page. Notice that it was hand-colored: in 1708 there was no way to print these colors, a problem Lesson 4.3's hero was already working on.

Look closely

- Compare the 7-circle and the 12-circle. Which is easier to find opposites (complements) on, and why does an even count matter?
- Find red, yellow and blue on the 12-circle. Are they evenly spaced? What tradition is that spacing built for?
- The plate was colored by hand with the pigments of 1708. Which hues look weakest or least even? What does that say about the pigments available?
- Trace a complementary pair and an analogous run with your finger. Which neighbors blend most smoothly?

- Why would a miniature-painting manual (tiny portraits, precise work) care about a theoretical diagram like this?

Talk about it

1. Newton's circle described light; this one guides pigment. What gets awkward when one diagram serves both? (Think about where mixing two opposites lands.)
2. A wheel is a theory you can hold. What makes a good reference tool for a working artist: completeness or convenience?
3. What is the modern equivalent of this plate in your own workflow, and what do you trust it for (and not)?

STUDIO BRIEF

Studio brief: A Working Color Wheel for the Studio Wall

Client: your own studio (every professional builds reference tools). Deliverable: a 12-step color wheel, painted or colored by hand, at least 20 cm across, with complements, one triad and one analogous run marked, plus a 9-step value scale along the bottom; built accurately enough to use for every palette in this unit. A digital twin in Krita is the optional second deliverable.

You will need

- Any paints (watercolor, acrylic or gouache) or colored pencils; a cheap set is fine
- Stiff paper or cardstock, compass or a round plate to trace, protractor, pencil and ruler
- Black and white paint or pencil for the value scale; scrap paper for mixing tests
- Optional: Krita for the digital twin

Steps

1. Draw a circle and divide it into 12 equal 30° wedges with the protractor. Mark every wedge's angle (0°, 30°, … 330°).
2. Place the primaries of the painter's wheel first: red, yellow, blue, evenly spaced (120° apart). Paint them straight from the set.
3. Mix and place the secondaries between them: orange, green, violet. Test each mix on scrap until it sits visually halfway between its parents.
4. Mix the six tertiaries (red-orange, yellow-orange, yellow-green, blue-green, blue-violet, red-violet) and fill the remaining wedges.
5. Judge the finished circle at arm's length: does the chroma feel even all the way around, or do some wedges go dull? Note the weak wedges; cheap pigment sets always have them, and knowing yours is part of the tool.
6. Below the wheel, paint a 9-step value scale from white to black, aiming for even steps. Squint to check; fix the step that jumps.

7. Mark the geometry on the wheel in fine pen: one complement line across the center, one triad triangle, one analogous arc of three wedges. Label each with its name and degrees.
8. Optional digital twin: in Krita, recreate the 12 hues with the HSV picker (S and V at full, H at each multiple of 30°), swatch them in a ring, and compare with your painted wheel. Write two sentences on where pigment and screen disagree.

Tips

- Mix secondaries slightly toward the duller side on purpose if your set's primaries are weak; an even-looking wheel beats a theoretically pure one.
- Wash the brush fully between wedges; one dirty brush muddies the whole semester's reference.
- Label angles in pencil first; ink only after the paint is dry.

Check your work

- ☐ Twelve wedges at correct 30° spacing with primaries 120° apart.
- ☐ Secondaries and tertiaries sit visually between their parents.
- ☐ The value scale steps evenly under a squint.
- ☐ Complement, triad and analogous markings are geometrically correct and labeled with degrees.

SKETCHBOOK

1. Your five-object warm-up ranked twice (value order, chroma order), sketched as two small ladders with notes.
2. The additive and subtractive systems drawn side by side: three overlapping light circles (center white) and three overlapping pigment circles (center near-black), labeled.
3. Three harmonies found in the real world today (a package, a game screen, a room) with their approximate hue angles and a one-line verdict each.

KEY FORMULAS

complement of hue $h = (h + 180^\circ) \bmod 360^\circ$
triad: $h,\ (h + 120^\circ) \bmod 360^\circ,\ (h + 240^\circ) \bmod 360^\circ$
split-complement: $h,\ (h + 150^\circ) \bmod 360^\circ,\ (h + 210^\circ) \bmod 360^\circ$

From history. Newton's wheel had a quirk: he weighted the seven wedges unevenly, by analogy to the musical intervals, and later scientists quietly evened them out. Goethe published a rival theory in 1810 insisting color was also about perception and feeling, and though his physics lost, his observation that colors behave differently in the eye than in the equation pointed straight at what Chevreul proved in 1839, which is Lesson 4.4's story. In color, the physics, the pigment and the perception are three different subjects, and a designer works with all three.

WORKED EXAMPLES

Example 1. A brand's main hue is a warm red at $10°$ on the digital wheel. Find its complement, its split-complements and its triad partners.

Show solution

1. Complement: $10 + 180 = 190°$, a cyan-leaning blue-green.
2. Split-complements: $10 + 150 = 160°$ and $10 + 210 = 220°$: a green-cyan and a true blue.
3. Triad: $10 + 120 = 130°$ (green) and $10 + 240 = 250°$ (blue-violet).

Answer: Complement 190°; split pair 160° and 220°; triad 130° and 250°. The geometry is the easy part; value and chroma decisions make it a palette.

Example 2. A hue sits at $300°$ (a violet-magenta). Its triad partner computed as $300 + 120 = 420$. Fix the arithmetic and name both partners.

Show solution

1. Angles wrap at $360°$, so take the remainder: $420 \bmod 360 = 60°$, an orange-yellow.
2. Second partner: $(300 + 240) \bmod 360 = 180°$, a cyan.

Answer: 60° and 180°; wheel arithmetic is clock arithmetic, mod 360.

Example 3. Your screen mixes light. Predict the result and the rule that explains it: (a) full red + full green light; (b) all three RGB channels at full; (c) mixing all the paints in a cheap watercolor set.

Show solution

1. (a) Additive mixing: red + green light = yellow, surprising to every painter and true on every screen.
2. (b) R + G + B at full strength = white; adding light lightens.
3. (c) Subtractive mixing: each pigment absorbs more of the light, so the mixture collapses toward a dark gray-brown mud.

Answer: (a) yellow; (b) white; (c) mud. Light adds, pigment subtracts.

PRACTICE

1. Easy Name Munsell's three dimensions of color and give a one-phrase meaning for each.

   Show answer

   Hue (which color family on the wheel), value (how light or dark), chroma (how intense or muted).

2. Easy Find the complement of hues at 60°, 200° and 345°.

   Show answer

   240°, 20°, and $(345 + 180) \bmod 360 = 165°$.

3. Easy Which mixing rule governs each: a stage lighting rig, a box of oil pastels, an inkjet print, a phone screen?

   Show answer

   Additive (light), subtractive (pigment), subtractive (ink), additive (light).

4. Easy In Newton's crucial experiment, what happened when one isolated color passed through a second prism, and what did it prove?

   Show answer

   It bent but stayed the same color, proving the prism sorts light rather than staining it: white light is a mixture of colors.

5. **Medium** A design uses hues at 210°, 225° and 245° plus one accent at 30°. Name the scheme.

Show answer

Analogous blues (neighbors within about 35°) with a complementary accent (30° is nearly opposite the 210° anchor): an analogous-plus-complement scheme, one of the most common in professional work.

6. **Medium** Why does a monochrome scheme never clash, and what must carry the design instead of hue?

Show answer

With one hue there are no hue relationships to go wrong; value contrast and chroma variation must create all the hierarchy and interest.

7. **Medium** Your poster looked rich on screen and printed dull and dark. Explain with the two mixing systems.

Show answer

The screen made color by adding light (RGB, glowing), while the press made it by subtracting light with inks (CMYK, reflective). Printed color cannot be brighter than the paper, and every ink layer darkens; palettes must be planned, proofed or adjusted for print.

8. **Medium** Newton chose seven spectrum names partly to match the musical scale. What does that tell you about where the boundaries between colors actually are?

Show answer

The spectrum is continuous; the boundaries and the count are human choices. Color names are conventions laid over a smooth physical gradient, which is why the wheel can be divided into 6, 12 or 24 steps as the job requires.

9. Hard A client's two brand hues are 90° apart. One stakeholder calls it complementary, another analogous. Arbitrate with geometry and name the risk of this spacing.

Show answer

Neither: complementary is 180°, analogous is neighbors within roughly 60°. At 90° the hues are in-between: too far to unify on their own, too close for full contrast, so the scheme needs strong value separation or one hue muted into a supporting role.

10. Hard Plan a triadic scheme anchored at 220° where the blue leads. Give the partner hues and state, in Munsell terms, what you would do to the partners so the blue stays in charge.

Show answer

Partners at 340° (red-magenta) and 100° (yellow-green). Keep the blue at fuller chroma and useful values; drop the partners' chroma well down and push their values toward light tints or dark shades so they support rather than compete.

11. Hard You are the designer. A bakery (your Unit 3 client) asks for 'something colorful' for a spring flyer. Propose one harmony with hue angles, and one sentence each on the value plan and the chroma plan.

Show answer

Example: analogous 40°–80° (warm wheat golds to soft green) with a split accent near 220° for the headline. Values: light field, dark text, one mid tone. Chroma: everything muted except the single high-chroma accent on the offer. Any scheme with correct geometry, a stated value plan and one controlled accent earns full credit.

COMMON MISTAKES

- Confusing value with chroma: a pale baby blue is high value, low chroma; a navy is low value and can still be fairly high chroma. Rank them separately, as in the warm-up.
- Using every hue at full chroma. Professionals mute most of the palette and spend intensity in one or two places; full-chroma-everything is the surest amateur signature.

- Trusting hue to carry a design that fails in grayscale. If the squint test loses the hierarchy, no harmony will save it: fix the values first.

Make it a game · Wheel Spin Drill. A parent names any hue angle in multiples of 15° (say, 195°). In ten seconds, name the hue family, its complement's angle, and one triad partner; then point to all three on your painted wheel. One point each, three rounds of five. The reverse round: they point at a wedge and you call its angle within 15°. Beat your previous total.

Scripture. “I do set my bow in the cloud, and it shall be for a token of a covenant between me and the earth.” (Genesis 9:13, KJV)

The first spectrum in Scripture is a sign chosen by God to carry meaning: color as covenant, not decoration. Newton's prism explained how the bow's colors separate; the lesson of Genesis is that color can be made to say something, which is this whole unit's subject.

4.2 Building a Palette: Value First, Then Color

OBJECTIVES

- Plan a picture or layout as a value design first (a 3-value plan: light, mid, dark) and prove it with a grayscale check.
- Build a limited palette (3–5 colors) from a harmony, assign each color a value and a proportion, and state the palette's mood in words.
- Use the 60-30-10 proportion rule to distribute palette colors across a real layout and compute the areas.

> **Warm-up.** Take any colorful printed piece (cereal box, book jacket) and photograph it in black and white with a phone, or squint hard at it. Does it still organize itself: can you find the main thing, the support, the background? Write one sentence: the piece survives/fails in grayscale because its values do/do not separate. That test is this lesson's foundation.

WATCH

The Simple Color Lesson I Use In All My Paintings

Marco Bucci · 13:49

https://www.youtube.com/watch?v=VoUA8U0xxSY

> **WHEN TO WATCH**
> After the first two craft paragraphs. Watch how he commits to a value structure before color decisions, then pause and restate his rule in one sentence of your own.

Note: A working illustrator demonstrating value-first color on real paintings. The skill transfers whole to design layouts: replace his figures with your headline and body text.

BACKUP VIDEO

Learn EVERY Colour Theory Technique in ONE Video!

Satori Graphics · 10:59

https://www.youtube.com/watch?v=OB-XwRg1qTc

With the palette-building paragraph: harmonies and palette techniques applied to graphic design examples rather than paintings.

KEY TERMS

value plan (notan)

The design of a picture's lights and darks alone; the Japanese term notan (dark-light) is used by artists for 2- and 3-value studies.

limited palette

A deliberately small set of colors (often 3–5) from which everything in the piece is mixed or chosen; the discipline that gives work unity.

tint, shade, tone

A color plus white (tint), plus black (shade), or plus gray (tone): the main ways one hue becomes a whole family.

60-30-10 rule

A proportion rule of thumb: about 60% of the design in the dominant (usually quiet) color, 30% in a secondary, 10% in the accent.

mother color

A small amount of one color mixed into every other color in a palette, tying the whole scheme together; digital artists approximate it with a unifying overlay or adjustment.

gamut mapping

A palette-planning idea from painters: draw a shape over the wheel and allow only hues inside it; a narrow shape guarantees harmony because nothing outside it can intrude.

Prussian blue

The first modern synthetic pigment, discovered by accident in Berlin around 1704–06; cheap, strong and deep, it reached Japan as 'Berlin blue' and made Hokusai's wave possible.

CORE IDEAS

The story. Around 1704–06, in a Berlin laboratory, the colormaker Johann Jacob Diesbach was cooking up a batch of red lake pigment when a contaminated ingredient (potash tainted with animal oil, borrowed from the alchemist Johann Konrad Dippel) turned the batch a deep, powerful blue instead. The accident became Prussian blue, the first modern synthetic pigment: far cheaper than ultramarine ground from lapis lazuli, stronger than indigo, and lightfast enough to trade around the world. A century later it reached Japan in Dutch and Chinese cargoes as *bero-ai*, Berlin blue, and in 1830–32 the seventy-year-old printmaker Katsushika Hokusai

built his series *Thirty-six Views of Mount Fuji* around it. Its most famous sheet, the Great Wave off Kanagawa, is close to a monochrome: Prussian blue and indigo doing almost all the work over soft tans and grays, and it became perhaps the most reproduced image in art history. A new material, a tight palette, and total command of value: that is the recipe this lesson teaches.

How they figured it out. Japanese printmakers worked under hard constraints that turn out to be good training: every color in a woodblock print is a separate carved block, printed in a separate pass, so each added color cost real money and labor. The designer therefore planned prints as a few flat shapes of committed color, and the tradition thought in *notan*, the arrangement of dark and light, before any hue was chosen. Western painters learned the same discipline from their own economics (a Rembrandt backbone of cheap earth colors, with expensive color spent only where it tells). The modern statement of the rule: *get the values right and the color almost doesn't matter; get the values wrong and no color can save you.* You proved it in the warm-up: a design that organizes itself in grayscale is running on value, and value is what survives bad lighting, cheap printing, small screens and aging eyes.

The craft. Build palettes in this order. First the *value plan*: assign the piece three values (light, mid, dark) and decide what lives in each: in a layout, typically a light field, dark text and one mid-value supporting shape, or the inverse for a dark design. Sketch the plan as a small 3-value thumbnail (markers or pencil) and squint-test it. Second, choose the *harmony* (Lesson 4.1) and pick 3–5 colors, immediately assigning each a value from your plan: here is the step beginners skip, choosing five hues that are all mid-value and wondering why the design is porridge. Third, set *proportions* with 60-30-10: the dominant 60% is usually the quietest color (a paper white, a warm gray, a deep navy field), the 30% supports, and the 10% accent is your highest chroma spent at the focal point, exactly where Unit 2 put the emphasis. Fourth, unify: painters mix a *mother color* into everything; in Krita or GIMP the equivalent is a low-opacity color overlay on the finished piece, or simply reusing one mixing parent in every swatch. Fifth, test: desaturate a copy (grayscale check), view at thumbnail size, and view on another screen or a printout.

In the studio. Where do professionals find the hues themselves? Honest sources: nature and photographs you took (sample a dawn sky's five colors in Krita with the color picker and you will own a palette no generator suggests); the masters (build a palette by sampling a Hokusai print or a Monet: our picture studies are a palette

library); and the job's own materials (the client's existing sign, product, or the wheat tones of a bakery). Generators and trend sites exist, and designers peek at them, but a palette you can defend ('sampled from the client's own storefront at golden hour, values re-planned to 3 steps') wins meetings in a way 'the website suggested it' never will. Keep a palette journal in your sketchbook: five swatches per palette, values noted, proportions noted, mood named in two words. By Unit 8 you will have a personal library, and personal libraries are what art directors mean by 'a developed eye.'

PICTURE STUDY



The Great Wave off Kanagawa, Katsushika Hokusai, c. 1830–32, from the series Thirty-six Views of Mount Fuji · Polychrome woodblock print, ink and color on paper, 25.7 × 37.9 cm · Metropolitan Museum of Art, New York (H. O. Havemeyer Collection)

Image: Wikimedia Commons, public domain

Hokusai was about seventy when he designed this print, built around the newly affordable imported pigment his public was wild for: Prussian blue. It is close to a monochrome: blues from near-black to pale tint, over quiet tans and grays, and it may be the most reproduced image in the history of art.

Read it as a palette lesson: count the colors, rank their values, find the proportions. Everything this lesson teaches is already here, carved into cherry wood two centuries ago.

Look closely

- Count the distinct colors (each was a separate carved block). How few are there, honestly?
- Rank the blues by value, darkest to lightest. Where does the darkest blue land, and what does that placement do to your eye?
- Squint: does the print hold together in pure value? Where is the strongest light-against-dark edge?
- Estimate the proportions: how much of the sheet is quiet (sky, tan boats), how much is the mid blues, how much is the deepest accent? Is Hokusai near

60-30-10?

- Find Fuji. Why did Hokusai give the sacred mountain the smallest share and the quietest contrast in the sheet?

Talk about it

1. The wave's drama comes from shape and value, not from loud color. What modern design jobs call for exactly that discipline?
2. A new pigment technology (cheap synthetic blue) triggered a creative explosion. Name a modern material or tool that is doing the same for designers now, and what its 'Prussian blue palette' might be.
3. Each color cost a carved block and a printing pass. Your software makes color free. What replaces that economic discipline for you, or should anything?

STUDIO BRIEF

Studio brief: Three Palettes for One Client

Client: 'Orchard Lane Market,' a family farm store, is rebranding and wants to see directions before committing. Deliverable: a single presentation sheet with three distinct palettes (5 swatches each), every palette built value-first and labeled with harmony, value assignments, 60-30-10 roles and a two-word mood, plus one small mock application (a price sign or produce label) of your recommended palette. They sell apples, cider, pies and autumn produce; they are warm, multigenerational and tidy, not rustic-sloppy.

You will need

- Paints or colored pencils and cardstock, or Krita/GIMP for a digital sheet (either is professional; choose one and commit)
- Your Lesson 4.1 color wheel for harmony geometry
- A photograph you take or choose of real produce, orchard light or the family kitchen table, for the sampled palette
- Ruler and pencil for the swatch grid

Steps

1. Write the client's voice words from the brief (warm, multigenerational, tidy) where you can see them.
2. Make the value plan first: one 3-value thumbnail of the mock application (sign or label): where is light, mid, dark?
3. Palette 1, by harmony: choose a scheme on the wheel (state the angles), pick 5 colors, assign each a value from the plan and a 60-30-10 role.
4. Palette 2, by sampling: pull 5 colors from your photograph with the color picker (or match by eye in paint), then adjust their values to serve the same plan. Note the source honestly on the sheet.
5. Palette 3, limited: a near-monochrome in the Hokusai manner: one hue in 4 value steps plus one quiet neutral. Make the value steps do all the work.
6. Swatch all three as tidy rows of 5, each swatch at least 2 × 2 cm, labeled: harmony and angles (or source), value (light/mid/dark), role (60/30/10), mood

in two words.

7. Grayscale-check all three (photo in black and white, or desaturate): every palette must keep at least three clearly distinct values. Fix any that fail before presenting.
8. Choose your recommendation and build the small mock (a produce label or shelf sign with 'Honeycrisp — 2.50/lb' in your Unit 3 typography): palette applied by its stated roles.
9. Present the sheet to a parent as the client: one minute per palette, then your recommendation and why, in plain words tied to their voice words.

Tips

- Do the value plan before any color is squeezed or picked; it is ten minutes that saves the whole brief.
- Palettes read as professional when the swatches are tidy and labeled; presentation craft is palette craft.
- If two palettes drift toward each other, push one harder: three directions means three genuinely different answers.

Check your work

- ☐ All three palettes pass the grayscale check with 3+ distinct values.
- ☐ Every swatch carries harmony/source, value, role and the palette's mood.
- ☐ The mock applies the recommended palette by its stated 60-30-10 roles.
- ☐ The one-minute presentations connect each palette to the client's voice words.

SKETCHBOOK

1. A 3-value notan study (black, gray, white markers or pencil) of any picture study from Units 1–4, thumbnail size.
2. A palette journal page: two palettes sampled from life today (sky, a meal, a shelf), five swatches each with values and a two-word mood.
3. The Great Wave's palette reconstructed: its blues as a value ladder, its neutrals beside them, and your estimate of its proportions.

KEY FORMULAS

$$\text{area}_{60} = 0.6\,A, \quad \text{area}_{30} = 0.3\,A, \quad \text{area}_{10} = 0.1\,A$$

$$\text{tint strength} = \frac{\text{parts color}}{\text{parts color} + \text{parts white}} \times 100\%$$

From history. Prussian blue has a second designer connection: in 1842 the astronomer John Herschel used its chemistry to invent the cyanotype, the blueprint process, and for a century every building and machine in the Western world was built from white-line drawings on Prussian-blue paper. Architects' and engineers' 'blueprints' are the same accidental Berlin pigment, doing one more honest job.

WORKED EXAMPLES

Example 1. A poster is 18 × 24 in. Apply 60-30-10: how many square inches belong to each palette role? If the accent is a single band across the full 18 in width, how tall is the band?

Show solution

1. Total area: $18 \times 24 = 432$ in^2.
2. Shares: $0.6 \times 432 = 259$ in^2; $0.3 \times 432 = 130$ in^2; $0.1 \times 432 = 43$ in^2.
3. Accent band height: $43 \div 18 \approx 2.4$ in.
4. The rule is a starting proportion, not a law; but computing it shows how small a proper accent really is: one 2.4-inch band on a two-foot poster.

Answer: About 259 / 130 / 43 in^2; the accent band is only about 2.4 in tall. Accents are smaller than beginners think.

Example 2. You need a 5-step tint ladder of your brand blue for a flyer's backgrounds. Using parts of color to parts of white, give mixes at 100%, 75%, 50%, 25% and 10% strength, and state which steps can carry white text.

Show solution

1. 100%: pure color. 75%: 3 parts color to 1 white. 50%: 1 to 1. 25%: 1 to 3. 10%: 1 to 9.
2. Check each mix's value, not its strength: white text needs a dark field, so only the 100% and probably the 75% steps qualify; 50% is risky; 25% and 10% need dark text.
3. Digital shortcut: in Krita, keep hue and saturation, raise value stepwise, or lower opacity over white in the same percentages.

Answer: Mix ratios 3:1, 1:1, 1:3, 1:9 for 75/50/25/10%; white text only on the two darkest steps, pending the contrast check you will learn in Lesson 4.5.

Example 3. A woodblock print needs one carved block per color, and a carver charges the equivalent of $40 per block. Hokusai's publisher allows 8 blocks; a rival plans 14. What does the limited palette save, and what must the design do to compete?

Show solution

1. Cost difference: $(14 - 8) \times 40 = \$240$ saved per edition in carving alone, plus a printing pass saved per sheet per block.
2. The 8-block design must replace hue variety with value design: fewer colors, each doing more work, planned as flat committed shapes.
3. This is the historical economics that trained the limited-palette discipline; your software makes blocks free, but the discipline still produces the stronger image.

Answer: $240 per edition plus faster printing; the design competes on value structure, which is exactly why the 8-block tradition produced the Great Wave.

PRACTICE

1. Easy Define tint, shade and tone.

Show answer

Tint: color + white. Shade: color + black. Tone: color + gray (both white and black).

2. Easy State the 60-30-10 rule and which share the accent color takes.

Show answer

About 60% dominant, 30% secondary, 10% accent; the accent takes the 10% and is usually the highest-chroma color at the focal point.

3. Easy What is a value plan (notan), and what tool-free test checks it?

Show answer

The design of the piece in lights and darks only (2–3 values) before color; check by squinting (or a grayscale photo) to see whether the structure survives.

4. Easy What pigment, discovered by accident around 1704–06, made Hokusai's Great Wave possible, and why was it special?

Show answer

Prussian blue (Diesbach, Berlin): the first modern synthetic pigment, cheap, strong, deep and lightfast, traded worldwide as 'Berlin blue' (bero-ai in Japan).

5. Medium A 24 × 36 in poster uses 60-30-10. Compute the three areas, and say what typically occupies the 60%.

Show answer

Area 864 in^2: $518/259/86$ in^2. The 60% is usually the quiet field (background), not the loudest color.

6. Medium Your palette has five hues and the design looks like porridge. The grayscale check shows everything is mid-gray. Diagnose and fix.

Show answer

The palette has hue variety but no value plan: all five colors sit at similar values. Reassign values (push one light, one dark), keep hues if you like; the fix is in value, not in choosing new hues.

7. Medium Give the mixing ratio (parts color : parts white) for a 20% tint and a 60% tint.

Show answer

20%: 1 part color to 4 white. 60%: 3 parts color to 2 white.

8. Medium What is a mother color, and what is the digital equivalent?

Show answer

A single color mixed in small quantity into every other color of a palette to unify the scheme; digitally, a low-opacity unifying overlay or building every swatch from one shared parent.

9. Hard Build a palette brief for a autumn harvest-festival poster: harmony with hue angles, a value assignment for each of four colors, proportions, and the mood in two words.

Show answer

Example: analogous 20°–60° (rust, pumpkin, gold) plus split accent near 230° (dusk blue). Values: gold as light field (60%), rust mid (30%), dusk blue dark for text, pumpkin high-chroma accent (10% combined with blue's share adjusted). Mood: warm, gathered. Any geometrically correct harmony with distinct values, stated proportions and a plausible mood earns credit.

10. Hard Why does a palette sampled from a photograph you took usually beat one from an online generator, professionally speaking? Give two reasons.

Show answer

Its colors arrive with believable value and chroma relationships (nature's lighting already harmonized them), and you can defend it to a client with a story tied to the job; a generator palette is unowned, often all mid-value, and interchangeable with every other designer's.

11. Hard The Great Wave is nearly monochrome, yet nothing about it feels poor. Name three jobs the blue does that a bigger palette would have scattered, using this lesson's vocabulary.

Show answer

It carries the value plan (deep shades to pale tints of one hue read instantly in grayscale); it unifies (one hue acts as its own mother color); and it concentrates emphasis (the darkest, highest-chroma blue lands at the wave's crest and face, the focal point, like a built-in 10% accent).

COMMON MISTAKES

- Choosing hues before planning values. Five lovely colors at the same value make porridge; the value plan comes first, always.
- Making the accent big. The 10% is the design's one shout; at 30% it is just another color and the hierarchy collapses.
- Skipping the grayscale check because the colors look good. Looking good on your screen in color is the weakest test a palette ever faces; cheap printing, bad light and other screens are all grayscale-adjacent.

Make it a game · Palette Forensics. A parent picks any illustrated book cover, package or game art in the house. You have 90 seconds to name its palette like a professional: count the colors (within one), point to the 60, the 30 and the 10, rank the three main values, and name the harmony if there is one. They check your color count; a sibling can referee the rest. Three pieces per round; you win a piece by getting count and proportions right. Then reverse: you choose the piece and quiz the parent.

Scripture. “And thou shalt make holy garments for Aaron thy brother for glory and for beauty.” (Exodus 28:2, KJV)

God names beauty itself as a purpose of the priestly garments — the craftsmen were commanded to work "for glory and for beauty." A palette built with care, value first and colors chosen on purpose, is one of the chief means by which a designer's work earns that second word.

4.3 Color by the Numbers: RGB, Hex, CMYK and Spot Color

OBJECTIVES

- Convert hex color codes to decimal RGB and back by hand using base-16 place value, and explain why each channel runs 0–255.
- Explain the two working color systems: RGB (additive, for screens) and CMYK (subtractive process inks, for presses), the simple intuition connecting them, and why the same design cannot match exactly in both.
- Explain what a spot color is, what the Pantone Matching System standardized in 1963, and decide when a job needs spot ink instead of (or beside) CMYK.

> **Warm-up.** Open any color picker (Krita, GIMP, or a browser's). Set R=255, G=0, B=0 and read the hex code. Now set the hex to #FFFF00 and name the color you see before it appears. Finally set R=G=B=128. Write down all three codes and colors; by the end of this lesson you will be able to do all of this on paper.

WATCH

RGB vs CMYK: What's the difference?

99designs · 4:56

https://www.youtube.com/watch?v=NnP-SRiOc4o

> **WHEN TO WATCH**
> After the second craft paragraph. Pause at the gamut comparison and name one color from your Lesson 4.2 palettes that will suffer in print.

Note: A design marketplace's clean explainer on the two systems and when each applies. Short enough to watch twice; the second pass, predict each point before it is made.

BACKUP VIDEO

RGB, CMYK, and SPOT Color Basics

Cherimoya Tree · 7:24

https://www.youtube.com/watch?v=0o1eeoDZo14

With the spot-color paragraph: it adds the third system (spot inks) that the main video leaves out, with print-shop examples.

KEY TERMS

RGB

The additive screen system: each pixel's red, green and blue channels are set from 0 to 255, giving $256^3 = 16{,}777{,}216$ possible mixtures.

CMYK (process color)

The four printing inks: cyan, magenta, yellow and key (black), printed as layered tiny dot screens; each channel is given as a percentage of ink coverage.

gamut

The range of colors a system can produce. Screen RGB reaches vivid glowing colors that CMYK ink on paper cannot; out-of-gamut colors shift when printed.

Pantone Matching System (PMS)

The 1963 standard by Lawrence Herbert: numbered ink formulas and printed swatch books, so a color can be ordered by number anywhere in the world and match.

hexadecimal (hex)

Base-16 numbers using digits 0–9 and A–F (A=10 … F=15); a hex color like #2E86C1 packs the three RGB channels into six digits, two per channel.

key plate (K)

The black plate, named because it carried the detail to which the other plates were aligned (keyed); black ink exists because mixing CMY makes a muddy brown and costs triple ink.

spot color

A premixed ink of exactly one color, printed from its own plate rather than built from CMYK dots; specified by a standard number such as a Pantone number.

CORE IDEAS

The story. Full-color printing is older than you would guess, and it began as a theory of three. In the 1710s Jacob Christoph Le Blon, a painter-engraver born in Frankfurt, reasoned from Newton's new optics that if white light is a mixture, then perhaps all paintable colors could be built from three inks. He engraved three mezzotint plates per picture (one inked blue, one yellow, one red), printed them in careful register, and produced the first full-color printed pictures in history; King George I granted him a patent in 1719, and his 1725 book *Coloritto* explained the system. He soon

found theory needed help: flesh tones and deep darks wanted a fourth, black-brown plate, and his 1738 portrait of Cardinal Fleury used exactly the four-plate logic (three colors plus a dark key) that printing still uses. Today's presses run cyan, magenta, yellow and black (CMYK), better-chosen hues than Le Blon's, but the idea is his: any picture, from three colors and a key, three hundred years old and running on every inkjet in the world.

How they figured it out: the other system. Screens arrived with the opposite arithmetic. A display builds color by *adding light*: each pixel has red, green and blue emitters, each set to one of 256 levels (0 through 255), because early graphics memory gave one byte (8 bits) per channel and $2^8 = 256$. Three bytes per pixel yields $256^3 = 16{,}777{,}216$ mixtures, the famous 16.7 million colors. Programmers write the three bytes in base 16, hexadecimal, where one byte is exactly two digits: #FF0000 is R=255, G=0, B=0, pure red; #FFFFFF is white (all channels full, additive logic); #000000 is black. Reading hex is pure place value: the digits are 0–9 then A=10, B=11, C=12, D=13, E=14, F=15, and a two-digit pair means $16 \times$ first digit $+$ second digit. So #2E86C1 is $\mathrm{R} = 2 \times 16 + 14 = 46$, $\mathrm{G} = 8 \times 16 + 6 = 134$, $\mathrm{B} = 12 \times 16 + 1 = 193$: a strong mid blue. Every working designer can do this on paper, and interviewers have been known to check.

The craft. The two systems meet in every real job, and the meeting is where designs go wrong. The simple intuition connecting them: CMY are the opposites of RGB (cyan is anti-red, magenta is anti-green, yellow is anti-blue), so as a first approximation each ink percentage is the complement of its channel: $C \approx 1 - R/255$, $M \approx 1 - G/255$, $Y \approx 1 - B/255$ (expressed as percentages), with black (K) substituted for the shared gray component to save ink and keep darks crisp. But paper reflects at best the light that hits it, inks are imperfect, and so the printable *gamut* is smaller than the screen's: those glowing oranges, electric blues and neon greens you picked in RGB simply do not exist in CMYK, and the press will deliver their duller cousins. Professional practice: design for the destination (set documents for print work to CMYK early, or at least soft-proof), expect value shifts of a few percent as ink spreads into paper (dot gain), and never promise a client an exact match from a screen. The brand-critical fix is the third system: *spot color*, a single ink premixed to the exact color before it touches the press, printed from its own plate: perfectly consistent, available in colors CMYK cannot reach (vivid oranges, deep blues, metallics), and priced per extra ink.

In the studio. Spot color only works if printer and client mean the same ink, and that standard has a birthday: 1963. Lawrence Herbert, a chemist by training, had joined a small New Jersey printing company called Pantone in 1956 and found its ink room guessing; he cut its shelf of some sixty pigments down to about a dozen bases, wrote mixing formulas, and in 1963 published the Pantone Matching System: numbered colors in a fan-deck swatch book, each with its recipe, printed on both coated and uncoated paper. Now a designer in Oregon can specify PMS 186 (a flag-strong red) and a printer in Tokyo mixes the same ink. The deck has grown past two thousand colors, and brands guard their numbers the way they guard their logos. The working designer's rule of thumb: CMYK for photographs and many-colored work; spot ink when a brand color must match perfectly across jobs, or when the job uses one or two colors anyway (a two-color letterhead is often cheaper and sharper than process); RGB numbers for everything on a screen. Keep all three notations for your brand colors in one place: by Unit 8 your brand-guide documents will list exactly that: hex, RGB, CMYK and a Pantone number per color.

PICTURE STUDY



Four Color-Separation Proofs of Cardinal Fleury, Jacob Christoph Le Blon, after Hyacinthe Rigaud, 1738 · Color mezzotint: the separate progress proofs of the printing plates · Bibliothèque nationale de France, Paris

Image: Wikimedia Commons, public domain

These are working proofs from the world's first full-color printing system: Le Blon's separate plates for a 1738 portrait of Cardinal Fleury, after a painting by Rigaud. Each sheet shows ink layers of the build: the blue plate, the yellow, the red, and the dark key plate that sharpens the whole.

You are looking at the ancestor of CMYK, three hundred years before your inkjet does precisely the same trick with cyan, magenta, yellow and black dots too small to see.

Look closely

- Identify what each separate plate contributes: where does the blue plate work hardest (shadows? drapery?), and where does the yellow carry flesh?
- Find evidence of the register problem: every plate had to land on the paper in exactly the same position. What would a 1 mm slip do to the eyes or the lace?
- Why is there a dark 'key' plate at all, if blue + yellow + red were supposed to make every color? Look at where the darks would be weakest without it.

- Compare the single-plate proofs with the most complete state: which plate changes the portrait's mood the most?
- The mezzotint technique builds tone from fine roughened texture. Squint: can you see how each plate is really a value drawing in one color?

Talk about it

1. Le Blon started from Newton's theory and then let the craft correct the theory (adding the fourth plate). Where in your own work has a beautiful theory needed a practical patch?
2. Each plate is useless alone and perfect together. What does that teach about planning work in layers or separations, digital or physical?
3. Printers call the aligned plates 'in register.' What is the equivalent of mis-registration in a modern design file handed to a printer, and how do you prevent it?

Safety first. Color work means long sessions staring at bright screens. Keep the 20-20-20 habit from Unit 3, set the screen no brighter than the room requires, and judge print colors under decent light, not a dim desk lamp: your eyes are the instrument, and tired eyes measure badly.

STUDIO BRIEF

Studio brief: A Color Conversion Card and a Separation by Hand

Client: your studio again, plus the print shop you will someday call. Deliverable one: a pocket reference card (index card or quarter sheet) with the hex digit table, the three conversion formulas and the three systems' jobs, hand-lettered with Unit 3 care. Deliverable two: a Le Blon exercise: one small image separated by hand into three color layers plus a key, proving you understand separation physically.

You will need

- Index cards or cardstock; fineliner and pencil
- Tracing paper or any thin paper you can see through (3–4 sheets), tape, and colored pencils or markers in cyan-ish blue, magenta-ish red, yellow, and black
- A simple source image you draw first: a piece of fruit, a simple landscape, a mug: something with 3–4 clear colors
- Krita or GIMP for the digital check

Steps

1. Make the reference card: the 0–F digit values, the hex-pair formula, the decimal-to-hex division method, the CMY intuition formula, and one line each for when hex/RGB, CMYK and spot are the right notation. Letter it well; you will keep it.
2. Drill with the card: convert three hex codes of your own choosing to RGB and back until you get all three perfect without the card.
3. Draw the source image in line, about 10 × 10 cm, in pencil with clear color areas.
4. Tape a tracing sheet over it. On this sheet, color only what the YELLOW layer should carry (everything containing yellow: fruit body, warm highlights), in yellow, as flat value.
5. Second sheet: the RED/MAGENTA layer (everything containing red: the fruit's warm side, shadows that lean warm). Third sheet: the BLUE/CYAN layer (cool shadows, cool background, anything containing blue).

6. Fourth sheet: the KEY: dark lines and deepest darks only, in black, sparingly, as Le Blon learned.
7. Stack the sheets in register over white paper and tape a hinge edge. Lift and lower layers one at a time: watch the picture build the way the 1738 proofs do. Note where your separation guessed wrong (a color that needed two layers, a dark that needed the key).
8. Digital check: open your palette's main color in Krita, read its RGB, convert to hex on paper, then verify with the picker. Write the hex, RGB and intuition-CMY of three palette colors on the back of the reference card.
9. Photograph the stacked separation (fully assembled and half-lifted) for your process documentation.

Tips

- Flat, even color per layer: each layer is a value drawing in one ink, not a finished picture.
- Registration marks help: draw a small cross in two corners of every sheet and align the crosses.
- If a mixture disappoints (green looking gray), check which layer is too weak: that is exactly what a press operator does with ink density.

Check your work

- ☐ The reference card's formulas and table are correct and legibly lettered.
- ☐ Three hex↔RGB conversions done on paper verify perfectly in the picker.
- ☐ The four-layer separation assembles into a readable color image, with registration crosses.
- ☐ You can state, pointing at your own layers, why the key plate exists.

SKETCHBOOK

1. The hex digit table and both conversion formulas, written out once by hand from memory (then checked).
2. Your separation exercise's four layers sketched small side by side, each labeled with what it carries.
3. A gamut note: three screen colors you love that print cannot reach (name them in hex), with their nearest printable cousins beside them.

KEY FORMULAS

hex pair $d_1 d_0 = 16\,d_1 + d_0 \quad (\mathrm{A} = 10,\ \mathrm{B} = 11,\ \ldots,\ \mathrm{F} = 15)$

decimal $n \to$ hex : $\ d_1 = \lfloor n/16 \rfloor,\ d_0 = n \bmod 16$

colors $= 256^3 = 16{,}777{,}216$

$C \approx 1 - \dfrac{R}{255}, \quad M \approx 1 - \dfrac{G}{255}, \quad Y \approx 1 - \dfrac{B}{255}$ (first approximation, before black substitution)

From history. Pantone's fan deck turned color into a shared language, and in 2000 the company began naming a 'Color of the Year,' which retailers and manufacturers now plan products around: a reminder that whoever owns the standard owns a quiet kind of power. For designers the deck has a humbler daily use: the printed swatch is the truth that settles disputes, because no two screens, and no two eyes, ever quite agree.

WORKED EXAMPLES

Example 1. Convert #D35F2B to decimal RGB and describe the color in Munsell terms.

Show solution

1. R: $\mathrm{D3} = 13 \times 16 + 3 = 211$.
2. G: $\mathrm{5F} = 5 \times 16 + 15 = 95$.
3. B: $\mathrm{2B} = 2 \times 16 + 11 = 43$.
4. High red, middling green, low blue: an orange; moderately dark value, fairly high chroma: a burnt orange.

Answer: (211, 95, 43): a burnt orange of middle value and strong chroma.

Example 2. Convert RGB (64, 160, 255) to hex.

Show solution

1. 64: $64 \div 16 = 4$ remainder 0, so 40.
2. 160: $160 \div 16 = 10$ remainder 0, and 10 is A, so A0.
3. 255: $255 \div 16 = 15$ remainder 15, so FF.
4. Assemble in RGB order: #40A0FF, a bright sky blue (note B at full strength: likely out of the CMYK gamut).

Answer: #40A0FF; expect this one to dull down in print.

Example 3. Give the first-approximation CMY percentages for the brand orange (211, 95, 43), then explain in one sentence what the printer's black (K) substitution will do.

Show solution

1. C: $1 - 211/255 = 0.17 \to 17\%$.
2. M: $1 - 95/255 = 0.63 \to 63\%$.
3. Y: $1 - 43/255 = 0.83 \to 83\%$.
4. All three inks share a smallest component (17%), which is gray; the separation software will replace much of that shared gray with black ink (K), reducing C toward 0 and trimming M and Y, for crisper, cheaper printing.

Answer: About C17 M63 Y83 as a first pass; in practice roughly C0–5 M55–60 Y80 K10–15 after black substitution. The intuition gets you close; the software and a proof finish the job.

Example 4. A church prints 5,000 bulletins. Process (CMYK) printing runs $0.11 per piece. The design actually uses only black text plus one brand blue; a two-color job (black + one spot ink) runs $0.07 per piece plus a $60 plate charge. Which is cheaper, and what else does spot buy?

Show solution

1. CMYK: $5000 \times 0.11 = \$550$.
2. Spot: $5000 \times 0.07 + 60 = \$410$.
3. Savings: $140, and the blue is a solid premixed ink: perfectly even, exactly matched every single week, with no CMYK dot pattern in the logo.

Answer: The two-color spot job saves about $140 per run and matches the brand blue exactly: the classic case where spot beats process.

PRACTICE

1. Easy Convert the hex digits to decimal: A, F, 2C, 80, FF.

   Show answer

   10; 15; $2 \times 16 + 12 = 44$; $8 \times 16 = 128$; 255.

2. Easy Name these without a picker: #000000, #FFFFFF, #00FF00, #808080.

Show answer

Black; white; pure green; middle gray.

3. Easy Which system for each job: a website button, a magazine photograph, a company's exact brand red on packaging?

Show answer

RGB (hex); CMYK process; a spot ink (Pantone number), possibly alongside CMYK for the rest of the package.

4. Easy Why does each RGB channel run exactly 0–255?

Show answer

Each channel is stored in one byte: 8 bits give $2^8 = 256$ levels, numbered 0 through 255.

5. Medium Convert #1B4F72 to decimal RGB and describe the color.

Show answer

R $= 27$, G $= 4 \times 16 + 15 = 79$, B $= 7 \times 16 + 2 = 114$: a dark, somewhat muted navy blue.

6. Medium Convert RGB (245, 197, 66) to hex.

Show answer

245 = F5, 197 = C5, 66 = 42: #F5C542, a warm golden yellow.

7. Medium Compute the first-approximation CMY for RGB (40, 120, 200), then say which ink dominates and why that makes sense.

Show answer

C $= 1 - 40/255 \approx 84\%$; M $= 1 - 120/255 \approx 53\%$; Y $= 1 - 200/255 \approx 22\%$. Cyan dominates, which fits: the color is a blue, and cyan is the anti-red ink that lets blue light survive.

8. Medium Why does printing use a black (K) plate at all, if cyan + magenta + yellow theoretically make black?

Show answer

Real CMY inks mix to a muddy brown, not black; and building darks from three inks costs triple ink, oversoaks the paper and blurs fine text. One black plate gives crisp detail and cheap, true darks (and it was the key plate the others aligned to).

9. Hard How many distinct 6-digit hex codes are gray (R = G = B)? What fraction of all 16.7 million colors is that?

Show answer

256 grays (one per level). Fraction: $256/256^3 = 1/65{,}536 \approx 0.0015\%$: almost nothing, yet grays do most of design's work: another argument that value, not hue, is the scarce skill.

10. Hard A client's neon-green website color (#39FF14) must go on printed T-shirt tags. Predict the problem, then give the two professional options and the question you must ask the printer.

Show answer

#39FF14 is far outside the CMYK gamut; process printing will deliver a dull green and the client will blame the printer or you. Options: re-specify a printable CMYK green and manage expectations, or pay for a spot ink (a Pantone green close to the neon, possibly a fluorescent). Ask the printer: can this job carry a fifth (spot) ink, and at what cost per unit?

11. Hard You are the designer. Write the color section of a mini brand guide for 'Orchard Lane Market' (Lesson 4.2): give one brand color in all four notations (hex, RGB, approximate CMYK via the intuition formula, and an invented PMS-style number), and one sentence on when each notation is the one to hand over.

Show answer

Example: Orchard Red: #A63A2B; RGB (166, 58, 43); CMYK approx (0, 65, 74, 35) after black substitution of the shared gray; 'PMS 7599'-style spot for packaging. Hand hex/RGB to web developers, CMYK to the flyer printer, the spot number when the label color must match across print runs. Any correct conversions with sensible usage notes earn full credit.

COMMON MISTAKES

- Reading hex pairs as ordinary decimals (#25 is 37, not twenty-five). Every pair is base-16: multiply the first digit by 16.
- Designing print work in glowing RGB and converting on deadline day. Out-of-gamut colors shift; design toward the destination from the start.
- Specifying a brand color by screenshot or by eye. Professionals hand over numbers: hex and RGB for screens, CMYK builds for process print, a Pantone number for ink: so the color survives every handoff.
- Forgetting that K substitution changes the naive CMY numbers; the intuition formula is for understanding, the separation software and a printed proof are for production.

Make it a game · Hex Flash Duel. Make twelve cards: six with hex codes (#FF8000, #4040C0, #20A020, #F0F0F0, #803010, #00C8C8) and six with RGB triples to match. Shuffle both piles. Flip one card: convert it the other way on paper in 45 seconds, then check against its mate. One point per correct conversion, bonus point for naming the color family before checking. Play to ten points across days; retire codes you always get and write harder ones.

Scripture. “He that is faithful in that which is least is faithful also in much: and he that is unjust in the least is unjust also in much.” (Luke 16:10, KJV)

A hex digit is as small as design decisions get, two characters per channel, yet brand trust is built from exactly such smallness: the blue that matches every time. Faithfulness in least things is the whole business case for color standards.

4.4 What Color Says: Meaning, Branding and Convention

OBJECTIVES

- Explain simultaneous contrast (Chevreul, 1839): a color's appearance is changed by its neighbors, and show it with a demonstration you build yourself.
- Describe the main warm/cool associations and the industry color conventions designers work with (and sometimes deliberately break), keeping cultural notes factual.
- Audit a brand category's colors (collect, chart and analyze real examples) and argue for following or breaking the convention on a specific job.

> **Warm-up.** Find a mid-gray object (sock, card, lid). Set it first on the whitest surface in the room, then on the darkest, then on something strongly colored. Look hard each time: the gray appears to change: darker on white, lighter on black, tinged opposite the colored ground. Nothing about the object changed. Write the one-sentence moral: a color is never seen alone.

WATCH

What Does Colour Mean Within Logo Design? 6 COLOURS EXPLAINED

Satori Graphics · 7:03

https://www.youtube.com/watch?v=7-kM6pox0OM

> **WHEN TO WATCH**
> After the conventions paragraph. For each of his six colors, pause and name one real brand that confirms the convention and one that breaks it.

Note: A designer's working summary of color conventions in branding. Treat the meanings as market conventions (learned habits of buyers), not mystical laws: that is how the trade actually uses them.

BACKUP VIDEO

ADVANCED Colour Theory Makes Designs SUPERIOR! (With Real Examples)

Satori Graphics · 7:13

https://www.youtube.com/watch?v=XNkV6m4fosw

After the craft paragraph: simultaneous contrast and value relationships applied to real design examples.

KEY TERMS

simultaneous contrast

Chevreul's 1839 law: colors side by side push each other apart in appearance, each tinting its neighbor toward its own complement and shifting its apparent value.

warm and cool colors

The wheel's two temperaments: reds, oranges and yellows (advance, energize) versus blues, greens and violets (recede, calm); the strongest mood lever in a palette.

color convention

A learned association between colors and categories in a market: blue for banks and tech, green for garden and organic, red for food and urgency; conventions are habits of buyers, not laws of nature.

category audit

Collecting the actual colors used by the brands in one market and charting them, so a decision to blend in or stand out is made with evidence.

differentiation

Deliberately breaking a category's color convention so the brand is findable at a glance among rivals; powerful, and only safe when done knowingly.

afterimage

The complementary ghost your eye produces after staring at a strong color; the physiological cousin of simultaneous contrast.

CORE IDEAS

The story. In 1824 the chemist Michel Eugène Chevreul was appointed director of dyeing at the Gobelins, the French royal tapestry works, and he walked into a quality war: weavers and customers complained that the blacks in certain tapestries looked weak and brownish, and everyone blamed the dyes. Chevreul tested the black yarns chemically and found nothing wrong. Then he noticed *where* the complaints came from: blacks woven next to blues looked different from the same blacks next to orange or violet. The dye was innocent; the eye was the culprit. Colors change each other by proximity. He spent fifteen years mapping the effect with a chemist's patience and published the result in 1839: *The Law of Simultaneous Contrast of Colors*: set two colors side by side and each pushes the other toward its own complement, in hue and in value. The book became a designer's bible: weavers, printers and, famously, the painters who read him (Delacroix, and later Seurat and the pointillists, who built whole canvases from Chevreul's side-by-side dots). Chevreul lived to 102, long enough to be photographed and interviewed in 1886 as a living legend. The working moral has not aged a day: *you never choose a color; you choose a relationship.*

How they figured it out. Test it yourself, because designers get fooled by it weekly. The warm-up's gray sock is the classic demonstration; the studio version is two identical gray squares, one on a yellow field and one on a blue field: the first cools and darkens toward violet-gray, the second warms. The practical consequences: a

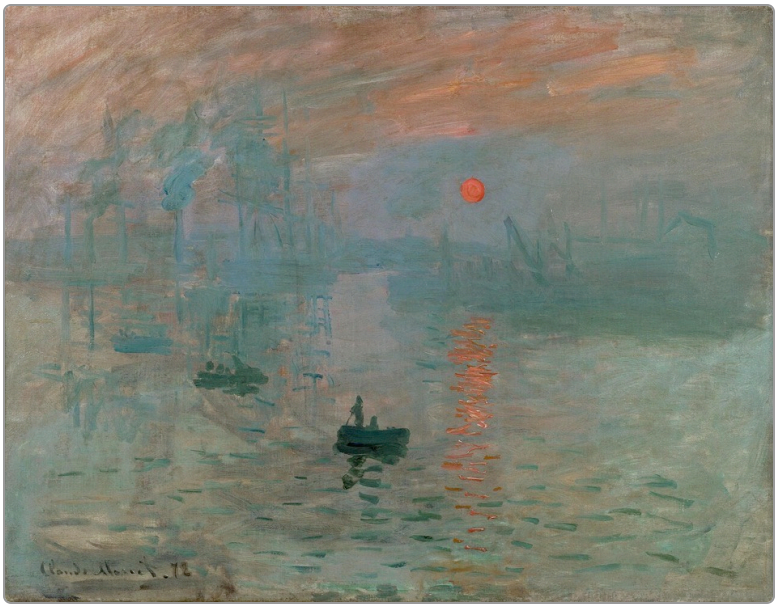
brand color approved on a white background will look different on the packaging's navy; text that contrasted nicely on your mockup's field may vibrate or vanish on the photo it finally sits on; and two palette colors that are comfortable apart can shimmer painfully when touching (full-chroma complements of equal value produce the infamous vibrating edge: the eye cannot settle, because each side keeps shoving the other). Professional habits that answer Chevreul: always judge colors in context (mock the palette up in its real proportions on its real background before approving it); test the brand color on every field it will live on; and when an edge vibrates, separate the combatants with value difference, a neutral line, or lowered chroma on one side.

The craft. Beyond the eye's mechanics lie the market's habits. Warm colors (red through yellow) read as energetic, appetizing, urgent: they advance toward the viewer; cool colors (blue through violet) read as calm, competent, clean: they recede. On top of that temperament, each market carries learned conventions, and a designer must know them the way a builder knows local code: blue dominates banks, insurers and technology (trust, stability: and nearly half of big-brand logos use it); green owns garden, organic, outdoor and money contexts; red runs food, clearance and urgency; black-plus-gold signals luxury; pastels mark baby and gentle products. Keep cultural notes factual and job-relevant: conventions are learned, so they vary by country and era (in much of East Asia, for instance, white has long been the color of mourning, and red of celebration: a real consideration for export packaging, checked per market, not guessed). The craft decision on every brand job is the same fork: *follow* the convention to borrow its instant recognition (a new lawn-care brand in green is understood before it is read), or *break* it to be findable (one orange box on a shelf of blue competitors owns the shelf). Both are legitimate; only ignorance is not. The tool for choosing is the category audit: collect the actual competitors, swatch their colors, chart the category's center of gravity, and then decide, with the client, where to stand.

In the studio. Here is the audit as a deliverable, because you will sell this exact work someday. For a client entering, say, the coffee-roaster market: gather 10–15 competitor bags (photos suffice); sample each brand's dominant color and accent into a swatch chart; cluster them (browns and blacks dominate, a few reds, one green); mark the empty regions of the wheel; then present two directions with reasoning: 'the category speaks kraft-brown and black; we can speak it more

beautifully than anyone, or we can be the only pale-blue bag on the shelf: here are both, mocked up between two real competitors.' That last detail: showing the design *between its actual neighbors*: is Chevreul applied to commerce, and it is what separates a professional presentation from a pretty one. Clients decide confidently when they see the relationship, because the relationship, not the swatch, is what shoppers will see.

PICTURE STUDY



Impression, Sunrise (Impression, soleil levant), Claude Monet, 1872 · Oil on canvas, 48 × 63 cm · Musée Marmottan Monet, Paris

Image: Wikimedia Commons, public domain

Shown in Paris in 1874, this harbor sketch of Le Havre lent its title to an entire movement when the critic Louis Leroy mocked it as mere 'impressionism.' The painting is a masterclass in this lesson: one small orange sun against a field of cool blue-grays: complementary contrast spent in one place, like a 10% accent.

It hides a famous secret: the sun is barely lighter than the sky around it. In a grayscale photo the sun almost disappears: its blaze is made almost entirely of hue and chroma contrast against the complementary field, not of value. Monet spent value everywhere else and let Chevreul's law light the sun.

Look closely

- Find the strongest chroma in the painting. How much area does it cover? Estimate it as a fraction of the canvas.
- Squint until the painting grays out: what survives (boats, water bands) and what vanishes (the sun)? What does that tell you about how the sun's glow is manufactured?
- The field is not one blue: find the warmer and cooler grays inside the haze. How do they keep so quiet?

- Follow the sun's reflection: how does Monet keep the orange alive as it drops through cool water?
- Where are the darkest values, and what work do they do that color does not?

Talk about it

1. Monet made the focal point out of hue contrast instead of value contrast: it glows but would fail a grayscale check. When is that trade available to a designer, and when (think text, signage, Lesson 4.5) is it forbidden?
2. The critic's insult became the brand of the century. What does that suggest about how names and reputations actually form, for movements and for studios?
3. One orange, many blues: restate the painting's palette as 60-30-10 roles. What is the 60? The 10?

STUDIO BRIEF

Studio brief: A Category Color Audit with Recommendation

Client: Orchard Lane Market (continuing account). Before committing to the palette you proposed in Lesson 4.2, the owners want proof it will work in the real market. Deliverable: a one-sheet category audit of at least 8 real food/farm/market brands you can actually observe (grocery shelves, local stands, packages in your own pantry), with swatch chart, analysis, and a follow-or-break recommendation showing your palette mocked between two real competitors. This is a genuine professional document type; do it to portfolio standard.

You will need

- Access to a pantry, grocery run or main-street walk, and a phone camera or careful notes
- Paints/pencils or Krita for swatching; cardstock or a digital sheet for the audit board
- Your three palettes from Lesson 4.2 and your value plan
- Ruler, pencil, fineliner for the chart

Steps

1. Collect: photograph or note at least 8 brands in the food/farm/market category (jam jars, produce boxes, farm signs, bread bags). Record each brand's dominant color, secondary and accent.
2. Swatch: paint or pick each brand's 2–3 colors as a tidy row with the brand name beneath. Honest sampling, not from memory.
3. Chart: draw a simple wheel and plot every dominant color's hue on it as a dot (grays and browns in a side column). Circle the crowded region; mark the empty regions.
4. Analyze in three written sentences: where the category clusters, what values dominate (light fields? dark?), and which of your Lesson 4.2 palettes lands where on the chart.
5. Decide: follow or break, with your chosen palette possibly adjusted (state any adjustment and why: this is normal; audits change palettes).

6. Mock in context: draw or assemble your Orchard Lane label or sign at small size between two actual competitor images (or careful sketches of them). This is the Chevreul exhibit: the client must see the neighbors.
7. Compose the one-sheet: title, swatch rows, wheel chart, three analysis sentences, the context mockup, and your recommendation in one bold sentence.
8. Present it in two minutes to your 'client,' leading with the chart, ending with the context mockup. Log one question they ask and your answer on the back.

Tips

- Audit what you can truly see; eight honest local samples beat twenty guessed national ones.
- Keep brand swatches small and uniform; the chart is the hero of the sheet.
- If the audit kills your favorite palette, let it die in public: writing 'adjusted after audit' on the sheet is professionalism, not defeat.

Check your work

- ☐ At least 8 real brands swatched honestly and named.
- ☐ The wheel chart shows clustering and empty regions clearly.
- ☐ The recommendation is explicit (follow or break) and the palette adjustment, if any, is stated.
- ☐ The context mockup shows your design between real neighbors.

SKETCHBOOK

1. The gray-strip demonstration built and taped in: one gray across two colored fields, with your observation written beside it.
2. An afterimage experiment: stare 30 seconds at a strong red square, look at white paper, and sketch/note the ghost's color. Connect it to simultaneous contrast in one sentence.
3. Three brands from today's audit redrawn as thumbnail labels with their colors swapped into a different category's convention: what breaks?

From history. Chevreul's day job built the science a second gift: his 1839 book included rules for the Gobelins' yarn-dyeing palette so vast (over 14,000 graded tones) that it amounted to an early color-order system, a forerunner of Munsell's 1905 notation. And his hundredth-birthday interview and photographs in 1886 are often called the first photo-interview in journalism: the man who proved colors change by context became, at the end, a lesson that careers can run very long when built on patient measurement.

WORKED EXAMPLES

Example 1. A category audit of 12 local service companies finds brand colors: 7 blue, 2 green, 1 red, 1 gray, 1 orange. Chart the percentages, and write the two-direction recommendation a designer would present.

Show solution

1. Percentages: blue $7/12 \approx 58\%$, green 17%, red, gray and orange about 8% each.
2. Direction A (follow): join the blue majority to borrow the category's trust signal, and differentiate by value and typography (a deeper navy than any rival, Unit 3 craft doing the distinguishing).
3. Direction B (break): claim the warm side of the wheel (orange territory, nearly empty) to be findable instantly, accepting the cost of building trust signals by other means (imagery, testimonials, type).
4. Both are defensible; the audit numbers are what make either a decision instead of a guess.

Answer: Blue 58%, green 17%, others 8% each; present 'deepest navy in the category' versus 'the only warm brand in town,' each mocked beside real competitors.

Example 2. Two palette colors, a red and a green of equal value and full chroma, vibrate where they touch on a poster. Give three fixes, each tied to one of Munsell's dimensions or to layout.

Show solution

1. Value fix: darken one (a deep green under a bright red) so the boundary carries value contrast, which the eye resolves calmly.
2. Chroma fix: mute one partner substantially; a gray-green lets the red sing without the shimmer.
3. Layout fix: keep both at strength but separate them with a neutral: white gap, black keyline, or distance.

Answer: Darken one, mute one, or part them with a neutral; equal-value full-chroma complements may never share an edge.

Example 3. A U.S. jam maker is exporting gift boxes to a market where white packaging reads as funerary. The current box is white with red accents. What does the designer do, in order?

Show solution

1. Verify, not guess: confirm the convention with in-market sources or the client's local distributor; conventions are factual claims and get checked like any other fact.
2. Audit the destination category: photograph competing gift jams there; chart their colors.
3. Adapt: shift the field color toward the market's gift conventions (the audit will show them: often warm creams, reds or golds) while keeping the brand's recognizable accents and type.
4. Proof in context: mock the box among the destination shelf's real neighbors before production.

Answer: Check the claim, audit the destination market, adapt the field color while preserving brand equity, and proof in shelf context: the same audit method, applied across a border.

PRACTICE

1. Easy State Chevreul's law of simultaneous contrast and the year he published it.

Show answer

Colors side by side change each other's appearance, each pushing its neighbor toward its own complement in hue and shifting its apparent value; published 1839.

2. Easy Warm or cool, and one word of mood each: terracotta, steel blue, lemon yellow, sage green.

Show answer

Terracotta: warm, earthy/inviting. Steel blue: cool, competent/calm. Lemon: warm, energetic/cheerful. Sage: cool (leaning neutral), gentle/natural.

3. Easy Name the conventional home category of: blue, green, red, black-and-gold.

Show answer

Blue: banks, insurance, technology (trust). Green: garden, organic, money. Red: food, urgency, clearance. Black and gold: luxury.

4. Easy Why did the Gobelins' black yarns look brown next to blue, chemically perfect as they were?

Show answer

Simultaneous contrast: the neighboring blue pushed the black toward blue's complement (orange-brown) in the eye; the dye was innocent, the relationship was the cause.

5. Medium Your client approved a brand teal on a white screen. On the final kraft-brown box it looks grayer and duller. Explain with this lesson and name the preventive habit.

Show answer

The warm brown ground pushes the teal toward its complement and changes its apparent value and chroma (besides any printing shift). Preventive habit: approve colors only in context: mocked on the real background, in the real proportions.

6. Medium An audit of 10 lawn-care brands finds 8 green, 1 yellow, 1 blue. Give one argument for green and one for not-green for a new entrant, each in a sentence a client would understand.

Show answer

Green: the category's customers recognize lawn care by green before they read a word, so we start understood. Not-green: on a shelf of eight greens, the one warm-yellow brand is found in a second, and being findable is worth more than blending in.

7. Medium Design a demonstration card that proves simultaneous contrast to a client in ten seconds. Describe exactly what is on it.

Show answer

One strip of a single mid-gray (cut from one sheet, so no one can argue) laid across two fields, half on bright yellow, half on deep blue; the gray visibly differs end to end. Optionally a flap that isolates each half to show the strip is identical.

8. Medium Why should cultural color notes in a brand guide be written as checkable facts with sources rather than as broad claims?

Show answer

Conventions are learned and local: they vary by market and change over time; a factual, sourced note ('verified with the distributor, 2026: white gift packaging reads funerary in this market') can be acted on and re-checked, while a vague claim misleads the next designer.

9. Hard A poster puts full-chroma red headline type directly on a full-chroma green field, equal value. Predict the physiological result for the reader and prescribe the standard fixes in order of preference for legibility.

Show answer

The edge vibrates (the eye oscillates between complements of equal value) and the type also risks disappearing entirely for red-green color-blind readers (Lesson 4.5). Fixes: first add value contrast (very dark green field, light red-influenced headline or white type); second mute one partner's chroma; third separate with a neutral outline. For text, value contrast is non-negotiable.

10. Hard Plan a category audit for 'Orchard Lane Market' (your Unit 4.2 client) entering the farm-stand market in your county. List the steps and what chart you would draw.

Show answer

Photograph or collect 10+ area farm stands' and markets' signs and labels; sample each one's dominant and accent colors; swatch them on one sheet; chart hue distribution around a wheel (expect greens, reds, kraft browns) and note empty regions; mark each competitor's value range; recommend follow-or-break with both options mocked between two real competitors' signs.

11. Hard Seurat and the pointillists painted with separate dots of pure color, trusting the viewer's eye to mix them. Connect that to Chevreul, and name the modern display technology that uses the same principle.

Show answer

They applied Chevreul's side-by-side laws deliberately, letting adjacent complements and neighbors mix optically rather than on the palette. Your screen does the same: every pixel is separate red, green and blue dots mixed by the eye at viewing distance.

COMMON MISTAKES

- Approving colors in isolation. A swatch on white tells you almost nothing about the same color on navy, kraft or a photograph; judge relationships, not chips.
- Treating color meanings as universal laws. They are market conventions, learned and local; check them per audience, and write them down as checkable facts.
- Breaking a category convention by accident. The one orange box on the blue shelf is a strategy when chosen and a mistake when stumbled into; the audit is what makes it a choice.
- Letting equal-value complements share an edge in text or logos: the vibration is fatiguing, and it previews the legibility failures Lesson 4.5 measures.

> **Make it a game · Shelf Spy.** In the pantry or on one grocery aisle (or from memory with packages on the table), a parent names a category: cereal, coffee, soap, canned vegetables. In 60 seconds, name the category's convention colors, the biggest rule-breaker you can find, and whether the breaker's choice looks deliberate or accidental, with one reason. Three categories per round; the parent judges reasons. Then swap: you name the category and judge their audit.

> **Scripture.** “Come now, and let us reason together, saith the LORD: though your sins be as scarlet, they shall be as white as snow; though they be red like crimson, they shall be as wool.” (Isaiah 1:18, KJV)
>
> Scripture itself speaks in color conventions: scarlet for guilt, white for cleansing, because colors carry meanings hearers already know. The verse works exactly the way a designer's palette works: meaning first, color as its messenger.

4.5 Color Everyone Can Read: Contrast and Color-Blind-Safe Design

OBJECTIVES

- Explain relative luminance and compute a WCAG contrast ratio from two luminance values with $(L_1 + 0.05)/(L_2 + 0.05)$, judging results against the 4.5:1 and 3:1 thresholds.
- Describe red-green color vision deficiency (about 8% of men, about 0.5% of women), what confusions it causes, and the design rules that make work readable anyway.
- Audit and repair a palette with free tools (WebAIM contrast checker, grayscale check, color-blindness simulation), framing the work as craftsmanship: legible for every reader, in bad light, on cheap paper, at speed.

> **Warm-up.** Take any page with colored text or buttons (a website, a flyer, a cereal box) and step back until it is just past comfortable reading distance, or view it through squinted eyes in dim light. Which text gives up first? Note its colors. Low contrast fails the weakest viewing conditions first, and every design is eventually viewed in weak conditions.

WATCH

How to test for Color Contrast | TPGI & WebAIM | WCAG

The Accessibility Guy · 6:45

https://www.youtube.com/watch?v=D8TPUqbhRmA

> **WHEN TO WATCH**
> After the craft paragraph on ratios. Follow along: open the WebAIM checker and test two colors from your own Unit 4.2 palettes as he demonstrates.

Note: A practical demonstration of the free testing tools professionals actually use. The ratios he checks against (4.5:1, 3:1) are the ones you will compute by hand in the worked examples.

BACKUP VIDEO

Hyperlegible: an approach to accessible type design

Linus Boman · 10:14

https://www.youtube.com/watch?v=wjE5eHLICzc

After the studio paragraph: how the Braille Institute's Atkinson Hyperlegible typeface was designed for low-vision readers, uniting this lesson with Unit 3's letterforms.

KEY TERMS

relative luminance (L)
A number from 0 (black) to 1 (white) expressing how bright a color is to the human eye, with green weighted most because the eye is most sensitive to it.

contrast ratio
The WCAG comparison of two luminances, $(L_1 + 0.05)/(L_2 + 0.05)$, running from 1:1 (identical) to 21:1 (black on white).

WCAG
The W3C's Web Content Accessibility Guidelines (version 2.0, 2008, and successors), the standard that sets the 4.5:1 and 3:1 contrast thresholds used across the industry and in many laws.

AA and AAA
WCAG conformance levels: AA requires 4.5:1 for normal text and 3:1 for large text (18 pt, or 14 pt bold); AAA raises text to 7:1.

color vision deficiency (CVD)

Reduced ability to distinguish certain hues, most commonly red from green; affects about 8% of men and about 0.5% of women of Northern European descent.

deuteranomaly / protanopia

The common forms of red-green CVD: weakened green sensitivity (most common) and missing red sensitivity; both collapse reds, greens, oranges and browns toward one another.

redundant coding

Never letting color be the only carrier of meaning: pair it with value difference, labels, shapes or patterns, so the message survives any eye.

CORE IDEAS

The story. In 1794 the chemist John Dalton, who would later found atomic theory, read a paper to the Manchester Literary and Philosophical Society describing an experiment he could not stop running: his own eyes. A pink geranium that others called red looked sky-blue to him by candlelight; ribbons others sorted easily, he confused; his brother saw the same way, and almost nobody else he asked did. 'Extraordinary Facts relating to the Vision of Colours' was the first scientific description of color blindness, and for a century the condition was simply called Daltonism. Dalton guessed his eye's fluid was tinted blue, and willed his eyes to science to check; the dissection in 1844 found the fluid clear, and the real answer waited 151 years: in 1995, DNA from his preserved eye showed he was a deuteranope, missing the green-sensitive photopigment. The numbers matter to every working designer: red-green color vision deficiency runs in roughly 8% of men and 0.5% of women of Northern European ancestry: about one man in twelve. Design a poster, a chart or a wayfinding sign for a hundred people and several of them are Daltons. Craftsmen build for the users they actually have.

How they figured it out. The web gave legibility its first enforceable arithmetic. The W3C's Web Content Accessibility Guidelines (WCAG 1.0 in 1999, the lasting WCAG 2.0 in December 2008) needed a definition of 'enough contrast' that a machine could check, and built it on *relative luminance*: every color reduces to a brightness number L from 0 (black) to 1 (white), computed from its RGB channels with weights near $0.2126\,R + 0.7152\,G + 0.0722\,B$ (after an exponent-based correction of each

channel): green carries most of the weight because the eye is most sensitive there, blue least. Two colors are then compared by the **contrast ratio** $(L_1 + 0.05)/(L_2 + 0.05)$, lighter color on top; the 0.05 terms model the faint veil of light every real screen and eye adds, and they keep the scale finite: pure black on pure white gives $1.05/0.05 = 21$, the maximum, and identical colors give 1. The thresholds: **4.5:1** for normal text and **3:1** for large text (18 pt and up, or 14 pt bold) at level AA, 7:1 for AAA. The exact luminance formula is fussy (the free checkers run it for you), but the ratio arithmetic is yours to own, and with it the judgment the numbers encode: text is read by its value contrast, measured, not vibed.

The craft. The contrast rules and the CVD rules turn out to be the same rules, which is why professionals treat them as one craft. What red-green CVD does: reds, greens, oranges and browns slide toward one another (a deuteranope sees your red-on-green Christmas flyer as brown-on-brown); red text on black loses its pop; red/green 'stop/go' coding in charts and forms simply vanishes. What survives every eye: *value contrast* (a dark anything on a light anything), *blue–orange oppositions* (blue sensitivity is almost never lost, which is why the colorblind-safe palettes lean on blue, orange and their neighbors, like the eight-color Okabe–Ito set published in 2008), and *redundant coding*: color never alone, always doubled with a label, a value step, a shape or a pattern (the subway map that pairs each colored line with a name and letter; the chart whose lines differ in dash pattern as well as hue). The working checklist for any design: (1) compute or check the contrast ratio of every text/background pair against 4.5:1 (or 3:1 for large); (2) grayscale the piece: hierarchy must survive; (3) simulate deuteranopia and protanopia (free in many tools and online simulators) and confirm nothing meaningful merges; (4) find every place color alone carries meaning and double-code it. Fifteen minutes, every job, forever.

In the studio. Frame this to clients and to yourself as what it is: craftsmanship and reach, the same professional duty as setting readable type. A poster read from a moving car in rain, a menu in candlelight, a label under a warehouse's orange sodium lamps, a grandfather's dimming eyes, a colorblind hiring manager reading your portfolio: high-contrast, redundantly coded design is simply design that works more places for more readers, and it costs nothing when planned (the dark navy that passes 4.5:1 was always available next to the mid-blue that fails). Practically: test early (checking after approval is expensive; checking at the palette stage is free: run

your Lesson 4.2 palettes through WebAIM now and mark which pairs can carry text); keep a tested-pairs card in your brand guides: each background with its approved text colors and ratios; and when a wanted color fails, fix value first (darken or lighten it), because hue can usually stay: clients rarely mind a deeper version of their blue, and never mind that their customers can read the sign. In Unit 9 (screens) these checks become contractual: many clients are legally required to meet WCAG AA, and the designer who arrives already fluent is the one who gets hired back.

PICTURE STUDY



Poster for Harper's Magazine, May 1897, Edward Penfield, 1897 (reproduced in Les Maîtres de l'Affiche) · Color lithograph poster · Designed for Harper's Magazine, New York

Image: Wikimedia Commons, public domain

Edward Penfield drew a new poster for Harper's Magazine nearly every month from 1893, and the series virtually founded the American poster style: broad flat shapes, few colors, blunt value contrast, and lettering plain enough to read from a passing streetcar. He was legibility's craftsman before legibility had standards.

Study it with this lesson's eyes: Penfield's posters pass the grayscale check, survive distance and bad light, and lean on value rather than hue: WCAG craft sixty years before the W of WCAG existed.

Look closely

- Squint or imagine the poster in grayscale: does every important element survive? Find the strongest value edge.
- Count the colors. How does Penfield get richness from so few? (Look for how flat shapes share edges.)
- Where is the darkest dark, and is it spent on the focal point? Compare with the Hokusai and Monet studies.
- Judge the lettering by Unit 3: classification, spacing, size for distance. Would it read across a street?

- Is there any place where color alone carries a meaning that value does not back up? What does that tell you about the poster's readers?

Talk about it

1. Penfield designed for streetcar distance, rain and hurry: the weak viewing conditions of his day. List the weak conditions your own work must survive, and which of this lesson's tests covers each.
2. Flat shapes with strong value contrast also happen to survive color blindness. Why does craftsmanship for one limitation so often serve another?
3. A monthly poster for years built Penfield's reputation sheet by sheet. What repeated, visible practice could build yours while you take this course?

Safety first. Contrast testing means staring at bright screens and tiny swatches; keep the 20-20-20 habit, and check print proofs under honest light rather than leaning into a dim page: good judgment needs rested eyes.

STUDIO BRIEF

Studio brief: The Accessibility Audit and Repair

Client: Orchard Lane Market's owners just learned their county fair booth will be seen by thousands, in tents, at dusk, by every kind of eye. They want their whole color system audited and repaired: the palette you recommended (4.2, adjusted in 4.4) must now pass professional legibility testing. Deliverable: a before/after audit sheet: every text/background pair tested with ratios recorded, CVD simulation results noted, failures repaired with values moved (hues preserved where possible), and a final 'tested pairs' card suitable for their brand guide.

You will need

- Your final Orchard Lane palette with hex codes (from Lessons 4.2–4.4)
- A browser with the WebAIM Contrast Checker and a free color-blindness simulator (several run in the browser; Krita and GIMP can also simulate via view filters or desaturation)
- The Lesson 4.3 conversion card for reading your hex codes
- Cardstock or a digital sheet for the audit board

Steps

1. List every realistic text/background pair in the brand's life: dark text on light field, light on dark, accent on field, text on accent, price numerals on label.
2. Test each pair in WebAIM: record the exact ratio and pass/fail at 4.5:1 and 3:1. No rounding up; the sheet is evidence.
3. Grayscale the palette (desaturate swatches in Krita/GIMP): confirm at least three distinct values survive; note any merges.
4. Simulate deuteranopia and protanopia on the palette and on your 4.4 mockup: note every pair that merges or loses meaning.
5. Repair the failures by moving value first: darken fields or text, lighten tints; keep hues where possible and record each change as old hex to new hex.
6. Hunt color-only meaning in the mockups (a red 'sale' that is only red? ripeness shown only by color?) and double-code each: words, shapes or value

steps.

7. Re-test every repaired pair and re-simulate; the 'after' column must show all passes.
8. Produce the tested-pairs card: each approved background with its approved text colors and their ratios, plus the one-line rule for the accent. Present before/after to your 'client' in two minutes, leading with what the dusk-lit tent would have done to the old palette.

Tips

- Fix value, keep hue: clients accept a deeper blue far more readily than a different blue.
- A pair at 4.6:1 passes but has no production margin; note 'barely' on the card like an honest surveyor.
- Save the before/after sheet for your portfolio: accessibility audits are billable professional work and prove rare discipline in a student book.

Check your work

- ☐ Every text/background pair has a recorded numeric ratio, before and after.
- ☐ All 'after' pairs pass their applicable threshold (4.5:1 or 3:1 as used).
- ☐ CVD simulations show no meaning carried by color alone.
- ☐ The tested-pairs card is client-ready: backgrounds, approved text colors, ratios, accent rule.

SKETCHBOOK

1. The contrast formula and both thresholds, hand-lettered as a studio-wall card with one worked example.
2. Your palette's swatches painted or printed twice: full color and grayscale, with the value merges circled.
3. A redesign thumbnail: take any red/green color-coded thing you find (a chart, a game, packaging) and sketch its redundantly coded version.

KEY FORMULAS

$$\text{contrast ratio} = \frac{L_1 + 0.05}{L_2 + 0.05} \quad (L_1 \text{ the lighter})$$

$L \approx 0.2126\,R' + 0.7152\,G' + 0.0722\,B'$ (channels gamma-corrected to 0–1; checkers compute this for you)

AA: 4.5:1 normal text, 3:1 large text (18 pt, or 14 pt bold), AAA: 7:1

From history. The tools for checking color vision have their own design history: in 1917 the Japanese ophthalmologist Shinobu Ishihara published his dot-plate tests, hand-painted circles of dots in which numerals hide, originally for military screening; they remain the standard first test today. And the Okabe–Ito palette of 2008: eight colors chosen by two vision scientists (themselves working with CVD colleagues) to stay distinct for all common color vision: has become a quiet standard in scientific charting, proof that a well-designed constraint can simply be adopted by a whole field.

WORKED EXAMPLES

Example 1. Compute the contrast ratio of pure black text ($L = 0$) on a white field ($L = 1.0$), and of middle-gray text ($L = 0.22$) on the same white.

Show solution

1. Black on white: $(1.0 + 0.05)/(0 + 0.05) = 1.05/0.05 = 21$: the maximum ratio, 21:1.
2. Gray on white: $(1.0 + 0.05)/(0.22 + 0.05) = 1.05/0.27 \approx 3.9$.
3. Judge: 3.9:1 fails the 4.5:1 normal-text threshold but passes 3:1, so this gray may serve large headlines only.

Answer: 21:1 and about 3.9:1; the gray is legal only for large text at AA.

Example 2. A brand blue has luminance $L = 0.14$. The client wants it as text on a pale cream of $L = 0.82$. Does it pass for body text? For large text? What about white text ($L = 1.0$) on the blue as a button?

Show solution

1. Blue on cream: $(0.82 + 0.05)/(0.14 + 0.05) = 0.87/0.19 \approx 4.6$: passes 4.5:1, barely; fine for body text, with no margin for a lighter cream.
2. Large text passes easily (4.6 > 3).
3. White on blue: $(1.0 + 0.05)/(0.14 + 0.05) = 1.05/0.19 \approx 5.5$: a comfortable pass for button labels.

Answer: About 4.6:1 (pass, barely) and 5.5:1 (pass). Report the numbers to the client; 'barely passes' is worth saying out loud before the cream drifts lighter in production.

Example 3. A co-op class has 24 students: 13 boys and 11 girls. Using 8% of men and 0.5% of women, what is the expected number of students with red-green CVD, and what does the answer mean for a 'red = wrong, green = right' worksheet design?

Show solution

1. Boys: $13 \times 0.08 = 1.04$.
2. Girls: $11 \times 0.005 = 0.055$.
3. Expected: about 1.1 students: in a typical class of this size, odds are someone cannot use red-versus-green coding.
4. Fix by redundant coding: red X versus green check (shape carries it), or dark red versus light green (value carries it), plus labels.

Answer: About 1 student. Color-only coding fails someone in nearly every classroom; double-code with shape, value or words.

Example 4. Your poster's orange accent ($L = 0.35$) sits on a mid-green field ($L = 0.30$). Compute the ratio, predict the CVD result, and prescribe the repair that keeps both hues.

Show solution

1. Ratio: $(0.35 + 0.05)/(0.30 + 0.05) = 0.40/0.35 \approx 1.1$: essentially no value contrast; even normal vision reads it as shimmer, not shape.
2. Under deuteranopia the orange and green hues also collapse toward each other: the accent disappears entirely.
3. Repair by value, keeping hue: darken the green field to about $L = 0.08$: $0.40/0.13 \approx 3.1$: passes 3:1 for large display shapes; for body text on that field use white or near-white instead ($1.05/0.13 \approx 8.1$).

Answer: 1.1:1: invisible to someone and weak for everyone. Deepen the field's value: large elements pass at about 3.1:1 and white text passes at about 8:1, with both brand hues intact.

PRACTICE

1. Easy State the WCAG AA contrast thresholds for normal and large text, and define large text.

   Show answer

   4.5:1 for normal text; 3:1 for large text, meaning 18 pt and up, or 14 pt bold and up.

2. Easy What fraction of men and of women have red-green CVD, and which color confusions result?

   Show answer

   About 8% of men and about 0.5% of women; reds, greens, oranges and browns collapse toward one another (and red/green signals fail).

3. Easy Compute the contrast ratio for white ($L = 1.0$) on a dark gray of $L = 0.05$.

   Show answer

   $1.05/0.10 = 10.5$: about 10.5:1, an easy AA and AAA pass.

4. **Easy** Why is green weighted most in the luminance formula?

Show answer

The human eye is most sensitive to green light (and least to blue), so green contributes most to perceived brightness: weights about 0.71 green, 0.21 red, 0.07 blue.

5. **Medium** Text of $L = 0.45$ sits on a field of $L = 0.95$. Ratio? Verdict for body text, and the two repair directions?

Show answer

$1.00/0.50 = 2.0$: fails both thresholds. Darken the text (toward $L \approx 0.17$ gives $1.00/0.22 \approx 4.5$) or lighten/darken the relationship otherwise (white field with much darker text); hue may stay, value must move.

6. **Medium** Why do colorblind-safe palettes lean on blue and orange?

Show answer

Blue discrimination survives nearly all common CVD (red-green types), so blue-versus-orange oppositions stay distinct where red-versus-green merges; the Okabe–Ito palette (2008) is built on this.

7. **Medium** A hiking map marks easy trails green and hard trails red, same value. Apply redundant coding: give three fixes that work together.

Show answer

Add labels (E/H or names), differentiate line patterns (solid versus dashed), and separate values (light green versus very dark red); any reader, any printer, any eye now reads it.

8. **Medium** A youth group of 40 boys attends your church event. Expected number with red-green CVD? Should the event signage use red/green team coding?

Show answer

$40 \times 0.08 = 3.2$: about three boys. No: use blue/orange (or add shapes and names), or several signs will fail their readers.

9. Hard Prove with the formula why no color can achieve 4.5:1 against both pure white and pure black at once. What is the design consequence for a logo that must sit on photos?

Show answer

Against white: $1.05/(L+0.05) \geq 4.5$ needs $L \leq 0.183$. Against black: $(L+0.05)/0.05 \geq 4.5$ needs $L \geq 0.175$. The overlap is a sliver ($0.175 \leq L \leq 0.183$), and real photos are never pure black or white, so practically one mid color cannot serve both extremes. Consequence: logos need light and dark versions, or a containing shape (badge) that guarantees the background.

10. Hard Monet's sun (Lesson 4.4) glows with almost no value contrast. A client asks for a website headline to 'glow like that' in orange on blue-gray at equal value. Reconcile art and standard in your professional reply.

Show answer

In painting, the focal point may run on pure hue contrast because nothing must be read. Text is different: equal-value orange on blue-gray fails the measurable 4.5:1 and may vanish for CVD readers. Offer the craftsman's version: deepen the field and brighten the orange so the ratio passes, keeping the complementary glow; the Chevreul effect still works, now with value behind it.

11. Hard Write the 'tested pairs' card for a two-color brand: navy ($L = 0.06$) and cream ($L = 0.88$): compute the ratio each way, state what sizes each direction may carry, and add the rule for the accent orange ($L = 0.35$).

Show answer

Navy on cream (or cream on navy): $0.93/0.11 \approx 8.5$: passes AA and AAA for all text sizes, both directions. Orange on cream: $0.93/0.40 \approx 2.3$: fails text; orange on navy: $0.40/0.11 \approx 3.6$: large text only. Card rule: orange is for shapes, rules and large display on navy, never for body text.

COMMON MISTAKES

- Testing the palette but not the pairs. Contrast is a property of two colors together; a 'good' color does not exist alone (Chevreul again, now with arithmetic).
- Treating 4.5:1 as a target instead of a floor. Production (ink spread, cheap screens, sunlight) erodes margins; passing with room is the craftsman's pass.

- Relying on hue contrast for text. The Monet trade (glow without value difference) is for pictures, never for words, numbers or wayfinding.
- Letting color alone carry meaning. If the grayscale or CVD version loses the message, add labels, shapes or value steps: redundancy is the rule, not the exception.

Make it a game · Pass or Fail Court. Make eight cards, each with a text/background luminance pair you invent (write both L values, e.g. text 0.12 on field 0.80). Deal them one at a time: you have 30 seconds per card to compute the ratio with the $(L_1 + 0.05)/(L_2 + 0.05)$ formula and rule pass or fail for body text and for large text. A parent checks with a calculator. Seven of eight correct wins; then both of you test two real pairs from this house (a package, a website) in the WebAIM checker and see who predicted them better.

Scripture. “Thou shalt not curse the deaf, nor put a stumblingblock before the blind, but shalt fear thy God: I am the LORD.” (Leviticus 19:14, KJV)

The law of Moses makes consideration for the limits of others' senses a matter of fearing God, not of convenience. Design that one reader in twelve cannot read is a stumblingblock laid by carelessness; the craftsman removes it before anyone trips.

UNIT 4

Color: Theory, Systems and Craft

Color is the fastest tool in design: a viewer feels a poster's color before reading a single word. It is also the most mismanaged, because beginners treat it as taste when professionals treat it as craft. In this unit you learn how color actually works (hue, value and chroma, and why value does most of the heavy lifting), how to build palettes on purpose, how the three color systems of the working designer (RGB on screens, CMYK on press, spot inks like Pantone) describe and deliver color, what colors conventionally say in branding, and how to make color that everyone can read, including the roughly one man in twelve with red-green color blindness.

The stories belong to careful people: Isaac Newton splitting sunlight with a prism in 1666 and closing the spectrum into the first color circle; Michel Eugène Chevreul, the dye chemist of the Gobelins works, discovering in the 1830s that a color's apparent change is caused by its neighbors and publishing the law of simultaneous contrast in 1839; Albert Munsell building a fair, numbered color system (hue, value, chroma) in 1905; Jacob Christoph Le Blon printing full-color pictures from three plates in the 1720s, the ancestor of CMYK; and Lawrence Herbert, who in 1963 turned a printer's ink-mixing chaos into the Pantone Matching System. Their tools are on your computer today, with the same numbers attached.

Color is numerical here, as it is in the trade: hex codes and their base-16 arithmetic, the 256 levels of each RGB channel, the simple intuition connecting RGB and CMYK, wheel geometry in degrees, and the WCAG contrast ratios (4.5:1 and 3:1) that decide whether text can be read. Everything is done with free tools: paint or colored pencils when mixing matters, Krita and GIMP when pixels do, and the free WebAIM contrast checker when legibility must be proved.

PREREQUISITES

- Units 1–3 of this course, especially value drawing (Lesson 1.3) and typography (Unit 3), since color will be applied to type throughout
- Arithmetic with percentages and ratios; place value (base-16 is taught in Lesson 4.3); reading simple formulas
- Any paints or colored pencils you have (a dollar-store watercolor set is enough), plus Krita or GIMP installed (free) and a browser

MASTERY CHECKLIST

- ☐ I can define hue, value and chroma (Munsell's three dimensions) and judge any color by all three.
- ☐ I can explain additive light (RGB) versus subtractive pigment (CMY/CMYK) mixing and tell which applies to a given job.
- ☐ I can build a 12-step color wheel and name the harmonies on it by geometry: complementary, split-complementary, analogous, triadic and monochrome.
- ☐ I can plan a picture or layout value-first, then build a limited palette with stated proportions (such as 60-30-10) and defend its mood.
- ☐ I can convert hex codes to decimal RGB and back by hand, and explain why screen color and press color cannot match exactly.
- ☐ I can explain what a spot color is, what Pantone standardized in 1963, and when a client job needs spot ink instead of CMYK.
- ☐ I can state the WCAG contrast thresholds (4.5:1 body text, 3:1 large text), compute a contrast ratio from luminances, and check a palette with free tools.
- ☐ I can design graphics that still work for red-green color-blind viewers and in grayscale, and explain why that is craftsmanship, not decoration.

FREE RESOURCES FOR THIS UNIT

- **Krita (free digital painting)**: Professional free painting software; its color picker shows HSV, RGB and hex side by side, which makes it a working laboratory for Lessons 4.1–4.3. A drawing tablet is nice but entirely optional; mouse and keyboard work for every exercise.
- **WebAIM Contrast Checker**: The industry-standard free checker for WCAG contrast ratios. Used throughout Lesson 4.5 to test the palettes you build in 4.2–4.4; paste two hex codes and it computes the ratio and pass/fail instantly.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

4.1	**How Color Works: Wheels, Mixing and Harmony**	3 sessions of 50 minutes
4.2	**Building a Palette: Value First, Then Color**	3 sessions of 50 minutes
4.3	**Color by the Numbers: RGB, Hex, CMYK and Spot Color**	3 sessions of 50 minutes
4.4	**What Color Says: Meaning, Branding and Convention**	3 sessions of 50 minutes
4.5	**Color Everyone Can Read: Contrast and Color-Blind-Safe Design**	3 sessions of 50 minutes

Unit 4 test

Time allowed: 50 minutes. A calculator is allowed; show your work and units. Useful numbers: hex digits A=10 … F=15; a hex pair is $16d_1 + d_0$; $C \approx 1 - R/255$ (and likewise M, Y); contrast ratio $(L_1 + 0.05)/(L_2 + 0.05)$ with thresholds 4.5:1 (normal text) and 3:1 (large text); wheel arithmetic is mod 360°. The test is worth 100 points.

1. **6 pts**

   Define Munsell's three dimensions of color and state which one carries a design's hierarchy and legibility.

2. **6 pts**

   Explain additive versus subtractive mixing in one sentence each, with the device or material that obeys each.

3. **6 pts**

   Find the complement of a hue at 140°, its two triad partners, and its split-complements.

4. **6 pts**

   Name the discovery, the man and the approximate date: (a) white light is a mixture, sorted (not stained) by a prism; (b) colors side by side change each other's appearance; (c) a numbered system of hue, value and chroma; (d) numbered spot-ink matching for printers.

5. **6 pts**

   A 16 × 20 in poster uses the 60-30-10 rule. Compute the three areas, and state which role gets the highest-chroma color and where it belongs.

6. **6 pts**

   A five-color palette looks like porridge; a grayscale photo shows all five colors at nearly the same gray. Diagnose and prescribe.

7. **6 pts**

   Convert #8C3F1E to decimal RGB and describe the color in Munsell terms.

8. **6 pts**

   Convert RGB (0, 168, 255) to hex.

9. **6 pts**

   Give the first-approximation CMY percentages for RGB (90, 180, 60), and name the dominant ink.

10. **6 pts**

    Why does process printing add a black (K) plate, and when does a job call for a spot ink instead of or beside CMYK? Give two spot cases.

11. **6 pts**

    A client approves a swatch on white; on the final navy packaging the same color looks lighter and warmer. Name the law and the professional habit that prevents the surprise.

12. **6 pts**

    An audit of 12 competing brands finds 8 blue, 2 green, 2 red. Chart the percentages and write one sentence each for the follow strategy and the break strategy.

13. **8 pts**

    Compute the contrast ratios and give verdicts (body text and large text): (a) text $L = 0.08$ on field $L = 0.90$; (b) text $L = 0.35$ on field $L = 0.90$.

14. **6 pts**

    About 8% of men and 0.5% of women have red-green CVD. In an audience of 150 men and 150 women, how many people are expected to be affected, and what design rule follows?

15. **8 pts**

    Production task. Sketch a 3-value notan thumbnail (light, mid, dark) for a produce-stand poster with a headline, one large apple and a price, then mark where the single high-chroma accent goes and why.

16. **6 pts**

    Critique task. A flyer sets equal-value full-chroma red headline type on a green field. Write a three-sentence professional critique naming the two distinct failures and the repair that keeps both hues.

ANSWER KEY

1. Hue (color family on the wheel), value (light/dark), chroma (intensity). Value carries hierarchy and legibility.
2. Additive: overlapping light adds toward white (screens, stage lights, RGB). Subtractive: each pigment or ink absorbs light so mixtures darken (paint, printing inks, CMY/CMYK).
3. Complement $320°$; triad $260°$ and $20°$; split-complements $290°$ and $350°$.
4. (a) Isaac Newton, 1666 (published 1672; Opticks 1704). (b) Michel Eugène Chevreul, law of simultaneous contrast, 1839. (c) Albert Munsell, A Color Notation, 1905. (d) Lawrence Herbert, Pantone Matching System, 1963.
5. Area 320 in^2: 192 / 96 / 32 in^2. The 10% accent takes the highest chroma and belongs at the focal point.
6. No value plan: hue variety without value separation. Reassign values (push at least one light and one dark, per a 3-value plan); hues may stay.
7. $R = 8 \times 16 + 12 = 140$; $G = 3 \times 16 + 15 = 63$; $B = 16 + 14 = 30$: (140, 63, 30), a dark, moderately muted red-orange (rust/brick).
8. 0 = 00; 168 = A8; 255 = FF: #00A8FF, a vivid sky blue.
9. $C = 1 - 90/255 \approx 65\%$; $M = 1 - 180/255 \approx 29\%$; $Y = 1 - 60/255 \approx 76\%$. Yellow dominates (with cyan close), fitting a green.
10. CMY inks mix to muddy brown, and triple-ink darks are expensive and blur detail, so K gives crisp, cheap true blacks. Spot cases: a brand color that must match exactly across runs, and colors outside the CMYK gamut (vivid orange, metallics), or cheap one/two-color jobs.
11. Chevreul's simultaneous contrast (1839): the navy ground pushes the color's apparent value and hue. Habit: approve colors only in context: mocked on the real background at real proportions.
12. Blue 67%, green 17%, red 17%. Follow: adopt blue to inherit the category's instant recognition and differentiate by value and typography. Break: claim the warm/empty region of the wheel to be findable at a glance, building trust by other means.
13. (a) $0.95/0.13 \approx 7.3$: passes 4.5:1 and even AAA. (b) $0.95/0.40 \approx 2.4$: fails both body (4.5:1) and large (3:1) thresholds.
14. $150 \times 0.08 + 150 \times 0.005 = 12 + 0.75 \approx 13$ people. Rule: never let color alone carry meaning: double-code with value, labels, shapes or patterns, and prefer

blue/orange oppositions to red/green.

15. Model answer: light field (60%), mid-value apple mass anchoring the lower two-thirds, dark headline and price for legibility; the accent (highest chroma) on or beside the apple at the focal point, small (about 10%), so hierarchy runs value-first with one controlled shout. Any thumbnail with three distinct values, dark type on light (or inverse) and a small, purposeful accent earns full credit.
16. Model answer: The equal-value complementary edge vibrates, so even normal vision gets shimmer instead of a readable headline. For roughly one man in twelve the red and green also collapse toward brown-on-brown and the headline can vanish. Keep the hues but move value: deepen the green field well down and lighten or outline the type so the pair passes 4.5:1 (verify in a contrast checker).

PORTFOLIO PIECE: A BRAND COLOR SYSTEM, AUDITED AND PRESENTED

Assemble the Orchard Lane Market color work of this unit into one portfolio-grade brand color board: the final 5-swatch palette with every color in all notations you can supply (hex, RGB, intuition CMYK, a spot-style note), the value plan, 60-30-10 roles, the category-audit wheel chart with your follow-or-break decision in one sentence, the tested-pairs card with WCAG ratios, and two small applications (produce label and shelf sign) shown in context: one in full color, one in grayscale, proving the system runs on value.

Finish it as a single composed board (tabloid print, or a clean digital sheet from Krita/Inkscape/Scribus), typeset to Unit 3 standards: one family or one tested pairing, sizes from a stated scale. This is piece four of the ten-piece professional portfolio this course builds, and it is the piece that shows employers something rare in student work: color decisions with evidence, numbers and repairs behind them. Photograph or export it cleanly.

LOOK FOR	WHAT IT MEANS
Color accuracy	Hex, RGB and intuition-CMYK notations are correct and mutually consistent; harmony geometry and value assignments are as labeled.
Palette craft	The palette passes the grayscale check with three distinct values; proportions follow the stated 60-30-10 roles; one controlled accent.
Evidence and audit	The category wheel chart reflects real sampled brands; the follow-or-break decision is stated and defensible from the chart.
Accessibility	Every text/background pair on the board and in the applications carries a recorded ratio meeting 4.5:1 (or 3:1 for large text); no meaning is carried by color alone.
Typography and layout	The board itself is set to Unit 3 standards: scale, leading, measure and alignment disciplined; hierarchy clear at arm's length.
Presentation and process	Clean execution, labeled sections, a colophon; before/after audit evidence attached, showing repairs as decisions rather than luck.

UNIT 5

Layout and Print Production

A designer's drawings, type and color all have to land somewhere, and for five hundred years that somewhere has usually been a printed page. In this unit you learn the craft of layout: how to divide a page with margins, columns and grids so that everything lines up for a reason; how to design a poster that delivers one message at a glance; how to build books, bulletins and magazines whose pages flow; and then how to hand your work to a printing press so that what comes back is exactly what you designed, with nothing blurry, nothing cut off and no surprises on the invoice.

The stories are of the people who worked all this out: the unknown medieval scribes whose page proportions Jan Tschichold reconstructed as the Gutenberg canon, William Morris and his Kelmscott Press, Josef Müller-Brockmann and the Swiss grid, Edward Penfield and Will Bradley and the American poster craze of the 1890s, Aldus Manutius and the pocket book, and Ira Rubel, the New Jersey pressman whose lucky mistake in 1901 gave us offset printing. You will measure pages in picas and points, compute column widths and bleed sizes, set up real documents in Scribus, and finish the unit with a print-ready poster you could hand to a commercial printer today.

The math in this unit is the math working designers use every week: page arithmetic for grids, type sizes for viewing distance, imposition and page counts for booklets, and the resolution, bleed and file-format numbers that decide whether a print job succeeds. Production skill is what separates a designer a printer trusts from one they quietly dread, and employers know the difference.

PREREQUISITES

- Units 1–4 of this course: drawing and composition basics, the vocabulary of hierarchy and critique, typography (point sizes, leading, measure) and color (CMYK versus RGB)
- Arithmetic and basic algebra: fractions, percentages, solving $c = \frac{W - 2m - (n-1)g}{n}$ style formulas for one variable
- Scribus (free, scribus.net) installed and opened at least once; a ruler marked in inches and, if possible, a pica rule or printed pica chart

MASTERY CHECKLIST

- ☐ I can measure a page in inches, picas and points and convert between them.
- ☐ I can construct the Gutenberg canon of page margins and explain why classical book margins are unequal.
- ☐ I can calculate column widths from page size, margins, columns and gutters, and build that grid in Scribus.
- ☐ I can design a poster with one dominant message and size its type for the distance it will be read from.
- ☐ I can set up a multi-page document with master pages, folios and facing pages, and explain recto, verso and imposition.
- ☐ I can calculate the pixel dimensions a photo needs for a given print size, add correct bleed to a document, and export a print-ready PDF.
- ☐ I can explain how offset lithography works, read a halftone with a loupe, and talk to a print shop in its own vocabulary.
- ☐ I can prepare a complete job for press: trim size, bleed, safe margin, resolution, CMYK and proof.

FREE RESOURCES FOR THIS UNIT

- **Scribus (free desktop publishing)**: The free, open-source page layout program used throughout this unit, for Windows, Mac and Linux. Download the stable version. It does the same job InDesign does in professional studios: frames, master pages, styles and print-ready PDF export. No purchase ever needed.
- **Library of Congress: Artist Posters collection**: Thousands of posters from the 1890s poster craze onward, free to browse and download, including dozens by Edward Penfield and Will Bradley. Use it in Lessons 5.2 and 5.4 to study real posters at high resolution.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

5.1	**The Grid: Margins, Columns and Alignment**	3 sessions of 50 minutes
5.2	**The Poster: One Message at a Glance**	3 sessions of 50 minutes
5.3	**Pages That Flow: Books, Magazines and Multi-Page Layout**	3 sessions of 50 minutes
5.4	**Ready for the Press: Resolution, Bleed and File Formats**	3 sessions of 50 minutes
5.5	**Ink on Paper: How Printing Actually Works**	3 sessions of 50 minutes

Unit 5 Test

Time allowed: 50 minutes. A calculator and scratch paper are allowed; a ruler is required for the sketching problems. Show arithmetic and units for every calculation. The test is worth 100 points.

1. **5 pts**
   Convert: 8.5 in to picas; 60 points to picas; 4.5 picas to inches.

2. **5 pts**
   State the Gutenberg canon margins for a 6 × 9 in page (inner, top, outer, bottom).

3. **5 pts**

   A 51-pica page has 5-pica margins and a 3-column grid with 2-pica gutters. Find the column width, and say whether it is a clean number for layout.

4. **6 pts**

   A text block is 48 picas tall; type is set 11/14. How many lines fit, and how many points are left over?

5. **6 pts**

   A poster must be readable at 30 feet. Give the required cap height and an approximate point size (caps about 70% of point size).

6. **7 pts**

   Name the three reading levels of a poster, and for a bake-sale poster assign one content item and a sensible viewing distance to each.

7. **7 pts**

   An 8-page saddle-stitched program: list the printing pairs for both sides of both sheets, and identify the center spread.

8. **8 pts**

   A client wants a 14-page saddle-stitched booklet. Explain the problem and present the two professional options with sheet counts.

9. **8 pts**

   A photo is 3600 × 2400 px. (a) Largest print at 300 PPI? (b) Effective PPI if placed 16 in wide, and the verdict for magazine work?

10. **8 pts**

    Give the full document setup for a press-ready 4 × 6 in postcard: canvas with bleed, safe area, and pixel dimensions of the canvas at 300 PPI.

11. **7 pts**

    Describe the path of the image through one offset printing unit, naming the cylinders in order, and state why the process is called offset.

12. **8 pts**

    Offset costs $210 makeready plus $0.05/sheet; digital costs $0.20/sheet. Compute both prices at 500 and 3,000 copies and find the crossover quantity.

13. **8 pts**

    Critique: a flyer proof shows (a) the background photo stopping exactly at the trim line, (b) the phone number 0.06 in from the edge, (c) body text set in a CMYK color build. Name each fault and its fix.

14. **12 pts**

    Production task. Sketch, with a ruler, a letter-size poster layout to scale (quarter size): construct margins, a grid of your choice, and mark the three reading levels with their computed type sizes for a 20-ft hook and 10-ft message. Label every measurement.

ANSWER KEY

1. $8.5 \times 6 = 51$ picas; $60/12 = 5$ picas; $4.5/6 = 0.75$ in.
2. Inner $6/9 = 0.67$ in; top $9/9 = 1.00$ in; outer 1.33 in; bottom 2.00 in.
3. $(51 - 10 - 4)/3 = 37/3 \approx 12.33$ picas, not clean; adjust margins to 4 picas for 13-pica columns, or gutters to 1p6.
4. $48 \times 12 = 576$ pt; $\lfloor 576/14 \rfloor = 41$ lines = 574 pt; 2 pt left.
5. Caps $30/10 = 3$ in; size $3 \times 72/0.7 \approx 310$ pt.
6. Hook (BAKE SALE plus one image) at 20–25 ft; message (church name, Saturday 9–12, address) at 10 ft; details (proceeds to missions, contact) at 3 ft.
7. Pairs sum to 9: sheet 1 outside 8|1, inside 2|7; sheet 2 outside 6|3, inside 4|5. Center spread is 4–5.
8. Saddle stitch needs multiples of 4 (each folded sheet = 4 pages); 14 is impossible. Offer 12 pages (3 sheets) by trimming content, or 16 pages (4 sheets) by adding a photo spread or notes page; quote the cost difference of the extra sheet.
9. (a) 12×8 in. (b) $3600/16 = 225$ PPI: fails the 300 spec; acceptable only for far-viewed output.
10. Canvas 4.25×6.25 in; safe 3.75×5.75 in; 1275×1875 px.
11. Plate cylinder (dampened, then inked) transfers to the rubber blanket cylinder, which prints the paper against the impression cylinder. It is offset because the plate never touches the paper; the image is set off onto rubber first.
12. 500: offset \$235, digital \$100. 3,000: offset \$360, digital \$600. Crossover $210/0.15 = 1{,}400$ copies.
13. (a) No bleed: extend the photo 0.125 in past trim. (b) Violates the safe margin: move at least 0.125 in inside trim. (c) Small text in a build fringes with misregistration: set body text 100% K.
14. Model answer: margins (e.g., 4/5/5/7 picas) drawn and labeled; a 3-column grid with computed 13-pica columns; hook zone marked about 2-in caps (~200 pt), message zone 1-in caps (~100 pt), details 18–24 pt; all arithmetic shown and elements aligned to the drawn grid. Grading: margins and grid arithmetic correct (4), distance-to-size arithmetic correct (4), hierarchy zones sensible and labeled (4).

PORTFOLIO PIECE: A PRESS-READY POSTER AND PRODUCTION PACK

Take your farmers-market poster (or a new poster for a real upcoming event) to full professional finish: final artwork on your documented grid, type sized by the distance rules, two or three disciplined colors, and every production requirement met: 11 × 17 trim with 0.125-in bleed, CMYK, effective 300 PPI on any image, and export as a press-ready PDF/X with crop marks.

Assemble the production pack a real studio would deliver alongside it: a one-page spec sheet (trim, bleed, stock recommendation, ink, quantity options with the digital/offset cost arithmetic from a real or researched quote), your preflight checklist with every item ticked, and one trimmed proof. This is piece five of the ten-piece professional portfolio this course builds; a poster plus its production pack shows an employer you can finish work, not just start it.

LOOK FOR	WHAT IT MEANS
Concept and hierarchy	One dominant message; hook, message and details read in order and survive the squint and 20-foot tests.
Grid and composition	A documented grid governs the layout; alignments are exact; any grid break is single and deliberate.
Typography and color	Type sizes follow the viewing-distance arithmetic; two or three colors with clear jobs; body-level text is legible and disciplined.
Production readiness	Bleed, safe, CMYK, resolution and PDF/X export are all correct; the preflight checklist is complete and honest.
Professional pack	Spec sheet, quote arithmetic (unit costs and crossover) and trimmed proof are present, accurate and neatly presented.
Craft	The trimmed proof is clean and square; files are named and versioned; the whole pack could be handed to a print shop today.

5.1 The Grid: Margins, Columns and Alignment

OBJECTIVES

- Measure and specify a page in inches, picas and points, and construct the Gutenberg canon of margins on any page.
- Calculate column widths from page width, margins, column count and gutters, and lay out that grid with pencil and in Scribus.
- Explain what a grid is for, tell the story of Jan Tschichold's canon and Josef Müller-Brockmann's Swiss grid, and judge when to keep a grid and when to break it.

> **Warm-up.** Open any printed book to a middle spread and measure its four margins with a ruler: inner (next to the spine), top, outer and bottom. Write the four numbers down. Are they equal? Now check a magazine and a church bulletin. Which publication's margins look most deliberate, and which look like leftovers?

WATCH

Learn EVERY Graphic Design Grid In 8 Minutes!

Satori Graphics · 8:20

https://www.youtube.com/watch?v=gUzkRue28VI

> **WHEN TO WATCH**
> After the craft paragraph. Pause at each grid type (manuscript, column, modular, baseline, hierarchical) and sketch a thumbnail of it in your sketchbook before he moves on.

Note: A fast, clear tour of the grid types working designers actually use. You only need to remember the big four in this lesson; the rest will make sense as the course goes on.

BACKUP VIDEO

Beginning Graphic Design: Layout & Composition

LearnFree · 5:14

https://www.youtube.com/watch?v=a5KYlHNKQB8

Any time in session one. A gentle overview of proximity, white space, alignment, contrast and repetition, which are the reasons grids work.

KEY TERMS

margin

The empty frame between the edge of the page and the content. Classical book margins are unequal: smallest at the inside, largest at the bottom.

pica

The traditional unit of page measure: 1 pica = 12 points, and 6 picas = 1 inch. A letter page is 51 picas wide and 66 picas tall. Written 4p6 for 4 picas 6 points.

column

A vertical band of the grid that text and images are poured into. More columns give a layout more possible positions, not more clutter.

gutter

The space between two columns (and also the inner margin area at a book's spine). Too narrow and the columns read as one; about 1 pica is a common starting value.

text block

The rectangle the main text lives in once margins are subtracted; also called the type area or live area.

baseline grid

A set of evenly spaced horizontal lines, one leading-increment apart, that the baselines of text sit on so lines align across columns and through the paper.

alignment

Placing elements so their edges or centers share invisible lines. Alignment is the cheapest, fastest way to make a layout look professional.

CORE IDEAS

The story. Open a well-made medieval manuscript or an early printed book, such as Gutenberg's Bible of about 1455, and the margins are strangely generous and strangely unequal: narrow at the inner edge, wider at the top, wider still at the outside, and widest at the bottom. For centuries nobody wrote down why. In 1953 the typographer Jan Tschichold (1902–1974), after measuring dozens of medieval books, published a reconstruction of what he called the secret canon of page construction, building on work by the Argentine typographer Raúl Rosarivo and the engineer J. A. van de Graaf. The rule turned out to be beautifully simple: on a classical page the inner margin is 1/9 of the page width, the top margin 1/9 of the page height, the

outer margin $2/9$ of the width and the bottom $2/9$ of the height, which makes the text block the same proportion as the page itself. William Morris used margins very like these in his Kelmscott Press books of the 1890s, including the great Kelmscott Chaucer of 1896, because he had measured the same old books.

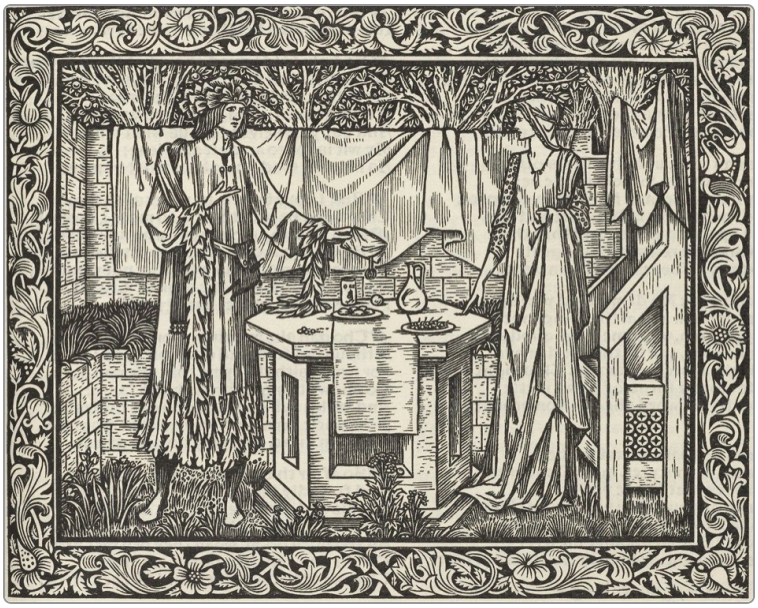
How they figured it out. The canon can be drawn with nothing but a straightedge: rule both diagonals of the two-page spread and the diagonal of each single page, and the crossing points locate a text block that lands exactly on the ninths. That is how a scribe with no ruler could lay out hundreds of pages consistently. Four hundred years later designers faced a different problem: not one text block but dozens of photographs, headlines, captions and columns that had to coexist on magazine and advertising pages. The answer came largely from Switzerland. Josef Müller-Brockmann (1914–1996), a Zürich designer famous for his concert posters for the Tonhalle, divided the page into a modular grid of equal cells with fixed gutters, sized everything in whole cells, and showed the system to the world in his book *Grid Systems in Graphic Design* (1981), still in print and still on studio shelves. His argument was a craftsman's argument: the grid is not a cage but a decision made once and well, so that a designer, or a whole team, can make a hundred later decisions quickly and consistently.

The craft. Page layout has its own units, and professionals use them. One inch is 6 picas; one pica is 12 points; so one inch is 72 points, which is why type sizes and page measures fit together. A US letter page (8.5 × 11 in) is 51 × 66 picas. To build a column grid you need four numbers: page width W, margin m (each side), number of columns n and gutter g. The live width is $W - 2m$, the gutters eat $(n-1)g$, and each column gets $c = \dfrac{W - 2m - (n-1)g}{n}$. Choose the numbers so c comes out whole: a 51-pica letter page with 6-pica margins and two 2-pica gutters gives $(51 - 12 - 4)/3 = 35/3$, which is ugly, but 5-pica margins give $(51 - 10 - 4)/3 = 37/3$, still ugly, and 4p6 margins give $(51 - 9 - 4)/3 = 38/3$; the craftsman's move is to work backward: decide you want 13-pica columns and 2-pica gutters, so the text block is $3(13) + 2(2) = 43$ picas and the margins share $51 - 43 = 8$ picas, 4 each. Vertically, a baseline grid repeats every leading increment: a 54-pica (648 pt) text block holds $\lfloor 648/14 \rfloor = 46$ lines of type set 11/14.

In the studio. Working designers set up the grid before they place a single element. In Scribus: File ▸ New sets page size and margins; File ▸ Document Setup ▸ Guides

adds column guides; View ▸ Snap to Guides makes frames click into place. Then every text frame and picture frame spans a whole number of columns, one, two or three, never two and a bit. An element may break the grid, a photo bleeding off the page, a headline crossing all columns, but it breaks the grid on purpose, once, for emphasis, the way a preacher raises his voice. Art directors reviewing junior portfolios check alignment first: they lay a straightedge on the printout, and every edge that almost lines up reads as carelessness. Ragged alignment is the single most common tell of amateur work, and a grid is the cure that costs nothing.

PICTURE STUDY



The Works of Geoffrey Chaucer, page 483 (Kelmscott Press), William Morris (page design and borders), Sir Edward Burne-Jones (illustration), engraved by W. H. Hooper, 1896 · Woodcut illustration and borders, letterpress on handmade paper · Houghton Library, Harvard University

Image: Wikimedia Commons, public domain

William Morris spent the last years of his life making what he called a pocket cathedral: an edition of Chaucer with 87 woodcut pictures by his friend Edward Burne-Jones, type Morris designed himself, and page margins measured from the great books of the 1400s. He died a few months after it was finished in 1896.

Look at it as a layout, not just a picture: every element, picture, border, initial, column, sits inside a strict structure. The exuberance is all inside the grid.

Look closely

- Find the four margins. Which is smallest and which is largest? Does it follow the classical canon?
- The text is set in two columns. Estimate the gutter width compared with the outer margin.
- Where does the border decoration live: inside the text block or in the margins? What does that tell you about which was drawn first?
- Trace the top line of the picture and the top line of the text. Do they align with anything else on the page?

- Squint until you cannot read the words. Does the page still look organized? Why?

Talk about it

1. Morris insisted the two-page spread, not the single page, is the designer's unit. What on this page only makes sense when facing its neighbor?
2. The Kelmscott Chaucer took four years and cost a fortune; a church bulletin takes an afternoon and must be free. Which of Morris's layout decisions cost nothing to copy?
3. Is a dense, decorated page like this easier or harder to read than a plain one? What job was this book designed for, display or reading on a train?

STUDIO BRIEF

Studio brief: a church bulletin grid

Client: your own church or a family friend's congregation. Deliverable: a reusable one-page bulletin template, letter size, two-sided feel (front: order of service; back: announcements), built on a documented grid. Specs: three-column grid, baseline grid, canon-inspired margins, body type 10.5/14, all in Scribus. Deadline feel: the secretary needs it by Friday and will reuse it every week, so the grid must survive someone else typing into it.

You will need

- Pencil, ruler, and two sheets of letter paper for thumbnails
- A real bulletin (or two) to study and improve on
- Scribus installed; one serif and one sans-serif family chosen from your Unit 3 work
- A printer for proofing (grayscale is fine)

Steps

1. Study the source material: list every item a bulletin must carry (service order, hymn numbers, scripture, announcements, times, contact line). Mark each item A, B or C importance.
2. On paper, draw the page at quarter size and construct margins: inner 4 picas, top 5, outer 5, bottom 7 (a gentled canon). Divide the live width into three columns with 1-pica gutters and compute the column width to check it is a whole number of points.
3. Thumbnail three different arrangements on the same grid: title band spanning all columns; two-column service order with a one-column sidebar; full three-column announcement page.
4. Build the page in Scribus: set page size and margins in File ▸ New, add column guides in Document Setup ▸ Guides, and turn on the baseline grid at 14 pt.
5. Create paragraph styles first, not last: Title, Section head, Body, Hymn line, Fine print. Set Body to 10.5/14 aligned to the baseline grid.

6. Pour in real content from last week's bulletin. Every frame must span whole columns and sit on the baseline grid.
7. Print a proof. Lay a straightedge along column edges and baselines across columns. Fix every near-miss.
8. Hand the printout to someone else to find the service time, a hymn number and the sermon text, timed. If anything takes more than five seconds, adjust hierarchy, not the grid.
9. Save as a Scribus template (.sla) with a one-page instruction note: which styles to use for what, and what never to change.

Tips

- Design the dullest page first (all announcements); if the grid handles that, the pretty pages are easy.
- When something refuses to fit, cut words before you shrink type below 10 pt.
- Name your styles for their job (Section head), never their look (Bold 14), so the look can change later without chaos.

Check your work

- ☐ My margins and column widths are computed, written on the template, and the arithmetic checks.
- ☐ Every text frame sits on the grid and the baseline grid; a straightedge test finds no accidental misalignments.
- ☐ A stranger found three facts in the proof in under five seconds each.

SKETCHBOOK

1. The Gutenberg canon constructed with diagonals on a 6 × 9 rectangle, with the ninths labeled and the text block shaded.
2. Measured margin diagrams of three real publications (book, magazine, bulletin) with the numbers written in picas.
3. Your three bulletin thumbnails on the same grid, with one sentence each on what changed and why.

KEY FORMULAS

$1\text{ in} = 6\text{ picas} = 72\text{ pt}, \qquad 1\text{ pica} = 12\text{ pt}$

$c = \dfrac{W - 2m - (n-1)g}{n}$ (column width)

Gutenberg canon: inner $= W/9$, top $= H/9$, outer $= 2W/9$, bottom $= 2H/9$

$\text{lines per column} = \left\lfloor \dfrac{\text{text block height (pt)}}{\text{leading (pt)}} \right\rfloor$

From history. Tschichold himself is a story of judgment maturing: as a young man in 1928 he wrote *The New Typography*, demanding asymmetric, sans-serif modernism, and later, after designing the classic Penguin paperback rules in 1947–49, he defended classical symmetric book pages as the better tool for long reading. The man who codified both the Swiss-adjacent modern page and the medieval canon is a standing lesson that rules serve reading, not the other way around.

WORKED EXAMPLES

Example 1. Construct the Gutenberg canon margins for a 6 × 9 in book page. What size is the text block, and what proportion is it?

Show solution

1. Inner margin: $W/9 = 6/9 = 0.67$ in. Outer: $2W/9 = 1.33$ in.
2. Top: $H/9 = 9/9 = 1.00$ in. Bottom: $2H/9 = 2.00$ in.
3. Text block width: $6 - 0.67 - 1.33 = 4.00$ in; height: $9 - 1 - 2 = 6.00$ in.
4. The block is 4 × 6, a 2:3 ratio, exactly the proportion of the 6 × 9 page. The canon always reproduces the page shape.

Answer: Margins 0.67 / 1.00 / 1.33 / 2.00 in (inner/top/outer/bottom); text block 4 × 6 in, the same 2:3 proportion as the page.

Example 2. You want a three-column grid on a letter page (51 picas wide) with 13-pica columns and 2-pica gutters. What margins result? Then check: do three 13-pica columns hold 11-pt type comfortably?

Show solution

1. Text block width: $3(13) + 2(2) = 43$ picas.
2. Margins share $51 - 43 = 8$ picas, so 4 picas (0.67 in) each side.
3. A 13-pica measure is 156 pt. A rough characters-per-line estimate is measure in points divided by half the type size: $156/5.5 \approx 28$ characters, short but workable for captions and lists; body text would be happier on a two-column version (20-pica columns).

Answer: 4-pica margins each side; 13-pica columns give about 28 characters per line at 11 pt, fine for sidebars, tight for body text.

Example 3. A bulletin's text block is 54 picas tall. The body type is set 11/14 (11 pt on 14 pt leading). How many lines fit in one column, and how tall is the text that fits?

Show solution

1. Convert: $54 \text{ picas} \times 12 = 648$ pt.
2. Lines: $\lfloor 648/14 \rfloor = 46$ lines.
3. Height used: $46 \times 14 = 644$ pt, leaving 4 pt of slack at the bottom. A baseline grid set to 14 pt makes every column bottom out at the same line.

Answer: 46 lines, using 644 pt of the 648-pt block.

Example 4. You are the designer. A client's flyer has 9 photos of nearly equal importance plus a title and three short paragraphs. Which grid type do you reach for, and what do you set first?

Show solution

1. Equal-weight repeating content is the signature case for a modular grid: columns crossed by rows making equal cells.
2. Set margins first, then choose a cell count that divides the content: a 3 × 4 module grid gives 9 cells for photos (3 × 3) plus a top row spanning all columns for the title and text.
3. Size the gutters once (1 pica) and let every photo snap to whole cells; crop photos to fit cells rather than resizing cells to fit photos.

Answer: A modular grid, 3 columns × 4 rows; margins and gutters chosen first, photos cropped to whole cells.

PRACTICE

1. Easy Convert: 8.5 in to picas; 27 picas to inches; 3 picas to points.

   Show answer

   $8.5 \times 6 = 51$ picas; $27/6 = 4.5$ in; $3 \times 12 = 36$ pt.

2. Easy Name the four classical margins from smallest to largest on a right-hand book page.

   Show answer

   Inner (spine), top, outer, bottom, in the canon $1 : 1.5 : 2 : 3$ relative to the inner margin (ninths of width and height).

3. Easy What is a gutter, and what goes wrong when it is too narrow?

   Show answer

   The space between columns. Too narrow and the eye jumps the gap, reading across both columns as one garbled line.

4. Medium Compute the Gutenberg canon margins for an 8.5 × 11 in page, to the nearest 0.05 in.

   Show answer

   Inner $8.5/9 \approx 0.95$ in; top $11/9 \approx 1.20$ in; outer ≈ 1.90 in; bottom ≈ 2.45 in.

5. **Medium** A letter page (51 picas) has 4-pica margins and a 4-column grid with 1-pica gutters. Find the column width.

   Show answer

   $c = (51 - 8 - 3)/4 = 40/4 = 10$ picas.

6. **Medium** You want 2 columns of exactly 20 picas with a 1-pica gutter on a 51-pica page. What total margin is left, and how would you split it for a page that is bound on the left?

   Show answer

   Block $= 41$ picas, leaving 10. Split unequally, e.g. 4.5 picas at the spine side and 5.5 outside (or 4/6), giving the binding extra room and the thumb a place to hold.

7. **Medium** A text block is 45 picas tall and the type is set 10/13. How many lines fit, and how many points are left over?

   Show answer

   $45 \times 12 = 540$ pt; $\lfloor 540/13 \rfloor = 41$ lines using 533 pt; 7 pt left.

8. **Medium** Why did Müller-Brockmann call the grid an aid, not a guarantee? Answer in two sentences.

   Show answer

   The grid only fixes positions and sizes; it cannot choose what matters or make a dull idea interesting. He insisted the designer still has to think, the grid just keeps a hundred small alignment decisions consistent.

9. **Hard** Design the numbers: a 66-pica-tall letter page needs a 14-pt baseline grid, a top margin of 5 picas and a bottom margin of at least 6 picas. What is the tallest text block that is a whole number of 14-pt lines, and what exact bottom margin results?

   Show answer

   Available: $66 - 5 - 6 = 55$ picas $= 660$ pt; $\lfloor 660/14 \rfloor = 47$ lines $= 658$ pt ≈ 54.83 picas. Bottom margin $= 66 - 5 - 54.83 = 6.17$ picas (6p2).

10. Hard You are the designer. A committee member says the bulletin would fit more announcements if the margins were shrunk to 0.25 in all around. Give a two-part professional answer: one reason from readability, one compromise that gains space without killing the page.

Show answer

Margins are where the eye rests and the thumbs hold; a page filled edge to edge reads as noise, and most desktop printers cannot even print to the edge. Compromise: keep outer margins, drop the body type from 12 to 11 pt and tighten leading from 16 to 14, which gains more lines than the margin raid would, invisibly.

11. Hard A two-page spread is 102 picas wide in total. Using the canon on the spread (diagonals method), the text blocks mirror each other. If each page's inner margin is 5.5 picas and outer is 11 picas, how wide is each text block, and how wide is the combined white channel at the spine?

Show answer

Each block: $51 - 5.5 - 11 = 34.5$ picas. The spine channel is the two inner margins together: $2 \times 5.5 = 11$ picas, the same as one outer margin, which is why the spread looks balanced as a single object.

COMMON MISTAKES

- Centering everything. Centered layouts have no shared edges, so nothing aligns with anything; reserve centering for formal, short pieces.
- Equal margins everywhere by default. The bottom margin should usually be largest, or the text block looks like it is sliding off the page.
- Building the grid after placing the content. The grid is decided first, from the page and the content list, then everything snaps to it.

> **Make it a game · Grid Spy.** Take any magazine page or cereal box. You have 60 seconds to find the grid: count the columns, estimate the gutter, and point out one element that breaks the grid on purpose. Your parent checks your call with a ruler. Three pages, score one point per correct column count and one per confirmed grid-breaker. Beat your score tomorrow with three new pages.

> **Scripture.** “Let all things be done decently and in order.” (1 Corinthians 14:40, KJV)
>
> Paul is instructing a noisy congregation, but the principle is the layout designer's daily rule: order is not decoration, it is courtesy to the reader. A grid is simply order decided in advance.

5.2 The Poster: One Message at a Glance

OBJECTIVES

- Design a poster around one dominant message, with a hierarchy that reads in order at a glance.
- Size type for viewing distance using the one-inch-per-ten-feet rule, and scale a small design up to poster size by percentage.
- Tell the story of the 1890s American poster movement through Edward Penfield and Will Bradley, and name what their posters still teach.

> **Warm-up.** Stand across the room from your refrigerator or a bulletin board with papers on it. Which sheet do you notice first, and what is the first word you can actually read? Walk closer and note the distance at which each level of text becomes readable. Write down the three distances.

WATCH

Visual Hierarchy In Poster Design | Design Lesson

Gareth David Studio · 8:51

https://www.youtube.com/watch?v=C1jBy3n00mw

> **WHEN TO WATCH**
> After the craft paragraph. Pause at each example poster and say aloud what you read first, second and third before he tells you.

Note: A working designer walks through how size, weight, color and position build a reading order on real posters. Keep your sketchbook open and steal the squint test he uses.

BACKUP VIDEO

La Belle Époque: a History of the Poster, plus Jean-Nicolas Gérard Slipware | GOLDMARK.TV

Goldmark Gallery · 51:14

https://www.youtube.com/watch?v=1W8aTwivQuo

With the story, as an evening watch. A gallery's affectionate tour of the first poster age, from Chéret's Paris lithographs onward; you may stop when the poster segment ends.

KEY TERMS

hierarchy

The designed order in which a viewer reads the elements: first the hook, then the message, then the details.

focal point

The single element a design is built to make you see first. A poster with two focal points has none.

lithography

Printing from a flat stone or plate using the chemistry of grease and water; invented by Alois Senefelder about 1796, it made big, cheap color posters possible.

flat color

Areas of a single unshaded ink, the signature look of classic posters; each flat color was a separate stone or plate.

silhouette

A shape readable by its outline alone. Penfield tested his figures as silhouettes because posters are read in motion, at distance.

cap height

The height of a capital letter, the practical measure for how far away type can be read.

CORE IDEAS

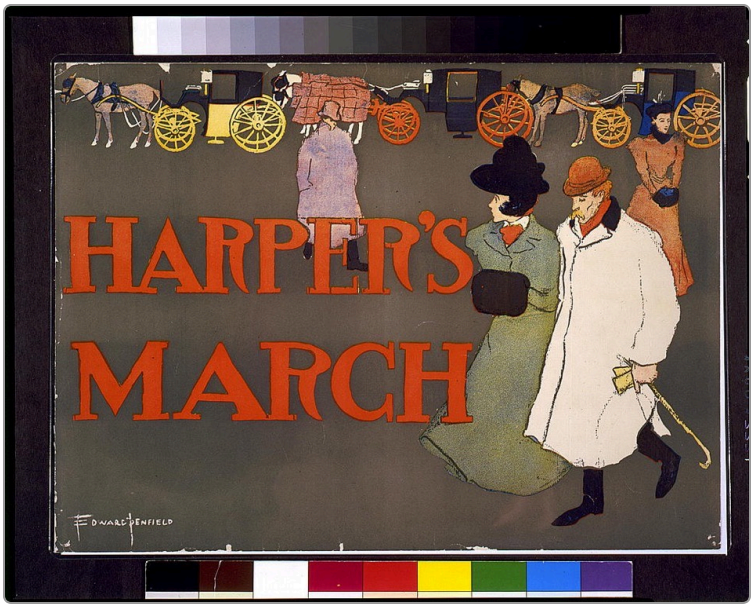
The story. In the spring of 1893, Harper's magazine let its young art editor Edward Penfield (1866–1925) design a small poster to hang in bookshops announcing the new issue. Penfield drew a single confident figure, flat color, almost no background, five or six words, and sales of the magazine jumped. He produced a new poster nearly every month until 1899, and the series set off what newspapers called the poster craze: Americans stripped them from walls to collect them, dealers sold them like prints, and every publisher wanted its own artist. The most dazzling was Will Bradley (1868–1962), a printer's apprentice from Boston who taught himself design at the type case. His 1894–95 posters for the little Chicago magazine *The Chap-Book*, swirling Art Nouveau line, two or three flat colors, are often called the first American Art Nouveau works, and Bradley went on to art-direct for Collier's and Hearst. Both men learned from Paris, where Jules Chéret had been printing joyous color lithograph posters since the 1870s, but they made the form plainer, flatter and more American.

How they figured it out. The poster men discovered their rules by watching people who were not trying to look. A magazine page is read at arm's length by someone who chose to read; a poster must stop a stranger walking past at ten feet, in the rain, in three seconds. So Penfield cut everything that did not survive those three seconds: backgrounds went flat, figures became silhouettes, palettes dropped to two or three inks (each color was a separate lithographic stone, so economy was also thrift), and the words shrank to a title and a month. He reportedly tested designs by their shadow-shape: if the silhouette did not read, the drawing did not matter. That discipline, one message, one picture, few words, big type, is still the entire theory of the poster, the billboard, the title slide and the online thumbnail.

The craft. Build a poster from the farthest distance inward. Sight-reading rules used by sign painters and traffic engineers say a capital letter needs roughly 1 inch of cap height for every 10 feet of comfortable reading distance, so a headline meant to work across a 30-foot fellowship hall needs caps about 3 inches tall, and since 1 inch is 72 points that is roughly $3 \times 72 = 216$ pt. Plan three reading levels: Level 1, the hook (picture plus a word or two) that works at full distance; Level 2, the message (what, when, where) readable at conversational distance, say 10 feet, so about 1-inch caps; Level 3, the fine print (price, website, sponsor) read at arm's length. Then apply the squint test: squint until detail dissolves; the hook should still be unmistakable. Finally check the path: the eye should land on the focal point, slide to the message, and exit at the details, usually top-left to bottom-right in a Z, because that is how readers of English scan.

In the studio. Designers still work posters at reduced size and scale up. If you design at letter size (8.5 × 11) and the final poster is 17 × 22, the enlargement is $17/8.5 = 200\%$, and every measurement doubles with it: your 108-pt headline becomes 216 pt, your 1-pica gutter becomes 2. That is why working in proportion matters more than working at size, and why vector artwork and type (which scale perfectly, as Unit 6 explains) rule poster work. A studio proofs posters by pinning a print to the wall and walking backward down a hallway, phone timer running: if the message has not landed in three seconds at target distance, the poster goes back on the bench. Clients will ask you to add more words; the professional's answer is to offer a second deliverable (a flyer or insert) rather than sink the poster.

PICTURE STUDY



Harper's March, Edward Penfield, 1897 · Color lithograph poster · Library of Congress, Prints and Photographs Division

Image: Wikimedia Commons, public domain

This is one of the monthly posters Edward Penfield drew for Harper's, the series that started America's poster craze. It had one job: make a passerby in a bookshop want this month's magazine.

Notice how little is here. That is not laziness; every element that could slow the eye down has been removed on purpose.

Look closely

- Count the distinct flat colors. Each one was a separate printing pass; was each one worth it?
- Cover the lettering with your hand. Does the image alone still say leisure, reading, the smart set?
- Where does your eye land first, and where does it exit? Trace the path with a finger.
- Find the hardest edge and the biggest empty area. How do they work together?
- How many words are there in total? How many would a modern flyer have used?

Talk about it

1. Penfield drew the magazine's reader, not the magazine. Why might showing the audience to itself sell better than showing the product?
2. What would be lost if this were a photograph instead of flat lithographic color?
3. Which of this poster's decisions could you copy directly in your farmers-market brief, and which belong to 1897?

STUDIO BRIEF

Studio brief: the farmers-market poster

Client: a seasonal farmers market opening in your town. Deliverable: one 11 × 17 poster for shop windows and bulletin boards. Specs: readable hook at 20 feet; market name, day, hours and location at 10 feet; one detail line; two or three flat colors in the classic poster spirit; hand-drawn or free-font type only. Deadline feel: the market board meets in one week and will pick between your two directions.

You will need

- Pencil, black marker or brush pen, and letter paper for thumbnails
- Tabloid (11 × 17) paper if you can print it, or two letter sheets taped; or finish digitally in Krita or Inkscape
- A tape measure and a hallway or yard at least 20 feet long
- Your Unit 4 limited-palette notes

Steps

1. Write the content inventory and assign levels: Level 1 hook (two or three words or an image), Level 2 message (name, day, hours, place), Level 3 one detail line.
2. Compute your type sizes from the distance rule for 20 ft and 10 ft at final size, and write them on the brief.
3. Thumbnail eight posters small (ten minutes, no erasing). Pick two that survive the squint test.
4. Develop both at quarter scale in flat values first (black, gray, white). The silhouette must read before any color enters.
5. Choose a two- or three-color palette and assign colors by job: one for the hook, one for calm, one accent, never three competing.
6. Produce both posters at full size (drawn, or printed from Krita/Inkscape at 11 × 17 with your computed type sizes).
7. Pin each to a wall. Walk to 20 feet: does the hook land in three seconds? Walk to 10 feet: is the message complete? Fix and reprint if not.

8. Present both to a family member as the market board: thirty seconds per poster, then ask which they would approve and why. Record the verdict in your sketchbook.
9. Write the production note on the back of the winner: final size, colors used, fonts used, and the enlargement percentage if it were rerun at 22 × 34.

Tips

- Vegetables make glorious silhouettes; a single enormous beet beats a crowded market scene.
- If the market name is long, the hook can be MARKET or FRESH with the full name at Level 2.
- Flat color means flat: resist gradients and drop shadows; the 1890s look is also the easiest to print.

Check your work

- ☐ My hook reads in three seconds at 20 feet, measured, not guessed.
- ☐ Type sizes match the distance arithmetic written on the brief.
- ☐ The board (family) could state the day, time and place from memory after one viewing.

SKETCHBOOK

1. Eight poster thumbnails with the two survivors circled and one sentence on why each survived the squint test.
2. A distance-and-size table for your poster: level, content, viewing distance, cap height, point size.
3. A master study: copy the structure (not the drawing) of one Penfield or Bradley poster as flat gray shapes, and label its three reading levels.

KEY FORMULAS

$$\text{cap height (in)} \approx \frac{\text{viewing distance (ft)}}{10}$$

$$\text{type size (pt)} \approx \text{cap height (in)} \times 72 \times 1.4 \text{ (caps are about 70\% of point size)}$$

$$\text{enlargement} = \frac{\text{output size}}{\text{original size}} \times 100\%$$

From history. The poster craze burned fast: by 1897 there were poster exhibitions, poster magazines and poster forgeries, and by 1900 the fad had cooled. But the discipline it taught never left American design. Will Bradley carried it into magazine art direction, and the three-second rule he and Penfield worked out now governs billboards (where highway engineers allow about one word per second of glance), video thumbnails and app-store banners. The surfaces change; the arithmetic of a stranger's attention does not.

WORKED EXAMPLES

Example 1. A farmers-market poster will hang where people pass at about 20 feet. How tall must the headline capitals be, and roughly what point size is that?

Show solution

1. Cap height: $20/10 = 2$ in.
2. Caps are only about 70% of a font's point size, so size $\approx 2 \times 72/0.7 \approx 206$ pt; call it 200–220 pt.
3. Sanity check: that is a headline of one to three words on an 11 × 17 sheet; if your message needs eight words at that size, the message is too long.

Answer: About 2-inch caps, roughly 210 pt; the headline must be very short.

Example 2. You design a poster at 8.5 × 11 and the print shop will output it at 22 × 28.5 (small poster size). What single enlargement percentage fits, and what happens to your 150-pt headline?

Show solution

1. Width ratio: $22/8.5 = 259\%$; height ratio: $28.5/11 = 259\%$. The sheet is proportional, so one scale fits exactly.
2. The headline scales with the page: $150 \times 2.59 \approx 389$ pt, caps about $389 \times 0.7/72 \approx 3.8$ in, readable from nearly 40 feet.

Answer: 259% enlargement; the headline becomes about 389 pt with 3.8-in caps, good to about 38 ft.

Example 3. Plan the three reading levels for a church concert poster: hook, message, details. Assign each level a distance and a type size for a 12 × 18 poster.

Show solution

1. Level 1 at 25 ft: the word CONCERT or a strong image plus one word; caps 2.5 in, about 250 pt. One element only.
2. Level 2 at 10 ft: who, date, time, place; caps about 1 in, 100 pt for the title line, 60–72 pt for date and place.
3. Level 3 at 3 ft: free admission, address, contact; 18–24 pt.
4. Check the budget: Level 1 should own roughly half the poster's visual weight; if Level 3 has more than six lines, move content to a handout.

Answer: 25 ft / ~250 pt; 10 ft / 60–100 pt; 3 ft / 18–24 pt, with the hook owning about half the poster.

PRACTICE

1. Easy What cap height reads comfortably at 50 feet?

   Show answer

   About $50/10 = 5$ in.

2. Easy Who drew the Harper's posters of 1893–1899, and name two trademarks of his style.

   Show answer

   Edward Penfield; flat unshaded color, strong silhouettes, almost no background, very few words.

3. Easy Why did classic poster artists use so few colors? Give the practical reason.

   Show answer

   Each flat color was a separate lithographic stone or plate, printed in a separate pass; every color added cost and registration risk.

4. Medium A design made at 6 × 9 in must print at 18 × 27 in. What is the enlargement, and what does a 0.5-pt hairline rule become?

   Show answer

   $18/6 = 300\%$; the rule becomes 1.5 pt. (Going the other way, reductions can make hairlines vanish.)

5. **Medium** Your headline font has caps that are 68% of the point size. What point size gives 1.5-inch caps?

Show answer

$1.5 \times 72 / 0.68 \approx 159$ pt.

6. **Medium** List the three reading levels of a poster and one piece of content that belongs to each, for a vacation Bible school poster.

Show answer

Hook: VBS plus an image (readable far off). Message: church name, dates, ages, time. Details: registration website, phone, cost (free), sponsor line.

7. **Medium** Explain the squint test in one sentence and what failing it means.

Show answer

Squint until detail blurs: whatever still reads is your real hierarchy, and if nothing reads, or the wrong thing reads first, the poster fails at distance and must be simplified.

8. **Hard** A client insists on adding four sponsor logos, a map, and three paragraphs to a poster. Write the two-sentence professional reply that protects the poster and serves the client.

Show answer

Model answer: A poster earns its keep in three seconds at twenty feet, and every added element taxes the one message that stops people; let us keep the poster to hook, message and a web address. I will design a matching flyer or bulletin insert that carries the logos, map and full details, so nothing is lost.

9. **Hard** Measure a real poster or yard sign in your neighborhood (estimate if needed): its headline cap height and its likely intended viewing distance. Does it obey the rule? Show your numbers.

Show answer

Sample answer: a yard sign with 4-in caps reads to about 40 ft, right for a car passing at neighborhood speed; one with 1.5-in caps works only to 15 ft, too small for drivers, fine for a sidewalk.

10. Hard Penfield's posters almost never show backgrounds. Using the silhouette idea, explain why a background usually weakens a poster, and name the exception.

Show answer

A background adds edges and values that compete with the figure's outline, so the silhouette, the thing read first at distance, gets noisy. The exception is when the background IS the message (a sunrise for an Easter service), in which case it must be treated as the focal point and kept as simple as a figure.

COMMON MISTAKES

- Two focal points. If the picture and the headline fight, the passerby reads neither; one must clearly serve the other.
- Sizing type to fill space instead of to viewing distance, which is how posters end up readable only in a portfolio.
- Putting the detail line in the hook's corner exit spot, so the eye leaves before it finds the date and time.

Make it a game · Three-Second Showdown. Your parent holds up a poster, flyer, or cereal box for exactly three seconds, then hides it. You state the main message, then everything else you caught, one point per correct item, minus one per wrong guess. Trade roles. After three rounds, say which item earned its place in three seconds and which design wasted the glance. Beat your score with new pieces tomorrow.

Scripture. “And the LORD answered me, and said, Write the vision, and make it plain upon tables, that he may run that readeth it.” (Habakkuk 2:2, KJV)

The prophet is told to letter the message so large and plain that a runner catches it in passing. That is the poster designer's entire brief, twenty-six centuries early: make it plain, make it fast, make it count.

5.3 Pages That Flow: Books, Magazines and Multi-Page Layout

OBJECTIVES

- Set up a facing-pages document in Scribus with master pages, automatic page numbers and consistent styles.
- Explain recto and verso, folios, running heads and spreads, and compute page counts and imposition pairs for a saddle-stitched booklet.
- Plan a multi-page piece so content flows in a deliberate order, with every spread designed as one unit.

> **Warm-up.** Pick up any paperback. Open it anywhere: notice which page number is on the right (always odd) and which is on the left (always even). Find three things that repeat on every page without you ever having noticed them (page number, running head, margin pattern). Repetition you never notice is the point: write one sentence about why.

WATCH

How to make Easy Scribus Layouts in 15 minutes

Top CLAX · 17:26

https://www.youtube.com/watch?v=slbiQ0mJWbw

> **WHEN TO WATCH**
> Start of session two, with Scribus open in a second window. Follow along: pause after each tool (frames, linking text, images) and repeat the step in your own document.

Note: A hands-on tour of Scribus frames, text flow and image placement, exactly the skills the brief needs. Scribus menus vary slightly by version; if a menu item has moved, check the same menu's neighbors.

BACKUP VIDEO

Getting Started with Scribus: 14 - Master Pages

Top CLAX · 4:02

https://www.youtube.com/watch?v=d9HUWeBFaYQ

Before step 4 of the brief: a focused walkthrough of creating master pages and applying them, the heart of multi-page work.

KEY TERMS

recto / verso

The right-hand page (recto, always odd-numbered) and left-hand page (verso, always even). Books begin on a recto.

spread

Two facing pages designed as a single unit, the real canvas of book and magazine design.

folio

The page number as a designed element, usually with a fixed position and style on the master page.

master page

A template page holding everything that repeats (folios, running heads, grid guides); document pages inherit it, so one change fixes every page.

running head

The small repeated line at the top of pages giving the book, chapter or section name, a courtesy to the browsing reader.

saddle stitch

Binding by folding sheets and stapling through the fold; it requires the total page count to be a multiple of four.

imposition

Arranging pages on the press sheet so they come out in order after folding; in a saddle-stitched booklet each printed pair of facing pages sums to the page count plus one.

CORE IDEAS

The story. In Venice in 1501, the scholar-printer Aldus Manutius did something publishers had not thought worth doing: he printed a serious book, Virgil, small enough to carry. His octavo editions, made by folding each press sheet three times to yield eight leaves, with a new compact italic type cut by Francesco Griffo, turned the book from furniture into a companion; students and travelers across Europe bought them by the thousand. Aldus had grasped that a multi-page object is a designed system: page size, margins, type and binding decided once, then repeated perfectly for hundreds of pages. Four centuries later the magazine art directors of New York, men like T. M. Cleland and later Alexey Brodovitch at Harper's Bazaar (from 1934), treated the magazine the same way but added rhythm: calm spreads then loud ones, dense then open, so that flipping pages felt like music. Brodovitch judged layouts by pinning whole issues to the wall as one long strip, the flow mattering as much as any single page.

How they figured it out. The mechanics forced the system. A book is printed on large sheets, folded; fold one sheet once and you get 4 pages, twice 8, three times 16, which is why page counts run in multiples called signatures and why a saddle-stitched bulletin must be 8, 12, 16 or another multiple of 4 pages: each folded sheet contributes exactly four. Imposition, deciding which pages share a sheet, follows one lovely rule for saddle stitch: the two pages printed side by side always sum to $N + 1$, where N is the page count. In an 8-page booklet the outer sheet carries pages 8 and 1 (sum 9) on one side and 2 and 7 on the other; the inner sheet 6 and 3, then 4

and 5. Printers learned to design master pages for the same reason scribes learned the canon: when a decision will be repeated five hundred times, you make it once, carefully.

The craft. Design spreads, not pages. The reader never sees page 7 alone; they see 6 and 7 as one object with a fold in it, so mirror your margins (inner margins smaller, because the two inner margins meet and pool at the spine), align baselines across the fold, and let a dominant element on one page be answered by calm on the other. Repetition carries the reader: folios in the same corner, running heads in the same style, body text in the same measure, so that anything that changes (a chapter opening, a pull quote) reads as a deliberate event. Plan the flow before opening Scribus with a flatplan, a sheet of tiny numbered rectangles, one per page, where you pencil what goes where: cover (page 1, a recto), inside front (2), content spreads, and the back. Editors and designers argue over the flatplan, cheaply, before anyone lays out anything.

In the studio. In Scribus the workflow is: File ▸ New with Facing Pages checked; Edit ▸ Master Pages to build Left and Right masters with guides, folios (Insert ▸ Character ▸ Page Number) and running heads; then Page ▸ Apply Master Page. Text frames link in a chain, select a frame, click the link tool, click the next frame, so a long article flows through the booklet and reflows when edited, exactly as InDesign does in commercial studios. Styles do the rest: edit the Body style once and forty pages update. Professional sanity checks before output: odd folios on rectos; no text within the safe margin of the trim; baselines aligned across every spread; and the page count a multiple of four with the flatplan's content actually fitting, because discovering on press day that you have nine pages of content for an 8-page booklet is a rite of passage you only need once.

PICTURE STUDY



Nuremberga, from the Nuremberg Chronicle, Hartmann Schedel (author); woodcuts from the workshop of Michael Wolgemut; printed by Anton Koberger, 1493 · Woodcut and letterpress on a double-page spread · Eran Laor Cartographic Collection, National Library of Israel

Image: Wikimedia Commons, public domain

The Nuremberg Chronicle of 1493 was the most lavishly illustrated book of the first fifty years of printing: over 1,800 woodcut images woven through the text, planned on hand-drawn layout dummies before a single page was set. This spread turns the book sideways into a panorama of Nuremberg itself, the city where it was printed.

It is also one of the first great examples of a designer letting content cross the fold: the city is too grand for one page, so the spread becomes the unit.

Look closely

- Find the fold line. What did the layout planners keep away from it, and what safely crosses it?
- How do text and image share the spread? Which came first in the plan, and how can you tell?
- Find repeated elements (banners, labels) that help you read the picture. What is labeled, and why those things?
- The woodcut views in this book famously reused some blocks for different cities, but Nuremberg got an accurate portrait. What details look specific

rather than generic?

- Estimate the margins. Do they follow the generous old canon or crowd the edges?

Talk about it

1. Why would a publisher plan a whole book on layout dummies before cutting any blocks? What is the modern equivalent?
2. What does a double-page panorama give the reader that two separate pictures cannot?
3. This book was printed in Latin and German editions from the same images. How does designing pictures separately from text make that possible?

Safety first. This brief includes folding and trimming. If you trim pages with a craft knife, use a metal straightedge and a cutting mat, keep the free hand behind the blade's path, use light repeated passes rather than force, and retract or cap the blade the moment you set it down. Scissors are the right tool for anyone not yet steady with a knife. For the long Scribus sessions, follow the 20-20-20 rule: every 20 minutes, look at something 20 feet away for 20 seconds, and stand and stretch between sessions.

STUDIO BRIEF

Studio brief: an eight-page zine

Client: yourself as publisher. Deliverable: an 8-page saddle-stitched zine (half-letter size, 5.5 × 8.5) on a wholesome topic you know well: your garden, a hobby, a family trip, local history. Specs: facing pages, master pages with folios and running heads, one linked text chain, a center-spread feature, printed two-up on letter sheets, folded and stapled. Deadline feel: three copies by the end of the week for three real readers.

You will need

- Scribus; your bulletin styles from 5.1 as a starting point
- Two letter sheets per copy, a long-reach stapler if available (or needle and thread for a pamphlet stitch), bone folder or spoon for creasing
- Craft knife or scissors, metal straightedge, cutting mat (for trimming)
- Written or gathered content: about 800–1,200 words plus 4–8 images or drawings

Steps

1. Draw the flatplan: eight numbered boxes; assign cover, intro, feature spread (4–5), supporting pages, back cover. Get the content to fit the plan on paper first.
2. Compute the imposition for 8 pages (pairs summing to 9) and write it on the flatplan: 8|1, 2|7, 6|3, 4|5.
3. Set up Scribus: half-letter page, facing pages, margins inner 0.5 / top 0.6 / outer 0.7 / bottom 0.8 in, two-column grid, 12-pt baseline grid.
4. Build Left and Right master pages: folios outside corners, running head with your zine's name, applied to pages 2–7 (covers go bare).
5. Place and link text frames through the inside pages; pour your text and style it with Body, Head and Caption styles.
6. Design the center spread (4–5) as one canvas; it is the only spread that prints as a true pair, so artwork may cross the fold.

7. Export a PDF, then print two-up double-sided per your imposition (most PDF viewers have a booklet print mode; check its output against your imposition arithmetic).
8. Fold with a firm crease, nest the sheets, staple twice on the fold, and trim the face edge if the inner pages creep outward.
9. Deliver three copies and collect one comment per reader; note the best and worst-received spread in your sketchbook.

Tips

- Booklet-print modes fail quietly; always fold a plain-paper dummy numbered by hand before printing good copies.
- Creep is real: inner sheets stick out after folding; a light trim squares the zine and instantly makes it feel professional.
- Keep the cover simple and poster-like; it obeys Lesson 5.2, not Lesson 5.3.

Check your work

- ☐ My page count, flatplan and imposition arithmetic agree, verified with a folded dummy.
- ☐ Folios sit in mirrored outside corners and all baselines align across every spread.
- ☐ Three real readers each received a copy, and I recorded their reactions.

SKETCHBOOK

1. Your flatplan with imposition pairs marked, plus the folded-dummy page numbers photographed or taped in.
2. A spread study: rule a real magazine or book spread's structure (margins, columns, baseline rhythm) in pencil.
3. Three running-head and folio treatments from books on your shelf, copied with notes on size and position.

KEY FORMULAS

sheets (saddle stitch) $= \dfrac{N}{4}$, with N a multiple of 4

Imposition pairs: facing printed pages sum to $N + 1$

Folds and pages per sheet: 1 fold $\to 4$ pages, $2 \to 8$, $3 \to 16$ (each fold doubles)

> **From history.** Aldus Manutius also gave us the semicolon's modern use, the italic type style, and the publisher's device (his dolphin and anchor is still echoed by publishers today). His pocket octavos were pirated across Europe within a few years, which is why he petitioned Venice for printing privileges, an early chapter in the long story of design, copying and copyright that this course returns to in Unit 10.

WORKED EXAMPLES

Example 1. A church wants a 10-page anniversary booklet, saddle-stitched. What do you tell them, and what are the options?

Show solution

1. Saddle stitch needs a multiple of 4: each folded sheet gives 4 pages, so 10 is impossible.
2. Option A: cut to 8 pages ($8/4 = 2$ sheets). Option B: grow to 12 ($12/4 = 3$ sheets), filling the extra spread with photos or a hymn.
3. The professional move is to present both with costs: 12 pages is one more sheet per copy, so for 200 copies at roughly 5 cents a printed sheet, about $200 \times 0.05 = \$10$ more.

Answer: 10 pages cannot saddle-stitch; offer 8 pages (2 sheets) or 12 pages (3 sheets, about $10 more at 200 copies).

Example 2. Write the full imposition for an 8-page saddle-stitched booklet: which pages print together on each side of each sheet?

Show solution

1. Pairs sum to $N + 1 = 9$.
2. Outer sheet, outside: 8 | 1 (back cover beside front cover). Outer sheet, inside: 2 | 7.
3. Inner sheet, outside: 6 | 3. Inner sheet, inside: 4 | 5, the center spread, the only pair that is also a reading spread.
4. Check: every pair sums to 9, and the center spread's pages are consecutive, which is why centerfold artwork may safely cross the fold.

Answer: Sheet 1: 8|1 and 2|7. Sheet 2: 6|3 and 4|5. All pairs sum to 9.

Example 3. Your 12-page booklet's inner margins are 0.5 in and outer margins 0.75 in. A photo must sit exactly centered on the middle spread, crossing the fold. The page is 8.5 in wide. How wide is the spread's live area, and where is the fold relative to it?

Show solution

1. Spread width: $2 \times 8.5 = 17$ in.
2. Live area: $17 - 2(0.75) = 15.5$ in wide (outer margins only; the inner margins are inside the live spread but mark the fold zone).
3. The fold is at the spread's center, 8.5 in from the left edge; the two inner margins form a $2 \times 0.5 = 1$ in channel around it.
4. Centering the photo on the spread centers it on the fold, so keep faces and text out of the central inch, where the curve of the binding swallows detail.

Answer: Live spread 15.5 in wide; the fold sits at its center with a 1-in gutter channel; keep critical detail out of that inch.

Example 4. A 16-page newsletter uses 10.5/14 body text in a 42-pica-tall text block, two columns of 19 picas. Estimate the word capacity of one full text page.

Show solution

1. Lines per column: $\lfloor 42 \times 12/14 \rfloor = 36$.
2. Characters per line at 10.5 pt on a 19-pica (228 pt) measure: roughly $228/5.25 \approx 43$.
3. Words per column: $36 \times 43/6 \approx 258$ (about 6 characters per word including the space).
4. Two columns: about 515 words per page, before headings and pictures take their share.

Answer: Roughly 500 words per full page; a 16-page newsletter with half its space given to images holds about 4,000 words.

PRACTICE

1. Easy Which side is the recto, and are its folios odd or even?

Show answer

The right-hand page; odd.

2. Easy How many sheets does a 16-page saddle-stitched booklet need, and how many pages does each folded sheet contribute?

Show answer

$16/4 = 4$ sheets; each contributes 4 pages.

3. Easy Name three things that belong on a master page rather than on individual pages.

Show answer

Folios (page numbers), running heads, and the grid/margin guides (also any repeating rules or footer line).

4. Medium In a 12-page saddle-stitched booklet, which page prints beside page 3, and which beside page 5?

Show answer

Pairs sum to 13: page 10 beside 3; page 8 beside 5.

5. Medium Why do inner margins get smaller than outer margins in a bound book, when the spine seems to need more room, not less?

Show answer

The two inner margins meet at the fold and pool into one visual channel, so each can be smaller; for thick or glued bindings you then add back a binding allowance because the curve swallows paper.

6. Medium A client sends 11 articles for an 8-page newsletter; your flatplan fits 7. List the three professional options in order of preference.

Show answer

1) Cut or shorten with the editor (flatplan decides, content negotiates). 2) Grow to 12 pages and quote the cost. 3) Run teasers that point to full articles online. Shrinking type to 8 pt is not on the list.

7. Medium What does linking text frames do in Scribus, and why is it better than pasting each page's text separately?

Show answer

Linked frames let one story flow through many pages; edits reflow automatically through the chain, so a cut on page 2 does not orphan text on page 5. Pasted blocks must all be fixed by hand after every edit.

8. Hard Sketch (describe) the flatplan for an 8-page church anniversary booklet: assign content to pages 1–8 so that the best photos get the center spread and the booklet opens and closes well.

Show answer

Sample: 1 cover (title, one strong image); 2 pastor's letter; 3 congregation history begins; 4–5 center spread photo essay (safe to cross the fold); 6 timeline; 7 testimonies; 8 back cover with verse and service times. The center spread gets the photos because its pages are printed as one pair.

9. Hard Your booklet proofs show the folio on some left pages printed in the right-page position. Diagnose the likely cause in Scribus and the fix.

Show answer

The Left master was not applied to those pages (or a single master was applied to all). Fix: create distinct Left and Right masters with mirrored folios, then Page ▸ Apply Master Page using the left/right options so each side inherits its own.

10. Hard Brodovitch pinned whole issues to the wall before approving any page. What does that catch that page-by-page review cannot? Give two examples.

Show answer

Flow problems: three loud spreads in a row that exhaust the reader, or two unrelated stories that open with near-identical layouts and read as one. Rhythm, pacing and accidental repetition only show at the scale of the whole sequence.

COMMON MISTAKES

- Designing single pages and discovering at the end that spreads clash across the fold; always view facing pages together.

- Forgetting that saddle stitch needs multiples of four pages, then padding with a blank page where readers notice it most (facing the cover).
- Putting critical content (faces, folios, text) in the inner inch at the fold or the outer eighth-inch at the trim.

Make it a game · Imposition Scramble. Number eight scraps of paper 1 through 8 and shuffle them. Against a 60-second timer, arrange them into correct saddle-stitch printing pairs (sums of 9) and state which pair is the center spread. Then fold two blank sheets, nest them, and number the resulting booklet by hand to check yourself. Best of three runs; next time, play with 12 pages and sums of 13.

Scripture. “And there are also many other things which Jesus did, the which, if they should be written every one, I suppose that even the world itself could not contain the books that should be written. Amen.” (John 21:25, KJV)

John closes his Gospel like an editor closing a flatplan: more material than any book can hold, chosen and ordered so that what remains serves the reader. Every multi-page design is an act of selection.

5.4 Ready for the Press: Resolution, Bleed and File Formats

OBJECTIVES

- Calculate print size from pixel dimensions and resolution, and the pixels required for a given print size at 300 PPI.
- Set up a document with correct trim, bleed and safe margins, and explain what each zone is for.
- Choose the right file format for a job (PDF/X, TIFF, PNG, JPEG, SVG) and export a print-ready PDF from Scribus.

> **Warm-up.** Find a printed photo in a newspaper or church bulletin and look at it through a magnifying glass (or take a phone photo zoomed way in). The smooth picture dissolves into dots. Now look at a glossy magazine photo the same way: the dots are finer. Count roughly how many dots fit in a quarter inch of each, and write both numbers down.

WATCH

Bleed, Trim, Margin + Safe Lines in Printing - Explained!

Design by Laney · 6:25

https://www.youtube.com/watch?v=UvjeIHBq-6g

> **WHEN TO WATCH**
> After the craft paragraph. Pause at her diagram and draw the three zones (bleed, trim, safe) around a business-card rectangle in your sketchbook, with the standard measurements.

Note: A designer explains the zones every print file needs and shows what goes wrong when they are missing. This vocabulary is exactly what your print shop expects you to know.

BACKUP VIDEO

PPI vs DPI - Explained Properly (at last!)

Myron Achtman · 30:18

https://www.youtube.com/watch?v=8S2cnZ2QR70

With the resolution paragraphs. He untangles pixels-per-inch (a property of your file at a size) from dots-per-inch (a property of the printer), the confusion behind half of all print disasters.

KEY TERMS

PPI (pixels per inch)

How densely an image's pixels are spread at a chosen print size. The same file has many possible PPIs; only pixels are fixed. Print standard is 300 PPI at final size.

halftone / LPI

Printing simulates tones with grids of dots; lines per inch (LPI) is the dot-grid frequency: newspapers about 85, magazines 133–150.

trim size

The final cut size of the piece, the only size the customer ever sees.

bleed

Artwork extended past the trim line, standardly 1/8 in (0.125 in, about 3 mm), so a slightly off cut never leaves a white sliver.

safe margin

The keep-inside zone, typically 1/8 to 1/4 in inside the trim, where text and logos must stay so the cutter cannot clip them.

PDF/X

A strict PDF standard for printing (PDF/X-1a, X-4) that embeds fonts, fixes colors and forbids surprises; the lingua franca between designers and presses.

lossy vs lossless

JPEG compresses by discarding detail (lossy); PNG and TIFF keep every pixel (lossless). Nothing recovers what JPEG threw away.

CORE IDEAS

The story. On March 4, 1880, the New York Daily Graphic printed a photograph, a row of shantytown rooftops, directly in a newspaper for the first time, using Stephen Horgan's experimental screen that broke the photo into printable dots. Through the 1880s Frederic Ives in Philadelphia perfected the crossline halftone screen: two ruled glass plates crossed at right angles, splitting any photograph into a grid of dots, large dots in shadows, pinpoints in highlights. The eye, at reading distance, blends the dots back into tone. Before the halftone, every published picture had to be redrawn by an engraver; within twenty years, photographs filled newspapers and magazines and the pictorial press was born. Every printed image you have ever

seen, and every screen you own, descends from that bargain: continuous tone traded for a grid fine enough to fool the eye. The whole craft of print resolution is making sure the grid stays too fine to see.

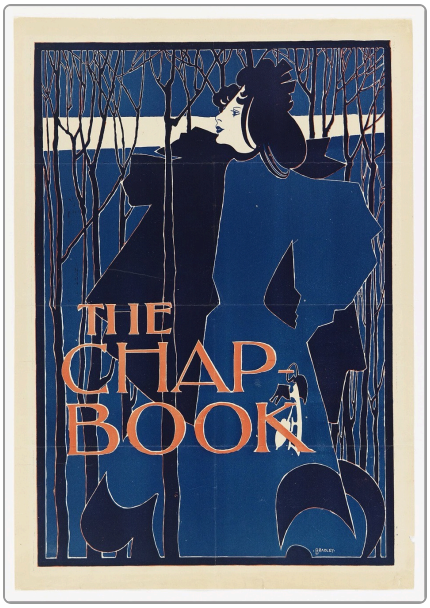
How they figured it out. Printers learned the numbers by ruin. A photo that looked crisp on a bright monitor came back from press soft and stair-stepped, because a monitor only needs around 100 pixels per inch while a 150-LPI magazine halftone wants roughly twice the LPI in image pixels, about 300 PPI at final printed size. The relationships are plain arithmetic: a file's print size is inches $=$ pixels$/$PPI, so a 3000 × 2400 px photo prints 10 × 8 in at 300 PPI, or 20 × 16 in at 150 PPI (fine for a poster read at arm's-length-times-four, since acceptable PPI falls as viewing distance grows). Changing the PPI number alone changes nothing real; only pixels are real. Upsampling, letting software invent pixels, adds blur, not detail. The cutting problem was solved the same humble way: paper cutters wander by a hair, so printers demanded art extended 1/8 inch past the trim (bleed) and content held 1/8 inch inside it (safe), and the white-sliver disaster disappeared.

The craft. Every print document has three nested rectangles, and you should be able to draw them blindfolded. For a standard US business card: trim 3.5 × 2 in; bleed extends 0.125 in on all four sides, so the artwork canvas is 3.75×2.25 in; safe margin sits 0.125 in inside trim, so text lives within 3.25×1.75 in. At 300 PPI the full-bleed canvas is 1125×675 pixels. Any background color or photo that should reach the edge must run to the bleed line, never stop at the trim. Formats then carry the work: TIFF or PNG for lossless images and scans; JPEG only for photos, at high quality, and never re-saved over and over; SVG for vector art on the web; and for the press, a PDF/X export with fonts embedded, images at 300 PPI effective resolution, and crop marks plus bleed included. Scribus does this under File ▸ Export ▸ Save as PDF, with the bleed settings on the Pre-Press tab.

In the studio. Production artists, a real job title, and a common first job on the pathway, spend their days preflighting: checking files against the printer's specs before they cost money. The checklist is short and merciless: CMYK not RGB (Unit 4); effective resolution at least 300 PPI at placed size (a 300 PPI photo scaled 200% in layout becomes 150 PPI, a fail); bleed present on every edge that prints to the edge; text inside safe; fonts embedded or outlined; and the PDF opened and inspected at 100% before sending. Printers publish spec sheets for exactly this, and the designer who reads them, asks one good question, and sends a clean file on the first try

becomes the designer the shop recommends to its other customers. Sloppy files cost real money: a reprint of 500 business cards wipes out the profit on the job, and the designer, not the printer, eats the error if the file was wrong.

PICTURE STUDY



The Blue Lady (poster for The Chap-Book), Will Bradley, 1894 · Color lithograph on thin cream wove paper · Cooper Hewitt, Smithsonian Design Museum

Image: Wikimedia Commons, public domain

Will Bradley drew this poster for The Chap-Book in 1894, when he was twenty-six and America's most imitated designer. Every area of color is a flat, hard-edged printing shape, each one a separate lithographic pass that had to land in perfect register with its neighbors.

Study it as a production file as much as a picture: Bradley, who had been a printer's boy since age twelve, designed nothing his press could not deliver.

Look closely

- Count the ink colors. Where two colors meet, is there an outline hiding the joint, or do the flats butt edge to edge?
- Butting flats demand tight registration. Find the longest shared edge between two colors, the riskiest line in the print.
- Does any shape run off the edge of the sheet? What would modern printers call that, and what would they require of the file?
- Look at the lettering. Hand-drawn to match the curves of the art: what does that unity buy the poster?
- Find a place where the paper itself (unprinted cream) is used as a color.

Talk about it

1. Bradley knew the press because he had worked one. Name one way that knowledge shows in this design, and one modern equivalent of a designer knowing the press.
2. Flat shapes with no gradients were a technical necessity in 1894. Why do designers still choose that look today, when gradients cost nothing?
3. If you were sending this artwork to a printer today, what three production specs would you write on the order?

Safety first. Trimming printed cards requires a craft knife: always a metal straightedge, always a cutting mat, fingers of the holding hand flat on the ruler and out of the blade's lane, several light passes instead of one forced cut, and the blade retracted the instant you finish. Change dull blades; a dull blade needs force, and force is what slips. For screen sessions, take a 20-second distance break every 20 minutes and keep the top of the screen at eye height.

STUDIO BRIEF

Studio brief: a print-ready business card

Client: a real person you know with a small trade or ministry: piano teacher, handyman, tutor, youth pastor. Deliverable: a two-sided business card as a press-ready PDF/X with bleed and crop marks, plus five hand-trimmed proofs. Specs: trim 3.5 × 2 in, 0.125-in bleed and safe, CMYK, type no smaller than 7 pt, logo or mark on front, details on back. Deadline feel: the client needs the file sent to an online printer this weekend, and the printer's preflight robot has no mercy.

You will need

- Scribus (set up the document with bleeds from the worked example)
- Your client's real information, checked twice (one typo = 500 useless cards)
- Cardstock, a printer, craft knife, metal straightedge and cutting mat for proofs
- One real printer's spec sheet downloaded from any online print shop, to preflight against

Steps

1. Interview the client for five minutes: what they do, who should call, what feeling the card should give (sturdy? gentle? precise?).
2. Set up the Scribus document: 3.5 × 2 in page, 0.125-in bleed in Document Setup, guides at the safe margin. Draw the three zones and label them on a sketch first.
3. Design the front: name or mark dominant, one accent, generous space; any background color must extend to the bleed line.
4. Design the back: contact details in a clean hierarchy, aligned to a tiny grid, nothing outside safe.
5. Set every color as CMYK in Scribus's color editor; body text 100% K. Check type sizes (7 pt minimum, 8–9 pt kinder).

6. Preflight against the shop's spec sheet line by line, then export PDF/X with crop marks and bleed from the Pre-Press tab.
7. Print on cardstock, trim five cards exactly on the crop marks with knife and straightedge (safety note above), and inspect: did anything important sit too close to an edge?
8. Hand the proofs to the client, record their one requested change, make it, and re-export, version-numbering the file (card-v2.pdf), the professional habit that prevents sending the wrong file.
9. Write the production record in your sketchbook: final specs, colors (CMYK values), fonts, and the preflight checklist with every box ticked.

Tips

- Design at 100% zoom frequently; cards are read at arm's length, and what looks balanced at 400% can be unreadably tiny in the hand.
- A hairline border around the trim is a beginner's trap: any cut wander makes the border visibly uneven. Avoid borders, or make them bold and inside safe.
- Dark, heavy ink near edges shows cut dust; a light design trims cleaner.

Check your work

- ☐ My PDF passes the real spec sheet: bleed present, safe respected, CMYK, 300 PPI effective on any image, type at least 7 pt.
- ☐ Five proofs trimmed on the marks look clean, with nothing clipped and no white slivers.
- ☐ The client approved version 2, and my production record is complete.

SKETCHBOOK

1. The three-zone diagram (bleed, trim, safe) for a business card and for an 11 × 17 poster, with all dimensions labeled.
2. A resolution table you compute once and keep: common sizes (4×6, 8×10, 11×17, 18×24) with pixels needed at 300 and 150 PPI.
3. Both sides of your card at double size with the grid, colors (CMYK values) and type sizes annotated.

KEY FORMULAS

$$\text{print size (in)} = \frac{\text{pixels}}{\text{PPI}}, \qquad \text{pixels needed} = \text{inches} \times \text{PPI}$$

$$\text{PPI needed} \approx 2 \times \text{LPI} \text{ (quality factor 2)}$$

$$\text{canvas with bleed} = \text{trim} + 2 \times 0.125 \text{ in (each dimension)}$$

$$\text{effective PPI} = \frac{\text{native PPI}}{\text{scale factor}} \text{ (a 300 PPI image placed at 150\% is 200 PPI)}$$

From history. The halftone screen did not just change printing; it changed what people believed. Before 1880, the public saw events through an engraver's interpretation; after, through what felt like the camera's own witness. Magazines built empires on halftone photo spreads, and the illustrators of Unit 7 lost the news business to photography even as they gained the story-and-advertising business. Technology reroutes careers in every generation, which is why this course keeps teaching the arithmetic underneath the tools rather than the tools alone.

WORKED EXAMPLES

Example 1. A phone photo is 4032 × 3024 pixels. How large can it print at full magazine quality (300 PPI)? At poster quality (150 PPI)?

Show solution

1. At 300 PPI: $4032/300 = 13.4$ in by $3024/300 = 10.1$ in.
2. At 150 PPI: 26.9×20.2 in, acceptable because posters are viewed from farther away.
3. Megapixels: $4032 \times 3024 = 12.2$ MP, which is why a modern phone covers most print jobs if the photo is sharp and well lit.

Answer: About 13.4 × 10.1 in at 300 PPI; about 26.9 × 20.2 in at 150 PPI.

Example 2. Set up the business-card document: trim 3.5 × 2 in, standard bleed and safe. Give the canvas size with bleed, the safe area, and the pixel dimensions at 300 PPI.

Show solution

1. Canvas: $3.5 + 0.25 = 3.75$ by $2 + 0.25 = 2.25$ in.
2. Safe area: $3.5 - 0.25 = 3.25$ by 1.75 in.
3. Pixels: $3.75 \times 300 = 1125$ by $2.25 \times 300 = 675$.
4. In Scribus, set the page to 3.5 × 2 and enter 0.125-in bleeds in Document Setup; Scribus draws the bleed box for you and includes it in the PDF/X export.

Answer: Canvas 3.75 × 2.25 in (1125 × 675 px at 300 PPI); safe area 3.25 × 1.75 in.

Example 3. A 2400 × 3000 px scan is placed in a layout at 12 in tall. A second copy is placed at 6 in tall. Find each effective PPI; do both pass a 300 PPI preflight?

Show solution

1. At 12 in: $3000/12 = 250$ PPI, a fail for fine print work (close, and fine for a poster, but below the magazine spec).
2. At 6 in: $3000/6 = 500$ PPI, a comfortable pass (extra resolution is harmless; the RIP downsamples).
3. The fix for the 12-in placement: rescan larger, or place smaller, or accept poster-grade quality knowingly, in writing.

Answer: 250 PPI (fails a 300 spec) and 500 PPI (passes).

Example 4. A newspaper prints at 85 LPI, a magazine at 150 LPI. Using the quality factor of 2, what image PPI does each need, and why does the same photo file work for the newspaper but fail for the magazine?

Show solution

1. Newspaper: $2 \times 85 = 170$ PPI. Magazine: $2 \times 150 = 300$ PPI.
2. A 1700-px-wide photo prints 10 in wide at 170 PPI, meeting newspaper spec, but at magazine spec it only covers $1700/300 = 5.7$ in.
3. Same pixels, different demands: resolution is always relative to the output process and size.

Answer: 170 PPI vs 300 PPI; the file covers 10 in of newspaper but only 5.7 in of magazine.

PRACTICE

1. Easy How many pixels wide must an 8-in-wide image be at 300 PPI?

   Show answer

   $8 \times 300 = 2400$ px.

2. Easy What is the standard bleed, and what is it for?

   Show answer

   0.125 in (1/8 in, about 3 mm) past trim on each edge; it ensures a slightly wandering cut never exposes unprinted paper.

3. Easy Name a lossless format for a scanned drawing and explain why JPEG is the wrong archive format for it.

   Show answer

   TIFF or PNG. JPEG discards detail each save, and its artifacts speckle clean line work; what is discarded never comes back.

4. Medium A 5 × 7 in invitation prints full-bleed. Give the document canvas size and the safe area (0.125-in safe).

   Show answer

   Canvas 5.25×7.25 in; safe 4.75×6.75 in.

5. Medium A 1500 × 2100 px image is placed at 10 in tall. Effective PPI, and verdict for 300-PPI work?

Show answer

$2100/10 = 210$ PPI; fails the 300 spec (usable only for far-viewed posters).

6. Medium Why does changing a file's PPI number from 72 to 300 in software, without resampling, not improve the image?

Show answer

PPI is just a tag dividing the same fixed pixels over fewer inches; the pixel count is unchanged. The print gets smaller, not better, and resampling up only invents blurry pixels.

7. Medium A banner 36 in wide will be read from 15 feet. Argue with numbers that 100 PPI is enough, using the ten-feet rule of thumb for viewing.

Show answer

Required PPI falls roughly with distance: the 300-PPI standard assumes about 12-in reading distance; at 15 ft (180 in, 15 times farther) even $300/15 = 20$ PPI blends, so 100 PPI has generous margin. Pixels needed: 3600 wide, a modest file.

8. Hard Preflight this file and list every failure: RGB JPEG, 1050 × 600 px, placed at 3.75 × 2.25 in for a full-bleed business card, text 0.05 in from trim, fonts not embedded (it is a flattened image, so no fonts).

Show answer

Failures: RGB (press needs CMYK); resolution $1050/3.75 = 280$ PPI (marginal, below 300); text at 0.05 in violates the 0.125-in safe margin; JPEG artifacts risky for text edges (should be rebuilt in layout with live type). Bleed dimensions are actually correct; fonts moot in a flattened image but the text will print soft.

9. Hard You are the production artist. The client's logo arrives as a 400-px-wide JPEG snagged from their website, for a 10-in-wide banner head. Effective PPI, and the professional email you send (two sentences)?

Show answer

$400/10 = 40$ PPI: mush. Model email: The logo file on hand is web resolution and will print visibly blurry at banner size; could you send the original vector file (AI, EPS, SVG or PDF from the logo's designer)? If none exists, I can redraw the mark as vector art for a small fee, and you will own a file that scales to any size forever.

10. Hard A print shop's spec sheet says: PDF/X-1a, 0.125 bleed, 300 PPI, no registration black. Explain the last item: what is registration black, and why would body text set in it be a disaster?

Show answer

Registration black is 100% of all four inks (used only for printer's marks that must appear on every plate). As text it lays down 400% ink coverage: the paper oversaturates, smears and ghosts, and tiny misregistration fringes every letter with color. Body text should be 100% K only.

11. Hard Compute the n-up yield: how many 3.75 × 2.25 in bleed-size cards fit on a 12 × 18 in press sheet (no rotation, ignore gripper margin), and how many sheets print 500 final cards?

Show answer

Across: $\lfloor 12/3.75 \rfloor = 3$; down: $\lfloor 18/2.25 \rfloor = 8$; 24-up. Sheets: $\lceil 500/24 \rceil = 21$ plus spoilage allowance.

COMMON MISTAKES

- Stopping background art at the trim line instead of the bleed line, the single most common cause of rejected files.
- Trusting the PPI tag instead of computing effective PPI at placed size.
- Setting small body text in four-color black or in a color build, which fringes at the slightest misregistration; small text wants 100% K.

Make it a game · Preflight Inspector. Your parent invents a print job by writing five specs on a card (for example: 6 × 4 postcard, full bleed, 300 PPI, CMYK, 0.125 safe), then describes a file with two hidden faults (wrong canvas size, 150 PPI photo, RGB, text at the trim). You have 90 seconds to catch both faults and state the fix, showing the arithmetic for any resolution call. Three jobs per round; a perfect round earns the title Production Artist.

Scripture. “The thoughts of the diligent tend only to plenteousness; but of every one that is hasty only to want.” (Proverbs 21:5, KJV)

Preflighting is diligence in its plainest form: ten unhurried minutes of checking against the spec saves a reprint bill and a reputation. Haste at the export stage is the costliest haste in design.

5.5 Ink on Paper: How Printing Actually Works

OBJECTIVES

- Explain how letterpress, offset lithography and digital printing each put ink on paper, and when a job calls for each.
- Describe CMYK halftone screens, screen angles and the rosette, and read a printed piece with a loupe or magnifier.
- Read paper specifications (bond, text, cover weights) and talk through a complete job with a print shop in its own vocabulary.

> **Warm-up.** Gather three printed things: a receipt, a newspaper or church bulletin, and a glossy magazine or product box. Feel each paper, hold each to the light, and look at the ink edges with a magnifier. Guess how each was printed and what each cost per piece. Keep the guesses to check at the end of the lesson.

WATCH

How Does The Offset Lithographic Printing Process Work?

Solopress · 2:20

https://www.youtube.com/watch?v=pNZb7CXUjs0

> **WHEN TO WATCH**
> After the story paragraph. Watch twice: once for the flow (plate to blanket to paper), once pausing to name each cylinder aloud.

Note: A print company's clear animation of dampening, inking, the blanket cylinder and the four color units. Short enough to rewatch until you can narrate it with the sound off, which is the test.

BACKUP VIDEO

International Printing Museum Tour: The Linotype & the Typesetting Race

International Printing Museum · 35:46

https://www.youtube.com/watch?v=5n5JQrN8qx4

With the history note. A working museum demonstrates the machine that set type as whole lines of hot metal, the heart of letterpress's industrial age.

KEY TERMS

letterpress

Printing from raised, inked surfaces pressed into paper, Gutenberg's method, dominant for 500 years and now a boutique craft.

offset lithography

Printing from a flat plate whose image areas take ink and whose wet areas refuse it, transferred (offset) to a rubber blanket and then to paper; the workhorse of commercial printing.

blanket cylinder

The rubber-covered cylinder that receives the inked image from the plate and lays it on the paper; its softness prints cleanly even on textured stock.

screen angles / rosette

Each CMYK halftone is rotated (commonly K 45°, M 75°, C 15°, Y 0°) so the dot grids interlock in tiny flower-like rosettes instead of clashing into moiré patterns.

moiré

An unwanted shimmering pattern made when two regular grids overlap at the wrong angle, the press disease the screen angles prevent.

paper weight

US paper is sold by the weight of 500 sheets at a basis size that differs by grade: 20 lb bond is everyday copy paper, 80 lb cover is card; metric gsm (grams per square meter) compares all papers directly.

makeready

The setup work before a press run (plates, registration, ink balance); it costs the same for 100 copies as for 10,000, which is why unit cost falls with quantity on offset.

CORE IDEAS

The story. In 1901, in a small lithography shop in Nutley, New Jersey, a pressman named Ira Rubel was printing bank deposit slips from a flat litho stone onto paper, with a rubber-covered impression cylinder behind the sheet. One day the feeder missed a sheet, and the stone printed its image onto the rubber itself; when the next sheet ran, it got printed on both sides, one side from the stone, the other from the

rubber. The mistake side was better: softer rubber pressed ink into the paper's grain more faithfully than hard stone ever had. Rubel, instead of scrapping the error, built a press that printed onto rubber on purpose and from rubber onto paper, and around the same time the Harris brothers in Ohio developed their own offset press from the same observation. Within two decades offset lithography was conquering commercial printing, and from roughly the 1960s to this day, nearly every magazine, package, poster and paperback you touch has been offset printed. The whole industry stands on a well-watched accident.

How they figured it out. Offset works because of chemistry older than Rubel: in 1796 Alois Senefelder, a Bavarian playwright too poor to pay for engraving, discovered he could print from flat limestone by drawing with a greasy crayon, wetting the stone, and rolling on oily ink, the ink took only where the grease was, the water repelled it everywhere else. Modern plates are aluminum, imaged by laser directly from your PDF (computer-to-plate), but the dance is the same: dampening rollers wet the plate, ink rollers ink the image, the plate offsets to the blanket, the blanket prints the sheet, and four units in a row lay down cyan, magenta, yellow and black halftones in one pass at tens of thousands of sheets per hour. The halftones must not fight: printers learned to rotate each color's dot grid, black at 45° (least visible to the eye), magenta 75°, cyan 15°, yellow (the faintest ink) at 0°, so the four grids lock into rosettes. Get an angle wrong, or scan an already-printed halftone, and moiré blooms across the page.

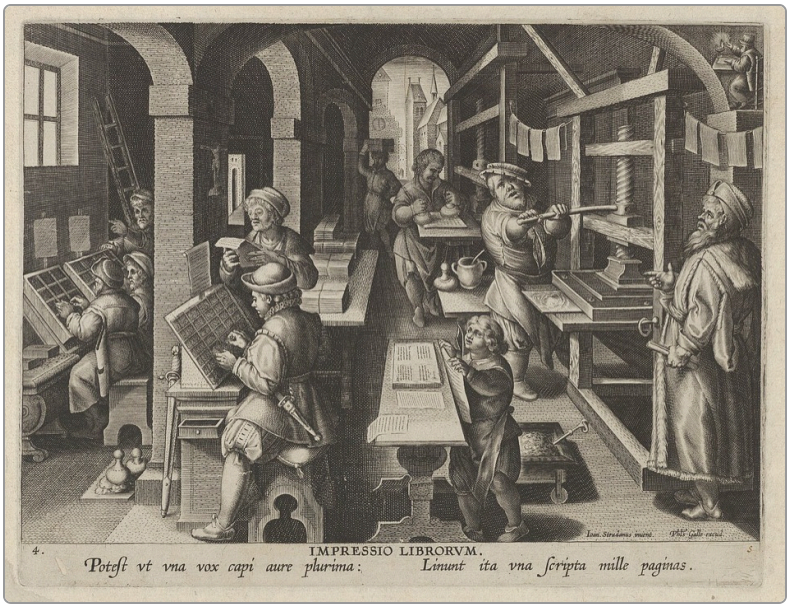
The craft. Choosing a process is arithmetic plus honesty about quantity and quality. Offset has high makeready cost but tiny per-sheet cost: good for 500 and up, unbeatable for 5,000. Digital presses (industrial cousins of the laser printer, toner or inkjet) have almost no setup, so 50 copies cost little, and every copy can differ (names on certificates), but per-sheet cost stays flat, so big runs favor offset; the crossover sits somewhere in the hundreds, and shops will quote both. Letterpress survives for wedding invitations and fine work where the bite of type into cotton paper is the point. Paper is the other half of the conversation: a sheet is specified by grade and weight, 20 lb bond copy paper (75 gsm), 70 lb text for nice flyers (about 104 gsm), 80–100 lb cover for cards (216–270 gsm), coated (gloss or matte, holds fine halftones, 150+ LPI) versus uncoated (warm, toothy, dots gain and spread, so printers screen coarser and you design accordingly). Ink soaks and spreads on press, dot gain, so midtones print darker than the screen showed; pros expect it and

shops compensate, but it is why a proof on the actual stock is the only proof that settles arguments.

In the studio. Designers who understand presses order print like professionals. A complete request for quote (RFQ) names: quantity; flat and finished (folded) size; page count; stock (grade, weight, coating); ink (4/4 means four-color both sides, 4/1 color front and black back, 1/0 black one side); bleeds; finishing (folding, saddle stitch, cutting, lamination); file format (PDF/X); and the date needed. Shops answer precise questions with precise prices, and they remember designers whose files run clean. The field trip in this brief exists because five minutes beside a running press teaches respect no video can: the speed, the noise, the pressman pulling sheets and reading color by eye against the proof, and the simple fact that your PDF becomes a physical object through other people's skill. Treat press operators as the craftsmen they are and your jobs will mysteriously come out better.

The pathway. Print production is itself a career door: prepress technicians, press operators and print estimators are skilled trades with real demand, and many designers fund their start with production work. A designer who can preflight, impose and talk paper is employable at every print shop, newspaper and in-house marketing department in the country, which is not something every illustration skill can say.

PICTURE STUDY



The Invention of Book Printing (Nova Reperta, plate 4), Designed by Jan van der Straet (Stradanus), engraved by Jan Collaert I, published by Philip Galle, About 1600 · Engraving · Metropolitan Museum of Art, New York

Image: Wikimedia Commons, public domain (CC0, Metropolitan Museum of Art)

Around 1600 the series Nova Reperta (New Inventions) celebrated the discoveries that had remade the world, and gave printing a plate of its own. This is a working print shop drawn by people who had stood in one: every job in the room is real, and the shop is organized like a small factory a century and a half after Gutenberg.

Find the workflow. The room reads like a diagram: copy comes in, type is set, proofs are read, the press prints, sheets dry and stack.

Look closely

- Find the compositors picking letters from the divided type cases. Why are the cases tilted toward them?
- Find the two-man press crew: one inks the type with leather balls, one pulls the bar. Why two men per press?
- Find the proofreader. What does his presence say about how errors were handled before a run, and what do we call that step now?
- Trace the paper's journey through the room, from blank stack to printed sheets. Where do finished sheets dry?

- Count the children in the shop. Printing was a trade entered by apprenticeship; what jobs are the boys doing?

Talk about it

1. Which jobs in this room still exist in a modern print shop, under what names, and which did machines absorb?
2. The press crew could pull roughly 200–250 sheets an hour; a modern offset press runs 15,000. What does that change about the cost of makeready versus the cost of each sheet?
3. Stradanus put printing among the great inventions beside the compass and gunpowder. Make the case in two sentences that he was right.

STUDIO BRIEF

Studio brief: the print-shop visit

Client: your own education. Deliverable: a visit to a working print shop (commercial printer, newspaper plant, in-plant shop at a business or school, or a copy-and-print store as a fallback), plus a written shop report and a real quote for one of your Unit 5 pieces. Specs: arrange the visit by phone or email like a professional, prepare eight questions, observe one job moving through the shop, and bring back paper samples. Deadline feel: within two weeks; presses do not wait, so you schedule around them.

You will need

- A parent to arrange and accompany the visit; many shops welcome polite students, especially in slower afternoon hours
- Your eight prepared questions and a notebook (ask before photographing anything)
- Your business card or poster PDF on a drive, with its spec sheet, to request a real quote
- A magnifier or loupe for (asked-for) close looks at printed sheets

Steps

1. Call or email the shop: introduce yourself as a student studying print production, ask for fifteen minutes to see the shop and one job in progress, and offer two or three time windows. Write the script before you call.
2. Prepare eight questions. Good ones: What is the most common mistake in customer files? Digital versus offset, where is your crossover quantity? What paper do you love that customers never pick? What does makeready involve on your press? How do you check color against the proof?
3. On the visit, trace one job: where files arrive, preflight, plates or direct to press, the press itself, cutting and finishing, packing. Sketch the floor as a flow diagram.
4. Ask to see (not touch) a press sheet with color bars and registration marks, and look at a printed photo through your loupe to find the rosettes.

5. Collect paper samples or a swatch book if offered, and label each with grade, weight and coating when you get home.
6. Present your poster or card spec sheet and ask for a quote at two quantities (say 100 and 1,000). Thank them in writing afterward: shops remember courteous students who become customers.
7. Write the shop report (one to two pages): the flow diagram, three things that surprised you, the quote arithmetic (unit cost at both quantities), and one thing you will change in your files after seeing preflight from the shop's side.
8. Fallback if no visit is possible: tour the International Printing Museum's channel and a modern press video, then do every other step by email with an online printer, including the two-quantity quote.

Tips

- Shops are loud and forklifts are real: stay where your host puts you, and keep sleeves, cords and hair away from machinery without being asked.
- The pressman's time is money while the press runs; save questions for between tasks and let your host set the pace.
- Asking what ruins customer files will teach you more in two minutes than any checklist; write the answer verbatim.

Check your work

- ☐ I arranged the visit myself, with a script, and followed up with written thanks.
- ☐ My report contains the job-flow diagram, the loupe observation of rosettes, and labeled paper samples.
- ☐ I obtained a real two-quantity quote and computed the unit costs and crossover.

SKETCHBOOK

1. A labeled diagram of one offset printing unit: plate, blanket and impression cylinders, dampening and inking rollers, drawn from the video.
2. Your loupe findings: sketches of halftone rosettes from a magazine and the coarser dots of a newspaper, with estimated LPI.
3. The print-shop flow diagram and your two-quantity quote arithmetic.

KEY FORMULAS

$$\text{unit cost} = \frac{\text{makeready} + \text{run rate} \times \text{quantity}}{\text{quantity}}$$

Screen angles (typical): K 45°, M 75°, C 15°, Y 0°

$\text{gsm} \approx \text{lb (bond)} \times 3.76$, $\text{gsm} \approx \text{lb (cover)} \times 2.70$ (per-grade conversion factors)

From history. Ottmar Mergenthaler's Linotype (1886) set type as whole lines of fresh-cast metal, five times faster than hand setting, and Thomas Edison reportedly called it the eighth wonder of the world; it made the thick daily newspaper possible, and Linotype operators were an elite trade for ninety years. Phototypesetting killed hot metal in the 1960s–70s, and desktop publishing killed phototypesetting in the 1980s (Unit 6 tells that story). Three generations of craftsmen retrained or retired; the lesson for a student entering design in the 2020s is not that machines are the enemy, but that the craftsman who understands principles outlasts the one who only knows this year's machine.

WORKED EXAMPLES

Example 1. A shop quotes a flyer two ways: offset with \$180 makeready plus \$0.04 per sheet, or digital at \$0.22 per sheet flat. Find the cost of 200, 1,000 and 5,000 copies each way, and the crossover quantity.

Show solution

1. Offset: $200 \to 180 + 0.04(200) = \$188$; $1{,}000 \to \$220$; $5{,}000 \to \$380$.
2. Digital: $200 \to \$44$; $1{,}000 \to \$220$; $5{,}000 \to \$1{,}100$.
3. Crossover where $180 + 0.04q = 0.22q$: $q = 180/0.18 = 1{,}000$ copies.
4. Advise: under 1,000 go digital, over 1,000 go offset, at 1,000 ask about paper options since the price ties.

Answer: Digital wins below 1,000 copies, offset above; they tie at exactly 1,000 (\$220).

Example 2. Convert 20 lb bond and 80 lb cover to gsm, and say which is heavier paper in absolute terms.

Show solution

1. 20 lb bond: $20 \times 3.76 \approx 75$ gsm.
2. 80 lb cover: $80 \times 2.70 \approx 216$ gsm.
3. The pound numbers cannot be compared across grades (they weigh 500 sheets of different basis sizes); gsm can, and cover stock is nearly three times the paper.

Answer: About 75 gsm vs 216 gsm; the gsm scale is the honest comparison.

Example 3. A scanned page from an old printed book shows a shimmering plaid pattern when placed in your layout. Name the disease, its cause, and two cures.

Show solution

1. It is moiré: the book's halftone dot grid is interfering with the scanner's sampling grid and the new output screen.
2. Cure 1: use the scanner's descreen setting (it blurs at the old screen's frequency), or scan at high resolution, apply a slight blur, and downsample.
3. Cure 2: rescan slightly rotated or at a different resolution so the grids stop beating; best of all, find the original photograph instead of the printed halftone.

Answer: Moiré from re-screening an already-halftoned image; descreen on scan or blur-and-downsample, or source the original.

Example 4. Estimate paper for the 5.3 zine: 200 copies of an 8-page half-letter zine printed two-up on letter sheets, plus 10% spoilage. How many letter sheets?

Show solution

1. Each copy: 8 half-letter pages = 2 letter sheets printed both sides (4 half-pages per sheet side… each letter sheet two-sided carries 4 zine pages, so $8/4 = 2$ sheets).
2. Base: $200 \times 2 = 400$ sheets.
3. Spoilage: $400 \times 1.10 = 440$ sheets, so buy a ream (500) and keep the rest for proofs.

Answer: 440 sheets including spoilage; buy one ream.

PRACTICE

1. Easy Put in order of invention: offset lithography, letterpress, digital printing, stone lithography.

   Show answer

   Letterpress (c. 1450), stone lithography (1796), offset lithography (1901–05), digital printing (late 20th century).

2. Easy What are the three main cylinders in one offset unit, in the order the image travels?

   Show answer

   Plate cylinder, blanket cylinder, impression cylinder (image: plate to blanket to paper, with the impression cylinder pressing from behind).

3. Easy Why is black's halftone screen set at 45 degrees?

   Show answer

   The eye is least sensitive to patterns on the diagonal, and black is the most visible ink, so it gets the least noticeable angle.

4. Medium A job is marked 4/1 on 70 lb text. Translate for a beginner.

   Show answer

   Four-color (CMYK) printing on the front, black only on the back, on text-grade paper weighing 70 lb per 500 basis sheets (about 104 gsm), a solid flyer stock.

5. **Medium** Offset: $240 makeready + $0.035/sheet. Digital: $0.19/sheet. Which is cheaper for 800 copies, and by how much?

Show answer

Offset $240 + 28 = \$268$; digital $152; digital wins by $116. (Crossover $\approx$ 1,548 copies.)

6. **Medium** Why does the same photo look richer on coated stock than on uncoated, in dot terms?

Show answer

Coated paper holds the halftone dots on its surface, so they stay small and sharp (fine screens, less dot gain). Uncoated fibers wick ink outward, dots fatten, midtones darken and fine screens clog, so printers use coarser screens on it.

7. **Medium** Why does letterpress survive for wedding invitations when offset is cheaper and sharper?

Show answer

Letterpress bites into soft cotton paper, leaving a tactile impression you can feel; the object itself, not just the image, carries the quality. Clients pay for the craft and the feel, a reminder that printing is a physical product.

8. **Hard** Write a complete RFQ (request for quote) for 300 copies of your Unit 5 poster, inventing sensible specs.

Show answer

Sample: 300 posters, 11 × 17 flat (no folding), 4/0, 100 lb gloss text, full bleed (file has 0.125 bleed), no finishing beyond trimming, PDF/X-4 supplied, needed by the 15th; please quote digital and offset and recommend. All nine elements present: quantity, size, pages, stock, ink, bleed, finishing, file, date.

9. Hard You are the designer. The 500 bulletins came back with every photo looking muddy and dark, though your screen and home printer showed them bright. Give the two most likely causes and what you change next run.

Show answer

Dot gain on uncoated stock (midtones printed darker than designed) and/or RGB-to-CMYK conversion done blind at the shop. Fix: convert images to CMYK yourself, lighten midtones to anticipate gain (or use the shop's profile), and ask for a printed proof on the job stock before the run.

10. Hard A client wants 75 personalized certificates, each with a different name, on nice cover stock. Which process, and why is the other wrong?

Show answer

Digital: variable data (each sheet different) is trivial for a digital press and impossible for one offset plate, and 75 copies is far below the offset crossover anyway. Offset would need a plate per name or a second imprint pass.

COMMON MISTAKES

- Confusing the printer (a machine or a person) with the press process; asking for letterpress prices on an offset job signals a beginner.
- Comparing paper weights across grades by the pound number; 80 lb text and 80 lb cover are very different papers. Use gsm.
- Treating the print shop as a vending machine. The shops that save your deadline are the ones you treated as partners when nothing was wrong.

> **Make it a game · Name That Press.** Your parent holds up printed objects one at a time: receipt, newspaper, cereal box, paperback, wedding invitation, photo print, church bulletin. For each, you have ten seconds to name the likely printing process and one clue that gives it away (dots, impression bite, toner shine, thermal fading). One point per correct call, a bonus point for naming the clue before touching the object. Replay with the loupe to check the dot evidence.

> **Scripture.** “Oh that my words were now written! oh that they were printed in a book!” (Job 19:23, KJV)
>
> Job longs for his testimony to outlast his voice, written, printed, engraved. Print's gift is permanence: what the press fixes on paper can speak when the author cannot, which is why the craft of putting ink on paper carried Scripture itself to the whole world.

UNIT 5

Layout and Print Production

A designer's drawings, type and color all have to land somewhere, and for five hundred years that somewhere has usually been a printed page. In this unit you learn the craft of layout: how to divide a page with margins, columns and grids so that everything lines up for a reason; how to design a poster that delivers one message at a glance; how to build books, bulletins and magazines whose pages flow; and then how to hand your work to a printing press so that what comes back is exactly what you designed, with nothing blurry, nothing cut off and no surprises on the invoice.

The stories are of the people who worked all this out: the unknown medieval scribes whose page proportions Jan Tschichold reconstructed as the Gutenberg canon, William Morris and his Kelmscott Press, Josef Müller-Brockmann and the Swiss grid, Edward Penfield and Will Bradley and the American poster craze of the 1890s, Aldus Manutius and the pocket book, and Ira Rubel, the New Jersey pressman whose lucky mistake in 1901 gave us offset printing. You will measure pages in picas and points, compute column widths and bleed sizes, set up real documents in Scribus, and finish the unit with a print-ready poster you could hand to a commercial printer today.

The math in this unit is the math working designers use every week: page arithmetic for grids, type sizes for viewing distance, imposition and page counts for booklets, and the resolution, bleed and file-format numbers that decide whether a print job succeeds. Production skill is what separates a designer a printer trusts from one they quietly dread, and employers know the difference.

PREREQUISITES

- Units 1–4 of this course: drawing and composition basics, the vocabulary of hierarchy and critique, typography (point sizes, leading, measure) and color (CMYK versus RGB)
- Arithmetic and basic algebra: fractions, percentages, solving $c = \frac{W - 2m - (n-1)g}{n}$ style formulas for one variable
- Scribus (free, scribus.net) installed and opened at least once; a ruler marked in inches and, if possible, a pica rule or printed pica chart

MASTERY CHECKLIST

- ☐ I can measure a page in inches, picas and points and convert between them.
- ☐ I can construct the Gutenberg canon of page margins and explain why classical book margins are unequal.
- ☐ I can calculate column widths from page size, margins, columns and gutters, and build that grid in Scribus.
- ☐ I can design a poster with one dominant message and size its type for the distance it will be read from.
- ☐ I can set up a multi-page document with master pages, folios and facing pages, and explain recto, verso and imposition.
- ☐ I can calculate the pixel dimensions a photo needs for a given print size, add correct bleed to a document, and export a print-ready PDF.
- ☐ I can explain how offset lithography works, read a halftone with a loupe, and talk to a print shop in its own vocabulary.
- ☐ I can prepare a complete job for press: trim size, bleed, safe margin, resolution, CMYK and proof.

FREE RESOURCES FOR THIS UNIT

- **Scribus (free desktop publishing)**: The free, open-source page layout program used throughout this unit, for Windows, Mac and Linux. Download the stable version. It does the same job InDesign does in professional studios: frames, master pages, styles and print-ready PDF export. No purchase ever needed.
- **Library of Congress: Artist Posters collection**: Thousands of posters from the 1890s poster craze onward, free to browse and download, including dozens by Edward Penfield and Will Bradley. Use it in Lessons 5.2 and 5.4 to study real posters at high resolution.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

5.1	**The Grid: Margins, Columns and Alignment**	3 sessions of 50 minutes
5.2	**The Poster: One Message at a Glance**	3 sessions of 50 minutes
5.3	**Pages That Flow: Books, Magazines and Multi-Page Layout**	3 sessions of 50 minutes
5.4	**Ready for the Press: Resolution, Bleed and File Formats**	3 sessions of 50 minutes
5.5	**Ink on Paper: How Printing Actually Works**	3 sessions of 50 minutes

Unit 5 test

Time allowed: 50 minutes. A calculator and scratch paper are allowed; a ruler is required for the sketching problems. Show arithmetic and units for every calculation. The test is worth 100 points.

1. **5 pts**
   Convert: 8.5 in to picas; 60 points to picas; 4.5 picas to inches.

2. **5 pts**
   State the Gutenberg canon margins for a 6 × 9 in page (inner, top, outer, bottom).

3. **5 pts**

   A 51-pica page has 5-pica margins and a 3-column grid with 2-pica gutters. Find the column width, and say whether it is a clean number for layout.

4. **6 pts**

   A text block is 48 picas tall; type is set 11/14. How many lines fit, and how many points are left over?

5. **6 pts**

   A poster must be readable at 30 feet. Give the required cap height and an approximate point size (caps about 70% of point size).

6. **7 pts**

   Name the three reading levels of a poster, and for a bake-sale poster assign one content item and a sensible viewing distance to each.

7. **7 pts**

   An 8-page saddle-stitched program: list the printing pairs for both sides of both sheets, and identify the center spread.

8. **8 pts**

   A client wants a 14-page saddle-stitched booklet. Explain the problem and present the two professional options with sheet counts.

9. **8 pts**

   A photo is 3600 × 2400 px. (a) Largest print at 300 PPI? (b) Effective PPI if placed 16 in wide, and the verdict for magazine work?

10. **8 pts**

    Give the full document setup for a press-ready 4 × 6 in postcard: canvas with bleed, safe area, and pixel dimensions of the canvas at 300 PPI.

11. **7 pts**

    Describe the path of the image through one offset printing unit, naming the cylinders in order, and state why the process is called offset.

12. **8 pts**

    Offset costs $210 makeready plus $0.05/sheet; digital costs $0.20/sheet. Compute both prices at 500 and 3,000 copies and find the crossover quantity.

13. **8 pts**

    Critique: a flyer proof shows (a) the background photo stopping exactly at the trim line, (b) the phone number 0.06 in from the edge, (c) body text set in a CMYK color build. Name each fault and its fix.

14. **12 pts**

    Production task. Sketch, with a ruler, a letter-size poster layout to scale (quarter size): construct margins, a grid of your choice, and mark the three reading levels with their computed type sizes for a 20-ft hook and 10-ft message. Label every measurement.

ANSWER KEY

1. $8.5 \times 6 = 51$ picas; $60/12 = 5$ picas; $4.5/6 = 0.75$ in.
2. Inner $6/9 = 0.67$ in; top $9/9 = 1.00$ in; outer 1.33 in; bottom 2.00 in.
3. $(51 - 10 - 4)/3 = 37/3 \approx 12.33$ picas, not clean; adjust margins to 4 picas for 13-pica columns, or gutters to 1p6.
4. $48 \times 12 = 576$ pt; $\lfloor 576/14 \rfloor = 41$ lines = 574 pt; 2 pt left.
5. Caps $30/10 = 3$ in; size $3 \times 72/0.7 \approx 310$ pt.
6. Hook (BAKE SALE plus one image) at 20–25 ft; message (church name, Saturday 9–12, address) at 10 ft; details (proceeds to missions, contact) at 3 ft.
7. Pairs sum to 9: sheet 1 outside 8|1, inside 2|7; sheet 2 outside 6|3, inside 4|5. Center spread is 4–5.
8. Saddle stitch needs multiples of 4 (each folded sheet = 4 pages); 14 is impossible. Offer 12 pages (3 sheets) by trimming content, or 16 pages (4 sheets) by adding a photo spread or notes page; quote the cost difference of the extra sheet.
9. (a) 12×8 in. (b) $3600/16 = 225$ PPI: fails the 300 spec; acceptable only for far-viewed output.
10. Canvas 4.25×6.25 in; safe 3.75×5.75 in; 1275×1875 px.
11. Plate cylinder (dampened, then inked) transfers to the rubber blanket cylinder, which prints the paper against the impression cylinder. It is offset because the plate never touches the paper; the image is set off onto rubber first.
12. 500: offset \$235, digital \$100. 3,000: offset \$360, digital \$600. Crossover $210/0.15 = 1{,}400$ copies.
13. (a) No bleed: extend the photo 0.125 in past trim. (b) Violates the safe margin: move at least 0.125 in inside trim. (c) Small text in a build fringes with misregistration: set body text 100% K.
14. Model answer: margins (e.g., 4/5/5/7 picas) drawn and labeled; a 3-column grid with computed 13-pica columns; hook zone marked about 2-in caps (~200 pt), message zone 1-in caps (~100 pt), details 18–24 pt; all arithmetic shown and elements aligned to the drawn grid. Grading: margins and grid arithmetic correct (4), distance-to-size arithmetic correct (4), hierarchy zones sensible and labeled (4).

PORTFOLIO PIECE: A PRESS-READY POSTER AND PRODUCTION PACK

Take your farmers-market poster (or a new poster for a real upcoming event) to full professional finish: final artwork on your documented grid, type sized by the distance rules, two or three disciplined colors, and every production requirement met: 11 × 17 trim with 0.125-in bleed, CMYK, effective 300 PPI on any image, and export as a press-ready PDF/X with crop marks.

Assemble the production pack a real studio would deliver alongside it: a one-page spec sheet (trim, bleed, stock recommendation, ink, quantity options with the digital/offset cost arithmetic from a real or researched quote), your preflight checklist with every item ticked, and one trimmed proof. This is piece five of the ten-piece professional portfolio this course builds; a poster plus its production pack shows an employer you can finish work, not just start it.

LOOK FOR	WHAT IT MEANS
Concept and hierarchy	One dominant message; hook, message and details read in order and survive the squint and 20-foot tests.
Grid and composition	A documented grid governs the layout; alignments are exact; any grid break is single and deliberate.
Typography and color	Type sizes follow the viewing-distance arithmetic; two or three colors with clear jobs; body-level text is legible and disciplined.
Production readiness	Bleed, safe, CMYK, resolution and PDF/X export are all correct; the preflight checklist is complete and honest.
Professional pack	Spec sheet, quote arithmetic (unit costs and crossover) and trimmed proof are present, accurate and neatly presented.
Craft	The trimmed proof is clean and square; files are named and versioned; the whole pack could be handed to a print shop today.

UNIT 6

The Digital Studio: Raster and Vector

Everything you have drawn, lettered and laid out so far can now move into the computer, and this unit is where you set up your digital studio and learn its two great languages. A computer stores a picture either as a grid of colored squares (raster, the language of paintings and photographs) or as mathematical curves (vector, the language of logos and type). Every tool, file format and job in the industry sorts along that line, and a professional knows at a glance which language a job speaks.

The stories are the founding stories of the tools themselves: Russell Kirsch scanning the first digital photograph, a picture of his baby son, in 1957; Paul de Casteljau and Pierre Bézier taming curves for French car bodies, in secret and in public; John Warnock and PostScript teaching printers to speak mathematics; and two brothers named Knoll who wrote a photo program in 1987 that became Photoshop. You will learn Krita for painting, Inkscape for vector drawing and GIMP for cleaning scans, free, serious tools used by working professionals, and you will finish the unit by carrying one drawing through the full hybrid pipeline: pencil, scan, clean, ink and color.

The math is the arithmetic of your daily work from now on: resolution and megapixels, bit depth and file size, memory, scanning resolution for enlargement, and the deep reason a vector logo scales to a billboard while a raster logo turns to mush. Lesson 6.5 closes the unit with an honest tour of the industry-standard tools, Adobe, Affinity, Procreate, what they cost, how your free-tool skills transfer, and how to walk into a job interview ready for either.

PREREQUISITES

- Units 1–5 of this course, especially drawing and value (Unit 1), color systems (Unit 4) and resolution and file formats (Lesson 5.4)
- Arithmetic with large numbers and scientific shortcuts: $\text{MB} = \text{bytes}/1{,}048{,}576 \approx \text{bytes}/10^6$, percentages and ratios
- Krita, Inkscape and GIMP installed from their official sites (all free); a mouse works for everything in this unit, and a budget drawing tablet is optional but welcome

MASTERY CHECKLIST

- ☐ I can explain how a raster image stores a picture (pixels, channels, bit depth) and compute its uncompressed file size.
- ☐ I can explain how a vector image stores a picture (anchor points, Bézier handles, fills and strokes) and why it scales without loss.
- ☐ I can choose raster or vector for a given job and defend the choice in one sentence.
- ☐ I can set up a Krita canvas for a print or screen target, paint with layers and blend modes, and keep values under control.
- ☐ I can draw clean paths with Inkscape's pen tool, edit nodes and handles, and combine shapes with Boolean operations.
- ☐ I can scan a drawing at the right resolution, clean it in GIMP or Krita, and color it on layers without harming the line art.
- ☐ I can name the industry-standard tools, map each free tool to its commercial counterpart, and say honestly what transfers and what does not.
- ☐ I can use keyboard shortcuts for the ten commonest operations in each program without looking.

FREE RESOURCES FOR THIS UNIT

- **Krita (free digital painting)**: The free, professional-grade painting program used in Lessons 6.2 and 6.4, for Windows, Mac and Linux. Download only from krita.org. Built by artists (the webcomic Pepper & Carrot is painted entirely in it); works fine with a mouse, better with any inexpensive tablet.
- **Inkscape (free vector drawing)**: The free vector editor used in Lesson 6.3, the open-source counterpart to Adobe Illustrator. Download only from inkscape.org. Its native SVG format is the web standard for vector graphics, so nothing you make in it is locked in.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

6.1	**Pixels and Paths: How a Computer Stores a Picture**	3 sessions of 50 minutes
6.2	**Painting with Pixels: Krita and the Raster Workflow**	3 sessions of 50 minutes
6.3	**Drawing with Curves: Inkscape and the Vector Workflow**	3 sessions of 50 minutes
6.4	**From Sketch to Finish: Scan, Clean, Ink and Color Your Drawing**	3 sessions of 50 minutes
6.5	**The Professional's Toolkit: Adobe, Affinity, Procreate and Yours**	3 sessions of 50 minutes

Unit 6 test

Time allowed: 50 minutes. A calculator is allowed; show arithmetic and units for every calculation. Where a question asks for a tool choice, one correct sentence of reasoning is required. The test is worth 100 points.

1. **5 pts**
   A camera produces 5472 × 3648 images. Compute the megapixels.

2. **5 pts**
   How many colors can 24-bit RGB express? Show the computation from bits.

3. **5 pts**

   Raster or vector, with one reason each: (a) a logo for vinyl cutting; (b) a restored family photo; (c) a font; (d) a scanned ink drawing.

4. **6 pts**

   Compute the uncompressed size of a 4800 × 6000 px scan in 8-bit grayscale and in 24-bit RGB, in MB (use 10^6).

5. **6 pts**

   Give the Krita canvas in pixels for a 6 × 9 in book cover at 300 PPI with 0.125-in bleed, and the approximate RAM for six RGBA layers.

6. **7 pts**

   Compute multiply mode for value 160 over value 120, and screen mode for the same pair, and state which you would use for shadows and which for light.

7. **7 pts**

   Tell the curve story in four facts: who at Citroën, who at Renault, whose name the curves carry and why, and what Adobe product carried the mathematics onto the printed page.

8. **7 pts**

   A client's only logo file is an 800-px-wide PNG. Compute its effective PPI at 2 in wide (letterhead) and 24 in wide (banner), give the verdicts, and state the permanent fix.

9. **8 pts**

   Where do nodes belong on a clean vector path, and what is wrong with a 200-node auto-trace of a simple leaf? Sketch or describe the right 6–8 node plan for a leaf.

10. **8 pts**

    A 4 × 5 in ink drawing must print at 12 × 15 in at 300 PPI. Compute the scan DPI and pixel dimensions, and name the scan mode you choose.

11. **8 pts**

    Describe the full hybrid pipeline in order from pencil drawing to delivered files, naming the adjustment that cleans the scan and the blend mode that carries the lines, and the three deliverables a studio expects.

12. **8 pts**

    Compute: four-year cost of a $59.99/month suite; the breakeven month of a $164.99 one-time suite against it; and the four-year savings of the one-time suite in dollars and percent.

13. **8 pts**

    Map the toolkit (five rows): digital painting, photo/scan editing, vector, layout, iPad illustration: your free tool (or current tool) and the industry standard for each.

14. **12 pts**

    Short essay. An employer says: Your portfolio was made with free software; we run Adobe. Why should we hire you? Answer in a short paragraph that names what transfers (at least four concepts), what does not, and the honest plan for the first week, then add the sentence you would NOT say (the bluff to avoid).

ANSWER KEY

1. $5472 \times 3648 \approx 20.0$ MP.
2. $2^{24} = 256^3 = 16{,}777{,}216$ colors.
3. (a) Vector: cutters follow paths. (b) Raster: continuous-tone pixels. (c) Vector: outlines must scale to every size. (d) Raster: a scan is a pixel grid.
4. Gray: 28.8 MB; RGB: 86.4 MB.
5. $6.25 \times 300 = 1875$ by $9.25 \times 300 = 2775$ px; per layer ≈ 20.8 MB, six layers ≈ 125 MB.
6. Multiply: $160 \times 120/255 \approx 75$ (shadows). Screen: $255 - (95)(135)/255 \approx 205$ (light).
7. Paul de Casteljau (Citroën, 1959, kept secret); Pierre Bézier (Renault's UNISURF, 1960s, published and lectured); the curves carry Bézier's name because he published; Adobe's PostScript (1984, Warnock and Geschke) described whole pages with such curves.
8. $800/2 = 400$ PPI (passes) and $800/24 \approx 33$ PPI (fails badly). Fix: redraw once as vector; every future size is then exact.
9. Nodes at curve extremes and true corners only, handles along the path's direction. The auto-trace enshrines every wobble, edits badly and chokes cutters. Leaf plan: tip and stem-base corners, two or three smooth nodes per side at the extremes of each curve.
10. Factor 3; scan at 900 DPI, giving 3600×4500 px; grayscale mode (ink carries no color, one third the data).
11. Thumbnail/pencil → ink → compute scan DPI → scan grayscale → Levels (drop paper, solidify ink, plus despeckle/threshold) → lines as top layer on multiply, locked → flats beneath → clipped shadows (multiply) and light (screen) → export. Deliverables: layered master (.kra), full-resolution flattened TIFF/PNG for print, reduced web copy.
12. $59.99 \times 48 \approx \$2{,}880$; breakeven $164.99/59.99 \approx 2.75$ (month 3); savings $\approx \$2{,}715 \approx 94\%$.
13. Krita/Photoshop; GIMP/Photoshop (Affinity Photo challenger); Inkscape/Illustrator; Scribus/InDesign; paper or tablet/Procreate.
14. Model answer: The portfolio's skills live above any vendor: layers and blend modes, Bézier paths, grids and master pages, and production arithmetic (resolution, bleed, CMYK) all map one-to-one onto Photoshop, Illustrator and

InDesign, and most shortcuts match. What differs is button locations and a few proprietary formats, so my first week includes an hour a day in your apps converting my ten commonest actions, which I have already begun in trial versions. Avoid the bluff: never claim years of Adobe experience you do not have; false fluency is exposed in an hour and costs the name that references are built on.

PORTFOLIO PIECE: PENCIL TO PIXELS: A FINISHED DIGITAL ILLUSTRATION WITH PROCESS PACK

Produce one finished illustration through the complete hybrid pipeline at portfolio quality: an original drawing (your subject, wholesome and story-bearing), inked on paper, scanned at computed resolution, cleaned, and colored in Krita with a disciplined layer stack, delivered as a printed 8 × 10 and a layered master. Alongside it, present your vector logo from Lesson 6.3 at three sizes on one sheet to show both of the digital studio's languages mastered.

Add the process pack that makes this piece an employer's exhibit rather than a pretty picture: the original pencil/ink drawing (or a photo of it), the scan arithmetic, a screenshot of the named layer stack, and a one-paragraph tools statement naming what was used and what it would map to in an Adobe shop. This is piece six of the ten-piece professional portfolio; it proves the thing studios doubt most in beginners, that you can carry a job through every stage and deliver files another professional can open and use.

LOOK FOR	WHAT IT MEANS
Drawing and composition	The underlying drawing is sound (Units 1–2): confident line, readable values, a composition with one clear focal point.
Pipeline execution	Scan resolution computed and correct; cleanup crisp (paper white, ink solid, no specks); lines locked on multiply and untouched.
Digital craft	Layer stack named and logical; flats clean; shadows and light restrained and non-destructive; values survive a grayscale check.
Vector competence	The logo sheet shows clean node-economy paths, a one-color version, and identical sharpness at all three sizes.
Files and delivery	Master (.kra), print file and web copy correctly sized, named and versioned; SVG master for the logo; everything reopens intact.
Process pack and presentation	Original drawing, arithmetic, stack screenshot and tools statement are complete, honest and neatly presented as one professional exhibit.

6.1 Pixels and Paths: How a Computer Stores a Picture

OBJECTIVES

- Explain raster storage: pixels, RGB channels and bit depth, and compute megapixels and uncompressed file size.
- Explain vector storage: anchor points, curves and shape instructions, and why vectors rescale perfectly while rasters cannot.
- Choose the right language (raster or vector) for photographs, paintings, logos, type and diagrams, and name the file formats of each.

> **Warm-up.** Open any photo on a computer or phone and zoom in as far as the software allows, until the picture becomes colored squares. Count how many distinct colors you can see in a 3 × 3 patch of what looked like one smooth skin tone or sky. Then look at a letter of text on the same screen at normal size: it is made of the same squares, yet looks sharp. Write one sentence guessing how the machine keeps text sharp at every size.

WATCH

Images, Pixels and RGB

CodeAI (the channel of Code.org) · 5:50

https://www.youtube.com/watch?v=15aqFQQVBWU

> **WHEN TO WATCH**
> After the first science paragraph. Pause when the RGB values appear and write out the three numbers for pure red, pure white and a dark gray before he reveals them.

Note: A Code.org lesson (presented by Instagram's co-founder) on how pixels and RGB channels store a picture, clear, visual and exactly the mental model you need. The bit-depth arithmetic in this lesson builds directly on it.

BACKUP VIDEO

Vector vs Raster Images (What's the Difference? When to Use Which)

June Escalada @ IllustratorHow · 4:26

https://www.youtube.com/watch?v=dBSekRc5ESo

After the vector paragraph. Watch for the zoom comparison, the single clearest demonstration of why the two languages exist.

KEY TERMS

pixel

One square of a raster image's grid, carrying a single color; short for picture element.

raster (bitmap) image

A picture stored as a fixed grid of pixels; photographs, scans and digital paintings. Resizing up spreads the same pixels thinner.

vector image

A picture stored as mathematical instructions: anchor points, curves, fills and strokes, redrawn fresh at any size; logos, type and diagrams.

channel

One color's worth of data in each pixel. Screen images carry red, green and blue channels; print-ready images carry C, M, Y and K.

bit depth

How many bits describe each channel of each pixel: 8 bits per channel gives 256 levels, and three channels give $256^3 = 16{,}777{,}216$ colors.

megapixel (MP)

One million pixels; width times height divided by a million. A 4000 × 3000 photo is 12 MP.

anchor point / node

A point on a vector path where the curve is defined; its handles set the curve's direction and tension on each side.

SVG

Scalable Vector Graphics, the open vector file format of the web and Inkscape's native language; readable as plain text instructions.

CORE IDEAS

The story. In 1957 at the National Bureau of Standards in Washington, a young engineer named Russell Kirsch (1929–2020) and his team built a rotating-drum scanner for SEAC, one of America's first programmable computers, and fed it a 2-inch photograph of Kirsch's three-month-old son, Walden. The machine read the photo as a grid of 176 by 176 squares, each square recorded as simply dark or light, one bit each, about 31,000 bits for the whole baby. It was the first scanned digital image, the ancestor of every photograph on every phone. Kirsch's grid was crude; by scanning several times at different thresholds his team coaxed out gray levels, and researchers spent the next decades adding bits: 8 bits per pixel gave 256 grays, then three 8-bit channels, red, green, blue, gave over sixteen million colors. Kirsch said late in life, with a scientist's humor, that he was sorry about the squareness of pixels; square or not, his grid conquered the world.

How they figured it out. The raster grid is the obvious way to store a picture and the expensive one, and everyone who used it hit the same two walls. Wall one is size: the data grows as width times height times channels, so file size (uncompressed) is $\text{bytes} = W \times H \times \dfrac{\text{bits per pixel}}{8}$, and a 12 MP photo at 24 bits per pixel is $12{,}000{,}000 \times 3 = 36$ million bytes, 36 MB, before compression squeezes it. Wall two is scaling: the grid records no shapes, only squares, so enlarging can only stretch or invent squares, and edges stair-step and blur. The second language was born from a different problem entirely: car bodies. At Citroën in 1959 the mathematician Paul de Casteljau worked out how to define smooth curves from a few control points (his employer kept it secret); at Renault in the 1960s the engineer Pierre Bézier

developed and published the same idea for the UNISURF design system, so the curves carry his name. A Bézier curve stores four little points instead of ten thousand pixels, and it is exact at any size, because the computer redraws it, fresh, every time.

The craft. Know both languages cold. A raster file is described by three numbers you can now manipulate: pixel dimensions (the only real size), bit depth, and the PPI tag that proposes a print size (Lesson 5.4). Grayscale at 8 bits is 1 byte per pixel; RGB at 24 bits is 3 bytes; CMYK at 32 bits is 4; line art can live in 1 bit. A vector file is described by its instruction count: a circle is one instruction (center, radius, fill), a traced signature might be two hundred nodes, and either one prints razor-sharp at business-card or billboard size, which is why logos, type and icons are always vector. The division runs straight through your toolbox: Krita, GIMP and Photoshop speak raster (formats: PNG, TIFF, JPEG); Inkscape and Illustrator speak vector (SVG, EPS, AI, and PDF can carry both); Scribus is a container that places each kind without converting it. The classic beginner's disaster is rasterizing a logo (exporting the vector to a small PNG and losing the original): the instructions are gone, and no software can truly recover them.

In the studio. Working designers triage every incoming job by language in the first minute. Photograph retouching, painting, texture: raster, open Krita or GIMP, check the pixel dimensions against the output size before promising anything. Logo, icon, lettering, diagram, anything that must scale or cut in vinyl: vector, open Inkscape, and if the client only has a JPEG of their logo, quote the redraw honestly. Mixed pieces, a poster with a photo and a headline, are built in layout or vector software with rasters placed inside, each at adequate resolution. And every studio keeps originals in lossless, layered form (Krita's .kra, GIMP's .xcf, SVG) and exports flattened delivery copies (PNG, JPEG, PDF), never the other way around: the layered original is the negative, the export is the print, and a professional can always go back to the negative.

PICTURE STUDY



Woven Portrait of Joseph Marie Jacquard, Woven by Michel-Marie Carquillat after a painting by Claude Bonnefond, 1839 · Picture woven in black and white silk on a Jacquard loom · Lyon, France (this example photographed for auction; other weavings are in major museums)

Image: Wikimedia Commons, public domain

This is not an engraving: it is cloth. In 1839 the weaver Carquillat reproduced a painted portrait of Joseph Marie Jacquard, inventor of the punched-card loom, by weaving it in silk, thread by thread, from about 24,000 punched cards that told the loom which threads to lift. Each tiny crossing of thread is a dark or light decision: a pixel, a century before the word.

Charles Babbage owned a copy and showed it to visitors to explain his planned computing engine: if cards could instruct a loom to weave a picture, cards could instruct a machine to calculate. The grid you studied in this lesson has ancestors in cloth.

Look closely

- Stand back (or shrink the image): the portrait looks like a smooth engraving. Move close: where do you first see the individual thread crossings, the pixels of 1839?
- Find the subtlest gradient, perhaps on the face or the window light. How does a machine with only dark and light threads fake a halftone?
- Jacquard sits with tools of his trade. Find the punched cards within the picture itself, the image contains its own program.

- Estimate the resolution: if the woven area is about 50 cm wide with roughly 1,000 threads, how many threads per inch is that, and how does it compare with a 300 PPI print?
- Look at the frame-like border. Is it woven too?

Talk about it

1. What exactly did the punched cards store: the picture, or instructions for making the picture? Which of this lesson's two languages is that, raster or vector, or something of both?
2. Why did Babbage treat this weaving as an argument about computing? Trace the line from loom cards to Kirsch's 1957 scan.
3. The weaving took enormous labor to set up but copies could then be woven repeatedly. What modern cost structure does that resemble (think Lesson 5.5)?

STUDIO BRIEF

Studio brief: the two-languages demonstration board

Client: the next student to take this course (a real audience: your finished board becomes teaching material). Deliverable: one letter-size demonstration sheet that proves the raster/vector difference with your own experiments, plus a decision card. Specs: at least four experiment panels with captions, every number computed and shown, assembled in any tool and printed. Deadline feel: one week, pinned to the wall when done.

You will need

- A computer with Krita and Inkscape installed; GIMP optional
- One photo you took and one simple shape or letterform you make yourself
- Printer (grayscale fine); glue stick and card if you assemble by hand

Steps

1. Experiment 1 (raster zoom): open your photo in Krita, crop a 100 × 100 px detail, scale it up 800% and export. Caption it with the arithmetic: what PPI would this be printed at 4 in wide?
2. Experiment 2 (vector zoom): draw a bold letter or simple fish/leaf shape in Inkscape with the pen tool (rough is fine), export it at 100 px and at 1600 px wide. Print both at the same physical size and caption why the big one stayed sharp.
3. Experiment 3 (file size table): create and export the same 1000 × 1000 image as PNG, JPEG (high and low quality) and, for your vector shape, SVG. Make a table of file sizes and one sentence per format on what it is for.
4. Experiment 4 (bit depth): in Krita or GIMP, convert a copy of your photo to grayscale, then to 1-bit (threshold). Show all three side by side with the bytes-per-pixel arithmetic under each.
5. Compute the uncompressed size of your original photo from its pixel dimensions and verify against the exported PNG and JPEG sizes; explain the differences in one caption (compression).

6. Design the decision card: a pocket-size raster-or-vector flowchart (photo? painting? scan? → raster; logo? type? must scale or cut? → vector; mixed? → layout container).
7. Assemble everything on one letter sheet with clear captions, print it, and pin it above your workspace.
8. Explain the board to a family member in three minutes; if any panel needs more than two sentences of explanation, rewrite its caption.

Tips

- Use your own photo and your own shape; explaining experiments you ran beats copying someone's diagram.
- When exporting JPEG at low quality, zoom into a hard edge first, the artifacts are the lesson.
- Keep the captions in complete sentences with the numbers in them; the board should teach with you absent.

Check your work

- ☐ All four experiments are present with correct, shown arithmetic.
- ☐ My file-size table matches reality and I can explain every difference.
- ☐ A family member correctly answered two raster-or-vector quiz questions using only my decision card.

SKETCHBOOK

1. A hand-drawn diagram of one pixel's RGB values and of one Bézier anchor with its two handles, labeled.
2. Your file-size table (format, size, best use) copied neatly with a sentence of conclusion.
3. A timeline: Jacquard's loom (1801–04), Kirsch's scan (1957), de Casteljau (1959) and Bézier (1960s), PostScript (1984), Photoshop 1.0 (1990).

KEY FORMULAS

$$\text{megapixels} = \frac{W \times H}{1{,}000{,}000}$$

$$\text{uncompressed bytes} = W \times H \times \frac{\text{bits per pixel}}{8}$$ (8-bit gray: 1 byte/px; RGB: 3; CMYK: 4)

$$\text{colors} = 2^{\text{bits per channel} \times \text{channels}}, \text{ e.g. } 2^{24} = 16{,}777{,}216$$

$$1 \text{ MB} = 1{,}048{,}576 \text{ bytes} \approx 10^6 \text{ bytes}$$

From history. Kirsch's 176 × 176 baby picture was named by Life magazine among the 100 photographs that changed the world, and the original print hangs in the Portland Art Museum. SEAC, the computer that held it, had about 45 kilobytes of total memory, less than one second of music on your phone; the scan had to be small because the whole machine could barely hold it. Constraints, not comfort, set the shape of early digital art, and knowing the arithmetic of those constraints is still what separates professionals from hopeful amateurs.

WORKED EXAMPLES

Example 1. A scanner produces an 8-bit grayscale scan at 2400 × 3000 px. Find the megapixels and the uncompressed file size in MB. What do the numbers become if you scan in 24-bit RGB instead?

Show solution

1. Megapixels: $2400 \times 3000 = 7{,}200{,}000 = 7.2$ MP.
2. Grayscale is 1 byte per pixel: 7.2×10^6 bytes ≈ 6.9 MB (dividing by 1,048,576).
3. RGB is 3 bytes per pixel: 21.6×10^6 bytes ≈ 20.6 MB.
4. Same pixels, three times the data: scan line art in grayscale (or 1-bit) and save color scanning for color art.

Answer: 7.2 MP; about 6.9 MB in grayscale, about 20.6 MB in RGB.

Example 2. How many distinct colors can 8-bit RGB represent? How many grays can an 8-bit grayscale image show, and why is 1-bit enough for clean ink line art?

Show solution

1. RGB: three channels of 256 levels: $256^3 = 16{,}777{,}216$ colors.
2. Grayscale: $2^8 = 256$ levels from black to white.
3. Clean ink art is only black or white: $2^1 = 2$ values suffice, and the file shrinks 8-fold versus grayscale, which is why old scanner drivers call the mode line art.

Answer: 16,777,216 colors; 256 grays; line art needs only the 2 values of 1 bit.

Example 3. A client's logo exists only as a 500 × 300 px PNG. They want it on a 3-ft-wide banner and on a pen. Analyze both requests and give the professional answer.

Show solution

1. Banner: 36 in wide from 500 px is $500/36 \approx 14$ PPI, visible blocks even across a room: fails.
2. Pen: printed 1.5 in wide, $500/1.5 = 333$ PPI: passes, by luck of the small size.
3. The right fix is one vector redraw of the logo; from then on every size from pen to billboard is the same file. Quote the redraw once rather than fighting resolution forever.

Answer: The PNG survives the pen (333 PPI) but fails the banner (14 PPI); redraw the logo as vector once and both problems vanish permanently.

Example 4. Kirsch's 1957 scan was 176 × 176 at 1 bit. Compute its size in bytes, and compare with one single pixel row of a modern 12 MP phone photo (4000 px wide, 24-bit).

Show solution

1. Kirsch: $176 \times 176 = 30{,}976$ bits $= 3{,}872$ bytes.
2. One modern row: $4000 \times 3 = 12{,}000$ bytes.
3. A single row of today's snapshot carries three times the data of the first digital photograph ever made.

Answer: 3,872 bytes for the whole 1957 image; 12,000 bytes for one row of a modern photo.

PRACTICE

1. Easy A camera shoots 6000 × 4000. How many megapixels?

   Show answer

   24 MP.

2. Easy Raster or vector: a wedding photo, a church logo, a scanned ink drawing, a highway sign's arrow?

   Show answer

   Raster; vector; raster; vector.

3. Easy How many levels per channel does 8-bit give, and what RGB value is pure white?

   Show answer

   256 levels (0–255); white is (255, 255, 255).

4. Easy Name one raster format, one vector format, and one format that can carry both.

   Show answer

   Raster: PNG, JPEG or TIFF. Vector: SVG (or EPS/AI). Both: PDF.

5. **Medium** Uncompressed size of a 3000 × 2000 24-bit RGB image, in MB (approximate with 10^6)?

Show answer

$3000 \times 2000 \times 3 = 18 \times 10^6$ bytes ≈ 18 MB.

6. **Medium** Why can a 50 KB SVG logo print sharper on a billboard than a 50 MB raster of the same logo?

Show answer

The SVG stores shape instructions that the output device redraws at its own full resolution at any size; the raster stores a fixed pixel grid that must be stretched, and stretching adds no information, only bigger squares.

7. **Medium** A 16-bit-per-channel RGB scan doubles each channel's bits. How many bytes per pixel, and what multiple of the 8-bit file size results?

Show answer

$3 \times 2 = 6$ bytes per pixel; exactly double the 24-bit size.

8. **Medium** JPEG makes photos small by throwing detail away. Name one kind of artwork JPEG damages most, and the format to use instead.

Show answer

Hard-edged art: line drawings, type, logos, flat color: JPEG speckles the clean edges with artifacts. Use PNG (or TIFF) for those.

9. **Hard** Compute whether a 12 MP phone photo (4000 × 3000) can cover an 11 × 17 poster at 300 PPI, showing the arithmetic both ways (pixels needed, or PPI achieved).

Show answer

Pixels needed: $17 \times 300 = 5100$ by $11 \times 300 = 3300$; the photo is 4000 × 3000: short. PPI achieved at 17 in: $4000/17 = 235$ PPI, below 300 but acceptable for a poster viewed at distance; for a magazine spread it fails.

10. Hard Open an SVG file in a plain text editor (or imagine one): you can read commands like circle, path and fill. Explain in two sentences why this transparency matters to a designer's future-proofing.

Show answer

A vector file is human-readable instructions in an open standard, so it can never be held hostage by one company's dying program; anything can parse it decades from now. Layered proprietary raster files, by contrast, depend on their maker's software surviving.

11. Hard You are the studio's triage desk. For each incoming job, name the language and the free tool you open: (a) restore a faded photo of a grandfather, (b) a decal that will be cut in vinyl, (c) a hand-drawn map to be colored, (d) a six-icon set for a website.

Show answer

(a) Raster, GIMP (or Krita). (b) Vector, Inkscape (vinyl cutters follow paths). (c) Raster pipeline: scan, clean in GIMP, color in Krita. (d) Vector, Inkscape, exported as SVG.

COMMON MISTAKES

- Judging an image by its on-screen look instead of its pixel dimensions; the screen shows at most a few megapixels no matter what the file holds.
- Enlarging a raster and hoping; upsampling invents pixels and always costs sharpness.
- Saving the only copy of layered or vector work as a flattened JPEG/PNG; keep the editable original and export copies for delivery.

> **Make it a game · Raster or Vector Lightning Round.** Your parent names twelve things in quick succession: family photo, stop-sign symbol, scanned signature for documents, comic-book page, airline logo, wedding invitation lettering, X-ray, embroidery pattern for a machine, YouTube thumbnail, road map app arrows, oil-painting scan, T-shirt vinyl design. You call raster or vector in three seconds each, plus one word of reason. Ten or more right wins; then swap and try to stump each other with three new items.

> **Scripture.** “He telleth the number of the stars; he calleth them all by their names.” (Psalm 147:4, KJV)
>
> A twelve-megapixel photograph is twelve million numbered points, each named by its values, and the computer attends to every one. The psalmist reminds us that counting the uncountable and naming each item is, first and originally, the Lord's kind of care.

6.2 Painting with Pixels: Krita and the Raster Workflow

OBJECTIVES

- Set up a Krita canvas correctly for a chosen output (print or screen), and navigate with the essential shortcuts.
- Use layers, opacity and the core blend modes (normal, multiply, screen) to build a painting that stays editable.
- Paint a small study using the value-first discipline from Unit 1, and manage brush size, flow and color like a traditional painter.

> **Warm-up.** Lay a dry sheet of tracing paper (or any thin paper) over a drawing and add shading on the overlay only. Lift it off: the original is untouched. Stack a second overlay and add color. You have just performed manually what digital layers do a thousand times faster. Write one sentence on what the overlay system lets you risk.

WATCH

Krita Tutorial for Beginners: Start Painting in 8 Minutes 🎨

Aaron Rutten · 8:23

https://www.youtube.com/watch?v=UjtzfE609Vs

> **WHEN TO WATCH**
> Start of session one with Krita open beside it. Pause after each tool (brush picker, color selector, layers panel) and find it in your own window before continuing.

Note: A professional digital artist's fast orientation to Krita's canvas, brushes and layers, everything you need to start the study in this lesson. Repeat his steps rather than just watching them.

BACKUP VIDEO

Introduction to graphic tablets

GDQuest · 3:46

https://www.youtube.com/watch?v=RfTumTdNhho

Session two, if you are considering a tablet. A sober guide to what tablets do (pressure, tilt) and which budget models suffice. A mouse completes every brief in this course; a tablet is optional comfort, not required equipment.

KEY TERMS

canvas

The document's pixel grid, set at creation: width, height, resolution and color model. Everything in Lesson 5.4 about sizing applies here first.

layer

A transparent sheet in the image's stack; paint on one without touching the others. The order of the stack decides what covers what.

blend mode

The arithmetic a layer uses against what is below it: normal covers, multiply darkens (like ink glazes), screen lightens (like projected light).

opacity / flow

Opacity caps how strongly a layer or stroke covers; flow is how much paint each pass of the brush lays down, letting strokes build up like real media.

pressure sensitivity

A tablet pen reports how hard you press, mapped to size or opacity, recovering the hand's expressiveness that a mouse lacks.

non-destructive editing

Working so earlier states remain recoverable: separate layers, masks and filter layers instead of repainting over the only copy.

.kra

Krita's native layered file. Keep it as the master; export flattened PNG or JPEG copies for sharing.

CORE IDEAS

The story. In 1987 Thomas Knoll, a University of Michigan doctoral student in computer vision, wrote a little program called Display so his Mac Plus could show grayscale images on its black-and-white screen. His brother John Knoll worked at Industrial Light & Magic, the movie-effects house founded for Star Wars, and saw something bigger: John kept requesting features, gamma correction, color, selections, file conversion, until Display had become an image editor they renamed ImagePro and shopped around. A scanner company, Barneyscan, shipped a few hundred copies; then Adobe, the PostScript company of Lesson 6.3, licensed it, and Adobe Photoshop 1.0 shipped in February 1990, for the Macintosh only, written almost entirely by Thomas while John made the demo magic (he went on to become an Oscar-winning effects supervisor). Photoshop so completely conquered image editing that its name became a verb, and every raster program since, including the free ones you will use, speaks its dialect of layers, selections and filters.

How they figured it out. Krita's story shows the other way software happens. Beginning around 1999 inside the KDE free-software community, and shipping in earnest from 2005, Krita was built not as a Photoshop clone but as a painter's tool, by volunteers and, later, crowdfunded developers working with artists like David Revoy, whose webcomic Pepper & Carrot is painted entirely in Krita and given away free. The painters asked for brush engines, canvas rotation, wrap-around texture mode and a distraction-free canvas, so that is what got built. The lesson for your toolkit is that free does not mean lesser: it means a different patron. You are learning transferable concepts, canvas, layers, blend modes, brushes, that are the same in

Photoshop, Procreate, Affinity Photo and Krita, the way a pianist's hands transfer between pianos.

The craft. Start every painting with the arithmetic, then the values. Canvas setup is Lesson 5.4 applied: a 5 × 7 in card at 300 PPI with bleed (5.25 × 7.25) needs 1575×2175 px; screen work for a 1920-wide display needs no PPI thinking at all, just pixels. Memory explains why layered files feel heavy: each full layer costs roughly $W \times H \times 4$ bytes in RAM, so ten layers on that card is about $1575 \times 2175 \times 4 \times 10 \approx 137$ MB before undo history. Then paint the way Unit 1 trained you: big shapes first with a large brush, values before color (many professionals block the whole painting in grays, then add color on a layer set to multiply or color mode), darks as glazes (multiply builds darkness the way watercolor washes do), lights last on a screen or normal layer. Name your layers (sketch, values, color, light): future-you is the first client you must not confuse.

In the studio. Digital painters keep a discipline that beginners skip: they protect the stages. The sketch layer stays, dimmed, under everything; values are settled before color is allowed to argue; each experiment happens on a duplicate layer so a failure costs one keystroke, not an afternoon. Professionals also flatten nothing until delivery, and they save incrementally (painting-01.kra, painting-02.kra) at every milestone, a habit that has saved more careers than talent has. Expect the first hours with a mouse or tablet to feel clumsy, like the first hours with any brush; the Unit 1 cure applies unchanged, which is ten minutes of warm-up strokes, lines, circles, pressure scales, before each session. Illustrators who work digitally bill the same way traditional ones do, by the piece, and clients neither know nor care which brush was physical; they care that the values read and the deadline held.

PICTURE STUDY



The Starry Night, Vincent van Gogh, 1889 · Oil on canvas · Museum of Modern Art, New York

Image: Wikimedia Commons, public domain

In June 1889, from his room at Saint-Rémy in the south of France, Vincent van Gogh painted the night sky from memory and observation combined — and made no attempt to hide a single stroke. Look at the sky: every mark is distinct, loaded with paint, and laid in the direction of a current, stroke after stroke queued like brushwork in formation. The stars are not dots but built-up spirals of touches; the cypress is flame-shaped licks of dark green; the hills are long pulled strokes that follow the land.

This is the picture to study before you open Krita, because digital painting lives and dies by exactly what Van Gogh mastered: stroke economy and stroke direction. A pressure-sensitive brush gives you what his loaded bristle brush gave him — a mark with weight, direction and personality. The difference between a muddy digital painting and a living one is rarely the software; it is whether each stroke is placed with intention and allowed to stay visible, the way every stroke in this sky still is, a hundred and thirty years on.

Look closely

- Pick one small patch of sky and count the strokes in it. Does any stroke look accidental or scrubbed over?

- Follow the direction of the marks: around the spiral, along the hills, up the cypress. What happens to the picture's energy where the direction changes?
- Find the thickest paint and the thinnest. How does Van Gogh vary pressure and load the way you vary a tablet stylus?
- The village is painted calm and small under the churning sky. How do the brushstrokes themselves — not just the colors — separate the two moods?
- Look at a star up close, then from across the room. How do separate visible strokes fuse into glow at viewing distance?

Talk about it

1. Digital brushes can blend endlessly until every stroke disappears. After studying this sky, what is the argument for letting strokes stay visible?
2. If you repainted one square inch of this sky in Krita, what brush properties — size, opacity, pressure response, texture — would you need to match, and which matters most?
3. Van Gogh built forms from stroke direction instead of outlines. How would you apply that to painting hair, water or grass on a layer of your own?

Safety first. Digital painting sessions run long. Follow the 20-20-20 rule (every 20 minutes, focus 20 seconds on something 20 feet away), keep the top of the screen at eye height and feet flat, and take a standing stretch between the three sessions. Grip the stylus or mouse lightly; a clenched hand for an hour invites wrist strain, and the warm-up strokes at the start of each session are for your tendons as much as your lines.

STUDIO BRIEF

Studio brief: a painted greeting card

Client: a family member with a birthday, anniversary or thank-you occasion in the next month. Deliverable: a digitally painted 5 × 7 greeting-card front, printed and delivered. Specs: canvas 1575 × 2175 px (300 PPI with bleed), a simple still life or landscape subject, value study first, color by glaze or flats, at least five named layers, master saved as .kra, delivery as PNG and a printed card. Deadline feel: the occasion does not move.

You will need

- Krita; mouse or tablet
- A real still-life setup (fruit and a cup by a window beats any photo) or a landscape you can see
- Printer and cardstock, or a one-off print from a local shop
- Your Unit 1 value-scale page for reference beside the screen

Steps

1. Create the canvas from the worked example and immediately save as card-01.kra. Set autosave in Krita's preferences.
2. Warm up ten minutes: lines, ellipses, a ten-step value scale with one brush at varying pressure or opacity.
3. Thumbnail three compositions on one small layer (divide the canvas in thirds); pick one using Unit 2's rules and crop to it.
4. Sketch the subject loosely on a layer named sketch; reduce its opacity to 30%.
5. Block the value study on a layer named values: three values first (light, mid, dark) with a big brush, then model the forms, checking against your Unit 1 scale. No color until this reads at arm's length.
6. Choose the color route: glaze hues on a color-mode layer, or flats beneath a multiplied copy of the values. Name every layer as you go.
7. Add one light effect (window light, rim light) on a screen or overlay layer at low opacity, and sign small on the top layer.

8. Export PNG at full resolution; also export a flattened JPEG proof and print it on cardstock. Check the print against the screen and adjust values once if the print came out darker (it usually does).
9. Deliver the card on time. Record in your sketchbook what the print changed about your on-screen judgment.

Tips

- Paint at 50% zoom or fit-to-screen; working zoomed-in produces precious details on a broken whole.
- Flip the canvas horizontally (Krita: M) every twenty minutes; errors invisible for hours appear instantly mirrored.
- If colors turn muddy, stop mixing on the canvas and re-block from your value study; mud is a value problem wearing a color costume.

Check your work

- ☐ My canvas arithmetic, layer names and .kra master are all in order, with incremental saves.
- ☐ The value study reads correctly in grayscale before any color was added.
- ☐ The card was printed, checked against screen, and delivered by the occasion.

SKETCHBOOK

1. Your three thumbnails and the chosen composition with a one-line reason.
2. A blend-mode experiment chart: the same two values combined under normal, multiply and screen, with the computed numbers beside the swatches.
3. A print-versus-screen note: what shifted (values, saturation) and what you will compensate next time.

KEY FORMULAS

$$\text{canvas px} = \text{inches (with bleed)} \times \text{PPI}$$

$$\text{RAM per layer} \approx W \times H \times 4 \text{ bytes (RGBA, 8-bit)}$$

Multiply mode: $\text{result} = \dfrac{a \times b}{255}$ (always darker); screen mode: $\text{result} = 255 - \dfrac{(255 - a)(255 - b)}{255}$ (always lighter)

From history. Photoshop 1.0 fit on a single 800 KB floppy disk, and the Knolls' royalty deal, signed when Adobe expected modest sales, made the brothers wealthy as the program sold millions. John Knoll meanwhile supervised effects for Star Wars prequels and won an Academy Award for Rango; the demo artist and the engineer remained a team of brothers. Krita's developers, by contrast, are paid partly by donations from artists who use it, two healthy patronage models, both resting on the same insight: painters will follow the tool that respects their craft.

WORKED EXAMPLES

Example 1. Set up a Krita canvas for a 5 × 7 in greeting-card painting, full bleed, 300 PPI. Give pixels, and estimate the RAM cost of eight layers.

Show solution

1. With bleed: 5.25×7.25 in; pixels 1575×2175.
2. Per layer: $1575 \times 2175 \times 4 \approx 13.7$ MB.
3. Eight layers: ≈ 110 MB, comfortable on any modern machine, but a 24 × 36 poster at 300 PPI would be 16 times the pixels, which is why poster painters often work at 150 PPI.

Answer: 1575 × 2175 px; about 110 MB for eight layers.

Example 2. A gray of 128 is multiplied over a value of 200. Compute the result and show why multiply can only darken.

Show solution

1. $200 \times 128/255 \approx 100$.
2. Because the multiplier $b/255 \leq 1$, the result never exceeds the original value: multiplying by at most 1 cannot lighten.
3. Painting shadows on a multiply layer therefore behaves like glazing ink over a drawing: the drawing stays visible, darkened.

Answer: About 100; multiply scales values by a factor ≤ 1, so it always darkens or preserves, never lightens.

Example 3. Your value study is finished in grays. Describe the two standard ways to add color without repainting, and when each is chosen.

Show solution

1. Way 1, color on top: add a layer in color blend mode (or soft multiply) and glaze hues over the grays; the values underneath keep governing. Fast, good for mood pieces.
2. Way 2, flats underneath: put flat local colors on a layer under a multiply copy of the value study; the values darken the flats. More control per object, the standard for illustration and comics.
3. Either way the gray study survives untouched: a non-destructive habit, and if color goes wrong you still own a working painting.

Answer: Glaze color in color/multiply mode over the grays, or set flats beneath a multiplied value layer; both keep values in charge and the study intact.

PRACTICE

1. Easy What four properties define a new canvas, and which is unchangeable later without consequences?

   Show answer

   Width, height, resolution (PPI) and color model. Pixel dimensions are the real one: enlarging later means inventing pixels.

2. Easy Which blend mode behaves like glazing dark washes, and which like adding light?

   Show answer

   Multiply darkens like a glaze; screen lightens like projected light.

3. Easy Who wrote the program that became Photoshop, and when did Adobe ship 1.0?

   Show answer

   Thomas Knoll (with features driven by his brother John at ILM); Photoshop 1.0 shipped February 1990 for the Mac.

4. **Medium** Canvas for an 8 × 10 in print at 300 PPI with 0.125-in bleed: give the pixel dimensions.

   Show answer

   $8.25 \times 300 = 2475$ by $10.25 \times 300 = 3075$ px.

5. **Medium** Estimate RAM for twelve 8-bit RGBA layers on a 2475 × 3075 canvas.

   Show answer

   Per layer $2475 \times 3075 \times 4 \approx 30$ MB; twelve ≈ 365 MB.

6. **Medium** Compute multiply for value 180 over value 90, and screen for the same pair.

   Show answer

   Multiply: $180 \times 90/255 \approx 64$. Screen: $255 - (75)(165)/255 \approx 206$.

7. **Medium** Why do digital painters block in values before color, when the computer would let them pick any color instantly?

   Show answer

   Because readability lives in value, not hue (Unit 2 and 4): a painting that works in grayscale survives any palette, while color cannot rescue broken values. The tool changed; the eye did not.

8. **Hard** Your painting file was saved only as flattened JPEG each day. The client asks to brighten just the background. Describe the cost of the mistake and the layer habit that prevents it.

   Show answer

   The background is no longer separable: brightening it now means hand-selecting around the subject, redoing edges, and fighting JPEG artifacts. Keeping subject, background and effects on named layers in the .kra master makes the change a thirty-second opacity or curves tweak on one layer.

9. Hard A friend says real artists do not use undo. Give a craftsman's two-sentence answer that honors both practice and tools.

Show answer

Model answer: Every tool has always offered its own undo: painters scraped oil, plasterers re-floated walls, and masters painted studies before the final. Undo does not replace skill, it cheapens the cost of courage, and skill still decides whether attempt forty-one is better than attempt one.

10. Hard Plan the layer stack (bottom to top, with blend modes) for a painted scene: pencil sketch scan, flat colors, shadows, warm evening light, signature.

Show answer

Sample: paper-white background; flats (normal); sketch above flats at low opacity (multiply) while working, hidden at the end or kept subtle; shadows (multiply); evening light (screen or overlay, warm hue, low opacity); signature (normal, topmost). Any reasonable order with multiply shadows and screen light passes.

COMMON MISTAKES

- Painting everything on one layer, which converts every small regret into a repaint.
- Choosing colors before values are settled; grayscale-check the painting before committing to a palette.
- Working at a tiny canvas because it feels faster, then discovering the client needs print size; set pixels from the output arithmetic on day one.

> **Make it a game · Blend-Mode Arithmetic Duel.** Write values 0, 64, 128, 200 and 255 on slips. Each round, draw two: both players compute multiply (a×b÷255, round it) in their heads or on paper, fastest correct answer scores; every third round use screen instead. After five rounds, open Krita, make two gray squares with your last pair, and check the machine agrees with your arithmetic. First to seven points names the next painting's subject.

> **Scripture.** “Whatsoever thy hand findeth to do, do it with thy might; for there is no work, nor device, nor knowledge, nor wisdom, in the grave, whither thou goest.” (Ecclesiastes 9:10, KJV)
>
> Digital tools tempt us to endless tinkering because nothing is ever final. The Preacher's counsel cuts through: do the work at hand with your might, finish it, and deliver the card. Undo is a tool; diligence is a calling.

6.3 Drawing with Curves: Inkscape and the Vector Workflow

OBJECTIVES

- Draw and edit Bézier paths in Inkscape: placing anchor nodes, pulling handles, and converting between corner and smooth nodes.
- Build shapes with Boolean operations (union, difference, intersection) and manage fills, strokes and stacking order.
- Explain the de Casteljau/Bézier story and the PostScript revolution, and compute what vector scaling means for output at any size.

> **Warm-up.** Tape a string loosely between two pencil dots on paper. Push the middle of the string sideways with a third pencil: the curve changes shape while the endpoints stay anchored. Move your push-point closer to one end and watch the curve lean. You have just operated a control handle. Write one sentence on what controls a curve without touching it.

WATCH

Inkscape Lesson 1 - Interface and Basic Drawing

TJ FREE · 9:31

https://www.youtube.com/watch?v=8f011wdiW7g

> **WHEN TO WATCH**
> Start of session one with Inkscape open. Follow along tool by tool; pause and repeat each action (shapes, fill and stroke, select and transform) before he moves on.

Note: The classic free Inkscape orientation series, patient, complete, nothing wasted. Lesson 1 covers the interface and shapes; the series continues if you want more after this unit.

BACKUP VIDEO

Inkscape Explained: Editing Nodes, Paths & The Bezier Pen

Logos By Nick · 21:28

https://www.youtube.com/watch?v=dVjJfx2oc5w

Session two, before the tracing project. A professional logo designer's focused lesson on the pen tool and node editing, the exact skills the brief needs.

KEY TERMS

path

A vector line or shape defined by nodes and the curve segments between them; open (a line) or closed (a shape).

node (anchor point)

A point the path must pass through. Corner nodes make angles; smooth nodes keep the curve continuous through themselves.

handle (control point)

The lever attached to a node that sets the curve's direction and depth on that side; the curve bends toward handles it never touches.

Bézier curve

The standard curve of all vector graphics, defined by two end nodes and their handles; named for Pierre Bézier of Renault.

Boolean operations

Shape arithmetic: union joins shapes, difference subtracts the top from the bottom, intersection keeps only the overlap.

fill and stroke

A path's interior color (fill) and its outline (stroke, with a width). A stroke's width is a property, not drawn pixels, so it can change at any time.

node economy

The professional habit of using the fewest nodes that hold the shape; fewer nodes give smoother curves and easier edits.

CORE IDEAS

The story. The curve under every logo and every font was born in the French auto industry. In 1959 at Citroën, a quiet mathematician named Paul de Casteljau worked out an algorithm for defining car-body curves from a handful of control points, so elegant that engineers could compute any point on the curve with nothing but repeated averaging; Citroën classified it as a trade secret, and de Casteljau published almost nothing for decades. Across town at Renault, the engineer Pierre Bézier (1910–1999) developed the same mathematics openly in the 1960s for UNISURF, Renault's pioneering computer-aided design system for body panels and tooling, lectured on it, published it, and so the curves carry his name while de Casteljau's algorithm quietly computes them. It is a double lesson: in how ideas find their names, and in where design tools come from, sheet metal before logos.

How they figured it out. The genius of the Bézier curve is that four points describe infinitely many points. The two end nodes anchor the curve; the two handles declare a direction and an eagerness at each end; and de Casteljau's recipe, repeatedly averaging along the points, generates the curve to any precision the output device can use. That any precision is the key phrase. In 1982 John Warnock and Charles Geschke left Xerox's research center to found Adobe, and their first product, PostScript (1984), described entire pages, type, rules, curves, placed images, as this kind of mathematics, letting each printer render the same file at its own best resolution. When Apple's LaserWriter shipped with PostScript in 1985 and met Aldus PageMaker on the Macintosh, desktop publishing was born (Lesson 6.5 finishes that story). Every PDF you exported in Unit 5 is PostScript's grandchild; every font you set

in Unit 3 is a bundle of Bézier outlines, scaling from 7 pt to billboard with no loss, because mathematics has no pixels.

The craft. The pen tool rewards planning and punishes noodling. Place nodes where the curve changes behavior, at the extreme points of curves (top, bottom, left, right of a circle-ish arc) and at genuine corners, and nowhere else; pull each handle along the direction the path is traveling. A circle wants four nodes; a leaf, perhaps six; if your trace of a simple shape has forty, delete and retry with intention. Build complex marks from simple shapes and Boolean arithmetic rather than heroically pen-tooling the whole outline: a crescent is a circle minus a circle; a cross is two rectangles unioned; a gear is a circle, one tooth, and rotated copies, then one union. Keep strokes as strokes while designing (editable width), convert to paths only on final export if a cutter or engraver demands it. And remember node economy is not vanity: a logo you deliver will be edited by strangers for years, and every needless node is a trap you set for them.

In the studio. Vector drawing is the language of identity work, the branding jobs of Unit 8, and of anything manufactured: vinyl cutters, engravers, embroidery digitizers, screen printers and sign shops all consume paths, not pixels. The professional workflow for turning a hand-drawn mark into vector art is the one in this brief: scan or photograph the drawing, place it on a locked layer at reduced opacity, and redraw deliberately on a layer above, correcting with the client's intent, not tracing every wobble, then present outlines-only and filled versions. Inkscape's automatic Trace Bitmap exists and has honest uses (reclaiming old clip art, vectorizing a texture), but auto-trace of a logo produces node-swamps that no sign shop thanks you for; employers can tell hand-built paths from auto-trace at a glance, and so will you by the end of this lesson. Save masters as SVG, deliver copies as PDF, EPS or PNG as the job requires.

PICTURE STUDY



Victor Bicycles, William H. Bradley, c. 1896 · Color lithograph poster · Library of Congress, Washington, D.C.

Image: Wikimedia Commons, public domain

Around 1896 Will Bradley — the American printer's apprentice who became the country's most famous poster designer — drew this advertisement for the Overman Wheel Company of Massachusetts. Look at how little he used: three or four flat ink colors, no shading, no gradients, no outlines doing the work of edges. Every area of the picture is a closed flat shape — the black of the riders, the violet of the ground, the cream of the poppies and spokes — and every edge is a long, confident curve.

That is vector thinking, sixty years before the computer. When you draw with Bézier paths in Inkscape you are making exactly the decisions Bradley made on the lithographic stone: reduce the subject to flat shapes, give each shape one clean boundary, let shapes overlap and cut one another, and make the silhouette carry the drawing. Study this poster as a file you could rebuild — because you could, path by path.

Look closely

- Count the colors. How many separate flat inks can you find, and where does the paper itself do the work of a color?
- Trace the back wheel's curve with your eye, then the sweep of the riding woman's skirt. Where would you place the anchor points and handles if these

were Bézier paths?

- Find three places where one flat shape overlaps or cuts into another — a Boolean union or subtraction done in ink.
- Squint. Does the picture still read when the detail disappears? Which silhouette carries it?
- Look at the lettering of VICTOR. Are those letters type, or drawn shapes like everything else in the design? How can you tell?

Talk about it

1. Bradley had no gradients and no filters, only flat shapes — and the poster has lost none of its punch in more than a century. What does that suggest about where a vector illustration's real power lives?
2. If you traced this poster in Inkscape, roughly how many paths would you need? What does that small number tell you about Bradley's discipline?
3. Why do flat, hard-edged shapes reproduce perfectly at any size — on a trading card or a billboard — while a soft pencil drawing does not?

Safety first. Vector work is precision mousing for long stretches. Keep the 20-20-20 eye rule, drop your shoulder and let the whole arm, not the wrist alone, steer long curves, and stand between sessions. If your drawing hand aches, your grip is too tight or your zoom is too deep; zoom out and loosen.

STUDIO BRIEF

Studio brief: the vector logo trace

Client: a family venture, real or plausible (a woodshop, a bakery stand, a tutoring service). Deliverable: their hand-drawn mark rebuilt as professional vector art. Specs: start from a pencil/marker drawing (yours from Unit 2 sketching or a fresh one), deliver an SVG master plus PNG exports at 256 px and 2048 px, one-color version required, node-economy reviewed. Deadline feel: the client wants it on a T-shirt order form by next week, and the shirt printer demands clean paths.

You will need

- A hand-drawn mark, bold marker over pencil, photographed or scanned (300 PPI is plenty)
- Inkscape; a mouse is fully sufficient for vector work
- Graph paper for the node-planning sketch

Steps

1. Simplify the drawing first on paper: a mark, not an illustration; it must survive at 0.75 in. Redraw it bold with a marker.
2. Import the image into Inkscape, place it on its own layer, set opacity near 40%, and lock the layer.
3. On paper, plan the paths: mark every node you intend (extremes and corners only) with dots on a printout or in your sketchbook. Count them; that is your budget.
4. Build the large simple shapes first with shape tools (circles, rectangles) and Boolean operations wherever geometry allows; pen-tool only what geometry cannot give.
5. Draw the remaining paths with the Bézier tool: click for corners, click-drag for smooth nodes, then refine with the node editor. Stay within about 120% of your node budget.
6. Make the one-color test: select all, fill black, no strokes. The mark must read perfectly; if it needed its colors to make sense, simplify the shapes.

7. Create the color version with your Unit 4 palette discipline (two or three fills), align and group everything, and size the document to the drawing.
8. Export: SVG master (File ▸ Save As), then PNG at 256 and 2048 px wide; confirm both PNGs are crisp and the small one still reads.
9. Present to the client: the mark at business-card size, shirt size and letterhead size on one sheet, with the sketch beside it to show the craftsmanship, and record their reaction.

Tips

- Fewer nodes, longer handles: if a curve will not sit right, remove a node before adding one.
- Use Edit ▸ XML or the node count in the status bar to audit your path weight; a clean mark is usually under 60 nodes total.
- Snap to a grid for anything symmetric, and build half, then mirror with duplicate-and-flip, unioning the halves.

Check your work

- ☐ My final node count is within budget and every node sits at an extreme or a true corner.
- ☐ The one-color version reads at 0.75 in printed.
- ☐ SVG master plus 256/2048 PNG exports are delivered and named sensibly (venture-logo-master.svg, -256.png, -2048.png).

SKETCHBOOK

1. Your node-plan drawing: the mark with every planned node dotted and the final count versus budget.
2. A pen-tool drill page: trace a circle, an S-curve and a capital R, each twice, recording node counts falling with practice.
3. The de Casteljau midpoint construction from the worked example, drawn accurately on graph paper.

KEY FORMULAS

Vector scaling: output is exact at every size; raster effective resolution $= \dfrac{\text{pixels}}{\text{inches}}$ degrades as inches grow

$\text{enlargement} = \dfrac{\text{output}}{\text{original}} \times 100\%$ (a 2-in sketch to a 10-in sign is 500%)

De Casteljau's idea: points on the curve come from repeated averaging, e.g. the midpoint construction $M = \dfrac{A + B}{2}$ applied down the control polygon

From history. Pierre Bézier spent 42 years at Renault and said the resistance he met inside the company was harder than the mathematics; draftsmen feared the machine would erase their craft, yet the designers who learned the system became more valuable, not less. De Casteljau's priority was only widely acknowledged decades later, and the two men's names now share the textbook chapter: one for the curve, one for the algorithm, a quiet lesson in credit, patience and publishing your work.

WORKED EXAMPLES

Example 1. A hand-drawn mark is 2.5 in wide. The client needs it at 0.75 in (business card) and 30 in (banner). Give the two scale percentages, and state what happens to path data at each.

Show solution

1. Card: $0.75 / 2.5 = 30\%$. Banner: $30 / 2.5 = 1200\%$.
2. Vector paths are instructions: at 30% and at 1200% the same nodes are redrawn exactly; only stroke widths need checking (a 1-pt stroke at 30% becomes visually 0.3 pt, below many presses' minimum).
3. A raster of the same mark scanned at 300 PPI would be 750 px wide: at 30 in that is 25 PPI, unusable.

Answer: 30% and 1200%; the vector stays exact at both (watch hairline strokes at reduction), while a 300 PPI raster would collapse to 25 PPI on the banner.

Example 2. Plan the minimum nodes for: (a) a circle, (b) a capital D, (c) a five-pointed star. Explain where and why.

Show solution

1. (a) Four smooth nodes at the extremes (N, E, S, W), handles horizontal and vertical.
2. (b) Eight-ish: four corners of the stem (corner nodes), and the bowl's extremes, two or three smooth nodes; the junction points where bowl meets stem are corners.
3. (c) Ten corner nodes (five points, five valleys), no handles at all: straight segments only.
4. The principle: nodes at extremes and corners, handles only where curvature lives.

Answer: Circle 4, D about 8 (corners at the stem, smooth on the bowl), star 10 straight-line corners.

Example 3. Describe the Boolean recipe for a crescent moon and for a 1-in washer (ring) with a 0.4-in hole, including which shape goes on top for the difference.

Show solution

1. Crescent: draw circle A (the moon), overlap circle B shifted to one side on top of it, select both, apply Difference: B is subtracted from A, leaving the crescent.
2. Washer: circle of 1 in diameter; centered circle of 0.4 in on top (use align-center both ways); Difference cuts the hole.
3. In Inkscape, Difference always subtracts the top object from the bottom one; stacking order is the whole trick.

Answer: Both are circle-minus-circle differences, with the cutting circle on top; alignment tools center the washer's hole.

Example 4. Demonstrate de Casteljau's averaging once: nodes A(0,0) and B(8,0), handles P(2,6) and Q(6,6). Find the curve's midpoint by repeated midpoints.

Show solution

1. First averages: $M_1 = (1, 3)$ (A,P), $M_2 = (4, 6)$ (P,Q), $M_3 = (7, 3)$ (Q,B).
2. Second: $N_1 = (2.5, 4.5)$ (M1,M2), $N_2 = (5.5, 4.5)$ (M2,M3).
3. Third: $C = (4, 4.5)$, a true point of the curve, found with nothing but averaging.
4. Every point of every font outline you print is computed by this ladder of averages.

Answer: The curve passes through (4, 4.5); repeated averaging of control points generates Bézier curves to any precision.

PRACTICE

1. Easy What do the two handles of a node control?

   Show answer

   The direction and depth (tension) of the curve entering and leaving that node; the curve bends toward handles without touching them.

2. Easy Union, difference or intersection: which makes a bite taken out of a cookie shape?

   Show answer

   Difference (the bite shape on top, subtracted from the cookie below).

3. Easy Why do fonts stay sharp at every size on every device?

   Show answer

   Each glyph is stored as Bézier outlines, mathematics redrawn by the renderer at the device's own resolution; no pixels are stored to stretch.

4. Easy Who published the curve mathematics openly and at which company? Whose algorithm computes it?

   Show answer

   Pierre Bézier at Renault (UNISURF, 1960s); the algorithm is Paul de Casteljau's, developed secretly at Citroën in 1959.

5. Medium A 3-in-wide vector logo is scaled to 0.5 in for a pen barrel. Its finest strokes are 0.8 pt. What do they become, and what is the fix?

Show answer

Scale $= 0.5/3 \approx 17\%$, strokes become about 0.13 pt, below printable minimums. Fix: a simplified small-size version of the mark with thickened strokes, standard practice in logo packages.

6. Medium Your auto-trace of a hand-drawn leaf has 214 nodes; your hand redraw has 9. Give two practical costs of the 214-node version.

Show answer

Lumpy curves that cannot be smoothly edited (every wobble is enshrined), and trouble downstream: huge files, slow cutters, and sign shops or embroiderers who must clean it up at your reputation's expense.

7. Medium Where do nodes belong when tracing an S-curve, and what kind of nodes are they?

Show answer

At the curve's extremes and at the inflection where the bend reverses, smooth nodes with handles aligned along the path's direction; typically three or four nodes total.

8. Medium Compute one de Casteljau step: midpoint of handle pair P(2,8) and Q(10,4).

Show answer

$((2+10)/2, (8+4)/2) = (6, 6)$.

9. Hard A sign shop asks for your logo with text converted to paths. What does that mean, why do they need it, and what is the one risk you must manage?

Show answer

Each letter's live type is converted to its Bézier outlines, so the file renders identically without the font installed and can drive a cutter. Risk: the text is no longer editable, so deliver outlined copies and keep the live-type master.

10. Hard Make the raster-versus-vector call with numbers: a client's mark exists as a 1200-px-wide PNG. Jobs: (a) 1-in lapel pin art, (b) 4-ft trade-show wall. Verdict for each, and the permanent fix.

Show answer

(a) $1200/1 = 1200$ PPI: fine. (b) $1200/48 = 25$ PPI: fails badly. Permanent fix: redraw once as vector (this lesson's brief), after which both jobs and all future ones use the same file.

11. Hard PostScript let one file print on a 300-DPI office printer and a 2400-DPI imagesetter with no change. Explain in two sentences why vector page description made that possible when raster files could not.

Show answer

PostScript ships the mathematics (curves, type, placements) and lets each device rasterize at its own resolution, so every printer renders the page at its personal best. A raster file fixes the resolution at creation, too coarse for the imagesetter or absurdly heavy for the office printer.

COMMON MISTAKES

- Tracing every wobble of the sketch instead of the intended shape; the drawing is the brief, not the boundary.
- Too many nodes, placed mid-curve instead of at extremes, which guarantees lumpy paths.
- Scaling a mark with strokes and forgetting that stroke widths scale too (or do not, depending on settings), so the delivered sizes have inconsistent line weights; check every export at 100%.

> **Make it a game · Node Budget Bidding.** Your parent names a simple object: heart, lightning bolt, fish, crescent, letter B. Both players secretly write the fewest nodes they believe a clean vector of it needs, then reveal; the lower bid must defend it by sketching the shape with dots at each claimed node. If the sketch convinces, low bidder scores; if a needed corner or extreme is missing, the other player scores. Five objects a round; check one answer in Inkscape afterward.

> **Scripture.** “Who hath laid the measures thereof, if thou knowest? or who hath stretched the line upon it?” (Job 38:5, KJV)
>
> God answers Job as the master builder who set the world's measures and stretched the line. Every line you stretch between two anchors is a small echo of an ordered creation, and precision in your paths honors the Orderer.

6.4 From Sketch to Finish: Scan, Clean, Ink and Color Your Drawing

OBJECTIVES

- Scan or photograph a drawing at the right resolution for its output size, computing the scan DPI for any enlargement.
- Clean a scan in GIMP or Krita with levels and threshold so the lines are crisp and the paper drops to pure white.
- Color line art non-destructively using a multiply-mode line layer over flats, completing the full hybrid pencil-to-pixels pipeline.

> **Warm-up.** Find the strongest pencil drawing in your Unit 1–2 sketchbook. Photograph it with your phone in good window light, square-on. Zoom into the photo: notice the gray paper tone, the shadow across one corner, the faint construction lines. List the three things standing between this photo and a crisp printable image; this lesson removes all three.

WATCH

GIMP - Clean Up An Ink Drawing Scan

WatchBand · 8:32

https://www.youtube.com/watch?v=Hnref67HAS4

> **WHEN TO WATCH**
> Session one, after the craft paragraph, with GIMP open and your own scan loaded. Pause at the Levels dialog and repeat each slider move on your scan before continuing.

Note: A direct demonstration of the levels-and-cleanup pass on a real ink scan, exactly step 4 of the brief. The same dialog exists in Krita (Filters ▸ Adjust ▸ Levels) if you prefer one program.

BACKUP VIDEO

How to color your lineart in Krita

Kate Oleska · 27:01

https://www.youtube.com/watch?v=_GXyUsjjAdg

Session two, before coloring. A professional illustrator shows line-layer handling and coloring approaches in Krita; take her multiply-layer setup and simplify the rest to this lesson's flats-plus-shadows.

KEY TERMS

line art

The cleaned black-line layer of an illustration, kept separate from color so each can be edited alone.

levels

The adjustment that remaps tones: pull the white point down to bleach the paper, the black point up to solidify the ink, and the lines pop clean.

threshold

The all-or-nothing adjustment: every pixel darker than the cutoff becomes black, everything lighter becomes white; the final step to true 1-bit line art.

flatting

Laying flat local color under the line art, shape by shape, the comics industry's name for the patient base-coloring pass (and an actual entry-level paid job).

multiply line layer

Setting the line-art layer to multiply so its white becomes transparent and the black lines ride cleanly over any color beneath.

descreen / despeckle

Cleanup filters: despeckle removes scanner dust and paper noise; descreen removes halftone patterns when scanning printed sources.

alpha lock / clipping

Restricting paint to a layer's existing pixels (or to the layer below), so shading stays inside the flats without re-selecting.

CORE IDEAS

The story. The pipeline you learn today, clean line art made for reproduction, then color added as a separate pass, is older than computers. In the 1890s Charles Dana Gibson (1867–1944) ruled American illustration with pen and ink alone: his crisp crosshatched drawings of the Gibson Girl reproduced perfectly on the cheap photoengraved line blocks of the day, and he understood that drawing for print meant drawing for the process, lines that held up, no gray washes the lineblock could not carry. When magazines wanted color, it was added as separate printing plates, not mixed into the line. The comic-book industry industrialized the same separation: penciller, inker (turning pencil into reproducible black line) and colorist were, and still are, distinct paid crafts, and the colorist worked on separate overlays keyed to the inker's lines. When illustration went digital in the 1990s, the pipeline survived almost unchanged, scan the ink, drop the white, color underneath, because it was never about the tools; it was about the logic of keeping line and color sovereign.

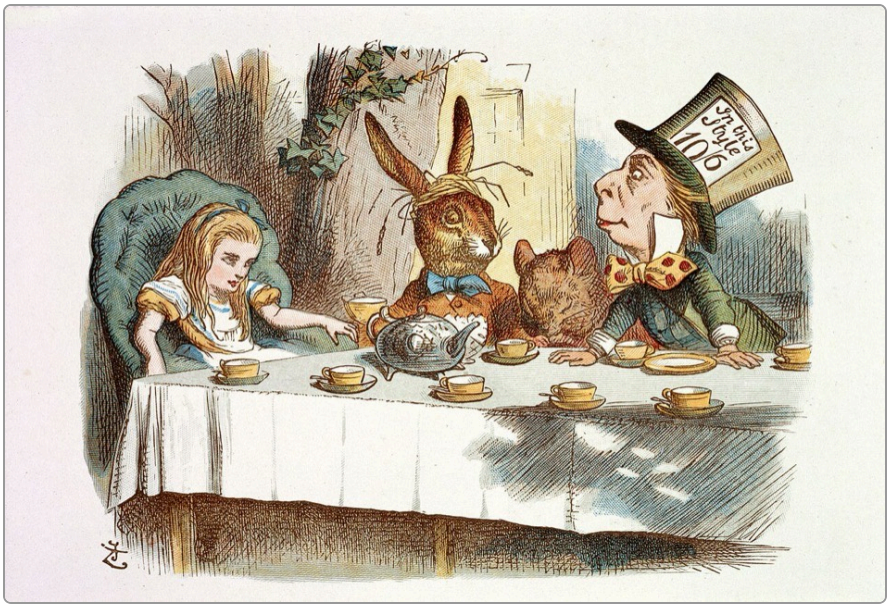
How they figured it out. The digital versions of the old steps were worked out by the first generation of digital colorists and are now standard. The paper problem (gray tone, uneven light) fell to the Levels adjustment: a scan's histogram shows a mountain of paper tones and a hill of ink tones, and dragging the white point below the paper mountain bleaches it to pure white while the black point solidifies the ink; Threshold finishes the job where true black-and-white is wanted. The white problem (how can lines sit over color if they ride on white paper?) has two classic answers: set the line layer to multiply, where white times anything leaves the anything

unchanged, or select-and-delete the white to leave lines alone on transparency. And the coloring problem (how to stay inside the lines without painting like a nervous child) became flatting: fill each region with its flat local color on a layer under the lines, then do all shading with alpha-lock or clipped layers so paint physically cannot leave the shapes. Each solution is five hundred years of print logic wearing new buttons.

The craft. The arithmetic comes first, as always. Scan at the resolution your output demands: for same-size reproduction at 300 PPI, scan at 300; for enlargement, scan at $\text{scan DPI} = \text{output PPI} \times \frac{\text{output size}}{\text{original size}}$, so a 4-in sketch destined for an 8-in print at 300 PPI scans at 600 DPI; and line art tolerates, even loves, 600 DPI since hard edges are everything. Grayscale mode is right for pencil and ink (a third of the data of RGB, Lesson 6.1). A phone camera substitutes for a scanner if you shoot square-on in even window light and crop, though a $60 flatbed repays itself in straight, evenly lit scans. Then the pass order: rotate and crop; Levels to drop the paper and solidify ink; despeckle lightly and erase stray marks by hand; Threshold if going to pure line; then into Krita as the top layer, set to multiply, locked. Flats go on layers beneath, named by region (skin, cloak, pot, leaves); shadows and lights ride above the flats, clipped. The lines stay untouched from first to last, which is the whole secret.

In the studio. This hybrid pipeline is not a compromise; for many working illustrators it is the preferred method, because pencil and paper still offer a sensitivity of hand that styluses approximate. Children's book artists commonly ink traditionally and color digitally; comic studios scan pencils and distribute inking and coloring across time zones; and art directors routinely ask for the line layer and the color layers separately so a detail can be revised without resurrecting the whole painting. Deliverables from this pipeline are a layered master (.kra), a flattened full-resolution TIFF or PNG for print, and a reduced web copy, three files, three jobs. Keep your original drawing, too: clients have bought the paper original as a bonus more than once in illustration history, and your own archive of pencils is the record of your hand improving.

PICTURE STUDY



A Mad Tea-Party, from The Nursery "Alice", John Tenniel, 1890 (drawing 1865, colored for this edition) · Color-printed wood engraving · British Library, London

Image: Wikimedia Commons, public domain

This picture went through the whole pipeline this lesson teaches — a quarter century before you were asked to do it in an afternoon. In 1865 John Tenniel drew the Mad Tea-Party in pen line for Alice's Adventures in Wonderland, and the Dalziel Brothers engraved his lines into wood for black-and-white printing. In 1890, Lewis Carroll published The Nursery "Alice" for the youngest readers, and twenty of Tenniel's illustrations were enlarged and printed in color under the artist's own exacting direction — Tenniel's line art, finished in color, twenty-five years after the ink dried.

Look at how the two layers live together. The line work still does all the drawing: forms, faces, folds, the Hatter's astonished eyebrows. The color sits inside and under the line — flat, clean washes that never fight the black. That is precisely the relationship you build when you scan a drawing, clean it, ink it on one layer and color beneath it on another: line for structure, color for light and mood, each doing only its own job.

Look closely

- Find a place where the black line is doing the drawing and the color is only filling. Now find any place where color does work the line does not.

- Look at Alice's dress and the tablecloth. How flat are the color areas? Where did the colorists allow a little modeling, and where none at all?
- The line work was drawn for black-and-white printing in 1865. What qualities of Tenniel's inking made it survive coloring so well?
- Check the edges: does the color ever slip past the line? What would the digital equivalent of that slip be, and which tool prevents it?
- Compare the white of the tablecloth with the colored areas. What is the white doing in the design — and which 'layer' is it on?

Talk about it

1. In your pipeline, line and color sit on separate layers so each can change without harming the other. How did the 1890 edition's makers enjoy the same advantage with woodblocks and ink?
2. Tenniel supervised the coloring of lines he had drawn twenty-five years earlier. What does that say about how well-made line art holds its value — and about finishing your inks cleanly before coloring?
3. If you were handed this scene as uncolored line art today, what three color decisions would you make first, and why?

Safety first. Scanning, cleanup and coloring stack up screen hours. Keep the 20-20-20 habit, stand and stretch between the three sessions, and alternate detailed cleanup (small motions) with flatting (broad motions) so neither your eyes nor your wrist does the same tiny work for an hour straight.

STUDIO BRIEF

Studio brief: ink it, scan it, color it

Client: a children's story page for a family read-aloud (a scene from a Bible story, a fable, or your own family's tale). Deliverable: one finished illustration, drawn and inked on paper, scanned, cleaned, and colored digitally. Specs: ink on paper at 5 × 7 or larger; scan per the resolution arithmetic for an 8 × 10 print; layered master with named layers (lines multiply-locked, flats, shadows, light); deliver a printed 8 × 10 plus a web PNG. Deadline feel: one week, the read-aloud is Sunday.

You will need

- Pencil, pen (fineliner or dip pen), smooth paper
- Scanner or phone camera and window light; GIMP and Krita
- Printer for the 8 × 10 (or a print shop one-off)
- Your Unit 2 composition notes and Unit 4 palette discipline

Steps

1. Thumbnail the scene three ways (Unit 2 rules); pick one and pencil it at 5 × 7 or larger with clean, confident construction.
2. Ink deliberately: vary line weight (thick toward shadow and weight-bearing edges, thin toward light), let lines close their regions so flatting is easy, and let it dry before erasing pencil.
3. Compute your scan: output 8 × 10 at 300 PPI from your original's size (show the arithmetic in your sketchbook), and scan grayscale at that DPI.
4. Clean in GIMP or Krita: rotate/crop, Levels (drop paper, solidify ink), despeckle, hand-erase strays. Save the cleaned line art as PNG.
5. In Krita, build the stack: white paper layer, cleaned lines on top set to multiply and locked.
6. Flat the regions on layers beneath, two to four local colors chosen value-first; name every layer.
7. Add one multiply shadow pass (single cool color, clipped) and one screen/overlay light pass, both restrained; the line carries the drawing.

8. Export: full-resolution PNG for print and a 1200-px-wide web copy; print the 8 × 10 and compare with the screen.
9. Read the story aloud with the picture on Sunday; record the audience's first comment, verbatim, in your sketchbook. That is client feedback.

Tips

- Closed line regions make the fill tool your flatting friend; one pinhole gap floods the whole scene (Krita's fill has gap-closing settings when you sin).
- Keep shadows one color on one multiply layer; beginners who shade each flat separately drift into mud.
- If the ink wobbles, remember Gibson and Dürer: confident wrong lines read better than timid right ones, and the eraser is for pencil, not for courage.

Check your work

- ☐ My scan arithmetic is written down and the file measures exactly what I computed.
- ☐ Lines are untouched from cleanup to delivery: locked, multiply, topmost.
- ☐ The printed 8 × 10 was delivered on time and the layered master reopens with every named layer intact.

SKETCHBOOK

1. Your scan-resolution arithmetic and the histogram sketch with your chosen Levels points marked.
2. A line-weight study: the same small object inked three times (uniform line, weighted line, broken line) with a note on which colored best.
3. The full layer-stack diagram of your finished piece, drawn as a labeled sandwich.

KEY FORMULAS

$$\text{scan DPI} = \text{output PPI} \times \frac{\text{output size}}{\text{original size}}$$

$$\text{scan pixels} = \text{original inches} \times \text{scan DPI}$$

Multiply's transparency trick: white is 255, and $\frac{255 \times b}{255} = b$, so white leaves the color below unchanged while black (0) stays black

From history. Charles Dana Gibson earned what newspapers reported as the largest illustration contract of his era, $100,000 from Collier's in 1904 for a hundred pen drawings, on the strength of line alone, and when photoengraving had made his style reproducible everywhere, imitators flooded in; he stayed ahead by drawing better, not by guarding the technique. The pipeline is learnable by anyone, which is exactly why the drawing underneath it, your Units 1 and 2, is where careers are actually decided.

WORKED EXAMPLES

Example 1. A 5 × 7 in ink drawing will print at 10 × 14 in at 300 PPI. Find the scan DPI and the resulting pixel dimensions.

Show solution

1. Enlargement factor: $10/5 = 2$.
2. Scan DPI: $300 \times 2 = 600$.
3. Pixels: $5 \times 600 = 3000$ by $7 \times 600 = 4200$, which at 10 × 14 output is exactly 300 PPI.
4. Grayscale file size: $3000 \times 4200 \times 1 \approx 12.6$ MB uncompressed, light work for any machine.

Answer: Scan at 600 DPI, giving 3000 × 4200 px, exactly 300 PPI at the doubled size.

Example 2. Explain, with the multiply arithmetic, why a line-art layer set to multiply shows the flats through its white areas but keeps its black lines black over any color.

Show solution

1. Multiply computes result $= a \times b/255$ per channel, where a is the line layer and b the color below.
2. Where the line layer is white, $a = 255$: result $= b$: the flat color passes through untouched.
3. Where the line layer is black, $a = 0$: result $= 0$: the line stays black over everything.
4. Grays in between darken proportionally, which is why soft pencil lines also sit naturally over color in multiply.

Answer: White (255) is multiply's identity and black (0) is its annihilator, so the paper vanishes and the ink survives: the whole trick in two numbers.

Example 3. Your scan's histogram shows paper tones clustered around 190–230 and ink around 20–70, with dust specks scattered between. Give the Levels settings and the follow-up that produce clean line art.

Show solution

1. Set the white input point to about 185: everything lighter than 185 (all paper) becomes pure white.
2. Set the black input point to about 75: everything darker becomes solid black, firming the ink.
3. The 75–185 middle zone keeps edge antialiasing smooth; specks surviving in it get a light despeckle filter and a hand pass with the eraser at 100% white.
4. For pure 1-bit art, finish with Threshold around 128 and inspect edges at 200% zoom.

Answer: White point ~185, black point ~75, despeckle plus hand cleanup, optional Threshold ~128 for true black-and-white.

Example 4. Plan the complete layer stack for a colored ink illustration of a garden scene, naming each layer, its blend mode and its job.

Show solution

1. Top: lines (multiply, locked), the cleaned scan.
2. Below it: shadows (multiply, clipped to flats), one cool shadow color over everything shaded.
3. Then: light (screen or overlay, low opacity) for the sun side.
4. Then the flats group: sky, leaves, soil, watering-can, each flat color on its own normal layer (or one flats layer if regions are few).
5. Bottom: paper (white or cream background).
6. Deliver by exporting flattened PNG while the .kra keeps the stack alive.

Answer: paper → flats (normal) → shadows (multiply, clipped) → light (screen) → lines (multiply, locked, topmost); master stays layered, exports flatten.

PRACTICE

1. Easy What scan DPI reproduces a drawing at the same size for 300 PPI print?

   Show answer

   300 DPI (output PPI times enlargement factor of 1).

2. Easy Which adjustment bleaches paper tone to white while keeping ink black, and which makes the image strictly two-valued?

   Show answer

   Levels (white and black input points); Threshold.

3. Easy Why is the line-art layer set to multiply instead of normal?

   Show answer

   In multiply, its white areas leave lower layers unchanged (255 is the identity), so the paper becomes effectively transparent while black lines stay black.

4. Easy What is flatting, and who does it in a comics studio?

   Show answer

   Filling each region with its flat base color under the lines; it is an entry-level paid role (flatter) supporting the colorist.

5. **Medium** A 3-in sketch must print 9 in wide at 300 PPI. Scan DPI and pixel width?

Show answer

$300 \times 3 = 900$ DPI; $3 \times 900 = 2700$ px wide.

6. **Medium** Grayscale versus RGB for scanning an ink drawing: give the file-size ratio and the reason grayscale suffices.

Show answer

One third the size (1 byte vs 3 per pixel); ink drawings carry no color information, only tones from black to white, which one channel stores completely.

7. **Medium** After Levels, faint construction-pencil lines still ghost through the inks. Two clean removal options?

Show answer

Tighten the white input point further (construction lines are lighter than ink), or erase them by hand at 100% white; classic prevention is inking over blue pencil, which drops out even more easily (desaturate the blue channel first).

8. **Medium** Why do art directors ask for lines and colors as separate layers in the delivered master?

Show answer

So revisions stay cheap: a color change, a recolored jacket or a line-weight tweak touches one layer instead of demanding a repaint, and the line art can be reused (coloring books, animation, merchandise) independently.

9. **Hard** Your phone photo of a drawing has a bright side and a shadowed side, and Levels cannot clean one without wrecking the other. Name the cause and two fixes, one at capture, one in software.

Show answer

Uneven illumination: the paper is not one tone, so no single white point works. Capture fix: reshoot square-on in even window light (or scan). Software fix: a gradient-filled layer in divide/grain-extract style to flatten the lighting, or clean the halves with separate selections, then Levels.

10. Hard Compute and compare: a 4 × 6 in drawing scanned at 600 DPI grayscale, versus the same scanned at 300 DPI RGB. Which file is larger and by how much, and which serves line art better?

Show answer

600 gray: $2400 \times 3600 \times 1 = 8.6$ MB. 300 RGB: $1200 \times 1800 \times 3 = 6.5$ MB. The 600 gray file is about a third larger but serves line art far better: double the edge resolution where line art lives, with no useless color data.

11. Hard You are the studio. A client supplies a drawing photographed at an angle, with a hand shadow, asking for color by Friday. List your triage steps in order.

Show answer

1) Ask for a rescan/reshoot square-on in even light (politely, with a thirty-second how-to); 2) if impossible, perspective-correct the photo, flatten lighting, Levels, hand cleanup, and state honestly the quality ceiling; 3) confirm output size to set the needed resolution before any cleanup; 4) only then flat and color. Order matters: pixels lost at capture cannot be restored downstream.

COMMON MISTAKES

- Scanning at 300 DPI regardless of enlargement, then upsampling when the print is bigger than the drawing; compute the scan from the output first.
- Coloring on the line-art layer itself, the one layer that must never be painted on; lock it the moment it lands in the stack.
- Overworking the shadows until the ink drawing drowns; in this pipeline the line is the soloist and color is the accompanist.

> **Make it a game · Pipeline Scramble.** Write the nine pipeline stages on slips (thumbnail, pencil, ink, compute scan DPI, scan, levels cleanup, flats, shadows and light, export and print). Your parent shuffles and deals them face up; you re-order the chain in under 30 seconds, then they quiz two slips: for compute scan DPI you must state the formula, and for levels you must say what moves where. Swap roles with a twist: the parent orders them wrong on purpose and you name the disaster each wrong order causes.

> **Scripture.** “Prepare thy work without, and make it fit for thyself in the field; and afterwards build thine house.” (Proverbs 24:27, KJV)
>
> Field first, house second: the proverb is about right order in work. The pipeline keeps that order, drawing before ink, ink before scan, flats before shading, and every stage done fit makes the next stage simple.

6.5 The Professional's Toolkit: Adobe, Affinity, Procreate and Yours

OBJECTIVES

- Name the industry-standard tools in each category, map each free tool you know to its commercial counterpart, and state honestly what transfers and what does not.
- Compare tool costs over multi-year horizons (subscription versus one-time versus free) and compute the differences.
- Build keyboard-shortcut fluency deliberately, and plan how to present free-tool skills to employers and translate them to Adobe when a job requires it.

> **Warm-up.** Time yourself in Krita or Inkscape doing this sequence twice: new document, draw three shapes, duplicate one, change its color, undo twice, zoom to fit, save. First time using menus only; second time using every keyboard shortcut you know. Write both times down, and the sequence's shortcuts you had to look up.

WATCH

When to Use Photoshop vs Illustrator vs InDesign

UT San Antonio Academic Innovation · 4:34

https://www.youtube.com/watch?v=k5_Da_Hd8l8

> **WHEN TO WATCH**
> After the craft paragraph. As you watch, write the three-column map: each Adobe app, its job in one phrase, and the free tool you already know that does that job.

Note: A university's plain-spoken sorting of the big three by job: pixels, paths, pages. You already think this way from Lesson 6.1; this video attaches the industry's product names to it.

BACKUP VIDEO

Photoshop vs Illustrator vs Indesign - When to use each one

Teaching Tech · 10:59

https://www.youtube.com/watch?v=fWJ_BvfUo6o

Same placement as the main video, if it is unavailable: the same triage explained with worked examples of choosing the right app for a job.

KEY TERMS

industry standard

The tools most studios and printers assume: Adobe Photoshop (raster), Illustrator (vector) and InDesign (layout), plus Figma for interface design and Procreate for iPad painting.

Adobe Creative Cloud

Adobe's subscription licensing: roughly $60 a month for all apps or about $23 for one, rented, not owned; free trials and discounted student plans exist.

Affinity suite

Serif's one-time-purchase alternatives (Affinity Photo, Designer, Publisher), professional tools positioned against the subscription model.

Procreate

Savage Interactive's iPad painting app (2011), a one-time purchase beloved by illustrators; needs an iPad and pencil.

transferable skill

Knowledge that moves between tools: layers, Bézier paths, color models, resolution arithmetic, typography. The concepts are the career; the buttons are the week's rental.

keyboard shortcut fluency

Operating the tool from the keys (B brush, E eraser, Ctrl+Z, Ctrl+S, Space-drag pan) so the hands work while the eyes stay on the art; studios notice it in interviews.

native file format

Each tool's own layered format (PSD, AI, INDD, .kra, SVG, .afphoto); studios expect deliverables in the formats their pipeline consumes.

CORE IDEAS

The story. The modern toolkit was born in about eighteen months. Apple shipped the Macintosh in 1984; Adobe, founded in 1982 by John Warnock and Charles Geschke to sell PostScript (Lesson 6.3), put that page mathematics inside Apple's LaserWriter printer in 1985; and that same year Paul Brainerd's small Seattle company Aldus shipped PageMaker, the first real page-layout program, coining the phrase desktop publishing to describe what the three products did together. A studio that had needed typesetters, stat cameras and paste-up artists could suddenly be one person at one desk. Adobe then assembled the rest of the standard kit: Illustrator (1987) put Bézier paths in designers' hands, Photoshop (1990, Lesson 6.2) owned the pixel, and InDesign (1999) took the layout crown from its aging rival QuarkXPress, helped by Quark's own complacency, a business lesson studios still cite. Adobe bought Aldus in 1994; the empire was complete, and in 2013 Adobe moved it all from boxes you bought to subscriptions you rent.

How they figured it out. The subscription turn created the counter-movement you benefit from. Serif, a British firm, rebuilt its products from scratch as the Affinity suite (Designer 2014, Photo 2015, Publisher 2019): fully professional, sold once, owned forever, and priced about like three months of Adobe. Savage Interactive's Procreate (2011) showed that a five-figure studio tool could be a one-time purchase on a tablet, and it became the default for a generation of illustrators. Meanwhile the free-software world matured from hobby to profession: GIMP (begun 1995), Inkscape (2003), Scribus (2003) and Krita (Lesson 6.2) now cover every category this

course teaches. The market sorted into three honest tiers, rent the standard, buy the challenger, or learn the free tools, and a working designer should be able to say what each tier buys: Adobe buys frictionless studio compatibility; Affinity and Procreate buy ownership; free tools buy independence and zero overhead, at the cost of occasionally translating file formats at the border.

The craft. What actually transfers between tools is nearly everything you have learned, because you learned concepts. Layers, blend modes, selections and resolution arithmetic move from Krita to Photoshop unchanged; nodes, handles and Booleans move from Inkscape to Illustrator unchanged; master pages, styles and bleeds move from Scribus to InDesign unchanged; even most shortcuts rhyme (B is a brush almost everywhere). What does not transfer is the location of buttons, some format borders (Krita opens PSD well; Scribus does not open INDD, so studios exchange PDF and IDML at that border), and a handful of Adobe-only conveniences you learn in a week on the job. The money arithmetic deserves the same honesty: Adobe all-apps at about $60/month is about $720 a year and $2,880 over four years; one Adobe app is about $275 a year; the Affinity suite is a one-time purchase in the low hundreds; your current toolkit is $0, forever. For a student, the professional play is free tools now, a portfolio that proves the skills, Adobe's free trial or a student plan in the month you are interviewing, and let the first employer's license pay for the buttons.

In the studio. Employers hire for portfolio and fundamentals, then expect tool fluency to follow; a hiring art director would rather take a student with strong drawing, typography and production arithmetic who learned them on Krita than a weak portfolio wrapped in a Creative Cloud subscription. Be plain on the resume: Digital tools: Krita, Inkscape, Scribus, GIMP (Photoshop/Illustrator/InDesign workflows and shortcuts familiar), and be ready to prove it by doing a small task live. Build shortcut fluency the way musicians build scales: ten keys at a time, drilled until invisible, because in interviews and on deadlines the hands must not interrupt the eyes. And keep a craftsman's humility about tools in both directions: no subscription makes weak work strong, and no free tool excuses missing a spec. The maker matters more than the instrument, but the professional learns the instruments the shop plays.

The pathway. From here, Unit 7 turns to illustration as a business, and Units 8–10 to branding, screens and the working career. Mark this honestly as the point where

your toolkit became professionally complete: everything from thumbnail to press-ready PDF, from scan to colored illustration, from sketch to scalable logo, can now be produced at this desk for the cost of the paper. Fabricando fit faber: the maker is made by making, and nothing about the making now waits on money.

PICTURE STUDY



The Artist in His Studio, Rembrandt van Rijn, c. 1628 · Oil on panel · Museum of Fine Arts, Boston

Image: Wikimedia Commons, public domain

Rembrandt painted this when he was about twenty-two, working in Leiden at the start of his career. It is a picture of a professional's toolkit, and the inventory is short: one easel, one panel, a palette, a fistful of brushes, a grinding stone for pigments by the wall, a plain room with good light. The most expensive thing in the picture is the attention. The painter has stepped back — some say the full length of the room — to think, because the decisive work of painting happens before the brush touches the panel.

This lesson is about Adobe, Affinity, Procreate and the free tools you already own, and this little panel is the oldest and best commentary on the subject. The tools matter — Rembrandt ground the best pigments he could afford — but they are few, they are servants, and the craftsman is not the one with the biggest kit. He is the small figure in the corner who knows exactly what the next stroke should be.

Look closely

- List every tool you can find in the room. How many are there — and what is conspicuously absent from a working studio this spare?
- Why has the painter stepped so far back from the easel? What is he doing right now, and why is it the hardest part of the job?

- Rembrandt made the easel and panel enormous and the artist small. What does that size relationship say about the work and the worker?
- Find the light source. What makes this plain room a good studio, and what is its modern equivalent at your desk?
- Look at the wall: cracked plaster, a grinding stone, palettes hung by the door. What does the room's plainness tell you about where the money and care went?

Talk about it

1. A student today can feel unable to start without the industry-standard software. What would this picture say to that student?
2. Which parts of your toolkit — hardware, software, skills, habits — correspond to the easel, the pigments and the stepping-back? Which is hardest to buy?
3. Rembrandt's materials were professional but his room was bare. When you can afford one upgrade, how do you decide whether the bottleneck is your tools or your judgment?

STUDIO BRIEF

Studio brief: your toolkit map and shortcut card

Client: yourself, one year from now, and any employer who asks what you work in. Deliverable: a designed, printed one-page Toolkit Map (each job → your tool → industry standard → file formats at the border) plus a pocket shortcut card for your two most-used programs, both produced with the tools themselves. Specs: letter sheet for the map on your 5.1 grid discipline; card at 3.5 × 2 in with proper bleed per 5.4; ten shortcuts per program chosen by your own logged frequency. Deadline feel: this week, then the card lives beside your keyboard.

You will need

- Scribus or Inkscape for the map; your 5.4 business-card document as the card template
- Your warm-up timing log and two weeks of honest notes on which actions you perform most
- Printer and cardstock; craft knife, straightedge and mat to trim the card

Steps

1. Log first: during two normal work sessions, tally every action you perform in Krita and Inkscape. The tally, not a website's list, decides your ten shortcuts per program.
2. Draft the Toolkit Map's table on paper: rows for painting, photo/scan work, vector, layout; columns for job, my tool, industry standard, challenger, formats that cross the border.
3. Design the map in Scribus on a documented grid: clear hierarchy (Unit 2), two typefaces (Unit 3), restrained color (Unit 4). It must be readable pinned to a wall.
4. Design the shortcut card at 3.5 × 2 in with 0.125 bleed: front Krita, back Inkscape, type no smaller than 6.5 pt for the keys, grouped by task.
5. Run the two-week drill from the worked example, retiring sticky notes as keys become automatic, and record the timed sequence at days 1, 7 and 14.
6. Print both pieces; trim the card with knife, straightedge and mat (safety rules from 5.4), and laminate it with packing tape if you like.

7. Install an Adobe-familiarity hour: using free trial versions or in-browser demos and videos, locate your ten actions' equivalents in Photoshop and Illustrator, and annotate your map where names differ.
8. Write the three-sentence interview answer (practice problem 8) in your own words on the back of the map, and rehearse it aloud twice.

Tips

- Design the card for your own eyes at keyboard distance, not for a portfolio; it is a tool, and tools are judged in use.
- If an action did not appear in your tally, it does not belong on the card, however famous the shortcut.
- Date the map; remake it yearly. Watching the industry column change over a career is its own education.

Check your work

- ☐ My shortcut choices come from my logged tallies, and my day-14 sequence time beat day 1 by at least a third.
- ☐ The map's grid, type and production specs obey Units 3–5 (and the card's bleed survived the trim).
- ☐ I can deliver the interview answer from memory, unhurried.

SKETCHBOOK

1. Your action-frequency tallies and the three timed-sequence entries (days 1, 7, 14).
2. The toolkit map's paper draft with the format-border notes (what crosses, what does not).
3. A one-paragraph tier decision for yourself today (free / own / rent) with the arithmetic that justifies it, dated, to revisit in Unit 10.

KEY FORMULAS

$$\text{subscription cost} = \text{monthly rate} \times 12 \times \text{years}$$

$$\text{breakeven (months)} = \frac{\text{one-time price}}{\text{monthly rate}}$$

$$\text{savings} = \frac{\text{costlier} - \text{cheaper}}{\text{costlier}} \times 100\%$$

From history. Paul Brainerd, who coined desktop publishing and sold Aldus to Adobe in 1994, spent his fortune on conservation and philanthropy, and PageMaker itself was quietly retired in favor of InDesign by 2004: the product died, the revolution stayed. Tools are mortal; the capacities they spread are not. The student who learned paste-up in 1980 and PageMaker in 1990 and InDesign in 2000 and Scribus today was never actually relearning the job, only the buttons, provided the first learning was principles.

WORKED EXAMPLES

Example 1. Compare four-year costs: Adobe all-apps at $59.99/month, one Adobe app at $22.99/month, Affinity's three-app suite at a one-time $164.99, and the free toolkit. Then find the breakeven month for Affinity against all-apps Adobe.

Show solution

1. Adobe all-apps: $59.99 \times 48 \approx \$2{,}880$.
2. One app: $22.99 \times 48 \approx \$1{,}104$.
3. Affinity: $164.99 once; free toolkit: $0.
4. Breakeven: $164.99 / 59.99 \approx 2.75$, so Affinity pays for itself against Adobe in under three months.
5. Honest caveat to carry into Unit 10 pricing: a studio billing $5,000 a month treats $60 as negligible against compatibility; a student billing $0 should treat $720 a year as real money.

Answer: Four years: about $2,880 vs $1,104 vs $165 vs $0; Affinity breaks even against full Adobe in month three. The right tier depends on who is paying and what compatibility is worth.

Example 2. Map the toolkit: for each job, name the free tool you learned and the industry-standard counterpart: digital painting, photo retouching, vector logo, multi-page layout, iPad sketching.

Show solution

1. Digital painting: Krita → Photoshop (or Procreate on iPad).
2. Photo retouching: GIMP → Photoshop (Affinity Photo as challenger).
3. Vector logo: Inkscape → Illustrator (Affinity Designer).
4. Multi-page layout: Scribus → InDesign (Affinity Publisher).
5. iPad sketching: paper and pencil are your current tool → Procreate.
6. The file borders to remember: PSD opens widely; INDD does not travel (exchange PDF/IDML); SVG goes everywhere.

Answer: Krita/Photoshop, GIMP/Photoshop, Inkscape/Illustrator, Scribus/InDesign, Procreate for iPad: five rows every interviewer will recognize.

Example 3. Design a two-week shortcut drill that takes a student from menus to fluency in Krita and Inkscape, and state how to measure it.

Show solution

1. Pick the ten highest-frequency actions per app (Krita: B, E, Ctrl+Z, Ctrl+S, M flip, R rotate canvas, [and] brush size, Ctrl+T transform, Space pan. Inkscape: S selector, N nodes, B Bézier, R rectangle, E ellipse, Ctrl+D duplicate, Ctrl+G group, Ctrl+Shift+F fill/stroke, plus zoom and save).
2. Week one: five shortcuts per day, used exclusively, menus forbidden for those actions; a sticky note on the monitor retires when its key is automatic.
3. Week two: timed sequences (the warm-up drill) each session, logging the times.
4. Measure: the warm-up sequence's time should drop by at least a third, and the log proves it, a before-and-after an employer would respect more than a software certificate.

Answer: Ten keys per app, five a day used exclusively, timed sequence logs; success is a one-third speed gain in two weeks, documented.

PRACTICE

1. Easy Name the Adobe standard for raster, vector and layout, and your free counterpart for each.

   Show answer

   Photoshop/Krita (or GIMP), Illustrator/Inkscape, InDesign/Scribus.

2. Easy What three products together created desktop publishing in 1984–85?

   Show answer

   The Apple Macintosh, the PostScript-equipped Apple LaserWriter, and Aldus PageMaker (Paul Brainerd's company, which coined the term).

3. Easy One year of a $59.99/month subscription costs how much?

   Show answer

   $\$719.88 \approx \$720$.

4. Medium A $164.99 one-time suite versus a $22.99/month single-app subscription: breakeven month, and five-year totals.

   Show answer

   Breakeven $164.99/22.99 \approx 7.2$ months. Five years: $164.99 versus $22.99 \times 60 \approx \$1{,}379$.

5. Medium Name four concepts that transfer unchanged from your free tools to Adobe's, and two things that do not.

   Show answer

   Transfer: layers and blend modes, Bézier paths and nodes, resolution/bleed arithmetic, styles and master pages (also most shortcuts). Do not: exact menu locations, and some proprietary format borders (e.g., INDD) plus a few Adobe-only conveniences.

6. Medium Why did InDesign displace QuarkXPress around 1999–2005, and what is the standing business lesson?

   Show answer

   Quark grew complacent on its dominance (high prices, slow fixes, dismissed Mac OS X early), while InDesign shipped better typography and bundled pricing; studios switched. Lesson: market leaders that stop serving customers train their replacements, true of designers as much as software.

7. Medium Write the one-line resume entry that presents your toolkit honestly and reassures an Adobe shop.

Show answer

Sample: Digital tools: Krita, Inkscape, Scribus, GIMP; Photoshop/Illustrator/InDesign workflows, formats and shortcuts familiar; portfolio produced entirely with professional free software.

8. Hard An interviewer asks: We are an Adobe shop; you trained on free tools. Why should that not worry us? Give the three-sentence answer.

Show answer

Model answer: The skills in my portfolio, drawing, typography, color, production arithmetic, live above any tool, and the concepts map one-to-one: layers, paths, masters and bleeds work the same in your apps as in mine. I have already worked in Photoshop and Illustrator trials and the shortcuts are largely shared, so the transition is a week of button-finding, not retraining. Judge the portfolio; the toolbar I can learn by Friday.

9. Hard A freelancer bills $2,000/month and collaborates weekly with an agency that exchanges PSD and INDD files. Which tier should she choose and why, with the arithmetic that justifies it?

Show answer

Rent Adobe: $60 is 3% of monthly revenue, and format friction with her main client would cost more than $720/yr in lost time and trust. The free/Affinity tiers suit workers whose deliverable borders are PDF, PNG and SVG; hers are native Adobe files.

10. Hard Defend and attack this claim in two sentences each: Better tools make better designers.

Show answer

Defend: tools remove friction and widen what one person can attempt, and desktop publishing genuinely replaced whole departments with one skilled designer. Attack: every unit of this course produced professional work with free tools and paper, because judgment, drawing and arithmetic decide quality; a subscription has never fixed a bad layout.

COMMON MISTAKES

- Confusing tool fluency with design skill in either direction: neither a subscription nor a principled refusal of one ever fixed a weak portfolio.
- Learning shortcuts from someone else's top-ten list instead of your own usage; fluency follows frequency.
- Bluffing Adobe experience in an interview. Familiar and ready to transfer is honest and hireable; false claims die in the first hour at the desk, and with them your name (a Unit 10 theme).

Make it a game · Shortcut Showdown. Open Krita or Inkscape. Your parent reads tasks from your own shortcut card, brush, duplicate, flip, group, save, and you must execute each by keys alone, hands visible, three seconds per task; a menu touched scores for the parent. Ten tasks a round. When you win a shutout, play the harder variant: parent names the task, you say the key before touching it, in both your program and its Adobe counterpart from your map.

Scripture. “If the iron be blunt, and he do not whet the edge, then must he put to more strength: but wisdom is profitable to direct.” (Ecclesiastes 10:10, KJV)

The Preacher's economics of the sharpened axe: skill with the tool multiplies strength, and wisdom chooses where to swing. Shortcut drills are whetting; the toolkit map is wisdom directing; neither replaces the arm that does the work.

UNIT 6

The Digital Studio: Raster and Vector

Everything you have drawn, lettered and laid out so far can now move into the computer, and this unit is where you set up your digital studio and learn its two great languages. A computer stores a picture either as a grid of colored squares (raster, the language of paintings and photographs) or as mathematical curves (vector, the language of logos and type). Every tool, file format and job in the industry sorts along that line, and a professional knows at a glance which language a job speaks.

The stories are the founding stories of the tools themselves: Russell Kirsch scanning the first digital photograph, a picture of his baby son, in 1957; Paul de Casteljau and Pierre Bézier taming curves for French car bodies, in secret and in public; John Warnock and PostScript teaching printers to speak mathematics; and two brothers named Knoll who wrote a photo program in 1987 that became Photoshop. You will learn Krita for painting, Inkscape for vector drawing and GIMP for cleaning scans, free, serious tools used by working professionals, and you will finish the unit by carrying one drawing through the full hybrid pipeline: pencil, scan, clean, ink and color.

The math is the arithmetic of your daily work from now on: resolution and megapixels, bit depth and file size, memory, scanning resolution for enlargement, and the deep reason a vector logo scales to a billboard while a raster logo turns to mush. Lesson 6.5 closes the unit with an honest tour of the industry-standard tools, Adobe, Affinity, Procreate, what they cost, how your free-tool skills transfer, and how to walk into a job interview ready for either.

PREREQUISITES

- Units 1–5 of this course, especially drawing and value (Unit 1), color systems (Unit 4) and resolution and file formats (Lesson 5.4)
- Arithmetic with large numbers and scientific shortcuts: $\text{MB} = \text{bytes}/1{,}048{,}576 \approx \text{bytes}/10^6$, percentages and ratios
- Krita, Inkscape and GIMP installed from their official sites (all free); a mouse works for everything in this unit, and a budget drawing tablet is optional but welcome

MASTERY CHECKLIST

- ☐ I can explain how a raster image stores a picture (pixels, channels, bit depth) and compute its uncompressed file size.
- ☐ I can explain how a vector image stores a picture (anchor points, Bézier handles, fills and strokes) and why it scales without loss.
- ☐ I can choose raster or vector for a given job and defend the choice in one sentence.
- ☐ I can set up a Krita canvas for a print or screen target, paint with layers and blend modes, and keep values under control.
- ☐ I can draw clean paths with Inkscape's pen tool, edit nodes and handles, and combine shapes with Boolean operations.
- ☐ I can scan a drawing at the right resolution, clean it in GIMP or Krita, and color it on layers without harming the line art.
- ☐ I can name the industry-standard tools, map each free tool to its commercial counterpart, and say honestly what transfers and what does not.
- ☐ I can use keyboard shortcuts for the ten commonest operations in each program without looking.

FREE RESOURCES FOR THIS UNIT

- **Krita (free digital painting)**: The free, professional-grade painting program used in Lessons 6.2 and 6.4, for Windows, Mac and Linux. Download only from krita.org. Built by artists (the webcomic Pepper & Carrot is painted entirely in it); works fine with a mouse, better with any inexpensive tablet.
- **Inkscape (free vector drawing)**: The free vector editor used in Lesson 6.3, the open-source counterpart to Adobe Illustrator. Download only from inkscape.org. Its native SVG format is the web standard for vector graphics, so nothing you make in it is locked in.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

6.1	**Pixels and Paths: How a Computer Stores a Picture**	3 sessions of 50 minutes
6.2	**Painting with Pixels: Krita and the Raster Workflow**	3 sessions of 50 minutes
6.3	**Drawing with Curves: Inkscape and the Vector Workflow**	3 sessions of 50 minutes
6.4	**From Sketch to Finish: Scan, Clean, Ink and Color Your Drawing**	3 sessions of 50 minutes
6.5	**The Professional's Toolkit: Adobe, Affinity, Procreate and Yours**	3 sessions of 50 minutes

Unit 6 test

Time allowed: 50 minutes. A calculator is allowed; show arithmetic and units for every calculation. Where a question asks for a tool choice, one correct sentence of reasoning is required. The test is worth 100 points.

1. **5 pts**
   A camera produces 5472 × 3648 images. Compute the megapixels.

2. **5 pts**
   How many colors can 24-bit RGB express? Show the computation from bits.

3. **5 pts**

   Raster or vector, with one reason each: (a) a logo for vinyl cutting; (b) a restored family photo; (c) a font; (d) a scanned ink drawing.

4. **6 pts**

   Compute the uncompressed size of a 4800 × 6000 px scan in 8-bit grayscale and in 24-bit RGB, in MB (use 10^6).

5. **6 pts**

   Give the Krita canvas in pixels for a 6 × 9 in book cover at 300 PPI with 0.125-in bleed, and the approximate RAM for six RGBA layers.

6. **7 pts**

   Compute multiply mode for value 160 over value 120, and screen mode for the same pair, and state which you would use for shadows and which for light.

7. **7 pts**

   Tell the curve story in four facts: who at Citroën, who at Renault, whose name the curves carry and why, and what Adobe product carried the mathematics onto the printed page.

8. **7 pts**

   A client's only logo file is an 800-px-wide PNG. Compute its effective PPI at 2 in wide (letterhead) and 24 in wide (banner), give the verdicts, and state the permanent fix.

9. **8 pts**

   Where do nodes belong on a clean vector path, and what is wrong with a 200-node auto-trace of a simple leaf? Sketch or describe the right 6–8 node plan for a leaf.

10. **8 pts**

    A 4 × 5 in ink drawing must print at 12 × 15 in at 300 PPI. Compute the scan DPI and pixel dimensions, and name the scan mode you choose.

11. **8 pts**

    Describe the full hybrid pipeline in order from pencil drawing to delivered files, naming the adjustment that cleans the scan and the blend mode that carries the lines, and the three deliverables a studio expects.

12. **8 pts**

    Compute: four-year cost of a $59.99/month suite; the breakeven month of a $164.99 one-time suite against it; and the four-year savings of the one-time suite in dollars and percent.

13. **8 pts**

    Map the toolkit (five rows): digital painting, photo/scan editing, vector, layout, iPad illustration: your free tool (or current tool) and the industry standard for each.

14. **12 pts**

    Short essay. An employer says: Your portfolio was made with free software; we run Adobe. Why should we hire you? Answer in a short paragraph that names what transfers (at least four concepts), what does not, and the honest plan for the first week, then add the sentence you would NOT say (the bluff to avoid).

ANSWER KEY

1. $5472 \times 3648 \approx 20.0$ MP.
2. $2^{24} = 256^3 = 16{,}777{,}216$ colors.
3. (a) Vector: cutters follow paths. (b) Raster: continuous-tone pixels. (c) Vector: outlines must scale to every size. (d) Raster: a scan is a pixel grid.
4. Gray: 28.8 MB; RGB: 86.4 MB.
5. $6.25 \times 300 = 1875$ by $9.25 \times 300 = 2775$ px; per layer ≈ 20.8 MB, six layers ≈ 125 MB.
6. Multiply: $160 \times 120/255 \approx 75$ (shadows). Screen: $255 - (95)(135)/255 \approx 205$ (light).
7. Paul de Casteljau (Citroën, 1959, kept secret); Pierre Bézier (Renault's UNISURF, 1960s, published and lectured); the curves carry Bézier's name because he published; Adobe's PostScript (1984, Warnock and Geschke) described whole pages with such curves.
8. $800/2 = 400$ PPI (passes) and $800/24 \approx 33$ PPI (fails badly). Fix: redraw once as vector; every future size is then exact.
9. Nodes at curve extremes and true corners only, handles along the path's direction. The auto-trace enshrines every wobble, edits badly and chokes cutters. Leaf plan: tip and stem-base corners, two or three smooth nodes per side at the extremes of each curve.
10. Factor 3; scan at 900 DPI, giving 3600×4500 px; grayscale mode (ink carries no color, one third the data).
11. Thumbnail/pencil → ink → compute scan DPI → scan grayscale → Levels (drop paper, solidify ink, plus despeckle/threshold) → lines as top layer on multiply, locked → flats beneath → clipped shadows (multiply) and light (screen) → export. Deliverables: layered master (.kra), full-resolution flattened TIFF/PNG for print, reduced web copy.
12. $59.99 \times 48 \approx \$2{,}880$; breakeven $164.99/59.99 \approx 2.75$ (month 3); savings $\approx \$2{,}715 \approx 94\%$.
13. Krita/Photoshop; GIMP/Photoshop (Affinity Photo challenger); Inkscape/Illustrator; Scribus/InDesign; paper or tablet/Procreate.
14. Model answer: The portfolio's skills live above any vendor: layers and blend modes, Bézier paths, grids and master pages, and production arithmetic (resolution, bleed, CMYK) all map one-to-one onto Photoshop, Illustrator and

InDesign, and most shortcuts match. What differs is button locations and a few proprietary formats, so my first week includes an hour a day in your apps converting my ten commonest actions, which I have already begun in trial versions. Avoid the bluff: never claim years of Adobe experience you do not have; false fluency is exposed in an hour and costs the name that references are built on.

PORTFOLIO PIECE: PENCIL TO PIXELS: A FINISHED DIGITAL ILLUSTRATION WITH PROCESS PACK

Produce one finished illustration through the complete hybrid pipeline at portfolio quality: an original drawing (your subject, wholesome and story-bearing), inked on paper, scanned at computed resolution, cleaned, and colored in Krita with a disciplined layer stack, delivered as a printed 8 × 10 and a layered master. Alongside it, present your vector logo from Lesson 6.3 at three sizes on one sheet to show both of the digital studio's languages mastered.

Add the process pack that makes this piece an employer's exhibit rather than a pretty picture: the original pencil/ink drawing (or a photo of it), the scan arithmetic, a screenshot of the named layer stack, and a one-paragraph tools statement naming what was used and what it would map to in an Adobe shop. This is piece six of the ten-piece professional portfolio; it proves the thing studios doubt most in beginners, that you can carry a job through every stage and deliver files another professional can open and use.

LOOK FOR	WHAT IT MEANS
Drawing and composition	The underlying drawing is sound (Units 1–2): confident line, readable values, a composition with one clear focal point.
Pipeline execution	Scan resolution computed and correct; cleanup crisp (paper white, ink solid, no specks); lines locked on multiply and untouched.
Digital craft	Layer stack named and logical; flats clean; shadows and light restrained and non-destructive; values survive a grayscale check.
Vector competence	The logo sheet shows clean node-economy paths, a one-color version, and identical sharpness at all three sizes.
Files and delivery	Master (.kra), print file and web copy correctly sized, named and versioned; SVG master for the logo; everything reopens intact.
Process pack and presentation	Original drawing, arithmetic, stack screenshot and tools statement are complete, honest and neatly presented as one professional exhibit.

UNIT 7

Illustration as a Profession

Illustration is pictures with a job to do: selling a story, explaining an idea, putting a face on a magazine or a book. In this unit you will learn how illustration became a profession — in the great magazine era of Howard Pyle and N.C. Wyeth, and in the color picture books of Walter Crane, Randolph Caldecott and Arthur Rackham — and how the same business works today. You will learn who buys illustration now (editorial pages, advertising, book covers, concept art and children's books), how the money works (flat fees, advances and royalties), and how a real illustration job runs from the client's brief through thumbnails, sketch approval, final art and revisions.

You will also do the work. You will paint a story moment the way Pyle taught his students to, build a three-spread picture-book dummy, take an editorial assignment from brief to finished spot, run a disciplined style experiment, and finally carry a complete illustration job start to finish with a parent or friend acting as your art director. By the end of the unit you will have two portfolio-quality pieces and, just as important, you will know how to behave like a professional: answer promptly, meet the deadline, take notes graciously and deliver exactly what was asked.

PREREQUISITES

- Units 1 and 2: drawing what you see, gesture and heads, value, and compositional hierarchy — every brief in this unit uses them
- Unit 6: the digital studio basics (scanning a drawing, cleaning it up, Krita and Inkscape) for finishing and delivering work
- Percentages and simple arithmetic, for royalty, print-run and fee calculations

MASTERY CHECKLIST

- ☐ I can tell the story of the Golden Age of American illustration: Howard Pyle, his schools, his students, and why the halftone and the mass magazine created the profession.
- ☐ I can explain how a 32-page picture book is built — signatures, spreads, front matter and page turns — and storyboard one.
- ☐ I can calculate a royalty, an advance earn-out and a print run, and explain royalties versus a flat fee.
- ☐ I can name today's five main illustration markets, what each one buys, and how a portfolio should differ for each.
- ☐ I can describe style as a set of consistent decisions, run an honest master study, and keep a series visually consistent.
- ☐ I can run an illustration job from brief to final: thumbnails, sketch approval, final art and limited revisions, with professional art-director etiquette.
- ☐ I can deliver finished art to spec, on deadline, with a courteous handoff.

FREE RESOURCES FOR THIS UNIT

- **Internet Archive**: Free scans of the Golden Age itself: the 1911 Treasure Island with all of Wyeth's plates, Howard Pyle's Book of Pirates, Caldecott's picture books and bound volumes of the old magazines. Search a title, then read the real pages. No account needed.
- **The Metropolitan Museum of Art — Open Access collection**: Hundreds of thousands of free, downloadable public-domain images, including prints, posters and drawings by many artists in this unit. Use it to collect reference and master-study material legally.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

7.1 The Golden Age: Howard Pyle, N.C. Wyeth and the Magazine Era
3 sessions of 50 minutes

7.2 Pictures for Children: Crane, Caldecott, Rackham and the Picture Book
3 sessions of 50 minutes

7.3 Today's Markets: Editorial, Advertising, Covers and Concept Art
3 sessions of 50 minutes

7.4 Finding Your Style: Influences, Practice and Consistency 3 sessions of 50 minutes

7.5 From Brief to Final: The Illustration Job, Start to Finish 3 sessions of 50 minutes

Unit 7 test

Time allowed: 50 minutes. A calculator is allowed for the royalty and rate problems; show your work. Answer the short essays in complete sentences. The test is worth 100 points.

1. **5 pts**
   What printing invention of the 1880s created the Golden Age of Illustration, and why?

2. **5 pts**

   Place these in time and connect them in two sentences: Howard Pyle at Drexel; the Brandywine school; N.C. Wyeth's Treasure Island.

3. **6 pts**

   Define Pyle's 'vital moment' and apply it: name the moment you would paint from the story of Noah receiving the dove, and defend the choice in one sentence.

4. **6 pts**

   Why are picture books 32 pages, and after 4 pages of front matter, how many story spreads remain?

5. **7 pts**

   An illustrator takes a $7,000 advance against a 5% royalty on a $19.99 hardcover. Compute the royalty per copy, the earn-out point, and total earnings at 25,000 copies sold.

6. **6 pts**

   Royalty versus flat fee: give one situation where each is the wiser choice for the illustrator, with the reasoning.

7. **8 pts**

   Name today's five main illustration markets and, for each, the buyer and one thing its portfolio must prove.

8. **7 pts**

   Job A pays $420 and takes 7 hours; Job B pays $900 and takes 3 days (8-hour days). Compute both effective hourly rates and name two non-rate factors that could still justify the lower-rate job.

9. **6 pts**

   A client who paid for one-time program use writes: 'We're putting the art on billboards — we already paid for it.' Write the two-sentence professional reply.

10. **6 pts**

    Define style in one sentence as this unit taught it, and list four of the axes on which style decisions are made.

11. **8 pts**

    State the rules of an honest master study, and explain — using Rockwell and Leyendecker or Wyeth and Pyle — how strong influence becomes a personal style instead of imitation.

12. **10 pts**

    List the five gates of an illustration job in order, and state for each what passes through it and why changing course gets more expensive at every gate.

13. **10 pts**

    Short essay. Your final is going to be a day late, four days before deadline. Write the email you send now, and explain in three sentences why early honesty is both right and professionally safer than hoping to catch up.

14. **10 pts**

    Production task. Thumbnail (2 inches, value only) two different 'vital moment' choices for this scene: a lighthouse keeper's daughter rows out at dusk to warn a ship off the rocks. Label each before/during/after and circle the one Pyle would choose, with one sentence why.

ANSWER KEY

1. The photographic halftone: it broke paintings into printable dots, replacing slow hand wood-engraving, so mass magazines could reproduce paintings cheaply by the millions — creating a huge paying market for illustrators.
2. Pyle began teaching illustration at Drexel in 1894, then ran his own tuition-free school from 1900; his students clustered around Chadds Ford on the Brandywine, becoming the Brandywine school. His student N.C. Wyeth illustrated Scribner's 1911 Treasure Island — seventeen canvases for $2,500 — the tradition's most famous commission.
3. The single instant carrying the most story meaning, often just before or after the action. Example answer: the breath after the dove lands — olive leaf visible, Noah's face changing — because the storm, the wait and the promise are all legible in that one quiet beat.
4. Presses fold printed sheets into 16-page signatures, so books run in multiples of 16; 32 pages is the economical standard. $(32-4)/2 = 14$ spreads.
5. Per copy $0.05 \times \$19.99 \approx \$1.00$; earn-out $\approx 7{,}000$ copies; beyond it $18{,}000 \times \$1.00 = \$18{,}000$, total $\approx \$25{,}000$.
6. Flat fee: work-for-hire educational or low-sales projects, where the guaranteed fee exceeds likely royalties and income is needed now. Royalty: a trade book with real retail life, where per-copy earnings continue for years and can far exceed any flat fee (Caldecott's penny-per-copy versus Wyeth's one-time $2,500).
7. Editorial — magazine/news ADs; fast visual ideas and metaphors. Advertising — agency ADs; polish and brand-safe execution to layout. Book covers — publisher ADs; one image that sells with room for type. Concept art — game/film studios; fast iteration and design process, not just finished paintings. Children's books — publisher ADs/editors; consistent characters telling a story across spreads.
8. A: $\$60/\text{hr}$; B: $\$900/24 = \$37.50/\text{hr}$. Lower-rate work can still be right for the relationship (a returning client or AD), portfolio value, or broader usage fees attached — but the choice should be made knowingly.
9. Model answer: 'I'm glad the piece worked so well! The original fee licensed one-time program use, so billboard advertising is a new, broader license — I'll send a quote today, and the files are ready to go as soon as it's confirmed.'
10. Style is the recognizable sum of an artist's repeated decisions across many works. Axes (any four): line, shape language, value, palette, proportion, texture/finish, subject and mood.

11. Copy privately and deliberately to learn decisions; label the study after its artist; never sell it or present it as original; feed on several masters. Rockwell copied Leyendecker's stroke technique in studies, then digested the influence through volume and his own storytelling temperament until his style diverged — apprenticeship followed by departure, as with Wyeth under Pyle.
12. Brief (the written job: deliverable, size, usage, deadline, fee, rounds — questions cost nothing here); thumbnails (3–5 cheap directions, minutes to redo); sketch approval (the tight drawing becomes a promise — last cheap change); final art (matches the approved sketch; changes now cost days); revisions (the agreed rounds; beyond scope or after approval is billed). Cost rises because each gate converts options into finished labor.
13. Model email: 'Heads-up: the final is tracking one day behind. I can deliver Thursday 9 a.m. instead of Wednesday, or simplify the background and hold Wednesday — your call.' Explanation: the AD still has options on Tuesday and none on Friday; honesty keeps the relationship's trust intact even when the schedule bends; and silent hope converts a small adjustable slip into a broken promise, which is the one unforgivable professional failure.
14. Model answer: (1) Before — the small boat leaving the lighthouse's pool of light into darkness, ship's lights distant; (2) After — the girl shipping her oars as the freighter's wake lifts her boat, danger past. Either circled is defensible with reasoning; Pyle favored the moment that lets the viewer imagine the climax — strongest is usually the 'before,' tension unresolved, two light sources telling the whole story.

PORTFOLIO PIECE: A STORY SEQUENCE, PITCHED LIKE A PROFESSIONAL

Choose your strongest work from this unit — the vital-moment illustration (7.1) or the picture-book dummy (7.2) — and develop it to portfolio finish: for the illustration, a fully rendered final with the book's title line; for the dummy, one spread taken to finished art plus the complete sketch dummy.

Then package it the way the profession would see it: a one-page case study presenting brief, thumbnails, approved sketch and final in order, with two sentences on each decision, your style memo from Lesson 7.4, and your hours log with the effective hourly rate computed at an imagined market fee. This is piece seven of the ten-piece professional portfolio you will complete by the end of the course.

LOOK FOR	WHAT IT MEANS
Storytelling	A vital moment is clearly chosen and defensible; the image or sequence tells story the text does not repeat, and reads at small size.
Craft	Drawing is constructed (gesture, forms, studied drapery from a posed model where figures appear); values organize into 2–3 big shapes; the finish is consistent.
Process	Thumbnails, approved sketch and final are all present and the final honors the approved sketch; the case study explains decisions in plain sentences.
Professional arithmetic	Hours are logged honestly; effective hourly rate and (for the book option) a royalty earn-out example are computed correctly.
Consistency	Characters, palette and handling hold steady across the sequence or between sketch and final; the style memo matches the work shown.
Presentation	The case-study page is clean, labeled and complete — the kind of page an art director could approve in sixty seconds.

7.1 The Golden Age: Howard Pyle, N.C. Wyeth and the Magazine Era

OBJECTIVES

- Tell how the halftone printing process and the mass-circulation magazine created the first great market for American illustration, and place Howard Pyle, Drexel (1894) and the Brandywine school in that story.
- Explain Pyle's teaching method — live in the picture, costumed models, the vital moment — and why it still trains illustrators today.
- Describe how N.C. Wyeth's Treasure Island commission of 1911 worked as a business arrangement, and what it tells you about how illustrators were hired and paid.

> **Warm-up.** Find three illustrated things in your house made before you were born — an old book with plates, a magazine, a game box, a Bible with engravings. For each, write one sentence: what job was the picture hired to do? Sell the book, explain the text, or make you feel something?

WATCH

THE ILLUSTRATIONS OF HOWARD PYLE HD

pete beard · 15:49

https://www.youtube.com/watch?v=ORd1LQVz6SQ

> **WHEN TO WATCH**
> After the story paragraph. Pause on the pirate pictures and ask of each one: what exact moment of the story did Pyle choose to paint?

Note: A calm, well-researched survey of Pyle's work and influence from a British illustration historian. Notice how often Pyle paints the second before or after the obvious action — that choice is the lesson.

BACKUP VIDEO

N. C. WYETH

pete beard · 13:26

https://www.youtube.com/watch?v=5yI2vMh1Fjg

With the Treasure Island section. Watch for the plates you will study in the picture study and count how many you recognize.

KEY TERMS

illustration

A picture made to serve a text, a product or an idea — commissioned art with a job to do, as distinct from gallery art made first and sold after.

halftone

The 1880s printing process that breaks a photograph or painting into tiny dots so a press can reproduce it; it replaced hand wood-engraving and let magazines print paintings cheaply.

Golden Age of Illustration

Roughly the 1880s to the 1920s, when mass magazines and illustrated books made illustrators famous, well paid and central to American visual life.

the vital moment

Pyle's term for the single instant of a story that carries the most meaning — often just before or after the action, not during it.

costumed model

A model posed in period clothing and props so the artist can paint figures from life; the Pyle–Wyeth tradition built complete professional skill this way, with clothed models — this course does the same.

art editor

The magazine or publisher staff member who chose and hired illustrators, assigned stories and approved sketches — the ancestor of today's art director.

CORE IDEAS

The story. In 1876 a young Quaker from Wilmington, Delaware named Howard Pyle (1853–1911) sold an illustrated fable to *Scribner's Monthly* and moved to New York to learn the magazine trade. Within a decade he was the most admired illustrator in America — his *Merry Adventures of Robin Hood* (1883) is still in print — and his pirate pictures for *Harper's* invented the way the whole world now imagines pirates: the sashes, the headscarves, the buried treasure. But Pyle's greatest work was teaching. In 1894 he began teaching the first real school course in illustration at the Drexel Institute in Philadelphia; in 1900 he left and opened his own school in Wilmington, charging no tuition at all and accepting only a dozen students a year from hundreds of applicants. Out of those classrooms came Frank Schoonover, Jessie Willcox Smith, Elizabeth Shippen Green, Violet Oakley, Harvey Dunn — and a big, homesick farm boy from Needham, Massachusetts named N.C. Wyeth (1882–1945), who arrived in Wilmington in October 1902 and sold a bucking-bronco cover to *The Saturday Evening Post* within months, at age twenty. Because so many of Pyle's students settled near his summer school at Chadds Ford on the Brandywine River, the whole tradition is called the Brandywine school.

How they figured it out. None of this could have happened without a printing invention. For most of the 1800s, every published picture had to be carved by hand into wood blocks by engravers; it was slow, expensive and second-hand. In the 1880s the photographic *halftone* arrived: a camera and a screen broke any painting into thousands of tiny dots a press could print. Suddenly a magazine could reproduce an oil painting for a fraction of the old cost, and could print millions of copies. Magazines became the television of the age: *The Saturday Evening Post* passed one million copies a week in 1908 and about two million by 1913, and publishers discovered that a striking cover or a gripping story picture sold copies. They competed for the best illustrators the way studios now compete for stars. Pyle

understood that this new industry needed trained artists who could *tell stories*, not just render objects — so that is what he taught. His rules sound simple and are not: throw your heart into the picture and jump in after it; paint the vital moment, not the obvious one; know the scene so well you could walk around in it; work from costumed models and real props so the truth gets into the paint.

The craft. Study any great Pyle or Wyeth plate and you can watch the rules working. First, *one* moment is chosen — Jim Hawkins aloft with two pistols, not the whole sea fight. Second, the composition is ruthlessly simple: one big value shape for the figure, one for the sky, so the picture reads across a room (you learned this in Unit 2). Third, everything is drawn from knowledge: Wyeth posed models in oilskins, borrowed flintlocks, and painted mood with color temperature — the warm candle-lit cabin, the cold green sea. Fourth, the picture leaves room for the story: Pyle taught that the illustrator supplies what the author cannot say, and leaves out what the author already said. Notice also what the tradition proves about training: Pyle's students built complete professional skill drawing clothed, costumed figures — drapery, heads, hands, gesture — and that is exactly how this course trains you.

In the studio. The business side of the Golden Age looked surprisingly like freelancing today. An art editor — Joseph Chapin held the job at Scribner's — commissioned a set of pictures for a fee agreed in advance; the artist supplied sketches for approval, then finals, by a hard deadline, and the publisher kept the reproduction rights it paid for. In 1911 Chapin hired the 28-year-old Wyeth to illustrate a new gift edition of Robert Louis Stevenson's *Treasure Island* for $2,500 — serious money then, several months of a workman's wages per picture. Wyeth painted seventeen big canvases in about four months, the book was a hit that has never gone out of print, and Wyeth used the fee to buy eighteen acres at Chadds Ford and build his house and studio. He painted his farm into existence. That is the whole profession in one story: a client with an audience, an artist with a skill, a brief, a deadline, a fee — and work good enough to outlive them both.

In the studio, today. The Golden Age ended as photography and then television took over the storytelling jobs — by the late 1920s photographic covers were crowding out painted ones — but the profession did not die; it moved. The publishers, ad agencies and studios you will meet in Lesson 7.3 are the heirs of Chapin's office, and the skills are the same ones Pyle taught. When a modern art director asks for "one clear

moment, strong silhouette, room for the headline," she is asking for a Pyle picture. Learn the history and you inherit the toolbox.

PICTURE STUDY



One More Step, Mr. Hands!, N.C. Wyeth, 1911 · Oil on canvas, reproduced as a book plate · Illustration for Robert Louis Stevenson's Treasure Island (Charles Scribner's Sons, 1911)

Image: Wikimedia Commons, public domain

This is one of the seventeen canvases Wyeth painted for Treasure Island in 1911, the commission that bought his farm. Jim Hawkins has scrambled up the mizzen shrouds of the Hispaniola; the mutineer Israel Hands is climbing after him with a dagger. Stevenson wrote the whole fight — Wyeth chose one breath of it.

Notice that the enemy is not in the picture. Wyeth gives us Jim, the sky, two pistols and a boy's set jaw, and our imagination supplies Hands below. That restraint is pure Pyle teaching: paint the vital moment and let the reader do the rest.

Look closely

- Where is your eye sent first, and what two or three big value shapes organize the whole picture?
- The viewpoint is low, looking up. What does that camera position make you feel about Jim's situation?
- Look at Jim's hands and bare feet gripping the rigging. What did Wyeth have to know from life to paint them convincingly?

- What is left out of the picture, and why is leaving it out stronger than showing it?
- Find the places where the paint is loose and the places where it is careful. Why did Wyeth spend his precision where he did?

Talk about it

1. Pyle taught "the vital moment." Which moment of this fight did Wyeth choose — before, during or after the shot — and what does the choice gain?
2. This painting had to work reduced to a small book plate. What compositional decisions keep it readable at that size?
3. Wyeth was 28, two years out of Pyle's school, and this commission made his name and bought his land. What does that tell you about how skill, opportunity and diligence worked together in his career?

STUDIO BRIEF

Studio brief: The Vital Moment

Client: Lantern Press, a small publisher reissuing classic adventure novels with new illustrations. Deliverable: one full-page story illustration (vertical, about 8 × 10 in) for a scene from a book you know well — Treasure Island, Robinson Crusoe, The Swiss Family Robinson or another classic your family approves. Deadline feel: one week. The art editor's note reads: "One clear moment, strong silhouette, must read at paperback size."

You will need

- Pencil, eraser and printer paper for thumbnails; one sheet of good drawing paper or mixed-media paper about 9 × 12 in
- Your finishing medium: soft pencils, ink and wash, or Krita if you prefer digital
- A "costumed model": a family member posed in improvised costume (coat, scarf, boots, broom-handle prop), or yourself in a mirror; a phone photo of the pose is allowed
- The actual text of your chosen scene, printed or marked in the book

Steps

1. Read the scene twice and list five possible moments to paint, including at least one before-the-action and one after-the-action moment.
2. Choose your vital moment and write one sentence defending the choice, Pyle-style: what does this instant carry that the others do not?
3. Draw six thumbnail compositions, each under 3 inches tall, trying different viewpoints (low, high, close, far). Squint: each must read as two or three big value shapes.
4. Pick the strongest thumbnail and pose your costumed model for the key figure. Shoot or sketch the pose; study how the clothing actually folds and pulls.
5. Draw the full-size line drawing lightly, constructing figures the way you learned in Unit 1 (gesture first, then forms).

6. Make a three-value study on scrap: darkest dark, middle, light. Decide where your single strongest contrast goes — that is your focal point.
7. Render the final in your chosen medium, keeping the big value plan. Precision at the focal point, economy everywhere else.
8. Shrink the test: photograph the finished piece and view it at about 2 inches tall on a screen. Does it still read? Note what survived and what vanished.
9. Write the caption: the line of text from the book your picture serves, and sign your work.

Tips

- If a thumbnail needs explaining, it fails; the paperback buyer gets half a second.
- Keep the enemy, the outcome or the cause off-stage at least once in your thumbnails — leaving something out is a composition tool.
- Don't copy a photo pose stiffly; exaggerate the gesture line 10% beyond what the camera saw.

Check your work

- ☐ I can defend my chosen moment in one sentence.
- ☐ My final reads as 2–3 value shapes at thumbnail size.
- ☐ The figure's clothing and grip were studied from a real posed model, not guessed.

SKETCHBOOK

1. A timeline of the Golden Age with at least eight dated entries: halftone (1880s), Pyle at Drexel (1894), his Wilmington school (1900), Wyeth's arrival (1902) and Post cover (1903), Treasure Island (1911), the Post at two million (about 1913), photography's takeover (late 1920s).
2. Three small copies (honest master studies, labeled as studies after Wyeth or Pyle) of value compositions from Golden Age plates — big shapes only, no detail.
3. Your six thumbnails from the studio brief with one line under each saying why it works or fails.

From history. Pyle gave his teaching away. He refused tuition at his Wilmington school because he believed he was repaying a debt to art itself, and he chose students by the quality of their imagination, not their rendering. His generosity multiplied: his students taught students (Harvey Dunn trained a generation of magazine artists, N.C. Wyeth trained his own children — Andrew Wyeth became one of America's most famous painters). When Pyle died suddenly in Florence in 1911, the profession he had practically invented filled the magazines for another forty years.

PRACTICE

1. Easy What printing invention made the Golden Age possible, and what did it replace?

   Show answer

   The photographic halftone of the 1880s, which broke paintings into printable dots; it replaced slow, expensive hand wood-engraving.

2. Easy Where and when did Howard Pyle begin teaching illustration, and what was unusual about his own school in Wilmington?

   Show answer

   He began at the Drexel Institute in Philadelphia in 1894; his own Wilmington school (from 1900) charged no tuition and accepted only about a dozen students a year.

3. Easy Name four of Pyle's students.

   Show answer

   Any four of: N.C. Wyeth, Frank Schoonover, Jessie Willcox Smith, Elizabeth Shippen Green, Violet Oakley, Harvey Dunn.

4. Medium Define Pyle's "vital moment" and give an example of choosing it: a knight is about to fight a dragon. Name three different moments you could paint and say which Pyle would likely prefer.

   Show answer

   The single instant carrying the most story meaning, often just before or after the action. Moments: arming before the fight; the clash itself; standing exhausted after. Pyle would usually prefer the before or after — the tense walk into the cave, or the knight staring at his notched sword — because it lets the viewer's imagination supply the fight.

5. **Medium** The Saturday Evening Post cost 5 cents in 1912 and sold about 2,000,000 copies a week by 1913. About how much money is that per week from copy sales alone, and why did advertising matter even more?

Show answer

About $2{,}000{,}000 \times \$0.05 = \$100{,}000$ a week. Advertisers paid far more than readers did for access to those two million households, which is why circulation — driven partly by great covers — was worth so much.

6. **Medium** Wyeth was paid $2,500 for seventeen Treasure Island canvases in 1911. What was the fee per picture? If prices have risen roughly 30-fold since 1911, what would the whole commission feel like today?

Show answer

$\$2{,}500 \div 17 \approx \$147$ per picture; roughly $30 \times \$2{,}500 = \$75{,}000$ in today's feel — a strong professional book commission.

7. **Medium** Why did Pyle insist on costumed models and real props, and what does that tradition prove about training from clothed figures?

Show answer

Because truth observed from life gets into the drawing — weight, folds, how a coat pulls at the shoulder — where invention goes vague. It proves an artist can build complete professional figure skill from clothed, costumed models: drapery, gesture, heads and hands carry the training.

8. **Hard** Critique task. Pick any story illustration in a book you own. Answer in a short paragraph: what moment did the artist choose, what is the single biggest value shape, and what did the artist leave for your imagination?

Show answer

Answers vary. A good answer names a specific moment (before/during/after), identifies one dominant light or dark mass that organizes the composition, and names something implied but not shown (the enemy off-frame, the outcome, a sound).

9. Hard You are the illustrator. A publisher asks you for a cover for a boys' adventure novel and says only "make it exciting." Using what you learned from Pyle, write the three questions you would ask before sketching.

Show answer

Model answer: Which scene or character sells the book best — may I read the manuscript? What must the cover leave room for (title, author, spine)? What moment do you want the reader to feel — the danger before, the action, or the aftermath? (Also acceptable: deadline, size, fee, how it will be printed.)

10. Hard Photography eventually took the magazines' storytelling jobs away from painters. Why did the profession survive anyway? Give two reasons with examples.

Show answer

Because illustration does jobs photography cannot: it shows what cannot be photographed (history, fantasy, ideas, diagrams — concept art, picture books), and it carries a personal style that brands and publishers want (a drawn cover or character is ownable; a stock photo is not). The market moved rather than vanished.

COMMON MISTAKES

- Painting the obvious action instead of the vital moment — the swing of the sword instead of the breath before it.
- Treating the Golden Age as nostalgia instead of a business lesson: these were working artists with clients, deadlines and fees.
- Inventing figures and costumes from imagination before studying them from a posed model, which is exactly backward from how Pyle trained professionals.

> **Make it a game · Vital Moment Showdown.** A parent names a familiar story scene (David and Goliath, the shipwreck of Paul, Washington crossing the Delaware). In 30 seconds you must name three paintable moments — before, during, after — and declare which one Pyle would pick and why. Then swap roles and judge their answer. Three rounds; best defense of a "before" or "after" moment wins.

> **Scripture.** “Seest thou a man diligent in his business? he shall stand before kings; he shall not stand before mean men.” (Proverbs 22:29, KJV)
>
> Wyeth arrived in Wilmington an unknown farm boy; nine years of diligent study and hard deadlines later, his pictures stood before the whole nation — and are still standing. Skill diligently built finds its audience.

7.2 Pictures for Children: Crane, Caldecott, Rackham and the Picture Book

OBJECTIVES

- Tell how Edmund Evans's color printing and the artists Walter Crane, Randolph Caldecott and Kate Greenaway invented the modern picture book, and how Arthur Rackham's gift books perfected the deluxe edition.
- Explain the anatomy of a 32-page picture book — signatures, front matter, spreads and page turns — and storyboard one.
- Calculate royalties, advances and earn-outs, and weigh a royalty against a flat fee.

> **Warm-up.** Fetch the best picture book in your house. Count its pages (count one side of a leaf as one page, starting from the first endpaper). Find the title page and copyright page. Then read it watching only one thing: what happens each time you turn a page. Write down the page turn that surprises you most.

WATCH

The Parts of a Book (You NEED to know!) ✷ PICTURE BOOK BASICS #2

Anoosha Syed · 10:06

https://www.youtube.com/watch?v=Ho5U4xejfR4

> **WHEN TO WATCH**
> After the craft paragraph. Pause at the page-count diagram and sketch the 32-page map in your sketchbook as she explains it.

Note: A working children's book illustrator (Penguin, HarperCollins and others) walks through exactly the anatomy this lesson teaches: cases, endpapers, front matter, spreads, gutters and why 32 pages. Professional and clean.

BACKUP VIDEO

THE ILLUSTRATIONS OF WALTER CRANE

pete beard · 17:40

https://www.youtube.com/watch?v=2CcTtEwBYoE

With the story paragraph, to see the toy books and Crane's page designs; notice how pattern and flat color came from the limits of color wood-engraving.

KEY TERMS

toy book

The cheap, color-printed children's picture books of Victorian England, sold for sixpence or a shilling; the ancestors of the modern picture book.

signature

A large printed sheet folded into a block of pages — usually 16 — which is why picture books come in multiples of 16 and the standard is 32 pages.

spread

Two facing pages designed as one picture surface; a 32-page picture book typically carries its story on 12 to 14 spreads.

gutter

The fold where facing pages meet the binding; art is designed so nothing important drowns in it.

dummy

A hand-made mock-up of the whole book with sketches in place, used to test pacing and page turns before any final art is painted.

advance against royalties

Money paid to the author or illustrator before publication; the book must "earn out" the advance from royalties before further payments begin.

royalty

A percentage of each copy's price paid to the creator — commonly around 10% of list price on a hardcover picture book, split between author and illustrator.

CORE IDEAS

The story. The modern picture book was invented by a printer. Edmund Evans (1826–1905) was London's finest color wood-engraver, and he believed cheap children's books could be beautiful if a real artist designed them and the color was printed with care. From the mid-1860s he printed Walter Crane's "toy books" — flat, patterned, gorgeously designed sixpenny books that sold by the tens of thousands. When Crane moved on, Evans recruited a young sporting artist named Randolph Caldecott (1846–1886). Their first two books, *The House that Jack Built* and *The Diverting History of John Gilpin* (1878), were printed ten thousand copies each — and sold out before Christmas. Caldecott produced two picture books every year until his

early death, and nearly a million copies of them were printed. Crucially, Caldecott did not take only a flat fee: he took a small royalty on every copy, so the enormous sales paid him for years. Kate Greenaway joined the Evans stable in 1879 with *Under the Window*, which sold about 100,000 copies. Sixty years later, when American librarians created the annual medal for the best picture book (first awarded 1938), they put Caldecott's name on it — and one of his galloping John Gilpin riders on the medal itself.

How they figured it out. Caldecott's revolution was pacing. Earlier illustrated books decorated the text; Caldecott made the pictures tell half the story — his drawings add jokes, side characters and whole subplots the words never mention, and he designed around the page turn: every turn answers a question or springs a surprise. Modern picture-book artists still study him for exactly this. A generation later, Arthur Rackham (1867–1939) perfected a different business: the gift book. His *Rip Van Winkle* (1905) and *Peter Pan in Kensington Gardens* (1906) were published in two forms at once — an ordinary trade edition, and a signed, numbered deluxe edition at luxury prices — while London galleries exhibited and sold his original watercolors. Three incomes from one set of pictures: trade copies, deluxe copies, originals. When the copyright on *Alice's Adventures in Wonderland* expired in 1907, publishers raced out new editions, and Rackham's was the prize of the year. The lesson for you is not Victorian sentiment; it is that illustrators who understand printing and publishing arithmetic do better than those who do not.

The craft. A standard picture book is 32 pages because presses print large sheets that fold into 16-page signatures; 32 pages is two signatures (and some books are "self-ended," spending four of those pages as endpapers). Subtract the front matter — half-title, title, copyright and dedication — and roughly 12 to 14 spreads remain for the story. The text is short: most picture books run between about 300 and 800 words, so every word and every page turn must earn its place. The illustrator's working tools are the *storyboard* (all spreads thumbnailed on one sheet, so pacing is visible at a glance) and the *dummy* (a folded mock-up you can actually page through). The craft rules: vary your shots like a film director — close, wide, high, low; let the page turn conceal and reveal; never trap a face or a key object in the gutter; leave quiet space for the text on every spread; and keep characters consistent in costume, proportion and color from page 1 to page 32, which is harder than it sounds and is exactly what Lesson 7.4 trains.

In the studio. Today's picture-book market works on advances and royalties. A typical hardcover deal pays a royalty of about 10% of the list price, split between author and illustrator (5% each; an author-illustrator keeps the whole share), with an advance paid partly on signing and partly on delivery. The arithmetic matters: on an $18.99 hardcover, the illustrator's 5% is about $0.95 per copy, so a $6,000 advance earns out at about 6,300 copies — after which every copy pays the illustrator again, for as long as the book sells. A flat fee (common in educational and mass-market work) pays once, whatever happens. Caldecott's royalty on John Gilpin and Wyeth's flat $2,500 for Treasure Island are the two sides of that bargain, a century early. Timelines are long — an illustrator typically gets most of a year for a trade picture book, delivering storyboard, then a dummy, then approved finals — and the art director and editor give notes at each gate, exactly the rhythm you will practice in Lesson 7.5.

In the studio, continued. Who buys this work now? Trade publishers large and small, religious publishers, educational publishers (flat-fee, faster, a common first market), and magazines for children. Art directors find illustrators through portfolios, published work and agents (who take about 25% of the deal they negotiate). What they look for in a children's portfolio is specific: the same two or three characters drawn consistently across several scenes, real settings, emotion on faces, and at least one full wordless sequence that proves you can carry story without text. A portfolio of beautiful but unrelated single images does not prove you can make a book; your three-spread dummy from this lesson's brief is worth more than ten pretty pictures.

PICTURE STUDY



The Diverting History of John Gilpin (color plate), Randolph Caldecott, color-engraved and printed by Edmund Evans, Drawn 1878; this printing about 1917 · Color wood-engraving · From R. Caldecott's Picture Book No. 1 (George Routledge / Frederick Warne)

Image: Wikimedia Commons, public domain

William Cowper's comic poem tells how draper John Gilpin's family wedding-anniversary outing goes gloriously wrong when his horse runs away with him. Here Caldecott paints the calm before: the family boarding the chaise in Cheapside, every sign, bonnet and cobble lovingly observed.

Look at how much story the poem never mentions — the children's excitement, the onlookers, the shop fronts, the waiting horse. That added life is Caldecott's invention, and it is why the picture-book medal carries his name.

Look closely

- Count the colors. Evans engraved a separate wood block for each — how few does Caldecott need to make the scene feel complete?
- Where does the outline do the work and where does flat color do it? Find a place with almost no detail that still reads perfectly.
- Follow the gazes: who is looking at whom? How do those sight-lines move your eye through the crowd?
- What tells you this is a specific real street (signs, steeple, shopfronts) and not a generic backdrop?

- If this is one page of a 32-page book, what question does it plant that makes you turn the page?

Talk about it

1. Caldecott's pictures add jokes and characters the text never states. Why is that collaboration — rather than repetition — the heart of picture-book craft?
2. Evans printed ten thousand copies of this book for a shilling each and they sold out by Christmas 1878. What had to be true of both the printing and the pictures for that to happen?
3. Caldecott took a royalty instead of only a flat fee. Using this book's sales, explain why that decision mattered.

Safety first. If you trim your dummy pages with a craft knife, use a metal ruler and a cutting mat, keep your guiding hand behind the blade, and make several light passes instead of one hard one. Scissors are the better tool for young helpers.

STUDIO BRIEF

Studio brief: Three Spreads and a Dummy

Client: Greenfield Press, a small publisher testing a new picture-book text. Deliverable: a storyboard of the whole book plus a three-spread dummy (sketch quality) of the strongest sequence, for an acquisition meeting. Text: choose a public-domain story or poem your family approves — a fable of Aesop, a psalm of praise, John Gilpin itself, or a family story written in 300–600 words. Deadline feel: one week. Editor's note: "Show us the page turns."

You will need

- Printer paper (several sheets), pencil, eraser, fine marker
- One sheet folded into an 8-page mini-dummy (fold twice, trim the folds) or three sheets folded as spreads
- Your chosen text, printed, with room to mark page breaks
- Optional: Krita or colored pencils for one spread taken a step further

Steps

1. Read your text aloud and mark the natural beats: where something changes, where a question is raised, where the surprise lands.
2. Divide the text across 12–14 story spreads by writing spread numbers in the margin. Put a page turn right before each surprise.
3. Draw the storyboard: all spreads as small boxes on one or two sheets, stick-figure simple. Check the shot variety — mark each box C/W/H/L (close, wide, high, low) and fix any three-in-a-row repeats.
4. Check the gutter: mark the center line of each spread and move anything important away from it.
5. Choose the strongest three consecutive spreads — the ones with the best page turns — and draw them at full dummy size with readable characters, settings and hand-lettered or penciled text in place.
6. Design your characters on a separate model sheet first: front, side, one action pose, costume colors noted, so all three spreads match.

7. Assemble the dummy so the page turns physically work: what is hidden before the turn must actually be hidden.
8. Test it on a real child or your family: read it to them, watch their faces at each turn, and take notes without defending yourself.
9. Revise one spread based on what you observed and write two sentences on what the test taught you.

Tips

- Words and pictures should not say the same thing; if the text says the dog ran, the picture's job is how, where, and what it knocked over.
- Keep text zones quiet: plan a light, simple area on every spread where type can sit.
- Pacing beats polish at this stage — a rough dummy with great turns wins the meeting over beautiful art with dead pacing.

Check your work

- ☐ My storyboard covers the whole text in 12–14 spreads with varied shots.
- ☐ Each of my three dummy spreads ends on a question the page turn answers.
- ☐ My characters stay consistent across all three spreads, and nothing important sits in the gutter.

SKETCHBOOK

1. The 32-page map from the video, drawn and labeled: endpapers, half-title, title, copyright/dedication, and story spreads numbered.
2. A character model sheet for your dummy: front, side, action pose, costume and color notes.
3. Your storyboard sheet with the C/W/H/L shot marks and one line on the best page turn you designed.

KEY FORMULAS

$$\text{royalty per copy} = \text{royalty rate} \times \text{list price}$$

$$\text{earn-out copies} = \frac{\text{advance}}{\text{royalty per copy}}$$

$$\text{total income} = \text{advance} + \text{royalty per copy} \times \max(0,\ \text{copies sold} - \text{earn-out copies})$$

From history. Caldecott drew fast because he had to: rheumatic illness had weakened his heart since childhood, and he worked winters in warmer climates. He died at 39 in St. Augustine, Florida, on an American sketching tour, with sixteen picture books behind him. Maurice Sendak, who kept Caldecott's books by his drawing table, called him the inventor of the picture book's music — the beat of words, picture and page turn working together. The American Library Association's Caldecott Medal, first struck in 1938, shows Gilpin's runaway ride and is still the highest honor in the field.

WORKED EXAMPLES

Example 1. A publisher offers an illustrator a $6,000 advance against a 5% royalty on an $18.99 hardcover. How many copies must sell before the book earns out, and what has the illustrator made if it sells 20,000 copies?

Show solution

1. Royalty per copy: $0.05 \times \$18.99 \approx \$0.95$.
2. Earn-out: $\$6{,}000 \div \$0.95 \approx 6{,}300$ copies.
3. Copies beyond earn-out: $20{,}000 - 6{,}300 = 13{,}700$.
4. Royalties beyond the advance: $13{,}700 \times \$0.95 \approx \$13{,}000$, so total income $\approx \$19{,}000$.

Answer: About 6,300 copies to earn out; about $19,000 total on 20,000 copies.

Example 2. An educational publisher offers the same book as a flat fee of $8,000, no royalty. At what sales level does the royalty deal above beat the flat fee?

Show solution

1. The royalty deal pays $6,000 up front and then $0.95 per copy after 6,300 copies.
2. It reaches $8,000 when royalties beyond the advance total $2,000: $\$2{,}000 \div \$0.95 \approx 2{,}100$ copies past earn-out.
3. So at about $6{,}300 + 2{,}100 = 8{,}400$ copies the deals are equal; beyond that the royalty wins.

Answer: Above roughly 8,400 copies sold, the royalty deal pays more — and keeps paying.

Example 3. Evans printed 10,000 copies each of Caldecott's first two books at one shilling. Suppose Caldecott's royalty was a penny a copy (12 pennies to a shilling). What did the sold-out first printings pay him, and what fraction of the retail price is that royalty?

Show solution

1. Copies: $2 \times 10{,}000 = 20{,}000$.
2. At a penny each: $20{,}000$ pence $= 20{,}000/240 \approx 83$ pounds (240 pence to the pound) — months of a good wage in 1878.
3. Rate: $1/12 \approx 8.3\%$ of the retail price, in the same neighborhood as a modern 10% hardcover royalty.

Answer: About £83 from the first printings; a penny on a shilling is about an 8.3% royalty.

PRACTICE

1. Easy Why are picture books 32 pages?

   Show answer

   Presses print big sheets that fold into 16-page signatures; 32 pages is two signatures (or one 32-page section), the economical standard.

2. Easy Name the three artists of Edmund Evans's stable and one fact about each.

   Show answer

   Walter Crane (patterned sixpenny toy books from the 1860s); Randolph Caldecott (two books a year 1878–1885, the page-turn master, the medal bears his name); Kate Greenaway (Under the Window, 1879, about 100,000 copies).

3. Easy A picture book has 32 pages and uses 4 for front matter (half-title, title, copyright, dedication). How many spreads remain for the story?

   Show answer

   $(32 - 4)/2 = 14$ spreads.

4. **Easy** What is a dummy and why make one before final art?

Show answer

A hand-made mock-up of the whole book with sketches in place. It is the only way to test pacing and page turns — the things a picture book lives or dies by — before months are spent painting finals.

5. **Medium** A hardcover lists at $17.99 with a 10% royalty split evenly between author and illustrator. What does the illustrator earn per copy, and on a 15,000-copy sale (advance already earned out)?

Show answer

$0.05 \times \$17.99 \approx \$0.90$ per copy; $15{,}000 \times \$0.90 = \$13{,}500$.

6. **Medium** An illustrator receives a $5,000 advance at 5% on a $19.99 book. How many copies to earn out?

Show answer

Per copy $\approx \$1.00$; about $5{,}000$ copies.

7. **Medium** When is a flat fee the better deal for the illustrator? Give two honest cases.

Show answer

When the book is unlikely to sell many copies (educational series, work-for-hire supplements) so the guaranteed fee exceeds likely royalties; and when the illustrator needs certain income now rather than possible income later. For a book with real retail life, royalties usually win over time.

8. **Medium** Explain what Caldecott did with the page turn and why film directors are a useful comparison.

Show answer

He designed each turn to answer a question or spring a surprise, and varied his "camera" — close, wide, high, low — so the pictures tell story the words never state. Like a director, he controlled what you see, when you see it, and what is withheld until the cut.

9. Hard Rackham's gift-book model earned three incomes from one set of paintings. Name them, and name a modern parallel for each.

Show answer

Trade edition royalties (today: the hardcover deal); deluxe signed limited edition (today: special or collector's editions, signed prints); gallery sale of originals (today: selling original art, often online or at shows). One job of work, several rights, several incomes.

10. Hard You are the illustrator. An art director says your portfolio is "beautiful but doesn't prove you can make a book." What exactly is missing, and what two pieces would you add?

Show answer

Missing: evidence of storytelling and consistency — the same characters across scenes, varied shots, pacing. Add: a three-spread sequence from one story with consistent characters, and a short wordless sequence that carries narrative with pictures alone.

11. Hard A publisher plans a 10,000-copy first printing at $18.99 list. Bookstores buy at about half of list. Estimate the publisher's gross if the printing sells through, and the author's and illustrator's royalties (5% of list each). What fraction of the publisher's gross goes to the creators?

Show answer

Publisher gross $\approx 10{,}000 \times \$9.50 = \$95{,}000$; each creator $\approx 10{,}000 \times \$0.95 = \$9{,}500$, so both together $\$19{,}000 \approx 20\%$ of the publisher's gross — the rest covers printing, distribution, returns, staff and risk.

COMMON MISTAKES

- Letting the pictures merely repeat the words instead of adding what the words cannot say.
- Spending all the effort on one beautiful spread while the pacing of the whole book goes untested.
- Forgetting the gutter and the text zones, so faces drown in the fold and type has nowhere to sit.
- Characters that drift — different face, costume or proportions from spread to spread.

Make it a game · Page Turn Prophet. A parent reads any picture book aloud, stopping at each page turn before turning. You predict what the next spread shows — who, where, close or wide. Score a point for each right prediction. A low score on a good book is the lesson: the best bookmakers stay one surprise ahead of you. Then swap: you read, they predict, using your dummy.

Scripture. “But when Jesus saw it, he was much displeased, and said unto them, Suffer the little children to come unto me, and forbid them not: for of such is the kingdom of God.” (Mark 10:14, KJV)

The Lord took children seriously, and so does this craft. Making books for children is not lesser work than making art for adults; Evans, Caldecott and generations after them gave children their very best, and so should anyone who draws for them.

7.3 Today's Markets: Editorial, Advertising, Covers and Concept Art

OBJECTIVES

- Name today's main illustration markets — editorial, advertising, book covers, concept art and children's books — and describe what each buys, who the buyer is, and how the pay is structured.
- Explain why a portfolio must be tailored to a market, and list what an art director in each market expects to see.
- Compare jobs by effective hourly rate and weigh a flat fee against licensed usage.

> **Warm-up.** Go on an illustration hunt around the house and (with permission) a news or magazine website: find one editorial illustration (next to an article), one advertising illustration (selling something), one book cover with drawn art, and one game or film image that began as concept art. For each, write who you think paid for it.

WATCH

Who hires illustrators?

The Illustrator's Guide · 16:14

https://www.youtube.com/watch?v=bUyBZL6MMBE

> **WHEN TO WATCH**
> After the craft paragraph. Keep a two-column list as you watch: market on the left, what its buyers want from a portfolio on the right.

Note: A working illustrator maps the real client landscape — publishing, editorial, advertising, products and more — with honest notes on how each pays. Match his categories to this lesson's five markets.

BACKUP VIDEO

Illustration VS Concept - Why do some companies want Sketches and others want paintings?

Trent Kaniuga · 22:51

https://www.youtube.com/watch?v=q05Ikl-uUB8

With the concept-art paragraph. A veteran game artist (League of Legends, Zelda projects) explains the real difference between a finished illustration and a working concept sketch — and why studios pay for each.

KEY TERMS

editorial illustration

Art commissioned to accompany an article or opinion piece in a magazine, newspaper or website; it must capture an idea, fast, at small size.

advertising illustration

Art commissioned by an agency or brand to sell a product; the highest day rates and the most layers of approval.

concept art

Working design art for games, film and animation — characters, environments, props — made to guide a production team, not to be published as-is.

usage rights

What the client is allowed to do with the art, for how long, and where; fees rise with broader usage, and the artist keeps what is not sold.

art director (AD)

The person who hires illustrators, writes the brief, approves sketches and defends the work inside the client's organization; your most important professional relationship.

day rate

A fee charged per working day, common in advertising and concept work, instead of a per-piece fee.

portfolio

The 10–20 pieces that prove you can do a specific job; tailored per market, led by your strongest piece, with nothing you would not want to be hired to repeat.

CORE IDEAS

The story. In 1975 a filmmaker with an unsellable script hired a technical illustrator to paint what his movie would look like. George Lucas had been turned down because studio executives could not imagine his "space opera"; Ralph McQuarrie (1929–2012), a former Boeing technical artist, painted a handful of production paintings — a black-masked villain boarding a ship, two robots lost in a desert, a duel across a chasm. Shown those paintings, Twentieth Century-Fox could suddenly see the film, and *Star Wars* was green-lit. McQuarrie's job — making the imaginary concrete enough to invest in — is what thousands of concept artists now do daily for games and films. A generation earlier, in 1954, a few Cooper Union graduates including Milton Glaser and Seymour Chwast founded Push Pin Studios in New York and proved that illustrators with strong personal styles could lead advertising and publishing design rather than follow it; Glaser's 1967 poster of Bob Dylan with rainbow hair was printed six million times as a record-sleeve insert. Different markets, same truth: illustration survives wherever a drawing can do what a photograph cannot.

How they figured it out. When photography took over the magazines' realism jobs in the mid-1900s, illustrators learned to sell the two things a camera does not make: *ideas* and *worlds*. Editorial illustration became the art of the visual metaphor — a tightrope walker for an article about risk, a maze for one about bureaucracy — because a photo can show what a thing looks like but a drawing can show what it *means*. Concept art went the other way: it builds worlds that do not exist yet, cheaply, so that producers can choose among them before spending millions. Advertising

buys borrowed distinctiveness — a hand-drawn style makes a brand feel crafted and human. Covers buy a promise: the one image that makes a browser pick the book up. Learn to name what each market is really buying and you will know what to show them.

The craft. Here is the map, market by market. *Editorial*: buyers are magazine, newspaper and website ADs; turnarounds are short (sometimes 24–48 hours for news, a week or two for features); sizes run from quarter-page "spots" to full pages and covers; pay is per piece, modest but steady, and the credit line builds your name. *Advertising*: buyers are agency art directors; money is the best in the field — day rates and licensed usage — but approvals run through many hands and the brief is strict. *Book covers*: publisher ADs; one strong image plus room for type; typically a flat project fee in the hundreds to low thousands, more for established names. *Concept art*: game and film studios; much of it is salaried in-house work or long freelance contracts; the product is clear, fast design drawing — model sheets, environment sketches, props — not framed masterpieces. *Children's books*: you met the advance-and-royalty structure in Lesson 7.2. For honest, current numbers in every category, the standard reference is the Graphic Artists Guild's *Handbook of Pricing and Ethical Guidelines*, updated regularly; treat any figure in this lesson as a typical published range, and always confirm current rates before quoting.

In the studio. The portfolio is a key that must be cut for a specific lock. A children's AD wants consistent characters across scenes; an editorial AD wants ideas — covers of imaginary articles beat random pretty drawings; a concept recruiter wants process pages showing ten iterations of one design, with construction visible; an advertising AD wants polish, brand-friendly subjects and evidence you can hit a layout. Ten to fifteen pieces is plenty; your weakest piece sets the impression, so cut ruthlessly, and show only work you want to be hired to repeat. Then put the key where the locks are: a simple portfolio site with your name, clear images and a working email; printed or emailed promos to a researched list of ADs; and steady, finished personal projects — most young illustrators get their first assignments because an AD saw a self-initiated piece that looked like a job done well.

In the studio, continued. Two business habits separate professionals from hopefuls in every market. First, think in *effective hourly rate*: a $400 spot finished in six hours beats an $800 piece that eats a week, and the arithmetic below makes the comparison honest. Second, think in *usage*: clients buy rights, not your original. A

fee that licenses one-time magazine use should not hand over advertising rights forever for free; when a client wants broader usage, the fee rises. You will study contracts, copyright and pricing deeply in Unit 10 — this lesson's job is the map and the mindset.

PICTURE STUDY



The Hurdy-Gurdy Man (Saturday Evening Post cover), J.C. Leyendecker, May 25, 1912 · Oil painting, reproduced as a magazine cover · The Saturday Evening Post, May 25, 1912 issue

Image: Wikimedia Commons, public domain

This is the cover market at full power. By 1912 The Saturday Evening Post printed around two million copies a week, and J.C. Leyendecker — whose style you will study further in the next lesson — was its star cover artist. A street organ-grinder plays; two girls break into a dance; the whole scene floats on white so the masthead and cover lines stay clean.

A cover is a poster for a magazine. It had half a second at the newsstand to make a stranger reach for a nickel, which is exactly the job a book cover or a thumbnail image does today.

Look closely

- The background is almost empty. What does cutting the scene out against white do for newsstand legibility — and where have you seen that trick in Unit 2?
- Find the planned emptiness: where does the composition leave room for the masthead and the text lines?
- The man's back is to us and his face is hidden. Why is the picture stronger told through the children's reaction?

- Look at Leyendecker's brushwork in the coat — long, confident, visible strokes. How does a recognizable handling like this become a selling point for an artist?
- What tells you the music is lively without a single visible note?

Talk about it

1. A 1912 Post cover and a modern video thumbnail have the same half-second job. List three design rules that apply to both.
2. The Post's covers were idea-pictures about ordinary life, not portraits of celebrities. Why did that editorial choice suit a two-million-copy audience?
3. What has to be true of an image for it to work with type printed over and around it — and how does an illustrator plan for that?

STUDIO BRIEF

Studio brief: An Editorial Spot on Deadline

Client: The Home Workshop Quarterly, a family magazine. Assignment: one editorial spot illustration (square, about 5 × 5 in print size) for an essay titled "Why Handwork Still Matters" — the writer argues that making things by hand teaches patience that screens cannot. Deadline feel: three days — sketches due day one, final due day three. The AD's note: "Idea first. No literal hands-holding-tools cliché unless you can make it fresh. Must read at phone size."

You will need

- Pencil and paper for idea lists and thumbnails
- Your finishing medium: ink and wash, colored pencil, or Krita/Inkscape from Unit 6
- A timer — this brief practices deadline discipline
- An 'art director': a parent who will pick one sketch and give one round of notes

Steps

1. Read the premise and brainstorm in words first: list 15 associations with patience, handwork and screens (knots, dovetails, bread dough, hourglass, thread, battery icons…). Ten minutes, no drawing.
2. Combine pairs from the list into visual metaphors; write five, pick the three strongest, and reject any you have seen before.
3. Thumbnail the three ideas small and in value only. Each must read as a clear silhouette at one inch.
4. Submit the three thumbnails to your AD with one sentence of rationale each — exactly as you would email a real art director.
5. Accept the AD's pick and notes without argument; restate the notes in your own words to confirm you understood (a professional habit worth gold).
6. Produce a tight sketch of the chosen idea at full size; get a one-word approval before going to final.

7. Execute the final in your medium, square format, bold shapes, limited palette (three colors plus neutrals is plenty for a spot).
8. Shrink-test at 2 inches on a screen; adjust contrast if the idea dissolves.
9. Deliver on time: final image, a one-line caption, and a courteous handoff note thanking the AD — then log your hours and compute your effective hourly rate at an imaginary $350 fee.

Tips

- The idea list is the real work; the drawing only serves the best idea.
- A spot is a haiku, not a mural: one subject, one metaphor, one read.
- If your first idea came instantly, it probably came instantly to a hundred other illustrators too. Push past it.

Check your work

- ☐ I generated ideas in words before drawing, and my three thumbnails show three different ideas, not one idea three ways.
- ☐ I took the AD's notes gracefully and confirmed them back in my own words.
- ☐ My final reads at phone size, and I delivered all three gates (sketches, approval, final) on schedule.

SKETCHBOOK

1. The five-market map in your own hand: market, buyer, what they're really buying, pay structure, portfolio proof required.
2. Your 15-word association list and the three metaphor thumbnails from the brief, with the AD's notes recorded verbatim.
3. One "fake assignment": pick any article headline from this week and thumbnail two editorial metaphors for it.

KEY FORMULAS

$$\text{effective hourly rate} = \frac{\text{fee}}{\text{hours spent}}$$

$$\text{project fee} \approx \text{day rate} \times \text{days}, \qquad 1 \text{ day} = 8 \text{ working hours}$$

From history. Push Pin Studios' founders were art-school friends who began with a mailed promotional booklet, the Push Pin Almanack, sent free to art directors they wanted to work for. The work in it was self-initiated — fake assignments done to prove what they could do — and the commissions followed. Seventy years later the strategy is unchanged: illustrators still win their first real briefs with invented ones, mailed or posted where art directors will see them. Make the job you want, then show it.

WORKED EXAMPLES

Example 1. Job A is a $350 editorial spot you can finish in 6 hours. Job B is an $800 small-business job that will take 3 full days with meetings and revisions. Compare effective hourly rates.

Show solution

1. Job A: $\$350/6 \approx \$58$ per hour.
2. Job B: 3 days $\times 8 = 24$ hours; $\$800/24 \approx \$33$ per hour.
3. Job A pays nearly double per hour — and editorial credit lines also market you. Fee size alone is a poor guide.

Answer: A ≈ $58/hr, B ≈ $33/hr; the smaller fee is the better job.

Example 2. An agency offers a $1,500 flat buyout of an illustration, all rights forever. Your normal license for one year of web use is $900, and history says clients renew about half the time at $450 per extra year. Which is worth more over three years?

Show solution

1. License path, expected value: year 1 $900; years 2 and 3: $2 \times 0.5 \times \$450 = \$450$. Total $\approx \$1{,}350$.
2. Buyout: $1,500 now, but the art can never be licensed to anyone else and never earns again.
3. The buyout pays slightly more in this case — so a buyout is not automatically wrong, it must simply be priced higher than a license, knowingly.

Answer: Buyout $1,500 versus about $1,350 expected from licensing; the point is to price the difference deliberately, not to refuse buyouts on principle.

Example 3. A concept-art studio contract pays a $280 day rate. A junior illustrator wonders how that compares with a salaried studio job advertised at $52,000 a year. Compare annual gross, assuming the freelancer bills 170 days.

Show solution

1. Freelance gross: $170 \times \$280 = \$47{,}600$.
2. Salary: $52,000 plus benefits, paid vacation and steadier work — but less freedom and no other clients.
3. Freelance days are never 250: finding work, admin and gaps eat the calendar. 150–180 billable days is a realistic planning number.

Answer: About $47,600 freelance versus $52,000 salaried plus benefits; the day rate must carry the unbillable days.

PRACTICE

1. Easy Match the market to what it is really buying: editorial, advertising, covers, concept art.

   Show answer

   Editorial buys ideas made visible (metaphors for articles); advertising buys distinctiveness and polish that sells; covers buy the one image that makes a browser pick up the book; concept art buys fast, clear world-and-character design that guides a production.

2. Easy Who painted the production paintings that convinced the studio to green-light Star Wars in 1975, and what was his earlier job?

   Show answer

   Ralph McQuarrie; he had been a technical illustrator at Boeing.

3. Easy What is the standard professional reference for current illustration pricing?

   Show answer

   The Graphic Artists Guild's Handbook of Pricing and Ethical Guidelines.

4. Easy A $300 spot takes you 5 hours. Effective hourly rate?

   Show answer

   $\$300/5 = \$60$ per hour.

5. Medium Why do advertising jobs pay the most per day of any illustration market? Give two reasons.

Show answer

The art earns the client far more than it costs (it runs in paid media reaching millions), and broad usage rights are being bought; also the approval process costs the artist more time and revision, which the rate must cover.

6. Medium An AD needs a news-page spot in 36 hours. List the three portfolio qualities that would make her trust you with it.

Show answer

Evidence of fast conceptual thinking (idea-driven pieces), a consistent reliable style (no guessing what she'll get), and finished work at small sizes that reads instantly.

7. Medium What belongs in a concept-art portfolio that does not belong in an editorial one, and vice versa?

Show answer

Concept: iteration sheets (ten versions of one prop or character), construction and orthographic views, environments — process over polish. Editorial: single finished images that carry an idea or metaphor, shown at article scale. Each looks unprofessional in the other's portfolio.

8. Medium A client offers $600 for one-time use in a printed program, then emails later wanting to reuse the art in a national ad campaign "since we already paid for it." What is the correct professional response?

Show answer

A courteous explanation that the fee licensed program use only; advertising usage is a new, broader license at a new fee. The original is still yours; usage is what was sold. Quote the new license in writing.

9. Hard Compute and compare: Job A, $450 for a cover sketch-plus-final you estimate at 9 hours; Job B, a 2-day advertising storyboard at a $300 day rate; Job C, a $1,200 children's educational job you estimate at 30 hours. Rank by effective hourly rate.

   Show answer

   A: $\$50/\text{hr}$; B: $\$600/16 = \$37.50/\text{hr}$; C: $\$40/\text{hr}$. Ranking: A, C, B — though B's client relationship might still make it worth taking.

10. Hard You are the illustrator. You love painting detailed fantasy landscapes, but the steady local work is editorial spots for a business journal. Is taking the spots a betrayal of your style? Answer like a professional.

    Show answer

    No. Markets buy jobs, not souls: the spots fund the studio, build AD relationships and sharpen idea skills, while fantasy landscapes grow as personal work until a market (covers, concept, prints) can buy them. Professionals run both tracks deliberately — paid work and portfolio-building work.

11. Hard Critique task. Find one editorial illustration in a current magazine or news site. In four sentences: what is the article's idea, what visual metaphor did the artist choose, does it read at phone size, and what would you try instead?

    Show answer

    Answers vary. A strong answer names the abstract idea (risk, inflation, friendship), identifies the concrete stand-in image, judges small-size legibility honestly, and proposes one genuinely different metaphor rather than a style change.

COMMON MISTAKES

- Showing one portfolio to every market and wondering why nobody bites — the key must fit the lock.
- Judging jobs by fee size instead of effective hourly rate and relationship value.
- Selling all rights for a one-time-use price because nobody taught you that usage is the product.
- Reaching for the first visual cliché (light bulb for ideas, handshake for deals) instead of pushing to the second and third idea.

Make it a game · Market Match Lightning Round. Make ten slips, each naming an imaginary job: 'spot for a tax article, due Friday,' 'dragon designs for a game studio,' 'jam-jar label art,' 'novel cover, room for type.' Draw slips in turns; in ten seconds name the market, the likely buyer, and the pay structure (per piece, day rate, flat fee, advance/royalty). First to seven correct wins; wrong answers go back in the pile.

Scripture. “And that ye study to be quiet, and to do your own business, and to work with your own hands, as we commanded you;” (1 Thessalonians 4:11, KJV)

Scripture dignifies ordinary diligent trade: learn your business, do it faithfully, work with your hands. An illustration career is built less on genius than on quiet, steady, trustworthy work — the kind clients return to.

7.4 Finding Your Style: Influences, Practice and Consistency

OBJECTIVES

- Define style as an accumulated set of consistent decisions — line, shape, palette, subject, finish — rather than a mystery you are born with.
- Run an honest master study: learning from an artist's decisions without copying their work for sale or passing it off as your own.
- Use volume practice (the 100-drawings habit) and a consistency test to grow a style that holds together across a series.

> **Warm-up.** Gather three artists' work you love (books, printouts, or saved images). For each, finish these sentences: 'The lines are...', 'The colors are...', 'The shapes are mostly...', 'They always draw...', 'They never seem to draw...'. You have just described style as decisions — keep the sheet.

WATCH

My Best Style Advice for Illustrators

Mr. Tom Froese · 14:27

https://www.youtube.com/watch?v=N_29UaV1Th8

> **WHEN TO WATCH**
> After the craft paragraph. Write down the single sentence of his advice that most contradicts what you expected — and test it against this lesson.

Note: A working commercial illustrator (clients from publishing to packaging) talks about style as something that emerges from doing the work, not before it. Calm, practical and honest about the business value of consistency.

BACKUP VIDEO

Design 100 Somethings e005

Jake Parker · 12:20

https://www.youtube.com/watch?v=Xxa01j9Ns7o

With the 100-drawings section. Parker — illustrator and founder of the Inktober drawing challenge — demonstrates the volume habit this lesson assigns: designing many versions of one thing until taste and style show up.

KEY TERMS

style

The recognizable sum of an artist's repeated decisions — line quality, shape language, palette, subjects, degree of finish — visible across many works.

shape language

The family of shapes an artist favors (round, boxy, angular, flowing) and uses consistently to build figures and scenes.

master study

A copy of another artist's work made deliberately to learn its decisions, labeled as a study, never sold or posted as original work.

influence diet

The set of artists and images you regularly study; vary it, because a single influence produces an imitator while many influences digest into a voice.

consistency

The ability to make many pieces that clearly belong together — what art directors actually buy when they 'buy a style.'

the 100-drawings habit

Volume practice: drawing one subject (or one kind of thing) a hundred times, so your preferences surface and your decisions become deliberate.

CORE IDEAS

The story. In 1896 the Century Company announced a poster contest, and a 22-year-old Chicago engraver's apprentice named Joseph Christian Leyendecker (1874–1951) beat about seven hundred entries to win it — second place went to Maxfield Parrish. Leyendecker had drawn relentlessly since boyhood, studied nights at the Art Institute of Chicago while working at an engraving house, then saved for two years of study in Paris. What he built from all that volume was the most recognizable style in American illustration: figures carved out of confident, parallel oil strokes, each stroke left visible, highlights snapped on like chrome. Between 1899 and 1943 he painted 322 covers for *The Saturday Evening Post*, and his Arrow Collar advertisements (you will meet them in Unit 8) made a shirt collar glamorous. A boy named Norman Rockwell grew up worshiping that style, moved to New Rochelle partly to be near Leyendecker, copied his stroke technique in studies — and then spent years working *through* the influence until Rockwell's own warmer, story-rich style emerged. When Leyendecker died in 1951, Rockwell was a pallbearer. That

chain — Leyendecker to Rockwell, Pyle to Wyeth — is how style has always actually been learned: by honest apprenticeship to admired work, followed by departure from it.

How they figured it out. Notice what nobody in that chain did: nobody waited to be struck by a style. Leyendecker's stroke technique came from thousands of studies and from the practical pressure of engraving-friendly, deadline-friendly rendering. Rockwell copied openly, in private studies, and let the influence be digested by volume and by his own temperament. The working rule is this: *style is a byproduct of making many finished things while paying attention to your preferences.* Copy to learn — never to sell or to sign as your own, which is theft of another kind — and copy from several masters, not one. One influence makes you an echo; five influences, plus five hundred drawings, make you yourself. This is also why 'I haven't found my style yet' is not a reason to delay professional practice. Styles are found in the work, like a path worn by walking.

The craft. Style decomposes into decisions you can name and steer. *Line*: weighted or uniform, crisp or rough, present or absent. *Shape language*: round and friendly, square and sturdy, angular and dangerous — and how simplified. *Value*: full range or compressed, high-key or low. *Palette*: how many colors, which temperature bias, how saturated. *Proportion*: realistic or pushed, and pushed in which direction. *Texture and finish*: flat, painterly, grainy, clean vector. *Subject and mood*: what you choose to draw at all, and the feeling you return to. Take your warm-up sheet: every sentence you wrote about your three favorite artists names one of these axes. Now run the same sentences on a stack of your own recent work — your current style is simply whatever you have been deciding lately, mostly by accident. The craft move is to make three of those decisions deliberately and hold them constant across a series.

In the studio. Style is a business asset because it is a promise. When an art director hires you, she is showing your old work to her editor and promising the new piece will match; if your portfolio holds five styles, she cannot make that promise and hires someone else. This is why working illustrators keep a consistent public portfolio even while experimenting privately, and why 'versatile' sells worse than 'reliable.' The standard professional test is the *series test*: can you produce six pieces — different subjects, same voice — that a stranger would instantly group together? That is also exactly what a children's book contract demands (32 pages, one voice, months apart) and what a brand demands of its illustrations. Consistency under

variety is the skill; the 100-drawings habit is the gym where it is built. Draw a hundred teapots, or a hundred crows, or a hundred cottages — a few a day, dated. Around thirty you run out of clichés; around sixty you start stealing from your own earlier sheets; by a hundred you have preferences you can defend. That sheet of preferences is a style, caught in the act of forming.

In the studio, continued. A word of honesty about influence and credit. Every artist is built from other artists — Wyeth sounded like Pyle for years, and said so gratefully. The line is simple: studies are labeled as studies; client work and portfolio work are your own drawing, from your own reference, in a voice that has digested its influences rather than traced them. If a piece would embarrass you when hung beside its source, it is too close. And when your style does arrive, expect it to keep moving: Tom Froese's style a decade ago is visibly not his style now, and that evolution — slow, logged, honest — is the normal shape of a working life.

PICTURE STUDY



A Mad Tea-Party, Arthur Rackham, 1907 · Pen and ink with watercolor, reproduced as a tipped-in color plate · From Alice's Adventures in Wonderland (Heinemann, 1907)

Image: Wikimedia Commons, public domain

When the copyright on Lewis Carroll's Alice expired in 1907, publishers raced out new illustrated editions, and Arthur Rackham's was the one collectors fought over. His Alice had to survive comparison with John Tenniel's beloved 1865 originals — and it did, because Rackham did not imitate Tenniel. He made every scene unmistakably his own.

This plate is a masterclass in consistency: the wiry, searching line; the muted tea-stained palette; the gnarled tree like a living character; faces just a step past natural. Show anyone three Rackham plates and they will pick the fourth out of a lineup. That recognizability — not luck — is what this lesson means by style.

Look closely

- Name the style decisions you can see: what kind of line, how many colors, how much texture, how pushed are the proportions?
- Compare Alice's calm, naturalistic face with the Hatter's caricatured one. How does Rackham decide who gets pushed and who stays real?
- Find the tree. How does its drawing match the way the figures are drawn — same shape language or different?

- The palette is quiet — browns, greens, a touch of blue. What mood does that restraint set that bright colors would break?
- Where exactly did Rackham's line get slow and careful, and where did he let it run loose?

Talk about it

1. Rackham illustrated a book that Tenniel had already made famous. What does his solution teach about handling a dominant influence?
2. List the constants you would expect to find in any other Rackham plate, sight unseen. Then (if you can) check one online — were you right? What does that predictability mean to a publisher?
3. Rackham's gift books sold in trade, deluxe and original-art forms (Lesson 7.2). Why did a strongly recognizable style make all three markets stronger?

STUDIO BRIEF

Studio brief: One Voice, Four Pieces

Client: yourself, acting as your own future art director. Deliverable: a four-piece mini-series proving you can hold one voice across different subjects — the series test in miniature. This brief runs alongside the start of your 100-drawings habit; the series is the performance, the habit is the training.

You will need

- Your preferred medium, kept constant for all four pieces (same pens, same palette, or same Krita brushes)
- Your warm-up style sheet and the axes checklist from the craft paragraph
- Four pieces of identical paper or identical digital canvases (same size, same orientation)
- A folder or wall space to view all four together

Steps

1. Choose three style decisions to hold constant and write them as rules at the top of a page (e.g., 'thick uniform outline; palette of brick red, olive, cream, black; flat shapes, no gradients').
2. Do two honest master studies first, from two different artists, labeled as studies: copy a small piece of each, hunting specifically for how they handle your three chosen axes.
3. Pick four subjects as different as you can make them — a person at work, an animal, a building, an object.
4. Thumbnail each subject twice, applying your three rules even at thumbnail size.
5. Execute piece one. Before piece two, write one line: which rule was hardest to keep, and what will you watch for next time.
6. Execute pieces two, three and four across separate sessions, keeping the rules — resist the itch to 'improve' the rules mid-series; finishing the series under constraint is the exercise.

7. Hang all four together. Run the stranger test: would someone group these instantly? Ask a family member to judge honestly.
8. Write a three-sentence 'style memo' describing your voice as if introducing yourself to an art director — present tense, concrete decisions, no apologies.
9. Start the long habit: choose your 100-drawings subject and do the first five, dated, in the back of your sketchbook.

Tips

- Constraints feel like handcuffs for two pieces and like a signature by the fourth.
- If a piece drifts, diagnose which axis slipped (palette and line weight are the usual escapees) rather than starting over.
- Identical sizes and margins do silent, powerful work in making a series read as a series.

Check your work

- ☐ My three rules are written, concrete and visible in all four pieces.
- ☐ My master studies are labeled as studies and taught me something I can name.
- ☐ A family member grouped the four pieces without being prompted, and my style memo describes decisions, not wishes.

SKETCHBOOK

1. Your three-rules sheet and the style memo, dated — you will enjoy contradicting them in a year.
2. The two labeled master studies with margin notes on what each master decided about your three axes.
3. The first five entries of your 100-drawings habit, numbered 1/100 through 5/100.

> **From history.** Leyendecker's visible-stroke technique was partly an engraving-era trade secret: he worked out, stroke by stroke, exactly how much modeling the magazine presses could hold, and his studies for a single cover figure could outnumber the finished strokes ten to one. He kept those oil studies stacked in his New Rochelle studio for decades. When they were finally exhibited, younger artists were startled to find the 'effortless' style was the most rehearsed surface in American illustration. Every effortless-looking style you admire has a drawer of ugly rehearsals behind it.

PRACTICE

1. Easy Define style in one sentence without the word 'unique.'

   Show answer

   Style is the recognizable sum of an artist's repeated decisions — line, shape, value, palette, proportion, finish and subject — across many works.

2. Easy What are the rules of an honest master study?

   Show answer

   Copy deliberately to learn specific decisions; label it a study after the artist; never sell it, post it as original work, or sign it as your own; and study several masters, not one.

3. Easy Name four of the seven style axes from the craft paragraph.

   Show answer

   Any four of: line, shape language, value, palette, proportion, texture/finish, subject and mood.

4. Easy How many Saturday Evening Post covers did Leyendecker paint, and over what years?

   Show answer

   322 covers, between 1899 and 1943.

5. **Medium** Why does an art director prefer a consistent illustrator over a versatile one? Explain with the 'promise' idea.

Show answer

Hiring is a promise to the AD's own bosses that the delivered art will look like the portfolio. A consistent portfolio makes the promise safe; five styles in one portfolio make the outcome unpredictable, so the AD cannot stake her name on it.

6. **Medium** Describe the Leyendecker-to-Rockwell chain and what it teaches about influence.

Show answer

Rockwell idolized Leyendecker, studied and copied his stroke technique privately, lived near him in New Rochelle, then worked through the influence until his own warmer storytelling style emerged — honoring the master (he was a pallbearer in 1951) without remaining an imitation. Influence is digested by volume and temperament, not avoided.

7. **Medium** Run the style-axes checklist on your own last five drawings. Write one sentence per axis describing what you actually did.

Show answer

Answers vary. A good answer is specific ('my lines are uniform fineliner, my shapes are rounded, my values stay middle-grey, I always draw animals, I never finish backgrounds') and treats the findings as current decisions, not fate.

8. **Medium** Why does the 100-drawings habit work when 'waiting for inspiration' does not? Use the 30/60/100 milestones.

Show answer

Volume forces you past borrowed answers: by about 30 the clichés are used up, by 60 you begin building on your own earlier solutions, by 100 you hold defendable preferences. Style surfaces as a byproduct of many finished decisions; waiting produces no decisions to learn from.

9. Hard Critique task. Find two pieces by the same well-known illustrator (book, covers, or a museum site). List five decisions that stayed constant between them and one that changed. What do the constants let a client count on?

Show answer

Answers vary. Strong answers name concrete constants (palette temperature, outline weight, simplified faces, flat texture, recurring subjects) and note that the constants let a client predict the look of unmade work — which is what they are buying.

10. Hard You are the illustrator. A client says: 'We love the piece you did for Magazine X. Can you do ours just like Artist Y instead?' What is wrong with the request, and what do you answer?

Show answer

They are asking you to imitate another living artist's style, which is poor ethics, legally murky, and bad business for everyone — the client should hire Artist Y if they want Artist Y. Courteously decline the imitation, point to what in your own work overlaps with what they liked, and offer to solve their problem in your voice (or refer them to Artist Y).

11. Hard Design a series test for yourself: pick six different subjects and three style decisions you will hold constant. Write the plan; you will execute part of it in the studio brief.

Show answer

Answers vary. A good plan names six genuinely different subjects (e.g., lighthouse, baker, bicycle, heron, kettle, barn) and three concrete constants (e.g., two-color palette plus black; thick uniform outline; flat shapes with one grain texture).

COMMON MISTAKES

- Waiting to 'find a style' before doing finished work, when style is a byproduct of finished work.
- Feeding on one influence until the work becomes an impression of it — vary the diet and digest by volume.
- Changing the rules mid-series, which produces five first pieces instead of one series.

- Confusing style with a filter or texture pack: surface treatment is one axis of seven, and the shallowest.

> **Make it a game · Style Detective.** A parent opens a picture book or illustrated site and covers any signatures. You get 20 seconds per image to name three decisions (line, palette, shapes, finish) and guess whether each new image is the same artist as the last. Ten images; score two points per correct same/different call and one per decision a parent agrees is really there. Beat your score with a new set tomorrow.

> **Scripture.** “But let every man prove his own work, and then shall he have rejoicing in himself alone, and not in another.” (Galatians 6:4, KJV)
>
> The cure for envy of other artists and for imitation alike: prove your own work. Test it, improve it, let it become honestly yours — then your satisfaction rests on what God gave you to do, not on measuring yourself against another's gift.

7.5 From Brief to Final: The Illustration Job, Start to Finish

OBJECTIVES

- Walk the standard pipeline of a professional illustration job: brief, thumbnails, sketch approval, final art, and limited revisions — and explain why each gate exists.
- Read a brief like a professional: deliverable, size, usage, deadline, fee, and the questions to ask before drawing.
- Practice art-director etiquette: prompt replies, confirmed notes, honest schedule warnings, exact delivery and a courteous handoff.

> **Warm-up.** Think of the last time you made something for someone else (a card, a meal, a repair). Write the 'brief' you were actually working from: what they asked for, by when, and how you knew it was done. Circle anything you had to guess. Guessing is what real briefs and sketch approvals exist to remove.

WATCH

Step by Step: How Art Director Works With a Freelance Illustrator

Art Prof: Your Art School · 42:21

https://www.youtube.com/watch?v=tw1J_tlCfUE

> **WHEN TO WATCH**
> Across sessions one and two — watch to the sketch-approval stage first, then finish. Note every email they exchange: count the gates.

Note: An art professor and a working art director walk through an actual assignment relationship — brief, sketches, feedback, final — showing the professional correspondence most students never see. Long, so split it; the middle section on sketch notes is the heart.

BACKUP VIDEO

Approaching Art Directors and Getting Illustration Work | Episode 9

Mr. Tom Froese · 34:11

https://www.youtube.com/watch?v=fvD05jZG5_U

After the etiquette paragraph, for the relationship side: how illustrators contact, serve and keep art directors across many jobs.

KEY TERMS

brief

The client's written description of the job: deliverable, size and format, content direction, usage, deadline and fee. If it isn't written, write it back to them yourself.

thumbnails

Several small, fast compositional options (often 3–5) sent for the art director's choice before any careful drawing begins.

sketch approval

The gate where the AD signs off a tight sketch; changes are cheap before it and expensive after it, which is why finals begin only after approval.

revision round

One cycle of requested changes. Professional agreements include a set number (commonly two); changes beyond scope or after approval are billed additionally.

kill fee

A partial payment (often 25–50%) owed if the client cancels the job after work has begun; agreed in advance so cancellation is survivable.

deliverables

Exactly what files you hand over at the end — format, resolution, color mode, naming — matching the spec in the brief.

scope

The boundary of the agreed work; 'scope creep' is the polite name for unpaid extras, and the cure is a courteous quote for the addition.

CORE IDEAS

The story. The best-documented illustration job in American history started with a letter. In the spring of 1911, Joseph Chapin, art editor at Charles Scribner's Sons, commissioned N.C. Wyeth to illustrate a deluxe *Treasure Island*: seventeen pictures, a cover and endpapers, for $2,500, to be delivered in time for the fall season. That letter was the brief — subject, count, deadline, fee. Wyeth read the novel hard, chose his moments (Lesson 7.1's vital moments), submitted compositions, took Chapin's notes, and then painted the seventeen big canvases in roughly four months of disciplined studio days at Chadds Ford, finishing on schedule. Scribner's printed the

plates, the book triumphed, and both parties came back for more: Wyeth went on to illustrate *Kidnapped* (1913), *The Boy's King Arthur* (1917), *The Last of the Mohicans* (1919) and a shelf of others for the same house. Note what made the relationship durable: Wyeth was not only brilliant — he was *reliable*. Chapin could hand him a classic and a date and stop worrying. Art directors have hired on that basis ever since.

How they figured it out. The modern pipeline is the same contract Chapin and Wyeth ran, with the gates named. *One:* the **brief** arrives — read it twice, then reply the same day with any questions: What exact size and format? Where will it run, and what usage is being bought? Who approves? When are sketches due versus finals? What is the fee, and does it include how many revision rounds? A professional confirms the whole arrangement in writing before drawing — one courteous email that restates the job protects both sides. *Two:* **thumbnails** — three to five genuinely different small options with a line of rationale each. *Three:* **sketch approval** — a tight drawing of the chosen direction, because this gate is the cheap place to change course; a sketch change costs minutes, a final change costs days. *Four:* **final art**, matching the approved sketch — the approved sketch is a promise, and surprising an AD at final, even with 'improvements,' breaks it. *Five:* **revisions**, limited and gracious: the agreed rounds are part of the job; changes beyond them, or after approval, earn a friendly note — 'Happy to make that change; since the sketch was approved, I'd bill it at my hourly rate of X. Shall I proceed?'

The craft. Professional etiquette is craft, learnable like perspective. The habits that make art directors keep your number: reply to every email within one business day, even if only 'Received — answers tomorrow.' Restate notes in your own words before acting on them ('So: warmer palette, the figure larger, keep the dog — correct?'), which catches misreadings while they are free. Warn early and honestly the moment a deadline wobbles — ADs can solve a problem on Tuesday that destroys them on Friday. Never miss the deadline itself: the magazine prints with or without you, and one blown date can end the relationship. Take notes without defending each choice; the AD is not attacking your art, she is doing her job, and 'make it bigger' usually means 'it isn't reading' — solve the reading problem. Deliver exactly to spec: right size, right color mode, right file names, on or before the date. Then close warmly: thanks, invoice, and the file put away where you can find it in two years when they come back.

In the studio. The paperwork is light but real. Before starting: the confirming email (or a simple agreement) naming deliverable, size, usage, deadline, fee, revision rounds and the kill fee. During: keep sketches, notes and approvals in one folder — the approval email is your protection if 'final' changes get requested later. After: deliver files per the spec from Unit 5 and Unit 6 (print work in CMYK at 300 DPI with bleed; screen work in RGB at the pixel size asked), send a short handoff note listing what was delivered, and invoice promptly with the agreed terms (commonly net 30 — payment due within thirty days). Log your hours against the fee and compute the effective hourly rate from Lesson 7.3; that number, job after job, teaches you what to charge and which work to seek. Then do the one thing beginners skip: file the job's reference, sketches and correspondence together. Your studio's memory is a business asset.

In the studio, continued. Expect the human wrinkles. Briefs arrive vague ('make it pop') — your questions turn fog into a job. Feedback arrives contradictory when two stakeholders disagree — ask the AD which voice decides, and serve that one. Dream jobs get canceled — the kill fee clause exists so a canceled job pays for the work done. And some Fridays the approved sketch is simply wrong and you can see a better picture — the professional move is to deliver the approved direction *and* attach the alternative as a gift, clearly optional. Sometimes they take the gift; either way you kept the promise. Reliability, over years, compounds into the only marketing that never stops working: art directors telling each other your name.

PICTURE STUDY



An Attack on a Galleon, Howard Pyle, 1905 · Oil painting, reproduced as a magazine and book plate · Painted for Harper's Monthly; later the frontispiece of Howard Pyle's Book of Pirates (1921)

Image: Wikimedia Commons, public domain

This painting was a job: Harper's commissioned Pyle to illustrate a piracy article in 1905, and this canvas — the low longboat, the mountainous galleon, the haze that swallows detail — was delivered on a magazine schedule to a magazine's specifications, then lived a second life as a book frontispiece in 1921.

Study it as the end of a pipeline. Somewhere behind this image were a brief, compositional studies, an art editor's approval and a hard date — and none of that machinery shows. The machinery exists so the picture can look inevitable.

Look closely

- Pyle put the viewer low, almost in the water, at the attackers' level. What does the job's purpose — thrilling a magazine reader — gain from that choice?
- The galleon is mostly silhouette in haze. How does withholding its detail make it bigger and the scene more dangerous?
- Find the value structure: how many big shapes carry the whole composition?
- Where has Pyle grouped the figures into one readable mass rather than drawing fourteen separate men?
- A frontispiece shares its page with a title and shares the book with sixteen other plates. What makes this image strong alone, yet calm enough not to

exhaust the reader?

Talk about it

1. Reconstruct the probable brief for this painting in three lines: deliverable, content, constraints.
2. Pyle reused and resold paintings across magazines and books (as did Rackham, Lesson 7.2). How does this connect to usage rights in a modern brief?
3. Chapin and the Harper's editors kept returning to Pyle and his students for decades. Which half of that durability was talent, and which half was the pipeline conduct this lesson teaches?

Safety first. Final-art sessions run long. Every 50 minutes, stand, stretch your wrists and shoulders, and rest your eyes on something distant for a minute (screens and close drawing both fatigue focus). Good posture at the desk now prevents the repetitive-strain injuries that sideline working artists later.

STUDIO BRIEF

Studio brief: The Whole Job, Gates and All

Client: Riverbend Community Fair (fictional), via its volunteer art director — played for real by a parent or older sibling, who receives the AD instruction card you will write out in step one. Deliverable: a full-page program illustration (vertical, 7.5 × 10 in) on the theme 'Harvest Evening,' leaving the top quarter clear for the fair's title type. Fee (imaginary): $400, two revision rounds included, 30% kill fee. Sketches due day 2, approval day 3, final due day 6. This brief is graded on conduct as much as on art.

You will need

- Pencil, paper, and your finishing medium (traditional or Krita/Inkscape)
- An 'AD instruction card' you copy out: 'Pick ONE thumbnail and give two notes. At sketch stage give one more note, then approve in writing. At final, request one small change — even if you love it.'
- A job folder (physical or digital) labeled RIVERBEND-PROGRAM with subfolders: brief, sketches, final, correspondence
- A timer and an hours log

Steps

1. Write the confirming email and put it in the folder: restate deliverable, size, clear-space requirement, usage (printed program only), deadlines, fee, rounds, kill fee. Have your AD 'reply' to confirm.
2. Produce four thumbnails of genuinely different compositions honoring the clear top quarter. Deliver them on schedule with one line of rationale each.
3. Receive the AD's choice and two notes. Restate the notes back in your own words and get a 'correct.'
4. Draw the tight sketch at full size, incorporating the notes. Submit, take the one further note, revise, and obtain written approval ('Approved — proceed to final').
5. Execute the final to match the approved sketch — resist improvements that break the promise. Log your hours.

6. Deliver the final on day 6 exactly to spec (full size, top quarter clear; if digital, export per the brief). Include a two-line handoff note listing the files.
7. Field the AD's requested small change graciously; decide out loud whether it falls inside the included rounds (it does — say why), make it, and redeliver.
8. Issue the imaginary invoice: job, fee, terms net 30. Then compute your effective hourly rate from the log.
9. Hold a two-question debrief with your AD: 'What should I ask earlier next time?' and 'Would you hire me again — why or why not?' Record the answers in the folder.

Tips

- Fight for the schedule on day one, not day five: the early gates are where lateness is born.
- Keep every scrap in the job folder as you go — assembling it afterward is how things get lost.
- If a note stings, answer tomorrow's version of it today: 'Good catch — here's the fix' is a complete professional sentence.

Check your work

- ☐ Every gate happened in writing and on schedule, and the folder proves it.
- ☐ My final matches the approved sketch, with the clear space intact.
- ☐ I handled the post-delivery change correctly, invoiced, computed my hourly rate, and recorded the debrief answers.

SKETCHBOOK

1. A one-page flowchart of the five gates with the cost-of-change curve drawn over it (cheap at thumbnails, expensive at final).
2. Your four Riverbend thumbnails with the AD's notes transcribed beside them.
3. The debrief answers and your effective hourly rate, with one sentence on what you would quote for the same job next time.

> **From history.** Chapin's letters to his illustrators survive in archives, and they read exactly like a good art director's emails today: a clear subject, a count of pictures, a date, a fee, encouragement, and the occasional firm correction. Wyeth, for his part, wrote home constantly about deadlines — fretting, planning weeks, pushing through. The glamour of the Golden Age ran on the same unglamorous machinery this lesson teaches, which should encourage you: the machinery can be learned by anyone willing to be dependable.

PRACTICE

1. Easy Name the five gates of the illustration pipeline in order.

   Show answer

   Brief, thumbnails, sketch approval, final art, revisions (limited, with delivery and handoff closing the job).

2. Easy What six facts must a brief contain before you start drawing?

   Show answer

   Deliverable, size/format, content direction, usage rights, deadline(s) for sketches and final, and fee (with revision rounds included).

3. Easy Why do finals begin only after sketch approval?

   Show answer

   Because change is cheap at the sketch and expensive at the final; the approval gate concentrates all cheap changes before the costly work starts, and the approved sketch becomes the agreed promise for the final.

4. Easy What is a kill fee and when is it agreed?

   Show answer

   A partial payment (often 25–50%) owed if the client cancels after work begins; it is agreed in advance, in the brief or confirming email.

5. Medium An AD's note says 'make the figure bigger.' What is she probably really saying, and what are two ways to solve it besides scaling the figure?

   Show answer

   She means the focal point isn't reading. You could increase contrast at the figure (value or color), simplify the background around it, or redirect leading lines — any of which may fix the read without breaking the composition.

6. Medium Write the one-sentence email you send the day you realize the final will be a day late, which is still four days before deadline.

Show answer

Model answer: 'Heads-up: the final is tracking one day behind — I can deliver Thursday morning instead of Wednesday, or deliver Wednesday with simplified background detail; which would you prefer?' Early, honest, and offering the AD a choice.

7. Medium The client approved the sketch Monday; on Thursday they ask for a different setting in the final. Is this a free revision? Write the courteous reply.

Show answer

No — it reverses an approved decision, beyond the agreed rounds. Reply: 'Happy to move the scene to the harbor. Since the barn setting was approved Monday and the final is painted, that change is about N extra hours at $X; shall I proceed, or would you like a lighter adjustment within the current setting?'

8. Medium Wyeth delivered seventeen Treasure Island canvases in about four months. If he kept a six-day work week, roughly how many working days per painting is that, counting reading, sketches and approvals inside the same span?

Show answer

About $17 \text{ weeks} \times 6 \approx 100$ working days, so roughly $100/17 \approx 6$ days per picture — large finished oils on a magazine-era schedule. Professional speed is planned, not rushed.

9. Hard Your sketches are due Friday. Build the back-plan: today is Monday; thumbnails take half a day, the AD typically answers in one day, and the tight sketch takes one day. Lay out the week and name your slack.

Show answer

Monday morning: thumbnails sent by midday. Tuesday: AD's choice returns. Wednesday: tight sketch drawn and sent. Thursday: buffer for a second thumbnail round or sketch tweaks. Friday: deadline met with one full day of slack — which is the point of starting the half-day task Monday morning, not Thursday.

10. Hard You are the illustrator. At final stage you genuinely see a stronger picture than the approved sketch. What does the professional do, and why is silently delivering the 'better' version a breach?

Show answer

Deliver the approved version, and attach the alternative clearly marked as an optional extra. The approved sketch is a promise the AD has already resold inside her organization; a surprise final — even a better one — makes her look out of control and forces a defense she never agreed to make.

11. Hard Draft the confirming email for this fuzzy phone call: 'We'd love a drawing of the old mill for our festival program, maybe by next month, we'll pay something fair.' Invent reasonable specifics and cover all six brief facts.

Show answer

Model answer: 'Thank you! Confirming: one illustration of the Harris Mill for the Fall Festival program — full page, 5 × 8 in plus bleed, print (CMYK, 300 DPI); usage: this year's printed program and festival flyer; sketches to you by the 10th, final by the 24th; fee $250 including two revision rounds, 30% kill fee if canceled after sketches; payment within 30 days of delivery. Reply to confirm and I'll begin.'

COMMON MISTAKES

- Starting to draw before the brief's six facts are confirmed in writing — guessing is not humility, it is risk.
- Sending one thumbnail (no choice) or seven (no judgment) instead of three to five strong options.
- Improving the final beyond the approved sketch and expecting delight instead of alarm.
- Going silent when a deadline slips, which converts a solvable Tuesday problem into a Friday catastrophe.
- Treating revision requests as insults instead of as the paid, normal second half of the job.

Make it a game · Gate Keeper. Shuffle nine index cards: the five gates plus four troubles ('vague brief,' 'late feedback,' 'change after approval,' 'deadline wobble'). Deal them out of order; you must arrange the gates correctly in under 20 seconds, then draw one trouble card and answer aloud, in two sentences, exactly what you would say to the AD. A parent judges: calm, honest and specific scores the point. First to five points retires as champion.

Scripture. “As the cold of snow in the time of harvest, so is a faithful messenger to them that send him: for he refresheth the soul of his masters.” (Proverbs 25:13, KJV)

An art director with a deadline is 'them that send him.' The illustrator who delivers faithfully — on time, as promised — refreshes the soul of a client the way cool snow-water refreshes harvesters, and is sent for again and again.

UNIT 7

Illustration as a Profession

Illustration is pictures with a job to do: selling a story, explaining an idea, putting a face on a magazine or a book. In this unit you will learn how illustration became a profession — in the great magazine era of Howard Pyle and N.C. Wyeth, and in the color picture books of Walter Crane, Randolph Caldecott and Arthur Rackham — and how the same business works today. You will learn who buys illustration now (editorial pages, advertising, book covers, concept art and children's books), how the money works (flat fees, advances and royalties), and how a real illustration job runs from the client's brief through thumbnails, sketch approval, final art and revisions.

You will also do the work. You will paint a story moment the way Pyle taught his students to, build a three-spread picture-book dummy, take an editorial assignment from brief to finished spot, run a disciplined style experiment, and finally carry a complete illustration job start to finish with a parent or friend acting as your art director. By the end of the unit you will have two portfolio-quality pieces and, just as important, you will know how to behave like a professional: answer promptly, meet the deadline, take notes graciously and deliver exactly what was asked.

PREREQUISITES

- Units 1 and 2: drawing what you see, gesture and heads, value, and compositional hierarchy — every brief in this unit uses them
- Unit 6: the digital studio basics (scanning a drawing, cleaning it up, Krita and Inkscape) for finishing and delivering work
- Percentages and simple arithmetic, for royalty, print-run and fee calculations

MASTERY CHECKLIST

- ☐ I can tell the story of the Golden Age of American illustration: Howard Pyle, his schools, his students, and why the halftone and the mass magazine created the profession.
- ☐ I can explain how a 32-page picture book is built — signatures, spreads, front matter and page turns — and storyboard one.
- ☐ I can calculate a royalty, an advance earn-out and a print run, and explain royalties versus a flat fee.
- ☐ I can name today's five main illustration markets, what each one buys, and how a portfolio should differ for each.
- ☐ I can describe style as a set of consistent decisions, run an honest master study, and keep a series visually consistent.
- ☐ I can run an illustration job from brief to final: thumbnails, sketch approval, final art and limited revisions, with professional art-director etiquette.
- ☐ I can deliver finished art to spec, on deadline, with a courteous handoff.

FREE RESOURCES FOR THIS UNIT

- **Internet Archive**: Free scans of the Golden Age itself: the 1911 Treasure Island with all of Wyeth's plates, Howard Pyle's Book of Pirates, Caldecott's picture books and bound volumes of the old magazines. Search a title, then read the real pages. No account needed.
- **The Metropolitan Museum of Art — Open Access collection**: Hundreds of thousands of free, downloadable public-domain images, including prints, posters and drawings by many artists in this unit. Use it to collect reference and master-study material legally.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

7.1 The Golden Age: Howard Pyle, N.C. Wyeth and the Magazine Era
3 sessions of 50 minutes

7.2 Pictures for Children: Crane, Caldecott, Rackham and the Picture Book
3 sessions of 50 minutes

7.3 Today's Markets: Editorial, Advertising, Covers and Concept Art
3 sessions of 50 minutes

7.4 Finding Your Style: Influences, Practice and Consistency 3 sessions of 50 minutes

7.5 From Brief to Final: The Illustration Job, Start to Finish 3 sessions of 50 minutes

Unit 7 test

Time allowed: 50 minutes. A calculator is allowed for the royalty and rate problems; show your work. Answer the short essays in complete sentences. The test is worth 100 points.

1. **5 pts**
   What printing invention of the 1880s created the Golden Age of Illustration, and why?

2. **5 pts**

   Place these in time and connect them in two sentences: Howard Pyle at Drexel; the Brandywine school; N.C. Wyeth's Treasure Island.

3. **6 pts**

   Define Pyle's 'vital moment' and apply it: name the moment you would paint from the story of Noah receiving the dove, and defend the choice in one sentence.

4. **6 pts**

   Why are picture books 32 pages, and after 4 pages of front matter, how many story spreads remain?

5. **7 pts**

   An illustrator takes a $7,000 advance against a 5% royalty on a $19.99 hardcover. Compute the royalty per copy, the earn-out point, and total earnings at 25,000 copies sold.

6. **6 pts**

   Royalty versus flat fee: give one situation where each is the wiser choice for the illustrator, with the reasoning.

7. **8 pts**

   Name today's five main illustration markets and, for each, the buyer and one thing its portfolio must prove.

8. **7 pts**

   Job A pays $420 and takes 7 hours; Job B pays $900 and takes 3 days (8-hour days). Compute both effective hourly rates and name two non-rate factors that could still justify the lower-rate job.

9. **6 pts**

   A client who paid for one-time program use writes: 'We're putting the art on billboards — we already paid for it.' Write the two-sentence professional reply.

10. **6 pts**

    Define style in one sentence as this unit taught it, and list four of the axes on which style decisions are made.

11. **8 pts**

    State the rules of an honest master study, and explain — using Rockwell and Leyendecker or Wyeth and Pyle — how strong influence becomes a personal style instead of imitation.

12. **10 pts**

    List the five gates of an illustration job in order, and state for each what passes through it and why changing course gets more expensive at every gate.

13. **10 pts**

    Short essay. Your final is going to be a day late, four days before deadline. Write the email you send now, and explain in three sentences why early honesty is both right and professionally safer than hoping to catch up.

14. **10 pts**

    Production task. Thumbnail (2 inches, value only) two different 'vital moment' choices for this scene: a lighthouse keeper's daughter rows out at dusk to warn a ship off the rocks. Label each before/during/after and circle the one Pyle would choose, with one sentence why.

ANSWER KEY

1. The photographic halftone: it broke paintings into printable dots, replacing slow hand wood-engraving, so mass magazines could reproduce paintings cheaply by the millions — creating a huge paying market for illustrators.
2. Pyle began teaching illustration at Drexel in 1894, then ran his own tuition-free school from 1900; his students clustered around Chadds Ford on the Brandywine, becoming the Brandywine school. His student N.C. Wyeth illustrated Scribner's 1911 Treasure Island — seventeen canvases for $2,500 — the tradition's most famous commission.
3. The single instant carrying the most story meaning, often just before or after the action. Example answer: the breath after the dove lands — olive leaf visible, Noah's face changing — because the storm, the wait and the promise are all legible in that one quiet beat.
4. Presses fold printed sheets into 16-page signatures, so books run in multiples of 16; 32 pages is the economical standard. $(32-4)/2 = 14$ spreads.
5. Per copy $0.05 \times \$19.99 \approx \$1.00$; earn-out $\approx 7{,}000$ copies; beyond it $18{,}000 \times \$1.00 = \$18{,}000$, total $\approx \$25{,}000$.
6. Flat fee: work-for-hire educational or low-sales projects, where the guaranteed fee exceeds likely royalties and income is needed now. Royalty: a trade book with real retail life, where per-copy earnings continue for years and can far exceed any flat fee (Caldecott's penny-per-copy versus Wyeth's one-time $2,500).
7. Editorial — magazine/news ADs; fast visual ideas and metaphors. Advertising — agency ADs; polish and brand-safe execution to layout. Book covers — publisher ADs; one image that sells with room for type. Concept art — game/film studios; fast iteration and design process, not just finished paintings. Children's books — publisher ADs/editors; consistent characters telling a story across spreads.
8. A: $\$60/\text{hr}$; B: $\$900/24 = \$37.50/\text{hr}$. Lower-rate work can still be right for the relationship (a returning client or AD), portfolio value, or broader usage fees attached — but the choice should be made knowingly.
9. Model answer: 'I'm glad the piece worked so well! The original fee licensed one-time program use, so billboard advertising is a new, broader license — I'll send a quote today, and the files are ready to go as soon as it's confirmed.'
10. Style is the recognizable sum of an artist's repeated decisions across many works. Axes (any four): line, shape language, value, palette, proportion, texture/finish, subject and mood.

11. Copy privately and deliberately to learn decisions; label the study after its artist; never sell it or present it as original; feed on several masters. Rockwell copied Leyendecker's stroke technique in studies, then digested the influence through volume and his own storytelling temperament until his style diverged — apprenticeship followed by departure, as with Wyeth under Pyle.
12. Brief (the written job: deliverable, size, usage, deadline, fee, rounds — questions cost nothing here); thumbnails (3–5 cheap directions, minutes to redo); sketch approval (the tight drawing becomes a promise — last cheap change); final art (matches the approved sketch; changes now cost days); revisions (the agreed rounds; beyond scope or after approval is billed). Cost rises because each gate converts options into finished labor.
13. Model email: 'Heads-up: the final is tracking one day behind. I can deliver Thursday 9 a.m. instead of Wednesday, or simplify the background and hold Wednesday — your call.' Explanation: the AD still has options on Tuesday and none on Friday; honesty keeps the relationship's trust intact even when the schedule bends; and silent hope converts a small adjustable slip into a broken promise, which is the one unforgivable professional failure.
14. Model answer: (1) Before — the small boat leaving the lighthouse's pool of light into darkness, ship's lights distant; (2) After — the girl shipping her oars as the freighter's wake lifts her boat, danger past. Either circled is defensible with reasoning; Pyle favored the moment that lets the viewer imagine the climax — strongest is usually the 'before,' tension unresolved, two light sources telling the whole story.

PORTFOLIO PIECE: A STORY SEQUENCE, PITCHED LIKE A PROFESSIONAL

Choose your strongest work from this unit — the vital-moment illustration (7.1) or the picture-book dummy (7.2) — and develop it to portfolio finish: for the illustration, a fully rendered final with the book's title line; for the dummy, one spread taken to finished art plus the complete sketch dummy.

Then package it the way the profession would see it: a one-page case study presenting brief, thumbnails, approved sketch and final in order, with two sentences on each decision, your style memo from Lesson 7.4, and your hours log with the effective hourly rate computed at an imagined market fee. This is piece seven of the ten-piece professional portfolio you will complete by the end of the course.

LOOK FOR	WHAT IT MEANS
Storytelling	A vital moment is clearly chosen and defensible; the image or sequence tells story the text does not repeat, and reads at small size.
Craft	Drawing is constructed (gesture, forms, studied drapery from a posed model where figures appear); values organize into 2–3 big shapes; the finish is consistent.
Process	Thumbnails, approved sketch and final are all present and the final honors the approved sketch; the case study explains decisions in plain sentences.
Professional arithmetic	Hours are logged honestly; effective hourly rate and (for the book option) a royalty earn-out example are computed correctly.
Consistency	Characters, palette and handling hold steady across the sequence or between sketch and final; the style memo matches the work shown.
Presentation	The case-study page is clean, labeled and complete — the kind of page an art director could approve in sixty seconds.

UNIT 8

Branding and Logo Design

A logo is the smallest piece of design that carries the largest weight: one mark that must stand for a whole business, print at any size, survive in one color, and still mean something in twenty years. In this unit you will trace the mark from its ancestors — medieval guild marks, silver hallmarks, printers' devices, and the Bass red triangle that became Britain's registered trade mark number one on 1 January 1876 — to the modern masters Paul Rand and Saul Bass, and you will learn the trademark-law basics every designer needs. Then you will learn to judge logos the way professionals do: simple, memorable, versatile, appropriate and built to last.

The second half of the unit is one continuous professional job. You will take a fictional local business through the full identity process: a real brief, research, fifty sketches, refinement on grids (with the golden ratio used honestly, as a tidying tool rather than magic), vector construction in Inkscape, a color-and-type system, a brand guide, and finally a client presentation with mockups and a complete file package — priced by the hour like a working designer. By the end you will have a complete brand-identity case study, one of the strongest pieces a beginning design portfolio can hold.

PREREQUISITES

- Unit 3 (typography) and Unit 4 (color): you will choose and pair typefaces and build a palette with exact color values
- Unit 6: Inkscape basics — Bézier curves, Boolean operations and clean vector habits — for constructing the final mark
- Simple algebra and ratios for the golden-ratio constructions and the pricing math

MASTERY CHECKLIST

- ☐ I can tell the story of marks from guild marks, hallmarks and printers' devices to Bass's 1876 triangle, and explain what a trademark legally is and is not.
- ☐ I can explain the difference between a logo, an identity and a brand, and why a brand is at bottom a reputation.
- ☐ I can classify any logo (wordmark, lettermark, symbol, abstract mark, combination, emblem) and test it: one color, tiny size, memory sketch.
- ☐ I can run the professional logo process: brief, research, 50 thumbnail sketches, three directions, grid-based refinement and clean vector construction.
- ☐ I can use the golden ratio and simple grids honestly in refining a mark, and say what they can and cannot do.
- ☐ I can build a brand one-pager: logo versions, clear space, minimum sizes, palette with exact values, type system and usage rules.
- ☐ I can present identity work to a client, explain decisions calmly, handle feedback, and deliver a complete, correctly named file package.

- ☐ I can price a logo package by estimated hours at a defensible rate.

FREE RESOURCES FOR THIS UNIT

- **Inkscape**: The free, professional-grade vector editor you met in Unit 6 — this unit's main tool for constructing final marks, testing one-color versions and exporting every file a client needs. Download only from the official site.
- **Google Fonts**: Free, properly licensed typefaces for your brand systems. The pairing skills from Unit 3 plus this library cover real client work; note each font's license allows commercial use.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

8.1	**Marks That Mean Something: From Maker's Marks to Modern Identity**	3 sessions of 50 minutes
8.2	**What Makes a Logo Good: Simple, Memorable, Versatile**	3 sessions of 50 minutes
8.3	**The Logo Process: Brief, Research, Sketches, Refinement**	3 sessions of 50 minutes
8.4	**More Than a Logo: Color, Type and the Brand Guide**	3 sessions of 50 minutes
8.5	**Presenting and Defending the Work**	3 sessions of 50 minutes

Unit 8 test

Time allowed: 50 minutes. A calculator is allowed for the ratio and pricing problems; show your work. Sketch answers may be rough but must be legible. The test is worth 100 points.

1. **5 pts**
   What became UK registered trade mark No. 1, under what law, and on what date did registration open?

2. **5 pts**

   Trace 'trust at a distance' through three pre-modern marks: the hallmark, the printer's device, the guild mark — one sentence each.

3. **6 pts**

   Distinguish trademark, copyright and patent, and explain TM versus ®.

4. **6 pts**

   Rank for protectability and explain: an invented word; 'Speedy' for a courier; 'Cold Ice Cream' for an ice-cream shop; 'Grocery' for a grocery. Name the disease that killed aspirin and escalator as trademarks.

5. **6 pts**

   Define logo, identity and brand in one sentence each, and state which one the designer cannot draw and why.

6. **7 pts**

   Name the six logo types with a one-line trade-off for each.

7. **7 pts**

   List the five tests of a good mark and describe how to actually perform the two versatility tests.

8. **6 pts**

   Attribute and date three Paul Rand marks and one Saul Bass program, and state Rand's 'identify, don't describe' rule in your own words with an example.

9. **6 pts**

   Tell the NASA meatball/worm story with dates as a lesson about identity systems, not just marks.

10. **7 pts**

    Compute: (a) φ to three decimals from its formula; (b) the φ-related smaller companion to a 55 mm symbol; (c) snap-fix this radius family meant to be two related sizes: 14, 13.5, 14.2, and 8.9 px.

11. **8 pts**

    Describe the six-step logo process in order, and use the FedEx story (designer, firm, year, method) as evidence for the fifty-sketch discipline.

12. **8 pts**

    You are handed a finished mark and asked to 'prove it's good' by overlaying golden-ratio circles. Write the honest professional reply, stating what grids and ϕ can and cannot do.

13. **8 pts**

    List the six sections of a small-business brand guide, and for three of them give the exact kind of value or rule the section must state.

14. **8 pts**

    Pricing. Target income $5,400, overhead $600, billable hours 300. Compute the hourly rate; then price this package: brief/research 3 h, sketches 5 h, refine/vector 6 h, one-pager 5 h, presentation/files 5 h, two rounds at 2 h each — and the extra-round price.

15. **7 pts**

    Production task. Sketch a quick emblem-to-system rescue: draw any simple emblem (badge with a name), then extract and sketch (a) the symbol alone for a favicon and (b) a horizontal combination lockup — and write one guide rule stating when each version is used.

ANSWER KEY

1. The Bass red triangle, under the Trade Mark Registration Act 1875, when registration opened on 1 January 1876 — and the mark is still registered.
2. The hallmark (leopard's head required on English silver from 1300, assayed at Goldsmiths' Hall) let a buyer trust the metal without testing it. Printers' devices (Fust & Schöffer 1457; Aldus's anchor and dolphin from 1502) let scholars trust a text's source — and were counterfeited for exactly that reason. Guild marks traced work to its maker so bad work could be punished and good work rewarded.
3. Trademark protects source identifiers in trade; copyright protects creative works automatically from creation; patent protects inventions. TM claims rights in a mark being used; ® may only be used after federal registration (USPTO, Lanham Act 1946).
4. Invented (fanciful — strongest); 'Speedy' (suggestive — strong); 'Cold Ice Cream' (descriptive — weak, needs proven association); 'Grocery' (generic — unprotectable). The disease is genericide: the public turning a mark into the product's common noun.
5. Logo: the mark itself. Identity: the designed system the mark commands (color, type, layouts, usage). Brand: the reputation people attach to the mark. The brand cannot be drawn — it is earned by the company's conduct; the designer only builds the vessel that collects it.
6. Wordmark — makes a short distinctive name the mark, but needs a good name. Lettermark — compresses a long name, but initials start meaningless. Pictorial — instantly nameable, but risks describing today's product. Abstract — grows with any business, but means nothing on day one. Combination — flexible symbol+name, but must work together and apart. Emblem — badge dignity, but fails at small sizes.
7. Simple, memorable, versatile, appropriate, durable. One-color test: convert to solid black and reversed white — no gradients or effects — and check it survives. Scale test: view at 16-pixel favicon size and at large size; it must stay legible, balanced and crisp at both.
8. Rand: UPS shield with bow-tied parcel 1961, ABC circle mark 1962, IBM eight-bar stripes 1972 (also Westinghouse 1960, NeXT 1986). Bass: the 1969 Bell System redesign (and the 1983 AT&T globe). The rule: a mark points at the maker, not the merchandise — a pizza-slice logo traps the pizzeria that grows; a distinctive mark grows with it.

9. Meatball insignia 1959; Danne & Blackburn's worm logotype with the Graphics Standards Manual 1975–76; worm retired for the meatball 1992; worm revived alongside it 2020. Lesson: the written system (the 1976 manual) was as important as the mark — it coordinated one voice across ten centers, and preserved the design argument so well the mark could return decades later.
10. (a) $(1+\sqrt{5})/2 \approx 1.618$. (b) $55/1.618 \approx 34$ mm. (c) Snap the first three to exactly 14 px; make the small family a stated ratio of it — 7 px (halves) or $14/1.618 \approx 8.5$ px (ϕ); the crime is near-equal wobble and an unrelated 8.9.
11. Brief; research/competitor audit; fifty thumbnail sketches; three genuinely different directions; grid refinement; vector construction. Evidence: Lindon Leader at Landor, 1994, explored about two hundred concepts before the FedEx wordmark; the hidden arrow in the E–x negative space was found deep in the volume and perfected with custom letterforms (Univers 67 blended with Futura Bold) — strong ideas are mined by discipline, not awaited.
12. Model answer: overlays after the fact prove nothing — circles fit almost anything. Ratios and grids are construction tools: used during refinement they make weights even, radii consistent and sizes related instead of arbitrary. They cannot make a weak idea good; the mark's worth is shown by the real tests — one color, small size, memory, distinctiveness in its field — and I'm glad to run those.
13. Logo versions; clear space and minimum sizes; color; type; imagery and voice; don'ts. Examples: clear space — a unit from the mark itself (e.g., one cap height on all sides) plus minimums in mm and px per version; color — named colors with hex, RGB and CMYK values and a proportion rule (e.g., 60/30/10); type — the display and text faces, weights, cases and a minimum body size. (Don'ts shown as crossed-out pictures.)
14. Rate: $\$6{,}000/300 = \$20$/hr. Hours: $3+5+6+5+5+4 = 28$; package $28 \times \$20 = \$560$, quoted as one number with scope attached; extra round $2 \times \$20 = \$40$.
15. Sketches vary. A correct answer shows the badge, a simplified symbol pulled from it (bold silhouette, no inner text) marked for small/informal uses, and a symbol-plus-name horizontal lockup for letterheads and signs; the rule states, e.g., 'Use the full emblem at 40 mm/200 px and above; below that, use the symbol alone or the horizontal lockup.'

PORTFOLIO PIECE: THE STONEBRIDGE IDENTITY: A COMPLETE BRAND CASE STUDY

Assemble the entire Stonebridge Woodworks job into one presented case study: the written brief and competitor audit; the fifty-sketch pages with the three directions marked; the construction plate of the final mark (grid, radius family and ratio choices labeled, Dürer-style); the black and reversed vectors; the brand one-pager; the three mockups; the presentation deck; and the quote traced to your logged hours. Bind it physically or as one clean PDF, opened by a one-paragraph summary written for a stranger.

This is piece eight of your ten-piece professional portfolio, and for many clients it is the most persuasive thing a young designer can show — not because the mark is perfect, but because the process is complete: research, volume, refinement, system, presentation and honest arithmetic, end to end. Present it to your family panel once more as a finished case study, cold, in under eight minutes.

LOOK FOR	WHAT IT MEANS
Process integrity	Every stage is present and genuinely connected: the brief drives the research, the fifty sketches are real and captioned, the three directions differ in idea, and the final traces defensibly back to the brief.
Craft of the mark	The vector is cleanly constructed (few nodes, even weights, stated radius and ratio families) and passes the one-color, reversal, 16-pixel and memory tests.
System thinking	The one-pager is complete (versions, clear space, minimums, exact color values, licensed type, don'ts), written for non-designers, and obeyed by every mockup and deck page.
Presentation and defense	The deck runs rationale-before-reveal; objections were translated, held or yielded appropriately, and decisions recorded; the spoken case study lands inside eight minutes.
Professional arithmetic	Hours are honestly logged; the rate and package price compute correctly and are quoted with scope and extra-round terms.
Delivery	The file package is complete and sanely named with a plain-English read-me; the bound case study is clean, ordered and ready to show a real client.

8.1 Marks That Mean Something: From Maker's Marks to Modern Identity

OBJECTIVES

- Trace the ancestry of the logo: masons' and guild marks, silver hallmarks, printers' devices, and the first registered trademarks of the 1870s.
- State the basics of trademark law: what a trademark protects, TM versus ®, trademark versus copyright versus patent, distinctiveness, and how marks die by becoming generic.
- Distinguish logo, identity and brand, and explain why a brand is finally a reputation.

> **Warm-up.** Open the kitchen cupboard and find five product marks. For each, cover the name and ask: would you still know the maker from the shape and color alone? Then look under a plate or on a spoon for a maker's stamp or hallmark. People have been signing their work this way for a very long time — list who, in your house, can be identified by their 'mark' (handwriting, stitching, the way they stack wood).

WATCH

A History of Trademarks: From the Ancient World to the 19th Century

World Intellectual Property Organization – WIPO · 16:04

https://www.youtube.com/watch?v=y15psIdWpjk

> **WHEN TO WATCH**
> After the story paragraph. Keep a dated timeline as you watch — you will extend it in your sketchbook.

Note: The UN's intellectual-property agency tells the whole pre-modern story: potters' marks, Roman brick stamps, guild marks, hallmarks and the first registration laws. Authoritative and image-rich; note every date it gives you.

BACKUP VIDEO

The History of Logos I: What Was the First Logo Ever Made? | Domestika English

Domestika English · 6:34

https://www.youtube.com/watch?v=qKPu8jdLPeo

With the story paragraph — a brisk illustrated overview of early marks and the birth of registered trademarks, good for review at the end of session one.

KEY TERMS

maker's mark

A personal sign stamped, carved or woven into work to say who made it — used by masons, potters, goldsmiths, weavers and printers centuries before modern branding.

hallmark

An official purity mark struck on gold or silver at an assay office; English law required the leopard's head on silver from 1300, and the word comes from Goldsmiths' Hall in London.

printer's device

A printer's emblem printed in his books — Fust and Schöffer used twin shields in the 1457 Mainz Psalter; Aldus Manutius used the anchor and dolphin from 1502.

trademark

A word, name or symbol used in trade to identify the source of goods or services and distinguish them from others'; it protects buyers from confusion and sellers' reputations from theft.

registration (®, TM)

TM claims a mark in use; ® means the mark is officially registered (in the US, with the USPTO under the Lanham Act of 1946). Registration strengthens legal protection; using ® without registration is unlawful.

distinctiveness

How strongly a mark can identify one source: invented and arbitrary marks are strong; descriptive ones are weak; generic words cannot be trademarks at all.

genericide

The death of a trademark that becomes the common word for the product itself — as happened in the United States to aspirin, escalator and thermos.

brand

The reputation attached to a mark: everything people believe and feel about the maker. The designer draws the mark; the company's conduct fills it with meaning.

CORE IDEAS

The story. On New Year's Day 1876, Britain's new Trade Mark Registration Act came into force, and the brewery Bass & Co. of Burton-on-Trent was ready: company legend says an employee spent New Year's Eve waiting outside the registrar's office so that Bass's red triangle would be first through the door. It worked — the red triangle became United Kingdom registered trade mark No. 1, and it is still registered today, nearly a century and a half later. (We tell this story in text on purpose: it is a landmark of design law, not an advertisement.) The law existed because industrial Britain had a counterfeiting problem: goods with a reputation were being imitated, mark and all, and buyers could no longer tell the true maker. Registration gave a mark's owner a legal weapon — and gave designers, eventually, a profession: somebody has to make marks worth protecting.

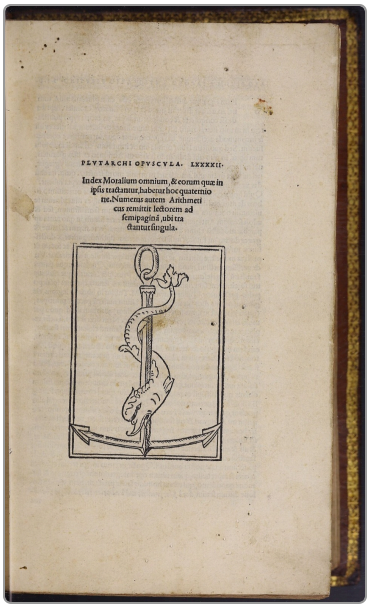
How they figured it out. The idea is far older than the law. Roman brickmakers stamped their bricks; medieval stonemasons chiseled personal marks into cathedral stones so their work — and their pay — could be traced; the craft guilds required masters' marks on goods precisely so that bad work could be traced to its maker and good work rewarded. From 1300, English law required silver to be assayed and struck with the leopard's head — the hallmark, named for Goldsmiths' Hall in London where the testing was done from 1478 — so a buyer could trust the metal without being a metallurgist. Printers joined in almost the moment printing began: Johann Fust and Peter Schöffer put their twin-shield device in the Mainz Psalter of 1457, the first printed book to name its makers, and in 1502 the great Venetian publisher Aldus Manutius adopted the anchor and dolphin with the motto *festina lente* — 'make haste slowly': the dolphin's speed, the anchor's steadiness. Aldus's books were so trusted that counterfeiters in Lyon copied the device onto inferior editions, and Aldus published a public notice in 1503 telling buyers how to spot the fakes — trademark infringement and brand policing, four centuries before the modern law. Every one of these marks solved the same problem: *trust at a distance*, between people who would never meet.

The craft. A designer needs a working map of the law, so here it is (the basics, not legal advice). A **trademark** identifies the *source* of goods or services; it is a different right from **copyright** (which protects creative works like your illustrations, automatically, from creation) and from a **patent** (which protects inventions). Trademark rights in America arise from *use* in trade — the TM mark claims them — and grow much stronger with federal *registration* (®) under the Lanham Act of 1946. Marks live on a **spectrum of distinctiveness**: invented words and arbitrary marks are strongest (a made-up word, or an unrelated common word applied to a product); suggestive marks are middling; descriptive marks ('Creamy Yogurt') are weak and protectable only after long use proves people associate them with one source; generic words ('Bakery' for a bakery) can never be owned. And a mark can die: when the public turns a trademark into the common noun for the thing itself, courts may declare it generic — in the United States this *genericide* killed aspirin, escalator and thermos as trademarks. The practical designer's duties follow: search before you propose a name or mark (the USPTO's free public search, plus plain web and state searches, is the first pass — final clearance belongs to a trademark attorney), design marks distinctive enough to protect, and never imitate an existing mark.

In the studio. Keep three words straight, because clients confuse them and you must not. The **logo** is the mark itself — the triangle, the anchor, the drawn name. The **identity** is the whole designed system the mark commands: colors, typefaces, layouts, packaging, the look of everything the company shows the world (Unit 8.4 builds one). The **brand** is neither of those: it is the *reputation* — what people believe, expect and feel about the company. You cannot draw a brand; you can only draw the mark that collects the reputation, the way a name collects a man's character. This is why a beautiful logo cannot save a dishonest business, and why Bass could defend a plain red triangle: the triangle meant something because the product behind it was consistent. Designers serve brands the way heralds served knights — the shield must be distinctive, legible and worthy, but the knight still has to keep his oaths.

In the studio, continued. This history is a working toolkit, not trivia. When a client asks 'why can't our logo just be a picture of what we sell,' the distinctiveness spectrum is your answer. When they ask why registration is worth money, Bass and the Lyon counterfeiters are your answer. When they want to name the business a generic word, genericide is your warning. And when you design, the old marks set the bar: the leopard's head, the anchor and dolphin, and the red triangle have outlived every fashion since — simple shapes, one color, meaning earned by conduct. That standard is where the next lesson begins.

PICTURE STUDY



The Aldine Anchor and Dolphin, Aldine Press of Aldus Manutius (woodcut device), Printed March 1509 · Woodcut printer's device on a letterpress page · Title page of Plutarch's Moralia, printed by Aldus Manutius in Venice

Image: Wikimedia Commons, public domain

This is a logo doing its job five hundred years ago. Aldus Manutius printed the classics in Venice in small, affordable, scrupulously edited volumes, and from 1502 every genuine one carried this device: the dolphin for speed, the anchor for steadiness — festina lente, make haste slowly.

Scholars across Europe bought on sight of the mark, and counterfeiters in Lyon copied it onto sloppy fakes, forcing Aldus to publish a warning describing the differences in 1503. One mark: trust, reputation, infringement and brand defense, all before Columbus's generation had passed.

Look closely

- The device is one color and made of two simple interlocking shapes. Would it survive being shrunk to thumbnail size? Stamped in wax? Carved in wood?
- How do the dolphin and anchor share one vertical axis, and what does that symmetry-with-a-twist do for memorability?
- The mark sits alone on the page with generous space. What does that placement say about how Aldus valued it?

- Find the texture of the woodcut lines. Does the slight roughness weaken the mark or humanize it?
- The motto pairs two opposites — haste and slowness. How do the two animals' meanings embody the pairing without any words?

Talk about it

1. This device passed every test Lesson 8.2 will teach — simple, memorable, versatile, appropriate, durable — centuries early. Which test does it pass most impressively, and why?
2. Why would Lyon printers copy this mark rather than invent their own? What exactly were they stealing?
3. A brand is a reputation collected by a mark. What conduct of Aldus's press filled this mark with meaning — and what would have emptied it?

STUDIO BRIEF

Studio brief: Your Own Maker's Mark

Client: you — every artist in this course needs a mark for portfolio pieces, dummy books and future invoices, exactly as masons and printers needed theirs. Deliverable: a personal maker's mark (monogram or small symbol), black only, working at both signature size and letterhead size — plus a short 'brand audit' of a real local business, to train your eye for how marks collect reputation. Deadline feel: three sessions.

You will need

- Pencil, pen and paper; tracing paper is helpful
- Inkscape (or careful pen finish) for the final mark
- A notebook page for the brand audit
- Your initials, and any honest symbol of your work (a tool, a plant, a letterform — nothing occult, nothing copied)

Steps

1. Study precedent for one session: hallmarks, masons' marks and printers' devices (the WIPO video and the picture study). Copy six historical marks small, noting what makes each read at stamp size.
2. List your raw material: initials, a meaningful honest symbol or two, and one word you would want your work to be known by (careful, bold, warm, precise).
3. Sketch 20 small marks in pencil — monograms, initial-plus-symbol, symbol alone. Thick lines only; anything that needs thin detail dies at small size.
4. Test the best five at tiny size: redraw each at about 1 cm. Keep the three that survive.
5. Refine one winner: clean construction, one color, strong silhouette. Build it in Inkscape with the Unit 6 Bézier and Boolean skills (or ink it carefully twice, small and large).
6. Stamp-test it: place it on a corner of three past works (lightly, in pencil or digitally). Does it sit without shouting?

7. Brand audit: choose a local business your family knows. Record its mark (sketch it from memory first, then from life), then interview one family member: 'What do you think of when I name this business?' Write five lines separating the mark (what it looks like), the identity (where and how it appears) and the brand (the reputation you just heard).
8. Write three sentences connecting the audit to your own mark: what reputation do you intend your mark to collect, and what conduct will fill it?

Tips

- The memory-sketch step of the audit is revealing: whatever your family member drew correctly is the part of that mark doing its job.
- A maker's mark is for decades — avoid this year's styling tricks.
- If your monogram tangles, let one letter dominate and the other serve; equal letters usually fight.

Check your work

- ☐ My mark reads clearly at 1 cm, in one color.
- ☐ It is built cleanly (smooth curves, deliberate shapes) and sits politely on a work's corner.
- ☐ My audit correctly separates logo, identity and brand for a real business, with the reputation stated in the subject's own words.

SKETCHBOOK

1. A dated timeline of marks from this lesson: Roman brick stamps, masons' marks, the 1300 leopard's head, Goldsmiths' Hall 1478, Mainz Psalter 1457, Aldus 1502–03, the 1875 Act and Bass triangle 1876, Lanham Act 1946 — with a thumbnail sketch beside each.
2. Your six copied historical marks with one-line notes on why each survives at stamp size.
3. The 20 maker's-mark sketches with the three tiny-size survivors circled and the final mark drawn large and small.

> **From history.** Trademark law's purpose is often misread as protecting companies. Its first purpose, running back through the guild statutes, is protecting buyers: the leopard's head existed so a widow buying a spoon was not cheated on the silver. The company's right is derivative — it may stop imitators because imitation deceives customers. That ordering is worth a designer's remembering: the mark's first duty is honest identification. 'A false balance is abomination to the LORD: but a just weight is his delight' (Prov. 11:1) was carved, in spirit, into every assay office in Europe.

PRACTICE

1. Easy What was UK registered trade mark No. 1, and what date made it possible?

   Show answer

   The Bass red triangle; the Trade Mark Registration Act came into force on 1 January 1876 and Bass registered first.

2. Easy Why did medieval guilds require masters' marks on goods?

   Show answer

   So work could be traced to its maker — bad work punished, good work rewarded — protecting both buyers and the guild's collective reputation.

3. Easy What is a hallmark, where does the word come from, and how old is the English leopard's head requirement?

   Show answer

   An official purity mark struck on precious metal after assay; named for Goldsmiths' Hall in London (assaying there from 1478); the leopard's head on silver was required by law from 1300.

4. Easy Match the right to what it protects: trademark, copyright, patent.

   Show answer

   Trademark: source identifiers (names, marks) in trade. Copyright: creative works (pictures, text, music). Patent: inventions.

5. **Medium** What is the difference between TM and ®, and when is using ® unlawful?

Show answer

TM claims trademark rights in a mark being used; ® declares a federally registered mark (USPTO, Lanham Act 1946). Using ® on an unregistered mark is unlawful.

6. **Medium** Rank these for distinctiveness and protectability: 'Bakery' for a bakery; 'Swift' for a courier; an invented word; 'Fresh Hot Bread' for a bakery.

Show answer

Invented word (strongest, fanciful); 'Swift' for a courier (suggestive — hints at speed); 'Fresh Hot Bread' (descriptive — weak, protectable only with proven association); 'Bakery' (generic — never protectable).

7. **Medium** Explain genericide with two of the US examples, and name one habit companies use to fight it.

Show answer

When the public uses a mark as the common noun for the product, courts can rule it generic and unprotectable — as happened to aspirin and escalator (also thermos) in the US. Companies fight it by using the mark as an adjective with a generic noun ('LEGO bricks,' 'Band-Aid brand bandages') and correcting generic use.

8. **Medium** Aldus Manutius published a notice in 1503 about Lyon printers copying his anchor-and-dolphin device. What modern problem and modern remedy does this story anticipate?

Show answer

Counterfeiting/trademark infringement trading on a trusted mark; the modern remedy is registration and legal enforcement — plus exactly what Aldus did: telling customers how to recognize the genuine article.

9. Hard Logo, identity, brand: define all three in one sentence each, then apply them to a business you know (a local shop, a ministry, a product).

Show answer

Logo: the mark itself. Identity: the designed system the mark commands — color, type, layouts, packaging. Brand: the reputation people attach to the mark. Application varies; a good answer locates each (the sign over the door; the matching menus, aprons and bags; what neighbors say about the place).

10. Hard A client wants to open 'The Coffee Shop' and trademark that name nationally. Advise them in three sentences, using this lesson's law.

Show answer

Model answer: 'The Coffee Shop' is generic-to-descriptive for a coffee shop, so it is weak or impossible to protect and anyone may use similar wording. A distinctive name — invented, arbitrary or suggestive — can be owned, searched and registered. Let's develop name candidates, run USPTO and web searches, and have a trademark attorney clear the finalist before you print anything.

11. Hard Why is 'trust at a distance' the single idea uniting hallmarks, printers' devices and modern trademarks? Write a short paragraph.

Show answer

Model answer: all three let a stranger rely on a maker they will never meet — the assay office vouches for the silver, Aldus's dolphin vouches for the text, the registered mark vouches for the source. Each mark concentrates a reputation into a sign that travels where the maker cannot, and each is protected (by guild, by notice, by law) precisely because trust is valuable enough to steal.

COMMON MISTAKES

- Confusing copyright with trademark — your drawing of a mark is copyrightable art, but only use in trade (and registration) makes it a protectable trademark.
- Designing or proposing a mark without searching first; a beautiful mark that infringes is a liability, not a deliverable.
- Saying 'brand' when you mean 'logo' in front of clients — the designer who keeps the words straight instantly sounds professional.
- Building a personal mark with fine detail that vanishes (or clogs) at signature size.

Make it a game · Mark or Myth. A parent reads statements mixing this lesson's facts with plausible fakes: 'The Bass triangle was registered in 1876' (true), 'The ® symbol may be used on any mark in use' (false), 'Escalator was once a trademark' (true), 'Copyright protects brand names' (false). You call mark or myth in five seconds and must correct every myth. Ten statements; eight right unlocks the title of Junior Examiner of Trade Marks.

Scripture. “A good name is rather to be chosen than great riches, and loving favour rather than silver and gold.” (Proverbs 22:1, KJV)

Here is the whole theology of branding in one verse. The mark is only a vessel; the 'good name' — reputation earned by honest conduct — is the treasure, worth more than the riches it brings. Design the vessel well, and counsel your clients that conduct fills it.

8.2 What Makes a Logo Good: Simple, Memorable, Versatile

OBJECTIVES

- Classify logos by type — wordmark, lettermark, pictorial symbol, abstract mark, combination mark, emblem — and say when each type serves best.
- Judge a mark by the professional tests: simplicity, memorability, versatility (one-color and scale tests), appropriateness and longevity.
- Tell the stories of Paul Rand (IBM, ABC, UPS, NeXT), Saul Bass (Bell System, AT&T) and the NASA meatball and worm, and draw working principles from them.

> **Warm-up.** The memory test, on yourself: draw from memory, in 30 seconds each, the marks of three companies everyone knows (a shoe company, a car maker, a fast-food chain). Then find the real marks and compare. What did your memory keep? Whatever survived — one shape, one gesture, one letter — is what a logo actually is.

WATCH

4 Principles For PROFESSIONAL Logo Design (Test Included)

Satori Graphics · 10:05

https://www.youtube.com/watch?v=w0M3Z3oTh08

> **WHEN TO WATCH**
> After the craft paragraph. Take the built-in test honestly and compare his principles with this lesson's five tests — where do they overlap and what does each list have that the other lacks?

Note: A professional logo designer's principles with strong visual examples. Fast-paced; pause at each example mark and run the one-color and scale questions yourself before he answers them.

BACKUP VIDEO

3 Principles to Improve Your Logo Design Process - Legibility, Hierarchy, and Contrast

The Futur Academy · 6:13

https://www.youtube.com/watch?v=dBIq0KArHFE

Second session, before critiquing your warm-up marks — three more lenses (legibility, hierarchy, contrast) that apply Unit 2 and Unit 3 skills directly to marks.

KEY TERMS

wordmark

The full name set or drawn as the mark itself (a styled company name with no separate symbol).

lettermark

A monogram mark built from initials — the choice when the name is long but the initials are known.

pictorial symbol

A recognizable object drawn as the mark — an apple, a shell, a bird.

abstract mark

A non-representational shape built to acquire meaning through use — strong for companies whose work has no obvious picture.

combination mark

Symbol plus wordmark designed to work together and apart; the most common identity package today.

emblem

Name and symbol locked inside one container shape, like a badge or seal — dignified, but the least flexible at small sizes.

one-color test

Reducing a mark to solid black (and reversed white) to check that it survives without color, gradients or effects — as it must on a fax, a stamp, an engraving or a one-color print job.

scale test

Viewing a mark at favicon size (16 pixels) and at sign size to check it stays legible and balanced at both extremes.

CORE IDEAS

The story. Two designers did more than anyone to define the modern logo. Paul Rand (1914–1996), a Brooklyn grocer's son, brought European modernism into American business: the ABC circle mark (1962), the UPS shield with its bow-tied parcel (1961), Westinghouse's circled W (1960), and two decades of work for IBM, whose eight-bar striped letters (1972) turned three heavy slabs into something optical and light — the stripes borrowed from the scan lines of the machine age. Rand wrote that a logo is 'a flag, a signature, an escutcheon' — it identifies; it does not describe. Saul Bass (1920–1996), famous first for film title sequences, redrew the Bell System's bell in 1969 — the rollout reached hundreds of thousands of trucks, booths and buildings, among the largest identity programs ever attempted — and when the

Bell System was broken up, his 1983 globe for AT&T carried the successor company. Between them sits a government case study: NASA's original 1959 insignia (nicknamed the 'meatball'), a busy badge of planet, stars, orbit and wing, was replaced in 1975 by Danne & Blackburn's radically simple red 'worm' logotype under the federal design-improvement program — then the meatball was brought back in 1992, and the worm revived alongside it in 2020. Two good marks, two philosophies — badge versus mark — arguing publicly for fifty years.

How they figured it out. Rand's method was reduction with wit. He began with the problem, not the pencil: what must this mark do, everywhere, for decades? Then he cut away everything that did not serve. The UPS problem: make a delivery company feel safe and personal — his shield (heritage, security) wears a wrapped parcel with a bow (your package, cared for). The IBM problem: a huge company that needed to feel precise, not heavy — stripes gave the monogram rhythm and air. Bass tested marks the way engineers test parts: his studio shot logos out of focus, at distance, in motion, tiny and enormous, because a trademark lives in glimpses — on a truck passing at forty miles an hour, embroidered on a pocket, stamped in one color on an invoice. Both men insisted on the same discipline you will practice: the mark must be simple enough to survive abuse, distinctive enough to be remembered from a glimpse, and abstract enough to grow with the company (a pictorial pizza slice traps the pizzeria that starts selling sandwiches).

The craft. First, know the six types and their trades. A *wordmark* makes the name itself memorable — right when the name is short and distinctive. A *lettermark* compresses a long name into ownable initials. A *pictorial symbol* is instantly nameable ('the apple one') but must avoid describing the product too literally. An *abstract mark* describes nothing and can therefore mean anything the company earns — strongest for broad or changing businesses, weakest on day one. A *combination mark* pairs symbol and wordmark, used together while the symbol earns the right to stand alone. An *emblem* locks name into badge — dignified for schools, teams and ministries, but it fails small: the name shrinks with the badge. Second, run the five tests on every candidate. **Simple:** can you describe it in one phrase, and draw it from memory after one look? **Memorable:** what one feature does the memory keep? If the answer is 'nothing in particular,' the mark is wallpaper. **Versatile:** the one-color test (solid black, then reversed white — no gradients, no effects) and the scale test (crisp at 16-pixel favicon, composed at building size). **Appropriate:** right in feeling for the

business — a bank and a toy store should not swap marks — without literally illustrating the product. **Durable:** would it have looked sane twenty years ago, and will it in twenty more? Trend styling is a rented suit; a logo needs its own clothes.

In the studio. Professionals judge marks in grayscale first, at small sizes first — exactly backwards from the amateur, who judges a full-color rendering at full screen. Set up your critique sheet the studio way: the candidate mark repeated at 16 px, 1 in, and 4 in; in black, in white-on-black, and in one color; beside its name set in a plain typeface. Then ask the five tests out loud and write the answers. When you critique famous marks (the practice problems do), be fair about history: a mark that looks inevitable now — the Aldine dolphin, the Bass triangle, Rand's stripes — looked radical when proposed, and part of its 'rightness' is decades of consistent use filling it with meaning. That is the same lesson as 8.1: the mark collects; conduct fills. Your job as designer is to make a vessel that cannot leak — simple enough to survive, distinct enough to hold.

In the studio, continued. One more professional habit: name the mark's *one idea*. Strong marks can be stated in a sentence — 'a parcel with a bow on a shield,' 'a dolphin on an anchor: speed held steady,' 'eight stripes make three letters precise.' If a candidate needs a paragraph, it has too many ideas; if it needs no sentence at all, it may have none. You will use this sentence discipline in the 8.3 process (every sketch gets a muttered caption) and in the 8.5 presentation (the client hears the sentence before they see the mark).

PICTURE STUDY



His Master's Voice, Francis Barraud, 1898–1900 · Oil on canvas · EMI Archive Trust, United Kingdom (original painting)

Image: Wikimedia Commons, public domain

In the winter of 1898 the English painter Francis Barraud painted something he had actually seen: his late brother's fox terrier, Nipper, puzzling at the horn of a talking machine, head cocked, listening for the master whose voice it played. Barraud titled it His Master's Voice. In 1899 The Gramophone Company bought the painting and its copyright for £100 — on the condition that Barraud repaint the machine as one of their disc gramophones — and the image went on to serve as the trademark of His Master's Voice, Victor and RCA for most of a century, pressed onto hundreds of millions of record labels.

Test it against this lesson's three measures. Simple: one dog, one horn, nothing else — readable at the size of a coin in the middle of a spinning record. Memorable: it tells a complete story, loyalty hearing its master, in a single glance; people who saw it once named their own dogs Nipper. Versatile: it survived engraving, embossing, one-color printing and sixty years of changing machines, because the idea never depended on rendering. Few marks ever drawn pass all three tests so completely.

Look closely

- Squint the image down to logo size. What two shapes survive — and is that enough to recognize it?

- The dog's cocked head is the whole story. Cover it mentally with a level head: what dies?
- Run the one-color test from this lesson: would this image work in plain black on a record label? What makes it immune to losing its colors?
- The painting has a story a child can retell after one look. Say it in one sentence — then count how many famous logos you can do that for.
- What in the image dates it to 1900 — and why didn't that stop it working for sixty more years?

Talk about it

1. Barraud painted a real moment, and the sincerity shows. What is the difference between a mark with a true story and a mascot invented by committee?
2. The company bought the copyright, not just the canvas, and required one change before the deal closed. What does this 1899 transaction teach about logos, ownership and client revisions?
3. A dog listening to a horn says nothing literal about price, quality or technology. Why did it still make a better trademark than a picture of the product would have?

STUDIO BRIEF

Studio brief: The Logo Test Lab

Client: your own studio — before you design marks (next lesson), you must prove you can judge them. Deliverable: a 'test lab' critique board of six real marks, run through the full professional battery, plus a one-page verdict memo written as if advising the mark's owner. Deadline feel: three sessions.

You will need

- Six real marks you can study: products at home, local businesses, your church or co-op, a school — sketched or (for this private exercise) photographed
- Paper and pen; Inkscape or GIMP to make one-color and small-size versions, or careful hand redraws
- A ruler and the five-test checklist from the craft paragraph
- Index cards for the memory test with family members

Steps

1. Choose six marks covering at least four of the six types (wordmark, lettermark, pictorial, abstract, combination, emblem). Classify each and state its one idea in a sentence — or record honestly that you cannot.
2. Build the versatility sheet for each mark: redraw or convert it to solid black, then white-on-black, then at roughly 16-pixel size and at 4 inches. Note exactly what breaks and at which step.
3. Run the memory test on two family members per mark: let them look for five seconds, wait ten minutes, then have them draw it. Keep the drawings — they are data.
4. Score each mark 1–5 on each of the five tests, in grayscale, small sizes first. Total the scores and rank your six marks.
5. For the top mark, write three sentences on why it wins — connect its virtues to Rand's and Bass's principles.
6. For the bottom mark, write the kind-but-firm verdict memo (like practice problem 10): what works, what fails which tests, and the one structural

change you would recommend.

7. Pin or lay out the whole board: six marks, their test sheets, memory drawings and scores. Review it with a parent, defending any score they challenge.
8. Write the lab's closing line: the single rule from this exercise you most want your own future marks to obey.

Tips

- Do the one-color conversion honestly — tracing the real shapes, not idealizing them. Weak marks hide in their colors.
- The family memory drawings are the gold of this project: whatever everyone remembered, however crudely, is the mark's true core.
- Keep critique charitable and specific: 'the inner detail clogs at 16 px' teaches; 'it's ugly' doesn't.

Check your work

- ☐ My board covers at least four types, each classified correctly with a one-idea sentence attempted.
- ☐ Every mark has a true one-color version and a small-size check, with failures noted precisely.
- ☐ My two memos (best and worst) judge by the five tests, kindly and firmly, and my closing rule is concrete.

SKETCHBOOK

1. The six-type taxonomy page: a thumbnail example of each type from memory or observation, with its trade-offs noted.
2. Your warm-up memory drawings beside the real marks, annotated: what memory kept, what it threw away.
3. A 'glimpse diary': five marks seen out and about this week, each sketched in under ten seconds from a single glance — training for designing marks that live in glimpses.

> **From history.** When Rand presented the striped IBM letters, executives worried the stripes looked like prison bars; Rand had prepared variations and rationale enough to carry the room — the design was inseparable from its argument, a lesson Lesson 8.5 builds on. And when AT&T needed a mark after the Bell breakup, Bass's team reportedly explored hundreds of globe variations before the twelve-line version was chosen: even for a master, simplicity is not the first idea but the last one standing. The clean mark on the page is the visible tip of an invisible mountain of rejected drawings — which is exactly what your fifty sketches are for in the next lesson.

PRACTICE

1. Easy Name the six logo types and one example business where each shines.

   Show answer

   Wordmark (short distinctive name — a startup with an invented name); lettermark (long institutional name — a broadcasting corporation); pictorial symbol (a brand wanting instant nameability — 'the shell one'); abstract mark (broad or changing business — a conglomerate); combination mark (most small businesses — symbol earns independence over time); emblem (schools, teams, ministries — badge dignity, used large).

2. Easy What are the five tests of a good mark from this lesson?

   Show answer

   Simple, memorable, versatile (one-color and scale tests), appropriate, durable.

3. Easy Who designed the IBM stripes, the ABC circle and the UPS bow-tied shield, and in which years?

   Show answer

   Paul Rand — UPS 1961, ABC 1962, IBM's eight-bar striped letters 1972 (after beginning with IBM in the 1950s).

4. Easy Why must a logo pass the one-color test even in an age of cheap full-color printing?

   Show answer

   Because the mark will still live one-colored lives: engraving, embossing, embroidery, stamps, faxes and photocopies, single-color print jobs, reversed-out footers — and a mark that depends on gradients or effects falls apart there.

5. **Medium** Tell the NASA meatball-and-worm story with its four dates, and give one argument for each mark.

Show answer

Meatball insignia 1959; worm logotype by Danne & Blackburn 1975 (federal design-improvement era); worm retired and meatball restored 1992; worm revived alongside the meatball 2020. For the meatball: heritage, badge richness, beloved symbolism. For the worm: radical simplicity, flawless scaling and reproduction, modern confidence.

6. **Medium** Rand said a logo 'identifies' rather than 'describes.' Explain the difference using a pizzeria that may someday sell sandwiches.

Show answer

A describing mark (a pizza slice) names today's product and traps tomorrow's menu; an identifying mark (a distinctive name, letter or shape) points at the maker, not the merchandise, so the business can grow without redesign. Identification ages well because reputations, not products, are what marks collect.

7. **Medium** Run the full five-test critique on your own warm-up memory drawings: which features survived your memory, and what does that teach about what to design for?

Show answer

Answers vary. Strong answers notice that memory kept one dominant shape or gesture and discarded detail, color subtleties and taglines — therefore design the one survivable feature on purpose and subordinate everything else.

8. **Medium** An emblem badge looks magnificent on the client's building. What goes wrong on the app icon and the pen, and which type conversion rescues it?

Show answer

The name inside the badge becomes unreadable at small sizes and the detail clogs. Rescue: develop a combination system — extract a simplified symbol (or lettermark) from the emblem for small uses, keeping the full badge for large, formal ones.

9. Hard Critique task. Choose any two marks you can see from your desk (products, books, appliances). For each: classify the type, state its one idea in a sentence, run the five tests, and give a verdict with one improvement.

Show answer

Answers vary. A good answer classifies correctly, produces an honest one-sentence idea (or honestly reports there isn't one), tests at one color and small size by actually trying it, and proposes a concrete improvement (simplify a detail, strengthen the silhouette, separate symbol from name).

10. Hard A client's nephew made a logo with a photo-realistic eagle, a gradient globe, the full business name, a tagline and a ribbon. Applying this lesson, write the three kindest, firmest sentences of your professional assessment.

Show answer

Model answer: 'There is real love for the business in this — and that eagle tells me boldness is the feeling we want, so let's keep that. As a working mark it will struggle: at stamp and icon sizes the photo detail, gradient and small type disappear, and in one color they vanish entirely. I'd propose we distill it — one bold eagle silhouette or a strong lettermark, name set beside it — so the boldness survives everywhere the logo must live.'

11. Hard Why might a deliberately 'empty' abstract mark be the strongest choice for a company planning decades of growth — and what is the honest cost of that choice on launch day?

Show answer

An abstract mark describes nothing, so it never contradicts a changing business, and decades of consistent use fill it with exactly and only the company's own reputation. The cost: on day one it means nothing, so it needs more repetition, discipline and budget before it earns recognition — a trade of early convenience for long-term capacity.

COMMON MISTAKES

- Judging logos in full color at full screen first, when their real lives are small, fast and often one-colored.
- Mistaking decoration for identity — gradients, bevels and trends age in years; structure lasts decades.

- Choosing a literal pictorial mark that describes today's product and traps tomorrow's business.
- Critiquing famous marks without crediting the decades of consistent use that filled them with meaning.

Make it a game · Five-Second Flash. A parent shows you a product mark for five seconds, then hides it. You must (1) classify its type, (2) state its one idea in a sentence, and (3) draw its silhouette from memory — one point each, judged honestly. Then reverse roles. Eight marks; the winner designs the family's imaginary crest, which must itself pass the one-color test.

Scripture. “Even a child is known by his doings, whether his work be pure, and whether it be right.” (Proverbs 20:11, KJV)

Even a child is identified by what he consistently does — known, in effect, by his mark. A logo works the same way: it is not decoration but a sign that stands for conduct, and it earns its meaning only from the pure and right work done under it.

8.3 The Logo Process: Brief, Research, Sketches, Refinement

OBJECTIVES

- Run the professional logo process in order: brief, research, 50 thumbnail sketches, three directions, refinement, vector construction.
- Use grids, consistent radii and the golden ratio honestly as refinement tools — knowing what they can and cannot do.
- Construct a clean final mark in Inkscape with deliberate curves, Boolean operations and a tested one-color version.

> **Warm-up.** Take any capital letter and a sheet of scrap paper. Set a timer for five minutes and draw the letter twenty different ways — thick, thin, boxed, rounded, broken, doubled. Do not stop before twenty. Notice where the good ones came: almost never in the first five. That is the whole argument for the fifty-sketch discipline, felt in your own hand.

WATCH

How To Sketch Logo Design Ideas (Professionally) 🚀

Will Paterson · 10:06

https://www.youtube.com/watch?v=ikrVDEhblg8

> **WHEN TO WATCH**
> Before your first sketching session. Copy his page setup — small boxes, fast pencil, captions — for your own fifty.

Note: A professional logo and lettering designer shows exactly how working sketch pages look: small, rough, plentiful and annotated. Notice how unprecious every single drawing is; volume first, selection after.

BACKUP VIDEO

How To Design A Logo with Inkscape

Logos By Nick · 14:10

https://www.youtube.com/watch?v=cESqiwJcJ6Y

At the vector-construction step. Nick Saporito builds a mark in the same free tool you are using — watch his node economy: few points, deliberate handles.

KEY TERMS

design brief

The written foundation of a logo job: what the business does and believes, who its customers are, what feeling the mark must carry, where it will live, and what already exists.

competitor audit

Research into the marks of similar businesses so your design can be deliberately different — distinctiveness is relative to the field it must stand out in.

thumbnail sketching

Generating many small, fast, rough mark ideas — fifty is the professional discipline — before judging any of them.

direction

One of the few (usually three) distinct concepts chosen from the sketch pages to refine — different ideas, not three versions of one idea.

construction grid

The guides, circles and consistent radii used to tidy a chosen mark: equal weights, aligned terminals, deliberate curves.

golden ratio (ϕ)

The proportion $\varphi = \frac{1+\sqrt{5}}{2} \approx 1.618$, where the whole relates to the larger part as the larger part relates to the smaller; one honest tool among several for choosing related sizes.

vectorizing

Rebuilding the refined sketch as clean Bézier geometry so the mark scales infinitely — drawn deliberately with few nodes, not auto-traced.

CORE IDEAS

The story. In 1994 the overnight-shipping giant Federal Express hired Landor Associates of San Francisco to rethink its identity. The senior designer, Lindon Leader, led an exploration that produced some two hundred logo concepts before anything was shown. Along the way, Leader noticed that in a tight setting of the shortened name 'FedEx,' the space between the capital E and the lowercase x wanted to become an arrow. He rebuilt the letterforms — blending two typefaces, Univers 67 and Futura Bold, into custom letters — until the arrow sat perfectly in the negative space: invisible until seen, unforgettable after. The FedEx wordmark launched in

1994, won more than forty design awards, and became the standard classroom example of two professional truths. First, the famous arrow was not a lightning bolt of genius; it was found deep in a disciplined pile of two hundred attempts. Second, the cleverness is quiet: the mark works completely for people who never see the arrow, and delights the people who do.

How they figured it out. Every seasoned studio converges on the same sequence, because each step exists to keep the next one honest. The **brief** comes first and in writing: what the business does, what it believes, who buys from it, the three feelings the mark must carry (and two it must avoid), every place the mark will live, and any history that must be kept. **Research** follows — not for things to copy but for things to avoid: audit the competitors' marks, and the clichés of the trade (every plumber's droplet, every tutor's owl), because distinctiveness is relative; map the field, then leave it. Only then come the **fifty sketches**, small and fast, pencil on paper, a muttered caption under each. Fifty is not superstition: like your warm-up, the first dozen flush out the obvious; the clichés die by thirty; what surfaces after is yours. From the pages, choose **three directions** — three genuinely different ideas, not one idea in three hats — and refine each a little before choosing one (in a client job, the client chooses at this gate; in this unit, Lesson 8.5 stages that moment). Then **refinement** and **construction**, below. The sequence is cheap insurance: every hour of brief and research saves days of beautifully drawn wrong answers.

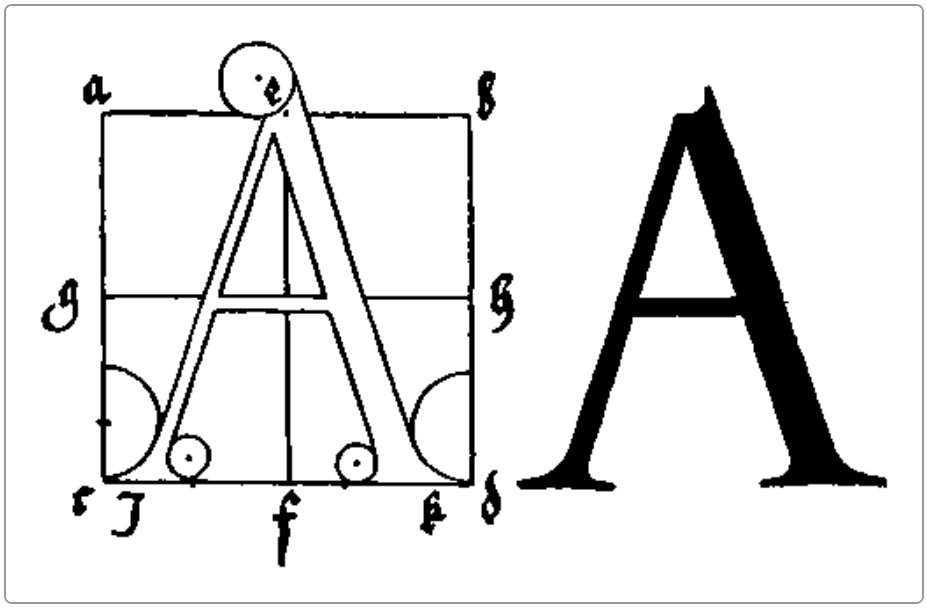
The craft. Refinement is where a promising sketch becomes a professional mark, and it is mostly geometry. Redraw the chosen sketch larger. Even out the stroke weights so the mark has one voice (calipers or squinting both work). Give every curve a deliberate radius, and reuse radii — a mark whose corners share two or three radii feels engineered rather than wobbled. Align terminals and axes to a simple grid. For related sizes — symbol against lettering, inner shape against outer — designers often reach for ratio systems: halves and thirds, the proportions of a chosen rectangle, or the **golden ratio**, $\varphi = (1+\sqrt{5})/2 \approx 1.618$, dividing a whole so the big part relates to the small as the whole relates to the big. Use it honestly: ϕ is one pleasing proportion among several (so is $\sqrt{2} \approx 1.414$, so is 3:2), a tool for making size choices *related instead of arbitrary* — not a secret that makes designs good, whatever the internet posters claim. The same honesty applies to the fashionable circle-grid overlays: drawing circles on a finished logo proves nothing, but *building* with shared circles and radii genuinely tidies curves. Grids refine a good idea; they

cannot rescue a bad one. Rand's stripes and Leader's arrow were ideas first, geometry second.

In the studio. Construction in Inkscape, using Unit 6's skills: set up guides and a document grid; block the mark from primitive shapes (circles, rectangles) wherever possible and weld them with Boolean operations — union, difference, intersection — because primitives carry perfect geometry into the result; where you must draw Béziers by hand, use the fewest nodes that describe the curve (a professional circle quadrant is one segment, not five) and keep handles smooth. Work in solid black only: color is Lesson 8.4's decision, and building in black keeps you honest about silhouette. Test as you build: duplicate the mark at 16 pixels and at full screen, reverse it white-on-black, and step back from the monitor. Then stress it: the mark must survive printing small on an invoice, embroidery on a cap, engraving on a pen. When the geometry is done, tidy the file — union final shapes, delete construction scraps, name the layers — because in 8.5 this file becomes the master from which every client deliverable exports.

In the studio, continued. A note on taste and patience, from the two hundred FedEx concepts: professionals generate past the point of comfort *on purpose*. The amateur falls in love with sketch number four and spends the week polishing it; the professional knows that affection for an early idea is usually just relief at having any idea. Fifty sketches cost two or three sessions and give you something priceless in the client meeting: the honest sentence 'we explored broadly, and this direction won for reasons I can show you.' Keep every page. The rejected sketches are not waste — they are the evidence that the survivor earned it, and more than one studio has rescued next year's mark from last year's reject pile.

PICTURE STUDY



The Construction of the Letter A, Albrecht Dürer, From Underweysung der Messung; this plate from the 1528 printing (first published 1525) · Woodcut diagram · Dürer's treatise 'Instruction in Measurement with Compass and Ruler,' Nuremberg

Image: Wikimedia Commons, public domain

Five centuries before vector grids, Albrecht Dürer published exact instructions for constructing Roman capital letters with compass and ruler: each letter in a square, stem widths as fractions of its side, serifs swung with stated circle radii. His treatise on measurement (1525) taught German craftsmen the geometry beneath the ancient Roman inscriptions.

Look at this A the way you look at your own refinement stage: an idea (the Roman letter, a thousand years old by Dürer's time) being tidied by geometry — radii chosen and repeated, weights made deliberate. Dürer did not believe the compass invented the letter; he believed it perfected what the eye had already judged. That is exactly the honest claim this lesson makes for grids and ϕ.

Look closely

- Find the square that contains the letter. What fraction of its side is the thick stem's width, as near as you can measure?
- Count the compass circles. What jobs are they doing — which curves of the letter do they define?
- The two legs of the A are different thicknesses. Is that inconsistency or system? Where else do Roman capitals thick-and-thin like this (recall Unit 3)?

- Where do you see repeated radii — the same circle size reused for different serifs?
- What in this diagram could a ruler and compass not decide? What had to be judged by eye?

Talk about it

1. Dürer wrote construction rules for letters that stonecutters had drawn beautifully by eye for centuries. What does systematizing add — and what does it risk?
2. How is this plate an ancestor of your Inkscape construction stage — primitives, shared radii, deliberate geometry?
3. A modern designer overlays circles on a finished logo to impress a client; Dürer drew circles to build the letter. State the difference in one sentence.

Safety first. Vector construction means long, close screen sessions. Follow the 20-20-20 rule — every 20 minutes, look at something 20 feet away for 20 seconds — and stand and stretch wrists and shoulders between steps. Position the screen at arm's length with the top near eye level; node-editing hunched over a laptop is how designers buy neck trouble.

STUDIO BRIEF

Studio brief: Stonebridge Woodworks, Part One — Brief to Vector

Client: Stonebridge Woodworks (fictional), a two-man custom furniture shop in your town — a father and son who build heirloom tables and benches from local hardwood. They have no mark at all; the truck door and invoices just say the name in plain type. Deliverable for this brief: the full front half of the logo process — written brief, research audit, fifty sketches, three refined directions, and ONE direction constructed as a clean black vector in Inkscape. (Color, type and the brand guide come in 8.4; the presentation and files in 8.5. Keep everything.) Deadline feel: all three sessions, honestly logged.

You will need

- Pencil and plenty of cheap paper ruled into small boxes (about 25 per page)
- Inkscape, with a STONEBRIDGE job folder: brief, research, sketches, vector
- A timer and your hours log (8.5 prices this job from it)
- A parent to play the client for the brief interview (give them three index cards describing the business, which you write first from this intro)

Steps

1. Write the brief by interviewing your 'client' for ten minutes: what they make, what they believe about their work, who buys, the three feelings the mark must carry (e.g., crafted, honest, lasting) and two to avoid (e.g., rustic-kitschy, corporate), everywhere the mark will live (truck door, branded stamp burned into wood, invoice, small web shop, embroidered caps). Write it as one page and have the client confirm it.
2. Research: audit at least six real furniture or woodworking marks (search or sketch from memory of local shops). Chart the clichés — count the saws, trees and sawblade monograms. Write three sentences on what the field is full of and where the gaps are.
3. Sketch session one: boxes 1–25. Fast pencil, caption each. Include the obvious ideas on purpose — they must be flushed out, and a few may

surprise you.

4. Sketch session two: boxes 26–50. Push into the client's specifics: the stone bridge of the name, joinery shapes (dovetail, mortise), the initials, the idea of two generations. No stopping before fifty.
5. Choose three genuinely different directions (mark them A, B, C) and refine each on its own sheet, larger, cleaning weights and shapes — fifteen minutes each, no more.
6. Pick the strongest (write two sentences defending the choice against the brief — the brief, not your affection, is the judge).
7. Construct it in Inkscape in solid black: guides and grid first; primitives and Booleans where possible; minimal-node Béziers elsewhere; even weights; shared radii (state your radius family in a text note beside the mark, e.g., '12 / 6 px').
8. Apply one ratio system deliberately somewhere — φ or halves — for two related sizes in the mark, and note it beside the radius family.
9. Test: export or view at 16 px, 1 in, and full screen; make the white-on-black version; fix what breaks. Save the tidy master file and back it up.

Tips

- Caption every thumbnail, even 'bridge + dovetail, too busy' — captions are how pages of scribbles stay useful next week.
- When choosing directions, let the brief's 'feelings to avoid' veto as powerfully as the 'feelings to carry' elect.
- In Inkscape, zoom out as often as you zoom in; marks are judged at arm's length, not at 6400%.

Check your work

- ☐ My brief page exists, client-confirmed, and my audit names the field's clichés with counts.
- ☐ All fifty numbered sketches exist with captions; my three directions are genuinely different ideas.
- ☐ My black vector is clean (few nodes, even weights, stated radius and ratio families) and survives 16 px and reversal.

- [ ] My hours log is current through this stage.

SKETCHBOOK

1. The Stonebridge brief page and the competitor-cliché tally chart.
2. All fifty captioned thumbnails (tape or scan them in), with the three directions circled and your two-sentence defense of the winner.
3. A construction plate of your final mark, Dürer-style: the mark large, with its grid, radius family and ratio choices drawn and labeled.

KEY FORMULAS

$$\varphi = \frac{1+\sqrt{5}}{2} \approx 1.618, \qquad \frac{a+b}{a} = \frac{a}{b} = \varphi$$

$$\text{larger} = \text{smaller} \times \varphi, \qquad \text{smaller} = \frac{\text{larger}}{\varphi}$$

golden rectangle: $1 : 1.618$; alternatives: $1 : \sqrt{2} \approx 1 : 1.414$, $2 : 3$, $3 : 4$

From history. Dürer's letter constructions had a practical purpose: Nuremberg's craftsmen — masons, painters, goldsmiths — needed to letter buildings and monuments at sizes where eyeballing fails, and his treatise put the geometry of the ancient Roman capitals into any careful workman's hands. He was honest about the limits, adjusting his constructions where the eye demanded it. The twentieth century repaid the compliment: when typographers revived classical Roman capitals for metal and then digital type, Dürer's plates were on their desks. Good geometry, honestly used, travels five hundred years.

WORKED EXAMPLES

Example 1. Your symbol is 34 mm tall and you want the lettering height related to it by the golden ratio. What lettering heights are available, and which would you test first for a combination mark?

Show solution

1. Smaller companion: $34 \div 1.618 \approx 21$ mm.
2. Next step down (for a tagline or secondary line): $21 \div 1.618 \approx 13$ mm.
3. Test 21 mm lettering beside the 34 mm symbol first: the symbol clearly leads, the name clearly matters — related, not arbitrary. Trust your eye over the arithmetic for the final nudge.

Answer: About 21 mm (and 13 mm for a third level); start with 21 mm and adjust optically.

Example 2. You are designing inside a golden rectangle whose short side is 40 mm. Find the long side, and show how subtracting the 40 mm square leaves another golden rectangle.

Show solution

1. Long side: $40 \times 1.618 \approx 64.7$ mm.
2. Remove the 40×40 square: the remainder is 40×24.7 mm.
3. Check its ratio: $40/24.7 \approx 1.62 \approx \varphi$ — the leftover is golden again, which is why the proportion nests so gracefully in construction grids.

Answer: Long side ≈ 64.7 mm; the leftover 40 × 24.7 mm rectangle is again golden (ratio ≈ 1.618).

Example 3. A refined mark uses corner radii of 12 px, 11 px, 13 px and 12.5 px, all meant to look equal. Why does it feel 'off,' and what is the fix? Then: the designer wants a second, smaller radius family 'related' to 12 px — propose two defensible options.

Show solution

1. Near-equal-but-not-equal values read as wobble: the eye detects the inconsistency without naming it. Fix: snap all four to exactly 12 px.
2. Related smaller family, option 1 (halves): $12/2 = 6$ px.
3. Option 2 (golden): $12/1.618 \approx 7.4 \approx 7.5$ px. Either is defensible; the crime is a random 8.7.

Answer: Snap the radii to one value (12 px); derive the second family by a stated ratio — 6 px (halves) or about 7.5 px (ϕ).

PRACTICE

1. Easy List the six steps of the logo process in order.

   Show answer

   Brief, research (competitor and cliché audit), fifty thumbnail sketches, three directions, refinement on grids, vector construction.

2. Easy What five things must a logo design brief establish?

   Show answer

   What the business does and believes; who the customers are; the feelings the mark must carry (and avoid); everywhere the mark will live; existing history or equity to keep. (Plus the practical frame: deadline, fee, rounds.)

3. Easy Compute ϕ from its formula and verify that $1/\varphi = \varphi - 1$.

   Show answer

   $(1 + \sqrt{5})/2 = (1 + 2.236)/2 \approx 1.618$; $1/1.618 \approx 0.618 = 1.618 - 1$.

4. Easy Why sketch fifty marks instead of five?

   Show answer

   The first dozen are the obvious answers everyone has; clichés exhaust by about thirty; original, ownable ideas surface in the later pages. Volume is how you get past borrowed thinking — and it arms you to defend the survivor.

5. **Medium** A symbol is 55 px tall. Give the ϕ-related smaller size and the ϕ-related larger size, rounded sensibly.

Show answer

Smaller: $55/1.618 \approx 34$ px; larger: $55 \times 1.618 \approx 89$ px.

6. **Medium** What is the FedEx arrow, how was it found, and what two lessons does it teach?

Show answer

An arrow formed by the negative space between the E and x, discovered during Lindon Leader's 1994 Landor exploration of about two hundred concepts and perfected with custom letterforms blending Univers 67 and Futura Bold. Lessons: strong ideas are found by disciplined volume, not waited for; and the best cleverness is quiet — the mark works even for viewers who never see it.

7. **Medium** 'Three directions' does not mean three versions of one idea. For a fictional bicycle shop, name three genuinely different directions.

Show answer

Example answer: (1) a lettermark — the shop's initial built from handlebar curves; (2) a pictorial mark — a simplified heron whose wings echo wheels (local river bird, memorable); (3) a wordmark — the name in sturdy custom slab letters with a chain-link counter detail. Different concepts, not recolorings.

8. **Medium** Why build a vector mark from primitive shapes and Booleans where possible, rather than freehand Béziers?

Show answer

Primitives carry perfect geometry (true circles, straight edges, exact corners) into the result, so unions and differences stay clean and consistent; freehand nodes wobble. Hand-drawn Béziers are for the curves no primitive provides — with the fewest nodes that describe them.

9. Hard A tutorial claims a famous logo is good because circles overlay neatly on it. Write the honest paragraph you would tell a younger student about grids, circles and ϕ.

Show answer

Model answer: overlays drawn after the fact prove nothing — circles can be fitted to almost anything. Grids, shared radii and ratios like ϕ are construction tools: used while building, they make weights even, curves deliberate and sizes related instead of arbitrary. They refine a good idea and cannot rescue a bad one; the idea, tested at one color and small size, is still the design.

10. Hard Your competitor audit of six local coffee shops finds: four cups, three steam swirls, two beans, one owl. Your client is a coffee shop. What does the audit tell you to do, and what are two honest directions it leaves open?

Show answer

Avoid cups, steam, beans (and that owl): in this field they are camouflage, not identity. Open directions: build on what is specific to this shop — its name, building, street, story or convictions — e.g., a lettermark from its unusual name, or a mark drawn from the shop's historic storefront; identification over description (Rand's rule, 8.2).

11. Hard Construction exercise. On paper, draw a 40 × 64.7 mm golden rectangle, subtract the square, and sketch a simple lettermark whose symbol sits in the square and whose name sits in the leftover golden strip. Report the two heights you used and their ratio.

Show answer

Answers vary; the symbol area is 40 mm square, the strip 24.7 mm wide, so a natural pairing is symbol ≈ 34 mm and lettering ≈ 21 mm (ratio ≈ 1.62). Any pairing is acceptable if the ratio is stated and approximately ϕ.

COMMON MISTAKES

- Falling in love with sketch number four and polishing it all week — affection for an early idea is usually relief, not judgment.
- Presenting three versions of one idea as 'three directions.'
- Using the golden ratio as a selling myth instead of an honest sizing tool — or skipping ratios entirely and shipping arbitrary, wobbly sizes.

- Auto-tracing the pencil sketch instead of rebuilding it with deliberate geometry, which bakes every wobble into the 'final.'
- Designing in color too early, which hides silhouette weaknesses that the one-color test would catch.

Make it a game · Thumbnail Sprint. Set a five-minute timer. A parent names any ordinary business (shoe repair, orchard, tutoring). You fill a 10-box strip with ten captioned thumbnail marks before the bell; the parent then crosses out every cliché they have seen before. Your score is the survivors. Play two rounds — watch the survivor count rise as you learn to skip the obvious faster.

Scripture. “In all labour there is profit: but the talk of the lips tendeth only to penury.” (Proverbs 14:23, KJV)

Talking about the logo produces nothing; drawing the fifty sketches does. The proverb promises that the unglamorous labour of the sketch phase is never wasted — the profit hides in the forty-nine drawings that make the fiftieth possible.

8.4 More Than a Logo: Color, Type and the Brand Guide

OBJECTIVES

- Expand a finished mark into an identity system: logo versions, clear space, minimum sizes, color palette with exact values, type system and imagery rules.
- Explain why identity systems are written down — the NASA 1976 and New York subway 1970 standards manuals as the classic cases.
- Produce a brand one-pager that another person could follow without you in the room.

> **Warm-up.** Find two printed or packaged things from the same company (a box and a bottle, a flyer and a card, two product packages). Lay them side by side and hunt for the system: same mark placement? Same exact color? Same typeface? List three things that match and anything that doesn't. Someone wrote the rules you are reverse-engineering — today you learn to write them.

WATCH

The 'Must Haves' For Brand Guidelines

madebyjames · 14:16

https://www.youtube.com/watch?v=KCMv6HYzvLE

> **WHEN TO WATCH**
> After the craft paragraph. Checklist as you watch: tick every 'must have' this lesson also names, and star anything new to add to your one-pager.

Note: A professional brand designer walks through the sections of real client guidelines — logo rules, color, type, usage. Practical and current; his structure maps almost one-to-one onto the one-pager you will build.

BACKUP VIDEO

Brand Guideline Fundamentals in 11 minutes

Jack Watson · 11:34

https://www.youtube.com/watch?v=DJg4Pl_61B4

Second session, before assembling your own guide — a fast second pass over the same fundamentals from another working designer, useful for seeing which sections every professional includes.

KEY TERMS

identity system

The complete designed kit a mark commands — logo versions, color, type, spacing and imagery rules — so everything a company shows looks like one hand made it.

brand guide (brand guidelines)

The written document of the identity system's rules, from a one-pager for a small shop to a bound manual for a government agency.

logo versions

The approved forms of the mark: primary (full combination), secondary (stacked or horizontal), the symbol alone, and one-color/reversed versions — each with stated uses.

clear space

The protected empty zone around the mark that nothing may enter, usually defined by a unit taken from the mark itself (a letter height, the symbol's width).

minimum size

The smallest reproduction at which each logo version may be used, stated in millimeters for print and pixels for screen.

brand palette

The named colors of the identity with exact values in every needed system — hex and RGB for screens, CMYK for print (Unit 4.3) — plus rules for how much of each to use.

type system

The brand's typefaces and their jobs: display face, text face, weights and the pairings allowed (Unit 3 skills, written into law).

don'ts page

The gallery of forbidden abuses — stretching, recoloring, shadowing, crowding, busy backgrounds — shown crossed out, because people copy pictures faster than they read rules.

CORE IDEAS

The story. In January 1976, NASA's new red logotype arrived at field centers accompanied by something just as important as the mark itself: the *NASA Graphics Standards Manual*, a ring-bound rulebook by the New York firm Danne & Blackburn. It specified everything — exactly how the 'worm' logotype sat on reports, vehicles, signage and the Space Shuttle itself; the typefaces; the red; the layouts — so that ten NASA centers across the country, with hundreds of print shops and sign painters, would speak with one visual voice. (A US government publication, by the way: that manual's pages are now public property, and design students still study the 2015 reissue.) Six years earlier, New York had run the same experiment underground: the Transit Authority's 1970 *Graphic Standards Manual*, by Massimo Vignelli and Bob Noorda of Unimark, replaced decades of chaotic hand-painted subway signs with one system — one typeface family, colored route discs, consistent arrows and placement rules — so that a rider could learn the system once and read the whole city. Both manuals made the same discovery for the same reason: when many hands must produce one identity, *the rules are the design*. A mark without written rules dissolves in a year of enthusiastic misuse.

How they figured it out. The manual writers learned their craft from failure patterns that still repeat. A new mark goes out; within months the office downstairs has stretched it to fit a flyer, the print vendor has 'matched' the blue from memory, somebody's nephew has added a drop shadow, and the sign shop has set the name in

whatever font was loaded. None of it is malice — every abuser thought they were close enough. The cure is to remove judgment calls: state the exact color values (not 'our red' but its hex, RGB and CMYK numbers); derive clear space and minimum sizes from the mark itself so they travel with it at every scale; show the approved versions and when each is used; and — the manual writers' cleverest invention — show the *don'ts* as pictures, crossed out, because a wrong example is understood in one second while a paragraph of rules is skimmed. Vignelli's team even specified sign placement by rule (what information appears at which decision point) because consistency of *behavior*, not just of looks, is what makes a system trustworthy.

The craft. Here is the small-business identity kit you will build, section by section. **1. Logo versions:** primary lockup; a secondary arrangement for awkward spaces (stacked vs. horizontal); the symbol alone (earned for small and informal uses); each in full color, one-color black, and reversed white — six to eight approved forms, no more. **2. Clear space and minimum size:** define a unit from the mark (the height of the name's capital letter is the classic choice) and rule that no text, image or edge comes closer than one unit; state minimum sizes per version (for example, primary lockup never below 25 mm print / 120 px screen; symbol alone carries the small sizes down to favicon). **3. Color:** a lead color, a support color or two, and a neutral, each named (names make colors discussable) with hex, RGB and CMYK values from your Unit 4 skills — plus proportions: lead color roughly 60%, support 30%, accent 10% is a serviceable starting rule. **4. Type:** one display face and one text face from Google Fonts (Unit 3 pairing rules apply: contrast of role, harmony of mood), with weights and cases specified ('headlines: Family X Bold; body: Family Y Regular, never below 10 pt print'). **5. Imagery and voice:** two sentences on photography/illustration mood and two on wording tone — enough to steer a flyer writer. **6. The don'ts:** six crossed-out abuses of your actual mark. On one well-organized page (or a few), this is a complete working brand guide for a real small business.

In the studio. Assemble it like a designer, not a form-filler. Build the one-pager in Inkscape or Scribus on a grid (Unit 5), because a guide that is itself sloppily set refutes its own authority. Generate the don'ts honestly by abusing your own mark — stretch it, recolor it, crowd it, set it on a busy photo — and you will usually discover a real weakness to fix in the master file while it is still cheap (this is why the guide is made *before* the client presentation, not after). Choose colors with print in mind from

the start: a brilliant screen orange that turns mud in CMYK (Unit 4.3) is a support color, not a lead. Test the type system by actually setting a fake invoice, a business card and a web headline. And write the rules in plain, kind English — 'Give the mark room to breathe: nothing closer than one cap-height' — because the person following your guide next year will be a volunteer, a vendor or the owner's teenager, not a designer. The guide's real audience is the busy and the untrained; write for them and the identity survives.

In the studio, continued. Know the document's limits, too. A brand guide governs the *vessel* — it cannot make the business punctual or honest, and a company whose conduct contradicts its stated character will find customers believe the conduct (8.1's lesson, again). Neither is a guide a cage: it should say what varies freely (content, imagery subjects, layout within the grid) as clearly as what is fixed (mark, colors, type), or people will either break it or be paralyzed by it. The NASA manual specified the worm precisely — and still left designers room to lay out a thousand different documents well. Rules exist to spend the team's creativity where it counts, not to abolish it.

PICTURE STUDY



F. Champenois, Imprimeur-Éditeur, Alphonse Mucha, 1897 · Color lithograph poster · Printed by F. Champenois, Paris; impressions in many collections

Image: Wikimedia Commons, public domain

F. Champenois was not an actress or a perfume — he was a printer. His Paris house held Mucha's exclusive contract from 1896, printing the posters that made both men famous, and in 1897 he had Mucha design this poster to advertise the print shop itself. It is a brand identity in one sheet: the circular halo, the flowing figure, the ornamental border, the hand-drawn lettering — every signature element of 'le style Mucha' that customers were buying — deployed to say this is the house where that style is printed.

This is the lesson's subject in miniature: a brand is more than a logo. Champenois's name appears quietly at the base; what sells is the consistent system around it — recognizable composition, palette, ornament and letterforms, repeated across hundreds of posters until Paris could spot a Champenois sheet across the street. A brand guide does deliberately and in writing what Mucha's contract did in practice: it keeps every piece that leaves the shop unmistakably of the house.

Look closely

- Identify the system elements: the halo circle, the border ornament, the figure's pose, the lettering style. Which of these appear in other Mucha posters you have seen in this course?

- Where is the client's name, and how large? What is actually doing the work of identifying the brand?
- Look at the palette — soft, warm, close in value. How would you specify it in a brand guide so another artist could match it?
- The woman holds a book and the client is a printer-publisher. How does the image argue the brand's business without showing a press?
- Find the lettering. Is it type or drawn? Why would a print house advertise with letters no one else could set?

Talk about it

1. Mucha's style was consistent enough to function as a brand without rules ever being written down. Why does a modern brand, handled by many designers across many media, need the rules in a written guide?
2. List the five sections a brand guide for 'le style Mucha' would need — logo, color, type, imagery, layout — and fill in one rule for each based on this poster.
3. A printer branding himself with his star artist's style ties the brand to one man. What are the strengths and risks, and how do modern brands handle the same question?

STUDIO BRIEF

Studio brief: Stonebridge Woodworks, Part Two — The System and the One-Pager

Client: Stonebridge Woodworks, continued. The owners loved the mark (they will formally approve it in 8.5 — stay humble). Deliverable now: the identity system and a brand one-pager. Their stated needs: truck door, wood-burned stamp, invoices, a small web shop, embroidered caps and a market-stall banner. Deadline feel: all three sessions, hours logged.

You will need

- Your 8.3 vector master file, Inkscape (and Scribus if you prefer it for the one-pager)
- Google Fonts access for the type system (check each font's license line)
- Your Unit 4 color skills and a printer if available (one CMYK reality-check print helps)
- The brief page from 8.3 — every system decision must trace back to it

Steps

1. Build the logo versions: primary lockup; one secondary arrangement; symbol alone; each in black, reversed white, and (after step 3) lead color. Discard any version you cannot defend a use for.
2. Derive clear space from the mark (state the unit) and set minimum sizes per version in mm and px — then verify by actually scaling them down on screen and squinting.
3. Choose the palette per the brief's feelings: a lead, one or two supports, a neutral. Name each color, record hex, RGB and CMYK, and write the proportion rule. Check the lead color survives CMYK and against both white and reversed use.
4. Choose the type system: one display face, one text face from Google Fonts, pairing by Unit 3 rules. Specify weights, cases and a minimum body size. Set a test invoice header and a web headline to prove the pair works.
5. Write the imagery-and-voice section: two sentences on photography mood (e.g., honest workshop light, real hands, real wood — no staged stock) and

two on wording tone.

6. Make the don'ts: six crossed-out abuses of the real mark (stretch, recolor, shadow, crowd, busy background, wrong version small). If an abuse reveals a real weakness, fix the master now and note the fix.
7. Lay out the one-pager on a grid: all six sections, clean hierarchy, the guide itself obeying its own rules (its colors, its typefaces).
8. Road-test it: hand the one-pager to a family member with a blank sheet and ask them to rough out a market-stall sign using only the guide. Watch silently; every question they ask is a hole in the guide. Patch the holes.
9. Export a clean PDF of the one-pager into the job folder and update your hours log.

Tips

- Derive, don't decorate: every color and face should answer to a feeling in the brief, and you should be able to say which.
- The wood-burned stamp is your harshest judge: one color, rough medium, small — if the symbol survives branding into oak, it survives anything.
- Write rules as help, not law: 'Use the stacked version when space is tall and narrow' beats 'Incorrect usage is prohibited.'

Check your work

- ☐ Every logo version exists in every needed form, each with a stated use, clear space and minimum size.
- ☐ My palette carries names, hex, RGB, CMYK and a proportion rule; my type system is licensed, paired by role, and proven on a test setting.
- ☐ My don'ts page shows six real abuses, and the road-test produced (and I patched) at least one hole.
- ☐ The one-pager itself is set on a grid in the brand's own voice.

SKETCHBOOK

1. The reverse-engineered system from your warm-up: the two artifacts sketched with their matching elements labeled.
2. Your palette exploration page: candidates with values, the CMYK survivors marked, and the final named palette with its proportion rule.

3. The road-test log: what your tester asked, what you patched, and one sentence on what guides are really for.

> **From history.** The NASA manual's 'worm' era ended in 1992 when the agency returned to its 1959 meatball insignia, and for years the 1976 manual survived mainly in archives — until two New York designers reissued it in facsimile in 2015 and a new generation discovered how complete its thinking was. In 2020 NASA revived the worm for crewed launches, and both marks now serve together under written rules. Moral for your one-pager: identities are arguments that outlive their first decade, and the written system is what lets a good mark come back.

PRACTICE

1. Easy Name the six sections of a small-business brand guide as this lesson builds it.

   Show answer

   Logo versions; clear space and minimum sizes; color palette with exact values and proportions; type system; imagery and voice notes; the don'ts page.

2. Easy What were the two landmark standards manuals of 1970 and 1976, and who made each?

   Show answer

   The New York City Transit Authority Graphic Standards Manual (1970) by Massimo Vignelli and Bob Noorda of Unimark; the NASA Graphics Standards Manual (1976) by Danne & Blackburn, for the 'worm' logotype era.

3. Easy Why is clear space defined by a unit taken from the mark itself rather than in centimeters?

   Show answer

   A unit from the mark (a cap height, the symbol's width) scales automatically with every reproduction, so the rule stays correct from business card to billboard; a fixed measurement would be wrong at every size but one.

4. **Easy** Why must brand colors be specified in hex/RGB and CMYK rather than by eye?

Show answer

Screens and print build color differently (Unit 4.3); 'matching from memory' is how brand colors drift. Exact values in each system remove the judgment call, and naming the colors makes them easy to discuss and enforce.

5. **Medium** Your primary lockup's cap height is 9 mm when the logo prints 40 mm wide. State the clear-space rule and compute the protected zone's total width.

Show answer

Nothing comes within one cap height (9 mm at this size) of the mark on any side; total protected width $= 40 + 2 \times 9 = 58$ mm.

6. **Medium** Why does a brand guide show don'ts as crossed-out pictures instead of only written rules?

Show answer

Because the guide's real users skim: a wrong example is understood in a second and remembered, while prose is skipped. Abuse-pictures also cover the exact mistakes people actually make — stretching, recoloring, shadowing, crowding, busy backgrounds.

7. **Medium** Apply the 60/30/10 rule: your palette is Walnut (deep brown, lead), Meadow (green, support) and Cream (neutral accent). Describe a shop-front flyer's color plan in those proportions.

Show answer

Example: roughly 60% of the flyer's colored area in Walnut (header band, footer, main headings), 30% in Meadow (subheads, panel, rules), 10% Cream used as the breathing accent (background panels or reversed text zones) — with white space not counted as palette. Proportion, not just hue, is what makes it look like the brand.

8. Medium Which logo version carries the favicon and the embroidered cap, and why must the guide say so explicitly?

Show answer

The symbol alone (or a simplified lettermark) — the full lockup's name is illegible at those sizes. The guide must say so because the untrained will dutifully squeeze the primary lockup into a 16-pixel square unless a rule hands them the right version.

9. Hard The print shop calls: your lead blue 'doesn't come out right' in CMYK. Using Unit 4 knowledge, explain what has happened and the two professional fixes the brand guide should already contain.

Show answer

The blue sits outside the CMYK gamut, so the press's nearest mix shifts it (screens mix light, print mixes ink). Fixes the guide should carry: a specified CMYK conversion chosen by eye in advance (the 'print version' of the color), and/or guidance that color-critical jobs use that stated build — never the vendor's on-the-fly match.

10. Hard Write the 'what varies freely' paragraph for a church's brand guide whose fixed elements are mark, two colors and two typefaces.

Show answer

Model answer: 'Within these rules, everything else is yours: photography of our real congregation and town, any layout on the document grid, seasonal artwork for events, and the length and voice of your text. The mark, colors and typefaces are the frame — the picture inside it should be as alive as the week it serves.'

11. Hard A volunteer 'improves' the newsletter with a third typeface and a lavender headline, and is hurt when corrected. As the designer, write three sentences that defend the system without crushing the volunteer.

Show answer

Model answer: 'Thank you for giving your Saturday to this — the layout reads clearly and that effort shows. The reason we hold to the two typefaces and the stated colors is that a hundred small choices like these, each fine alone, add up to an organization nobody recognizes; the rules let all our hands look like one. Here's the one-pager — and I'd genuinely value your eye on the parts that are free: the photos, the stories and the layout grid.'

COMMON MISTAKES

- Writing rules for designers instead of for the busy and untrained volunteers who will actually use the guide.
- Specifying colors by appearance ('our green') instead of exact values in both screen and print systems.
- Forgetting the don'ts page — the single most-consulted page of any real brand guide.
- Building a cage: failing to say what varies freely, so users either break the system or stop making things.
- Letting the guide document a weak mark instead of fixing the master while changes are still cheap.

Make it a game · Guideline Enforcer. Using your Stonebridge one-pager, a parent secretly produces three quick fake artifacts (sketched business card, flyer corner, web banner) — two containing deliberate violations (wrong color, stretched mark, third typeface, crowded clear space), one fully compliant. You have 60 seconds per artifact to rule compliant or cite the violated section by name. Then swap: you forge, they enforce. Most correct citations wins the title of Keeper of the Standards.

Scripture. “Can two walk together, except they be agreed?” (Amos 3:3, KJV)

Two cannot walk together without agreement — and neither can the dozen hands that will touch a brand over the years. A brand guide is that agreement set down in writing: color, type and voice settled beforehand, so everyone who walks with the brand walks in step.

8.5 Presenting and Defending the Work

OBJECTIVES

- Build a client presentation that walks from the brief to the recommendation — mockups in context, rationale before reveal — and deliver it calmly.
- Handle feedback professionally: translate vague notes, defend decisions from the brief rather than from taste, and know when to yield.
- Price a logo package by estimated hours at a defensible rate, and deliver the complete, correctly named file package a client actually needs.

> **Warm-up.** Try to sell your family on something you genuinely like (a book, a hike, a recipe) in 60 seconds — but you must begin with their problem, not your enthusiasm ('You said Saturdays feel wasted...'). Notice how different that feels from 'Look how great this is!' That inversion — their problem first, your solution second — is the whole secret of presenting design.

WATCH

How To Present Logo Designs and Identity Projects to Clients

The Futur · 24:10

https://www.youtube.com/watch?v=BSxg87CoOu4

> **WHEN TO WATCH**
> Before building your deck. Note the order he insists on: context and rationale before any logo is shown. Steal the structure, not the slides.

Note: Chris Do's design-business channel is the standard free education on the client side of design. Watch for how he frames decisions in the client's language — outcomes and fit to the brief — never 'I liked it better this way.'

BACKUP VIDEO

How To Prepare Logo Files In Inkscape | Batch Export Tutorial

Logos By Nick · 14:24

https://www.youtube.com/watch?v=HLtmf3KOwkg

At the deliverables step — the exact free-tool workflow for exporting every format and size in your handoff package, with sane file naming.

KEY TERMS

mockup

The mark shown in its real life — on the truck door, the cap, the invoice, the shop sign — so the client judges the identity at work instead of a logo floating on white.

presenting one

The practice of recommending a single best solution (with the exploration shown as evidence) rather than laying out options like a menu — you were hired to solve, not to offer.

hourly rate

What an hour of your work must earn: (target income + overhead) ÷ billable ho — the foundation under every package price.

file package

The complete delivery: vector masters (SVG, PDF), PNGs at stated sizes, one-color and reversed versions, favicon, the brand one-pager, and a read-me — named so a stranger can navigate them.

rationale

The reasoning that connects each design decision back to the client's brief; presented before the reveal so the work is seen through its purpose.

feedback translation

Converting a client's vague reaction ('make it pop,' 'too plain') into the design variable actually at issue — contrast, size, color, weight — before touching anything.

package price

A single quoted price for a defined scope (estimated hours × rate, plus rounds and deliverables named), which clients prefer to open-ended hourly billing.

CORE IDEAS

The story. In 1986 Steve Jobs, newly departed from Apple, wanted a mark for his next computer company and called Paul Rand. Rand's terms were famous and firm: one hundred thousand dollars, and he would present *one* solution — not options. 'I will solve your problem for you,' he told Jobs, 'and you will pay me.' What arrived weeks later was not a logo on a card but a bound presentation book: page by page it

restated the problem, walked through the name (Rand proposed the lowercase 'e' in NeXT), the geometry of the tilted cube, the colors, the reasoning — so that by the final page, the mark appeared as the inevitable conclusion of an argument rather than a guess to vote on. Jobs — not a man easily sold — later called Rand's logo a jewel and the process a masterclass. You are not Rand and your clients are not Jobs, and beginning designers usually do show a short list rather than one mark. But the heart of the story scales all the way down to Stonebridge Woodworks: a design presented as the conclusion of the client's own brief is received completely differently from a design presented as 'which do you like?' Taste is a trap; reasoning is a rail.

How they figured it out. Designers learned presentation order the hard way: show a logo cold and the room reacts in taste-language ('my wife loves teal'), and the meeting is lost before reasoning begins. So the professional deck runs: *first* the brief, repeated back in the client's own words (you prove you listened, and you set the judging criteria); *then* the research in one slide (the field's clichés — remember the four coffee cups — and the gap your direction claims); *then* the process evidence, one page of your fifty thumbnails (not for approval — to show the survivor beat forty-nine rivals); *then* the rationale of the recommended mark in two or three sentences; and *only then* the reveal — followed immediately by **mockups**, because a mark on a truck door, a cap and an invoice is judged as an identity, while a mark alone on white is judged as a picture. Close with the system (your 8.4 one-pager) and the road map: what happens on yes. Every slide answers the question the client was already asking; none asks the client to do your job.

The craft. Feedback is where presentations are won or lost, and the craft is translation plus grace. Vague notes name feelings, not fixes: 'make it pop' usually means contrast is low somewhere; 'too corporate' may mean the geometry reads cold — ask what it should feel like instead, and listen for brief-words. The two professional sentences to master: *'Tell me more about that'* (which turns reaction into information) and *'Here's why it's built that way — the brief asked for X'* (which defends from the agreed criteria, not from your pride). Yield gracefully on matters of preference inside the system (a support color, a secondary arrangement); hold respectfully on matters of function (legibility at size, one-color survival, distinctiveness in the field) — and when you hold, demonstrate rather than argue: shrink the suggested change to 16 pixels in front of them and let the evidence speak.

If the client insists on something you believe harms the work, say so once, clearly and kindly, then do what they decide: it is their mark and their money, and your counsel — given, recorded, and overruled — is still professional success. The failure modes are two: the pushover (agrees to everything, delivers mush) and the artist-martyr (defends every node as sacred). The professional is a trusted advisor: convictions held in open hands.

In the studio. Now the money, with Unit 10's full treatment ahead. A defensible price starts from a defensible rate: decide the annual income the work must produce and add overhead (software is free in your studio, but count equipment, materials, a share of internet), then divide by honest billable hours — for a student running a weekend studio, the arithmetic below uses 300 billable hours a year; an adult freelancer's math is the same shape with bigger numbers. Then price the *package*, not the logo: list the scope (brief and research, fifty-sketch exploration, one refined mark with two revision rounds, the brand one-pager, the full file package), estimate the hours per line from your actual logs — this is why every studio brief made you log hours — multiply by your rate, and quote one number with the scope attached. Never quote the mark alone ('$40 for a logo') because the mark alone is not what protects the client; the system is. State what an extra revision round costs before anyone needs one. And remember Prov. 16:11 belongs over the desk: an honest estimate, honestly logged, is just weights in a designer's scales.

In the studio, continued. The job ends with the handoff, and the handoff is a craft of its own. The package: **vector masters** — SVG and PDF of every approved version (these scale forever and the client must own them); **raster exports** — PNG at useful sizes (1024, 512, 256 px with transparent backgrounds) plus a 32/16 px favicon; **one-color and reversed files** for every version; the **brand one-pager PDF**; and a plain-text **read-me** saying which file serves which purpose in non-designer English. Name files so a stranger navigates blind: *stonebridge-logo-primary-color.svg, stonebridge-symbol-black-512.png* — never *final-FINAL-v3(2).svg*. Deliver in one tidy folder, walk the client through it in five minutes, invoice promptly (net 30), and archive your own master copy. Six months later the embroiderer will call asking for 'the stitchable one,' and because your read-me already told the client it is the one-color SVG of the symbol, the call lasts one minute and your reputation grows another ring.

PICTURE STUDY



Arrow Collar advertisement, J.C. Leyendecker, 1907 · Oil painting reproduced for magazine advertising · Advertisement for Cluett, Peabody & Co.'s Arrow collars

Image: Wikimedia Commons, public domain

In 1905 the shirt-maker Cluett, Peabody & Co. hired J.C. Leyendecker to give its Arrow collars a face, and he gave them a world: the 'Arrow Collar Man,' confident, immaculate, slightly amused. The campaign ran for decades, the fictional Arrow Man received real fan mail by the sackful, and collar sales climbed with him. This 1907 panel is the identity at work: product, people and promise in one image.

Study it as Lesson 8.5 material: this is a mockup of a brand's meaning. The collar itself is a small white shape — everything else is context persuading you what wearing it says about you. When you set your Stonebridge mark onto a truck door and a craftsman's apron, you are doing exactly this: letting context argue.

Look closely

- Where are the actual collars in the composition, and how does Leyendecker make such small white shapes the picture's point?
- The figures' postures sell confidence before you register any product. What specifically in the poses does the selling?
- Find the visible brushstroke style (recall Lesson 7.4). Why did a recognizable artist's hand itself become part of the brand's identity?

- How does the wide, frieze-like format suit magazine pages, and what does that teach about designing for the mark's real homes?
- What is promised here beyond cloth — what does the picture claim the product says about its wearer?

Talk about it

1. A brand is a reputation (8.1); this campaign built one for a detachable collar. What did consistency across years of these paintings contribute that one great painting could not?
2. Translate this into your presentation: why will the Stonebridge owners understand their mark better on a truck door than centered on white?
3. Advertising imagery makes promises the product must keep. Where is the honest line between presenting work attractively and overpromising — for Arrow in 1907, and for your mockups this week?

STUDIO BRIEF

Studio brief: Stonebridge Woodworks, Part Three — The Presentation and the Handoff

Client: Stonebridge Woodworks, final act. Deliverable: the client presentation (8–10 pages, paper or PDF — Inkscape, Scribus or Penpot), delivered live to a two-person client panel (parent and sibling/friend, each given a role card: one enthusiastic, one skeptical with two scripted objections), followed by the complete file package, the quote, and the imaginary invoice. This brief completes the unit's case study and is graded, like 7.5, on conduct as much as craft.

You will need

- All prior Stonebridge materials: brief, audit, fifty sketches, vector master, one-pager, hours log
- Inkscape/Scribus/Penpot for the deck; simple photo mockups (photograph a real truck door, cap and invoice, then place the mark with GIMP or Inkscape — free-tool mockups are part of the exercise)
- Two role cards you write for the panel, including the skeptic's objections ('needs more going on' and one of your choice)
- A folder structure ready for the final package and the read-me

Steps

1. Build the deck in the professional order: 1 brief restated; 2 research and the field's clichés; 3 one page of your fifty thumbnails; 4 rationale (two or three sentences tying the mark to the brief); 5 the reveal, large and alone; 6–8 mockups (truck door, burned stamp or cap, invoice/web header); 9 the system one-pager; 10 next steps and quote.
2. Make the three mockups honestly: photograph real surfaces, place the correct logo version on each per your own brand guide (the one-color symbol on the stamp!), matching perspective roughly.
3. Compute your quote from your real hours log using the lesson's formulas, at the $15 student rate (or your own computed rate). Put the scope list beside the single number, with the extra-round price stated.

4. Rehearse once, aloud, with a timer: the whole presentation in under ten minutes, the rationale sentences by heart.
5. Deliver to the panel. Rationale before reveal. Pause after mockups and ask for reactions — then practice the two sentences: 'Tell me more about that' and 'Here's why it's built that way.'
6. Field the scripted objections: translate each to a design variable aloud, demonstrate where you hold (shrink the mark live for the 'more going on' note), yield where it's preference, and record every decision in writing.
7. Win the approval (the panel approves when you have defended or absorbed both objections professionally), then assemble the file package: all versions as SVG and PDF; PNGs at 1024/512/256 and favicon 32/16; one-color and reversed files; the one-pager PDF; the read-me explaining every file in plain English; all named in the stonebridge-logo-version-color-size pattern.
8. Hand off: walk the client through the folder in five minutes, deliver the invoice (package price, net 30), and ask the two debrief questions from 7.5 ('What should I have asked earlier?' 'Would you hire me again?').
9. Archive the entire job — brief to invoice — as one case-study folder: this is the portfolio piece.

Tips

- Say the rationale sentences before showing the mark even to your family panel; the discipline is the point.
- If the skeptic rattles you, slow down and ask a question — the presenter who gets curious instead of defensive keeps the room.
- Check every mockup against your own one-pager before the meeting; presenting a guide violation yourself is the classic self-inflicted wound.

Check your work

- ☐ My deck runs brief → rationale → reveal → mockups → system → quote, in under ten minutes.
- ☐ I translated both objections into design variables, held once with a live demonstration, yielded once gracefully, and recorded decisions.
- ☐ My quote traces to logged hours at a computed rate, and my file package is complete, correctly named, read-me included.

- [ ] The whole job now exists as one archived case study.

SKETCHBOOK

1. Your rationale page: the two or three sentences connecting the final mark to the brief, written and rewritten until they carry no filler.
2. Notes from the presentation: each objection, your translation of it, what you held, what you yielded, and the panel's debrief answers.
3. The file-package map: the folder tree drawn out with one line per file on who will ask for it someday.

KEY FORMULAS

$$\text{hourly rate} = \frac{\text{target income} + \text{overhead}}{\text{billable hours}}$$

$$\text{package price} = \text{estimated hours} \times \text{hourly rate}$$

$$\text{extra round} = \text{round hours} \times \text{hourly rate}$$

From history. Rand's NeXT presentation book ended with the mark applied to stationery and a business card — mockups, 1986-style — and Jobs kept the book and showed it off for years. The $100,000 bought the argument as much as the artwork: a defensible process, documented, that made one answer feel inevitable. Decades later, designers still study scans of such presentation books the way illustrators study Wyeth plates. Your Stonebridge case-study folder, kept complete, is the same artifact at student scale — and more than one real client has been won by exactly such a folder shown at the right moment.

WORKED EXAMPLES

Example 1. A student designer wants $4,200 a year from weekend design work, with $300 of yearly overhead (paper, ink, a share of internet), and can honestly bill 300 hours a year. Find the hourly rate.

Show solution

1. Total to recover: $\$4{,}200 + \$300 = \$4{,}500$.
2. Rate: $\$4{,}500 \div 300 = \$15$ per hour.
3. Note the structure, not the size: a full-time freelancer targeting $48,000 + $7,000 overhead over 1,100 billable hours computes $\$55{,}000/1{,}100 = \$50$ per hour by the identical formula.

Answer: $15 per hour for the student studio; same formula scales to professional rates.

Example 2. Price the Stonebridge package at the $15 student rate. Logged/estimated hours: brief and research 4; fifty sketches 5; refinement and vector construction 6; brand one-pager 6; mockups, presentation and file package 5; two revision rounds included at 2 hours each.

Show solution

1. Total hours: $4 + 5 + 6 + 6 + 5 + 4 = 30$.
2. Package: $30 \times \$15 = \$450$, quoted as one number with the scope listed beside it.
3. State in the quote: additional revision rounds $2 \times \$15 = \$30$ each. At a professional's $50 rate the same scope quotes at $30 \times \$50 = \$1{,}500$ — which is why real identity packages cost what they cost.

Answer: $450 for the defined package ($30 per extra round); $1,500 at a $50 professional rate — same honest arithmetic.

Example 3. A client balks: 'The print shop makes signs with free clip-art. Why does your package cost $450?' Build the designer's three-sentence answer from the package's contents, without apologizing.

Show solution

1. Name what is actually being bought: not a picture but a searched, distinctive, tested mark plus the system and files for every future use.
2. Anchor to the client's own costs: the mark will outlive the truck it's painted on; spread over ten years, $450 is pennies a week on the business's public face.
3. Offer scope control, not discount: if the budget is firm, reduce scope (e.g., defer the one-pager), never the hourly honesty.

Answer: Model answer: 'You're buying a mark we verified no competitor owns, tested to work burned into wood, stitched on caps and shrunk to a favicon, plus every file any vendor will ever ask you for and the rulebook that keeps it all consistent. Spread over the years it will serve, it's among the cheapest tools your shop will own. If $450 doesn't fit this season, we can trim the scope together — the arithmetic stays open-book either way.'

PRACTICE

1. Easy What is the professional presentation order, and why does rationale come before the reveal?

   Show answer

   Brief restated, research/clichés, process evidence (the fifty sketches), rationale, reveal, mockups, system, next steps. Rationale first sets the judging criteria, so the room evaluates against the brief instead of reacting in taste-language.

2. Easy Why show mockups instead of the logo alone on white?

   Show answer

   A mark on white is judged as a picture; a mark on the truck, cap and invoice is judged as an identity doing its job — which is what the client is buying. Context also answers size and one-color questions before they are asked.

3. **Easy** Compute: target income $6,000, overhead $600, billable hours 330. Hourly rate?

Show answer

$\$6{,}600 / 330 = \$20$ per hour.

4. **Easy** Name six components of a complete logo file package.

Show answer

Vector masters (SVG and PDF) of all versions; PNGs at stated sizes with transparency; one-color and reversed files; favicon sizes; the brand one-pager PDF; a plain-English read-me — all sanely named in one folder.

5. **Medium** Translate these three notes into design variables before touching anything: 'make it pop,' 'feels old-fashioned,' 'can the name be bigger?'

Show answer

'Pop' → contrast (value, color or scale) is low somewhere — find where. 'Old-fashioned' → ask what it should feel like; likely culprits are the typeface's associations or heavy ornament. 'Name bigger' → the name isn't reading; try contrast, clear space or weight before scale (and check which version/size they saw it at).

6. **Medium** Give one example each of a feedback point to yield on and one to hold on, with the reason.

Show answer

Yield: the client prefers the deeper of two support greens — preference inside the system, their mark. Hold (respectfully, with a demonstration): adding a detailed woodgrain texture into the symbol — it dies at small sizes and in one color, failing functions the brief requires. Yield on taste; hold on function; demonstrate rather than argue.

7. Medium Why is 'presenting one' (Rand's rule) powerful, and why might a beginner still present a short list? What must a beginner never do?

Show answer

One solution presented as the conclusion of the brief positions you as the problem-solver and prevents committee-mixing of options. Beginners often show two or three because trust isn't established yet. Never present options you couldn't stand behind — anything shown might be chosen — and never present them without a stated recommendation.

8. Medium Estimate a smaller package: brief 2 h, twenty-five sketches 3 h, refinement/vector 4 h, files and read-me 2 h, one round 1.5 h, at $20/hour. Quote it and the extra-round price.

Show answer

Hours $= 12.5$; package $12.5 \times \$20 = \$250$; extra round $1.5 \times \$20 = \$30$.

9. Hard The client's brother-in-law, at the meeting uninvited, says the mark 'needs more going on.' Write your two-sentence reply that honors the brief, the client and the brother-in-law.

Show answer

Model answer: 'That's worth examining — the quiet is deliberate, because the brief asked for a mark that survives being burned into wood at two inches and stitched on a cap, and detail is the first casualty there; let me show you both at that size. If after that you'd like us to explore a richer version for large-format uses only, that's a sensible addition we can scope.'

10. Hard You advised against the client's requested change; they insisted; you made it. A month later it causes the exact problem you predicted, and the client calls unhappy. What does the professional do and not do?

Show answer

Do: fix it promptly at the agreed rate (or graciously, if small), re-recommending the original solution with the new evidence; keep the tone future-facing. Don't: say 'I told you so,' relitigate the meeting, or hide that the fix is the old recommendation. Your recorded counsel protects the relationship precisely so this moment can stay warm.

11. Hard Write the read-me paragraph for stonebridge-symbol-black.svg, addressed to a non-designer.

Show answer

Model answer: 'stonebridge-symbol-black.svg — the symbol alone, solid black, as a vector file that scales to any size without blurring. This is the file for single-color uses: the wood-burning stamp, embroidery, engraving, rubber stamps and one-color printing. Send this exact file to those vendors; if they ask for "vector art" or "line art," this is it.'

COMMON MISTAKES

- Opening with the logo and hoping it defends itself — the reveal before the rationale surrenders the meeting to taste.
- Presenting options as a menu with no recommendation, which converts the designer into a vendor and the client into a committee.
- Arguing feedback instead of translating it — or yielding everything, which delivers mush with your name on it.
- Quoting 'a logo' instead of a scoped package, and then resenting the unpaid system work the client assumed was included.
- Delivering a zip of mystery files named final-v3; the handoff read-me is five minutes that saves five years of support calls.

Make it a game · Objection Volley. Write eight client objections on slips ('too plain,' 'my nephew uses free clip-art,' 'can we try purple?', 'needs to feel more fun,' 'why so expensive?'...). A parent draws and delivers one with feeling; you have 20 seconds to respond using the pattern translate → reason from the brief → hold or yield. The parent scores grace (kind), salt (honest) and brief (reasoned), one point each. Twenty-four possible points; beat your score next round.

Scripture. “Let your speech be alway with grace, seasoned with salt, that ye may know how ye ought to answer every man.” (Colossians 4:6, KJV)

Presenting and defending work is speech under pressure: grace keeps it kind when the critique stings; salt keeps it honest and worth hearing. The verse is a complete training in client meetings — and in knowing how to answer the skeptical brother-in-law.

UNIT 8

Branding and Logo Design

A logo is the smallest piece of design that carries the largest weight: one mark that must stand for a whole business, print at any size, survive in one color, and still mean something in twenty years. In this unit you will trace the mark from its ancestors — medieval guild marks, silver hallmarks, printers' devices, and the Bass red triangle that became Britain's registered trade mark number one on 1 January 1876 — to the modern masters Paul Rand and Saul Bass, and you will learn the trademark-law basics every designer needs. Then you will learn to judge logos the way professionals do: simple, memorable, versatile, appropriate and built to last.

The second half of the unit is one continuous professional job. You will take a fictional local business through the full identity process: a real brief, research, fifty sketches, refinement on grids (with the golden ratio used honestly, as a tidying tool rather than magic), vector construction in Inkscape, a color-and-type system, a brand guide, and finally a client presentation with mockups and a complete file package — priced by the hour like a working designer. By the end you will have a complete brand-identity case study, one of the strongest pieces a beginning design portfolio can hold.

PREREQUISITES

- Unit 3 (typography) and Unit 4 (color): you will choose and pair typefaces and build a palette with exact color values
- Unit 6: Inkscape basics — Bézier curves, Boolean operations and clean vector habits — for constructing the final mark
- Simple algebra and ratios for the golden-ratio constructions and the pricing math

MASTERY CHECKLIST

- ☐ I can tell the story of marks from guild marks, hallmarks and printers' devices to Bass's 1876 triangle, and explain what a trademark legally is and is not.
- ☐ I can explain the difference between a logo, an identity and a brand, and why a brand is at bottom a reputation.
- ☐ I can classify any logo (wordmark, lettermark, symbol, abstract mark, combination, emblem) and test it: one color, tiny size, memory sketch.
- ☐ I can run the professional logo process: brief, research, 50 thumbnail sketches, three directions, grid-based refinement and clean vector construction.
- ☐ I can use the golden ratio and simple grids honestly in refining a mark, and say what they can and cannot do.
- ☐ I can build a brand one-pager: logo versions, clear space, minimum sizes, palette with exact values, type system and usage rules.
- ☐ I can present identity work to a client, explain decisions calmly, handle feedback, and deliver a complete, correctly named file package.

- ☐ I can price a logo package by estimated hours at a defensible rate.

FREE RESOURCES FOR THIS UNIT

- **Inkscape**: The free, professional-grade vector editor you met in Unit 6 — this unit's main tool for constructing final marks, testing one-color versions and exporting every file a client needs. Download only from the official site.
- **Google Fonts**: Free, properly licensed typefaces for your brand systems. The pairing skills from Unit 3 plus this library cover real client work; note each font's license allows commercial use.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

8.1	**Marks That Mean Something: From Maker's Marks to Modern Identity**	3 sessions of 50 minutes
8.2	**What Makes a Logo Good: Simple, Memorable, Versatile**	3 sessions of 50 minutes
8.3	**The Logo Process: Brief, Research, Sketches, Refinement**	3 sessions of 50 minutes
8.4	**More Than a Logo: Color, Type and the Brand Guide**	3 sessions of 50 minutes
8.5	**Presenting and Defending the Work**	3 sessions of 50 minutes

Unit 8 test

Time allowed: 50 minutes. A calculator is allowed for the ratio and pricing problems; show your work. Sketch answers may be rough but must be legible. The test is worth 100 points.

1. **5 pts**
   What became UK registered trade mark No. 1, under what law, and on what date did registration open?

2. **5 pts**

   Trace 'trust at a distance' through three pre-modern marks: the hallmark, the printer's device, the guild mark — one sentence each.

3. **6 pts**

   Distinguish trademark, copyright and patent, and explain TM versus ®.

4. **6 pts**

   Rank for protectability and explain: an invented word; 'Speedy' for a courier; 'Cold Ice Cream' for an ice-cream shop; 'Grocery' for a grocery. Name the disease that killed aspirin and escalator as trademarks.

5. **6 pts**

   Define logo, identity and brand in one sentence each, and state which one the designer cannot draw and why.

6. **7 pts**

   Name the six logo types with a one-line trade-off for each.

7. **7 pts**

   List the five tests of a good mark and describe how to actually perform the two versatility tests.

8. **6 pts**

   Attribute and date three Paul Rand marks and one Saul Bass program, and state Rand's 'identify, don't describe' rule in your own words with an example.

9. **6 pts**

   Tell the NASA meatball/worm story with dates as a lesson about identity systems, not just marks.

10. **7 pts**

    Compute: (a) φ to three decimals from its formula; (b) the φ-related smaller companion to a 55 mm symbol; (c) snap-fix this radius family meant to be two related sizes: 14, 13.5, 14.2, and 8.9 px.

11. **8 pts**

    Describe the six-step logo process in order, and use the FedEx story (designer, firm, year, method) as evidence for the fifty-sketch discipline.

12. **8 pts**

    You are handed a finished mark and asked to 'prove it's good' by overlaying golden-ratio circles. Write the honest professional reply, stating what grids and ϕ can and cannot do.

13. **8 pts**

    List the six sections of a small-business brand guide, and for three of them give the exact kind of value or rule the section must state.

14. **8 pts**

    Pricing. Target income $5,400, overhead $600, billable hours 300. Compute the hourly rate; then price this package: brief/research 3 h, sketches 5 h, refine/vector 6 h, one-pager 5 h, presentation/files 5 h, two rounds at 2 h each — and the extra-round price.

15. **7 pts**

    Production task. Sketch a quick emblem-to-system rescue: draw any simple emblem (badge with a name), then extract and sketch (a) the symbol alone for a favicon and (b) a horizontal combination lockup — and write one guide rule stating when each version is used.

ANSWER KEY

1. The Bass red triangle, under the Trade Mark Registration Act 1875, when registration opened on 1 January 1876 — and the mark is still registered.
2. The hallmark (leopard's head required on English silver from 1300, assayed at Goldsmiths' Hall) let a buyer trust the metal without testing it. Printers' devices (Fust & Schöffer 1457; Aldus's anchor and dolphin from 1502) let scholars trust a text's source — and were counterfeited for exactly that reason. Guild marks traced work to its maker so bad work could be punished and good work rewarded.
3. Trademark protects source identifiers in trade; copyright protects creative works automatically from creation; patent protects inventions. TM claims rights in a mark being used; ® may only be used after federal registration (USPTO, Lanham Act 1946).
4. Invented (fanciful — strongest); 'Speedy' (suggestive — strong); 'Cold Ice Cream' (descriptive — weak, needs proven association); 'Grocery' (generic — unprotectable). The disease is genericide: the public turning a mark into the product's common noun.
5. Logo: the mark itself. Identity: the designed system the mark commands (color, type, layouts, usage). Brand: the reputation people attach to the mark. The brand cannot be drawn — it is earned by the company's conduct; the designer only builds the vessel that collects it.
6. Wordmark — makes a short distinctive name the mark, but needs a good name. Lettermark — compresses a long name, but initials start meaningless. Pictorial — instantly nameable, but risks describing today's product. Abstract — grows with any business, but means nothing on day one. Combination — flexible symbol+name, but must work together and apart. Emblem — badge dignity, but fails at small sizes.
7. Simple, memorable, versatile, appropriate, durable. One-color test: convert to solid black and reversed white — no gradients or effects — and check it survives. Scale test: view at 16-pixel favicon size and at large size; it must stay legible, balanced and crisp at both.
8. Rand: UPS shield with bow-tied parcel 1961, ABC circle mark 1962, IBM eight-bar stripes 1972 (also Westinghouse 1960, NeXT 1986). Bass: the 1969 Bell System redesign (and the 1983 AT&T globe). The rule: a mark points at the maker, not the merchandise — a pizza-slice logo traps the pizzeria that grows; a distinctive mark grows with it.

9. Meatball insignia 1959; Danne & Blackburn's worm logotype with the Graphics Standards Manual 1975–76; worm retired for the meatball 1992; worm revived alongside it 2020. Lesson: the written system (the 1976 manual) was as important as the mark — it coordinated one voice across ten centers, and preserved the design argument so well the mark could return decades later.
10. (a) $(1+\sqrt{5})/2 \approx 1.618$. (b) $55/1.618 \approx 34$ mm. (c) Snap the first three to exactly 14 px; make the small family a stated ratio of it — 7 px (halves) or $14/1.618 \approx 8.5$ px (ϕ); the crime is near-equal wobble and an unrelated 8.9.
11. Brief; research/competitor audit; fifty thumbnail sketches; three genuinely different directions; grid refinement; vector construction. Evidence: Lindon Leader at Landor, 1994, explored about two hundred concepts before the FedEx wordmark; the hidden arrow in the E–x negative space was found deep in the volume and perfected with custom letterforms (Univers 67 blended with Futura Bold) — strong ideas are mined by discipline, not awaited.
12. Model answer: overlays after the fact prove nothing — circles fit almost anything. Ratios and grids are construction tools: used during refinement they make weights even, radii consistent and sizes related instead of arbitrary. They cannot make a weak idea good; the mark's worth is shown by the real tests — one color, small size, memory, distinctiveness in its field — and I'm glad to run those.
13. Logo versions; clear space and minimum sizes; color; type; imagery and voice; don'ts. Examples: clear space — a unit from the mark itself (e.g., one cap height on all sides) plus minimums in mm and px per version; color — named colors with hex, RGB and CMYK values and a proportion rule (e.g., 60/30/10); type — the display and text faces, weights, cases and a minimum body size. (Don'ts shown as crossed-out pictures.)
14. Rate: $\$6{,}000/300 = \$20$/hr. Hours: $3+5+6+5+5+4 = 28$; package $28 \times \$20 = \$560$, quoted as one number with scope attached; extra round $2 \times \$20 = \$40$.
15. Sketches vary. A correct answer shows the badge, a simplified symbol pulled from it (bold silhouette, no inner text) marked for small/informal uses, and a symbol-plus-name horizontal lockup for letterheads and signs; the rule states, e.g., 'Use the full emblem at 40 mm/200 px and above; below that, use the symbol alone or the horizontal lockup.'

PORTFOLIO PIECE: THE STONEBRIDGE IDENTITY: A COMPLETE BRAND CASE STUDY

Assemble the entire Stonebridge Woodworks job into one presented case study: the written brief and competitor audit; the fifty-sketch pages with the three directions marked; the construction plate of the final mark (grid, radius family and ratio choices labeled, Dürer-style); the black and reversed vectors; the brand one-pager; the three mockups; the presentation deck; and the quote traced to your logged hours. Bind it physically or as one clean PDF, opened by a one-paragraph summary written for a stranger.

This is piece eight of your ten-piece professional portfolio, and for many clients it is the most persuasive thing a young designer can show — not because the mark is perfect, but because the process is complete: research, volume, refinement, system, presentation and honest arithmetic, end to end. Present it to your family panel once more as a finished case study, cold, in under eight minutes.

LOOK FOR	WHAT IT MEANS
Process integrity	Every stage is present and genuinely connected: the brief drives the research, the fifty sketches are real and captioned, the three directions differ in idea, and the final traces defensibly back to the brief.
Craft of the mark	The vector is cleanly constructed (few nodes, even weights, stated radius and ratio families) and passes the one-color, reversal, 16-pixel and memory tests.
System thinking	The one-pager is complete (versions, clear space, minimums, exact color values, licensed type, don'ts), written for non-designers, and obeyed by every mockup and deck page.
Presentation and defense	The deck runs rationale-before-reveal; objections were translated, held or yielded appropriately, and decisions recorded; the spoken case study lands inside eight minutes.
Professional arithmetic	Hours are honestly logged; the rate and package price compute correctly and are quoted with scope and extra-round terms.
Delivery	The file package is complete and sanely named with a plain-English read-me; the bound case study is clean, ordered and ready to show a real client.

UNIT 9

Designing for Screens

Most of the design work bought and sold today is never printed. It is read on a phone held in one hand on a bus, on a laptop in a kitchen, on a tablet in a waiting room. In this unit you learn how the web actually shows your work — what a browser, HTML and CSS really are — and then how to design for it: buttons and forms people can actually press, layouts that reflow gracefully from a 375-pixel phone to a 1440-pixel monitor, social graphics and emails that stay legible at thumbnail size, and clickable prototypes you can hand to a developer without losing anything in translation.

The stories run from Tim Berners-Lee's first web page at CERN in 1991, through the first banner advertisement in 1994 and Ethan Marcotte's 2010 essay that gave us responsive design, to the free, open-source tool Penpot that you will use for real client-style briefs. There is honest math in this unit — relative units, breakpoints, grid and spacing arithmetic — because screen layout is arithmetic before it is art. Everything you learned about type, color, hierarchy and grids still applies; the screen just adds one hard new rule: you do not control the size of the page. The reader does.

By the end of the unit you will have a responsive landing-page mockup, a mobile app screen set, and a social template series — three portfolio pieces that show employers you can design for the medium where most design jobs now live.

PREREQUISITES

- Units 3–5: type scales, measure and leading; color contrast and color-blind-safe palettes; grids, margins and columns
- Unit 6: comfortable moving around Penpot, Inkscape or Krita, exporting PNG and SVG
- Arithmetic and simple algebra: percentages, ratios and solving $a = b/c$ for one variable

MASTERY CHECKLIST

- ☐ I can explain what a browser, HTML and CSS each do, and why live text beats text saved inside an image.
- ☐ I can name the standard UI components and draw a button in its five states: default, hover, active, focus and disabled.
- ☐ I can explain Fitts's law in plain words and size touch targets to at least 44 points.
- ☐ I can convert between px, rem and percent, and lay out a page on an 8-point spacing grid without breaking it.
- ☐ I can choose breakpoints from the content, and design one page that works at 375, 768 and 1440 pixels wide.
- ☐ I can design a social graphic that passes the thumbnail test at 120 pixels, and an email that survives a 600-pixel single column.
- ☐ I can build a clickable prototype in Penpot with named frames and components, and hand it to a developer with clear specs.

FREE RESOURCES FOR THIS UNIT

- **Penpot (free, open-source UI design tool)**: Runs in the browser; this unit's studio briefs use it for mockups, components and prototypes. Have a parent create or approve the account. A drawing tablet is optional — a mouse is fine for UI work.
- **MDN Web Docs (Mozilla's free HTML and CSS reference)**: The reference working developers actually use. You will not memorize it; you will learn to look things up in it, which is what professionals do. Free, no account needed.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

9.1 **How the Web Shows Your Work: Browsers, HTML and CSS Basics** — 3 sessions of 50 minutes

9.2 **Buttons, Forms and Flows: User Interface Fundamentals** — 3 sessions of 50 minutes

9.3 **One Design, Every Screen: Responsive Layout** — 3 sessions of 50 minutes

9.4 **Design in the Feed: Social Graphics, Thumbnails and Email** — 3 sessions of 50 minutes

9.5 **Prototype and Handoff: Penpot, Figma and Working with Developers** — 3 sessions of 50 minutes

Unit 9 test

Time allowed: 50 minutes. A calculator is allowed. Show your work and units for every calculation; base text size is 16 px unless stated. The test is worth 100 points.

1. **6 pts**
   Name the three inventions Tim Berners-Lee created for the web and the job each does, and give the year the first website went online.

2. **7 pts**
   Give four practical advantages of live text over text saved inside an image, and name the one place image text is professionally acceptable on a site.

3. **7 pts**

   List the five states of a button and explain why the focus state must never be removed.

4. **8 pts**

   State Fitts's law and the Apple and Material minimum touch targets, then use both to critique a design that puts a tiny Delete icon directly beside a same-sized Confirm icon.

5. **8 pts**

   Calculate: (a) 28 px in rem; (b) the px value of 3.5 rem; (c) the breakpoint 60 rem in px.

6. **6 pts**

   A 960 px mockup has a 240 px sidebar. Give the fluid width, and name the formula and its author's 2010 essay.

7. **8 pts**

   A 1200 px container holds 12 columns with 20 px gutters. Compute the column width and the width of a 5-column span.

8. **7 pts**

   Body text is 16 px. Using the half-em estimate, how many characters per line does a 720 px column hold, and what should the designer do?

9. **7 pts**

   Which of these spacings belong on a strict 8-point grid: 4, 10, 16, 18, 40, 52, 64? Correct the failures with the nearest legal value.

10. **7 pts**

    Give the pixel dimensions for: a 1:1 post at 1080 wide, a 9:16 story at 1080 wide, and a 16:9 thumbnail at 1280 wide — and state the story's approximate safe-area rule.

11. **8 pts**

    A 1280 px-wide thumbnail displays at 160 px. (a) Find the scale factor. (b) What does 48 px text display at — legible or not? (c) What designed size displays at 13 px?

12. **7 pts**

    Name four professional constraints of email design and the reason behind each.

13. **7 pts**

    What changed between redlines-on-pictures and structured files in Figma/Penpot — where does the truth live in each, and why does that matter to a developer?

14. **7 pts**

    Production task. Sketch (small and rough) one phone screen for a library app's empty reading list, then list the four items its behavior note must cover.

ANSWER KEY

1. HTML (page structure/content), HTTP (how browsers request pages), URL (page addresses); first site 1991 (info.cern.ch, 6 August).
2. Any four: searchable, selectable/copyable, translatable, resizable by the reader, screen-reader accessible, crisp on high-density screens, far smaller files. Acceptable exception: logos/lettering art.
3. Default, hover, active, focus, disabled. Focus is the only way keyboard users (including many users of assistive technology) can see where they are; deleting it makes the interface unusable without a mouse.
4. Time to hit a target rises with distance and falls with size; minimums 44 × 44 pt (Apple) and 48 × 48 dp (Material). The side-by-side equal targets make the destructive mis-tap as likely as the intended tap; separate them, enlarge Confirm as primary, reduce the prominence of Delete and confirm destructive actions.
5. (a) $28/16 = 1.75$ rem; (b) $3.5 \times 16 = 56$ px; (c) $60 \times 16 = 960$ px.
6. $240/960 = 25\%$; target ÷ context, from Ethan Marcotte's "Responsive Web Design" (A List Apart, 2010).
7. Columns: $(1200 - 11 \times 20)/12 = 980/12 \approx 81.7$ px. Span: $5(81.7) + 4(20) \approx 488$ px.
8. $720/8 = 90$ CPL — over the ~75 ceiling; cap the measure near 528–576 px (33–36 rem) or raise the type size.
9. 16, 40 and 64 pass (4 passes only as the allowed half-step). 10 → 8 or 12*/16, 18 → 16, 52 → 48 or 56. (*12 only if the team permits 4-point steps.)
10. 1080 × 1080; 1080 × 1920; 1280 × 720. Keep essential content out of roughly the top and bottom 250 px of the story, where platform interface overlays sit.
11. (a) $1280/160 = 8$. (b) $48/8 = 6$ px — illegible. (c) $13 \times 8 = 104$ px.
12. ~600 px single column (conservative rendering engines, phone reflow); live text, not an image of text (image-blocking inboxes, screen readers, spam filters); alt text on every image (blocked images and accessibility); key message and link high in the email (seen without scrolling). Also accepted: dark-mode testing, real-device test send.
13. With redlines, truth lived in hand annotations on static pictures — incomplete and instantly stale. In a structured file the design itself is inspectable (real components, tokens, measurements), so the developer reads exact values from one live source and the file updates for everyone at once.

14. Sketch: friendly empty state with an illustration or message ('No books yet'), one primary button ('Add your first book') in thumb reach, nav intact — not a blank screen. Notes: what shows on first run, what the button does, loading/error behavior, and what the screen becomes once one item exists.

PORTFOLIO PIECE: A RESPONSIVE PAGE, PROTOTYPED AND SPECIFIED

Finish the Greenhouse & Porch landing page as a portfolio piece: the three frames (375 / 768 / 1440) refined after critique, sharing one type ramp, palette, and 8-point spacing system, with the desktop frame sitting on a documented 12-column grid.

Attach the professional wrapper that makes it hire-worthy: your written grid and token sheet (the arithmetic shown), the developer behavior notes with breakpoints in rem, and a clickable Penpot prototype linking the page's primary action through the Recipe Box flow *or* the Reading Club flow from this unit's briefs. Present it as one case study: brief, process thumbnails, three frames, specs.

This is piece nine of the ten-piece professional portfolio you complete in Unit 10 — and for many employers it is the first one they will look at, because it proves you design for the screens where their customers actually are.

LOOK FOR	WHAT IT MEANS
Responsiveness	The three frames are honest recompositions of one design — constant brand and hierarchy, adapted layout — with breakpoints justified from content (measure, CPL), not device names.
System discipline	Type ramp in rem, palette with passing contrast, every spacing value on the 8-point grid, and the 12-column desktop grid computed correctly and matched by the frame.
Interface craft	Components are used properly with states present; touch targets meet 44 points; forms and buttons follow Lesson 9.2's affordance and state rules.
Prototype and specification	The prototype walks a complete primary flow including a non-happy-path state; the behavior notes and token sheet would let a developer build without asking the designer a question.
Craftsmanship	File hygiene a stranger could navigate: named frames and layers, shared styles, versioned file; exports are correctly formatted (SVG vector, 1x/2x raster).
Presentation	The case study reads cleanly — brief, process, result — with the squint-ladder and arm's-length tests documented; the work is shown at real sizes, honestly.

9.1 How the Web Shows Your Work: Browsers, HTML and CSS Basics

OBJECTIVES

- Explain what a browser does, what HTML and CSS each are responsible for, and tell the story of Tim Berners-Lee's first website in 1991.
- Write a small, valid HTML page by hand — headings, paragraphs, links, an image — and style it with a short CSS file.
- Argue the case for live text over text saved inside an image: searchable, selectable, translatable, resizable, crisp on every screen, and far lighter to load.

> **Warm-up.** Open any website on a computer, select a sentence of body text with your mouse, and make the text larger with Ctrl/Cmd and +. Now find a place on the same page where words will not select — a logo, a button saved as a picture, text baked into a photo. Write one sentence on the difference you just found. That difference is the subject of this lesson.

WATCH

HTML & CSS for Absolute Beginners: What is HTML?

Kevin Powell · 7:36

https://www.youtube.com/watch?v=X4sClFRMJ00

> **WHEN TO WATCH**
> After the craft paragraph, before you write your first page. Pause when he shows tags wrapping content and copy the pattern on paper first.

Note: Kevin Powell is a CSS teacher developers themselves learn from. This is the first video of his free beginner series; watch the next two or three in the series during your sessions if you are enjoying it. Calm, clear, no filler.

BACKUP VIDEO

The Internet: HTTP & HTML

CodeAI · 7:07

https://www.youtube.com/watch?v=kBXQZMmiA4s

With the story paragraph. This is Code.org's classic explainer (the channel has since been renamed): real engineers explain how a browser requests a page and what comes back.

KEY TERMS

browser

The program (Safari, Chrome, Firefox, Edge) that requests a page from a server, reads the HTML and CSS it gets back, and draws — *renders* — the page on your screen.

CSS

Cascading Style Sheets: the file that holds a page's appearance — fonts, sizes, colors, spacing, layout — kept separate from the HTML content.

live text

Text that exists as characters the browser lays out, rather than as pixels inside an image. Live text can be selected, searched, enlarged, translated and read aloud by assistive software.

rendering

The browser's act of turning HTML and CSS into drawn pixels. Different screens render the same page at different sizes, which is why screen design never fixes the page width.

HTML

HyperText Markup Language: the file that holds a page's content and structure — headings, paragraphs, links, images — each wrapped in labeled tags like <h1> and <p>.

tag / element

A labeled wrapper in HTML. <h1>Bread</h1> is a level-one heading element: an opening tag, the content, and a closing tag.

web font

A font file the page loads so every visitor sees the same typeface. Google Fonts serves hundreds of them free, including Inter, Lora and Source Serif.

CORE IDEAS

The story. In March 1989 a 33-year-old English physicist-programmer at CERN, the particle physics laboratory near Geneva, handed his boss a memo titled *Information Management: A Proposal*. The boss, Mike Sendall, wrote three words on the cover: "Vague but exciting." The programmer was Tim Berners-Lee, and the proposal became the World Wide Web. Working on a NeXT computer, he wrote the three inventions the web still runs on: HTML, the language of pages; HTTP, the rules by

which a browser asks a server for a page; and the URL, the address that names every page in the world. On 6 August 1991 he put the first website online at info.cern.ch — plain black text, blue underlined links, no pictures, explaining what the web was and how to join it. Crucially, CERN announced in April 1993 that the technology was free for anyone to use, forever. No license, no fee. That single decision is why a homeschool student in 2026 can publish a portfolio to the entire world for nothing.

How they figured it out. The early web had almost no design controls, and designers hated it. Through the late 1990s they forced layouts into invisible tables and saved headlines as GIF images just to choose a typeface — pages became heavy, fragile and invisible to search engines. The better answer had already been proposed: in October 1994 a Norwegian programmer at CERN, Håkon Wium Lie, published *Cascading HTML Style Sheets*, and CSS level 1 became a standard in December 1996. The idea is the great separation: HTML holds what the content *is* (this is a heading, this is a paragraph, this is a quotation); CSS holds how it should *look*. One stylesheet can restyle a thousand pages overnight. The web-standards movement spent years persuading designers, and the argument was settled in 2003 by a demonstration: Dave Shea's CSS Zen Garden, one fixed HTML file that hundreds of designers restyled into wildly different designs by changing only the CSS. Same content, different clothes — the point was unanswerable.

The craft. You do not need to become a programmer, but a designer who can read a little HTML and CSS is worth more and is fooled less. HTML is a nested outline: a page contains a heading (<h1> through <h6>), paragraphs (<p>), links (<a>), images (<img>) and containers (<header>, <main>, <footer>). Headings are structure, not styling: you choose <h2> because it is the second level of the outline, then use CSS to size it. CSS is a list of rules: a *selector* names which elements, then properties set their look — h1 { font-family: 'Lora', serif; font-size: 2.5rem; color: #1a3324; }. Every element sits in a box with content, padding, border and margin — the *box model* — and layout on the web is the art of arranging boxes. And here is the rule that touches everything you did in Units 3–5: on the web, typography is live text. Text saved inside an image cannot be searched, selected, translated, enlarged by a reader with weak eyes, or read aloud by a screen reader; it blurs on high-density screens and weighs ten times more to download. A professional reserves image text for logos and lettering art, and sets everything else live.

In the studio. Working UI designers rarely write the final code — developers do — but they speak the language daily. They say "that should be an h2, not a bolded paragraph," "the body is 16px Inter with 1.5 line-height," "can we load Lora from Google Fonts for headings only?" They use the browser's own X-ray machine: right-click any page and choose *Inspect*, and the browser shows the live HTML and CSS of what you are looking at — the single best free design teacher on the internet, because every site you admire will show you exactly how it is built. This week you will hand-write one small page, not to become a developer, but so that for the rest of your career you know what the developer on the other side of the table is actually doing with your design.

In the studio, continued. Learn the vocabulary of sizes now, because the rest of the unit depends on it. Screen measurements are in pixels (px), but good CSS uses *relative* units: 1rem equals the reader's base text size, 16px by default, so 2.5 rem is 40px — and if a reader with low vision raises their base size, your whole design scales with it. That is accessibility as craftsmanship, the same habit as your contrast work in Lesson 4.5: not a regulation to satisfy, but the mark of a maker who respects the reader.

PICTURE STUDY



Jean Miélot in His Scriptorium, Unknown miniaturist (workshop associated with Jean Le Tavernier), Second half of the 15th century · Manuscript miniature · Royal Library of Belgium, Brussels, MS 9278
Image: Wikimedia Commons, public domain

Jean Miélot was a professional of the page: scribe, translator and secretary to Philip the Good, Duke of Burgundy, in the decades just before printing reached the Low Countries. Here he sits at a slanted desk purpose-built for the work, pen in one hand, knife in the other, with his sources propped on stands around him.

Five centuries before CSS, Miélot's whole trade was deciding how text should be structured and presented so a reader could use it: letter size, line spacing, margins, headings in red. Study his workspace as the ancestor of yours — the screen replaced the parchment, but the job of making words plain to the reader has not changed.

Look closely

- Find the slant of the writing desk. Why would a scribe — or a drafter at a drawing table today — want the work surface tilted toward the eye?
- Miélot holds a pen in one hand and a small knife in the other. The knife held the springy parchment flat and scraped away mistakes. What are the undo and hold-still tools in your software?

- Count the books open on stands around him. What does that tell you about how much reference material one page of work required?
- Look at the window and where the light falls on the desk. Why does the light source matter for this work?
- Find evidence of structure in the room itself — shelves, chest, stands. How does an organized workspace change the work?

Talk about it

1. A manuscript page and a web page both have margins, headings and body text. What jobs do those features do for the reader in both media?
2. Miélot's books could only be read by one person in one place. What exactly did Berners-Lee's inventions change about that — and what did they not change about the designer's job?
3. Within forty years of this painting, printing made Miélot's copying trade obsolete, yet the design of pages mattered more than ever. What lesson should a designer facing new technology take from that?

Safety first. Screen sessions this unit are long. Set your chair so your feet are flat, the screen top at eye height and about an arm's length away. Every 20 minutes, look at something 20 feet away for 20 seconds (the 20-20-20 rule), and stand and stretch your wrists and shoulders between sessions.

STUDIO BRIEF

Studio brief: A hand-built page for Harvest Bread Co.

Client: Harvest Bread Co., a one-family bakery opening next month. They need a single coming-soon web page: name, one line about the bakery, opening date, and where to find them. Budget: zero. Deliverable: one HTML file and one CSS file that open in any browser. Deadline feel: end of the week.

You will hand-write this page in a plain text editor. The point is not to become a developer; it is to touch the real material of the web once, the way a print designer once visited the press.

You will need

- Any computer with a plain text editor (TextEdit on Mac set to plain text, Notepad on Windows, or the free VS Code) and a browser
- Pencil and paper for the sketch
- Google Fonts open in a browser tab (fonts.google.com)
- Your sketchbook for notes

Steps

1. Sketch the page on paper first: bakery name large, one sentence, opening date, address. Choose hierarchy exactly as you did in Unit 2 — what reads first, second, third?
2. Create a folder named harvest. Inside it create a file named index.html. Type the skeleton: <!doctype html>, then <html>, <head> with a <title>, and <body>.
3. In the body, mark up the content by meaning: <h1> for the name, <p> for the sentence, another <p> for date and address. Save, then open the file in your browser. Ugly is correct at this stage — this is structure.
4. Create style.css in the same folder and link it from the head: <link rel="stylesheet" href="style.css">. Reload and confirm the link works by setting a loud test color, then remove it.
5. Choose one display face and one text face on Google Fonts (you paired faces in Lesson 3.3). Copy the two <link> lines Google gives you into your head,

and set font-family rules in the CSS.

6. Style deliberately: a background color and text color with at least 4.5:1 contrast (Lesson 4.5), the h1 at about 3rem, body at 1rem to 1.125rem with line-height around 1.5, and generous margins — center the text block and cap its width at about 36rem so the measure stays readable.
7. Test like a professional: narrow the browser window to phone width and widen it fully. Raise the browser zoom to 150%. Fix what breaks.
8. Show the page to a family member on a different device if you can. Watch where their eyes go first; compare with your intended hierarchy.
9. **Check your work.** Validate the structure by eye: exactly one h1, every tag closed, contrast checked, live text only — no words inside images.

Tips

- Type the tags yourself rather than pasting; your hands learn the grammar in one evening.
- When something will not change, the cause is almost always a typo in a selector or a missing semicolon. Inspect the page and read what the browser thinks.
- Keep this folder. In Unit 10 you may reuse it as the seed of your hosted portfolio page.

Check your work

- ☐ My page opens in a browser, with one h1, linked CSS and two Google Fonts.
- ☐ The text is live, the contrast passes 4.5:1, and the measure is capped near 36rem.
- ☐ I can explain to a client, in two sentences, what HTML and CSS each do.

SKETCHBOOK

1. Draw the anatomy of a web page as a labeled diagram: browser window, HTML outline (h1, p, img, footer) on the left, and arrows to the rendered result on the right.
2. Copy out your finished CSS file by hand and annotate every line in the margin with what it controls.
3. A timeline of this lesson's story: 1989 proposal, 1991 first site, 1993 CERN makes it free, 1994 Lie proposes CSS, 1996 CSS1, 2003 CSS Zen Garden.

> **From history.** The browser wars of the late 1990s — Netscape Navigator against Internet Explorer — littered the web with badges reading "Best viewed in…" because each browser rendered pages its own way. The Web Standards Project (founded 1998) campaigned for browsers to follow the published HTML and CSS standards, and won; today a page built to the standard renders faithfully everywhere, which is the only reason one designer can serve every screen on earth.

PRACTICE

1. Easy Name the three inventions Tim Berners-Lee wrote for the first web, and what each one does.

   Show answer

   HTML (the language that structures a page's content), HTTP (the rules a browser uses to request a page from a server), and the URL (the address that names each page).

2. Easy Which file would you edit to change every heading on a 40-page site from navy to forest green: the HTML or the CSS? Why?

   Show answer

   The CSS. Color is appearance, and one stylesheet rule (for example h2 { color: #1a3324; }) applies to every page that links to it; the HTML holds only the content.

3. Easy Write the HTML for a level-one heading that says Harvest Bread Co. and a paragraph that says Fresh every morning.

   Show answer

   <h1>Harvest Bread Co.</h1> followed by Fresh every morning.

4. Medium List five things live text can do that the same words saved inside a JPEG cannot.

   Show answer

   Be selected and copied; be found by search; be translated; be resized by the reader; be read aloud by a screen reader. (Also: it stays crisp on high-density screens and downloads far lighter.)

5. **Medium** The default base size is 16px. Convert to pixels: 1.5rem, 2.25rem, 0.875rem.

   Show answer

   $1.5 \times 16 = 24$ px, $2.25 \times 16 = 36$ px, $0.875 \times 16 = 14$ px.

6. **Medium** A client's old site has its headline set as a picture of text. Give the client three plain-English reasons to rebuild it as live text with a web font.

   Show answer

   Search engines cannot read a picture, so the headline does nothing for finding the business; visitors with weak eyes cannot enlarge it and screen readers cannot speak it; and it blurs on modern phone screens while a live headline stays sharp and loads faster.

7. **Medium** Why did designers in the 1990s save headlines as GIF images, and what two costs did that habit carry?

   Show answer

   Browsers then could only show the handful of fonts installed on the reader's machine, so images were the only way to pick a typeface. The costs: heavy, slow pages, and text that was invisible to search engines and assistive software.

8. **Hard** What did the CSS Zen Garden (2003) demonstrate, and why did it end the argument for separating HTML and CSS?

   Show answer

   Hundreds of completely different designs were built from one identical HTML file by changing only the CSS. It proved content and appearance really are separable: structure once, restyle forever — which makes redesigns, consistency and maintenance vastly cheaper.

9. Hard You are the designer. A developer says your mockup's quotation should be an <h3> "because it needs to be big." What do you answer?

   Show answer

   Heading tags are outline structure, not sizing. A quotation is not a heading; it should be a <blockquote> (or a paragraph), styled large with CSS. Using headings for size scrambles the page's outline for search engines and screen-reader users.

10. Challenge Open a real website, right-click a headline and choose Inspect. Find three facts about its typography in the CSS panel and write them down with their CSS property names.

    Show answer

    Answers vary; for example font-family: Inter, sans-serif; font-size: 2rem; line-height: 1.2; font-weight: 700; color: #111827. The point is that every site will show you its own recipe.

COMMON MISTAKES

- Choosing heading tags for their size instead of their outline level. Structure first; size it with CSS.
- Fixing the page at one width and calling it done. The reader chooses the window size, not you — test narrow and wide every time.
- Saving text inside images out of habit. On screen, image text is reserved for logos and lettering art; everything else is live text.

Make it a game · Tag or Style?. A parent reads page features aloud — "the headline," "the headline is dark green," "a link to the order page," "the paragraph's line spacing," "a photo of the storefront," "the photo has rounded corners." You call HTML or CSS in three seconds each. Ten in a row wins; then swap roles and try to stump them with trick cases like "the text of the button" (HTML) versus "the button's shadow" (CSS).

Scripture. “Their line is gone out through all the earth, and their words to the end of the world. In them hath he set a tabernacle for the sun,” (Psalm 19:4, KJV)

The heavens publish without speech, yet their line runs through all the earth and their words reach the end of the world. The web hands your words the same reach — a page made at one desk can be read anywhere on earth, so build it worthy of where it may travel.

9.2 Buttons, Forms and Flows: User Interface Fundamentals

OBJECTIVES

- Name the standard UI components and design a button in all five states: default, hover, active, focus and disabled.
- Explain Fitts's law (1954) and the 44-point touch target in plain words, and apply both to a phone-screen design.
- Map a user flow — every screen and decision between a person's goal and its completion — and simplify a form so it asks only what it must.

> **Warm-up.** Find three doors in your house or a public building. For each, decide before touching it: push or pull? What told you — a flat plate, a graspable handle, a label? Write down any door that lied to you. Designers call a door that needs a PUSH sticker a Norman door, after the designer who made them famous, and your job this lesson is to never design one on a screen.

WATCH

Be a Better UI Designer in 5 minutes

Jesse Showalter · 4:35

https://www.youtube.com/watch?v=XoNTygM2BOI

> **WHEN TO WATCH**
> After the craft paragraph. It is dense — watch it twice, and pause to screenshot one before/after that convinces you.

Note: A working UI designer compresses the habits of the trade — spacing, alignment, contrast, consistency — into five minutes. Notice how much of it is Unit 2 and Unit 3 applied to components.

BACKUP VIDEO

User Flow Diagram Basics

Jesse Showalter · 10:21

https://www.youtube.com/watch?v=cvYhuowazh0

Before you draw the flow in the studio brief. He diagrams screens and decisions with simple boxes and diamonds — copy his notation.

KEY TERMS

component

A reusable interface part — button, text field, checkbox, dropdown, card — designed once and used everywhere, so the interface stays consistent.

affordance

What an object's appearance tells you about how to use it. A raised, shadowed rectangle affords pressing; underlined colored text affords clicking. The term came through psychologist James J. Gibson and designer Don Norman.

state

One of a component's appearances: default, hover (pointer over it), active (being pressed), focus (selected by keyboard), and disabled (currently unavailable). A professional designs all five.

touch target

The tappable area around a control. Apple's Human Interface Guidelines call for at least 44 × 44 points; Google's Material Design calls for 48 × 48 dp — both roughly a 9 mm fingertip.

Fitts's law

Paul Fitts's 1954 finding that the time to hit a target grows with distance and shrinks with target size. Big, close targets are fast; small, far ones are slow and error-prone.

user flow

The mapped path from a person's goal to its completion: every screen, tap and decision along the way, drawn as a diagram before any screen is designed.

form

A set of inputs that collects information — name, address, choices. The craft is asking the minimum, labeling clearly, and writing error messages that help rather than scold.

CORE IDEAS

The story. In 1947 a U.S. Army Air Forces psychologist named Paul Fitts and his colleague Richard Jones did something unusual with pilot error: they took it seriously as a design problem. They interviewed hundreds of pilots about cockpit mistakes — wheels-up landings, wrong levers pulled at the wrong moment — and

found the same pattern again and again: in some aircraft the flap and landing-gear levers were identical in shape and sat side by side. The pilots were not careless; the cockpit was dishonest. Fix the controls — give the gear lever a little wheel-shaped knob, the flap lever a flap-shaped one — and the "pilot error" largely disappeared. In 1954 Fitts published the law that still carries his name: the time to acquire a target depends on its distance and its size. Those two findings — blame the design, not the user, and make targets big and close — are the foundation stones of interface design, laid a half-century before the touchscreen phone.

How they figured it out. The ideas matured in plain sight. Psychologist James J. Gibson described how creatures read their environment for action — what a surface or handle *affords* — and in 1988 the engineer-psychologist Don Norman carried the idea to designers in *The Design of Everyday Things*, with the now-famous example of doors that need instruction stickers. When Apple shipped the iPhone in 2007, the finger replaced the mouse pointer, and the old laboratory numbers suddenly mattered in every pocket: a fingertip covers roughly 9–10 millimeters of glass, so Apple's guidelines set the minimum touch target at 44 × 44 points and Google's at 48 × 48. None of this is fashion. It is applied measurement of the human hand and eye, as real as the pilot studies it descends from.

The craft. Interfaces are built from a small standard kit: buttons for actions, links for navigation, text fields, checkboxes (choose many), radio buttons (choose one), dropdowns, toggles, cards. Two disciplines separate the professional from the dabbler. First, *states*: a button is not one drawing but five — default, hover, active, focus and disabled — and the reader's trust depends on the interface answering every touch (press a real button and it visibly depresses; press a dead image and you wonder if the thing is broken). The focus state matters doubly: it is how a keyboard user — including many users with limited mobility — sees where they are, so it must be plainly visible, not politely deleted. Second, *honest affordance*: the thing that looks pressable must be pressable, and the pressable thing must look it. Underlined colored text that goes nowhere, and plain gray text that is secretly a button, are Norman doors on glass. For forms: ask only what the task requires (a bakery pre-order needs a name and a pickup day, not a birthdate), label every field outside it (placeholder text that vanishes when you type is a memory test, not a label), group related fields, and write error messages that name the problem and the fix — "Please enter a phone number with area code," not "Invalid input."

In the studio. Professionals design the flow before any screen. A user flow diagram is boxes (screens), diamonds (decisions) and arrows (paths): Start → Browse breads → Choose loaf → Pickup day? → Confirm → Done. Drawing it first exposes the screen you forgot — the empty state when no breads are listed, the error when the bakery is closed, the confirmation the customer screenshots. Then they design the components once, as a small kit, and assemble screens from the kit, which is why good apps feel consistent: the same button means the same thing everywhere. In Penpot you will build a tiny version of exactly this: components with states, assembled into a flow.

In the studio, continued. Sizing by the numbers, so you can defend it in a review: at least 44 × 44 points per touch target with at least 8 points between adjacent targets; primary action biggest and nearest the thumb's reach on a phone; destructive actions (Delete) separated from routine ones so Fitts's law works *for* safety — make the dangerous target smaller and farther, never adjacent to Confirm. Count taps: every tap you remove from a flow is friction removed from every customer, every day. When a stakeholder asks why the button is "so big," you now have a 1954 answer.

PICTURE STUDY



Nihonbashi: Morning Scene (from The Fifty-three Stations of the Tōkaidō), Utagawa Hiroshige, c. 1833–1834 (Hōeidō edition) · Color woodblock print · British Museum, London

Image: Wikimedia Commons, public domain

In 1833 Hiroshige began publishing one print for each of the fifty-three post stations on the Tōkaidō, the great road from Edo (Tokyo) to Kyoto. This is plate one: Nihonbashi, "Japan Bridge," the official starting point from which all distances in the country were measured. A procession sets out across the bridge at dawn; fish sellers and porters crowd the street.

The whole series is a journey designed as a sequence — a traveler moves from station to station, each print a step with its own scene, until the goal is reached. Read it this lesson as the grandfather of the user flow: a path with a clear start, ordered stages, and wayfinding at every stop.

Look closely

- Find the signs of start: gates, the bridge, the direction of movement. How does Hiroshige tell you this is the beginning of a journey rather than the middle?
- Trace where your eye travels through the crowd. What lines and shapes steer it — and what would a viewer miss if the print were shrunk to a postage stamp?

- The series ran fifty-five prints (fifty-three stations plus start and end), each legible alone yet clearly part of the set. What repeated elements made every print recognizably part of the series?
- Travelers on the Tōkaidō navigated by stations — known stopping points with known services. What are the stations in an app's sign-up flow?
- Count how many different trades you can identify in the crowd by shape alone. How much does Hiroshige communicate with silhouette?

Talk about it

1. A journey of fifty-three stations is bearable because it is divided into stages with rests. How does that principle apply to a long form or checkout flow?
2. What is the equivalent of a mile marker or station signboard in an interface — the thing that tells you where you are and how far is left?
3. Hiroshige's travelers never wondered whether a bridge was a bridge. When has an interface made you wonder what something was — and what would Fitts and Norman have said about it?

Safety first. Long pointer-and-keyboard sessions strain the wrist. Keep your wrist straight and floating, not bent and planted; drop your hands to your lap during every pause; and follow the 20-20-20 rule for your eyes. If your mousing hand tingles or aches, stop for the day — pain is data.

STUDIO BRIEF

Studio brief: Sign-up flow for the Summer Reading Club app

Client: your local library's Summer Reading Club (fictional stand-in welcome). They need the sign-up flow for a simple phone app: a child and parent register, choose a weekly reading goal, and land on a home screen showing progress. Deliverable: a user-flow diagram, a mini component kit, and three linked phone screens in Penpot. Deadline feel: one week.

The client's one hard rule, from bitter experience with their current paper form: ask for as little as possible.

You will need

- Pencil, paper and a ruler for the flow diagram and paper wireframes
- Penpot (free) with a 375 × 812 frame size for phone screens
- A phone (a parent's is fine) for the arm's-length legibility test
- Sketchbook for the component kit notes

Steps

1. Write the user's goal in one sentence: "Sign my child up and set a goal in under two minutes." Everything serves that sentence.
2. Draw the user flow on paper: boxes for screens, diamonds for decisions, arrows for paths. Include the success screen, one error state and one empty state. Aim for the fewest screens that stay unhurried.
3. Decide the minimum fields. Defend every field in writing with one line each; cut anything you cannot defend.
4. Wireframe the three key screens on paper at phone proportion: Welcome, the form, and Home with the goal shown. Thumb-reach matters: primary button in the lower half.
5. In Penpot, build the component kit first: one primary button with all five states, one text field (default, focus, error with message), one radio-button group for the weekly goal.
6. Assemble the three screens from your components on 375-wide frames. Every touch target at least 44 points tall; at least 8 points between targets;

body text at least 16.

7. Add Penpot's prototype links so tapping the primary button walks Welcome → Form → Home.
8. Test on a human: hand a parent or sibling the flow (even as clickable frames on your screen) and ask them to sign up a fictional child while you watch silently. Note every hesitation.
9. Revise once from what you saw, and write three sentences in your sketchbook: what you changed and why.
10. **Check your work** against the mastery checklist items for states, targets and flows before calling it done.

Tips

- Design the form's error state before the happy path; it is where trust is won or lost.
- Watching a real person use your design without you narrating is the single fastest way to improve as a UI designer. Silence is hard; keep it anyway.
- Name your Penpot layers and components properly now (Button/Primary/Default) — Lesson 9.5 depends on this habit.

Check your work

- ☐ My flow diagram includes a success, an error and an empty state.
- ☐ My button component shows five states; my targets measure 44 points or more.
- ☐ A test user finished sign-up without asking me a question — or I revised until one could.

SKETCHBOOK

1. A component kit page: draw a button in all five states, a text field in default/focus/error, and a radio group, each labeled with sizes in points.
2. Your door audit from the warm-up plus the app audit from practice problem 11, drawn as paired honest/dishonest sketches.
3. The Summer Reading Club user flow, inked cleanly with boxes, diamonds and arrows — portfolio-neat; flow diagrams are interview material.

> **From history.** The 1984 Macintosh carried Fitts's law in its bones: the menu bar sits at the screen's absolute top edge because a target at the edge is effectively infinitely deep — you can throw the pointer at it without overshooting, making it the fastest pixel row on the screen. Forty years later, phone designers put primary buttons at the bottom for the same reason wearing a new disguise: that is where the thumb already lives.

PRACTICE

1. Easy Name the five states of a button and say when each appears.

   Show answer

   Default (resting), hover (pointer over it), active (while pressed), focus (selected by keyboard, shown with a visible ring or outline), disabled (action unavailable — grayed, not hidden).

2. Easy State Fitts's law in one plain sentence, and give the two ways to make a control faster to hit.

   Show answer

   The farther and smaller a target, the longer it takes to hit. Make it bigger, and put it closer to where the pointer or thumb already is.

3. Easy What minimum touch target do Apple's guidelines require, and roughly what physical size does it correspond to?

   Show answer

   44 × 44 points, roughly a 9 mm fingertip — about the width of an adult's finger pad on the glass.

4. Easy Checkboxes or radio buttons: a form asks a customer to pick exactly one pickup day from five. Which component, and why?

   Show answer

   Radio buttons — they afford choose-one-of-these; checkboxes afford choose-any-number. Using the wrong one lies to the user about the rule.

5. **Medium** What was Fitts and Jones's 1947 finding about "pilot error," and what is its lesson for every interface designer?

Show answer

Most cockpit errors traced to controls that were identical, adjacent or inconsistent — design faults, not carelessness. Lesson: when users keep failing, redesign the control; blame the design, not the user.

6. **Medium** A sign-up form asks for first name, last name, email, phone, street address, birthday and favorite color — to join a bread waiting list. Cross out what should go, and justify the survivors.

Show answer

Keep name (one field is enough) and email — that is all a waiting list needs. Phone, address, birthday and favorite color add friction and privacy cost with no task value; every needless field loses real customers.

7. **Medium** Why must the keyboard focus state be clearly visible, and who depends on it?

Show answer

Keyboard users — including many people who cannot use a mouse or touchscreen, and all power users tabbing through forms — can only know where they are by the focus indicator. Removing it because it "looks untidy" makes the interface unusable for them.

8. **Medium** Rewrite this error message to professional standard: "ERROR: Invalid input."

Show answer

Name the field, the problem and the fix, politely — for example: "Please enter your phone number with area code, like (555) 234-5678."

9. Hard Two buttons sit side by side at the same size: Confirm order and Delete order. Critique the layout using Fitts's law and affordance, and fix it.

Show answer

Adjacent equal targets make the catastrophic mis-tap as easy as the intended tap. Separate them, make Confirm the large filled primary button, style Delete as a smaller, visually quieter secondary action farther away, and require a confirmation step for the destructive one.

10. Hard Draw (in words) the user flow for reserving a loaf: list the screens, the one decision point, and two states beginners forget.

Show answer

Browse list → Loaf detail → Choose pickup day (decision: day available? if not, show next available) → Contact info → Confirm → Success screen. Commonly forgotten: the empty state (nothing available this week) and the error state (submission fails or shop closed).

11. Challenge Audit a real app with a parent for ten minutes. Find one honest affordance, one dishonest one, one touch target you judge under 44 points, and one form field that should not exist. Record all four in your sketchbook.

Show answer

Answers vary. The skill being built is seeing interfaces as designed objects with defensible or indefensible choices — the same critical eye as Lesson 2.5, pointed at glass.

COMMON MISTAKES

- Designing only the happy path. Professionals are hired for the error, empty and loading states; beginners forget them.
- Deleting the focus outline because it looks untidy. It is a load-bearing accessibility feature; restyle it, never remove it.
- Making every button equally loud. One primary action per screen; the rest step back — hierarchy (Unit 2) applies to controls, too.

Make it a game · State Five, Target Size. Round one: a parent points at any control in a real app — you name its five states and mime what each looks like, ten seconds per state. Round two: they point at targets on the phone screen and you call "legal" or "under 44" before measuring against your thumb's width. Score a point per correct call; beat your own score tomorrow with a different app.

Scripture. “Therefore all things whatsoever ye would that men should do to you, do ye even so to them: for this is the law and the prophets.” (Matthew 7:12, KJV)

Usability is the golden rule practiced in pixels: honest buttons, forms that ask no more than needed, and error messages written as you would want to be spoken to. Designing for the person on the other side of the glass is a small, daily act of loving your neighbor.

9.3 One Design, Every Screen: Responsive Layout

OBJECTIVES

- Tell how Ethan Marcotte's 2010 essay defined responsive design's three ingredients — fluid grids, flexible images and media queries — and why the Boston Globe's 2011 site proved it at scale.
- Convert between px, rem and percent; compute fluid widths with target ÷ context; and lay out columns and gutters with grid arithmetic.
- Build one page design at 375, 768 and 1440 pixels on an 8-point spacing grid, choosing breakpoints from where the content breaks.

> **Warm-up.** Pour the same glass of water into a tall glass, a wide bowl and a jar. The water is the content; the vessels are screens. Now open one website on a phone and on a computer side by side and list three things that changed between the two — columns, menu, image sizes — and one thing that stayed the same. You have just done a responsive design audit.

WATCH

A practical guide to responsive web design

Kevin Powell · 23:13

https://www.youtube.com/watch?v=x4u1yp3Msao

> **WHEN TO WATCH**
> After the worked examples. His big idea — the web is responsive by default, and bad CSS breaks it — reframes the whole lesson; pause at each demo and predict what will happen before he resizes.

Note: Powell shows that fixed sizes cause most responsive bugs and that letting the browser do the work beats fighting it. You will not write much CSS in this course, but you will brief developers, and this video teaches you what to ask for.

BACKUP VIDEO

Master Spacing in UI Design 💪

Jesse Showalter · 10:22

https://www.youtube.com/watch?v=cf95Z7Ngg8k

With the 8-point grid section of the craft paragraph. He demonstrates spacing scales in practice; copy his before/after into your sketchbook.

KEY TERMS

responsive design

One design that adapts its layout to any screen width, built from fluid grids, flexible images and media queries. Named by Ethan Marcotte in 2010.

breakpoint

A width at which the layout changes — for example, from one column to three at 768 px. Chosen where the content starts to break, not from a list of devices.

rem

A relative unit equal to the root text size, 16 px by default: 1 rem = 16 px, so 1.5 rem is 24 px. Designs in rem scale when the reader enlarges text.

fluid grid

A grid whose columns are percentages of their container rather than fixed pixels, computed by target ÷ context.

media query

The CSS rule that applies styles only under a condition, usually a minimum width:
@media (min-width: 48rem) { … } — the switch that fires at a breakpoint.

8-point grid

A spacing discipline where every margin, padding and gap is a multiple of 8 (with 4 for fine adjustment): 8, 16, 24, 32, 48, 64. Popularized by Google's Material Design (2014).

mobile-first

Designing the narrow screen first, then enhancing for wider ones — forcing the hard decisions about what matters most to be made first.

CORE IDEAS

The story. On 25 May 2010, a Boston web designer named Ethan Marcotte published an essay called *Responsive Web Design* in the online magazine A List Apart. The iPhone was three years old, the iPad three months, and the industry's answer to small screens was to build a second, stripped-down "m-dot" site — twice the work, half the content, forever out of sync. Marcotte, borrowing his title from "responsive architecture" (buildings that adapt to the people in them), argued the page itself should flex, and named the three ingredients that make it possible: fluid grids, flexible images and CSS media queries. The next year he and the Filament Group rebuilt bostonglobe.com as the first major responsive news site — one design serving every width from a flip phone's browser to a newsroom monitor. The argument ended in October 2016, when StatCounter measured mobile devices passing desktop computers in worldwide web use: 51.3 percent. Since then, every serious design brief assumes every width at once.

How they figured it out. Marcotte's fluid grid rests on one fraction a sixth-grader can compute: result $=$ target $\div$ context. Take a layout drawn 960 px wide (the context) with a 300 px sidebar (the target): $300 \div 960 = 0.3125 = 31.25\%$. Write the sidebar as 31.25% and it holds its proportion at every width. Flexible images follow with one rule — an image may never exceed its container — and media queries handle what proportion alone cannot: below some width, three columns of 31% are each too narrow to hold a readable line, so a breakpoint stacks them into one. The second key idea arrived from Luke Wroblewski in 2009: *mobile first*. Design the 375 px screen

before the 1440 px one, because scarcity forces honesty — on a phone there is no room for the carousel nobody wanted anyway. Wider screens then receive enhancements, not the narrow screen amputations.

The craft. Three pieces of arithmetic run every responsive layout, and you must own all three. *Units:* pixels are fixed; rem is relative to the root size (16 px default), so $\text{px} = \text{rem} \times 16$ and $\text{rem} = \text{px} \div 16$. Type, spacing and breakpoints are best set in rem so the whole design scales when a reader enlarges text. *Grid arithmetic*, straight from Lesson 5.1 but now at three widths: a container W with n columns and gutters g has columns of width $c = \dfrac{W - (n-1)g}{n}$. At 1200 px with 12 columns and 24 px gutters: $(1200 - 264)/12 = 78$ px — and a card spanning four columns is $4 \times 78 + 3 \times 24 = 384$ px, because spans include the gutters they cross. *Spacing:* the 8-point grid. Every gap, padding and margin is a multiple of 8 (4 allowed for fine work): 8, 16, 24, 32, 48, 64. Why 8? Common screens divide evenly by it, it halves and doubles cleanly, and — the real reason — it replaces a hundred small arbitrary decisions (13 here? 15 there?) with one system, which is what makes a layout feel calm and a team's files consistent.

The craft, continued. Where do breakpoints go? Not at device names — there are thousands of devices — but where your content breaks. The usual suspects are around 20–24 rem (320–384 px, small phones), 48 rem (768 px, where one column can become two or three), and 64–80 rem (1024–1280 px, where the grid reaches full width); but the honest method is to stretch your one-column design wider until something fails — most often the measure: when body text passes about 75 characters per line (Lesson 3.4), the line is too long, and that width is your breakpoint. Estimate characters per line with the half-em rule: an average character is about half the font size, so $\text{CPL} \approx \dfrac{\text{measure}}{0.5 \times \text{font size}}$. A 600 px column of 16 px text holds about 75 characters — at the limit; cap the measure near 36 rem (576 px) and you sit comfortably in the 45–75 range no matter how wide the screen grows.

In the studio. Designers deliver responsive work as two or three frames of the same page — mobile 375, tablet 768, desktop 1440 are the common stand-ins — plus notes on what happens between them ("columns are fluid percentages; nav collapses to a menu button below 48 rem; images fill their column"). In Penpot you will set up exactly these frames and keep one source of truth for type styles and spacing tokens so the three frames stay siblings, not strangers. Developers will translate your

percentages and rems directly; a file whose spacing is all 8s and whose type ramp is in rems can be built in half the time of a file full of 13s and 37s, and the developer will quietly respect you for it.

PICTURE STUDY



Rainstorm Beneath the Summit, Katsushika Hokusai, c. 1830–1832 · Color woodblock print · Shimane Art Museum, Matsue, Japan

Image: Wikimedia Commons, public domain

From the same Thirty-six Views of Mount Fuji that produced the Great Wave, Hokusai printed two portraits of the mountain itself, back to back. In Fine Wind, Clear Morning the peak stands red and serene in dawn light. In this print the subject is identical — same mountain, same triangular composition — but the conditions have changed: above the clouds the summit is calm, while beneath them a storm has blackened the slopes and lightning snaps across the base. One subject, two renderings, each honest about its circumstances.

That is responsive design, a century before the first screen. Your layout is the mountain: its identity — hierarchy, voice, content — must survive every condition it meets. The phone, the tablet and the desktop are the clear morning and the storm. A design system that only works in one weather is a postcard; one that keeps its character while adapting its arrangement to each circumstance is Fuji. Hokusai did not draw a different mountain for the storm. He drew the same mountain responding.

Look closely

- Compare this print with Fine Wind, Clear Morning from the same series (Lesson 2.1). List exactly what stayed the same and exactly what changed.

- Where does Hokusai divide the two 'conditions' in a single image? Find the boundary line between calm and storm.
- The lightning is the print's only jagged line. What does that contrast against the mountain's long smooth edges accomplish?
- What tells you this is still unmistakably the same mountain as the red Fuji — which features carry its identity across the change?
- Check the values: summit against sky, base against lightning. How does Hokusai keep the design readable in both halves at once?

Talk about it

1. Name the parts of one of your own designs that must never change across screen sizes — its Fuji silhouette — and the parts that may be rearranged like the weather.
2. Hokusai adapted one subject to different conditions rather than inventing a new picture. Why is that harder, and why is it worth more, than designing each version from scratch?
3. A viewer who knows the red Fuji instantly recognizes this dark one. What is the equivalent recognition test for a responsive layout seen first on a phone, then on a desktop?

Safety first. Grid work means long, close screen focus. Keep the 20-20-20 habit, blink deliberately (screen staring dries the eyes), and set your frames at 100% zoom rather than leaning in — if you cannot read your own 16 px text at arm's length, that is design data, not a reason to move closer.

STUDIO BRIEF

Studio brief: Responsive landing page for Greenhouse & Porch

Client: Greenhouse & Porch, a fictional family nursery that sells seedlings and runs Saturday workshops. They need a landing page designed at three widths — phone 375, tablet 768, desktop 1440 — with a hero section, three feature cards (Plants, Workshops, Visit), a quote from a customer, and a footer. Deliverable: three Penpot frames plus a half-page of behavior notes for the developer. Deadline feel: one week.

Everything must sit on an 8-point spacing grid and a 12-column desktop grid, and every number in your file should be defensible with this lesson's arithmetic.

You will need

- Pencil and paper for thumbnails at three proportions
- Penpot with frames at 375 × 812, 768 × 1024 and 1440 × 900
- Your type ramp from Unit 3 converted to rem, and a palette from Unit 4 with checked contrast
- Calculator for grid arithmetic; sketchbook for the spec notes

Steps

1. Thumbnail mobile first: six tiny 375-proportion sketches arranging hero, cards, quote, footer in one column. Pick the strongest.
2. Define the system before drawing screens: spacing tokens (8, 16, 24, 32, 48, 64), type ramp in rem, and the desktop grid — compute the 12-column/24 px-gutter column width for a 1312 px content area and write it in your sketchbook.
3. Build the 375 frame: one column, measure capped, touch targets 44+, generous 8-grid spacing. This frame is the design; the others adapt it.
4. Build the 768 frame: cards go two-up or three-up — do the CPL check on card text before deciding, and record the numbers.
5. Build the 1440 frame on the 12-column grid: hero text spanning 6–7 columns (check its measure), cards 4 each, quote centered on 8.

6. Audit all three frames with Penpot's measurement tools: every gap a multiple of 8, every column matching your computed widths. Fix drift now, not later.
7. Write the developer notes: fluid percentages for the main regions (target ÷ context from your 1440 frame), the two breakpoints in rem, what the nav does below 48 rem, and how images behave.
8. Squint test and arm's-length phone test, then one revision pass.
9. **Check your work.** Compare the three frames side by side: same brand, same hierarchy, three honest compositions — Fuji in every print.

Tips

- Design tokens first, screens second. Deciding spacing per-element is how files drift into chaos.
- When a section fights you at some width, the content is telling you where its real breakpoint is. Listen, and note it for the developer.
- Keep the hero's headline live text in your mockup, not lettering baked into the image — the developer must build it that way anyway.

Check your work

- ☐ All three frames share one type ramp, one palette and one spacing scale.
- ☐ My desktop grid math (columns, spans, margins) is written out and matches the frame.
- ☐ My developer notes name breakpoints in rem and describe behavior between frames.

SKETCHBOOK

1. The full grid computation for your 1440 frame — container, margins, columns, three span widths — worked long-hand like an engineering calculation.
2. Side-by-side thumbnails of your page at 375, 768 and 1440 with the constant elements circled in one color and the adapting elements in another.
3. A spacing-scale ruler: draw bars of 4, 8, 16, 24, 32, 48 and 64 px at true size and label where each belongs (between letters? paragraphs? sections?).

KEY FORMULAS

$$\text{result } \% = \frac{\text{target}}{\text{context}} \times 100$$

$$\text{px} = \text{rem} \times 16, \qquad \text{rem} = \frac{\text{px}}{16}$$

$$c = \frac{W - (n-1)\,g}{n}$$ (column width for n columns, gutter g, container W)

$$\text{span}_k = k\,c + (k-1)\,g$$ (width of an element spanning k columns)

$$\text{CPL} \approx \frac{\text{measure}}{0.5 \times \text{font size}}$$

From history. Marcotte did not invent fluid pages — the web was born fluid, and early pages flowed to any window until designers imposed fixed 960 px layouts in the 2000s to control line lengths. Responsive design was partly a repentance: a return to the medium's native flexibility, now with media queries to protect the measure. Kevin Powell's refrain that "the web is responsive by default" is historically exact.

WORKED EXAMPLES

Example 1. A desktop mockup is 960 px wide with a 620 px article column and a 300 px sidebar. Convert both to fluid percentages, and check the remainder.

Show solution

1. Article: $620 \div 960 = 0.6458 \approx 64.6\%$.
2. Sidebar: $300 \div 960 = 0.3125 = 31.25\%$.
3. Remainder for the gutter between them: $100 - 64.6 - 31.25 \approx 4.15\%$, which at 960 px is the original $0.0415 \times 960 \approx 40$ px gutter. The proportions now hold at any width.

Answer: Article ≈ 64.6%, sidebar 31.25%, gutter ≈ 4.15% — target ÷ context, three times.

Example 2. A 12-column grid sits in a 1200 px container with 24 px gutters. Find the column width, and the width of a card spanning 4 columns.

Show solution

1. Gutters between 12 columns: $11 \times 24 = 264$ px.
2. Column width: $c = (1200 - 264)/12 = 936/12 = 78$ px.
3. A 4-column span crosses 3 gutters: $4(78) + 3(24) = 312 + 72 = 384$ px.

Answer: Columns are 78 px; a 4-column card is 384 px wide.

Example 3. Convert a type ramp of 14, 16, 20, 25, 31 px to rem, and state the breakpoint 768 px in rem.

Show solution

1. Divide each by 16: $14/16 = 0.875$, $16/16 = 1$, $20/16 = 1.25$, $25/16 \approx 1.5625$, $31/16 \approx 1.9375$.
2. Breakpoint: $768/16 = 48$ rem.
3. Written in rem, the whole ramp and the breakpoint scale together if the reader raises the base size.

Answer: 0.875, 1, 1.25, 1.5625 and 1.9375 rem; 768 px = 48 rem.

Example 4. Body text is 16 px. A full-width column on a 1280 px laptop would run about 1200 px of text. Use the CPL estimate to show the problem, then size a comfortable measure and give it in rem.

Show solution

1. Average character $\approx 0.5 \times 16 = 8$ px.
2. Unconstrained: $1200/8 = 150$ characters per line — double the readable limit of about 75 (Lesson 3.4).
3. Target 66 CPL: measure $\approx 66 \times 8 = 528$ px. Round onto the spacing system: 544 px ($= 34$ rem) or the common cap of 576 px (36 rem), giving about 72 CPL.
4. So the rule "cap the article column near 36 rem" is the CPL math, pre-solved.

Answer: Unconstrained ≈ 150 CPL — unreadable; cap the measure near 528–576 px (33–36 rem) for roughly 66–72 CPL.

PRACTICE

1. Easy Convert 24 px, 32 px and 12 px to rem (16 px base).

   Show answer

   $24/16 = 1.5$ rem, $32/16 = 2$ rem, $12/16 = 0.75$ rem.

2. Easy Name Marcotte's three ingredients of responsive design and the year and publication of the essay.

   Show answer

   Fluid grids, flexible images and media queries — "Responsive Web Design," A List Apart, 25 May 2010.

3. Easy Which of these spacing values belong on an 8-point grid: 8, 12, 24, 30, 48, 56, 70?

   Show answer

   8, 24, 48 and 56 are multiples of 8 (12 passes only if the team allows the 4-point half-step; 30 and 70 fail either way).

4. Medium A 940 px layout has a 220 px navigation column. Express it fluidly.

   Show answer

   $220 \div 940 = 0.234 \approx 23.4\%$.

5. Medium A 768 px tablet container uses 8 columns with 16 px gutters. Find the column width.

   Show answer

   $(768 - 7 \times 16)/8 = (768 - 112)/8 = 82$ px.

6. Medium Using the grid from problem 5, how wide is a photo spanning 3 columns?

   Show answer

   $3(82) + 2(16) = 246 + 32 = 278$ px.

7. Medium Your breakpoints are 30 rem, 48 rem and 75 rem. Give them in px, and say which one most likely switches one column to a multi-column layout.

   Show answer

   480 px, 768 px and 1200 px. The 48 rem / 768 px breakpoint is the classic switch from a stacked phone layout to columns.

8. Medium Body text is 18 px in a 720 px column. Estimate the characters per line. Comfortable, or over the limit?

Show answer

Character ≈ 9 px; $720/9 = 80$ CPL — just over the 75 ceiling; narrow the measure or enlarge the type slightly.

9. Hard A card's padding is 20 px, the gap between cards 28 px, and the section margin 72 px. Re-specify all three on the 8-point grid, changing each as little as possible.

Show answer

Padding 20 → 16 or 24; gap 28 → 24 or 32; margin 72 is already 9×8 and stands. Pick one direction consistently, e.g. 24 / 32 / 72.

10. Hard You are the designer. A client asks, "Which phones did you design for?" Give the professionally correct two-sentence answer.

Show answer

None in particular and all of them: the layout is fluid, so it fits every width, and its breakpoints come from where the content needs to change, not from any device list. New phone sizes next year will be covered automatically.

11. Hard Your three-column desktop section (columns ≈ 31% each) collapses badly on a 600 px screen. Walk the reasoning that sets the breakpoint, using CPL with 16 px body text.

Show answer

At 600 px each column is ≈ 186 px, about $186/8 \approx 23$ CPL — far under the 45-character floor, so three columns are unreadable there. Stack to one column below the width where columns last hold ≈ 45 CPL: $45 \times 8 = 360$ px per column, roughly an 1152 px container for three — so keep three columns only above about 72 rem, two between 48 and 72, one below 48.

12. **Challenge** Build the full spec for a 1440 px desktop frame: 12 columns, 24 px gutters, 64 px outer margins each side. Find the column width and the width of spans of 3, 4 and 6 columns.

    Show answer

    Content width $= 1440 - 128 = 1312$ px; columns $(1312 - 11 \times 24)/12 = (1312 - 264)/12 \approx 87.3$ px. Spans: 3 cols $\approx 3(87.3) + 2(24) = 310$ px; 4 cols ≈ 421 px; 6 cols ≈ 644 px. (Real grids often round the container to make these integers — say why that is kind to developers.)

COMMON MISTAKES

- Choosing breakpoints from a list of devices instead of from where the content breaks. Devices change yearly; your content's limits are yours.
- Letting text columns run past 75 characters on wide screens because "there was room." Cap the measure; empty margin is a feature.
- Mixing arbitrary spacing values (13, 18, 27) with the 8-grid. One off-system number invites ten; the calm of the layout is the system.

Make it a game · Grid Mental Math Sprint. A parent calls out conversions and grid problems from this lesson's formulas — "40 px in rem!", "10 columns, 20 px gutters, 1000 px container!", "span of 3!" — and you answer with paper but no calculator, 30 seconds each. Five rounds; a correct CPL estimate question is worth double. Record your score and rerun the same sheet in two days to beat it.

Scripture. “To every thing there is a season, and a time to every purpose under the heaven:” (Ecclesiastes 3:1, KJV)

Wisdom gives everything its fitting time and place rather than forcing one form on every occasion. Responsive design is that discipline applied to layout: one purpose, honestly re-fitted to each season of screen it meets — phone, tablet and desktop each receiving the form that suits it.

9.4 Design in the Feed: Social Graphics, Thumbnails and Email

OBJECTIVES

- Tell the story of the first banner ad (1994) and what the collapse of its click rate teaches about earning attention honestly.
- Design to platform geometry: standard sizes and aspect ratios, safe areas under interface overlays, and type that survives at 120 px.
- Build a reusable template series that keeps a brand consistent across dozens of posts, and state the special constraints of email design.

> **Warm-up.** Hold your phone at arm's length and scroll any feed for sixty seconds (with a parent nearby, on their account if you do not have one). Count how many graphics pass, and how many you could still read. Then pick one graphic and shrink the phone farther away until the words give out. Write down what died first — the small text, the thin text, or the low-contrast text.

WATCH

How To Make Social Media Templates

Abi Connick · 9:00

https://www.youtube.com/watch?v=w5BN3Cpu91Y

> **WHEN TO WATCH**
> Before the studio brief. She builds a template system a client can reuse — watch for how she locks the constant elements and leaves the variable ones editable.

Note: A professional brand designer on the template discipline this lesson's brief requires. She works in paid tools, but every move translates directly to Penpot or Inkscape; the thinking, not the software, is the lesson.

BACKUP VIDEO

Email Design Best Practices | Responsive Email Design

Kasey Luck · 7:17

https://www.youtube.com/watch?v=GSZ16Pwn4n8

With the email paragraph. Practical constraints — width, single column, live text, image-off behavior — from someone who ships real campaigns.

KEY TERMS

aspect ratio

The proportion of width to height, written like 16:9 or 4:5. Height follows from width: a 16:9 frame 1280 wide is $1280 \times 9/16 = 720$ tall.

safe area

The region of a graphic guaranteed visible and unobstructed — away from edges that get cropped and corners where the platform lays its own buttons, captions or timestamps over your design.

thumbnail test

Judging a design at the smallest size it will actually be seen — often 120 px wide or less. If the message dies at thumbnail size, the design fails, whatever it looks like full-screen.

template

A locked layout with defined editable zones (headline, image, date) that produces consistent, on-brand graphics quickly — the design-once, use-fifty-times discipline.

banner ad

The web's original ad unit. The first ran on HotWired on 27 October 1994; its descendants fund much of the internet, and designing them honestly is part of the trade.

alt text

The written description attached to an image, read aloud by screen readers and shown when images fail to load — mandatory craftsmanship in email, where many readers block images.

CORE IDEAS

The story. On 27 October 1994, the website of Wired magazine — HotWired — switched on the web's first banner advertisements. The most famous, made for AT&T's "You Will" campaign by a tiny team including designer Joe McCambley, was a 468 × 60 pixel strip of rainbow letters reading, "Have you ever clicked your mouse right HERE? You will." Forty-four percent of the people who saw it clicked it. Today the average banner's click rate is around one in a thousand — a collapse of roughly 400-fold — because novelty wore off and readers learned to look past anything that looked like an ad; researchers named the reflex *banner blindness* as early as 1998. Every graphic you make for a feed lives downstream of that collapse: attention is no longer given to whatever blinks; it must be earned in about a second, at a small size, against a hundred competitors on the same scrolling screen.

How they figured it out. Designers already owned the solution, a century old. Lesson 5.2's poster masters — Penfield, Bradley, the Beggarstaffs — had solved "one message at a glance, at a distance, in passing" with flat shapes, few words, big silhouettes and fearless cropping. A feed graphic is a poster whose street is glass and whose passerby has a thumb. The new part is that the platform, not you, sets the canvas and obstructs it: each service publishes its sizes — the common currency today is 1080 px wide, at 1:1 (1080 × 1080), 4:5 (1080 × 1350) and 9:16 (1080 × 1920) for full-screen stories, with video thumbnails at 16:9 (1280 × 720) — and each lays its own interface over your edges: captions and buttons crowd a story's bottom and right, a timestamp sits on a thumbnail's corner, profile rings bite the top. Professionals keep all essential content inside the published safe areas (for a 1080 × 1920 story, roughly 250 px clear at top and bottom), and they verify by exporting and viewing on a real phone, because the spec sheet is always one redesign out of date.

The craft. Three disciplines. *Size arithmetic:* height = width ÷ (w:h ratio), and display scale = design width ÷ displayed width. A 1280 × 720 thumbnail seen at 120 px in a sidebar has been scaled by a factor of about 10.7 — your 40 px subtitle is drawn at under 4 px, which is nothing. Work backward instead: for text to display at a just-legible 11 px in a 120 px thumbnail, it must be set at about $11 \times 10.7 \approx 118$ px in the 1280 px file — which is why real thumbnails carry three to five enormous words, not sentences. *The squint ladder:* judge every feed graphic at the real sizes — full screen, feed size, thumbnail — before approving it; what Unit 2 called the squint test is here a deliverable. *Template thinking:* a client does not buy one post, they buy a system — a locked layout with brand colors, type ramp and logo position fixed, and defined zones for the changing headline, image and date. Three templates (announcement, quote, event) cover most small organizations, keep every post on brand when the volunteer takes over, and are what you will build in the studio brief.

The craft, continued — email. Email design is screen design with the rules of 2004, because email programs render far more conservatively than browsers. The professional constraints: build about 600 px wide, single column (it reflows painlessly on phones and survives old rendering engines); keep the message in live text, never one big image of text — many mail programs block images until the reader opts in, so an all-image email arrives blank (and the spam filters know it); write alt text for every image; put the essential point and link in the top portion the reader sees without scrolling; and test in a real inbox on a real phone before the

client sends to five hundred people. Dark-mode mail apps may invert your backgrounds, so transparent-background logos and tested colors matter. None of this is glamorous; all of it is billable, because an email that renders broken is marketing money burned.

In the studio. Feed work is volume work, so professionals systematize ruthlessly: a master Penpot or Inkscape file per client with artboards at each platform size; brand tokens (colors, type, logo lockups) referenced, not redrawn; export presets named and reused; and a one-page cheat sheet of current platform sizes and safe areas, re-verified a couple of times a year, because the platforms move. They also decline dishonest work — the fake play-button on a still image, the "1 unread message" counterfeit, bait the content does not pay off. Those tricks click once and burn the client's name forever after; Unit 8 taught you the brand is the client's most valuable asset, and the feed is where it is spent or squandered fastest.

PICTURE STUDY



I Want You for U.S. Army, James Montgomery Flagg, 1917 · Color lithograph poster · United States Army recruiting poster, 1917 (copies in many collections)

Image: Wikimedia Commons, public domain

In 1916 the illustrator James Montgomery Flagg drew a stern Uncle Sam — using his own face, aged, to save the cost of a model — pointing straight out of a magazine cover. When America entered the First World War the next spring, the image became an Army recruiting poster, and more than four million copies were printed in 1917 and 1918. It may be the most effective piece of graphic communication ever produced in this country, and it works in under half a second: eye contact, a pointing finger, six short words, and the word YOU set largest of all.

Half a second is exactly the budget this lesson gives you. A graphic in a scrolling feed gets a glance in passing, at a small size, in a crowd of competitors — the same brutal conditions as a poster on a 1917 street. Flagg's solution is the permanent one: one face, one gesture, one sentence, aimed at one person. Nothing in the design talks to a crowd; everything talks to you. Before you lay out a thumbnail or a feed graphic, ask what your half-second says — and whether anything in the frame is not saying it.

Look closely

- Time the read. What do you get in the first half second — and what is left for the second look?

- The pointing finger and the eyes aim at the same target: you. Follow how the hat, face, collar and sleeve all funnel toward that line.
- Which word is largest, and why that word rather than ARMY? What does the size ranking tell you about who the poster is really about?
- Cover the figure and read only the words; then cover the words and read only the figure. What does each half carry, and why does neither work alone?
- Shrink the poster in your mind to the size of a postage stamp — a feed thumbnail. What still reads? What vanished without harm?

Talk about it

1. The poster addresses one person, not a crowd — 'you,' not 'citizens.' Why is direct address even more effective in a personal phone feed than on a street wall?
2. Flagg used his own face to save hiring a model and the image served for two world wars. What does that say about resourcefulness versus budget in effective design?
3. Find a graphic in a feed this week that survived your half-second scroll. Which of this poster's devices — eye contact, one gesture, one short line, one dominant word — was it using?

Safety first. Template production runs are long screen sessions of repetitive clicking — the hardest kind on wrists and eyes. Break every 20 minutes (20-20-20), alternate mouse work with paper tasks, and stop for the day if your wrist aches. Feed audits are done with a parent, on a parent's account; this course never requires a student to open a social media account.

STUDIO BRIEF

Studio brief: Template series for the Maplewood Farmers Market

Client: the Maplewood Farmers Market, a fictional Saturday market of thirty vendors. Their volunteer coordinator posts three kinds of graphics every week — a vendor spotlight, a this-Saturday announcement, and a seasonal quote card — and each one currently looks like a different organization made it. Deliverable: a three-template system at two sizes each (1080 × 1080 and 1080 × 1920 story), plus one filled-in example of each and a one-page usage guide a volunteer can follow. Deadline feel: one week.

Constraint from the client: the volunteer uses free tools only, so the templates must be editable in Penpot (or Inkscape) with nothing more than text changes and photo swaps.

You will need

- Penpot (or Inkscape) with artboards at 1080 × 1080 and 1080 × 1920
- A simple brand kit you define first: two colors plus a neutral (contrast-checked), one Google Fonts pairing, and a simple market wordmark or stamp from your Unit 8 skills
- Pencil and paper for layout roughs; a phone for real-size testing
- Sketchbook for the usage guide draft

Steps

1. Define the brand kit and write it down: colors with hex values, typefaces with sizes in px for each canvas, logo placement and clear space. This page becomes the core of the usage guide.
2. Rough all three templates on paper at both proportions — six little layouts. Decide now what is locked and what is a zone (headline zone, photo window, date line).
3. Build the 1080 × 1080 announcement template first: grid, locked elements, zones clearly named in the layers panel (Zone/Headline, Zone/Photo).
4. Apply the squint ladder before building the rest: export, view at feed size (~320 px) and thumbnail (~120 px) on a phone. Rework until the headline

survives the bottom rung.

5. Build the spotlight and quote templates to the same system, then adapt all three to 1080 × 1920 with the top and bottom 250 px kept free of essential content — draw the safe-area guides into the template file.
6. Create one honest filled example of each template with real-feeling content (vendor name, date, a scripture or harvest proverb for the quote card).
7. Write the one-page usage guide: how to duplicate a template, what may be edited, what must never move, export settings, and the safe-area warning, in words a non-designer volunteer understands.
8. Test the system on a family member: give them the guide and the file, ask them to produce next week's announcement unassisted, and watch silently.
9. Revise the templates or the guide based on where they stumbled — in template work, the guide is part of the design.
10. **Check your work** against the brief: three templates, two sizes, three examples, one guide, all free-tool editable.

Tips

- Lock more than feels generous. Every unlocked element is a place the system will drift once it leaves your hands.
- Design the quote card so it works with no photo at all — the volunteer will not always have one.
- Name a version: Maplewood-Templates-v1. Clients come back for v2; organized files are repeat business.

Check your work

- ☐ A non-designer produced an on-brand post from my system without my help.
- ☐ Every template passes the 120 px squint rung and respects story safe areas.
- ☐ My usage guide fits one page and a volunteer can follow it.

SKETCHBOOK

1. A platform geometry cheat sheet, drawn to scale: 1:1, 4:5, 9:16 and 16:9 rectangles with pixel dimensions, safe areas shaded, and overlay zones hatched.

2. Your squint-ladder results for one template: the same design drawn at three sizes with notes on what survived each rung.
3. A study of a Penfield poster reduced to three values and three shapes — the poster-to-feed translation exercise.

KEY FORMULAS

$h = w \times \dfrac{\text{ratio}_h}{\text{ratio}_w}$ (height from width and aspect ratio)

$s = \dfrac{\text{design width}}{\text{displayed width}}$ (scale factor)

$\text{displayed size} = \dfrac{\text{designed size}}{s}, \qquad \text{designed size} = \text{displayed size} \times s$

From history. Banner blindness was documented by usability researchers Jan Benway and David Lane in 1998, barely four years into the banner's life: readers had already learned to skip anything banner-shaped — even when it contained the answer to the task they were given. The lesson outlived the banner: attention flees whatever smells of advertising, which is why honest, useful, well-made graphics outperform tricks over any period longer than a week.

WORKED EXAMPLES

Example 1. Find the pixel heights of a 1080-wide graphic at 1:1, 4:5 and 9:16, and of a 1280-wide thumbnail at 16:9.

Show solution

1. 1:1 — $1080 \times 1/1 = 1080$.
2. 4:5 — $1080 \times 5/4 = 1350$.
3. 9:16 — $1080 \times 16/9 = 1920$.
4. 16:9 at 1280 wide — $1280 \times 9/16 = 720$.

Answer: 1080 × 1080, 1080 × 1350, 1080 × 1920 and 1280 × 720 — the working sizes of the feed.

Example 2. A 1280 × 720 thumbnail design will be displayed at 168 px wide in search results. Your title text is set at 60 px. How big does it display, and is it legible? What size must it be to display at 14 px?

Show solution

1. Scale factor: $s = 1280/168 \approx 7.6$.
2. Displayed size: $60/7.6 \approx 7.9$ px — below the ~11 px legibility floor; it will read as texture, not words.
3. For 14 px displayed: $14 \times 7.6 \approx 106$ px in the design file.
4. Hence the pro rule: thumbnail words at 100 px and up, and only a few of them.

Answer: It displays at about 8 px — illegible. Set it near 106 px (and cut the word count) to display at 14 px.

Example 3. A client's square 1080 × 1080 post must be adapted to a 1080 × 1920 story. The platform overlays roughly the top and bottom 250 px. What is the story's safe zone, and what are your options for the layout?

Show solution

1. Safe height: $1920 - 250 - 250 = 1420$ px — a vertical 1080 × 1420 window.
2. Option 1: recompose — move the headline and logo into the safe zone and let background art bleed into the risky bands (background may be covered; message may not).
3. Option 2: place the square design inside the story with generous breathing room: 1080 wide × 1080 tall sits within 1420 with $(1420 - 1080)/2 = 170$ px of margin above and below inside the safe zone.
4. Never: scale the square to fill 1920 tall — it becomes 1920 px wide, so $1920 - 1080 = 840$ px of width (420 px per side) is cropped away, and whatever lands near the top or bottom sits under the platform's buttons.

Answer: Safe zone ≈ 1080 × 1420 centered; recompose into it (best) or center the square with ~170 px clearance — never blind-scale and crop.

PRACTICE

1. Easy Compute the height of a 4:5 post that is 1080 px wide, and of a 16:9 thumbnail that is 640 px wide.

   Show answer

   $1080 \times 5/4 = 1350$ px; $640 \times 9/16 = 360$ px.

2. Easy What happened on 27 October 1994, and what was the click rate then versus roughly now?

   Show answer

   HotWired ran the web's first banner ads, including AT&T's "You will" banner; about 44% of viewers clicked. Today's banners average around 0.1% — attention must now be earned.

3. Easy Name three interface elements a platform may draw over your story graphic, and the design rule that protects you.

   Show answer

   Profile ring and username at top, caption text and reply box or buttons at bottom/right, progress bars at the very top. Rule: keep all essential content inside the safe area — roughly 250 px clear top and bottom on a 1080 × 1920 story.

4. Medium A 1080 px-wide post displays at 320 px in the feed. Your fine-print credit line is 18 px. What does it display at, and what do you do?

   Show answer

   Scale $s = 1080/320 \approx 3.4$; $18/3.4 \approx 5.3$ px — illegible. Either enlarge it to display ≥ 11 px (≈ 37 px designed) or move that information to the caption where it is live text.

5. Medium Why does an email that is one beautiful full-width image fail professionally, even though it renders perfectly in your own inbox? Give three reasons.

Show answer

Many mail programs block images by default, so it arrives blank; screen readers find nothing to read without live text and alt text; spam filters penalize all-image mail. (Also: it cannot reflow, and its text blurs on high-density screens.)

6. Medium List four things a template locks and three zones it leaves editable, for a church announcement series.

Show answer

Locks: canvas sizes, brand colors, typefaces and type ramp, logo position/clear space (and the grid). Editable zones: headline text, date/time line, and the photo or illustration window.

7. Medium Your video thumbnail reads perfectly at 1280 px but fails at 120 px. Name the three most likely culprits in order of likelihood.

Show answer

Too many words; type too small or too thin; too little contrast between text and background (busy photo behind letters). Fix in that order — cut words first.

8. Hard A client asks for a fake play-button triangle on a still image "because it doubles taps." Decline in two professional sentences.

Show answer

Example: "That tap is a broken promise — the reader expected video and will trust your name a little less, and platforms penalize engagement bait. Let's earn the tap instead with a stronger headline and image; I'll mock two options today."

9. Hard Lay out the squint ladder you will use to approve a thumbnail, with actual pixel widths and what you check at each rung.

   Show answer

   1280 (full size: craft, edges, spelling), ~320 (feed size: hierarchy still reads, colors hold), ~120 (search/sidebar size: the three-to-five words and the face/object silhouette still land). Approve only if all three rungs pass on a real phone.

10. Hard Compute: to display at 12 px within a 90 px-wide app icon preview of your 1024 px design, how large must a wordmark's letters be in the design file, and what should you probably do instead?

    Show answer

    $s = 1024/90 \approx 11.4$; $12 \times 11.4 \approx 137$ px. Better: drop the words at small sizes and use the symbol alone — the one-color and scale tests from Lesson 8.2 exist exactly for this.

11. Challenge Audit three real organizations' feeds (with a parent): can you tell their posts apart from each other's without reading names? Identify what consistent elements (or chaos) cause that, and write a three-line prescription for the weakest one.

    Show answer

    Answers vary. Strong feeds repeat palette, type, margins and logo placement (template discipline); weak ones change style post to post. A good prescription names three locks: one palette, one type pairing, one layout family.

COMMON MISTAKES

- Designing at full size and never checking the thumbnail. The smallest display size is the real exam; full size is the retake.
- Putting essential words in a story's top or bottom 250 px, where the platform's own interface sits on top of them.
- Building emails as one big image. Image-blocking inboxes, screen readers and spam filters all punish it; live text with alt-texted images is the professional floor.

Make it a game · Thumbnail Showdown. Export three of your graphics at 120 px wide. A parent views them at arm's length for two seconds each and writes down the message they received. Score: 2 points if they got the exact message, 1 if close, 0 if wrong. Then swap — they pick three real thumbnails from a video site and you call the message from across the room. Beat your combined score next week after one revision pass.

Scripture. “Let your light so shine before men, that they may see your good works, and glorify your Father which is in heaven.” (Matthew 5:16, KJV)

Public work is commanded — let it shine — but its aim is settled too: that God be glorified, not the maker. Post work in the feed honestly, measure it by whether it serves, and let the light fall where this verse points it rather than on yourself.

9.5 Prototype and Handoff: Penpot, Figma and Working with Developers

OBJECTIVES

- Tell how design tools moved from static pictures with hand-measured redlines to browser-based tools (Figma, 2016; Penpot, 2021) with live prototypes and self-serve specs.
- Build a small screen set in Penpot using named frames, shared components and a clickable prototype flow.
- Prepare a professional handoff: organized layers, exported assets, written behavior notes — and run the conversation with a developer respectfully.

> **Warm-up.** Write instructions for making a peanut butter sandwich for someone who has never seen one, in eight numbered steps. Hand them to a sibling or parent who must follow them exactly, literal-mindedly, ingredient by ingredient. Watch where they fail. A developer building your design has the same relationship to your file: they can only build what you actually specified. Note the two worst gaps in your instructions.

WATCH

How to Design Interactive Prototypes with Penpot: A Step-by-Step Guide

Penpot · 10:05

https://www.youtube.com/watch?v=le3SEv2ctkk

> **WHEN TO WATCH**
> Before step 5 of the studio brief. Follow along in your own file with a two-screen test before prototyping the real thing.

Note: The official walkthrough of Penpot's prototype mode: connecting frames, interactions and preview. Penpot is the free, open-source tool this course standardizes on; everything here transfers conceptually to Figma, which you may meet in a studio.

BACKUP VIDEO

Get started with Penpot in under 5 minutes

Penpot · 5:03

https://www.youtube.com/watch?v=vAkb4QQmbfk

At the start of the lesson if Penpot is still unfamiliar — a fast orientation to frames, boards and the interface before the deeper work.

KEY TERMS

frame (artboard)

A fixed-size canvas representing one screen — 375 × 812 for a phone screen, for example. A screen set is a row of named frames.

component

A master element (button, card, nav bar) whose copies stay linked to it: edit the master once and every copy updates — the tool-level version of design consistency.

prototype

Frames wired together with interactions — tap this button, go to that screen — so a design can be walked through and tested before any code exists.

design handoff

Delivering a design to developers: the organized file, exported assets, measurements and specs, plus written notes on behavior the pictures cannot show.

redlines

The old handoff method: printed mockups marked up by hand with every measurement in red ink. Modern tools generate measurements automatically, but the responsibility for completeness is still the designer's.

design tokens

The named values of a design system — color/primary, spacing/md, font/heading — shared between the design file and the code so both sides speak one vocabulary.

open source

Software whose source code is public and free to use and improve, like Penpot, Inkscape, Krita and GIMP. For a student it means professional capability at zero cost, forever.

CORE IDEAS

The story. For the web's first two decades, screen designs were handed over as pictures. The designer made a mockup in Photoshop — a tool built for photographs — then printed it or exported it and marked every spacing and size by hand in red lines; the developer squinted, measured, guessed, and the finished site was always a little (or a lot) off the design. The 2010s rebuilt the toolchain. Sketch (2010) was drawn-for-UI but Mac-only and file-based. Then two Brown University students, Dylan Field and Evan Wallace, spent four years building something the industry said was impossible — a full design tool running in the browser — and shipped Figma in 2016. The file lived at a URL; the whole team, including developers, could open it, inspect any element's measurements, and watch the design change live. It conquered the industry so completely that Adobe agreed in 2022 to buy Figma for twenty billion dollars (the deal was abandoned in December 2023 under regulatory pressure — worth knowing when someone tells you design tools are a small business). And in 2021 the Spanish company Kaleidos released **Penpot**, the first serious open-source alternative: browser-based, built on open web standards (its files are essentially SVG), free without asterisks. That is your tool — and because the concepts are identical, a student fluent in Penpot sits down at Figma in a studio and is productive the first morning.

How they figured it out. The deep change was not the browser; it was moving the single source of truth. When the design is a picture, truth lives in the designer's head and leaks out through annotations. When the design is a structured file — real frames, real components, real tokens — the file itself answers questions: the developer clicks your button and reads its exact padding, color and font. Components did for design what Maudslay's interchangeable parts did for machines: define the master once, stamp out linked copies, change the master and the system updates. Prototyping closed the other gap — Luke 14:28's tower-builder's gap — letting the team walk through the product and find the missing screen while it costs an afternoon, not a sprint of rebuilt code. None of this removed the need for written behavior notes, because a picture, however structured, still cannot say what happens when the list is empty, the name is forty characters, or the network fails. The designers who are loved by developers are the ones who answer those questions before being asked.

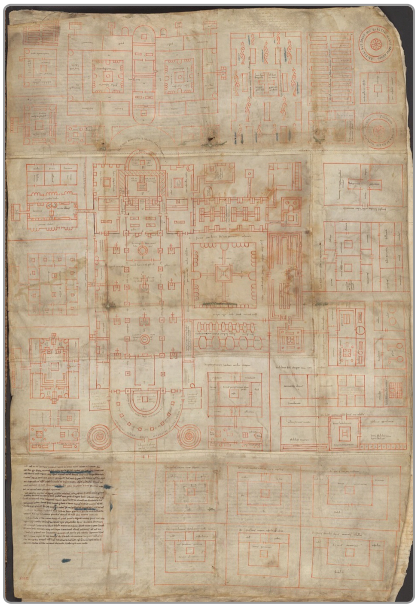
The craft. A professional file is legible to a stranger. Frames are named like destinations (Home, Recipe/Detail, Recipe/Empty), not Frame 14; layers are named and grouped; one component library holds the buttons, fields and cards, with states built in Lesson 9.2's discipline; colors and type exist as shared styles/tokens, not per-element choices; and spacing sits on the 8-grid so every inspected measurement comes out a believable number. The prototype wires the primary flow end to end — including one error or empty state, which is where reviewers learn whether you think like a professional. The handoff package adds: exported assets (icons and logos as SVG; photos as PNG or JPEG at 1x and 2x for high-density screens), and one page of behavior notes organized by screen: what scrolls, what fixes in place, what the text limits are, what loads, what happens offline. Write the notes as answers to a literal-minded reader — your peanut-butter lesson from the warm-up.

In the studio. Handoff is a relationship, not a file transfer. The good pattern: involve the developer *before* the design is finished — a ten-minute "is this buildable as drawn?" conversation at the halfway mark catches the expensive surprises; walk the prototype together at handoff rather than mailing a link; invite questions and treat every one as a gap in your file, not a failure of their reading; and when the build comes back, review it against the design kindly and precisely — a punch list of "spacing here is 12, file says 16" items, not "it feels off." Developers extend enormous respect to designers whose files are clean, whose numbers are systematic and who

understand constraints; that reputation, as much as your portfolio, is what gets you hired onto the next project. You will practice the whole loop in this brief with a family member standing in as the developer.

In the studio, continued. A note on tools and honesty for your future job hunt: listings will say Figma because studios run Figma. Your skills transfer — say exactly that in the interview, and say it truthfully: "I trained on Penpot, the open-source equivalent; the concepts are identical and I'll be fluent in Figma in a week." Figma offers free starter and education tiers if you want to confirm the claim before an interview (a parent approves and manages any account, per the course's standing rule). What you must not do is list a tool you have never opened; Unit 10 will have more to say about resumes that tell the truth.

PICTURE STUDY



The Plan of Saint Gall, Unknown monastic draftsmen (made at Reichenau), c. 820–830 · Red and brown ink on five sewn parchment sheets · Abbey Library of Saint Gall, Switzerland (Codex Sangallensis 1092)
Image: Wikimedia Commons, public domain

Around the year 820, draftsmen at the monastery of Reichenau drew, on five sheets of sewn parchment, the complete plan of an ideal monastery — church, cloister, scriptorium, kitchens, brewery, gardens, workshops, even the goose pen — and sent it to Abbot Gozbert of Saint Gall, who was contemplating a building program. It is the only major architectural drawing to survive from the seven centuries between the fall of Rome and the Gothic age.

Here is the remarkable part for this lesson: the plan was never built as drawn. It is not a picture of a building that existed; it is a specification — a design communicated from one team to another, labeled and measured so that builders the drafters would never meet could understand intent. Every handoff file you ever make descends from this parchment.

Look closely

- Find the church at the plan's heart, then trace outward: cloister, dormitory, kitchens, gardens. How is the whole complex organized around the main flow of monastic life?
- The plan carries over three hundred labels. Why are the words as necessary as the lines — what do they specify that drawing alone cannot?

- Look for repeated room shapes and standard elements. What are this plan's components?
- The drawing is to scale, in two ink colors with distinct jobs. What does each color do, and what is that in your design files?
- Find a practical detail that surprises you — animal pens, the brewery, beds drawn in rows. What does that completeness say about anticipating the user's whole day?

Talk about it

1. The drafters never saw the builders, and the builders could ask no questions. How does that constraint explain the plan's labels and completeness — and what is the modern equivalent in a handoff file?
2. A specification describes intent, and the built reality always adapts it. Who should decide which adaptations are acceptable — and how does that map to the designer-developer review?
3. Why do you think this plan survived eleven centuries when the buildings of its era mostly did not? What does that suggest about the value of the design document itself?

Safety first. Prototype work invites marathon sessions — the flow is absorbing. Set a timer: 20-minute focus blocks, eyes to the window between them (20-20-20), wrists straight and floating, and a hard stop at the session's end. Penpot requires an account; as always, a parent creates or approves it, and a minor's account is parent-managed.

STUDIO BRIEF

Studio brief: The Recipe Box app — screens, prototype and handoff

Client: Grandmother's Recipe Box (fictional), a family project to preserve handwritten recipes. They need the phone app's core flow designed and prototyped: Home (recipe list), Recipe Detail, Add Recipe (form), plus the list's empty state and one confirmation. Deliverable: five named frames at 375 × 812, a small component library, a clickable prototype of the add-a-recipe flow, exported assets and a one-page behavior note. Deadline feel: one week, with a mid-week buildability check.

A family member plays the developer. They get the halfway review, the final walkthrough, and the right to ask any literal-minded question — and every question they ask is scored against you, so specify completely.

You will need

- Penpot with a project named RecipeBox-v1
- Your component habits from Lesson 9.2 (button states, field states) and spacing tokens from 9.3
- Paper for the flow diagram and wireframes; a phone for arm's-length checks
- Sketchbook for the behavior notes draft

Steps

1. Diagram the flow first: Home → Add Recipe → Confirmation → Home (updated), with Home/Empty as the first-run state and Detail reachable from any list item.
2. Wireframe the five screens on paper. Decide the one primary action per screen and where the thumb finds it.
3. Build the component library before any screen: primary and secondary buttons (five states), text field (default/focus/error), recipe card, nav bar. Name them properly (Button/Primary/Default).
4. Assemble the five frames from components on the 8-point grid, type in your rem-based ramp, every touch target 44+ points. Name frames Home,

Home/Empty, Recipe/Detail, Recipe/Add, Recipe/Confirm.

5. Hold the halfway review: walk the frames with your developer. Ask one question only — "What can't you build, and what will you need to know?" — and write down every answer.
6. Wire the prototype: the full add-a-recipe path, plus Empty → Add. Preview it on the phone-size view and fix what feels wrong under the thumb.
7. Prepare handoff: export icons as SVG and any imagery at 1x/2x; write the one-page behavior note by screen (scrolling, text limits, empty/error/loading behavior, what Confirm actually saves).
8. Run the handoff meeting: walk the prototype, hand over the notes, then be silent while the developer re-explains the design back to you. Log every mismatch between what you meant and what they understood.
9. Fix the file where the mismatches came from — file first, explanation second; the next developer gets the file only.
10. **Check your work** with the practice-problem 10 checklist, audited by your developer.

Tips

- Design Home/Empty before Home. The first-run experience is the app's handshake, and it is the state beginners forget.
- In the walkthrough, resist narrating. If you must explain it aloud, the file does not say it yet.
- Save a dated duplicate before big changes: RecipeBox-v1, v2. Version discipline now is client trust later.

Check your work

- ☐ A stranger could open my file and name every screen and component from the layers panel alone.
- ☐ My prototype walks the whole primary flow, including the empty state, on a phone-sized preview.
- ☐ My behavior note answered the developer's questions before they asked them — or has been revised until it would.

SKETCHBOOK

1. Your app's flow diagram inked clean, with the five frames thumbnailed beside it — this spread is interview material.
2. The component library drawn by hand: every component, every state, with sizes and spacing labeled in points.
3. The handoff-meeting log: three columns — what I meant, what they understood, what I changed in the file.

> **From history.** Penpot's openness has a quiet strategic meaning for your career: its files are built on SVG, an open W3C standard, so your work is never hostage to one company's subscription or survival. The design industry learned this lesson the hard way when beloved proprietary tools (FreeHand, Fireworks) were bought and discontinued, stranding decades of files. Open formats are the digital version of archival-quality paper.

PRACTICE

1. Easy What problem did redlines solve, and what two problems did they create?

Show answer

They communicated measurements from a static mockup to the developer. But they were enormous hand labor for the designer, and they were always incomplete and instantly out of date when the design changed — truth lived in annotations, not in the design itself.

2. Easy What is the difference between a mockup and a prototype?

Show answer

A mockup is a static picture of one screen; a prototype wires mockups together with interactions so a person can tap through the flow and test it before code exists.

3. Easy Why are logos and icons exported as SVG but photographs as PNG or JPEG?

Show answer

SVG is vector — paths that stay crisp at any size (Lesson 6.3) — ideal for flat artwork. Photographs are pixel data, so they ship as raster files, at 1x and 2x sizes for high-density screens.

4. Medium Name four marks of a professional (legible-to-a-stranger) design file.

Show answer

Named frames and layers; a component library with states instead of one-off copies; shared color and type styles (tokens); spacing on the 8-point system. (Also accepted: an organized page structure and a wired prototype.)

5. Medium Give three behavior questions a static design cannot answer, for a recipe app's list screen.

Show answer

What shows when the list is empty? What happens while recipes load, and if loading fails? What happens when a title is too long for the card? (Also: what scrolls versus stays fixed; what the pull-to-refresh does.)

6. Medium Why did Figma running in the browser change collaboration more than better drawing tools would have?

Show answer

The file became a URL — one live source of truth anyone on the team could open and inspect, so developers measured the real design themselves and everyone saw changes immediately, instead of passing stale picture copies around.

7. Medium What is Penpot, who makes it, and why does this course standardize on it?

Show answer

An open-source, browser-based UI design and prototyping tool, released by the Spanish company Kaleidos in 2021, with files built on open standards (essentially SVG). It is professionally capable and free without conditions — and its concepts transfer directly to Figma.

8. Hard You are the designer. The developer builds your card list with 12 px gaps; your file says 16. Write the two-line message you send.

Show answer

Example: "Build looks great — one punch-list item: card gaps are 12, the file's spacing token is 16 (spacing/md). Everything else on that screen matches. Thanks!" Precise, kind, references the token, assumes good faith.

9. Hard Why should the developer see the design at the halfway point rather than only at handoff? Give two concrete saves.

   Show answer

   They can flag the unbuildable or expensive early — for example an interaction the platform cannot do, or a layout that needs a different structure — while changing it costs minutes; and they can tell you what states and specs they will need, so the handoff arrives complete instead of generating a week of questions.

10. Challenge Draw the complete handoff package as a checklist for your studio-brief app, and have a parent audit one screen against it.

    Show answer

    Checklist: named frames for every screen including empty/error states; component library with states; shared styles/tokens; wired prototype of the primary flow; assets exported (SVG icons, 1x/2x images); one page of behavior notes per the lesson; file versioned and dated. The audit finds what a stranger cannot answer — fix those gaps.

COMMON MISTAKES

- Prototyping only the happy path. The empty, error and loading states are where professionals are told apart from beginners — wire at least one.
- Handing off a file only you can navigate: unnamed frames, orphan copies instead of components, colors picked per-element. Clean as you go; it cannot be bolted on at the end.
- Explaining the design in the meeting instead of in the file. You will not be in the room when the next question comes up — the file is the designer who stays.

> **Make it a game · Literal-Minded Developer.** Show a parent one screen of your design for 30 seconds, then hide it. They ask five literal questions — "What happens when I tap the third card?", "How many characters fit in the title?", "What's behind the list while it loads?" You score a point for each answer your file (not your mouth) already contains. Four of five wins; any miss gets written into the behavior notes on the spot.

> **Scripture.** “For which of you, intending to build a tower, sitteth not down first, and counteth the cost, whether he have sufficient to finish it?” (Luke 14:28, KJV)
>
> Christ commends the builder who plans before building — and a prototype is exactly that sitting down first: the tower walked through on parchment and glass while mistakes are still cheap. Counting the cost honestly before the build is both good stewardship and good engineering.

UNIT 9

Designing for Screens

Most of the design work bought and sold today is never printed. It is read on a phone held in one hand on a bus, on a laptop in a kitchen, on a tablet in a waiting room. In this unit you learn how the web actually shows your work — what a browser, HTML and CSS really are — and then how to design for it: buttons and forms people can actually press, layouts that reflow gracefully from a 375-pixel phone to a 1440-pixel monitor, social graphics and emails that stay legible at thumbnail size, and clickable prototypes you can hand to a developer without losing anything in translation.

The stories run from Tim Berners-Lee's first web page at CERN in 1991, through the first banner advertisement in 1994 and Ethan Marcotte's 2010 essay that gave us responsive design, to the free, open-source tool Penpot that you will use for real client-style briefs. There is honest math in this unit — relative units, breakpoints, grid and spacing arithmetic — because screen layout is arithmetic before it is art. Everything you learned about type, color, hierarchy and grids still applies; the screen just adds one hard new rule: you do not control the size of the page. The reader does.

By the end of the unit you will have a responsive landing-page mockup, a mobile app screen set, and a social template series — three portfolio pieces that show employers you can design for the medium where most design jobs now live.

PREREQUISITES

- Units 3–5: type scales, measure and leading; color contrast and color-blind-safe palettes; grids, margins and columns
- Unit 6: comfortable moving around Penpot, Inkscape or Krita, exporting PNG and SVG
- Arithmetic and simple algebra: percentages, ratios and solving $a = b/c$ for one variable

MASTERY CHECKLIST

- ☐ I can explain what a browser, HTML and CSS each do, and why live text beats text saved inside an image.
- ☐ I can name the standard UI components and draw a button in its five states: default, hover, active, focus and disabled.
- ☐ I can explain Fitts's law in plain words and size touch targets to at least 44 points.
- ☐ I can convert between px, rem and percent, and lay out a page on an 8-point spacing grid without breaking it.
- ☐ I can choose breakpoints from the content, and design one page that works at 375, 768 and 1440 pixels wide.
- ☐ I can design a social graphic that passes the thumbnail test at 120 pixels, and an email that survives a 600-pixel single column.
- ☐ I can build a clickable prototype in Penpot with named frames and components, and hand it to a developer with clear specs.

FREE RESOURCES FOR THIS UNIT

- **Penpot (free, open-source UI design tool)**: Runs in the browser; this unit's studio briefs use it for mockups, components and prototypes. Have a parent create or approve the account. A drawing tablet is optional — a mouse is fine for UI work.
- **MDN Web Docs (Mozilla's free HTML and CSS reference)**: The reference working developers actually use. You will not memorize it; you will learn to look things up in it, which is what professionals do. Free, no account needed.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

9.1 **How the Web Shows Your Work: Browsers, HTML and CSS Basics** — 3 sessions of 50 minutes

9.2 **Buttons, Forms and Flows: User Interface Fundamentals** — 3 sessions of 50 minutes

9.3 **One Design, Every Screen: Responsive Layout** — 3 sessions of 50 minutes

9.4 **Design in the Feed: Social Graphics, Thumbnails and Email** — 3 sessions of 50 minutes

9.5 **Prototype and Handoff: Penpot, Figma and Working with Developers** — 3 sessions of 50 minutes

Unit 9 test

Time allowed: 50 minutes. A calculator is allowed. Show your work and units for every calculation; base text size is 16 px unless stated. The test is worth 100 points.

1. **6 pts**
   Name the three inventions Tim Berners-Lee created for the web and the job each does, and give the year the first website went online.

2. **7 pts**
   Give four practical advantages of live text over text saved inside an image, and name the one place image text is professionally acceptable on a site.

3. **7 pts**

   List the five states of a button and explain why the focus state must never be removed.

4. **8 pts**

   State Fitts's law and the Apple and Material minimum touch targets, then use both to critique a design that puts a tiny Delete icon directly beside a same-sized Confirm icon.

5. **8 pts**

   Calculate: (a) 28 px in rem; (b) the px value of 3.5 rem; (c) the breakpoint 60 rem in px.

6. **6 pts**

   A 960 px mockup has a 240 px sidebar. Give the fluid width, and name the formula and its author's 2010 essay.

7. **8 pts**

   A 1200 px container holds 12 columns with 20 px gutters. Compute the column width and the width of a 5-column span.

8. **7 pts**

   Body text is 16 px. Using the half-em estimate, how many characters per line does a 720 px column hold, and what should the designer do?

9. **7 pts**

   Which of these spacings belong on a strict 8-point grid: 4, 10, 16, 18, 40, 52, 64? Correct the failures with the nearest legal value.

10. **7 pts**

    Give the pixel dimensions for: a 1:1 post at 1080 wide, a 9:16 story at 1080 wide, and a 16:9 thumbnail at 1280 wide — and state the story's approximate safe-area rule.

11. **8 pts**

    A 1280 px-wide thumbnail displays at 160 px. (a) Find the scale factor. (b) What does 48 px text display at — legible or not? (c) What designed size displays at 13 px?

12. **7 pts**

    Name four professional constraints of email design and the reason behind each.

13. **7 pts**

    What changed between redlines-on-pictures and structured files in Figma/Penpot — where does the truth live in each, and why does that matter to a developer?

14. **7 pts**

    Production task. Sketch (small and rough) one phone screen for a library app's empty reading list, then list the four items its behavior note must cover.

ANSWER KEY

1. HTML (page structure/content), HTTP (how browsers request pages), URL (page addresses); first site 1991 (info.cern.ch, 6 August).
2. Any four: searchable, selectable/copyable, translatable, resizable by the reader, screen-reader accessible, crisp on high-density screens, far smaller files. Acceptable exception: logos/lettering art.
3. Default, hover, active, focus, disabled. Focus is the only way keyboard users (including many users of assistive technology) can see where they are; deleting it makes the interface unusable without a mouse.
4. Time to hit a target rises with distance and falls with size; minimums 44 × 44 pt (Apple) and 48 × 48 dp (Material). The side-by-side equal targets make the destructive mis-tap as likely as the intended tap; separate them, enlarge Confirm as primary, reduce the prominence of Delete and confirm destructive actions.
5. (a) $28/16 = 1.75$ rem; (b) $3.5 \times 16 = 56$ px; (c) $60 \times 16 = 960$ px.
6. $240/960 = 25\%$; target ÷ context, from Ethan Marcotte's "Responsive Web Design" (A List Apart, 2010).
7. Columns: $(1200 - 11 \times 20)/12 = 980/12 \approx 81.7$ px. Span: $5(81.7) + 4(20) \approx 488$ px.
8. $720/8 = 90$ CPL — over the ~75 ceiling; cap the measure near 528–576 px (33–36 rem) or raise the type size.
9. 16, 40 and 64 pass (4 passes only as the allowed half-step). 10 → 8 or 12*/16, 18 → 16, 52 → 48 or 56. (*12 only if the team permits 4-point steps.)
10. 1080 × 1080; 1080 × 1920; 1280 × 720. Keep essential content out of roughly the top and bottom 250 px of the story, where platform interface overlays sit.
11. (a) $1280/160 = 8$. (b) $48/8 = 6$ px — illegible. (c) $13 \times 8 = 104$ px.
12. ~600 px single column (conservative rendering engines, phone reflow); live text, not an image of text (image-blocking inboxes, screen readers, spam filters); alt text on every image (blocked images and accessibility); key message and link high in the email (seen without scrolling). Also accepted: dark-mode testing, real-device test send.
13. With redlines, truth lived in hand annotations on static pictures — incomplete and instantly stale. In a structured file the design itself is inspectable (real components, tokens, measurements), so the developer reads exact values from one live source and the file updates for everyone at once.

14. Sketch: friendly empty state with an illustration or message ('No books yet'), one primary button ('Add your first book') in thumb reach, nav intact — not a blank screen. Notes: what shows on first run, what the button does, loading/error behavior, and what the screen becomes once one item exists.

PORTFOLIO PIECE: A RESPONSIVE PAGE, PROTOTYPED AND SPECIFIED

Finish the Greenhouse & Porch landing page as a portfolio piece: the three frames (375 / 768 / 1440) refined after critique, sharing one type ramp, palette, and 8-point spacing system, with the desktop frame sitting on a documented 12-column grid.

Attach the professional wrapper that makes it hire-worthy: your written grid and token sheet (the arithmetic shown), the developer behavior notes with breakpoints in rem, and a clickable Penpot prototype linking the page's primary action through the Recipe Box flow *or* the Reading Club flow from this unit's briefs. Present it as one case study: brief, process thumbnails, three frames, specs.

This is piece nine of the ten-piece professional portfolio you complete in Unit 10 — and for many employers it is the first one they will look at, because it proves you design for the screens where their customers actually are.

LOOK FOR	WHAT IT MEANS
Responsiveness	The three frames are honest recompositions of one design — constant brand and hierarchy, adapted layout — with breakpoints justified from content (measure, CPL), not device names.
System discipline	Type ramp in rem, palette with passing contrast, every spacing value on the 8-point grid, and the 12-column desktop grid computed correctly and matched by the frame.
Interface craft	Components are used properly with states present; touch targets meet 44 points; forms and buttons follow Lesson 9.2's affordance and state rules.
Prototype and specification	The prototype walks a complete primary flow including a non-happy-path state; the behavior notes and token sheet would let a developer build without asking the designer a question.
Craftsmanship	File hygiene a stranger could navigate: named frames and layers, shared styles, versioned file; exports are correctly formatted (SVG vector, 1x/2x raster).
Presentation	The case study reads cleanly — brief, process, result — with the squint-ladder and arm's-length tests documented; the work is shown at real sizes, honestly.

UNIT 10

The Working Designer: Portfolio, Clients and Career

You can now draw, compose, set type, build palettes, lay out pages, work the digital studio, illustrate, brand and design for screens. This final unit teaches the other half of the profession: the half that gets you hired and keeps you honest. You will curate the ten-piece portfolio you have been building all year and learn where to show it; learn who owns a picture under United States copyright law, and how licensing and contracts actually work; do the freelance math — day rates, quotes, invoices and kill fees — with real numbers; learn how designers get hired, as freelancers, in-house staff or studio employees; and end with the long game: the habits and ethics of a craftsman's career, including an honest look at AI image tools.

The stories are of working makers: Villard de Honnecourt carrying his portfolio across thirteenth-century Europe; Albrecht Dürer defending his monogram in a Venetian court in 1506; the Graphic Artists Guild publishing the pricing handbook the industry still quotes; the twenty-two-year-old Norman Rockwell walking his canvases into the Saturday Evening Post's offices in 1916; and Milton Glaser, who sketched the most famous logo in America in the back of a taxi and gave away more than he billed.

There is real math here — pricing is arithmetic plus honesty — and a capstone: by the end of this unit you will hold a curated ten-piece professional portfolio, a clean resume, and a complete mock client package (quote, contract, invoice and delivered files). That is not a school folder. It is the kit a working designer carries into a first client meeting or a first interview.

PREREQUISITES

- Units 1–9 complete, with each unit's portfolio piece finished or nearly so — this unit curates and frames them
- Arithmetic with percentages and simple formulas: solving $r = (I + O)/H$ for any variable
- The presentation and critique habits of Lessons 2.5 and 8.5

MASTERY CHECKLIST

- ☐ I can curate ten strong pieces, sequence them deliberately, and write a case study that shows brief, process and result.
- ☐ I can explain when copyright begins, what registration adds, and the difference between licensing a work and working for hire.
- ☐ I can name the parts of a simple design contract: scope, schedule, payment, rights, revisions and kill fee.
- ☐ I can compute a freelance hourly and day rate from target income, overhead and billable time, and build a project quote and invoice from it.
- ☐ I can describe the three main employment paths — freelance, in-house, studio/agency — and how a portfolio review and interview actually run.
- ☐ I can state, accurately and without hype, what AI image tools do, what U.S. law currently says about their output, and what professional ethics require of me when they are in the room.
- ☐ I can present my ten-piece portfolio, resume and mock client package as one professional kit.

FREE RESOURCES FOR THIS UNIT

- **U.S. Copyright Office — Circular 1, Copyright Basics (free PDF)**: The government's own plain-English explanation of what copyright protects, when it begins and what registration does — the primary source behind Lesson 10.2. Free; read Circular 1 and skim Circular 30 (works made for hire).
- **GitHub Pages (free web hosting)**: Free hosting for a hand-built portfolio site like the page you wrote in Lesson 9.1 — no ads, your own work, professional address. A parent approves and manages the account for a minor; a PDF portfolio is a fully acceptable alternative if your family prefers no account at all.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

10.1 The Portfolio: Ten Strong Pieces and Where to Show Them
3 sessions of 50 minutes

10.2 Who Owns the Picture: Copyright, Licensing and Contracts
3 sessions of 50 minutes

10.3 Pricing the Work: Rates, Quotes and the Freelance Math 3 sessions of 50 minutes

10.4 Getting Hired: Clients, Studios, Applications and Interviews
3 sessions of 50 minutes

10.5 A Craftsman's Career: Habits, Ethics and the Long Game 3 sessions of 50 minutes

Unit 10 test

Time allowed: 50 minutes. A calculator is allowed; show your work for every computation. Answer scenario questions in complete sentences — in this unit, the sentence is the skill. The test is worth 100 points.

1. **6 pts**
   State the curator's rule (size and weakness) and the four parts of a case study.

2. **6 pts**

   Name three portfolio vessels and the online-safety rules this course sets for a student publishing one.

3. **7 pts**

   When does U.S. copyright protection begin, how long does it last, and what three advantages does timely registration add?

4. **7 pts**

   A client says 'I paid for it, so I own the copyright.' Explain the actual rule for freelancers, the two conditions of work-for-hire, and which project type is normally assigned outright anyway.

5. **6 pts**

   List the six parts of a simple design contract and the dispute each prevents.

6. **8 pts**

   Compute: target income $54,000, overhead $12,000, 2,000-hour year at 55% billable. Find billable hours, hourly rate and day rate.

7. **8 pts**

   Quote this job at $60/hour: research 4 h, concepts 9 h, revisions 6 h, final files 3 h; $90 expenses; 10% contingency. Then state the deposit at 40%.

8. **7 pts**

   The $1,550 job completes; deposit was $620, terms Net 15, late policy 1.5%/month. Give the invoice balance, and the balance after one month overdue.

9. **7 pts**

   A $2,000 project (kill schedule 25/50/100, deposit 30% paid) is cancelled after refinement. Settle the account and state who owns the designs.

10. **6 pts**

    A client's budget is $500 against your $800 quote. Give the professional response in one or two sentences with a number, and name the principle.

11. **6 pts**

    Compare the three employment paths on: who owns the work product, who finds the work, and where mentorship is strongest.

12. **7 pts**

    Script the interview walkthrough: how many pieces, how long each, the per-piece structure, and the two follow-up duties afterward.

13. **7 pts**

    State the human-authorship rule and its two landmark applications (the AI-only applicant, and the comic book), then translate the rule into the one-sentence commercial argument against delivering pure AI output to a brand client.

14. **6 pts**

    Name four professional ethics rules for AI image tools from Lesson 10.5.

15. **6 pts**

    Production task. Sketch the one-page 'rule of life' table for your first year after this course: the five time-scales with one named practice and its purpose each.

ANSWER KEY

1. Ten strong pieces beat thirty mixed, because reviewers judge by the weakest piece, not the average. Case study: brief, constraints, process, result.
2. PDF, own hosted page (e.g., GitHub Pages), portfolio platform (e.g., Behance). Rules: a parent approves and manages any account (minors use parent-managed accounts); no home address, phone, school or routine details; personal info scrubbed from images.
3. Automatically at fixation in tangible form; life of the author plus 70 years; registration permits filing suit, unlocks statutory damages (up to $30,000/work, $150,000 willful) and attorney's fees.
4. Payment transfers nothing; the freelancer owns the work and the contract defines the client's rights. Freelance WFH requires a signed written agreement plus the work fitting one of nine statutory categories. Logos are normally assigned outright because a business must own its mark.
5. Scope (scope creep), schedule (drift/blame), payment (when, how much, deposit), rights (who may use what), revisions (endless tweaks), kill fee (cancelled projects unpaid).
6. Billable $2{,}000 \times 0.55 = 1{,}100$ h; hourly $66{,}000 / 1{,}100 = \$60$; day rate $480.
7. 22 h × $60 = $1,320; + $90 = $1,410; × 1.10 = $1,551 — quote ≈ $1,550. Deposit $0.40 \times 1{,}550 = \$620$.
8. Balance $1{,}550 - 620 = \$930$; a month overdue adds $930 \times 0.015 = \$13.95 \rightarrow \$943.95$.
9. Kill amount $0.50 \times 2{,}000 = \$1{,}000$; deposit held $600; client owes $400. No assignment occurred, so the designer owns the designs.
10. Shrink scope, not rate: e.g., "For $500 I can deliver the mark with one revision round; the full package remains $800." Principle: the rate is a just weight — discounting it declares it was never true.
11. In-house: employer owns (automatic WFH), employer supplies work, moderate mentorship. Studio: firm/clients own per contracts, firm finds work, strongest daily mentorship. Freelance: designer owns and licenses, designer finds all work, mentorship only what you build yourself.
12. Three to five pieces, two to three minutes each: brief → constraint → key decisions and why → result. Afterward: a specific thank-you note the same day, then patience with one polite check-in after their stated timeline (and a gracious reply even to a no).

13. U.S. copyright protects only human authorship: Thaler's purely machine-generated image was refused (courts agreeing a machine cannot be an author), and Zarya of the Dawn (Feb 2023) kept the human's text and arrangement while refusing the AI images. Commercial translation: pure AI output is nobody's property, so the client would own nothing they can register or defend — fatal for a brand asset.
14. Never present machine output as your own drawing; respect and contract to each client's AI policy; disclose assistance plainly; do not mimic a living artist's style to trade on their name (and sign nothing you cannot sign honestly).
15. Model answer: Daily — 30 min deliberate sketch (compound the hand); Weekly — one finishing block (finished not perfect); Monthly — labeled master study (steal judgment honestly); Seasonal — one finished portfolio-grade piece (keep shipping); Yearly — rate, tools and portfolio review with re-curation (keep the weights just and the ten strong).

PORTFOLIO PIECE: THE CAPSTONE: A PROFESSIONAL PORTFOLIO, RESUME AND CLIENT PACKAGE

Assemble the finished kit a working designer carries: the **ten-piece professional portfolio** — re-curated from the whole course, sequenced deliberately, with five full case studies — delivered as a clean PDF (and, with family approval, a hosted page built with your own Unit 9 hands); the **one-page resume** that is itself a typography sample and contains no claim you cannot demonstrate; and the **mock client package** for the Maple Lane Orchard engagement — quote, signed contract, invoice and the delivered-files folder — proving you can run the business of design as honestly as the craft.

Present the whole kit in a live twenty-minute review before the toughest audience you can assemble, taking critique by Lesson 2.5's rules, and close by signing your rule of life. This is the tenth piece in the deepest sense: the evidence that the other nine were made by a professional in training, not a hobbyist in luck — and it is the kit you will genuinely hand to a first client or interviewer, with only the names changed.

Fabricando fit faber: the file you archive this week is the maker the course was building all along.

LOOK FOR	WHAT IT MEANS
Curation	Ten pieces that survive the cut criteria (no apologies, no redundancy, defensible decisions), sequenced with intent, honestly labeled, and demonstrating range across drawing, type, color, layout, illustration, brand and screen.
Case studies	Five case studies tell brief, constraints, process and result in 150–250 words with real process artifacts and one honest 'what I'd change' — judgment visible, not just output.
Business documents	The quote, contract and invoice are complete per Lessons 10.2–10.3 (six contract parts; all invoice items; deposit, kill-fee and late math correct to the dollar) and designed to portfolio standard.
Professional conduct	The live review runs to time; walkthroughs lead with decisions; critique is received with Lesson 2.5 composure; the resume and all claims are truthful and demonstrable on request.

LOOK FOR	WHAT IT MEANS
Craftsmanship of the kit	One consistent typographic system across portfolio, resume and client package; files named, formatted and organized to the 9.5 handoff standard; PDF under 10 MB; archive backed up twice.
The long game	The rule of life is specific, scheduled, signed and started — daily practice, finishing rhythm, master studies, review cycles — and the retrospective honestly names the next three actions.

10.1 The Portfolio: Ten Strong Pieces and Where to Show Them

OBJECTIVES

- Curate ruthlessly: choose ten strong pieces from a year's work, knowing why each one is in and — harder — why good pieces are out.
- Write a case study that gives a piece its context: the brief, the constraints, two process artifacts, the result.
- Choose where to show the work — PDF, a simple hosted page, a portfolio platform — and tailor the selection to a market.

> **Warm-up.** Lay out (or list) every finished piece you made this course — the nine unit portfolio pieces plus any studio briefs you are proud of. Without overthinking, sort them into three piles: proud, solid, weak. Count each pile. Now hide the weak pile and look at what remains. Does the work look stronger as a whole? You have just performed the core act of this lesson.

WATCH

Design Portfolio: Complete guide

Flux Academy · 15:53

https://www.youtube.com/watch?v=gADqcFUschQ

> **WHEN TO WATCH**
> After the craft paragraph, before you select your ten. Keep a list of every criterion he applies; you will reuse it as your own selection checklist.

Note: A working designer-educator on what a portfolio is for, what goes in, and how case studies are structured. Aimed at exactly the decision you face this week.

BACKUP VIDEO

GOOD Vs BAD Design Portfolios (With Examples)

Flux Academy · 9:02

https://www.youtube.com/watch?v=0VGc7jrD9zo

After your first selection pass. Seeing the same mistakes in real portfolios makes it far easier to admit them in your own.

KEY TERMS

curation

Choosing and ordering work deliberately. The curator's rule: you are judged by your weakest piece, so ten strong pieces beat thirty mixed ones every time.

case study

A portfolio entry told as a story: the brief, the constraints, the process (sketches, rejected directions), the finished work and the result — proof you can think, not just finish.

body of work

What a portfolio shows as a whole: range plus consistency. Reviewers read the collection as one argument about what kind of designer you are.

portfolio platform

A site that hosts creative portfolios (Behance is the big free one). Convenient and searchable, but you follow its rules and sit beside its other content; many professionals also keep a site of their own.

tailoring

Adjusting which ten pieces lead for a particular reader: branding work for a brand studio, screen work for a product team, illustration for an art director (Lesson 7.3's markets, applied).

walkthrough

Presenting your portfolio aloud, piece by piece, in a review or interview — typically two or three minutes per piece, decisions first, apologies never.

CORE IDEAS

The story. Around 1230, a draftsman from Picardy named Villard de Honnecourt filled a parchment book — thirty-three leaves survive, kept today in the Bibliothèque nationale in Paris — with the most persuasive thing a medieval designer could carry: proof of what he could do. Drawings of the new towers at Laon, the choir at Reims, figures in drapery, a lion "drawn from life," lifting machines, geometry for setting out arches — organized, labeled, portable. Scholars argue about his exact trade, but the book's purpose is written in its own preface: it was compiled to be shown, so that others would know its maker's range. Seven centuries later, in the summer of 1902, a sixteen-year-old from Massachusetts named Newell Convers Wyeth mailed samples ahead and traveled to Wilmington, Delaware, hoping to join Howard Pyle's school of illustration; Pyle judged applicants on nothing but the work they could show.

Admitted in October, Wyeth sold a bucking-bronco cover to the *Saturday Evening Post* within four months. The lesson has not changed since parchment: in this trade you are not your diploma or your promises. You are the folder in your hands.

How they figured it out. Every art director repeats the same discovery: the portfolio is judged by its weakest piece. A reviewer flipping through thirty samples does not average them — doubt sticks. The working rule across the industry is roughly ten pieces, two to three minutes of attention each, and the first and last slots carry extra weight (first impression, last memory), so you open with your second-strongest piece and close with your strongest. The other discovery is that finished pictures alone do not get people hired, because clients and employers are buying judgment, not artifacts. That is why the case study format won: brief, constraints, process, result. Two honest process artifacts — the thumbnail sheet, the rejected direction and why it lost — tell a reviewer more about your future value than a third glamour shot of the final.

The craft. Build the selection in passes. Pass one: inventory everything (your warm-up). Pass two: apply the cuts — out goes anything you would have to apologize for, anything redundant (two logo systems, keep the better), and anything you cannot explain the decisions behind. Pass three: read the survivors as a body of work — do they argue "this person can take a job from brief to finished, in more than one medium"? Your course arc gives natural range: drawing (Unit 1), a composition or poster (Units 2, 5), typography (3), color-driven work (4), the hybrid illustration (6, 7), the brand system (8), the responsive page and app flow (9). Sequence deliberately; write a case study for at least three anchor pieces (150–250 words each: the brief in one sentence, two constraints, two process images, the result and what you would do differently — honesty is disarming and professional). Then the vessel. A PDF portfolio — letter-landscape pages, one piece per spread, exported under 10 MB — is the universal, email-able baseline; make it first. A simple hosted page (your Lesson 9.1 skills on GitHub Pages' free hosting) adds a professional address. Platforms like Behance add discoverability but also put your work beside anything else on the platform; treat them as optional, with a parent's approval and supervision, never as the only copy of anything.

In the studio. How it is actually read: an art director or hiring manager gives a first pass somewhere between thirty seconds and three minutes — thumbnail impressions, maybe one case study skimmed. The portfolio's job in that pass is not to

get you hired; it is to earn the meeting. In the meeting comes the walkthrough (Lesson 10.4 rehearses it): you present three to five pieces, decisions first — "the client needed X, the constraint was Y, here is why the type does Z." Keep a master folder of everything and cut a tailored ten for each audience: the church that needs a bulletin system should meet your templates and brand work first, the children's publisher your illustration. And the portfolio is never finished: working designers re-curate every few months, and the day a new piece clearly beats your weakest current piece, the swap happens without sentiment.

In the studio, continued — a note on what counts. Students worry that coursework is not "real." Reviewers care whether the problem was real-shaped and the thinking visible, not whether money changed hands — a well-documented fictional client beats a real but undocumented favor for an uncle every time. Label work honestly ("student brief," "self-initiated," "for a family business") and never inflate; Lesson 10.2 will give the legal reasons, but the professional reason is simpler: this field runs on reputation, and yours starts now.

PICTURE STUDY



A Leaf from Villard de Honnecourt's Portfolio, Villard de Honnecourt, c. 1225–1235 · Ink on parchment · Bibliothèque nationale de France, Paris (MS Fr 19093)

Image: Wikimedia Commons, public domain

This is one surviving leaf of the most famous portfolio of the Middle Ages: the parchment book Villard de Honnecourt of Picardy filled around 1230 and carried to show what he could do. On this page he works out ornament — two faces built from interlaced leaves (a favorite motif of Gothic carvers), a band of repeating foliage ready to be laid along an arch, and below, two plants studied simply, the raw material of the ornament above.

Read the page as a working designer's spread: observation at the bottom, systemized pattern in the middle, finished invention at the top. Eight hundred years before design schools, here is nature study becoming repeatable ornament becoming a saleable skill — on a page made to be shown.

Look closely

- Find the two plant studies at the bottom. How simplified are they — what did Villard keep, and what did he leave out?
- Trace how the leaf forms reappear in the curved ornament band. What makes the band repeatable — could a carver continue it another three feet from this sample alone?

- The two foliate faces are the showpieces. What do they prove the maker can do that the plant studies alone do not?
- The page mixes three levels of finish. Why would a portfolio page showing process plus result persuade a patron more than the result alone?
- Look at the page's economy — no inch wasted, everything labeled by placement. What does that tell you about parchment's cost, and what is your equivalent constraint?

Talk about it

1. Villard's book held architecture, figures, machines and ornament — range — yet all in one confident line style — consistency. How does your ten-piece selection balance the same two demands?
2. He carried his portfolio to building sites and patrons across Europe. What are the modern equivalents of that journey, and what has not changed about the transaction?
3. This page survived; the buildings and carvings it fed mostly did not. What does that say about documenting your work as carefully as you make it?

Safety first. If you publish your portfolio online: a parent approves and manages any account a student creates (hosting, platform or email); minors use a parent-managed account. Publish no home address, phone number, school schedule or daily-routine details — a city and an email address a parent monitors are contact information enough. Review every piece for personal information in photos or screenshots (street signs, license plates, family names) before it goes public.

STUDIO BRIEF

Studio brief: The ten — first full curation

Client: you, one year from now, walking into an interview. Deliverable this week: the curated ten-piece selection as a draft PDF portfolio — cover, contents, ten pieces with titles and honest labels, three full case studies — plus your master-folder inventory. The capstone at unit's end will refine this; this week establishes it.

Treat it as a real production job with yourself as the demanding client: deadlines, passes, and a sign-off review.

You will need

- Every finished piece from Units 1–9, gathered digitally (photograph physical work in flat, even light, squared and cropped cleanly — Lesson 6.4 skills)
- Scribus, or Penpot/Inkscape, for the PDF layout; your Unit 3 type system
- Pencil and index cards (one per candidate piece) for the sorting passes
- A parent or sibling for the three-minute test

Steps

1. Inventory: one index card per piece — name, unit, category (drawing, type, color, layout, illustration, brand, screen), and your gut grade.
2. Pass one: cut to fifteen using the three cuts (apologies, redundancy, unexplainable decisions). Write each cut's reason on its card; keep the cards.
3. Pass two: read the fifteen as a body of work against the range list in the craft paragraph. Cut or swap to ten, and set the sequence — second-strongest opens, strongest closes.
4. Write the three case studies (150–250 words each) for your anchor pieces: brief, constraints, two process artifacts, result, one honest 'what I'd change.'
5. Lay out the PDF: letter landscape, quiet grid from Unit 5, one piece per spread, generous margins; typography does the talking, the pieces do the singing. Honest labels on every piece (student brief, self-initiated, family business).

6. Export under 10 MB and test it on a phone and a laptop — reviewers use both.
7. Run the three-minute test from practice problem 10 with a parent; log the answers.
8. Revise once from the test: re-sequence, strengthen one case study, or execute the swap the test demanded.
9. File the master: archive every piece, card and process file in one organized folder with dated subfolders — the capstone and every future tailoring draw from this.
10. **Check your work** against the mastery checklist's first item, judged by someone other than you.

Tips

- Photograph sketchbook spreads as well as finished work — process pages are case-study gold.
- If a piece needs ten minutes of polish to stop you apologizing for it, spend the ten minutes; if it needs ten hours, cut it and note it as a candidate after the course.
- Name files like a professional: lastname-portfolio-2026-draft1.pdf. The filename is the first design the reviewer sees.

Check your work

- ☐ Ten pieces, sequenced deliberately, every one labeled honestly and none I would apologize for.
- ☐ Three case studies show brief, constraints, process and result.
- ☐ The PDF survived the three-minute test with my intended identity coming back in the reader's words.

SKETCHBOOK

1. The cut list: every piece that did not make the ten, with its one-line reason — this page teaches more than the portfolio does.
2. A hand-drawn sequence map: ten thumbnails in order with arrows and notes on why each sits where it sits.
3. Three case-study drafts, written longhand first — the discipline of longhand keeps them honest and short.

> **From history.** Villard's thirty-three leaves are a remnant — stitch holes and numbering show the book once held more, and later owners added pages of their own. Portfolios have always been living documents, pruned and regrown for each audience. The Morgan Library's copy of N.C. Wyeth's letters records the other half of the tradition: Pyle's school asked applicants for samples, not credentials — the portfolio as the profession's only passport, then and now.

PRACTICE

1. Easy State the curator's rule about portfolio size and weakness, and the reasoning behind it.

   Show answer

   Roughly ten strong pieces beat thirty mixed ones, because reviewers do not average — the weakest piece sets the doubt. Every piece must defend its slot.

2. Easy List the four parts of a case study and what each proves.

   Show answer

   The brief (you understand problems), constraints (you work within reality), process (you can think and iterate — sketches, rejected directions), result (you can finish). Together they prove judgment, not just output.

3. Easy Why do you open with your second-strongest piece and close with your strongest?

   Show answer

   First and last slots carry the most memory weight: open strong to earn attention, close strongest to leave the final impression — and the true best piece lands when the reviewer is most engaged.

4. Medium Name the three main vessels for a portfolio with one strength and one weakness each.

   Show answer

   PDF: universal, email-able, fully controlled — but static and size-limited. Own hosted page: professional address and full control — requires upkeep (and a parent-managed account for hosting). Platform like Behance: discoverable and free — you follow its rules and sit beside uncurated neighbors.

5. Medium What belongs in your master folder that never belongs in the ten? Give three categories.

Show answer

Redundant pieces (second-best of a kind), work you cannot explain the decisions behind, and anything you would apologize for — plus archives, process files and older versions. The master keeps everything; the ten is an argument.

6. Medium Tailor on paper: which of your pieces lead for (a) a brand studio, (b) a children's book publisher, (c) a church needing communications help?

Show answer

Answers vary; pattern: (a) the Unit 8 identity system, logo process and brand guide, then the responsive page; (b) the Unit 7 illustration work, sketchbook character studies, the hybrid piece; (c) the template series, poster, and typography pieces. Same maker, different first impression.

7. Medium Write the one-sentence brief line of a case study for your Unit 8 brand project, in under 25 words.

Show answer

Example: "A startup garden nursery needed a mark and mini brand guide that worked in one color on a seed packet and a road sign." (Yours will differ; it must name client, need and constraint.)

8. Hard A friend pads their portfolio by labeling a school project as paid client work. Give the practical, professional and biblical cases against it in three sentences.

Show answer

Practically, one phone call or interview question exposes it, and the interview is over. Professionally, the field runs on reputation and references — a discovered inflation follows you. Biblically, it is a false witness about your own work; Proverbs 22:1 prices a good name above riches.

9. Hard Your two logo projects are both good. Argue the case for cutting one anyway, and what to do with the freed slot.

Show answer

Two of a kind read as one skill twice and crowd out range; keep the one with the stronger case study and give the slot to a category the body of work lacks — say the app flow or an illustration — so the collection argues breadth plus depth.

10. Challenge Run a timed test: give a parent your draft PDF for exactly three minutes, then take it away and ask them to name (a) what kind of designer you are, (b) the two pieces they remember, (c) one doubt they felt. Record the answers and act on the doubt.

Show answer

Answers vary. If (a) does not match your intent, re-sequence; if (b) does not include your intended closer, re-order; (c) usually names the piece to cut or the case study to strengthen — the three-minute read is the real-world condition.

COMMON MISTAKES

- Including everything you ever made. The portfolio is an argument, not an archive; the archive lives in the master folder.
- Showing finals only. Process artifacts prove judgment — reviewers hire the thinking, not the artifact.
- Apologizing during a walkthrough ('this one isn't great, but...'). If it needs an apology, it needed a cut; present decisions, not defenses.

> **Make it a game · Cut or Keep.** Shuffle your index cards and deal them one at a time to a parent. For each, you have 20 seconds to argue cut or keep and why — range, strength, redundancy, case-study potential. The parent rules for or against your argument (not the piece). Ten rounds; seven sustained arguments wins. Replay after the capstone and feel how much sharper the arguments have become.

> **Scripture.** “A man's gift maketh room for him, and bringeth him before great men.” (Proverbs 18:16, KJV)
>
> It is demonstrated gift — not connections or self-promotion — that makes room and brings a craftsman before the people who decide. A portfolio is your gift made visible: ten strong pieces will open doors that a résumé alone cannot.

10.2 Who Owns the Picture: Copyright, Licensing and Contracts

OBJECTIVES

- Explain when copyright begins under the Copyright Act of 1976, what registration adds, and roughly how long protection lasts.
- Distinguish licensing (exclusive and non-exclusive) from assignment and work-for-hire, and know which one a freelancer should reach for first.
- Draft a simple one-page design contract with all six working parts: scope, schedule, payment, rights, revisions and kill fee.

> **Warm-up.** Draw a quick five-minute sketch of anything on paper. Now answer three questions in writing: Who owns this drawing? If a company printed it on a thousand shirts tomorrow without asking, would that be wrong — and why, exactly? If a friend paid you five dollars to draw it, who would own it then? Keep your answers; by the end of the lesson you will grade them against federal law.

WATCH

Copyright, Trademarks & Patents Made Simple (Understanding Intellectual Property)

The Futur · 7:58

https://www.youtube.com/watch?v=kbv3RH49yPA

> **WHEN TO WATCH**
> After the first craft paragraph. Note the boundary lines: copyright for creative works, trademark for brand identifiers, patent for inventions — designers touch the first two weekly.

Note: A clean, fast map of the three kinds of intellectual property from a design-business educator. It is orientation, not legal advice — your primary source remains the Copyright Office's Circular 1 in this unit's kit.

BACKUP VIDEO

What designers NEED to know about IP, copyright & trademarks! #ad

CharliMarieTV · 7:29

https://www.youtube.com/watch?v=UeeRCBf7mcY

With the licensing paragraph; a working designer's practical view of rights in client work. The title flags a sponsor — skip the sponsor segment.

KEY TERMS

copyright

The exclusive legal right to copy, distribute, display and make derivatives of an original creative work. Under U.S. law it begins automatically the moment the work is fixed in tangible form — drawn, saved, recorded.

registration

Recording a work with the U.S. Copyright Office (copyright.gov, modest fee). Not required for ownership, but required before filing an infringement suit, and timely registration unlocks statutory damages and attorney's fees.

license

Permission to use a work in defined ways while the creator keeps ownership — scoped by use, territory, duration and exclusivity (exclusive: only this client may use it; non-exclusive: others may too).

kill fee

The contract clause stating what the client pays if the project is cancelled partway — commonly 25–50% depending on stage — protecting the maker's invested time.

public domain

Works whose copyright has expired or never existed — in the U.S., generally works published before 1930, plus U.S. government works. Free for any use; this course's picture studies live there.

work made for hire

Work owned by the employer from the start: everything an employee creates within their job, or a freelancer's work only if it fits one of nine statutory categories and both parties signed a written work-for-hire agreement.

infringement

Using a copyrighted work without permission. Innocence of the law is no defense, and 'it was on the internet' is not a license.

CORE IDEAS

The story. In 1506 Albrecht Dürer rode to Venice, and part of his business there was the first famous copyright fight in art history. An Italian engraver, Marcantonio Raimondi, had copied Dürer's woodcut series line for line — including the famous AD monogram — and the copies were selling as Dürers. Dürer went to the Venetian authorities. The ruling, to modern ears, is half a loaf: Raimondi could keep copying the pictures, but had to stop forging the monogram. Ideas and images were not yet property; a maker's mark already was. Dürer had seen the problem coming — the colophon of his 1511 editions thunders a warning against "thieves of the labor and invention of others" under threat of confiscation. His 1515 *Rhinoceros* proved the point commercially: pirated for three centuries across Europe, with none of the profit returning to Nuremberg. The world took another two and a half centuries to catch up: Britain's Statute of Anne (1710) made creators' rights law; the U.S. Constitution (1787) empowered Congress "to promote the progress of science and

useful arts" by securing authors' exclusive rights; and the modern American rulebook is the **Copyright Act of 1976**, in force since 1978.

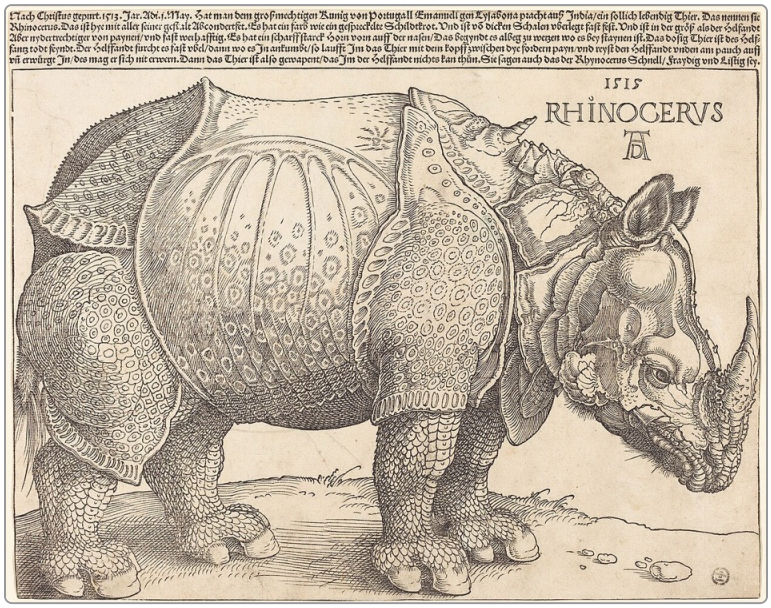
The craft — what the law actually says. Four facts carry most of a designer's daily questions. *One:* copyright is automatic. The moment your original work is fixed — pencil on paper, file saved — you own it; no notice, no registration, no fee required (Circular 1 says exactly this). *Two:* it lasts your life plus 70 years. *Three:* registration is the courtroom key: you must register before you can sue an infringer, and if you registered on time (within three months of publication, or before the infringement), you may claim statutory damages — up to $30,000 per work and up to $150,000 for willful infringement — plus attorney's fees, instead of having to prove your actual losses. Professionals register their important finished work in batches for this reason. *Four:* the rule cuts both ways with perfect symmetry. Every photograph, font, texture, song and illustration you find online is someone's property under exactly the laws that protect yours. "Fair use" is a narrow, four-factor legal defense argued in court — not a percentage, not a number of seconds, not a filter applied on top — and a working designer builds from what is licensed, owned or public domain, full stop. Exodus 20:15 needs no subsection numbers.

The craft, continued — who owns client work. Here is the part most beginners get backwards: when a client pays a freelancer for a design, the client does *not* automatically own the copyright. They own what the agreement says they own. The spectrum runs: *non-exclusive license* (client may use it as agreed; you may license it elsewhere), *exclusive license* (only this client, for the scoped uses — a magazine buying first North American rights to an illustration is the classic case from Lesson 7.5), *assignment* (you sell the copyright itself — price accordingly), and *work made for hire* (the client is the author from the start; for freelancers this requires both a signed agreement saying so and the work fitting one of nine statutory categories — while everything an employee designs on the job belongs to the employer automatically, which is one real difference between the in-house and freelance paths of Lesson 10.4). Logos are the practical exception to license-first thinking: a business must own its own mark outright, so logo projects are normally priced and papered as assignments — another reason identity work commands the fees it does. Price follows rights: broader rights, bigger number. The Graphic Artists Guild's *Handbook of Pricing and Ethical Guidelines* — the industry's reference since 1973 — prices by usage for exactly this reason.

In the studio — the simple contract. Professionals do not work from handshakes, not because clients are wicked but because memories are soft and projects drift. A one-page agreement, in plain English, carries six parts: **scope** (exactly what is being made: "one logo, two refinement rounds, final files in SVG, PNG and PDF"); **schedule** (dates for sketches, feedback, final — and that client delays move the dates); **payment** (the amount, the non-refundable deposit — commonly 30–50% to begin — and the balance due on delivery, Net 15 or 30); **rights** (which of the four arrangements above, in writing); **revisions** (how many rounds are included and the hourly rate after them — the clause that prevents the endless-tweaks spiral); and the **kill fee** (if the project dies at sketches, the deposit is earned; at refinement, 50%; after approval, 100% — numbers vary, the principle does not). Both parties sign and keep copies, and every later change is confirmed in a sentence by email: "Confirming we've added a third refinement round at $X — thanks!" That sentence, cheerfully written, has settled more disputes than any courtroom.

In the studio, continued — honor in both directions. The same law and the same honesty govern your inputs. Fonts are software under license — check what your license allows before a logo ships (Google Fonts' open licenses are one reason this course uses them). Stock images are licensed, not owned. Reference is for learning structure, not for tracing into "your" finished work (Lesson 7.4 drew this line for master studies; signed copies stay in the sketchbook). And when — not if — someone someday lifts your work, respond the way you would want to be approached: document it, assume ignorance before malice, send a polite note with an invoice or a takedown request, and escalate only as needed. A Christian designer's standard is older and stricter than Title 17: render to all their dues, and let your yes be yes on paper.

PICTURE STUDY



The Rhinoceros, Albrecht Dürer, 1515 · Woodcut · National Gallery of Art, Washington, D.C. (Rosenwald Collection)

Image: Wikimedia Commons, public domain

In 1515 a living rhinoceros — the first in Europe in a thousand years — arrived in Lisbon as a gift to the King of Portugal. Dürer, in Nuremberg, never saw it. Working from a merchant's letter and a secondhand sketch, he cut this armored marvel, got the armor plates wrong and the power exactly right, stamped it with his monogram, and printed by the thousand. It became the most influential animal picture ever made: for three centuries Europeans 'knew' the rhinoceros through Dürer's inaccurate, unforgettable image.

It is also a copyright parable. Nine years earlier Dürer had sued Marcantonio Raimondi in Venice for copying his prints — and won protection only for the monogram, not the images. The Rhinoceros was pirated across Europe for generations, in ceramics, natural histories and schoolbooks, earning its maker nothing after the first editions. Every law in this lesson exists because of what happened to images like this one.

Look closely

- Find the AD monogram and the date. Why did Dürer brand every print — what did the mark legally protect in 1515, and what did it fail to protect?
- Study the invented armor: plates, rivets, the small dorsal horn Dürer added. Where does observation end and confident invention begin?

- The text block above the image is part of the design. How do word and image share the sheet — and what does that teach about designed information?
- Woodcut is a one-color medium. How does Dürer get texture, weight and shadow from pure black line (connect to your Lesson 8.2 one-color test)?
- Pirated copies usually dropped or altered details. If you were authenticating a true Dürer printing, what three details would you check first?

Talk about it

1. Dürer's image was wrong about the animal and yet dominated for 300 years. What does that say about the power of a well-made image — and the responsibility that comes with it?
2. The Venice ruling protected the maker's mark but not the maker's image. What exactly did the Copyright Act of 1976 fix about that — and what does a monogram still do today that law does not?
3. Pirates profited for centuries from work they did not make. What was lost — to Dürer, to buyers, and to the pirates themselves? Read Exodus 20:15 over your answer.

STUDIO BRIEF

Studio brief: Paper the Maple Lane Orchard logo job

Client: Maple Lane Orchard, a fictional family orchard commissioning a logo and basic brand sheet (the design itself can be a light exercise or reuse Unit 8 work — this brief is about the paper). Deliverable: a one-page plain-English contract with all six parts, a rights paragraph handled as an assignment of the final mark (with your sketches retained), and a one-paragraph license for a second scenario — the orchard also wants to use one of your existing illustrations on a seasonal flyer. Deadline feel: three days.

A parent plays the orchard owner: they will read, question and sign — and they have been coached to push on scope ('could you also do the road sign?') so your contract has to answer.

You will need

- Word processor or neat handwriting; two printed copies for signing
- This lesson's six-part contract outline and the kill-fee stage percentages
- Copyright Office Circular 1 (from the kit) open for reference
- Your Unit 8 logo process knowledge for realistic scope language

Steps

1. Draft the scope: name the exact deliverables (one mark, two refinement rounds, final files SVG/PNG/PDF, one-page brand sheet) and — just as important — one sentence on what is not included.
2. Set the schedule with real dates: sketches day 3, feedback within 2 days, refinement day 7, final day 10; state that client delays shift the dates.
3. Write payment: a project price (use your gut now; Lesson 10.3 will teach you to compute it properly), 40% non-refundable deposit to begin, balance Net 15 on delivery.
4. Write rights two ways and label them clearly: (a) the logo as an assignment of the final approved mark upon full payment, sketches and unused directions remaining yours; (b) the flyer illustration as a one-season, non-exclusive license for print flyers only, artist credited.

5. Add revisions (two rounds included; further rounds at an hourly rate you name) and the kill fee (deposit earned at sketches; 50% through refinement; 100% after approval).
6. Read the whole page aloud. Strike every word a non-lawyer would stumble on; plain English is the professional register for a one-page agreement.
7. Hold the signing meeting: the parent-client reads it cold, asks their planted scope question, and you answer from the page, not from improvisation. Amend by hand-dated note if genuinely needed, then both sign both copies.
8. Afterward, send the confirming 'email' (a written note is fine): one sentence confirming the signed terms and the start date — the habit that settles disputes before they exist.
9. **Check your work:** trade contracts with a sibling or re-read after a day and try to find the loophole — the question the page cannot answer. Patch it.

Tips

- Write the revisions clause as if for your most enthusiastic imaginable client; enthusiasm, not malice, is where endless tweaks come from.
- Keep this contract as your reusable template — real first clients are often family businesses, and this page, with names changed, is genuinely serviceable.
- If a real job ever involves real money and real stakes beyond this scale, the professional move is a real attorney's review; knowing when you've outgrown your template is itself a professional skill.

Check your work

- ☐ All six parts present, in plain English, on one page.
- ☐ The rights language correctly distinguishes the assignment (logo) from the license (illustration).
- ☐ The contract answered the planted scope question without improvisation.

SKETCHBOOK

1. A one-page visual map of the rights spectrum — non-exclusive license → exclusive license → assignment → work for hire — with a one-line example and price arrow under each.

2. Your signed contract pasted in, with margin notes on the two clauses that were hardest to write and why.
3. A timeline of the lesson's story: 1506 Dürer v. Raimondi, 1511 colophon warning, 1515 Rhinoceros, 1710 Statute of Anne, 1787 Constitution's clause, 1976 Copyright Act, 1978 in force.

> **From history.** The nine freelance work-for-hire categories of the 1976 Act were hammered out between publishers and authors' groups, and 'illustration commissioned as part of a collective work' is among them — which is why magazine contracts matter so much, and why the Graphic Artists Guild (founded 1967 in Detroit by working artists) has published its Handbook of Pricing and Ethical Guidelines since 1973: artists kept discovering, too late, that one signature had quietly made someone else the author of their work.

PRACTICE

1. Easy At what exact moment does U.S. copyright protection begin for a drawing, and what must the artist file for that protection to exist?

   Show answer

   The moment the original work is fixed in tangible form (drawn, saved). Nothing — protection is automatic; no registration, notice or fee is required for ownership.

2. Easy If registration is not required, name the three things timely registration adds.

   Show answer

   The right to file an infringement suit at all, eligibility for statutory damages (up to $30,000 per work, $150,000 willful) instead of proving actual losses, and recovery of attorney's fees.

3. Easy Grade your warm-up answers: who owned the sketch, was the shirt company wrong, and did the five-dollar friend own it?

   Show answer

   You owned it from fixation; the company infringed your exclusive reproduction right — wrong legally and morally; and no — payment alone transfers nothing. The friend got the physical drawing at most; rights move only by written agreement.

4. **Medium** Put in order of how much the client receives (and roughly how the price should move): assignment, non-exclusive license, exclusive license, work for hire.

Show answer

Non-exclusive license < exclusive license < assignment ≈ work for hire (client owns outright; WFH makes them the author from the start). Price rises in the same order — broader rights, bigger number.

5. **Medium** A freelancer's client claims every project is automatically 'work for hire because I paid for it.' Correct them precisely.

Show answer

For freelancers, work for hire exists only when both conditions hold: a written agreement signed by both parties saying so, and the work fitting one of nine statutory categories. Otherwise the freelancer owns the copyright and the client gets what the contract licenses. (Employees' on-the-job work is the automatic case.)

6. **Medium** Why are logo projects normally handled as assignments when illustrators usually license? Give the business logic of each.

Show answer

A business must own its identifying mark outright — it cannot risk its own logo being licensed elsewhere, and it will trademark it. Illustration earns across uses and time (first rights, reprints, other territories), so the illustrator keeps copyright and sells scoped licenses — the GAG Handbook prices by usage for this reason.

7. **Medium** Name the six parts of the simple contract and the dispute each one prevents.

Show answer

Scope (scope creep — 'can you also do the menu?'); schedule (drift and blame for delays); payment (when and how much, deposit protects starting work); rights (who may use what, where); revisions (the endless-tweaks spiral); kill fee (cancelled projects consuming unpaid weeks).

8. Hard A client cancels a brand project after approving sketches but before refinement. The contract set a $1,200 fee, 40% deposit paid, kill fee of 50% through refinement. Who owes whom what, and who owns the sketches?

Show answer

Kill fee earned: $0.50 \times 1200 = \$600$; deposit held is $480, so the client owes $120 more. The designer owns the sketches — no final was delivered and no assignment occurred; the client may not use them without a new agreement.

9. Hard You discover a local business printed your portfolio illustration on their flyers. Write the three-sentence first message you would send (parent reviews before sending).

Show answer

Example: "Hello — I'm glad you liked my illustration of the orchard; I noticed it on your spring flyers. I'm the artist and copyright holder, and it wasn't licensed for that use, so I've attached a simple license and invoice at my standard rate to make it right. If you'd rather stop using it, I'd appreciate confirmation the flyers are retired — happy to talk either way." Documented, charitable, firm.

10. Hard A client asks you to 'just use' a well-known cartoon character on a church camp T-shirt 'since it's not for profit.' Explain the law and the better path in three sentences.

Show answer

The character is copyrighted (and likely trademarked); nonprofit use is still infringement, and fair use is a narrow court-argued defense that merchandise would almost certainly fail. The honest path is also the better design: an original camp character the church actually owns. Offer to design one — that is the job.

11. **Challenge** Using this unit's kit, skim Copyright Office Circular 1 and find: the phrase confirming automatic protection, the current basic online registration fee range, and one fact this lesson did not cover. Record all three with page or section references.

    Show answer

    Answers vary with edition; students should find 'Copyright exists automatically in an original work of authorship once it is fixed,' a standard online filing fee in the tens of dollars, and a third fact such as the deposit requirement, group registration options, or the 1930 public-domain line moving yearly.

COMMON MISTAKES

- Believing payment transfers copyright. It transfers nothing; rights move only by the written agreement — in both directions, for your clients and for your own use of others' work.
- Treating 'fair use' as a rule of thumb ('I changed 30%,' 'it's not for profit'). It is a narrow four-factor defense argued in court, not a license — build from owned, licensed or public-domain material.
- Starting work without a deposit and signed page 'because the client seems nice.' Nice clients sign happily; the paper protects the friendship, not just the fee.

Make it a game · Rights Court. A parent reads scenarios — 'client paid cash, no contract, now sells shirts of the art'; 'you traced a photo you found and sold the drawing'; 'employee designs a menu at work, quits, reuses it' — and you have 30 seconds to rule: who owns what, who owes what, and which contract clause or legal fact decides it. Parent scores each ruling against the lesson. Seven of ten verdicts correct wins; argue the close calls over dinner.

Scripture. “Thou shalt not steal.” (Exodus 20:15, KJV)

Four words govern this whole lesson from both sides: the pirate who prints another's rhinoceros and the designer who 'borrows' an internet photograph break the same command. Copyright law is civilization's long footnote to a sentence God wrote first.

10.3 Pricing the Work: Rates, Quotes and the Freelance Math

OBJECTIVES

- Derive an honest hourly and day rate from target income, overhead and billable time (about 60% of working hours).
- Build a project quote from estimated hours, expenses and rights, and present it with options rather than apologies.
- Produce a correct invoice — deposit credited, terms stated — and apply kill fees and late fees without drama.

> **Warm-up.** Ask a parent what a plumber or electrician charged for a recent house call, and how long the visit took. Divide money by hours. Now list three costs that number had to cover besides the worker's take-home pay (truck, tools, insurance, the unpaid hour driving between jobs…). Keep the list — freelance design has the same hidden iceberg, and today you learn to measure it.

WATCH

How To Price Design & Bid Projects (pt.1)

The Futur · 17:14

https://www.youtube.com/watch?v=OiUOaZJJYzg

> **WHEN TO WATCH**
> After the worked examples. Chris Do bids a real-shaped project on the whiteboard; pause and run your own numbers alongside his before he reveals each step.

Note: The Futur is the design industry's best-known business educator. Watch for how he separates the maker's cost from the work's value to the client — the two pricing floors this lesson teaches.

BACKUP VIDEO

Tips On How To Price Your Design Work And Make A Profit

The Futur · 6:48

https://www.youtube.com/watch?v=I48unL6m0eU

As a recap after the practice problems — a compact pass over rates, estimates and profit that consolidates the arithmetic.

KEY TERMS

overhead

The costs of being in business before any project starts: computer and software, insurance, workspace, internet, marketing, professional fees. Freelancers must recover it through their rate.

billable hours

Hours actually charged to clients. Even busy freelancers bill only ~60% of working time; the rest goes to finding work, administration, learning and estimating — necessary, but unpaid.

day rate

The price of a full working day of the designer's time — hourly rate × 8 in this course — commonly quoted for on-site or open-ended work.

quote (estimate)

The written price for a defined scope before work begins: estimated hours × rate, plus expenses and rights, often presented as two or three options at different scopes.

invoice

The bill: numbered and dated, itemizing deliverables and amounts, crediting the deposit, stating the balance, terms (e.g., Net 30) and the late policy.

Net 30

Payment terms meaning the balance is due within 30 days of the invoice date; Net 15 means fifteen. Late fees (commonly 1.5% per month) apply after the term.

usage-based pricing

Pricing that scales with the rights granted (Lesson 10.2): a spot illustration for one local flyer costs less than the same drawing licensed for national packaging — the Graphic Artists Guild Handbook's organizing principle.

CORE IDEAS

The story. In 1967, working artists in Detroit — tired of discovering that each had been quoting in the dark, undercutting one another into poverty — founded the Graphic Artists Guild. Six years later the Guild published a slim booklet of going rates and fair-dealing rules that grew into *the Handbook: Pricing & Ethical Guidelines*, now in its sixteenth edition and still the reference a working illustrator reaches for when a strange job needs a sane number. Its deepest lesson is not any particular price; it is that pricing is an ethical act with two failure modes. Price too high on bluff and you deal falsely. Price too low — the beginner's chronic temptation — and you still deal falsely: you undercut the working artists beside you, teach clients that design costs less than it does, and quietly guarantee that you cannot afford to do the work well. Scripture put the standard in the merchant's scale pans three thousand years ago: *a just weight and balance are the LORD's*. The number must be true — true to your costs, your time and the value delivered.

How they figured it out — the rate. The freelance rate formula is three honest numbers and one division. *Number one: target income.* What should a year of your full-time work pay? (For calibration: the U.S. Bureau of Labor Statistics put the median graphic designer's wage near $59,000 in 2023; a beginner targets lower, a specialist higher.) *Number two: overhead.* The plumber's truck, translated: computer, backups, any paid software or fonts, insurance, workspace share, internet, portfolio

hosting, professional books and dues — listed annually and honestly. *Number three: billable time.* A full-time year is about 2,000 working hours, and here is the number that shocks every beginner: a healthy freelance practice bills only about 60% of them. The other 40% is finding the next client, writing quotes, invoicing, bookkeeping, learning new tools — real work, paid by no one, recovered only through the rate. So: $\text{hourly} = \dfrac{\text{income} + \text{overhead}}{\text{billable hours}}$. Target $48,000 with $12,000 overhead: $(48{,}000 + 12{,}000)/1{,}200 = \$50$ per hour, $400 per day. A freelancer who skips this math and 'feels like' $20 an hour has, without noticing, chosen a $14,000 salary.

The craft — the quote. A quote is estimation plus honesty plus margin for the unknown. Decompose the job into phases — for a small brand job: discovery and research, sketches, refinement rounds, final files and brand sheet — and estimate hours per phase against your own tracked history (start tracking now, in this course; your time log becomes your most valuable business asset). Multiply by the rate, add actual expenses (fonts, printing, stock licenses — passed through transparently), adjust for rights (an assignment or national usage prices above a local one-season license, per Lesson 10.2), and add a contingency of about 10–15% because every project contains one surprise. Present two or three options at different scopes — good / better / best — rather than one take-it-or-leave-it number: it moves the conversation from *whether* to *which*. And when a budget is genuinely smaller than the work, the professional answer is to shrink the scope, never the rate: "Within $600 we can do the mark and a one-page guide; the full system would be $1,400." Discounting your rate on request teaches the client the number was never true.

The craft, continued — the paper trail of money. The deposit (30–50%, non-refundable, due before work begins) is the client's commitment made tangible; professionals do not start without it. The **invoice** is a designed document — yours should be portfolio-clean — carrying: your name and contact, the client's, a unique invoice number and date, line items matching the quote's language, expenses listed separately, subtotal, deposit credited, **balance due**, terms (Net 15 or Net 30) and the late policy (commonly 1.5% per month on overdue balances — stated on every invoice, enforced politely after a courteous reminder). The **kill fee** from your 10.2 contract turns cancellations into arithmetic instead of arguments: fee × the stage percentage, minus deposit held, settles the account in one line. Finally, the freelancer's quiet discipline: set aside 25–30% of every payment for taxes

immediately (self-employment tax plus income tax come due whether or not you saved), and track every hour and expense the week it happens — Proverbs 27:23's flocks and herds, kept in a spreadsheet.

In the studio. How the pros actually behave with numbers: they quote scopes, not hours, to clients (hours are the internal math; the client buys the outcome); they never send a number they have not slept on; they raise rates deliberately — reviewing yearly, raising for new clients first — rather than apologetically; and they decline bad-fit work graciously instead of punishing themselves with resentful discount labor. Watch for the day-rate traps, too: an on-site day pays the day rate even if the shoot wraps early (the day was reserved and unsellable elsewhere), and 'quick little jobs' carry a minimum fee, because a 20-minute edit still costs an hour of context, files and correspondence. None of this is greed. It is the just weight: a rate that lets you do unhurried, excellent work, pay your taxes, honor your commitments and still be in business next year to serve the client again.

PICTURE STUDY



The Moneylender and His Wife, Quentin Matsys (Quinten Massijs), 1514 · Oil on panel · Louvre, Paris

Image: Wikimedia Commons, public domain

Antwerp, 1514: Europe's busiest port needed money changers to weigh and verify the coins of twenty nations, and Quentin Matsys painted one at work with his wife beside him. He tests coins in a hand balance with a goldsmith's precision; she turns the page of an illuminated prayer book, her eyes drawn to the scales. On the original frame, now lost, ran a verse from Leviticus: 'Let the balance be just and the weights equal.'

Matsys — a smith's son from Louvain who became Antwerp's leading painter — set the two books of this trade side by side: the ledger and the prayer book, commerce and conscience in one frame. It is this lesson's whole argument hung in the Louvre: the scale pans must tell the truth, and the one who weighs answers to more than the customer.

Look closely

- Study the hand balance. How does Matsys show its delicacy — the thin beam, the careful fingers? Why did coins need weighing at all in 1514?
- Follow the wife's eyes. She touches a prayer book but watches the scales. What is the painter saying, without a word, about divided attention — and about keeping conscience in the counting room?

- Inventory the desk and shelves: coins, rings, pearls, ledgers, the convex mirror reflecting a window and a tiny figure. What does each object add to the portrait of this trade?
- The convex mirror shows the world outside the shop. Who might the tiny reflected figure be, and why include the outside world in a picture of accounts?
- Matsys renders fur, metal, glass and paper with equal honesty. How does the craftsmanship of the painting itself preach the same sermon as its subject?

Talk about it

1. The lost frame quoted Leviticus on just weights. Where are the 'scale pans' in a freelance design practice — name three places your numbers must balance true.
2. The moneylender's trade was necessary and respectable, yet moralists watched it closely. Why do trades that handle other people's money need visible, verifiable honesty — and how do a contract, a quote and an invoice provide it?
3. The wife's prayer book sits open while business runs. What would it mean, practically, for your faith to sit open on the desk while you price work — name one temptation it would check.

STUDIO BRIEF

Studio brief: Quote and invoice the Maple Lane Orchard job

Client: Maple Lane Orchard again — the fictional orchard from Lesson 10.2 now wants the full package: the logo (contracted last lesson), a roadside sign design, and a three-template social series (your Unit 9 skills). Deliverable: your personal rate derivation, a two-option written quote, and — assuming the client accepts the full option and the job completes — the final invoice, designed as cleanly as your portfolio pieces. Deadline feel: three days.

A parent plays the orchard owner once more, with one planted move: they will ask for 'a small discount since we're practically family.' Your answer comes from this lesson, not from panic.

You will need

- Calculator or spreadsheet; your time estimates from this course's actual briefs (how long DID the template series take you?)
- This lesson's formulas and the worked examples as models
- Scribus, Penpot or a word processor for the designed quote and invoice documents
- Your 10.2 contract for the rights and kill-fee language the quote must reference

Steps

1. Derive your rate honestly: pick a defensible student-apprentice target income, list a real overhead budget, choose a billable fraction with a one-line reason, and compute hourly and day rate. Show all work on one page.
2. Estimate the job phase by phase, consulting your real logged time on similar course briefs: logo (done — carry its contracted price), sign design (research, concepts, refinement, print file), social series (system, three templates, usage guide). Write hours beside each phase.
3. Build two options: Full package and a smaller 'this season' scope. Apply labor × rate + expenses (name at least one real pass-through) + 10% contingency; round to clean numbers.

4. Write the quote document: scope summary per option, price, what is and is not included, rights summary (per your 10.2 contract), validity ('this quote is good for 30 days'), and the deposit required to begin.
5. Present it to the parent-client aloud, options first, and field the discount request: hold the rate, offer the scope menu, stay friendly. Log their decision.
6. Fast-forward the project: assume completion on the full option. Produce the invoice with every required item — number, date, line items matching the quote's words, expenses, subtotal, deposit credited, balance due, Net 15, late policy.
7. Design the invoice as a brand piece: your own wordmark or name set well, your Unit 3 typography, aligned numbers (tabular figures if your face has them). It should look like it came from the same hands as the portfolio.
8. Run the stress tests on paper: compute the settlement if the job had died after the sign concepts, and the balance if payment ran 45 days late. Append both as a 'contract math' sheet.
9. **Check your work:** have the parent audit every number against the formulas — one arithmetic error on a real invoice costs more trust than it costs dollars.

Tips

- Round quotes to clean numbers ($1,600, not $1,606.00) but never round the arithmetic that got you there — the worksheet is exact, the presentation is tidy.
- Keep the quote's language identical to the invoice's line items; clients notice drift and drift smells like padding.
- Save both documents as templates with the math in live spreadsheet cells — your future self will quote real jobs in twenty minutes.

Check your work

- ☐ My rate derivation shows income, overhead and billable fraction, each defended in a line.
- ☐ The quote offers two scopes at one honest rate, with rights and validity stated.
- ☐ The invoice carries all eight required items, credits the deposit correctly, and looks like my brand.

SKETCHBOOK

1. Your rate-derivation worksheet, written out long-hand like an engineering calculation, with the 'naive 2,000-hour' wrong answer crossed out beside the true one.
2. A one-page anatomy of an invoice: draw the document with callouts naming all eight required parts.
3. The money flow of one project drawn as a diagram: quote → deposit → work → invoice → balance → tax set-aside → overhead → pay, with your percentages on the arrows.

KEY FORMULAS

$$\text{billable hours} = \text{working hours} \times \text{billable fraction}\ (\approx 0.60)$$

$$\text{hourly rate} = \frac{\text{target income} + \text{overhead}}{\text{billable hours}}$$

$$\text{day rate} = \text{hourly rate} \times 8$$

$$\text{quote} = (\text{estimated hours} \times \text{rate}) + \text{expenses} + \text{contingency}$$

$$\text{kill amount} = \text{project fee} \times \text{stage }\%, \qquad \text{balance} = \text{kill amount} - \text{deposit held}$$

$$\text{late fee} = \text{overdue balance} \times 0.015 \text{ per month}$$

From history. The Guild's Handbook survived a legal scare that shaped it: antitrust law forbids professions from fixing prices, so the modern editions publish survey data — what artists report actually charging — rather than mandated rates. The distinction matters to you: the Handbook is a map of the market, not a rulebook, and your own derived rate, defended by your own numbers, is the only rate you can stand behind in a negotiation.

Example 1. Derive the hourly and day rate for a freelancer targeting $48,000 income with $12,000 annual overhead, working 2,000 hours a year at 60% billable.

Show solution

1. Billable hours: $2{,}000 \times 0.60 = 1{,}200$.
2. Total to recover: $48{,}000 + 12{,}000 = \$60{,}000$.
3. Hourly: $60{,}000 / 1{,}200 = \$50$.
4. Day rate: $50 \times 8 = \$400$. Note what happens if she naively used all 2,000 hours: $60{,}000 / 2{,}000 = \$30$ — a built-in 40% pay cut.

Answer: $50/hour, $400/day — and the 60% billable correction is worth $20 an hour.

Example 2. Quote a logo-and-brand-sheet job at the $50 rate: discovery 5 h, sketches 10 h, two refinement rounds 8 h, final files and sheet 5 h; expenses $60 (font license); contingency 10%. Present the number.

Show solution

1. Hours: $5 + 10 + 8 + 5 = 28$.
2. Labor: $28 \times 50 = \$1{,}400$.
3. Add expenses: $1{,}400 + 60 = \$1{,}460$.
4. Contingency: $1{,}460 \times 1.10 = \$1{,}606$ — quoted cleanly as **$1,600**, with a smaller mark-only option (say 18 h ≈ $1,050 all-in ≈ **$1,000**) beside it.

Answer: About $1,600 for the full scope (28 h + expenses + 10%), offered beside a ~$1,000 mark-only option.

Example 3. Invoice math: the $1,600 job closes on time. The client paid a 40% deposit. Build the invoice's money block, then compute the late fee if the balance runs 30 days past Net 15.

Show solution

1. Deposit received: $0.40 \times 1{,}600 = \$640$.
2. Invoice: subtotal $1,600 − deposit $640 = **balance due $960**, terms Net 15, late policy 1.5%/month.
3. One month overdue: $960 \times 0.015 = \$14.40$; new balance $974.40.
4. The fee is small by design — it exists to make 'pay the designer' beat 'pay later' in the client's bookkeeping, not to profit from delay.

Answer: Balance due $960; after a month overdue, $974.40 (adding $14.40 at 1.5%/month).

Example 4. Kill-fee settlement: a $2,400 website design dies after refinement (kill schedule: 25% sketches / 50% refinement / 100% after approval). The client paid a 50% deposit. Settle the account.

Show solution

1. Kill amount: $0.50 \times 2{,}400 = \$1{,}200$.
2. Deposit held: $0.50 \times 2{,}400 = \$1{,}200$.
3. Balance: $1{,}200 - 1{,}200 = \$0$ — the deposit exactly covers the kill fee; nobody writes a check, and the contract turned a dispute into subtraction.
4. Rights check (Lesson 10.2): no final was delivered or assigned, so the designs remain the designer's.

Answer: The deposit covers the $1,200 kill fee exactly; account settled at $0 due, designs stay with the designer.

PRACTICE

1. Easy Compute billable hours for a 2,000-hour year at 60%, and at a realistic first-year 50%.

   Show answer

   $2{,}000 \times 0.60 = 1{,}200$ h; $2{,}000 \times 0.50 = 1{,}000$ h.

2. **Easy** Target income $36,000, overhead $9,000, 1,200 billable hours. Find the hourly and day rate.

Show answer

$45{,}000/1{,}200 = \$37.50$/h; day rate $300.

3. **Easy** Name six real overhead items for a home-based freelance designer.

Show answer

Computer and its replacement fund, backup storage, software/font licenses, internet share, insurance, portfolio hosting/domain, marketing and printed samples, professional books or dues — any six.

4. **Medium** Why does billing only 60% of your hours not mean you are working badly? Name four things in the other 40%.

Show answer

The unpaid 40% is the business itself: finding and talking to prospective clients, writing quotes, invoicing and bookkeeping, learning tools, maintaining the portfolio, estimating and correspondence. Skipping them ends the billable 60% soon after.

5. **Medium** A poster job: 3 h concepts, 6 h design, 2 h revisions, 1 h print files, at $40/h, $25 expenses, 10% contingency. Quote it.

Show answer

12 h × $40 = $480; + $25 = $505; × 1.10 ≈ $556 — quote $550–560.

6. **Medium** The client in problem 5 says their budget is $350. Give the professional response in one or two sentences, with a number.

Show answer

Shrink scope, not rate: "Within $350 I can deliver one concept with a single revision pass (about 8 hours of the plan); the full three-concept version stays at $550." The rate holds; the menu changes.

7. **Medium** Build the money block of an invoice: quote honored at $880, deposit was 50%, terms Net 30, late policy 1.5%/month. What is the balance, and the balance one month late?

Show answer

Deposit $440; balance due $440; one month late: $440 \times 1.015 = \$446.60$.

8. Medium List eight items every invoice must carry.

Show answer

Your name/contact, client's name, unique invoice number, date, line items matching the quote, expenses separately, subtotal with deposit credited and balance due, terms (Net 15/30) with the late policy. (Also good: project name and payment method.)

9. Hard A $1,800 brand job dies after sketches (kill: 25%/50%/100%). Deposit paid was 30%. Settle it, and state who owns the sketches.

Show answer

Kill amount $0.25 \times 1{,}800 = \$450$; deposit held $540. The deposit was non-refundable and exceeds the kill amount, so nothing more changes hands (the contract's deposit clause governs). The designer owns the sketches.

10. Hard A freelancer lands $2,000 of work in a month. How much should move to the tax set-aside at 27%, and what is actually spendable?

Show answer

Set aside $2{,}000 \times 0.27 = \$540$; spendable $1{,}460 — before overhead. The gross is never the pay.

11. Hard Why does the same illustration cost more licensed for national packaging than for one local flyer, when the drawing hours are identical? Name the principle and its reference book.

Show answer

Usage-based pricing: the client is buying rights and value, not only hours — national packaging extracts far more value from the image and forecloses more of the artist's other licensing. The Graphic Artists Guild's Handbook of Pricing and Ethical Guidelines organizes its prices this way.

12. **Challenge** Design your own first-year model: pick an honest target income, list and total a real overhead budget, choose a billable fraction with a reason, and derive your hourly, day rate and a minimum fee for small jobs. Defend each number in one line.

    Show answer

    Answers vary; grade on honesty and arithmetic. Example: $30,000 target + $6,000 overhead at 50% billable (first year, heavy marketing) on 2,000 h → $36{,}000/1{,}000 = \$36$/h, $290/day rounded, minimum fee one hour ($36). The defense lines matter more than the numbers.

COMMON MISTAKES

- Dividing by all 2,000 hours instead of billable hours — the silent 40% pay cut every beginner takes once.
- Cutting the rate when the budget is small. Shrink the scope and keep the rate true; a discounted rate tells the client the first number was false.
- Spending the gross. Taxes (25–30%) and overhead live inside every payment; move the set-aside the day the money arrives.

Make it a game · Rate Race. A parent invents freelancer profiles — "target $42,000, overhead $8,000, 55% billable"; "job: 15 hours at your rate, $40 expenses, 10% contingency"; "$900 balance, two months late at 1.5%" — and you produce the number on paper in 60 seconds. Five rounds, then one curveball: they demand a discount and you must answer with scope, not rate, in one sentence. Perfect round = new family record.

Scripture. “A just weight and balance are the LORD's: all the weights of the bag are his work.” (Proverbs 16:11, KJV)

The verse claims the merchant's scale for God himself — honest measurement is His invention and His property. A derived rate, a true estimate and an exact invoice are a designer's weights of the bag; pricing too high by bluff or too low by fear both tilt a balance the LORD calls His.

10.4 Getting Hired: Clients, Studios, Applications and Interviews

OBJECTIVES

- Compare the three main paths — freelance, in-house and studio/agency — by trade-offs: variety, stability, mentorship, ownership of time.
- Build a one-page resume that is itself a typography sample, and know where design jobs actually surface: boards, studios' own sites, internships and people.
- Rehearse the portfolio review and interview — the walkthrough, the common questions, your questions — and the follow-up etiquette that leaves a good name either way.

> **Warm-up.** Ask two adults how they got their current job or their best client: the job board, a person who knew their work, or walking in the door? Then ask what they looked for the last time they hired someone. Write both answers down. Most design work moves the same two ways — demonstrated work and people who have seen it — and today's lesson is organized around that fact.

WATCH

Presenting portfolio projects in a design interview

femke.design · 9:28

https://www.youtube.com/watch?v=w-PoV_slWos

> **WHEN TO WATCH**
> Before the mock interview in the studio brief. She structures a project walkthrough exactly as your case studies are built — brief, constraints, decisions, result; note her timing per piece.

Note: A working product designer who has sat both sides of the interview table. Everything she says about presenting decisions (not features) applies to brand and illustration portfolios as much as UX.

BACKUP VIDEO

What do companies look for in a design portfolio? How do you show passion?

The Futur · 18:32

https://www.youtube.com/watch?v=X_tUOfHpoyM

After the craft paragraphs — hiring-side perspective on what actually gets a candidate to the interview, and what 'show your thinking' means to the person flipping through forty portfolios.

KEY TERMS

in-house designer

A designer employed by one company to serve its own brand — steady salary and benefits, deep knowledge of one audience, less variety. The employer owns the work (Lesson 10.2).

studio / agency designer

A designer employed by a firm that serves many clients — high variety and mentorship, fast pace, deadline pressure. The classic apprenticeship environment of the trade.

production artist

The entry role that prepares and corrects files for output — print production, asset exports, template execution. Historically the trade's first rung, and still an excellent one: it teaches precision and vocabulary while you are paid.

internship

A short, defined stint inside a studio or department, paid or for credit, traded for experience, mentorship and references. The portfolio gets you in; the conduct gets you remembered.

informational interview

A 20-minute conversation you request with a working designer not to ask for a job, but to ask about the work — the lowest-pressure, highest-yield door-opener in the field.

portfolio review

The interview's center: you walk a reviewer through selected pieces, two to three minutes each, presenting the brief, constraints, decisions and result — then take questions and sometimes critique on the spot.

follow-up

The thank-you note within a day, the patient silence afterward, the gracious reply to rejection. Etiquette is strategy: every reviewer is a future colleague in a small industry.

CORE IDEAS

The story. In March 1916 a twenty-two-year-old illustrator from New Rochelle packed two finished paintings and a sketch into a case and rode the train to Philadelphia, to the offices of the *Saturday Evening Post* — the biggest magazine in America, two million copies a week. Norman Rockwell had no appointment worth the name and no national reputation; he had work. The art editor looked, the editor George Horace Lorimer approved, and Rockwell left having sold two covers and been commissioned for three more. His first *Post* cover ran that May; over the next forty-seven years he painted 321 more. Two details of the story matter more than its luck. First, Rockwell showed finished, professional pieces aimed at that exact magazine — he had studied what the *Post* ran and made work that belonged there: tailoring, before the word existed. Second, he was prepared to be examined: the

paintings could survive an art editor's eye at arm's length. The portfolio got him through the door; what kept him there for half a century was Lesson 10.5's subject — but the door itself opened on demonstrated, targeted work, and it still does.

The craft — the three paths. Design employment comes in three shapes, and knowing their trade-offs is career navigation. *Freelance* (Lessons 10.2–10.3's world): you own your time, choose your clients, keep your copyrights — and you also own the finding of work, the dry months, the taxes and the solitude; most freelancers thrive only after some employed years build skills and contacts. *In-house*: one brand, served deeply — a church, a hospital system, an orchard grown large; steady salary and benefits, humane pace, real expertise in one audience; the costs are less variety and the fact that the employer owns everything you make on the clock. *Studio or agency*: many clients, relentless variety, senior designers correcting your work weekly — the trade's true apprenticeship; the price is pace and pressure. There is no ranked order; there are seasons. The classic arc — studio first for the mentorship, then in-house or freelance as life requires — is classic because it works, and the entry rung for all three is often the humble, honorable *production artist* role: preparing files, correcting others' work, learning how the sausage actually ships, while being paid to get precise.

The craft, continued — where the jobs are, and the paper. Openings surface in layers: public boards (the general ones plus design-specific boards like AIGA's job listings and Dribbble's); studios' own sites (good studios list openings there first — follow ten studios you admire); schools' and churches' and small businesses' word of mouth, where most first clients actually live; and internships, which convert to jobs more reliably than applications do. But your warm-up already told you the deeper truth: most hires move through people who have seen the work. That is why the *informational interview* is the beginner's best tool — a respectful note to a working designer: twenty minutes, by call or coffee shop with a parent present, questions about their path and their week, no job request anywhere in it. Most professionals say yes; all remember the teenager who asked good questions. The paper that supports all this: a **one-page resume**, which for a designer is a typography exam you cannot fail politely — your Unit 3 skills, one clean face or pairing, a clear hierarchy of name, contact, skills (honest tools only — Penpot, Inkscape, Krita, Scribus, and never a program you have not opened), education including this coursework, experience including family-business and volunteer work labeled as such, and no

decoration doing hierarchy's job. A short cover letter in your own warm, plain voice names why *this* studio, points at two relevant pieces, and stops.

In the studio — how the interview actually runs. A design interview is mostly a portfolio review, and reviews run to a pattern you can rehearse. Expect: a few minutes of settling, then "walk us through some work." You present three to five pieces — not all ten — at two to three minutes each, in case-study order: the brief, the constraint, one or two decisions and why, the result. Decisions are the product; reviewers are buying how you think under constraint. Expect the standard questions — "tell me about this project's hardest moment," "what would you change now?", "how do you take feedback?" (they may test that one live by critiquing a piece; your Lesson 2.5 habits — listen, clarify, thank — are the answer itself). Expect to ask questions back, because you are also choosing them: "who would mentor me?", "what does a junior's first month look like?", "how does work get critiqued here?" Afterward, the follow-up: a short thank-you the same day, naming one specific thing from the conversation; then patience; a single polite check-in after their stated timeline passes; and if the answer is no, a gracious reply that thanks them and asks one growth question. Rejection handled well is a seed — juniors are regularly called back months later by studios that said no — and either way you have left what Proverbs calls a good name, which in an industry this small is the résumé that circulates without you.

In the studio, continued — honest expectations. Calibration, so hope stays tied to facts: the U.S. Bureau of Labor Statistics measured the median graphic designer's pay near $59,000 in 2023, with entry roles below that and senior brand or product roles well above; illustration (Unit 7.3) runs more freelance and more variable. First jobs are won by portfolio plus conduct, not credentials alone; homeschool graduates compete on exactly those terms, and a disciplined body of work like your capstone is the equalizer. The field also rewards the adjacent skills you now carry — production precision, template systems, screen fundamentals, plain-English writing — so the first job may wear a surprising title. Take the rung that teaches; titles follow craft.

PICTURE STUDY



A Goldsmith in His Shop, Petrus Christus, 1449 · Oil on oak panel · Metropolitan Museum of Art, New York (Robert Lehman Collection)

Image: Wikimedia Commons, public domain (CC0, Metropolitan Museum of Art)

Painted in Bruges in 1449 and signed and dated by Petrus Christus, this is one of the oldest portraits of a working professional with a client ever made. A young couple — by their dress, wealthy and likely choosing a wedding ring — stand at the goldsmith's counter. He does the one thing that matters most: he weighs the gold in an honest balance, in full view. Behind him his stock is displayed like a portfolio — rings, brooches, crystal, coral, coins — every piece evidence of what his bench can do. On the counter a convex mirror reflects the street and two passersby: the world outside his shop is watching, and he works as if it is.

You are in this picture, on both sides of the counter. The goldsmith shows every habit this lesson asks of a job seeker: visible skill (the shelves), verifiable honesty (the scales), a name he signs openly (Christus dated the panel), and full attention to the client in front of him. Studios and clients hire exactly this way today — demonstrated work, references that check out, and conduct in the room. The tools change; the counter does not.

Look closely

- Inventory the shelves behind the goldsmith. What is this display doing for his business — and what is its modern equivalent when you apply for work?

- Watch the scales. Why does Christus make the weighing — not the selling — the central action of the picture?
- Find the convex mirror and what it reflects. What does it mean that the street can see in, and the shop looks out?
- Read the three faces: the craftsman and the two clients. Who trusts whom, and how does the painter show it?
- The goldsmith wears a working robe, his shop is orderly, and the panel is signed and dated. List what each detail would tell a stranger deciding whether to hire him.

Talk about it

1. The couple chose this shop out of all the goldsmiths in Bruges. Based on the picture, what won them — and which of those factors are in your control when you seek work?
2. The honest balance is the painting's center. In interviews and freelance negotiations, what are the modern equivalents of weighing the gold where the client can see?
3. Guild craftsmen earned trust through visible work, verified skill and reputation among neighbors. How do portfolio, references and professional conduct map onto those three — and which is slowest to build?

STUDIO BRIEF

Studio brief: The application kit and the mock interview

Client: Meridian Design Co., a fictional eight-person studio with this posting: 'Junior designer / production artist. Portfolio required; we care about craft, honesty and how you take critique. One-page resume and short cover letter to the studio director.' Deliverable: the resume, the cover letter, your tailored lead-three pieces — then the interview itself, run live by a parent playing the director from a script of this lesson's standard questions, including one live critique. Deadline feel: application by day 3, interview day 5.

The parent-director also receives a secret instruction: end the interview without revealing a decision, so your follow-up note must be written not knowing the outcome — exactly as in life.

You will need

- Your Unit 10.1 portfolio PDF and case studies; your Unit 3 typography for the resume
- A word processor or Scribus for resume and letter; printed copies for the interview
- The interviewer's script: 'walk me through some work,' 'hardest moment?', 'what would you change?', one live critique, 'why this studio?', 'questions for us?'
- A timer (two to three minutes per piece) and, if possible, a second adult as silent observer taking notes

Steps

1. Design the resume as a typography sample: one page, one face or pairing, hierarchy doing all the work, every tool claim honest, coursework and family-business work labeled truthfully.
2. Write the cover letter in five sentences: why this studio specifically, the two pieces that prove fit, and a plain close. Read it aloud; strike anything you would not say to a person.
3. Choose and order your lead three pieces for this studio (production-minded: show the template system, the responsive page, the brand files) and rehearse

each walkthrough against the timer: brief → constraint → decisions → result.

4. Rehearse the hard beats once with the mirror and once with a sibling: the live-critique response (listen, clarify, find the true part, thank) and your three questions for them.
5. Submit the application: hand the printed kit to the parent-director a full day before the interview, as a real studio would receive it.
6. Sit the interview, full dress: greeting, small talk, walkthrough with timer, their questions, the planted critique, your questions, close — no breaking character, either side, for twenty to thirty minutes.
7. Debrief with the observer's notes: where did the walkthrough run long, where did you defend instead of listen, which answer was strongest?
8. Write and deliver the follow-up note the same day, naming one specific moment from the conversation — before hearing any decision.
9. Only then does the director reveal and explain the decision, grading against this lesson's craft paragraphs; log the three changes you will make before a real interview.
10. **Check your work** against the mastery checklist's interview item, signed off by the director.

Tips

- Print your lead pieces even if the portfolio is digital; handing a physical page across a table changes the conversation.
- In the walkthrough, name the constraint before the solution every time — constraint-first is what 'showing your thinking' sounds like.
- Keep the follow-up note to four sentences. Gratitude expands in the reader; length does not.

Check your work

- ☐ My resume passes the five typography marks and contains no claim I cannot demonstrate on the spot.
- ☐ I walked three pieces inside the timer, decisions first, and survived the live critique with composure.

- [ ] My follow-up went out the same day, specific and brief, written before I knew the outcome.

SKETCHBOOK

1. Your target list of ten (practice problem 11) laid out as a spread: who, why, which three pieces lead — the distribution plan for the capstone.
2. The interview debrief page: observer notes on one side, your three committed changes on the other, dated.
3. A conduct timeline for one application, drawn as a flow: research → note/application → interview → same-day thank-you → patience → one check-in → gracious reply either way, with the etiquette rule written on each arrow.

> **From history.** Rockwell's 1916 walk into the Post was not his first door: he had already worked years of unglamorous jobs — children's magazines, Boy Scout publications (he became Boys' Life's art editor at nineteen) — each one funding and sharpening the portfolio that Philadelphia finally saw. The legend remembers the lucky morning; the ledger shows the apprenticeship. Plan for the ledger and the morning will come.

PRACTICE

1. Easy Lay out the three employment paths with one gain and one cost each.

   Show answer

   Freelance: own your time and copyrights / own the dry months and taxes. In-house: stability and depth in one brand / less variety and employer owns the work. Studio: variety and daily mentorship / pace and deadline pressure.

2. Easy What does a production artist do, and why is it a strong first rung rather than a consolation prize?

   Show answer

   Prepares, corrects and exports files for print and screen to exact spec. It pays you to become precise, teaches the trade's vocabulary and failure points, and sits you beside the designers whose work you'll inherit.

3. Easy Name four layers where design openings and first clients actually surface.

Show answer

Job boards (general + AIGA/design-specific), studios' own sites, word of mouth through churches, schools and small businesses, and internships/informational interviews — plus people who have already seen your work, the layer under all of them.

4. Medium Write the four-sentence note requesting an informational interview with a local designer (parent reviews and sends).

Show answer

Example: "Dear Ms. Alvarez — I'm a high-school design student building toward this career, and I admire the wayfinding work your studio did for the county library. Could I ask you twenty minutes, by phone or at your office with my mother along, about your path into the field? I'm not asking about a job — I'd just value hearing how the work really runs. Thank you either way for your time." No job request, specific praise, bounded ask.

5. Medium Why is a designer's resume 'a typography exam you cannot fail politely'? Name five concrete marks of a passing one.

Show answer

The reviewer judges the design of the document before reading a word of it. Passing marks: one page; one face or disciplined pairing; clear hierarchy (name → contact → skills → experience); aligned, consistent spacing on a grid; honest content (only tools actually used, work labeled truthfully).

6. Medium In the walkthrough, why present three to five pieces instead of all ten, and what is the per-piece script?

Show answer

Attention is the budget: depth on a few beats a skim of many, and the rest of the ten are there for their questions. Per piece, two to three minutes: the brief, the constraint, one or two decisions and why, the result — decisions carrying the weight.

7. Medium An interviewer critiques your favorite piece to your face. What are they actually testing, and what do your Lesson 2.5 habits say to do?

Show answer

How you take feedback — a daily event in any studio. Listen fully, ask one clarifying question, find what is true in the critique, thank them, and if you have a reasoned defense, give it as reasoning, not as hurt. Composure is the answer; the piece is the prop.

8. Hard Draft your three questions to ask the studio, and say what each one signals.

Show answer

Examples: "Who would mentor me, and how does critique run here?" (you want to grow, you know critique is normal); "What does a junior's first month actually look like?" (you think concretely about contribution); "What separates the juniors who thrive here?" (you intend to be one, and will act on the answer).

9. Hard You are rejected by the studio you most wanted. Write the reply, and name the two practical doors it leaves open.

Show answer

Example: "Thank you for the time and the careful look at my work. If you're willing, I'd value one sentence on what the portfolio most needs — I intend to apply again as I grow. Either way, I'm grateful, and I hope our paths cross." Doors: a named growth target from the reviewer, and a warm file — studios recall gracious candidates when the next junior seat opens.

10. Hard Your friend lists Photoshop, Illustrator and Figma on their resume, having opened none of them, reasoning 'I could learn fast.' Give the practical and moral counsel, and the honest alternative sentence for the resume.

Show answer

Practically, tool claims are tested in minutes at any studio — the lie dies in the interview and takes the candidacy with it. Morally, it is false witness (and Lesson 9.5 gave the truthful script). Alternative: "Fluent in Penpot, Inkscape, Krita, Scribus; concepts transfer directly to Adobe/Figma equivalents and I'm ready to convert quickly."

11. **Challenge** Build your target list: ten studios, companies or organizations (including two local/church/small-business prospects) you would genuinely want to work with. For each: one line on why, and which three portfolio pieces would lead. Keep it in the sketchbook — it is the capstone's distribution plan.

    Show answer

    Answers vary. Grade on specificity: a real reason per target ('their picture-book list,' 'their county wayfinding work') and a tailored lead trio per target, per Lesson 10.1's tailoring rule.

COMMON MISTAKES

- Applying everywhere with one generic kit. Ten tailored applications outperform a hundred broadcast ones — tailoring is the respect that gets returned as attention.
- Narrating features instead of decisions in the walkthrough ('then I made this blue') — reviewers are buying how you think under constraint, not a tour of the pixels.
- Going silent after the interview, or replying to rejection with silence or sourness. The same-day thank-you and the gracious no-reply are remembered longer than most portfolios.

Make it a game · Lightning Interview. A parent fires the standard questions in random order — 'hardest project moment?', 'why us?', 'walk me through this piece in 90 seconds' (pointing at any portfolio page), 'what would you change about it?' — and you answer inside a timer: 90 seconds per answer, decisions first, no filler words ('um, like, basically' cost a point each). Ten questions a round; track your filler-word count across a week and watch it fall.

Scripture. “Let another man praise thee, and not thine own mouth; a stranger, and not thine own lips.” (Proverbs 27:2, KJV)

In applications and interviews, let the work and your references do the praising: a portfolio that speaks plainly and past clients who vouch for you outweigh any boast. Humility about yourself, backed by the testimony of others, is both godly and persuasive to the people who hire.

10.5 A Craftsman's Career: Habits, Ethics and the Long Game

OBJECTIVES

- Design a sustainable practice: deliberate daily drawing, honest master studies, periodic re-learning of tools — the habits that compound over decades.
- State plainly what AI image tools do, what U.S. law currently says about their output, how studios actually use them, and what ethics require of a designer when they are in the room.
- Write your own code of practice — honesty with clients, work as service, the long game over the quick win — and a five-year learning plan to carry it.

> **Warm-up.** Compute two numbers. First: if you draw thirty minutes a day, six days a week, how many hours is that in ten years? (Work it out — it is over 1,500.) Second: ask the oldest craftsman you know — carpenter, quilter, machinist, cook — what they do better now than at thirty, and what they wish they had started earlier. Write both answers under your arithmetic. This lesson is about the distance between those two numbers.

WATCH

The 10,000 Minutes Rule?

Jake Parker · 24:24

https://www.youtube.com/watch?v=5Ej7E1U8Vdw

> **WHEN TO WATCH**
> After the craft paragraph on deliberate practice. Parker reframes the famous 10,000-hours idea at a scale a student can actually start this week — note his distinction between logging time and practicing deliberately.

Note: Jake Parker is a working illustrator (and founder of the Inktober drawing challenge) whose channel is a long, generous argument for finishing work and compounding skill. Exactly the voice for the last lesson of this course.

BACKUP VIDEO

Finished Not Perfect

Jake Parker · 1:23

https://www.youtube.com/watch?v=lRtV-ugIT0k

Any time this week you stall on the capstone. Eighty-three seconds; the most-quoted motto in modern illustration education, and the antidote to perfectionism's slow leak.

KEY TERMS

deliberate practice

Practice aimed at a specific weakness with feedback — drawing fifty hands and comparing them against the model, not doodling the same comfortable faces. Minutes of it outweigh hours of repetition.

master study

Copying an excellent work to learn its decisions, always labeled as a study and never sold or passed off — the honest apprenticeship tradition from Lesson 7.4, continued for life.

generative AI image tool

Software trained on vast image sets that produces new images from text prompts or image inputs. A tool with real uses and real limits — and no claim to authorship under current U.S. law.

human authorship

The U.S. Copyright Office's requirement for protection: copyright covers what a human actually created. Output generated by a machine from a prompt is not registrable; a work combining both is protected only in its human-authored parts.

disclosure

Telling the client plainly what tools and sources a work involved — AI assistance included. The professional default, and a contractual duty when the client's policy addresses it.

continuing education

The career-long habit of re-learning the toolchain every few years while the foundations — drawing, composition, type, color — stay fixed. The tools of this course will change; the course will not.

vocation

From the Latin vocare, to call: work received as a calling to serve God and neighbor through skill, not merely a market position. The school's motto applies — fabricando fit faber, the maker is made by making.

CORE IDEAS

The story. In 1977, New York State was broke, crime-ridden and mocked, and its commerce department asked a Bronx-born designer named Milton Glaser to help a tourism campaign nobody expected to outlive the year. Glaser — already famous for co-founding New York magazine and for the 1966 Dylan poster with the rainbow hair — sketched an idea, then, riding in a taxi days later, pulled an envelope from his pocket and drew the better one: I ♥ NY, four characters stacked like a child's wooden blocks, set in the rounded slab face American Typewriter. He did the work pro bono and expected the campaign to last a few months. That red heart became arguably the most reproduced piece of graphic design on earth, and after September 11, 2001, the 72-year-old Glaser drew it again — *I ♥ NY More Than Ever*, with a small dark bruise on

the heart — and watched a city claim it from lampposts. Glaser worked until his death on his 91st birthday, June 26, 2020, and left the trade two testaments: the title of his collected essays, *Art is Work*; and a list he circulated to students called "The Road to Hell," twelve escalating steps of professional compromise — beginning with small dishonesties like designing a package to look bigger on the shelf — that he used as an examination of conscience. The most famous logo in the world was a gift, made in a taxi, by a man who spent sixty years asking whether his work was honest. That is the long game.

How they figured it out — the arithmetic of compounding. Your warm-up number is the whole secret, and the Golden Age proved it on canvas. Norman Rockwell, whom you met walking into the *Post* at twenty-two, stayed for 321 covers across forty-seven years by a regimen that startled his neighbors: he painted essentially every day, Christmases included, and ran every cover through the same unhurried pipeline — idea sketches, models posed and photographed, a full-size charcoal, color studies, then the final oil, each stage done completely whether or not anyone would see it. 'Inspiration,' in his practice, was a schedule. The modern science of skill (and Jake Parker's video) says why this works: what compounds is not time logged but *deliberate* time — a specific weakness, attacked, with feedback. Thirty minutes a day on identified weaknesses, six days a week, is over 1,500 hours a decade, and because most people quit, consistency alone moves you into rare company. The craftsman's secret is embarrassingly available.

The craft — an honest reckoning with AI image tools. You will work your whole career alongside these systems, so here is the account, plain, current and without panic or salesmanship. *What they do:* generative tools (the image models attached to the big AI systems, and open ones) are trained on enormous image collections and synthesize new images from text or image prompts — fast, fluent, frequently generic, and unreliable about details like hands, lettering and logical consistency. *What U.S. law currently says:* the Copyright Office requires human authorship — it has refused registration for purely machine-generated images (and the courts have agreed that a machine cannot be an author, as in the *Thaler* litigation); in the *Zarya of the Dawn* decision (February 2023) a comic's AI-generated pictures were denied protection even while the human's text and arrangement kept it. Translation for your business: pure AI output is nobody's property — a client who buys it owns nothing they can defend, which is a commercial argument for human work that requires no

sermon. Meanwhile, lawsuits over training data are still moving through the courts; a professional watches, and does not pretend the law is settled where it is not. *How studios actually use them:* as roughing tools — mood boards, quick concept variations to react against, texture ideas, and cleanup utilities inside ordinary software; rarely as finished art, because finished work must be owned, consistent, revisable and on-brand, which is exactly where prompts fail and professionals do not. *Why your foundations are worth more now, not less:* when fluent-but-generic images are nearly free, the premium moves to what the tools cannot supply — drawing that can revise a specific hand on request, taste that knows which of forty options is right and why, brand judgment, client trust, and ownable authorship. The flood raises the value of the dry ground.

The craft, continued — the ethics, which do not change. The rules you need were in this course before AI was in it. Never present machine output as your own drawing — that is false witness about your work, the same sin as tracing another artist and signing it (Lesson 7.4), and in a portfolio or interview it is fraud that one live-drawing request exposes. Respect each client's AI policy completely: some forbid generative tools anywhere in the pipeline (for legal-ownership reasons you can now explain better than most adults); their project, their rule, in the contract per Lesson 10.2. Disclose assistance plainly when tools contributed. And extend the old honesty outward: do not use tools to imitate a living artist's style and trade on their name, and treat 'the machine did it' as no excuse for shipping anything you would not sign. A Christian designer's position is neither fear nor worship of a tool: it is the same position Glaser's list takes toward every shortcut — the question is never only *can* it be done, but *can I sign it honestly*.

In the studio — the rule of life, and the calling. Build the practice that carries five decades: a sketchbook that never closes (Rockwell's pipeline, sized to your week — thirty deliberate minutes, six days); master studies monthly, labeled, forever; one finished piece a season after this course ends, because finishing is the skill that rusts fastest (Parker: finished, not perfect); tools re-learned on a cycle — expect your software toolkit to turn over every five years or so, and greet each turnover as the Miélot-to-Gutenberg moment of your generation: the page changes, the craft does not; community kept — a guild, a critique partner, the working designers you informational-interviewed, your church, which happens to be full of real design needs; and accounts kept honest — the time log, the tax set-aside, the just weights of

Lesson 10.3, reviewed yearly. Over all of it, the school's motto and this course's deepest claim: *fabricando fit faber* — the craftsman is made by crafting. Bezaleel was called by name and filled with the Spirit 'in wisdom, and in understanding, and in all manner of workmanship' for the sanctuary's sake; Paul told the Colossians that whatsoever work the hand finds is done heartily, 'as to the Lord, and not unto men.' A career in design, honestly priced, honestly papered, honestly made, is not a lesser calling waiting for a religious one to replace it. Done as unto the Lord, it is one. Make the work. Sign it truthfully. Serve the client and the reader. And keep drawing.

PICTURE STUDY



Self-Portrait at Twenty-Eight (Self-Portrait in a Fur-Trimmed Robe), Albrecht Dürer, 1500 · Oil on lime panel · Alte Pinakothek, Munich

Image: Wikimedia Commons, public domain

In the year 1500, at twenty-eight, Albrecht Dürer painted himself frontally — a pose his age reserved almost exclusively for images of Christ — in a fur-trimmed robe, with the Latin inscription: 'I, Albrecht Dürer of Nuremberg, painted myself thus, with undying colors, at the age of twenty-eight years.' It has startled viewers for five centuries, and it is not a joke and not simple vanity: Dürer, the most thoughtful craftsman of the German Renaissance, is making a theological claim he wrote about elsewhere — that the artist's creative gift is from God, an image-bearer's small participation in the Creator's work, and therefore a sacred responsibility.

Look at where he put the light and the finest brushwork: the eyes, and the drawing hand raised to the fur. Gift acknowledged; instrument presented. You have met Dürer three times in this unit — defending his monogram in Venice, branding the Rhinoceros, and now here, at the start of the career, declaring what the work is for. It is the right final picture for this course.

Look closely

- Compare the two most-rendered passages: the eyes and the right hand. Why would a craftsman making this picture's claim lavish his finest paint exactly there?

- The frontal pose echoes icons of Christ — deliberately. Read it alongside Genesis 1:27 and Exodus 31:1–5: what is Dürer claiming about the source of his skill, and where would the claim tip from reverence into pride?
- Find the monogram and inscription in the dark field. After Venice 1506 and the pirated Rhinoceros, what does his signature mean to him — and what does yours mean on your capstone?
- 'With undying colors' — he expected this panel to outlive him, and it has, by five centuries. How does making work 'to last' change the hundred small decisions of making it?
- The fur robe is a prosperous burgher's garment: the craftsman as established professional, not starving bohemian. What does that self-presentation say about how Dürer priced, papered and ran his workshop?

Talk about it

1. Dürer treats talent as a divine gift carrying obligation. List the three obligations this course would name first — and which one your rule of life guards least well so far.
2. A machine can now generate a fluent self-portrait in Dürer's style in seconds, and no one may own it. Standing before this panel, say precisely what the machine image lacks — in authorship, in witness, in claim — and why that gap is your career.
3. The inscription dares to say 'undying.' What work are you prepared to sign that way — and what would have to be true of its honesty, its craft and its purpose before you dared?

STUDIO BRIEF

Studio brief: The capstone — ten pieces, one resume, one client package

Client: your own career, which is from this week a real, open account. Deliverable — the course capstone: (1) the final ten-piece professional portfolio, re-curated from Lesson 10.1's draft with capstone-quality case studies and your 9.x pieces in their finished state, as a clean PDF and, if your family approves, the hosted page; (2) your one-page resume from Lesson 10.4, final; (3) the complete mock client package from Lessons 10.2–10.3 — quote, signed contract, invoice and a delivered-files folder — assembled as one professional kit. Deadline feel: two weeks, presented live.

The presentation is the course's final review: a 20-minute walkthrough before your family (invite the toughest audience available), run exactly as a studio review — and it ends with your rule of life read aloud and signed.

You will need

- Everything: the Unit 10.1 draft portfolio and master folder, the 10.2 contract, the 10.3 quote and invoice, the 10.4 resume and interview debrief
- Scribus/Penpot for final layout passes; your printer or a print shop for one physical copy of the portfolio if the budget allows
- The delivered-files discipline of Lesson 8.5: a client folder with final assets correctly formatted, named and organized
- Your rule of life from practice problem 11, fair-copied

Steps

1. Re-curate: against the Unit 10.1 cut criteria, re-judge all ten slots now that the Unit 9 pieces are finished — execute any swap without sentiment, and update the sequence (second-strongest opens, strongest closes).
2. Finish the case studies: five total for the capstone (the three anchors plus two more), each with brief, constraints, two process artifacts, result, and the honest 'what I'd change' line.

3. Assemble the client package as if shipping to Maple Lane Orchard: the quote, the signed contract, the invoice, and a delivered-files folder — final logo files in SVG/PNG/PDF, the brand sheet, the social templates with their usage guide — named and organized to Lesson 9.5's handoff standard.
4. Final-pass the resume and write the kit's cover page: name, one-line identity ('student designer completing a 10-unit professional pathway'), contact, and contents.
5. Produce the vessels: the portfolio PDF under 10 MB; the hosted page if approved (parent-managed account, Lesson 10.1's safety rules); one printed copy if possible — reviewers still love paper.
6. Dress-rehearse the 20-minute review once alone with the timer: five case-study walkthroughs at 2–3 minutes, the client package in 5, the rule of life to close.
7. Hold the final review: family assembled, phones down, you presenting — walkthroughs, questions taken Lesson 2.5-style, the client package explained money-and-rights included, and the rule of life read aloud and signed by you and a witness.
8. Close the account like a professional: archive the whole course's master folder with dated structure, back it up in two places, and write the one-page retrospective — strongest growth, weakest area, first three actions after the course.
9. **Check your work** against the full mastery checklist of this unit — every box, witnessed by the parent who signed the rule of life.

Tips

- The capstone is finished, not perfect — Parker's motto governs the deadline. Version 2 of this portfolio ships next year; version 1 ships this week.
- Let the client package surprise your audience: most families have never seen a contract, quote and invoice done beautifully, and it lands as the proof that this was career training.
- Photograph the final review. The picture of you presenting ten finished pieces is itself the last page of the retrospective.

Check your work

- ☐ Ten pieces, five case studies, resume and complete client package assembled as one kit in consistent typography.
- ☐ I presented for twenty minutes, took critique with composure, and can defend every piece's slot, every number on the invoice, and every clause in the contract.
- ☐ My rule of life is signed, calendared, and started — the first sketchbook entry after the course is already made.

SKETCHBOOK

1. The signed rule of life, fair-copied as a designed one-page document — the final typography exercise of the course, kept where you will see it.
2. A master-study plan for the next year: twelve works you will study monthly, drawn from this course's picture studies and your own heroes, with what each is meant to teach.
3. The retrospective spread: first-week drawings pasted beside capstone details, with the honest paragraph about the distance between them — fabricando fit faber, evidenced.

> **From history.** Glaser's I ♥ NY rebus had a quiet ancestor in this course: it works exactly like a maker's mark — minimal, one-color-proof, infinitely reproducible, instantly ownable — and New York State does own it, policing the trademark vigorously to this day, an irony Glaser enjoyed given that he was paid nothing. He later said he believed the mark endured because it asked the viewer to complete it — reading a letter, a symbol and two initials as a sentence — the designer's oldest trick: respect the audience's intelligence and they will carry your work for you.

PRACTICE

1. Easy Distinguish deliberate practice from logged time, with a drawing-specific example of each.

   Show answer

   Logged time repeats the comfortable (another evening of the same faces); deliberate practice targets a weakness with feedback (fifty hands this month, each checked against reference or the Loomis construction, errors named). Only the second compounds.

2. Easy Finish the warm-up arithmetic: 30 minutes a day, 6 days a week, for 10 years — how many hours, and what does Parker's 'finished not perfect' add to the number?

Show answer

$0.5 \times 6 \times 52 \times 10 = 1{,}560$ hours. The motto adds direction: hours spent finishing real pieces compound into skill and portfolio; hours spent polishing one eternal draft compound into neither.

3. Easy What did the Copyright Office decide in Zarya of the Dawn (February 2023), and what single word summarizes the legal requirement?

Show answer

The comic's AI-generated images were refused copyright while the human-written text and the human selection/arrangement kept protection. The word: authorship — U.S. copyright requires a human author.

4. Medium A small business asks you to deliver a purely AI-generated logo 'to save money.' Give the commercial argument — no sermon required — and your professional counter-offer.

Show answer

Pure machine output has no copyright owner, so they would build their brand on a mark they cannot register, defend or exclusively own — and logos exist to be owned (Lesson 10.2's assignment logic). Counter-offer: a human-designed mark at a scoped price, with AI welcome earlier in the process for mood exploration if they wish.

5. Medium Name three legitimate studio uses of generative tools and three places professionals do not rely on them, with the reason for the line.

Show answer

Legitimate: mood boards, rapid concept variations to react against, texture/reference ideas and cleanup utilities. Not relied on: finished client art, brand marks, anything requiring precise revision or consistency (hands, lettering, the same character twice). The line: finished work must be ownable, revisable and on-brand — exactly where prompting fails.

6. Medium Your course foundations — drawing, composition, type, color — versus the current toolchain: which should you expect to re-learn within five years, and which will not change? Defend with one historical example from this course.

Show answer

The tools turn over (expect new software and AI features); the foundations are stable across centuries. Example: Miélot's page design survived printing's disruption of his copying trade (9.1); Penfield's poster principles run today's feed graphics (9.4); Gutenberg changed the page, not the typography it needed.

7. Medium Write the disclosure sentence you would include when delivering a mood board that used generative images, to a client with no stated AI policy.

Show answer

Example: "Heads-up on process: the mood-board tiles on page 2 are AI-generated explorations for direction only — the finished illustration will be my own drawing, and nothing machine-generated will appear in your final files." Plain, unprompted, and it invites the client to state a policy.

8. Hard Glaser's 'Road to Hell' begins with designing a package to look bigger on the shelf. Why start a corruption list with something so small, and what is the design-career application of Luke 16:10 here?

Show answer

Because compromise is a gradient, not a cliff — each small dishonesty recalibrates what feels normal, and step twelve is unreachable except through step one. Luke 16:10's principle (faithful in least, faithful in much) says the small jobs and small claims are where the large character is actually built.

9. Hard Describe Rockwell's cover pipeline and extract the transferable principle for a student who 'waits to feel inspired.'

Show answer

Idea sketches → posed and photographed models → full-size charcoal → color studies → final oil, every stage completed, essentially daily for 47 years and 321 covers. Principle: inspiration was downstream of the schedule, not upstream — the pipeline produces the ideas, so build and keep the pipeline.

10. Hard A peer builds a following posting AI images 'in the style of' a named living illustrator. Lay out the counsel in three registers: legal, professional, biblical.

Show answer

Legal: the output itself is unprotectable, the style-mimicry sits in actively litigated territory, and trading on the artist's name risks other claims — a foundation of sand. Professional: the field is small; art directors notice, and the reputation cost lands before any lawsuit would. Biblical: it bears false witness (implying the artist's hand) and fails to do unto a fellow maker as he would be done by.

11. Challenge Draft your rule of life as a one-page table: daily, weekly, monthly, seasonal, yearly practices, each with its purpose in one phrase — then have a parent sign it as witness and calendar the first month.

Show answer

Answers vary; must include daily deliberate sketch time, a weekly finishing block, monthly labeled master study, a seasonal finished piece, yearly rate/portfolio/tools review and a named community of critique. The signature and calendar move it from essay to practice — grade on specificity and schedulability.

COMMON MISTAKES

- Treating AI tools with either panic or worship. Both are inaccuracies; the professional posture is informed, honest and calm — know what they do, what the law says, what your client's policy is, and what you will sign.
- Ending the course by stopping. Skill decays and compounds by the same arithmetic; the rule of life exists because the course's real product is the practice, not the PDF.
- Confusing the calling with the applause. Glaser's heart was given away; Rockwell's covers were weekly work-for-hire; Dürer signed for God's gift, not the market's. Serve the work and the neighbor it is for; the name tends to follow, and is not the point.

Make it a game · The Long Game Gauntlet. The course's final review game, best played with the whole family: rapid-fire, 30 seconds each, drawn from all ten units — 'name the two bowls in Matsys's painting' (ledger and prayer book — close enough), 'copyright begins when?', 'derive a day rate from $45,000, $9,000, 60%', 'five button states', 'Marcotte's three ingredients', 'what did Zarya of the Dawn decide?', 'finished, not ___?' Twenty questions; fifteen correct and the family buys the sketchbook for year two. Then everyone draws for ten minutes — including the parents — because fabricando fit faber.

Scripture. “And whatsoever ye do, do it heartily, as to the Lord, and not unto men;” (Colossians 3:23, KJV)

The verse that governs the whole pathway: the audience of record for every brief, invoice and brushstroke is the Lord, which both raises the standard (no careless work passes that review) and lifts the burden (men's applause is not the wage). A design career received this way is a vocation — and this course's last instruction is simply the verse's first word: whatsoever. All of it. Heartily. Keep drawing.

UNIT 10

The Working Designer: Portfolio, Clients and Career

You can now draw, compose, set type, build palettes, lay out pages, work the digital studio, illustrate, brand and design for screens. This final unit teaches the other half of the profession: the half that gets you hired and keeps you honest. You will curate the ten-piece portfolio you have been building all year and learn where to show it; learn who owns a picture under United States copyright law, and how licensing and contracts actually work; do the freelance math — day rates, quotes, invoices and kill fees — with real numbers; learn how designers get hired, as freelancers, in-house staff or studio employees; and end with the long game: the habits and ethics of a craftsman's career, including an honest look at AI image tools.

The stories are of working makers: Villard de Honnecourt carrying his portfolio across thirteenth-century Europe; Albrecht Dürer defending his monogram in a Venetian court in 1506; the Graphic Artists Guild publishing the pricing handbook the industry still quotes; the twenty-two-year-old Norman Rockwell walking his canvases into the Saturday Evening Post's offices in 1916; and Milton Glaser, who sketched the most famous logo in America in the back of a taxi and gave away more than he billed.

There is real math here — pricing is arithmetic plus honesty — and a capstone: by the end of this unit you will hold a curated ten-piece professional portfolio, a clean resume, and a complete mock client package (quote, contract, invoice and delivered files). That is not a school folder. It is the kit a working designer carries into a first client meeting or a first interview.

PREREQUISITES

- Units 1–9 complete, with each unit's portfolio piece finished or nearly so — this unit curates and frames them
- Arithmetic with percentages and simple formulas: solving $r = (I + O)/H$ for any variable
- The presentation and critique habits of Lessons 2.5 and 8.5

MASTERY CHECKLIST

- ☐ I can curate ten strong pieces, sequence them deliberately, and write a case study that shows brief, process and result.
- ☐ I can explain when copyright begins, what registration adds, and the difference between licensing a work and working for hire.
- ☐ I can name the parts of a simple design contract: scope, schedule, payment, rights, revisions and kill fee.
- ☐ I can compute a freelance hourly and day rate from target income, overhead and billable time, and build a project quote and invoice from it.
- ☐ I can describe the three main employment paths — freelance, in-house, studio/agency — and how a portfolio review and interview actually run.
- ☐ I can state, accurately and without hype, what AI image tools do, what U.S. law currently says about their output, and what professional ethics require of me when they are in the room.
- ☐ I can present my ten-piece portfolio, resume and mock client package as one professional kit.

FREE RESOURCES FOR THIS UNIT

- **U.S. Copyright Office — Circular 1, Copyright Basics (free PDF)**: The government's own plain-English explanation of what copyright protects, when it begins and what registration does — the primary source behind Lesson 10.2. Free; read Circular 1 and skim Circular 30 (works made for hire).
- **GitHub Pages (free web hosting)**: Free hosting for a hand-built portfolio site like the page you wrote in Lesson 9.1 — no ads, your own work, professional address. A parent approves and manages the account for a minor; a PDF portfolio is a fully acceptable alternative if your family prefers no account at all.

All free. Every studio brief in this course can be completed with pencil, paper and free software. School Launch has no ties to these companies.

LESSONS IN THIS UNIT

10.1 The Portfolio: Ten Strong Pieces and Where to Show Them
3 sessions of 50 minutes

10.2 Who Owns the Picture: Copyright, Licensing and Contracts
3 sessions of 50 minutes

10.3 Pricing the Work: Rates, Quotes and the Freelance Math 3 sessions of 50 minutes

10.4 Getting Hired: Clients, Studios, Applications and Interviews
3 sessions of 50 minutes

10.5 A Craftsman's Career: Habits, Ethics and the Long Game 3 sessions of 50 minutes

Unit 10 test

Time allowed: 50 minutes. A calculator is allowed; show your work for every computation. Answer scenario questions in complete sentences — in this unit, the sentence is the skill. The test is worth 100 points.

1. **6 pts**
   State the curator's rule (size and weakness) and the four parts of a case study.

2. **6 pts**

   Name three portfolio vessels and the online-safety rules this course sets for a student publishing one.

3. **7 pts**

   When does U.S. copyright protection begin, how long does it last, and what three advantages does timely registration add?

4. **7 pts**

   A client says 'I paid for it, so I own the copyright.' Explain the actual rule for freelancers, the two conditions of work-for-hire, and which project type is normally assigned outright anyway.

5. **6 pts**

   List the six parts of a simple design contract and the dispute each prevents.

6. **8 pts**

   Compute: target income $54,000, overhead $12,000, 2,000-hour year at 55% billable. Find billable hours, hourly rate and day rate.

7. **8 pts**

   Quote this job at $60/hour: research 4 h, concepts 9 h, revisions 6 h, final files 3 h; $90 expenses; 10% contingency. Then state the deposit at 40%.

8. **7 pts**

   The $1,550 job completes; deposit was $620, terms Net 15, late policy 1.5%/month. Give the invoice balance, and the balance after one month overdue.

9. **7 pts**

   A $2,000 project (kill schedule 25/50/100, deposit 30% paid) is cancelled after refinement. Settle the account and state who owns the designs.

10. **6 pts**

    A client's budget is $500 against your $800 quote. Give the professional response in one or two sentences with a number, and name the principle.

11. **6 pts**

    Compare the three employment paths on: who owns the work product, who finds the work, and where mentorship is strongest.

12. **7 pts**

    Script the interview walkthrough: how many pieces, how long each, the per-piece structure, and the two follow-up duties afterward.

13. **7 pts**

    State the human-authorship rule and its two landmark applications (the AI-only applicant, and the comic book), then translate the rule into the one-sentence commercial argument against delivering pure AI output to a brand client.

14. **6 pts**

    Name four professional ethics rules for AI image tools from Lesson 10.5.

15. **6 pts**

    Production task. Sketch the one-page 'rule of life' table for your first year after this course: the five time-scales with one named practice and its purpose each.

ANSWER KEY

1. Ten strong pieces beat thirty mixed, because reviewers judge by the weakest piece, not the average. Case study: brief, constraints, process, result.
2. PDF, own hosted page (e.g., GitHub Pages), portfolio platform (e.g., Behance). Rules: a parent approves and manages any account (minors use parent-managed accounts); no home address, phone, school or routine details; personal info scrubbed from images.
3. Automatically at fixation in tangible form; life of the author plus 70 years; registration permits filing suit, unlocks statutory damages (up to $30,000/work, $150,000 willful) and attorney's fees.
4. Payment transfers nothing; the freelancer owns the work and the contract defines the client's rights. Freelance WFH requires a signed written agreement plus the work fitting one of nine statutory categories. Logos are normally assigned outright because a business must own its mark.
5. Scope (scope creep), schedule (drift/blame), payment (when, how much, deposit), rights (who may use what), revisions (endless tweaks), kill fee (cancelled projects unpaid).
6. Billable $2{,}000 \times 0.55 = 1{,}100$ h; hourly $66{,}000 / 1{,}100 = \$60$; day rate $480.
7. 22 h × $60 = $1,320; + $90 = $1,410; × 1.10 = $1,551 — quote ≈ $1,550. Deposit $0.40 \times 1{,}550 = \$620$.
8. Balance $1{,}550 - 620 = \$930$; a month overdue adds $930 \times 0.015 = \$13.95 \rightarrow \$943.95$.
9. Kill amount $0.50 \times 2{,}000 = \$1{,}000$; deposit held $600; client owes $400. No assignment occurred, so the designer owns the designs.
10. Shrink scope, not rate: e.g., "For $500 I can deliver the mark with one revision round; the full package remains $800." Principle: the rate is a just weight — discounting it declares it was never true.
11. In-house: employer owns (automatic WFH), employer supplies work, moderate mentorship. Studio: firm/clients own per contracts, firm finds work, strongest daily mentorship. Freelance: designer owns and licenses, designer finds all work, mentorship only what you build yourself.
12. Three to five pieces, two to three minutes each: brief → constraint → key decisions and why → result. Afterward: a specific thank-you note the same day, then patience with one polite check-in after their stated timeline (and a gracious reply even to a no).

13. U.S. copyright protects only human authorship: Thaler's purely machine-generated image was refused (courts agreeing a machine cannot be an author), and Zarya of the Dawn (Feb 2023) kept the human's text and arrangement while refusing the AI images. Commercial translation: pure AI output is nobody's property, so the client would own nothing they can register or defend — fatal for a brand asset.
14. Never present machine output as your own drawing; respect and contract to each client's AI policy; disclose assistance plainly; do not mimic a living artist's style to trade on their name (and sign nothing you cannot sign honestly).
15. Model answer: Daily — 30 min deliberate sketch (compound the hand); Weekly — one finishing block (finished not perfect); Monthly — labeled master study (steal judgment honestly); Seasonal — one finished portfolio-grade piece (keep shipping); Yearly — rate, tools and portfolio review with re-curation (keep the weights just and the ten strong).

PORTFOLIO PIECE: THE CAPSTONE: A PROFESSIONAL PORTFOLIO, RESUME AND CLIENT PACKAGE

Assemble the finished kit a working designer carries: the **ten-piece professional portfolio** — re-curated from the whole course, sequenced deliberately, with five full case studies — delivered as a clean PDF (and, with family approval, a hosted page built with your own Unit 9 hands); the **one-page resume** that is itself a typography sample and contains no claim you cannot demonstrate; and the **mock client package** for the Maple Lane Orchard engagement — quote, signed contract, invoice and the delivered-files folder — proving you can run the business of design as honestly as the craft.

Present the whole kit in a live twenty-minute review before the toughest audience you can assemble, taking critique by Lesson 2.5's rules, and close by signing your rule of life. This is the tenth piece in the deepest sense: the evidence that the other nine were made by a professional in training, not a hobbyist in luck — and it is the kit you will genuinely hand to a first client or interviewer, with only the names changed.

Fabricando fit faber: the file you archive this week is the maker the course was building all along.

LOOK FOR	WHAT IT MEANS
Curation	Ten pieces that survive the cut criteria (no apologies, no redundancy, defensible decisions), sequenced with intent, honestly labeled, and demonstrating range across drawing, type, color, layout, illustration, brand and screen.
Case studies	Five case studies tell brief, constraints, process and result in 150–250 words with real process artifacts and one honest 'what I'd change' — judgment visible, not just output.
Business documents	The quote, contract and invoice are complete per Lessons 10.2–10.3 (six contract parts; all invoice items; deposit, kill-fee and late math correct to the dollar) and designed to portfolio standard.
Professional conduct	The live review runs to time; walkthroughs lead with decisions; critique is received with Lesson 2.5 composure; the resume and all claims are truthful and demonstrable on request.

LOOK FOR	WHAT IT MEANS
Craftsmanship of the kit	One consistent typographic system across portfolio, resume and client package; files named, formatted and organized to the 9.5 handoff standard; PDF under 10 MB; archive backed up twice.
The long game	The rule of life is specific, scheduled, signed and started — daily practice, finishing rhythm, master studies, review cycles — and the retrospective honestly names the next three actions.

COURSE EXAM

Midterm Exam

Covers Units 1–5. Time: 90 minutes.

You have 90 minutes. A calculator is allowed. Show your work for every calculation: the formula, the numbers with units and the answer with its unit; correct setup earns partial credit even if the arithmetic slips. Use 1 pt $= \frac{1}{72}$ in and 1 px $= \frac{3}{4}$ pt unless told otherwise. For critique and production tasks, work in pencil, label everything, and write in complete sentences. The exam has 19 problems worth a total of 100 points.

---

1. **5 pts** **Lesson 1.2**

   You sight a coffee pot at 4½ mug-widths tall and 2½ mug-widths wide. Your unit on paper is 3 cm. (a) Give the drawn height and width. (b) The real pot is 27 cm tall — what scale factor is your drawing using? (c) A client asks you to enlarge an 8 × 12 cm sketch by 125% for a flyer. Give the new dimensions and say whether the shape of the rectangle changes.

2. **5 pts** **Lesson 1.3**

   (a) Compute the digital gray levels (0–255) of a 5-step value scale. (b) What is the step size of a 9-step scale in gray levels? (c) A student's sphere drawing has its reflected light at the same value as its lit halftone. State the rule being broken, why it breaks the form, and the fix.

3. **5 pts** **Lesson 1.4**

   A fence post 10 ft from you draws 8 cm tall. (a) How tall do you draw identical posts at 20 ft and at 40 ft, and what law are you using? (b) Your eye level is 5 ft. Where does the horizon line cross a 6-ft-tall figure standing anywhere on the ground plane, and why does this scale him automatically?

4. **5 pts** **Lesson 1.5**

   A standing adult figure is drawn 15 cm tall. (a) Give the head size at 7.5 heads, and the location of the figure's halfway point in cm and as a body landmark. (b) A drawn face measures 6 cm from hairline to chin. Place the brow and the base of the nose, and give the correct hand length for this character.

5. **5 pts** **Lesson 1.1**

   Name the five main jobs of this field and one deliverable each makes. Then state the single item that is the door into the field, for employment and freelance alike.

6. **5 pts** **Lesson 2.2**

   (a) A dark mass of visual weight 9 sits 2 in left of a composition's center. How far right of center must an accent of weight 6 sit to balance it? Name the rule and write its formula. (b) Treating visual weight as size × contrast: a pale barn (size 8, contrast 1) sits 1 unit left of center; a crow (size 1) sits 4 units right. How much contrast must the crow carry to balance the barn, and how would you draw that?

7. **5 pts** **Lesson 2.3**

   (a) Compute the third lines and the four power points of a 12 × 9 in drawing. (b) A client wants a golden-rectangle poster 30 in wide. How tall is it? (c) Verify that the Fibonacci pair 8 : 13 approximates the golden ratio, and say why that is useful at the drawing board.

8. **4 pts** **Lesson 2.4**

   (a) Define negative space. (b) Explain why drawing the gaps defeats the symbol system. (c) Name the famous 1994 wordmark whose empty space carries its message, and the designer.

9. **4 pts** **Lesson 2.5**

   CRITIQUE TASK. A flyer proof uses five different typefaces, body text set 10 pt on 10 pt leading (solid), a 95-character line measure, and a decorative border that viewers report seeing first. Using the rules of professional feedback — specific, about the work, every fault paired with a fix — write a four-sentence professional critique.

10. **5 pts** **Lesson 3.1**

    Put these in chronological order with approximate dates (within 10 years counts): Helvetica, Jenson's roman, Times New Roman, Gutenberg's 42-line Bible, Caslon's specimen sheet, Aldus's first italic. Then say in one sentence what Jenson's roman contributed that we still use.

11. **5 pts** **Lesson 3.2**

(a) Face A has an x-height ratio of 0.52 and is set at 12 pt. What size makes face B (x-height ratio 0.40) match its apparent size? (b) Classify each description with one anatomy clue: (i) hairline serifs, vertical axis, extreme thick-thin contrast; (ii) sturdy bracketed serifs, tilted axis, moderate contrast.

12. **7 pts** **Lesson 3.4**

A web page's body text is 16 px with a line height of 1.4. (a) Convert the body size to points and give the leading in px and pt. (b) Build a five-step modular scale from a 12 pt base with ratio 1.25 (one step down, three up, rounded sensibly) and assign caption, body, subhead, heading, title. (c) A print column is 24 picas wide and its type is 12 pt. Estimate the CPL with $\mathrm{CPL} \approx \dfrac{\text{line length}}{0.5 \times \text{size}}$, judge it, and prescribe a leading.

13. **4 pts** **Lesson 3.5**

A church banner must be read from about 60 feet. (a) What is the minimum capital height? (b) If the main word has 10 characters averaging 0.75 of cap height in width including spacing, roughly how long does the word run, and what banner length do you order?

14. **5 pts** **Lesson 4.1**

(a) A brand's main hue sits at 40° on the digital color wheel. Find its complement, its triad partners and its split-complements, remembering that wheel arithmetic is mod 360. (b) In one sentence each, explain additive versus subtractive mixing, naming the device or material that obeys each.

15. **6 pts** **Lesson 4.3**

(a) Convert #C85A2E to decimal RGB, showing the arithmetic for each pair. (b) Convert RGB (32, 144, 255) to hex. (c) How many distinct colors can 24-bit RGB express? Show the computation.

16. **6 pts** **Lesson 4.5**

(a) Text of luminance $L = 0.10$ sits on a field of $L = 0.85$. Compute the WCAG contrast ratio and give verdicts for body text (AA 4.5:1), large text (AA 3:1) and AAA (7:1). (b) Repeat for text $L = 0.30$ on the same field. (c) A co-op class has 13 boys and 12 girls. Using 8% of men and 0.5% of women with red-green CVD, how many affected students do you expect, and what design rule follows?

17. **5 pts** **Lesson 5.1**

(a) A page is 51 picas wide with 4-pica side margins and a 3-column grid with 2-pica gutters. Find the column width with $c = \dfrac{W - 2m - (n-1)g}{n}$. (b) A text block is 42 picas tall and the body is set 11/14. How many lines fit, and how many points are left over?

18. **6 pts** **Lesson 5.4**

(a) A photo is 3000 × 2400 px. What is its largest print at full quality, 300 PPI? (b) The same photo is placed 15 in wide in a magazine layout. Find the effective PPI and the preflight verdict against a 300 PPI spec. (c) Give the full document setup for a press-ready 5 × 7 in card: canvas size with standard 0.125-in bleed, the safe area, and the canvas pixel dimensions at 300 PPI.

19. **8 pts** **Lesson 5.2**

PRODUCTION TASK. Sketch, with a ruler, a letter-size poster layout at quarter scale (2.125 × 2.75 in) for a school recital. Construct margins, draw a grid of your choice, and mark the three reading levels — hook read at 20 ft, message at 10 ft, details at 3 ft — each with its computed cap height and approximate point size ($\text{type size (pt)} \approx \text{cap height (in)} \times 72 \times 1.4$). Label every measurement.

ANSWER KEY

1. (a) Height 4.5×3 cm $= 13.5$ cm; width 2.5×3 cm $= 7.5$ cm. (b) $k = \dfrac{13.5 \text{ cm}}{27 \text{ cm}} = 0.5$, half life size. (c) $8 \times 1.25 = 10$ cm and $12 \times 1.25 = 15$ cm: 10×15 cm. The proportions (2 : 3) are unchanged — uniform scaling never changes shape.
2. (a) $\text{level}_i = i \times \dfrac{255}{4}$: 0, 64, 128, 191, 255 — black, dark gray, middle gray, light gray, white. (b) $255 \div 8 \approx 31.9$ levels per step. (c) Nothing in the shadow side may be as light as anything on the lit side. Equal values on both sides destroy the light logic, so the sphere flattens; darken the reflected light (to roughly value 6–7 on a 9-step scale with 1 as white) so it stays clearly inside the shadow family.
3. (a) Apparent size is inversely proportional to distance, $\dfrac{h_1}{h_2} = \dfrac{d_2}{d_1}$: at 20 ft (double the distance) the post draws $8 \div 2 = 4$ cm; at 40 ft, $8 \div 4 = 2$ cm. (b) The horizon sits at the viewer's eye level, 5 ft, so it crosses the figure at 5 of his 6 feet — about his upper chest — in every position. Anchoring his feet to the ground and his chest to the horizon sizes him lawfully wherever he stands.
4. (a) Head: $15 \text{ cm} \div 7.5 = 2$ cm. The midpoint, 7.5 cm from the top, falls at the hips — not the waist; placing it at the waist is the classic short-legs error. (b) Facial thirds: brow $6 \div 3 = 2$ cm below the hairline, nose base 4 cm below. Hand length ≈ face length (chin to hairline), so about 6 cm — beginners draw hands about half this size.
5. Brand/graphic designer — logos, identities and printed pieces; illustrator — pictures for books, magazines and products; production artist — press-ready, error-free final files; UI designer — screens and components for sites and apps; art director — the creative direction of a campaign or publication, directing other designers and illustrators. The door into the field is the portfolio: employers and clients hire on the strength of finished, demonstrated work before anything else.
6. (a) Steelyard balance, $w_1 d_1 = w_2 d_2$: $9 \times 2 = 6 \times d$, so $d = 3$ in right of center — small-far balances big-near. (b) $8 \times 1 \times 1 = 1 \times c \times 4$, so $c = 2$, double the barn's contrast: a small, very dark accent against light — the classic far-out counterweight.
7. (a) Vertical third lines at $x = 4$ and $x = 8$ in; horizontal at $y = 3$ and $y = 6$ in; power points (4,3), (8,3), (4,6), (8,6). (b) $30 \div 1.618 \approx 18.5$ in. (c) $13 \div 8 = 1.625 \approx \varphi = 1.618$; neighboring Fibonacci numbers give golden

proportions in ruler-friendly whole numbers, so a designer can lay out golden divisions without decimals.

8. (a) Negative space is the empty area around and between the subjects — the ground shapes rather than the figures. (b) The brain has no memorized symbol for a gap, so drawing the gaps forces you to see actual shapes instead of drawing the idea of the object; the gaps have no name to interfere. (c) The FedEx wordmark (1994), by Lindon Leader at Landor Associates, whose negative space between the E and the x forms a forward-pointing arrow.
9. Model answer: 'The flyer uses five typefaces where two families would do; cut to one headline face and one text face (or one superfamily) so the voice is consistent. The body is set solid at 10/10, which tangles ascenders and descenders; open the leading to about 10/13. The measure runs about 95 characters per line, far past the comfortable 45–75 band; narrow the column or break the text into two columns. The border currently outranks the message — subdue it and give the event name the size, contrast and placement of rank one.' Any version that names each of the four faults specifically, stays about the work rather than its maker, and pairs every fault with a concrete fix earns full credit.
10. Gutenberg's 42-line Bible, c. 1455; Jenson's roman, 1470; Aldus Manutius's first italic, 1501; Caslon's specimen sheet, 1734; Times New Roman, 1932; Helvetica, 1957. Jenson, working in Venice, cut the first great roman type — lowercase forms modeled on humanist handwriting with capitals from Roman inscriptions — and its proportions remain the model for text faces to this day.
11. (a) $S_B = S_A \times \dfrac{x_A}{x_B} = 12 \times \dfrac{0.52}{0.40} = 15.6$ pt — set face B at about 15.5 pt, or at 12 pt it will look noticeably smaller. (b) (i) A Didone (modern), like Bodoni — the vertical axis and hairlines are the giveaway; a display face, fragile at text sizes. (ii) An old-style (humanist/Garalde), like Garamond — the tilted axis and bracketed serifs descend from the broad-nib pen.
12. (a) $16 \text{ px} \times \frac{3}{4} = 12$ pt; leading $1.4 \times 16 = 22.4$ px $= 16.8$ pt (set 16/22.4). (b) $12 \div 1.25 = 9.6 \approx 9.5$; $12 \times 1.25 = 15$; $15 \times 1.25 = 18.75 \approx 19$; $19 \times 1.25 \approx 23$. Caption 9.5, body 12, subhead 15, heading 19, title 23 pt. (c) Line length $24 \times 12 = 288$ pt; CPL $\approx \dfrac{288}{0.5 \times 12} = 48$, comfortably inside the 45–75 band; set about 12/15 (leading 1.2–1.3 × size for a measure this moderate).
13. (a) cap height (in) $\approx \dfrac{60 \text{ ft}}{10} = 6$ in minimum — 8 in is safer. (b) $10 \times 0.75 \times 6 \text{ in} = 45 \text{ in} \approx 3.75$ ft; order at least a 4–5 ft banner so the word carries margins, and keep the message short enough to read in one glance.

14. (a) Complement $40 + 180 = 220°$. Triad: $160°$ and $280°$. Split-complements: $40 + 150 = 190°$ and $40 + 210 = 250°$. (b) Additive mixing combines light, so adding channels moves toward white — this is how a screen's RGB pixels work. Subtractive mixing combines pigments or inks that each absorb part of the light, so adding more moves toward dark mud — this is how paint and CMYK printing work.

15. (a) $\mathrm{C8} = 12 \times 16 + 8 = 200$; $\mathrm{5A} = 5 \times 16 + 10 = 90$; $\mathrm{2E} = 2 \times 16 + 14 = 46$: (200, 90, 46), a burnt orange. (b) $32 = 2 \times 16 + 0 \to 20$; $144 = 9 \times 16 + 0 \to 90$; $255 \to \mathrm{FF}$: #2090FF, a bright sky blue that will dull down in CMYK print. (c) $256^3 = 2^{24} = 16{,}777{,}216$ colors.

16. (a) $\dfrac{0.85 + 0.05}{0.10 + 0.05} = \dfrac{0.90}{0.15} = 6.0{:}1$: passes AA for body text and large text, fails AAA. (b) $\dfrac{0.90}{0.35} \approx 2.6{:}1$: fails body text and even large text (needs 3:1); this pair cannot carry type. (c) $13 \times 0.08 + 12 \times 0.005 = 1.04 + 0.06 \approx 1$ student — nearly every classroom has one, so never code meaning with color alone; double-code with shape, value or words.

17. (a) $c = \dfrac{51 - 2(4) - 2(2)}{3} = \dfrac{39}{3} = 13$ picas — a clean whole-pica column. (b) Block height $42 \times 12 = 504$ pt; $\lfloor 504 \div 14 \rfloor = 36$ lines, using $36 \times 14 = 504$ pt exactly — 0 pt left over, a perfectly tuned baseline grid.

18. (a) $3000 \div 300 = 10$ in by $2400 \div 300 = 8$ in. (b) $3000 \div 15 = 200$ PPI: fails a 300 PPI spec; place it smaller or get a bigger file. (c) Canvas with bleed: 5.25×7.25 in (trim + 0.125 in each side); safe area 4.75×6.75 in (0.125 in inside trim); pixels $5.25 \times 300 = 1575$ by $7.25 \times 300 = 2175$ px.

19. Model answer: a ruled 2.125 × 2.75 in rectangle with margins constructed and labeled (any consistent system, e.g. equal margins or a Gutenberg-style canon) and a visible column or modular grid. Reading levels computed: hook at 20 ft needs $20 \div 10 = 2$-in caps, about $2 \times 72 \times 1.4 \approx 200$ pt — one short line, e.g. the word RECITAL; message at 10 ft needs 1-in caps, about 100 pt — who and when; details at 3 ft run 18–24 pt — address, time, price. Full credit requires the hook owning roughly half the poster, rank 1 placed on or near a power point, every measurement labeled at quarter scale, and the three levels clearly distinct in size.

COURSE EXAM

Final Exam

Covers Units 1–10. Time: 90 minutes.

You have 90 minutes. A calculator is allowed. Show your work for every calculation: the formula, the numbers with units and the answer with its unit; correct setup earns partial credit even if the arithmetic slips. Use $1\ \text{px} = \frac{3}{4}\ \text{pt}$, $1\ \text{rem} = 16\ \text{px}$ and 10^6 bytes per MB unless told otherwise. For critique and production tasks, work in pencil, label everything, and write in complete sentences. The exam has 20 problems worth a total of 100 points.

---

1. **4 pts** **Lesson 1.3**

   Name the five zones of light on a sphere in order from the light source, plus the two shadows that are not on the sphere itself. Then explain why the reflected light must always stay darker than the lit halftone.

2. **4 pts** **Lesson 3.4**

   A site's body text is 16 px. (a) Convert it to points. (b) A full-width article column runs 720 px. Estimate the CPL with $\text{CPL} \approx \dfrac{\text{measure}}{0.5 \times \text{size}}$, judge it against the 45–75 band, and give the fix with a number.

3. **5 pts** **Lesson 4.5**

   (a) White text ($L = 1.0$) sits on a brand green of $L = 0.12$. Compute the WCAG contrast ratio and give the AA verdicts for body and large text, and the AAA verdict. (b) An orange of $L = 0.35$ is proposed as text on white ($L = 1.0$). Compute and judge. (c) In an audience of 200 men and 200 women, how many people with red-green CVD do you expect (8% of men, 0.5% of women)?

4. **4 pts** **Lesson 5.4**

   CRITIQUE TASK. A flyer proof shows: (a) the background photo stopping exactly at the trim line; (b) the phone number 0.05 in from the trimmed edge; (c) a placed photo 2400 px wide scaled to 13.3 in. Mark up the proof: name each fault, show the one computation, and give each fix.

5. **5 pts** **Lesson 6.1**

   A scanner produces a 3600 × 4800 px scan. (a) Compute the megapixels. (b) Compute the uncompressed file size in MB in 8-bit grayscale and in 24-bit RGB. (c) How many distinct colors can 24-bit RGB express, computed from bits?

6. **5 pts** **Lesson 6.4**

   A 4 × 6 in ink drawing must print at 8 × 12 in at 300 PPI. (a) Compute the scan DPI and the resulting pixel dimensions. (b) Compute multiply mode for a value of 128 over a value of 180, and explain with the arithmetic why a line-art layer set to multiply shows the color flats through its white paper but keeps its black lines black.

7. **4 pts** **Lesson 6.5**

   (a) Compute the four-year cost of a $59.99/month software suite. (b) A one-time $164.99 suite replaces it: find the breakeven month and the four-year savings in dollars. (c) Name two skills that transfer completely between the free toolkit (Krita, Inkscape, GIMP, Scribus) and the Adobe standard.

8. **5 pts** **Lesson 7.1**

   (a) What printing invention of the 1880s created the Golden Age of Illustration, and why? (b) Connect in two sentences: Howard Pyle at Drexel, the Brandywine school, and N.C. Wyeth's Treasure Island (1911). (c) What does the costumed-model tradition of that school prove for a student training today?

9. **6 pts** **Lesson 7.2**

   A publisher offers an illustrator a $5,000 advance against a 5% royalty on a $16.99 hardcover picture book. (a) Compute the royalty per copy and the earn-out point. (b) What has the illustrator earned in total if the book sells 15,000 copies? (c) Why are picture books 32 pages, and after 4 pages of front matter, how many story spreads remain?

10. **4 pts** **Lesson 7.3**

    Job A is a $400 editorial spot you can finish in 5 hours. Job B is a $1,200 local-business job that will take 2.5 full days (8-hour days) with meetings and revisions. Compute both effective hourly rates, name the better-paying job, and give one non-rate factor that could still justify the other.

11. **6 pts** **Lesson 7.5**

List the five gates of an illustration job in order, stating what passes through each, and explain why a change of direction gets more expensive at every gate. Then: your final art will be a day late, four days before deadline. What do you do, and why is that both right and professionally safer?

12. **4 pts** **Lesson 8.1**

(a) What became UK registered trade mark No. 1, under what law, and when did registration open? (b) Explain TM versus ®. (c) Name the disease that killed aspirin and escalator as trademarks, and what it teaches a brand's designer.

13. **5 pts** **Lesson 8.2**

(a) Attribute and date two Paul Rand marks, and state his 'identify, don't describe' rule in your own words. (b) List the five tests of a good mark, and describe how to actually perform the two versatility tests.

14. **4 pts** **Lesson 8.3**

(a) Your logo symbol is 55 mm tall and the lettering must relate to it by the golden ratio. Compute the first companion height and the next smaller step. (b) A refined mark uses corner radii of 10, 9.6 and 10.3 px, all meant to look equal, plus one radius meant to be a related smaller size. Fix the family, proposing two defensible options for the smaller radius.

15. **5 pts** **Lesson 9.3**

(a) A 1200 px container holds a 12-column grid with 24 px gutters. Compute the column width with $c = \dfrac{W - (n-1)\,g}{n}$ and the width of a card spanning 4 columns. (b) Convert 28 px to rem, and the breakpoint 48 rem to px. (c) Which of these spacings belong on a strict 8-point grid: 12, 16, 40, 52? Correct the failures.

16. **5 pts** **Lesson 9.4**

A 1280 px-wide video thumbnail will be displayed at 160 px wide in search results. (a) Find the scale factor. (b) Your title text is designed at 56 px: what does it display at, and is it legible? (c) What designed size displays at 14 px? (d) A 1080 × 1920 story has platform overlays covering roughly the top and bottom 250 px: give the safe zone.

17. **5 pts** **Lesson 10.2**

(a) When does U.S. copyright protection begin and how long does it last for an individual creator? (b) What three advantages does timely registration add? (c) A client says 'I paid for it, so I own the copyright.' State the actual rule for freelancers and the two conditions of work-for-hire for a commissioned piece — and name the deliverable that is normally assigned outright anyway.

18. **8 pts** **Lesson 10.3**

A freelancer targets $45,000 income with $9,000 annual overhead, working a 2,000-hour year at 60% billable. (a) Find the billable hours, hourly rate and day rate. (b) Quote this identity job at that rate: discovery 4 h, concepts 8 h, revisions 6 h, final files 4 h; expenses $70 (font license); contingency 10%. (c) State the 40% deposit.

19. **4 pts** **Lesson 10.5**

(a) State the human-authorship rule of U.S. copyright for AI-generated images and its two landmark applications. (b) Give two professional ethics rules this course set for AI image tools.

20. **8 pts** **Lesson 10.1**

PRODUCTION TASK. Sketch and annotate one case-study page for your own portfolio, using any finished piece from this course (a logo, poster, book cover, or illustration). Lay out the page small and rough, label its four required parts, and add the one-sentence caption each part would carry. Then state the curator's rule that governs the whole portfolio.

ANSWER KEY

1. On the sphere: highlight, light (full light), halftone, core shadow, reflected light. Off the sphere: the cast shadow and the occlusion shadow where the form meets the ground. Reflected light is only bounced light — a fraction of the source — so if it rises to match any lit value, the shadow family stops reading as shadow and the form flattens; it must stay clearly darker than everything on the lit side.
2. (a) $16 \times \frac{3}{4} = 12$ pt. (b) $\text{CPL} \approx \dfrac{720}{0.5 \times 16} = 90$, past the comfortable 45–75 band. Cap the measure near 528–576 px (33–36 rem) for roughly 66–72 characters per line — the same craft rule as a print column, enforced in CSS.
3. (a) $\dfrac{1.0 + 0.05}{0.12 + 0.05} = \dfrac{1.05}{0.17} \approx 6.2{:}1$: passes AA for body (4.5:1) and large text (3:1), fails AAA (7:1). (b) $\dfrac{1.05}{0.40} \approx 2.6{:}1$: fails both — this orange may decorate but not speak; darken it or reserve it for non-text accents. (c) $200 \times 0.08 + 200 \times 0.005 = 16 + 1 = 17$ people — so meaning is never coded by hue alone.
4. (a) No bleed: the cutter's 1/16-in wander will leave white slivers; extend the photo 0.125 in past trim on every bleeding side. (b) Inside the danger zone: anything critical must sit in the safe area at least 0.125 in inside trim, or the trimmer may clip it; move the number in. (c) Effective resolution $2400 \div 13.3 \approx 180$ PPI, well under the 300 PPI press standard — it will print soft; place it smaller (at 8 in it is 300 PPI) or obtain a larger original.
5. (a) $\dfrac{3600 \times 4800}{10^6} = 17.3$ MP. (b) Grayscale, 1 byte per pixel: 17,280,000 bytes ≈ 17.3 MB; RGB, 3 bytes per pixel: ≈ 51.8 MB. (c) $2^{24} = 16{,}777{,}216$ colors.
6. (a) scan DPI $= 300 \times \dfrac{8}{4} = 600$ DPI, giving 2400×3600 px — exactly 300 PPI at the doubled size. (b) $\dfrac{128 \times 180}{255} \approx 90$, darker than either input: multiply can only darken. White (255) is multiply's identity — $\dfrac{255 \times b}{255} = b$ — so the paper vanishes and the flats show through, while black (0) annihilates everything beneath it, so the ink survives.
7. (a) $\$59.99 \times 48 \approx \$2{,}880$. (b) $164.99 \div 59.99 \approx 2.75$, so it breaks even in month 3; four-year savings $\$2{,}880 - \$165 \approx \$2{,}715$. (c) Any two of: layers and blend modes, Bézier paths and node editing, grids/master pages and layout arithmetic, color management and press setup, nondestructive workflow and shortcut

habits — the concepts live in the craft, not the brand; only menu locations and file formats differ.

8. (a) The photomechanical halftone screen: it reproduced an artist's actual painting in ink dots on a press, replacing hand-cut wood engraving, so magazines could suddenly print real pictures cheaply and bought them by the thousands. (b) Pyle began teaching illustration at Drexel in the 1890s and then founded his own school, whose students at Chadds Ford became the Brandywine school. His student N.C. Wyeth painted the 1911 Treasure Island plates for Scribner's — still among the most famous book illustrations in American art. (c) Pyle's students worked from costumed, clothed models and built complete professional figure skill that filled the nation's books and magazines — proof that a professional can be fully trained from clothed models.
9. (a) $0.05 \times \$16.99 \approx \$0.85$ per copy; earn-out $\$5{,}000 \div \$0.85 \approx 5{,}900$ copies. (b) $\$5{,}000 + \$0.85 \times (15{,}000 - 5{,}900) \approx \$5{,}000 + \$7{,}740 \approx \$12{,}700$. (c) Presses print, fold and bind in 16-page signatures, so two signatures make the standard 32-page book; 28 story pages remain, which is 14 spreads.
10. A: $\$400 \div 5 = \$80/\text{hr}$. B: $\$1{,}200 \div 20\ \text{hr} = \$60/\text{hr}$. The smaller fee is the better-paying job. B could still be worth taking for a portfolio piece in a market you want to enter, a long-term client relationship, or work during an otherwise empty week — but you choose that knowingly, with the arithmetic in front of you.
11. Brief (the problem, audience, size, fee and deadline are agreed) → thumbnails (the idea and composition are chosen) → approved sketch (the client signs off on the exact drawing) → final art (the approved sketch is executed) → delivery and contracted revisions. Each gate locks decisions that everything afterward is built on, so a change after a gate throws away finished work: a new idea at the sketch stage costs a drawing, but at final it costs the whole painting. Email the art director now — not on deadline day — stating the real delivery date and what you are doing about it. Honesty is commanded, and practically it lets the AD adjust the schedule while there is still room; hiding it gambles their trust and the whole relationship on catching up.
12. (a) The Bass red triangle, under the Trade Marks Registration Act 1875, when registration opened on 1 January 1876 — Bass's man famously waited at the registrar's door. (b) TM claims a mark without registration; ® may be used only after the mark is federally registered, and using it falsely is unlawful. (c) Genericide: when a protected name becomes the common word for the whole category, protection dies. The brand must always be used as an adjective with a

generic noun and policed consistently — the designer's brand guide is part of that policing.

13. (a) Any two of: IBM (1956; the eight-bar version 1972), ABC (1962), UPS (1961), NeXT (1986), Westinghouse (1960). Rand's rule: a logo's job is to identify its owner distinctively, not to picture what the company does — the mark earns its meaning through use, which is why an apple can sell computers. (b) Simple, memorable, versatile, appropriate, and durable (not chasing a trend). Versatility tests: the one-color test — the mark must survive in solid black and reversed white, with no gradients or color tricks carrying it; and the scale test — print it at favicon size (about 16 px) and imagine it on a sign, and it must stay recognizable at both extremes.

14. (a) $55 \div 1.618 \approx 34$ mm; next step $34 \div 1.618 \approx 21$ mm — the Fibonacci neighbors appear on their own. (b) Snap the near-equal radii to one value, 10 px; nearly-equal always reads as sloppy, never as intentional. The smaller radius should be derived by a stated ratio: 5 px (halves) or about 6.2 px ($10 \div 1.618$) — either is defensible because it can be named.

15. (a) $c = \dfrac{1200 - 11 \times 24}{12} = \dfrac{936}{12} = 78$ px; span of 4: $4 \times 78 + 3 \times 24 = 384$ px. (b) $28 \div 16 = 1.75$ rem; $48 \times 16 = 768$ px. (c) 16 and 40 pass (multiples of 8); 12 and 52 fail — snap to 8 or 16, and to 48 or 56.

16. (a) $s = 1280 \div 160 = 8$. (b) $56 \div 8 = 7$ px — illegible; thumbnail type must be judged at displayed size, not design size. (c) $14 \times 8 = 112$ px, which also forces the word count down to a few words. (d) $1920 - 2 \times 250 = 1420$: a centered 1080 × 1420 safe zone — recompose into it rather than blind-scaling the square post.

17. (a) At fixation — the moment the work is set down in tangible form — and it lasts the author's life plus 70 years. (b) Registration is required before filing an infringement suit, and timely registration (before infringement or within three months of publication) unlocks statutory damages and attorney's fees instead of hard-to-prove actual damages. (c) The freelancer owns the copyright; the client buys the license the contract names. A commissioned work is work-for-hire only if it falls within the statute's listed categories and both parties signed a written work-for-hire agreement. The exception by custom is the logo: a client must own its own mark outright, so logo jobs normally include a full assignment — priced accordingly.

18. (a) Billable: $2{,}000 \times 0.60 = 1{,}200$ h. Rate: $\dfrac{45{,}000 + 9{,}000}{1{,}200} = \$45/\text{hr}$; day rate $45 \times 8 = \$360$. (b) Hours: $4 + 8 + 6 + 4 = 22$ h; $(22 \times \$45 + \$70) \times 1.10 = (\$990 + \$70) \times 1.10 = \$1{,}166$ — present it as about

$1,165 with the scope in writing. (c) $0.40 \times \$1{,}166 \approx \$466$ due before work begins.

19. (a) Copyright requires a human author, so purely AI-generated images receive no protection: the Copyright Office refused registration of Thaler's AI-only image 'A Recent Entrance to Paradise,' and in 'Zarya of the Dawn' (2023) it protected the artist's human-written text and arrangement while denying the AI-generated images themselves. Commercially, a brand asset nobody can own is a brand asset nobody can defend. (b) Any two of: never pass AI output off as your own drawing; respect each client's stated AI policy; disclose AI use honestly when asked or when the contract requires it; keep building foundational skill, which is exactly what the tools cannot supply and what the market now prizes.
20. Model answer: a rough page layout clearly showing the four parts of a case study — the brief (client and problem: 'Stonebridge Woodworks needed a mark that works burned into wood and shrunk to a favicon'), the process (thumbnails and sketches shown small: 'fifty sketches, three directions, one survivor'), the solution (the finished piece large and hero-sized, with specs), and the result (what it achieved or what was learned: 'delivered as a full file package with a one-page brand guide'). The curator's rule: show ten strong pieces, because the weakest piece in the portfolio — not the strongest — sets the viewer's estimate of your level; cut mercilessly and let every piece earn its place. Full credit requires all four parts present, labeled, with sensible captions, and the rule stated.