Personal Finance & Investing

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

FIRST EDITION

Course guide

This is a full-year, college-preparatory course in personal finance for students in grades 9–12. It covers the whole household economy a young adult will soon manage: work and the paycheck, budgeting, saving and giving, banks and payments, credit and debt, insurance, taxes, investing, the history of markets, big purchases such as a car and a home, and a lifetime plan of stewardship that ends with retirement, a will and a legacy of generosity. Every lesson has two to four fully worked examples, a practice set of 8 to 12 problems with answers, and a project done with real numbers. Each unit ends with a 100-point test, and there is a midterm after Unit 5 and a final after Unit 10.

Money was learned by people, one hard lesson at a time, and the course is built around their stories. Each lesson begins with **the story** (Benjamin Franklin's Father Abraham at the auction, Henry Duncan's savings bank in a Scottish parish, the crowds outside the banks in 1933, Mark Twain paying every creditor in full, the coffee house where Edward Lloyd's customers insured ships, the South Sea Bubble, Charles Ponzi's postal coupons, a Vermont janitor who quietly built a fortune), then **how they figured it out**, then **the big idea** with its formulas, and then **in business today**: how banks, employers, insurers and families use the idea now, and what a wise and honest person does with it now. Then the student does it: a pay stub decoded, a real household budget, a credit-card payoff schedule, an insurance comparison, a practice tax return, a pretend portfolio, a loan amortization spreadsheet and, at the end, a written financial plan.

The course teaches principles, history and arithmetic, never individualized advice. It names no stocks, funds or companies to buy; all investing is done in pretend portfolios. Tax brackets, contribution limits and similar figures change every year, so the course teaches the method with clearly labeled example numbers and shows the student where to find the current figures. Throughout, money is treated as a trust

from God: “The silver is mine, and the gold is mine, saith the LORD of hosts” (Haggai 2:8). Students learn to work heartily, spend wisely, avoid needless debt, save with patience, insure against what they cannot bear, pay what they owe, invest for the long run and give cheerfully.

> Videos were chosen lesson by lesson from public and educational sources: Khan Academy, Two Cents (PBS), the Federal Reserve Bank of St. Louis, the FDIC, the Federal Trade Commission, the IRS, The Plain Bagel and a few other teaching channels. Every video was checked in preview for accuracy and content, and none comes from a channel that sells a course, a coin or a trading platform or takes sides in present-day public debates. Tax amounts, contribution limits and insurance rules change every year, so some videos quote figures for a particular year; the lesson text tells you to treat those as examples and to look up the current numbers. A few channels end with a sponsor message or an invitation to subscribe; you can stop when the teaching ends.

Start with Lesson 1.1 →

Who it is for

Written for students in grades 9–12 who have completed (or are taking) Algebra I: percents, exponents and working with formulas. The few formulas beyond that, such as the loan-payment formula, are explained step by step, and every one can also be done in a free spreadsheet. Students work fairly independently, reading the lesson and working the examples themselves; a parent or mentor checks the practice sets, discusses the essay questions and shares real household numbers where the family is comfortable doing so. Nothing needs to be bought beyond a calculator, a notebook and free spreadsheet software.

How to use this course

1. **The weekly rhythm.** Each lesson takes three sessions of about 50 minutes. Session 1: the warm-up, the video, the core ideas and the worked examples. Session 2: the project and the ledger notebook. Session 3: the practice set, checked against the answers, with every missed problem corrected in the notebook. Each unit ends with a test day, and the midterm and final each have a review day. At five sessions a week the course fills a school year of about 33 weeks.

2. **Story, then the big idea, then today.** Read the core ideas in order. The story and "how they figured it out" explain why the rule exists; do not skip them. Then cover the solution to each worked example, try it yourself, and compare line by line.
3. **Show the arithmetic.** Write the formula, substitute the numbers with dollar signs and percents, and round money to the cent only at the end. A free spreadsheet (Google Sheets or LibreOffice Calc) is used in many projects; build the table yourself rather than using an online calculator, so you see how the numbers grow.
4. **Example numbers are examples.** Tax brackets, payroll tax rates, contribution limits, deposit-insurance limits and interest rates change. When a lesson says "in this example," the numbers were chosen to teach the method. Before you use a method on a real decision, look up the current figures from the official source the lesson names (the IRS, the FDIC, the Social Security Administration, the CFPB).
5. **Practice sets.** Problems are marked easy, medium, hard and challenge. Do all of the easy and medium problems and most of the hard ones; the challenge problem is for students who want more. Mark your work against the answers the same day, and rework every miss.
6. **Picture study.** Each lesson has one public-domain painting, print or historic photograph. Look at it quietly for two minutes, put it away and tell what you remember, then work through the "look for" items and questions, which point to the work, money or risk in the picture.
7. **The ledger notebook.** Keep one notebook for the year: budgets, pay-stub breakdowns, loan tables, insurance comparisons, tax worksheets and portfolio records. Date every page, label every column, and finish each page with one sentence about what the numbers mean for you.
8. **Real household numbers, with care.** Several projects work best with real family figures (a utility bill, an insurance declaration page, a pay stub). Use them only if your parents are comfortable, black out account numbers and personal information, and never share them online. Made-up figures are always acceptable.
9. **No individualized advice.** The course teaches how money works; it does not tell you what to buy. All investing in the course is with pretend money. Make real decisions together with your parents and, as an adult, with a qualified professional you trust.

10. **Unit tests and exams.** Each unit test is worth 100 points and mixes calculations, concepts and one short essay. Calculators are allowed on every test; work must be shown. The midterm (Units 1–5) and the final (Units 1–10) are longer and cumulative.
11. **Optional books and games.** Some units list free classics such as Franklin's *The Way to Wealth* and Wesley's sermon "The Use of Money," free government and Federal Reserve resources, and family games. They are extras; every lesson can be completed without them.

Scope and sequence

UNIT 1 · WEEKS 1–4

Work and Income

Work as a calling and choosing a career; reading a paycheck from gross pay to net; résumés and first jobs; self-employment income and its taxes; and Benjamin Franklin's *The Way to Wealth*.

1.1 Vocation and Career: Work as a Calling

1.2 The Paycheck: Gross Pay, Net Pay and Withholding

1.3 First Jobs and Résumés: Andrew Carnegie's Climb

1.4 Self-Employment Income: The Merchant Who Keeps His Own Books

1.5 Benjamin Franklin's *The Way to Wealth*

UNIT 2 · WEEKS 4–7

Budgeting, Saving and Giving

Building a zero-based budget; the emergency fund; tithing and generosity; spending decisions, opportunity cost and contentment; and John Wesley's rule to gain, save and give all you can.

2.1 The Budget: Rockefeller's Ledger A

2.2 Emergency Funds: Joseph's Storehouses

2.3 Tithing and Generosity: The Cheerful Giver

2.4 Spending Decisions and Contentment

2.5 Wesley's "The Use of Money": Gain, Save, Give

UNIT 3 · WEEKS 7–10

Banking and Payments

How banks take deposits and make loans, from Henry Duncan's parish savings bank to today; checking and savings accounts; the 1933 bank runs and the FDIC; the ways we pay; and guarding your accounts against fraud and scams.

3.1 How Banks Work: Henry Duncan's Parish Bank

3.2 Checking and Savings: The Clearing House and the Register

3.3 Bank Runs and the FDIC, 1933

3.4 Payment Methods: From the Bank of Amsterdam to the Card in Your Wallet

3.5 Protecting Your Accounts: The Spanish Prisoner and Modern Scams

UNIT 4 · WEEKS 10–13

Credit and Debt

Interest and APR; how credit cards work and what minimum payments cost; credit reports and scores; student loans; and paying off debt, with Mark Twain's honorable repayment and Proverbs 22:7.

4.1 Interest and APR: The Truth in Lending Act

4.2 Credit Cards: From Diners Club to the Minimum Payment

4.3 Credit Reports and Scores: Lewis Tappan's Mercantile Agency

4.4 Student Loans: Counting the Cost of Training

4.5 Getting Out of Debt: Mark Twain Pays in Full

UNIT 5 · WEEKS 13–17

Insurance and Risk

Risk, pooling and the coffee house that became Lloyd's; auto insurance; health insurance; home and renter's insurance after the Great Fire of London; and life and disability insurance, from the Scottish ministers' widows' fund to today.

5.1 Risk and Insurance: Edward Lloyd's Coffee House

5.2 Auto Insurance: The First Policy, 1897

5.3 Health Insurance: The Baylor Plan, 1929

5.4 Home and Renter's Insurance: After the Great Fire of London

5.5 Life and Disability Insurance: The Ministers' Widows' Fund

UNIT 6 · WEEKS 17–20

Taxes

Why and how taxes are paid; income tax brackets and a simple practice return; Social Security and Medicare payroll taxes; sales and property taxes; and honest records, with Romans 13:7 and Zacchaeus.

6.1 Why and How Taxes Are Paid: The Tribute Money

6.2 Income Tax Basics and a Simple Return: 1913 and Form 1040

6.3 Payroll Taxes: Ida May Fuller and Social Security

6.4 Sales and Property Taxes: From the Domesday Book to Your County

6.5 Records and Honesty: Zacchaeus and Romans 13:7

UNIT 7 · WEEKS 20–23

Investing Basics

The time value of money and Pacioli's rule of 72; stocks from the Dutch East India Company to today; bonds, from a 1648 Dutch water-board bond to Treasury bonds; mutual funds and John Bogle's index fund; and risk, return and diversification.

7.1 The Time Value of Money: Pacioli's Rule of 72 and Franklin's Gift

7.2 Stocks: From the Dutch East India Company to Today

7.3 Bonds: A 1648 Water Board Bond and Hamilton's Debt

7.4 Mutual Funds and Index Funds: John Bogle's "Folly"

7.5 Risk, Return and Diversification: "A Portion to Seven, and Also to Eight"

UNIT 8 · WEEKS 23–26

Markets Through History

Tulip mania and the South Sea Bubble; the crash of 1929 and the Depression; the crashes of 1987, 2000 and 2008; the frauds of Charles Ponzi and Bernard Madoff; and the patient investor.

8.1 Tulips and the South Sea Bubble

8.2 1929 and the Great Depression

8.3 1987, 2000 and 2008: Three Modern Crashes

8.4 Frauds: Charles Ponzi and Bernard Madoff

8.5 The Patient Investor: Ronald Read of Brattleboro

UNIT 9 · WEEKS 27–30

Big Purchases

Buying a car; renting a home and reading a lease; buying a home and choosing a mortgage; amortization with a spreadsheet; and contracts and fine print.

9.1 Buying a Car: Ford's Weekly Purchase Plan and the Car Loan

9.2 Renting: Jacob Riis and the Tenement House Act

9.3 Buying a Home and the Mortgage: From Five-Year Loans to Thirty

9.4 Amortization: The Building and Loan Association of 1831

9.5 Contracts and Fine Print: Jacob, Laban and Your Signature

UNIT 10 · WEEKS 30–33

Stewardship for Life

Retirement accounts and compound growth over a working life; wills and estate planning, simply; giving and legacy; avoiding get-rich schemes and games of chance; and a capstone written financial plan.

10.1 Retirement Accounts and Compound Growth Over Decades

10.2 Wills and Estate Planning, Simply: Lincoln Dies Without a Will

10.3 Giving and Legacy: George Müller's Orphan Houses

10.4 Avoiding Get-Rich Schemes and Games of Chance

10.5 A Capstone Financial Plan: "Well Done, Thou Good and Faithful Servant"

Weekly pacing calendar

WEEK	PLAN
1	• Day 1: Lesson 1.1 Vocation and Career: Work as a Calling: video, teaching and worked examples • Day 2: Lesson 1.1: project and notebook • Day 3: Lesson 1.1: practice set and corrections • Day 4: Lesson 1.2 The Paycheck: Gross Pay, Net Pay and Withholding: video, teaching and worked examples • Day 5: Lesson 1.2: project and notebook *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 First Jobs and Résumés: Andrew Carnegie's Climb: video, teaching and worked examples • Day 3: Lesson 1.3: project and notebook • Day 4: Lesson 1.3: practice set and corrections

WEEK	PLAN
	• Day 5: Lesson 1.4 Self-Employment Income: The Merchant Who Keeps His Own Books: video, teaching and worked examples
3	• Day 1: Lesson 1.4: project and notebook • Day 2: Lesson 1.4: practice set and corrections • Day 3: Lesson 1.5 Benjamin Franklin's *The Way to Wealth*: video, teaching and worked examples • Day 4: Lesson 1.5: project and notebook • Day 5: Lesson 1.5: practice set and corrections
4	• Day 1: Unit 1 test • Day 2: Lesson 2.1 The Budget: Rockefeller's Ledger A: video, teaching and worked examples • Day 3: Lesson 2.1: project and notebook • Day 4: Lesson 2.1: practice set and corrections • Day 5: Lesson 2.2 Emergency Funds: Joseph's Storehouses: video, teaching and worked examples
5	• Day 1: Lesson 2.2: project and notebook • Day 2: Lesson 2.2: practice set and corrections • Day 3: Lesson 2.3 Tithing and Generosity: The Cheerful Giver: video, teaching and worked examples • Day 4: Lesson 2.3: project and notebook • Day 5: Lesson 2.3: practice set and corrections
6	• Day 1: Lesson 2.4 Spending Decisions and Contentment: video, teaching and worked examples • Day 2: Lesson 2.4: project and notebook • Day 3: Lesson 2.4: practice set and corrections • Day 4: Lesson 2.5 Wesley's "The Use of Money": Gain, Save, Give: video, teaching and worked examples • Day 5: Lesson 2.5: project and notebook
7	• Day 1: Lesson 2.5: practice set and corrections • Day 2: Unit 2 test • Day 3: Lesson 3.1 How Banks Work: Henry Duncan's Parish Bank: video, teaching and worked examples • Day 4: Lesson 3.1: project and notebook

WEEK	PLAN
	• Day 5: Lesson 3.1: practice set and corrections
8	• Day 1: Lesson 3.2 Checking and Savings: The Clearing House and the Register: video, teaching and worked examples • Day 2: Lesson 3.2: project and notebook • Day 3: Lesson 3.2: practice set and corrections • Day 4: Lesson 3.3 Bank Runs and the FDIC, 1933: video, teaching and worked examples • Day 5: Lesson 3.3: project and notebook
9	• Day 1: Lesson 3.3: practice set and corrections • Day 2: Lesson 3.4 Payment Methods: From the Bank of Amsterdam to the Card in Your Wallet: video, teaching and worked examples • Day 3: Lesson 3.4: project and notebook • Day 4: Lesson 3.4: practice set and corrections • Day 5: Lesson 3.5 Protecting Your Accounts: The Spanish Prisoner and Modern Scams: video, teaching and worked examples
10	• Day 1: Lesson 3.5: project and notebook • Day 2: Lesson 3.5: practice set and corrections • Day 3: Unit 3 test • Day 4: Lesson 4.1 Interest and APR: The Truth in Lending Act: video, teaching and worked examples • Day 5: Lesson 4.1: project and notebook
11	• Day 1: Lesson 4.1: practice set and corrections • Day 2: Lesson 4.2 Credit Cards: From Diners Club to the Minimum Payment: video, teaching and worked examples • Day 3: Lesson 4.2: project and notebook • Day 4: Lesson 4.2: practice set and corrections • Day 5: Lesson 4.3 Credit Reports and Scores: Lewis Tappan’s Mercantile Agency: video, teaching and worked examples
12	• Day 1: Lesson 4.3: project and notebook • Day 2: Lesson 4.3: practice set and corrections • Day 3: Lesson 4.4 Student Loans: Counting the Cost of Training: video, teaching and worked examples • Day 4: Lesson 4.4: project and notebook • Day 5: Lesson 4.4: practice set and corrections

WEEK	PLAN
13	• Day 1: Lesson 4.5 Getting Out of Debt: Mark Twain Pays in Full: video, teaching and worked examples • Day 2: Lesson 4.5: project and notebook • Day 3: Lesson 4.5: practice set and corrections • Day 4: Unit 4 test • Day 5: Lesson 5.1 Risk and Insurance: Edward Lloyd's Coffee House: video, teaching and worked examples
14	• Day 1: Lesson 5.1: project and notebook • Day 2: Lesson 5.1: practice set and corrections • Day 3: Lesson 5.2 Auto Insurance: The First Policy, 1897: video, teaching and worked examples • Day 4: Lesson 5.2: project and notebook • Day 5: Lesson 5.2: practice set and corrections
15	• Day 1: Lesson 5.3 Health Insurance: The Baylor Plan, 1929: video, teaching and worked examples • Day 2: Lesson 5.3: project and notebook • Day 3: Lesson 5.3: practice set and corrections • Day 4: Lesson 5.4 Home and Renter's Insurance: After the Great Fire of London: video, teaching and worked examples • Day 5: Lesson 5.4: project and notebook
16	• Day 1: Lesson 5.4: practice set and corrections • Day 2: Lesson 5.5 Life and Disability Insurance: The Ministers' Widows' Fund: video, teaching and worked examples • Day 3: Lesson 5.5: project and notebook • 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 Why and How Taxes Are Paid: The Tribute Money: video, teaching and worked examples • Day 4: Lesson 6.1: project and notebook • Day 5: Lesson 6.1: practice set and corrections

WEEK	PLAN
18	• Day 1: Lesson 6.2 Income Tax Basics and a Simple Return: 1913 and Form 1040: video, teaching and worked examples • Day 2: Lesson 6.2: project and notebook • Day 3: Lesson 6.2: practice set and corrections • Day 4: Lesson 6.3 Payroll Taxes: Ida May Fuller and Social Security: video, teaching and worked examples • Day 5: Lesson 6.3: project and notebook
19	• Day 1: Lesson 6.3: practice set and corrections • Day 2: Lesson 6.4 Sales and Property Taxes: From the Domesday Book to Your County: video, teaching and worked examples • Day 3: Lesson 6.4: project and notebook • Day 4: Lesson 6.4: practice set and corrections • Day 5: Lesson 6.5 Records and Honesty: Zacchaeus and Romans 13:7: video, teaching and worked examples
20	• Day 1: Lesson 6.5: project and notebook • Day 2: Lesson 6.5: practice set and corrections • Day 3: Unit 6 test • Day 4: Lesson 7.1 The Time Value of Money: Pacioli's Rule of 72 and Franklin's Gift: video, teaching and worked examples • Day 5: Lesson 7.1: project and notebook
21	• Day 1: Lesson 7.1: practice set and corrections • Day 2: Lesson 7.2 Stocks: From the Dutch East India Company to Today: video, teaching and worked examples • Day 3: Lesson 7.2: project and notebook • Day 4: Lesson 7.2: practice set and corrections • Day 5: Lesson 7.3 Bonds: A 1648 Water Board Bond and Hamilton's Debt: video, teaching and worked examples
22	• Day 1: Lesson 7.3: project and notebook • Day 2: Lesson 7.3: practice set and corrections • Day 3: Lesson 7.4 Mutual Funds and Index Funds: John Bogle's "Folly": video, teaching and worked examples • Day 4: Lesson 7.4: project and notebook • Day 5: Lesson 7.4: practice set and corrections

WEEK	PLAN
23	• Day 1: Lesson 7.5 Risk, Return and Diversification: “A Portion to Seven, and Also to Eight”: video, teaching and worked examples • Day 2: Lesson 7.5: project and notebook • Day 3: Lesson 7.5: practice set and corrections • Day 4: Unit 7 test • Day 5: Lesson 8.1 Tulips and the South Sea Bubble: video, teaching and worked examples
24	• Day 1: Lesson 8.1: project and notebook • Day 2: Lesson 8.1: practice set and corrections • Day 3: Lesson 8.2 1929 and the Great Depression: video, teaching and worked examples • Day 4: Lesson 8.2: project and notebook • Day 5: Lesson 8.2: practice set and corrections
25	• Day 1: Lesson 8.3 1987, 2000 and 2008: Three Modern Crashes: video, teaching and worked examples • Day 2: Lesson 8.3: project and notebook • Day 3: Lesson 8.3: practice set and corrections • Day 4: Lesson 8.4 Frauds: Charles Ponzi and Bernard Madoff: video, teaching and worked examples • Day 5: Lesson 8.4: project and notebook
26	• Day 1: Lesson 8.4: practice set and corrections • Day 2: Lesson 8.5 The Patient Investor: Ronald Read of Brattleboro: video, teaching and worked examples • Day 3: Lesson 8.5: project and notebook • Day 4: Lesson 8.5: practice set and corrections • Day 5: Unit 8 test
27	• Day 1: Lesson 9.1 Buying a Car: Ford’s Weekly Purchase Plan and the Car Loan: video, teaching and worked examples • Day 2: Lesson 9.1: project and notebook • Day 3: Lesson 9.1: practice set and corrections • Day 4: Lesson 9.2 Renting: Jacob Riis and the Tenement House Act: video, teaching and worked examples • Day 5: Lesson 9.2: project and notebook

WEEK	PLAN
28	• Day 1: Lesson 9.2: practice set and corrections • Day 2: Lesson 9.3 Buying a Home and the Mortgage: From Five-Year Loans to Thirty: video, teaching and worked examples • Day 3: Lesson 9.3: project and notebook • Day 4: Lesson 9.3: practice set and corrections • Day 5: Lesson 9.4 Amortization: The Building and Loan Association of 1831: video, teaching and worked examples
29	• Day 1: Lesson 9.4: project and notebook • Day 2: Lesson 9.4: practice set and corrections • Day 3: Lesson 9.5 Contracts and Fine Print: Jacob, Laban and Your Signature: video, teaching and worked examples • Day 4: Lesson 9.5: project and notebook • Day 5: Lesson 9.5: practice set and corrections
30	• Day 1: Unit 9 test • Day 2: Lesson 10.1 Retirement Accounts and Compound Growth Over Decades: video, teaching and worked examples • Day 3: Lesson 10.1: project and notebook • Day 4: Lesson 10.1: practice set and corrections • Day 5: Lesson 10.2 Wills and Estate Planning, Simply: Lincoln Dies Without a Will: video, teaching and worked examples
31	• Day 1: Lesson 10.2: project and notebook • Day 2: Lesson 10.2: practice set and corrections • Day 3: Lesson 10.3 Giving and Legacy: George Müller’s Orphan Houses: video, teaching and worked examples • Day 4: Lesson 10.3: project and notebook • Day 5: Lesson 10.3: practice set and corrections
32	• Day 1: Lesson 10.4 Avoiding Get-Rich Schemes and Games of Chance: video, teaching and worked examples • Day 2: Lesson 10.4: project and notebook • Day 3: Lesson 10.4: practice set and corrections • Day 4: Lesson 10.5 A Capstone Financial Plan: “Well Done, Thou Good and Faithful Servant”: video, teaching and worked examples • Day 5: Lesson 10.5: project and notebook

WEEK	PLAN
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

A calculator

A scientific calculator with an exponent key (y^x or ^) is enough. A financial calculator is optional.

Free spreadsheet software (Google Sheets or LibreOffice Calc)

Used in about half the projects: budgets, compound-growth tables, loan payoff and amortization schedules, and the capstone plan.

Ledger notebook (a bound graph-paper or columnar notebook), pencil and ruler

For budgets, pay-stub breakdowns, loan tables, insurance comparisons, tax worksheets and every corrected practice problem.

A folder of sample household documents

Store receipts, a utility bill, an advertisement for a car or an apartment, and, if your parents are willing, a pay stub or insurance declaration page with personal numbers blacked out. Made-up documents work too.

Printouts of blank government forms (free from IRS.gov)

Form W-4 and Form 1040 for the tax lessons. Use the current year's forms for practice only.

Optional: one of the books or games listed in a unit

Never required. See the list in each unit.

Grading

Grades come from the practice sets, the projects, the ledger notebook, the ten unit tests, the midterm and the final. A calculation earns full credit when the formula, the substitution and the answer with its units (dollars, percent, months) are all shown. A project earns full credit for honest, carefully organized numbers and a clear explanation of what they mean, even when the result is not what the student hoped.

PART	%
Practice sets (completed and corrected)	**15**
Projects (real numbers, organization, explanation)	**25**
Ledger notebook (dated pages, labeled columns, honest records)	**10**
Unit tests	**30**
Midterm exam	**10**
Final exam	**10**

Scale: A 90–100, B 80–89, C 70–79, D 60–69, F below 60.

- Practice sets are graded for completion and correction, not first-try accuracy: a problem done, checked and correctly reworked earns full credit.
- On tests, give partial credit for a correct formula and setup even if the arithmetic slips. An answer with no work earns at most half credit.
- A project earns full marks when its numbers are complete and labeled, its totals are correct, and it ends with a paragraph on what the student learned and would do differently.
- For a high-school transcript this course is one full credit of personal finance (or economics with a personal-finance emphasis). Keep the ledger notebook, the projects and the capstone plan as the course portfolio.

A NOTE TO PARENTS

You do not need to be a banker or an accountant to teach this course well. Your jobs are to keep the rhythm (three sessions per lesson), check the practice sets against the answers, ask the student to explain one worked example aloud each week, and, where you are comfortable, let the student see real household numbers: what the electric bill costs, how a pay stub reads, what the car insurance covers. Nothing teaches money like a real bill read together at the kitchen table.

The course teaches principles, history and arithmetic and does not give individualized advice. It names no investments to buy and asks the student to make no real financial decisions alone. Practice portfolios use pretend money. Real choices about accounts, loans, insurance and investments belong to your family and, for the student as an adult, to a qualified professional. Tax and benefit figures change every year; the course labels its numbers as examples and points to the official sources.

The history is told honestly: crashes, bank failures and frauds are taught as lessons, without sensationalism, and the rules that grew out of them (deposit insurance, honest disclosure, truth in lending) are taught as settled history, not present-day debates. Above all, the course hopes to raise a young adult who works heartily, lives within his or her means, keeps clear of needless debt, pays what is owed, saves with patience and gives cheerfully, holding money as a steward and not as a master. *Fabricando fit faber*: by making, one becomes a maker.

UNIT 1

Work and Income

Every household budget begins with income, and nearly all income begins with work. In this unit you will think about work as a **calling** and learn how to weigh a career by its service, its training cost and its pay. You will take apart a real **paycheck**, from gross pay through withholding to net pay, and learn why Americans have had income tax taken out of every check since 1943. You will write a résumé and compare job offers the way Andrew Carnegie, a thirteen-year-old bobbin boy in 1848, learned to climb from one job to the next.

Then you will look at **self-employment**, where the worker is also the boss, the bookkeeper and the tax collector, and you will finish with Benjamin Franklin's *The Way to Wealth* (1758), the most famous short speech on work and thrift ever printed in America. By the end you will be able to turn an hourly wage into a yearly income, a gross paycheck into a net one, and a job offer into a careful comparison.

PREREQUISITES

- Can work with percents and decimals (find 7.65% of an amount, convert a percent to a decimal)
- Can multiply and divide money amounts and round to the cent
- Can use a calculator and, ideally, a simple spreadsheet

MASTERY CHECKLIST

- ☐ I can explain the idea of vocation and weigh a career by its service, training cost and income.
- ☐ I can convert between hourly, weekly, monthly and yearly pay, including overtime.
- ☐ I can read a pay stub and calculate net pay from gross pay and its deductions.
- ☐ I can write a one-page résumé and compare two job offers with numbers.
- ☐ I can figure self-employment profit, set aside money for taxes, and find an effective hourly rate.
- ☐ I can explain Franklin's main maxims about work and thrift and calculate the yearly cost of a small daily expense.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- ***The Way to Wealth*, by Benjamin Franklin (1758)**: Free on Project Gutenberg. Father Abraham's speech made of Poor Richard's sayings on industry, frugality and debt. Read the whole thing (about twenty minutes) with Lesson 1.5. Ages 12 and up.
- ***Autobiography of Benjamin Franklin***: Free. Franklin's own account of his apprenticeship, his print shop and his plan for daily habits. The chapters on his arrival in Philadelphia and his early business fit Lessons 1.1 and 1.4. Ages 13 and up.
- ***Autobiography of Andrew Carnegie***: Free. Chapters 3 and 4 tell of Carnegie's first jobs as a bobbin boy and telegraph messenger. Fits Lesson 1.3. Ages 13 and up.
- **IRS: About Form W-4**: Free. The current Form W-4 and its instructions, for the practice in Lesson 1.2. Use it for practice only; fill out a real one with a parent when you take a job.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

1.1	**Vocation and Career: Work as a Calling**	3 sessions of 50 minutes
1.2	**The Paycheck: Gross Pay, Net Pay and Withholding**	3 sessions of 50 minutes
1.3	**First Jobs and Résumés: Andrew Carnegie's Climb**	3 sessions of 50 minutes
1.4	**Self-Employment Income: The Merchant Who Keeps His Own Books**	3 sessions of 50 minutes
1.5	**Benjamin Franklin's *The Way to Wealth***	3 sessions of 50 minutes

Unit 1 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give the answer in dollars, percent or hours as asked. Where a problem says "in this example," use the rates given, not current law. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **5 pts**

   Convert $19.25 an hour, 40 hours a week, 52 weeks a year, to yearly pay, and then to monthly pay.

2. **5 pts**

   A salary of $61,000 requires 50 hours a week for 50 weeks. Find the effective hourly wage.

3. **6 pts**

   A worker earns $22 an hour and works 47 hours. Find gross pay with time and a half over 40.

4. **7 pts**

   In this example, gross pay is $1,111. Federal withholding is $98, state tax $44.44, FICA 7.65%, and a health premium $62. Find net pay and the percent of gross kept.

5. **5 pts**

   Explain what Form W-4 does and what happens at tax time if too much tax was withheld during the year.

6. **5 pts**

   Who was Beardsley Ruml, and what change did the Current Tax Payment Act of 1943 make?

7. **6 pts**

   Offer A: take-home $310 a week, costs $15 a week, 22 hours including travel.
   Offer B: take-home $350 a week, costs $45 a week, 27 hours including travel.
   Find each net value and effective hourly rate.

8. **5 pts**

   Rewrite as a strong résumé line: “I worked at a camp.”

9. **6 pts**

   Tell how Andrew Carnegie advanced from bobbin boy to telegraph operator, and name two lessons for a first job.

10. **6 pts**

A house painter's revenue is $42,000 and expenses $9,500. Find net profit and estimate self-employment tax by the lesson's method.

11. **6 pts**

The painter worked 1,600 hours including estimates and travel and set aside 25% of profit for taxes. Find the after-tax effective hourly rate.

12. **5 pts**

Give two reasons the self-employed must keep separate, careful records.

13. **5 pts**

A $6.50 habit is bought 3 times a week. Find the yearly cost and the 5-year cost.

14. **5 pts**

Name Franklin's three rules in *The Way to Wealth*, with a maxim for each.

15. **6 pts**

A training program costs $9,000 and takes one year, during which you give up $28,000 of wages. Afterward pay rises by $8,000 a year. Ignoring taxes and interest, how many years of higher pay recover the full cost?

16. **17 pts**

Short essay (one or two paragraphs): Using the idea of vocation, Colossians 3:23 and at least one number from this unit, explain how a Christian young person should choose and do a first job.

ANSWER KEY

1. $\$19.25 \times 2{,}080 = \$40{,}040$; monthly $\$3{,}336.67$
2. $\$61{,}000 / 2{,}500 = \$24.40$
3. $40(22) + 7(33) = \$880 + \$231 = \$1{,}111$
4. FICA $\$84.99$; net $\$1{,}111 - 98 - 44.44 - 84.99 - 62 = \$821.57$; about 73.9% kept.
5. It tells the employer how much federal income tax to withhold. If too much was withheld, the worker receives a refund after filing a return.
6. A Macy's treasurer and chairman of the New York Fed who proposed pay-as-you-go taxation; the act made employers withhold income tax from each paycheck.
7. A: $\$295$, $\$13.41$. B: $\$305$, $\$11.30$. B pays a little more in total; A pays more per hour.
8. For example: "Led a cabin of 8 campers, ages 9–11, for two summers, planning daily activities and teaching swimming basics."
9. He moved to a messenger job, learned the town, came early, practiced the telegraph and learned to read messages by ear, winning promotion. Lessons: treat a job as a school; reliability and skill bring trust and advancement.
10. Profit $\$32{,}500$; SE tax $0.153 \times 0.9235 \times 32{,}500 = \$4{,}592.10$
11. $0.75 \times \$32{,}500 / 1{,}600 = \$15.23$
12. To know true profit and price correctly, and to report income and expenses honestly for taxes (and to prove expenses if asked).
13. $\$1{,}014$; $\$5{,}070$
14. Industry ("Diligence is the mother of good luck"), frugality ("A small leak will sink a great ship"), avoiding debt ("He that goes a borrowing goes a sorrowing").
15. Full cost $\$37{,}000$; $37{,}000 / 8{,}000 = 4.6$, so about 5 years.
16. A strong answer explains vocation as service to God and neighbor in ordinary work; uses Colossians 3:23 to show that even humble work is done heartily for the Lord; weighs real numbers (net pay, job costs, effective hourly rate, or training cost and payback); and mentions skills, reputation and honesty (Carnegie, Proverbs 22:1) as reasons a first job matters beyond its pay.

PORTFOLIO PIECE: MY WORK AND INCOME FILE

Assemble a folder that shows you are ready to earn: your career comparison with its spreadsheet and interview notes, your one-page résumé and reference list, your decoded pay stub and practice W-4, your month of self-employment books (or detailed plan), and your small-leak audit. Add a one-page cover letter to your future employer explaining what kind of worker you intend to be, with one verse and one Franklin maxim you will live by.

LOOK FOR	WHAT IT MEANS
Numbers	All calculations (yearly pay, net pay, net value, profit, effective rate, yearly leak cost) are correct, labeled and shown.
Records	Ledger pages are dated, ruled into columns, complete and honest.
Résumé	One page, free of errors, with action verbs, numbers and no private information.
Reflection	The cover letter connects vocation, Scripture and Franklin's advice to specific habits the student will practice.

1.1 Vocation and Career: Work as a Calling

OBJECTIVES

- Explain the Christian idea of vocation and why ordinary work matters.
- Convert an hourly wage into weekly, monthly and yearly income.
- Compare two career paths by training cost, time and income, and by the service each gives.

> **Warm-up.** List five jobs held by people you know. For each, write one sentence about whom that work serves and one guess at what it pays per hour. Keep the list; you will check your guesses later.

WATCH

Education as an investment | Careers and education | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 6:15

https://www.youtube.com/watch?v=SAjZj3ZwebA

> **WHEN TO WATCH**
> After the big idea, before the worked examples: Sal Khan weighs education and training as an investment.

BACKUP VIDEO

Cost vs career comparison | Careers and education | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 4:44

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

With the worked examples: a cost-versus-career comparison worked step by step.

KEY TERMS

vocation

From the Latin *vocare*, "to call": the work God calls a person to do, in a trade, a profession, a home or a church, as a way of serving others.

career

The series of jobs a person holds over a working life, usually growing in skill and responsibility.

human capital

The skills, knowledge and habits a person has built that make his or her work more valuable.

opportunity cost

The value of the best thing you give up when you choose something, such as the wages not earned during years of training.

wage and salary

A wage is pay per hour worked; a salary is a fixed yearly amount paid in equal installments.

CORE IDEAS

The story. When the Israelites built the tabernacle, the first person in Scripture said to be "filled with the spirit of God" was not a priest or a prophet but a craftsman, Bezalel, given "wisdom, and in understanding, and in knowledge, and in all manner of workmanship" to cut stones and carve wood (Exodus 31:3-5). Centuries later, in the 1520s, Martin Luther pressed the same point on a Europe that had come to think only monks and priests had a "calling." He taught that the farmer, the maid, the cobbler and the magistrate each served God and neighbor in his or her station, and the German word *Beruf*, "calling," came to mean simply an occupation. The Puritans who settled New England carried the idea with them: a man's trade was his "particular calling," to be done diligently for the good of others.

How they figured it out. The Reformers did not invent the dignity of work; they recovered it from Scripture. Adam was put in the garden "to dress it and to keep it" (Genesis 2:15) before there was any curse. Paul made tents (Acts 18:3) and told the Thessalonians to "work with your own hands" (1 Thessalonians 4:11). The test of a calling, they said, is whether it serves real needs honestly, and whether you have the gifts for it. That gave young people three questions that still work: What am I good at? What do people need? What will it take to get there?

The big idea. A career is also an economic choice. Your skills are your **human capital**, and training is an investment in it: it costs tuition and, often more importantly, the wages you give up while you train (the **opportunity cost**). To compare paths, convert pay to the same unit. A full-time year is usually counted as 40 hours a week for 52 weeks, or 2,080 hours, so a wage of $20 an hour is about $41,600 a year before taxes. A quick rule: yearly pay ≈ hourly wage × 2,000. Then add

up the whole picture: years of training, cost, starting pay, how pay grows, the hours, and the kind of service you would give.

In business today. Employers pay for skill that is scarce and useful. Electricians, nurses, welders, accountants and software developers earn more than unskilled workers because their training lets them produce more value per hour. Many of the best-paid trades are learned through paid apprenticeships, which avoid the opportunity cost of school entirely. College can be a wise investment for careers that require it and a costly one for careers that do not. The official *Occupational Outlook Handbook* from the U.S. Bureau of Labor Statistics lists the training, typical pay and job outlook of hundreds of careers; pay figures change every year, so look them up fresh.

Think it through. Income is not the only measure of a calling. A pastor, a teacher, a soldier or a mother at home may earn less than she or he could elsewhere and still be exactly where God wants them. But a wise person counts the cost honestly (Luke 14:28) and does not borrow heavily for a training that will not pay its way.

PICTURE STUDY



The Angelus, Jean-François Millet, 1857–1859 · Oil on canvas · Musée d'Orsay, Paris

Image: Wikimedia Commons, public domain

Millet, the son of Norman farmers, painted the peasants of Barbizon at their work. Here a couple digging potatoes stops at the sound of the evening church bell, the Angelus, to pray. Work and worship meet in one field.

Look closely

- Find the tools. What work were the couple doing just before the bell rang?
- Find the church on the horizon. How does the painter connect the field and the church?
- Look at the light. What time of day is it, and what does that tell you about the length of their workday?
- Look at their clothes. Are these rich people or poor? How can you tell?

Talk about it

1. How does this painting show the idea of vocation: ordinary work done before God?
2. These farmers earned little money. In what ways can work be valuable even when it pays little?
3. What does the couple's pause suggest about the limits of work?

PROJECT

Career Investigation: Two Paths Compared

You will investigate two careers that interest you, interview someone who does one of them (with a parent), and compare the two paths with real numbers and with the service each gives.

You will need

- Ledger notebook and calculator
- Free spreadsheet (Google Sheets or LibreOffice Calc)
- Internet access with a parent, for the Bureau of Labor Statistics *Occupational Outlook Handbook*
- A list of interview questions

Steps

1. Choose two careers that interest you and that require different kinds of training (for example, a skilled trade and a profession that needs a degree).
2. For each, look up the typical training, the time it takes, the usual starting pay and the median pay. Write the source and the year next to every number.
3. Estimate the cost of the training (tuition, tools, licenses) and any wages you would give up while training.
4. Build a spreadsheet with years 1 to 15 in rows and, for each career, a column of yearly income minus training cost. Add a running total column for each.
5. Find the year when the running totals cross, if they do.
6. With a parent, interview someone who works in one of the careers for 15 minutes. Ask what a normal day is like, what training mattered most, what is hardest, and whom the work serves.
7. Write a one-page comparison: the numbers, what you learned in the interview, and which path fits your gifts and the needs you see. End with what you would do next to test your choice.

Tips

- Use median pay rather than the top salaries you see advertised.

- Count apprenticeship wages as income: many trades pay you while you learn.

Check your work

- ☐ I can convert pay figures to the same yearly unit.
- ☐ My spreadsheet shows the running totals and where they cross.
- ☐ I can explain my choice by both numbers and service.

LEDGER NOTEBOOK

1. Make a table of the five jobs from the warm-up: whom each serves, your guessed wage and the real wage you found.
2. Write the yearly-pay formula and use it to convert three wages ($15, $22.50 and $35 an hour) to yearly pay.
3. Draw the two running-total lines from your project on graph paper and mark where they cross.

KEY FORMULAS

$$\text{Yearly pay} = \text{hourly wage} \times \text{hours per week} \times \text{weeks per year}$$

$$\text{Monthly pay} = \frac{\text{yearly pay}}{12}, \qquad \text{Biweekly pay} = \frac{\text{yearly pay}}{26}$$

From history. The Puritan pastor Cotton Mather published *A Christian at His Calling* in 1701, urging every Christian to have both a "general calling" to serve Christ and a "personal calling," a useful occupation by which he could do good for his neighbors and support his family.

WORKED EXAMPLES

Example 1. A warehouse job pays $18.50 an hour for 40 hours a week, 50 weeks a year (two weeks unpaid). Find the yearly, monthly and weekly gross pay.

Show solution

1. Yearly: $\$18.50 \times 40 \times 50 = \$37{,}000$.
2. Monthly: $\$37{,}000 \div 12 = \$3{,}083.33$.
3. Weekly (in a working week): $\$18.50 \times 40 = \$740$.

Answer: $37,000 a year, about $3,083 a month, $740 a working week.

Example 2. A salaried job pays $52,000 a year, but the employee usually works 48 hours a week, 50 weeks a year. What is the effective hourly wage?

Show solution

1. Hours worked: $48 \times 50 = 2{,}400$ hours.
2. Effective wage: $\$52{,}000 \div 2{,}400 = \$21.67$ per hour.
3. Compare: at 40 hours for 52 weeks (2,080 hours) the same salary would be $\$25.00$.

Answer: About $21.67 an hour. Long hours lower the true hourly rate of a salary.

Example 3. In this example, Path A is a four-year apprenticeship that pays $40,000 a year while you train and $60,000 a year after. Path B is four years of school costing $20,000 a year with no earnings, then $65,000 a year. Ignoring taxes and interest, compare the total money in hand after 10 years.

Show solution

1. Path A: $4 \times \$40{,}000 + 6 \times \$60{,}000 = \$160{,}000 + \$360{,}000 = \$520{,}000$.
2. Path B: $-4 \times \$20{,}000 + 6 \times \$65{,}000 = -\$80{,}000 + \$390{,}000 = \$310{,}000$.
3. Difference after 10 years: $\$520{,}000 - \$310{,}000 = \$210{,}000$. Path B gains $5,000 a year after that, so it would need 42 more years to catch up.

Answer: Path A leads by $210,000 after 10 years. The numbers are invented to teach the method; real careers differ, and service and calling matter too.

PRACTICE

1. Easy Convert $16 an hour, 40 hours a week, 52 weeks a year, to yearly pay.

   Show answer

   $\$16 \times 2{,}080 = \$33{,}280$

2. Easy A salary of $48,000 is paid monthly. How much is each monthly check before deductions?

   Show answer

   $4,000

3. **Easy** What does the word *vocation* mean, and where does it come from?

Show answer

A calling: the work God calls a person to do in serving others. From the Latin *vocare*, "to call."

4. **Medium** A salary of $58,500 is paid biweekly (26 checks). Find the gross amount of each check.

Show answer

$\$58{,}500 \div 26 = \$2{,}250$

5. **Medium** Use the rule "yearly pay ≈ hourly wage × 2,000" to estimate the hourly wage of a $70,000 salary. Then find the exact figure using 2,080 hours.

Show answer

About $35; exactly $\$70{,}000 \div 2{,}080 = \$33.65$

6. **Medium** Job X pays $21 an hour for 40 hours a week. Job Y pays a salary of $45,000 but needs 45 hours a week. Both are 52 weeks. Which pays more per hour actually worked?

Show answer

X: $\$21.00$. Y: $\$45{,}000 \div 2{,}340 = \$19.23$. Job X pays more per hour.

7. **Medium** Name the craftsman whom Exodus 31 describes as filled with the spirit of God, and explain what his story teaches about ordinary work.

Show answer

Bezalel. God gave him skill in workmanship for the tabernacle, showing that skilled manual work can be a holy calling, not only religious offices.

8. **Hard** A two-year training program costs $12,000 a year. During those years you give up a job paying $30,000 a year. What is the full economic cost of the training?

Show answer

$2 \times (\$12{,}000 + \$30{,}000) = \$84{,}000$ (tuition plus the opportunity cost of wages).

9. Hard After the training in problem 8, pay rises from $30,000 to $44,000 a year. Ignoring taxes and interest, how many years of the higher pay are needed to recover the full cost?

Show answer

Gain per year $14,000; $84,000 ÷ $14,000 = 6 years.

10. Hard Explain why many skilled trades can be a better financial start than a degree, and name one situation where the degree is the wiser choice.

Show answer

Paid apprenticeships avoid tuition and the opportunity cost of lost wages, so the worker has income and no debt from the start. A degree is wiser when the calling requires it (for example, nursing, engineering or teaching) and its higher pay or service justifies the cost.

11. Challenge Career A starts at $40,000 and rises $1,000 a year. Career B starts at $34,000 and rises $2,500 a year. In which year (counting the first year as year 1) does B first pay more than A, and what are the two incomes that year?

Show answer

A: $40{,}000 + 1{,}000(n-1)$; B: $34{,}000 + 2{,}500(n-1)$. B exceeds A when $1{,}500(n-1) > 6{,}000$, so $n - 1 > 4$ and $n = 6$: A $45,000, B $46,500.

COMMON MISTAKES

- Comparing an hourly wage with a yearly salary without converting to the same unit.
- Forgetting the opportunity cost of training: the wages you do not earn while in school.
- Choosing a career by pay alone, or by passion alone, without counting the cost.

> **Make it a game · Wage Ladder.** Your parent calls out an hourly wage. In twenty seconds, state the weekly, monthly and yearly income at forty hours a week, fifty-two weeks a year. Score a point for each correct figure and keep your streak. Then set a one-minute timer and list as many ordinary jobs as you can that serve a neighbor, saying why each counts as a calling.

> **Scripture.** “And whatsoever ye do, do it heartily, as to the Lord, and not unto men;” (Colossians 3:23, KJV)
>
> Paul wrote these words to servants doing humble work. Every honest job can be done for God, and that changes how carefully and cheerfully we do it.

1.2 The Paycheck: Gross Pay, Net Pay and Withholding

OBJECTIVES

- Calculate gross pay, including overtime at time and a half.
- Identify the common deductions on a pay stub and calculate net pay.
- Explain why income tax is withheld from each paycheck and what Form W-4 does.

> **Warm-up.** Guess: if you earn $500 in a week, how much do you think you actually take home? Write your guess. At the end of the lesson, compare it with your worked answer.

WATCH

Anatomy of a paycheck

Careers and Personal Finance by Khan Academy · 5:40

https://www.youtube.com/watch?v=q1a6OkQwcQI

> **WHEN TO WATCH**
> After the story of withholding, before the worked examples; pause at each line of the stub and name it.

BACKUP VIDEO

Filling Out the W-4 Form

Federal Reserve Bank of St. Louis · 4:52

https://www.youtube.com/watch?v=rcu5Bx-fneY

Before you fill out the practice W-4 in the project. The form shown is from a recent year; use the current one.

KEY TERMS

gross pay

Total earnings before anything is taken out: hours × rate, plus overtime, tips or commissions.

net pay

“Take-home pay”: what is left after taxes and other deductions.

withholding

Income tax an employer takes from each paycheck and sends to the government on the worker's behalf.

FICA

The Federal Insurance Contributions Act taxes for Social Security and Medicare, taken from wages and matched by the employer.

Form W-4

The form a new employee fills out so the employer knows how much federal income tax to withhold.

pre-tax deduction

An amount taken from gross pay before income tax is figured, such as some retirement or health-plan contributions.

CORE IDEAS

The story. Until 1943, most Americans who owed federal income tax paid the whole year's bill in a lump sum (or in quarterly installments) the following year. Then, during the Second World War, the income tax was extended to millions of workers who had never paid it, and many of them had not saved enough to pay a year's tax at once. Beardsley Ruml, treasurer of R. H. Macy's department store and chairman of the Federal Reserve Bank of New York, proposed a "pay-as-you-go" plan: employers would take the tax out of each paycheck as it was earned. Congress passed the Current Tax Payment Act in June 1943, and payroll withholding has been part of American life ever since.

How they figured it out. Ruml noticed that the trouble was not the size of the tax but its timing. A worker who earned weekly wages had to find a large sum months later, after the money was spent. Withholding matched the tax to the paycheck, so the money never reached the worker's pocket. The employer's payroll clerk used a table to figure each worker's share from his pay and the information on his withholding certificate (the ancestor of today's Form W-4). At the end of the year the worker files a return; if too much was withheld, he gets a refund, and if too little, he owes the difference.

The big idea. Your **gross pay** is what you earned. Your **net pay** is what you keep. In between come deductions: federal income tax withholding (set by your W-4 and the IRS tables), **FICA** (Social Security and Medicare), state and sometimes local income tax, and any amounts you choose, such as a retirement contribution or a share of health insurance. For many years the employee's Social Security rate has been 6.2%

and the Medicare rate 1.45% of wages (7.65% together), and the employer pays a matching 7.65%; these rates are set by law and can change, so check them. Hourly workers covered by federal wage law earn **overtime** of 1.5 times their rate for hours over 40 in a week.

In business today. Every employer runs payroll: it calculates each worker's gross pay, takes out the deductions, sends the taxes to the government, deposits the net pay, and gives the worker a **pay stub** listing every line. At the end of the year it sends each worker a Form W-2 showing total wages and taxes withheld. Learn to read your stub every payday: check your hours and rate, make sure deductions match what you chose, and keep the stubs until you check them against your W-2. A mistake caught early is easy to fix.

Try it. Keep the warm-up guess in mind. In the second worked example below, a worker earning $500 in a week takes home about $427 in this example. Many first-time workers are surprised; a budget must always be built on net pay, never gross.

PICTURE STUDY



The Parable of the Workers in the Vineyard, Salomon Koninck, About 1647–49 · Oil on panel · The State Hermitage Museum, St. Petersburg

Image: Wikimedia Commons, public domain

Salomon Koninck, an Amsterdam painter of Rembrandt's circle, painted the moment at the end of the day in Jesus' parable (Matthew 20:1-16) when the laborers are paid. Each had agreed to a penny a day, and each is paid exactly what was promised, while a clerk records it in a book.

Look closely

- Find the money and the table. Who is handing out the pay, and how is he recording it?
- Find the workers who seem unhappy. What might they be saying?
- Look at the light. Where does it fall, and what does the painter want you to notice?
- Look for the agreement: is there a paper, a book or a ledger in the scene?

Talk about it

1. The workers were paid what they agreed. Why does a clear agreement about pay matter on any job?
2. Why would a modern worker want a written pay stub instead of just a handful of coins?

3. What does the parable teach about contentment with a fair wage?

PROJECT

Decode a Pay Stub and Fill Out a Practice W-4

You will take apart a real or sample pay stub line by line, rebuild it with your own calculations, and fill out a practice Form W-4 for an imaginary first job.

You will need

- A real pay stub from a parent with personal and account numbers blacked out, or the sample in this lesson
- The current Form W-4 printed from IRS.gov (practice only)
- Ledger notebook, calculator, highlighter

Steps

1. Highlight each part of the stub: pay period, hours, rate, gross pay, each deduction, net pay, and year-to-date totals.
2. Recalculate gross pay from hours and rate, including any overtime.
3. Check the FICA lines: compute Social Security and Medicare from the wage shown and compare with the stub.
4. List every other deduction and label it as a tax, a pre-tax choice or an after-tax choice.
5. Check that gross minus all deductions equals net pay, to the cent.
6. Find the year-to-date column and estimate what the total gross and net pay will be for the full year.
7. Read the W-4 instructions and fill out a practice W-4 for a single, first-time worker with one job. Write in the margin what each step means.
8. Write a paragraph: What surprised you about the stub? What percent of gross pay was net pay?

Tips

- If you use a family stub, never share it outside your home, and black out every account and identification number.
- Year-to-date figures help you check your W-2 in January.

Check your work

- ☐ I can recompute every line of a pay stub.
- ☐ I can explain the difference between gross and net pay and give the percent kept.
- ☐ I can explain what Form W-4 tells an employer.

LEDGER NOTEBOOK

1. Draw a pay stub as a waterfall: a tall bar for gross pay, then a step down for each deduction, ending at net pay.
2. Make a table of the deductions on your stub with three columns: name, amount, and percent of gross.
3. Write in one sentence why Beardsley Ruml's pay-as-you-go plan helped workers.

KEY FORMULAS

$$\text{Gross} = r \times h + 1.5\, r \times h_{\text{OT}}$$

$$\text{FICA} = 0.062 \times \text{wages} + 0.0145 \times \text{wages} = 0.0765 \times \text{wages}$$

$$\text{Net pay} = \text{Gross} - \text{taxes} - \text{other deductions}$$

From history. Ruml's plan had one famous twist: to switch to pay-as-you-go without making people pay two years of tax in one year, Congress forgave most of the tax for one year. Treasury officials worried about the lost revenue, but withholding proved so reliable that it soon became the backbone of federal tax collection.

WORKED EXAMPLES

Example 1. A worker earns $\$17.00$ an hour and works 46 hours in one week. Find gross pay with overtime at time and a half for hours over 40.

Show solution

1. Regular pay: $40 \times \$17.00 = \$680.00$.
2. Overtime rate: $1.5 \times \$17.00 = \$25.50$. Overtime pay: $6 \times \$25.50 = \$153.00$.
3. Gross: $\$680.00 + \$153.00 = \$833.00$.

Answer: $\$833.00$

Example 2. In this example, a worker's weekly gross pay is $500.00. Federal income tax withheld is $22.00, state tax is $12.75, and FICA is 7.65%. Find net pay.

Show solution

1. FICA: $0.0765 \times \$500.00 = \$38.25$.
2. Total deductions: $\$22.00 + \$12.75 + \$38.25 = \$73.00$.
3. Net: $\$500.00 - \$73.00 = \$427.00$. The worker keeps $\$427/\$500 = 85.4\%$ of gross.

Answer: $427.00 net pay.

Example 3. In this example, a salaried worker earns $2,400 gross per biweekly check and puts 5% into a pre-tax retirement plan. Federal withholding on the remaining taxable pay is 9% in this example. FICA (7.65%) applies to the full $2,400. Find net pay.

Show solution

1. Retirement: $0.05 \times \$2{,}400 = \$120$. Taxable for income tax: $2,280.
2. Federal withholding: $0.09 \times \$2{,}280 = \$205.20$.
3. FICA: $0.0765 \times \$2{,}400 = \$183.60$.
4. Net: $\$2{,}400 - \$120 - \$205.20 - \$183.60 = \$1{,}891.20$.

Answer: $1,891.20, and $120 is saved for retirement.

PRACTICE

1. Easy Find gross pay for 32 hours at $14.50.

   Show answer

   $464.00

2. Easy Find the FICA tax (7.65%) on $600.

   Show answer

   $45.90

3. **Easy** What is the difference between gross pay and net pay?

Show answer

Gross is total earnings before deductions; net is what you take home after taxes and other deductions.

4. **Medium** A worker earns $20 an hour and works 44 hours. Find gross pay with time and a half over 40 hours.

Show answer

$40(20) + 4(30) = \$800 + \$120 = \$920$

5. **Medium** Gross pay is $1,150. Deductions: federal $96, state $41, FICA 7.65%, health insurance $55. Find net pay.

Show answer

FICA $87.98; net $\$1{,}150 - \$96 - \$41 - \$87.98 - \$55 = \$870.02$

6. **Medium** Split the 7.65% FICA on a $900 paycheck into its Social Security (6.2%) and Medicare (1.45%) parts.

Show answer

Social Security $55.80; Medicare $13.05; total $68.85

7. **Medium** From the story: what problem did the Current Tax Payment Act of 1943 solve, and how?

Show answer

Millions of new taxpayers could not pay a whole year's tax in a lump sum later. The act had employers withhold the tax from each paycheck as wages were earned.

8. **Hard** A worker wants to take home $600 a week. If total deductions are 18% of gross, what gross pay is needed?

Show answer

Net is 82% of gross: $\$600 \div 0.82 = \$731.71$

9. Hard In this example, a worker had $2,340 of federal income tax withheld during the year, and her return shows a tax of $1,980. Does she get a refund or owe? How much? Is a big refund a good thing?

Show answer

Refund of $360. A large refund means she lent the government money all year without interest; adjusting her W-4 would raise her take-home pay instead.

10. Hard A pre-tax retirement contribution of $100 lowers the income on which tax is withheld. If income-tax withholding is 12% in this example, by how much does take-home pay actually fall?

Show answer

Withholding falls by $0.12 \times \$100 = \$12$, so take-home pay falls by only $\$100 - \$12 = \$88$

11. Challenge Weekly hours are 38, 45, 40 and 50 at $18. Overtime is time and a half over 40 hours each week. Deductions are 21% of gross. Find total net pay for the four weeks.

Show answer

Regular hours $38 + 40 + 40 + 40 = 158$, overtime $5 + 10 = 15$. Gross $158(18) + 15(27) = \$2{,}844 + \$405 = \$3{,}249$; net $0.79 \times \$3{,}249 = \$2{,}566.71$

COMMON MISTAKES

- Building a budget on gross pay instead of net pay.
- Paying overtime on all hours instead of only hours over 40 in the week.
- Thinking a large tax refund is free money. It is your own money returned without interest.

> **Make it a game · Paycheck Showdown.** Your parent writes a pretend pay stub: hours worked, an hourly wage and a few deductions. Race to calculate gross pay, including overtime at time and a half, and then net pay. Your parent hides one deduction on the stub; find it and say what it pays for. Play three rounds and try to beat your own time.

1.3 First Jobs and Résumés: Andrew Carnegie's Climb

OBJECTIVES

- Explain how a first job builds skills, references and reputation.
- Write a one-page résumé and prepare for an interview.
- Compare two job offers using pay, hours, costs and growth.

> **Warm-up.** Write down three things you can already do that an employer would pay for (for example, you are punctual, you can mow a lawn well, you can use a spreadsheet). Then write one thing you would like to learn on a first job.

WATCH

Soft Skills - No-Frills Money Skills

Federal Reserve Bank of St. Louis · 8:02

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

> **WHEN TO WATCH**
> After the story of Carnegie, before you write your résumé.

KEY TERMS

résumé

A one-page summary of your contact information, skills, work, service and education, given to an employer.

reference

A person who can tell an employer about your character and work, such as a former boss, coach or teacher.

soft skills

Habits and abilities such as punctuality, honesty, courtesy, teamwork and following through, which make a worker valuable in any job.

job offer

An employer's statement of the position, pay, hours, benefits and start date.

net value of a job

Take-home pay minus the costs of holding the job, such as commuting, uniforms and meals.

CORE IDEAS

The story. In 1848 the Carnegie family arrived in Pittsburgh from Scotland, poor and in debt. Andrew, thirteen, took his first job as a bobbin boy in a cotton mill for $1.20 a week, working from dark to dark. His next job, firing a boiler and dipping spools in oil in a cellar, was worse. Then in 1850 he became a messenger boy for the telegraph office at $2.50 a week. He memorized the businesses on every street so he could deliver faster, came early to sweep the office, and practiced on the instruments before the operators arrived. Soon he could take messages by ear, a rare skill, and was promoted to operator. A railroad superintendent, Thomas Scott, noticed him and hired him as his telegrapher and secretary. That was the start of a career that ended in steel.

How they figured it out. Carnegie later wrote that his first jobs paid little, but each one taught him something an employer would pay more for. He treated the messenger job as a school: he learned the town, the businessmen and the telegraph. He was reliable, so people trusted him with more. His story shows three things every first job gives: **skills** (some you can list on a résumé), **references** (people who will speak for you), and a **reputation**, which Proverbs calls better than great riches (Proverbs 22:1).

The big idea. A résumé is a one-page advertisement for your human capital. For a first job it lists contact information, a short objective, skills (including **soft skills** shown by real examples), work and volunteer experience with dates and results, education, and "references available on request." Use action verbs (organized, served, built, trained) and numbers where you can ("mowed 6 lawns weekly for two summers"). When you compare offers, find the **net value**: take-home pay minus the costs of the job (fuel, transit, uniforms, meals), and weigh what you will learn.

In business today. Employers hiring young people care most about soft skills: arriving on time, telling the truth, working without being watched, and treating customers with courtesy. Many hire from recommendations, so your reputation at church, in sports, or with neighbors you have worked for matters. A first interview is

mostly about character: look the person in the eye, answer honestly, and ask good questions. Federal and state laws limit the hours and kinds of work for workers under 18, and your parents should approve any job you take.

Who gained? Carnegie's employers gained a tireless worker; Carnegie gained skills and a patron. Later in life he gave away most of his fortune, building more than 2,500 public libraries, because he remembered a Pittsburgh man who had opened his private library to working boys.

PICTURE STUDY



Power House Mechanic Working on Steam Pump, Lewis Hine, 1920 · Gelatin silver photograph · National Archives and Library of Congress

Image: Wikimedia Commons, public domain

Lewis Hine is best known for photographing children in mills to help end child labor. In the 1920s he turned to what he called "work portraits," showing the skill and dignity of grown men and women who ran America's machines. This mechanic became his most famous image.

Look closely

- Find the wrench. What is the mechanic doing with it?
- Look at the size of the machine compared with the man. What does that suggest about the skill needed to keep it running?
- Look at his posture and face. Is he careless or focused?
- Find the curves of the machine and of his body. How do they echo each other?

Talk about it

1. Hine wanted to show that skilled work has dignity. What skill does this picture show?
2. How might a young worker learn to do this job? What first jobs could lead here?

3. Which soft skills would an employer want in someone trusted with a machine like this?

PROJECT

Résumé, Mock Interview and Offer Comparison

You will write a real one-page résumé, practice an interview with a parent or mentor, and compare two real or realistic job offers with numbers.

You will need

- Word processor or paper
- Ledger notebook and calculator
- Two job postings for jobs open to teenagers in your area (from a store window, a newspaper or a website viewed with a parent)

Steps

1. List everything you have done that shows work: paid jobs, chores done for others, volunteer service, sports, music, school projects and skills.
2. For each item write one line beginning with an action verb and including a number.
3. Assemble a one-page résumé: name and contact (email and phone only, no home address online), objective, skills, experience, education, and "references available on request."
4. Ask two adults who know your work whether they would serve as references, and write their names and how they know you (keep this list separate).
5. Hold a 15-minute mock interview with a parent or mentor using five common questions (Tell me about yourself. Why do you want this job? Tell me about a time you solved a problem. What is your greatest weakness? What questions do you have?).
6. Choose two job postings and estimate each offer's weekly take-home pay, job costs, net value, total hours including travel, and effective hourly rate.
7. Write a half page choosing one offer and explaining why, including what you would learn.

Tips

- Keep the résumé to one page and check every word for spelling.
- Never post your home address or birth date on a résumé you share online.

Check your work

- ☐ My résumé fits on one page and every line has an action verb.
- ☐ I can answer five common interview questions honestly and clearly.
- ☐ I can compare two offers by net value and effective hourly rate.

LEDGER NOTEBOOK

1. Draw a ladder of Carnegie's first four jobs, with the pay and the main skill learned at each rung.
2. Make a two-column table comparing your two job offers line by line.
3. Write your three best soft skills and a real example that proves each.

KEY FORMULAS

$$\text{Net value of a job} = \text{take-home pay} - \text{job costs}$$

$$\text{Effective hourly rate} = \frac{\text{net value}}{\text{hours worked} + \text{hours commuting}}$$

From history. The man who opened his library to working boys was Colonel James Anderson of Allegheny, who lent books every Saturday. Carnegie wrote that Anderson's books opened a window on the world for him in the years he worked long days for small pay, and he later raised a monument to Anderson in front of a library he gave to Allegheny.

WORKED EXAMPLES

Example 1. Offer A: $15.00 an hour, 20 hours a week, a 10-minute walk. Offer B: $17.00 an hour, 20 hours a week, a 30-minute drive each way, 5 days a week, costing $4.00 a day in fuel. Assume take-home pay is 90% of gross for both. Compare the weekly net value and effective hourly rate.

Show solution

1. A: take-home $0.90 \times 20 \times \$15 = \$270$; no job costs. Time: 20 hours plus about 1.7 hours walking. Effective: $\$270 / 21.7 = \$12.44$.
2. B: take-home $0.90 \times 20 \times \$17 = \$306$; fuel $5 \times \$4 = \$20$; net value $286. Time: 20 hours plus 5 hours driving. Effective: $\$286 / 25 = \$11.44$.

Answer: B pays $16 more a week in net value, but A pays more per hour of your time ($12.44 vs $11.44). Skills and growth may decide it.

Example 2. Rewrite this résumé line with an action verb and a number: "I helped at the church food pantry."

Show solution

1. Name the action: sorted, stocked, served, organized.
2. Add a measure: how often, how many, how long.
3. Add a result if you can.

Answer: "Sorted and stocked donations every Saturday for 18 months at the Grace Church food pantry, serving about 60 families a week."

Example 3. Carnegie's pay rose from $\$1.20$ a week as a bobbin boy to $\$2.50$ a week as a messenger. What was the percent increase?

Show solution

1. Increase: $\$2.50 - \$1.20 = \$1.30$.
2. Percent: $\dfrac{1.30}{1.20} \times 100\% \approx 108\%$.

Answer: About a 108% raise: his pay more than doubled by changing jobs and learning a skill.

PRACTICE

1. Easy Name three things every résumé for a first job should include.

   Show answer

   Any three of: contact information, objective, skills, experience (work and volunteer), education, references available on request.

2. Easy A job pays $\$13.50$ an hour for 15 hours a week. Find weekly gross pay.

   Show answer

   $\$202.50$

3. Easy What are soft skills? Give two examples.

   Show answer

   Habits that make a worker valuable in any job, such as punctuality, honesty, courtesy, teamwork or following through.

4. Medium Weekly take-home pay is $240. The job costs $3.50 a day in bus fare for 4 days and $12 a week for meals. Find the weekly net value.

Show answer

$\$240 - \$14 - \$12 = \$214$

5. Medium The job in problem 4 takes 16 hours of work and 4 hours of travel a week. Find the effective hourly rate.

Show answer

$\$214 / 20 = \$10.70$ an hour

6. Medium Rewrite with an action verb and a number: “I babysat sometimes.”

Show answer

For example: “Cared for three neighborhood children, ages 2 to 8, about two evenings a month for two years.”

7. Medium From the story: how did Carnegie turn a messenger job into a promotion?

Show answer

He memorized the businesses on every street, came early, practiced on the telegraph, and learned to take messages by ear, so he was promoted to operator and noticed by Thomas Scott.

8. Hard Job X pays $14 an hour with no raise. Job Y pays $13 an hour but promises $1 more after 3 months of good work and another $1 after 6 months. Over 12 months at 15 hours a week (52 weeks), which pays more in total gross? (Use 13 weeks per quarter.)

Show answer

X: $14 \times 780 = \$10{,}920$. Y: $13(195) + 14(195) + 15(390) = 2{,}535 + 2{,}730 + 5{,}850 = \$11{,}115$. Y pays $195 more, and it rewards skill.

9. Hard Explain why Proverbs 22:1 (“A good name is rather to be chosen than great riches”) is practical advice for a first job.

Show answer

A good reputation brings references, trust, raises and future jobs; a worker known to be honest and reliable is given more responsibility, which brings more income than a single high-paying job lost through dishonesty.

10. Hard Give two honest ways to answer “What is your greatest weakness?” in an interview, and one dishonest answer to avoid.

Show answer

Name a real weakness and what you are doing about it (for example, “I am new to using a cash register, so I have been practicing making change”). Avoid fake weaknesses such as “I work too hard,” which are not honest.

11. Challenge A teen can work 10 hours a week at a store for $14 an hour (take-home 92%) with $10 a week in costs, or mow lawns at $35 a lawn, each taking 1.25 hours including travel, with $4 of fuel per lawn and no tax withheld (he sets aside 15% for taxes). How many lawns a week give the same weekly net as the store?

Show answer

Store net $0.92 \times 140 - 10 = \$118.80$. Per lawn: $0.85 \times 35 - 4 = \$25.75$. Lawns: $118.80 / 25.75 \approx 4.6$, so 5 lawns (about 6.25 hours) beat the store’s 10 hours.

COMMON MISTAKES

- Listing duties without results or numbers (“helped at the store” instead of “stocked 40 shelves each Saturday”).
- Comparing jobs by hourly wage alone and ignoring travel time and costs.
- Exaggerating on a résumé. One discovered lie can cost the job and the reference.

> **Make it a game · Interview Hot Seat.** Your parent plays an interviewer with five questions about your skills, reliability and goals. Answer each one in thirty seconds, standing up as in a real interview. Your parent scores each answer out of three for clarity. Then compare two pretend job offers by their net value, and say what Carnegie's first jobs added to his reputation.

1.4 Self-Employment Income: The Merchant Who Keeps His Own Books

OBJECTIVES

- Calculate self-employment profit and an effective hourly rate.
- Explain why self-employed workers must set aside money for taxes and how self-employment tax works.
- Keep a simple income-and-expense record for a small job.

> **Warm-up.** Think of someone you know who works for himself or herself (a plumber, a piano teacher, a farmer, a photographer). Write three jobs that person must do besides the main work, such as finding customers or keeping records.

WATCH

Tax implications of non-typical pay structures | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 4:22

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

> **WHEN TO WATCH**
> After the big idea: the pros and cons of self-employment and the self-employment tax.

BACKUP VIDEO

Advice from young entrepreneurs | Careers and personal finance | Khan Academy

Careers and Personal Finance by Khan Academy · 3:03

https://www.youtube.com/watch?v=ZL-hdqYGuOw

Optional: three young business owners describe working for themselves.

KEY TERMS

self-employed

Working for yourself rather than an employer: you set prices, find customers, pay expenses and handle your own taxes.

independent contractor

A self-employed person hired to do a job for a business, paid without withholding, and usually sent a Form 1099 instead of a W-2.

net profit

Revenue minus business expenses: the self-employed person's actual earnings.

self-employment tax

The Social Security and Medicare tax a self-employed person pays, covering both the employee and employer shares.

estimated tax

Tax paid during the year, usually quarterly, by people whose income has no withholding.

CORE IDEAS

The story. In 1532 Hans Holbein painted Georg Gisze, a young merchant from Danzig who lived and traded in the Steelyard, the London compound of the German Hanseatic merchants. Gisze worked for himself and his family firm. Around him Holbein painted the tools of his trade: letters from partners pinned to the wall, a set of scales and weights, a seal for closing letters, a pen, a box of coins, and a ledger. He was his own boss, his own clerk and his own bookkeeper. If he misjudged a price or a partner, the loss was his. If he kept poor records, no one else would catch the mistake.

How they figured it out. Merchants like Gisze learned that freedom came with duties an employee never sees. They kept careful letters and accounts because every coin they spent on goods, shipping and rent came out of their own pocket before any profit. The same is true today. Scripture's best-known self-employed workers, Aquila, Priscilla and Paul, made tents in Corinth (Acts 18:3), and Paul could say he had "coveted no man's silver" because his own hands had supplied his needs (Acts 20:33-34).

The big idea. A self-employed worker earns **revenue**, pays **expenses**, and keeps the **net profit**. Nobody withholds taxes, so he must set money aside. Besides income tax, he pays **self-employment tax** for Social Security and Medicare, covering both the employee and the employer shares. For many years the IRS method has been: take 92.35% of net profit and multiply by 15.3% (the two 7.65% shares). These percentages are set by law and can change, so check the current IRS instructions. A simple safe habit is to move a fixed share of every payment, often 25% to 30% in this

course's examples, into a separate tax savings account, and to pay **estimated taxes** during the year when required.

In business today. Millions of Americans are self-employed: tradesmen, farmers, consultants, music teachers, photographers, drivers and small shopkeepers. Businesses that hire them as **independent contractors** report the payments on Form 1099. To know whether self-employment pays, figure the **effective hourly rate**: net profit divided by all the hours spent, including finding customers, traveling, and doing the books. Many a person charging $40 an hour discovers he earns far less once expenses, unpaid hours and taxes are counted.

Think it through. Self-employment offers freedom, flexibility and a chance to build something, but it offers no paid vacation, no employer retirement match and no steady paycheck. It rewards diligence and honest records: "Be thou diligent to know the state of thy flocks" (Proverbs 27:23).

PICTURE STUDY



Portrait of the Merchant Georg Gisze, Hans Holbein the Younger, 1532 · Oil on oak panel · Gemäldegalerie, Berlin

Image: Wikimedia Commons, public domain

Holbein painted Gisze in his office at the Steelyard in London. The merchant is opening a letter addressed to him, and every object around him is a tool of trade. The carnations in the vase may refer to his engagement.

Look closely

- Find the scale. What would a merchant weigh with it?
- Find the letters pinned to the wall. Why would a merchant need so many?
- Find the seal, the pen and the box of coins. What does each tell you about his work?
- Look at his face. Does he look carefree or watchful?

Talk about it

1. Gisze was his own bookkeeper. What could go wrong if he kept poor records?
2. Which of these tools have modern versions in a self-employed person's life?
3. Why might a self-employed person feel both more free and more burdened than an employee?

> **Safety first.** Work only for people your parents know and approve, with a parent aware of where you are. Never post your address or phone number publicly, and do not take on jobs with power tools or ladders without adult supervision.

PROJECT

A Month of Self-Employment Books

You will run (or plan in detail) a small self-employed service with a parent's approval, such as yard work, pet care or tutoring, and keep a month of real records showing revenue, expenses, hours, profit and money set aside for taxes.

You will need

- Ledger notebook ruled into columns
- Calculator or spreadsheet
- Receipts for every expense
- A parent's approval and supervision for every job

Steps

1. With a parent, choose a service, set a price, and list the people you already know who might hire you. Never advertise to strangers or go to a stranger's home.
2. Rule a ledger page with columns: Date, Customer, Hours, Revenue, Expense, Description.
3. Record every job and every expense for four weeks, keeping receipts in an envelope.
4. Each time you are paid, put 20% in a separate envelope marked Taxes and Savings.
5. At the end of the month total revenue, expenses, hours (including travel and planning) and net profit.
6. Calculate your effective hourly rate before and after the set-aside.
7. Write a short report: Was your price right? What hidden hours or costs did you find? What would you change?

Tips

- If you cannot run a real business this month, make a detailed plan using realistic prices from people you know.
- Record expenses the day you spend the money; receipts disappear.

Check your work

- ☐ My ledger shows every job, expense and hour for a month.
- ☐ I can calculate net profit and my effective hourly rate.
- ☐ I can explain why the self-employed must set aside tax money.

LEDGER NOTEBOOK

1. Copy your month's ledger summary: revenue, expenses, profit, hours, effective rate.
2. List every "hidden" hour you spent that no customer paid for directly.
3. Draw Gisze's desk and label which object matches which job of a self-employed person: selling, buying, record-keeping, communicating.

KEY FORMULAS

$$\text{Net profit} = \text{revenue} - \text{business expenses}$$

$$\text{SE tax} \approx 0.153 \times (0.9235 \times \text{net profit})$$ (method and rates as in recent IRS instructions; check the current year)

$$\text{Effective hourly rate} = \frac{\text{net profit}}{\text{all hours spent}}$$

From history. The Hanseatic League's London Steelyard stood on the Thames from the 1200s until 1598. Its merchants lived under strict rules, kept careful books and traded English wool and cloth for Baltic grain, timber, furs and wax. Holbein painted several of them during his years in London.

WORKED EXAMPLES

Example 1. A piano teacher charges \$30 per half-hour lesson and teaches 24 lessons a week for 40 weeks. Her expenses for the year are \$1,800 (books, tuning, advertising). Find her net profit.

Show solution

1. Revenue: $\$30 \times 24 \times 40 = \$28{,}800$.
2. Net profit: $\$28{,}800 - \$1{,}800 = \$27{,}000$.

Answer: \$27,000

Example 2. Using the method in this lesson, estimate the teacher's self-employment tax on $27,000 of net profit.

Show solution

1. Taxable base: $0.9235 \times \$27{,}000 = \$24{,}934.50$.
2. SE tax: $0.153 \times \$24{,}934.50 = \$3{,}814.98$.

Answer: About $3,815, before any income tax. That is why she must set money aside from every payment.

Example 3. Besides the 12 teaching hours a week, the teacher spends 3 hours a week on scheduling, billing and travel. Assume she also sets aside 25% of profit for all taxes. Find her after-tax effective hourly rate over 40 weeks.

Show solution

1. Hours: $(12 + 3) \times 40 = 600$ hours.
2. After setting aside 25%: $0.75 \times \$27{,}000 = \$20{,}250$.
3. Effective rate: $\$20{,}250 / 600 = \$33.75$.

Answer: About $33.75 an hour, well below the $60 an hour her lesson price suggests.

PRACTICE

1. Easy A dog walker earns $1,240 in a month and spends $95 on supplies. Find net profit.

   Show answer

   $1,145

2. Easy What form usually reports payments to an independent contractor instead of a W-2?

   Show answer

   Form 1099.

3. **Easy** Why does a self-employed worker need to set aside money for taxes?

Show answer

No employer withholds tax from the payments, so the worker must save and pay the tax himself.

4. **Medium** Using the lesson's method, estimate the self-employment tax on a net profit of $\$10{,}000$.

Show answer

$0.153 \times 0.9235 \times 10{,}000 = \$1{,}412.96$

5. **Medium** A tutor charges $\$40$ an hour, tutors 8 hours a week, and spends 4 more hours a week on preparation and travel. Expenses are $\$20$ a week. Find the weekly effective hourly rate before tax.

Show answer

$(\$320 - \$20)/12 = \$25$ an hour

6. **Medium** A photographer sets aside 28% of each payment for taxes. She receives $\$450$, $\$1{,}200$ and $\$675$ this month. How much should be in her tax account?

Show answer

$0.28 \times \$2{,}325 = \$651$

7. **Medium** From the picture study: name three objects in Holbein's portrait and the job of a self-employed merchant each represents.

Show answer

For example: letters (communicating with partners and customers), scale (checking goods and coins honestly), seal (signing agreements), coins (handling money), pen and ledger (keeping records).

8. **Hard** A lawn business charges $\$40$ a lawn. Each lawn costs $\$5$ in fuel and wear, and the owner wants to clear $\$600$ a month after setting aside 20% of profit for taxes. How many lawns a month are needed?

Show answer

Profit per lawn $\$35$, after set-aside $\$28$. $600/28 = 21.4$, so 22 lawns.

9. Hard An employee earning $30,000 pays 7.65% FICA. A self-employed person with $30,000 of net profit pays SE tax by the lesson's method. Find both amounts and explain the difference.

Show answer

Employee: $2,295. Self-employed: $0.153 \times 27{,}705 = \$4{,}238.87$. The self-employed person pays both the worker's and the employer's shares (the 92.35% adjustment roughly allows for the employer share being a business cost).

10. Hard List three costs or losses an employee usually does not bear but a self-employed person does.

Show answer

Any three: the employer's share of payroll tax, unpaid vacation and sick days, no retirement match, buying one's own tools and insurance, unpaid hours finding customers and keeping books, customers who do not pay.

11. Challenge A craftsman wants an after-tax effective rate of $30 an hour. Each job takes 5 hours of work plus 1 hour of travel and quoting, uses $60 of materials, and he sets aside 25% of profit for taxes. What should he charge per job?

Show answer

Needed after tax: $6 \times \$30 = \$180$. Profit before set-aside: $\$180 / 0.75 = \$240$. Price: $\$240 + \$60 = \$300$

COMMON MISTAKES

- Spending the whole payment and being caught short at tax time.
- Counting only working hours and ignoring travel, quoting and bookkeeping time.
- Mixing personal and business money in one jar or account, so the true profit is unknown.

> **Make it a game · Shoebox Books.** Your parent deals ten invented receipt cards from a month of self-employment, some income and some expenses. Sort them, calculate net profit, then divide by the hours worked to find your effective hourly rate. Set aside the share for self-employment tax that the lesson shows. Beat the clock with a second deal of cards.

1.5 Benjamin Franklin's *The Way to Wealth*

OBJECTIVES

- Tell the story of Poor Richard's Almanack and Father Abraham's speech of 1758.
- Explain Franklin's maxims on industry, frugality and debt and test them against Scripture.
- Calculate the yearly and multi-year cost of small daily expenses.

> **Warm-up.** Write down everything you have spent money on in the last two weeks, even small things. Circle anything under $5. Add up the circled items.

WATCH

Benjamin Franklin and Poor Richard's Almanac | US History | Khan Academy

Khan Academy · 10:56

https://www.youtube.com/watch?v=8jV1SwpZ-W4

> **WHEN TO WATCH**
> Before the core ideas: Walter Isaacson and Sal Khan on Franklin's almanac and his rise as a printer.

KEY TERMS

almanac

A yearly booklet of calendars, weather predictions, tides and useful sayings, one of the best-selling kinds of book in colonial America.

maxim

A short, memorable saying that teaches a rule of conduct.

industry

In Franklin's use, steady hard work: diligence.

frugality

Careful, sensible use of money and goods, avoiding waste.

latte factor

A modern name for small, repeated purchases that add up to a large yearly cost.

The story. From 1732 to 1758 Benjamin Franklin, a Philadelphia printer who had arrived in the city as a runaway apprentice with little more than a Dutch dollar in his pocket, published *Poor Richard's Almanack* under the pen name Richard Saunders. Besides the weather and the tides, each year's edition sprinkled short sayings in the margins. For the last edition, in 1758, Franklin gathered the best of them into a story: a crowd waits for an auction of merchants' goods to begin and complains about high taxes and hard times, and an old man, Father Abraham, answers them with a speech made almost entirely of Poor Richard's sayings. The speech was reprinted as *The Way to Wealth* and became one of the most widely printed works of the eighteenth century.

How they figured it out. Father Abraham's argument is that the heaviest taxes are not the government's: "We are taxed twice as much by our idleness, three times as much by our pride, and four times as much by our folly." His cure has three parts. **Industry**: "Diligence is the mother of good luck," and "Lost time is never found again." **Frugality**: "Beware of little expenses; a small leak will sink a great ship." **Avoiding debt**: "He that goes a borrowing goes a sorrowing," and "The second vice is lying, the first is running in debt." Franklin practiced what he printed; his print shop prospered, and he retired from business at 42 to devote himself to science and public service.

The big idea. Franklin understood that wealth for ordinary people is built from small, repeated choices. A small leak matters because it repeats. A $4 purchase made five days a week costs $1,040 a year, and over ten years, if that money had been saved at even a modest interest rate, it would have grown to much more. The math is simple: daily amount × days per year × years. The habit is harder. Franklin ends the speech with a warning many readers skip: all this is good, but "do not depend too much upon your own industry, and frugality, and prudence, though excellent things, for they may all be blasted without the blessing of Heaven."

In business today. Financial planners still teach Franklin's rules: automate your savings so industry is not wasted, track small expenses, and avoid consumer debt. Businesses use the same idea: a factory that trims a small waste from every unit, or a store that stops a small daily loss, can save a great deal over a year. But Franklin's advice must be read with Scripture. He praised thrift as the way to wealth; Christ

warns against laying up treasure on earth (Matthew 6:19-21) and Paul says contentment is great gain (1 Timothy 6:6). Thrift is a servant, not a master.

Think it through. At the end of the story, Franklin tells a joke on his own crowd: "The people heard it, and approved the doctrine, and immediately practised the contrary," spending freely at the auction. Knowing a good rule and keeping it are different things.

PICTURE STUDY



Benjamin Franklin, Joseph Siffred Duplessis, c. 1785 · Oil on canvas · National Portrait Gallery, Smithsonian Institution, Washington

Image: Wikimedia Commons, public domain

Duplessis first painted Franklin from life in Paris in 1778, while Franklin served as America's minister to France, and made several versions afterward; this one dates from about 1785. Franklin was by then famous across Europe as a scientist and writer, yet he chose to be painted in a plain coat with no wig, the image of the frugal American Poor Richard had made him.

Look closely

- Look at his clothes. Are they rich or plain? Why might Franklin have chosen them?
- Look at his face. What does the painter suggest about his character?
- Notice what is missing: no wig, no lace, no jewels. What message does that send?

Talk about it

1. How does this portrait match the advice of *The Way to Wealth*?
2. Franklin was wealthy when this was painted. Why might a wealthy person still choose to live and dress simply?
3. Which of Franklin's maxims do you think he would most want a young person to remember?

PROJECT

The Small-Leak Audit

You will track every purchase for two weeks, find your own "small leaks," calculate their yearly cost, and test one change for a week, the way Franklin tested his own habits.

You will need

- Ledger notebook and calculator
- Receipts or a bank or card statement reviewed with a parent
- A copy of *The Way to Wealth* (free online)

Steps

1. Read *The Way to Wealth* (about twenty minutes) and copy five maxims you think are most useful.
2. For two weeks, record every purchase: date, item, amount, need or want.
3. Group purchases under $10 by type (snacks, drinks, apps, games, impulse buys).
4. Calculate the yearly cost of each group if the two-week pattern continued.
5. Choose one leak to stop for one week. Record how much you did not spend and how the change felt.
6. Make a bar graph of your yearly leak costs.
7. Write a one-page reflection connecting your results to two of Franklin's maxims and to Matthew 6:19-21 or 1 Timothy 6:6-8.

Tips

- Do not judge every small purchase as bad. The goal is to choose on purpose.
- If you have no income yet, track family purchases you influence, such as snacks or extras.

Check your work

☐ My record covers every purchase for two weeks.

☐ I can calculate the yearly cost of a small repeated expense.

- [ ] I can explain Franklin's three rules and one place where Scripture goes deeper.

LEDGER NOTEBOOK

1. Copy five of Franklin's maxims and beside each write a modern example.
2. Draw Franklin's "small leak" as a ship with one hole labeled with your largest small expense and its yearly cost.
3. Write the formula for yearly cost and use it on three of your own small purchases.

KEY FORMULAS

$$\text{Yearly cost} = \text{amount per purchase} \times \text{purchases per week} \times 52$$

$$\text{Percent of income} = \frac{\text{yearly cost}}{\text{yearly net income}} \times 100\%$$

From history. Franklin also left a famous experiment in compound growth: his will of 1790 gave £1,000 each to Boston and Philadelphia, to be lent to young tradesmen for 200 years. You will meet it again in Unit 7.

WORKED EXAMPLES

Example 1. A student buys a $\$3.75$ drink five days a week, 50 weeks a year. Find the yearly cost and the cost over four years of high school.

Show solution

1. Yearly: $\$3.75 \times 5 \times 50 = \$937.50$.
2. Four years: $4 \times \$937.50 = \$3{,}750$.

Answer: $\$937.50$ a year, $\$3{,}750$ over four years: Franklin's "small leak."

Example 2. A young worker takes home $\$2{,}600$ a month. Small expenses in a month are: snacks $\$62$, app subscriptions $\$38$, fast food $\$115$ and impulse buys $\$80$. What percent of take-home pay do they use, and what is the yearly total?

Show solution

1. Monthly total: $\$62 + \$38 + \$115 + \$80 = \$295$.
2. Percent: $\$295 / \$2{,}600 = 0.1135 \approx 11.3\%$.
3. Yearly: $12 \times \$295 = \$3{,}540$.

Answer: About 11.3% of take-home pay, or $\$3{,}540$ a year.

Example 3. Father Abraham says the people are taxed "twice as much by our idleness, three times as much by our pride, and four times as much by our folly" as by the government. If the government's tax on a family were \$1 in Franklin's figure of speech, what is the total "tax," and what fraction comes from the family's own habits?

Show solution

1. Total: $1 + 2 + 3 + 4 = 10$.
2. From their own habits: $\frac{2+3+4}{10} = \frac{9}{10}$.

Answer: Ten times the government tax, nine tenths of it self-imposed. Franklin's point: we control the largest part of our expenses.

PRACTICE

1. Easy Find the yearly cost of a \$2.50 snack bought 4 times a week for 52 weeks.

   Show answer

   \$520

2. Easy In what year was *The Way to Wealth* first published, and under what pen name did Franklin write his almanac?

   Show answer

   1758; Richard Saunders ("Poor Richard").

3. Easy Explain in your own words: "A small leak will sink a great ship."

   Show answer

   Small expenses repeated many times add up to large losses that can ruin a budget.

4. Medium A \$12.99 monthly subscription is kept for 5 years. What is the total cost?

   Show answer

   $\$12.99 \times 60 = \$779.40$

5. Medium Small expenses total $180 a month on take-home pay of $1,500. What percent is that?

Show answer

12%

6. Medium Name Franklin's three main rules in *The Way to Wealth* and give one maxim for each.

Show answer

Industry ("Diligence is the mother of good luck"), frugality ("Beware of little expenses"), avoiding debt ("He that goes a borrowing goes a sorrowing").

7. Medium From the story: how did the crowd at the auction respond to Father Abraham's speech?

Show answer

They approved of it and immediately did the opposite, spending freely at the auction.

8. Hard If $20 a week saved from small expenses is put away for 10 years without interest, how much is saved? If instead it earns interest so that the total ends up 25% higher, what is the total?

Show answer

$\$20 \times 52 \times 10 = \$10{,}400$; with growth $\$13{,}000$

9. Hard Franklin warned that industry and frugality "may all be blasted without the blessing of Heaven." Explain what he meant and how it guards against a wrong view of money.

Show answer

Hard work and thrift do not guarantee success; sickness, disaster or loss can come. Trusting in our own effort alone is pride; the wise work diligently but depend on God and hold wealth loosely.

10. Hard A family spends $11 on lunch out each workday (5 days, 50 weeks). Packing lunch costs $3.50 a day. What is the yearly saving from packing lunch?

Show answer

$(\$11 - \$3.50) \times 250 = \$1{,}875$

11. **Challenge** Write a formula for the total cost C of a habit costing a dollars, bought n times a week for y years. Use it to find how many years a \$5, three-times-a-week habit takes to cost \$3,900.

    Show answer

    $C = 52\,a\,n\,y$. $3{,}900 = 52(5)(3)y = 780y$, so $y = 5$ years.

COMMON MISTAKES

- Treating thrift as the goal of life rather than a tool for stewardship and generosity.
- Ignoring small purchases because each one seems too small to matter.
- Approving good advice and, like Franklin's crowd, not practicing it.

Make it a game · Small-Leak Duel. Each of you secretly guesses what a three-dollar daily habit costs in a year. Reveal your guesses, then calculate; the closest guess wins. Take turns naming one maxim from Poor Richard's Almanack and saying whether Scripture agrees with it. Finish by telling what Father Abraham said in the 1758 speech about debt and industry.

Scripture. "There is treasure to be desired and oil in the dwelling of the wise; but a foolish man spendeth it up." (Proverbs 21:20, KJV)

Long before Poor Richard, Proverbs taught that the wise keep a reserve while the foolish spend all they have.

UNIT 1

Work and Income

Every household budget begins with income, and nearly all income begins with work. In this unit you will think about work as a **calling** and learn how to weigh a career by its service, its training cost and its pay. You will take apart a real **paycheck**, from gross pay through withholding to net pay, and learn why Americans have had income tax taken out of every check since 1943. You will write a résumé and compare job offers the way Andrew Carnegie, a thirteen-year-old bobbin boy in 1848, learned to climb from one job to the next.

Then you will look at **self-employment**, where the worker is also the boss, the bookkeeper and the tax collector, and you will finish with Benjamin Franklin's *The Way to Wealth* (1758), the most famous short speech on work and thrift ever printed in America. By the end you will be able to turn an hourly wage into a yearly income, a gross paycheck into a net one, and a job offer into a careful comparison.

PREREQUISITES

- Can work with percents and decimals (find 7.65% of an amount, convert a percent to a decimal)
- Can multiply and divide money amounts and round to the cent
- Can use a calculator and, ideally, a simple spreadsheet

MASTERY CHECKLIST

- ☐ I can explain the idea of vocation and weigh a career by its service, training cost and income.
- ☐ I can convert between hourly, weekly, monthly and yearly pay, including overtime.
- ☐ I can read a pay stub and calculate net pay from gross pay and its deductions.
- ☐ I can write a one-page résumé and compare two job offers with numbers.
- ☐ I can figure self-employment profit, set aside money for taxes, and find an effective hourly rate.
- ☐ I can explain Franklin's main maxims about work and thrift and calculate the yearly cost of a small daily expense.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- ***The Way to Wealth*, by Benjamin Franklin (1758)**: Free on Project Gutenberg. Father Abraham's speech made of Poor Richard's sayings on industry, frugality and debt. Read the whole thing (about twenty minutes) with Lesson 1.5. Ages 12 and up.
- ***Autobiography of Benjamin Franklin***: Free. Franklin's own account of his apprenticeship, his print shop and his plan for daily habits. The chapters on his arrival in Philadelphia and his early business fit Lessons 1.1 and 1.4. Ages 13 and up.
- ***Autobiography of Andrew Carnegie***: Free. Chapters 3 and 4 tell of Carnegie's first jobs as a bobbin boy and telegraph messenger. Fits Lesson 1.3. Ages 13 and up.
- **IRS: About Form W-4**: Free. The current Form W-4 and its instructions, for the practice in Lesson 1.2. Use it for practice only; fill out a real one with a parent when you take a job.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

1.1	**Vocation and Career: Work as a Calling**	3 sessions of 50 minutes
1.2	**The Paycheck: Gross Pay, Net Pay and Withholding**	3 sessions of 50 minutes
1.3	**First Jobs and Résumés: Andrew Carnegie's Climb**	3 sessions of 50 minutes
1.4	**Self-Employment Income: The Merchant Who Keeps His Own Books**	3 sessions of 50 minutes
1.5	**Benjamin Franklin's *The Way to Wealth***	3 sessions of 50 minutes

Unit 1 Test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give the answer in dollars, percent or hours as asked. Where a problem says "in this example," use the rates given, not current law. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **5 pts**

   Convert $19.25 an hour, 40 hours a week, 52 weeks a year, to yearly pay, and then to monthly pay.

2. **5 pts**

   A salary of $61,000 requires 50 hours a week for 50 weeks. Find the effective hourly wage.

3. **6 pts**

   A worker earns $22 an hour and works 47 hours. Find gross pay with time and a half over 40.

4. **7 pts**

   In this example, gross pay is $1,111. Federal withholding is $98, state tax $44.44, FICA 7.65%, and a health premium $62. Find net pay and the percent of gross kept.

5. **5 pts**

   Explain what Form W-4 does and what happens at tax time if too much tax was withheld during the year.

6. **5 pts**

   Who was Beardsley Ruml, and what change did the Current Tax Payment Act of 1943 make?

7. **6 pts**

   Offer A: take-home $310 a week, costs $15 a week, 22 hours including travel.
   Offer B: take-home $350 a week, costs $45 a week, 27 hours including travel.
   Find each net value and effective hourly rate.

8. **5 pts**

   Rewrite as a strong résumé line: “I worked at a camp.”

9. **6 pts**

   Tell how Andrew Carnegie advanced from bobbin boy to telegraph operator, and name two lessons for a first job.

10. **6 pts**

A house painter's revenue is $42,000 and expenses $9,500. Find net profit and estimate self-employment tax by the lesson's method.

11. **6 pts**

The painter worked 1,600 hours including estimates and travel and set aside 25% of profit for taxes. Find the after-tax effective hourly rate.

12. **5 pts**

Give two reasons the self-employed must keep separate, careful records.

13. **5 pts**

A $6.50 habit is bought 3 times a week. Find the yearly cost and the 5-year cost.

14. **5 pts**

Name Franklin's three rules in *The Way to Wealth*, with a maxim for each.

15. **6 pts**

A training program costs $9,000 and takes one year, during which you give up $28,000 of wages. Afterward pay rises by $8,000 a year. Ignoring taxes and interest, how many years of higher pay recover the full cost?

16. **17 pts**

Short essay (one or two paragraphs): Using the idea of vocation, Colossians 3:23 and at least one number from this unit, explain how a Christian young person should choose and do a first job.

ANSWER KEY

1. $\$19.25 \times 2{,}080 = \$40{,}040$; monthly $\$3{,}336.67$
2. $\$61{,}000 / 2{,}500 = \$24.40$
3. $40(22) + 7(33) = \$880 + \$231 = \$1{,}111$
4. FICA $\$84.99$; net $\$1{,}111 - 98 - 44.44 - 84.99 - 62 = \$821.57$; about 73.9% kept.
5. It tells the employer how much federal income tax to withhold. If too much was withheld, the worker receives a refund after filing a return.
6. A Macy's treasurer and chairman of the New York Fed who proposed pay-as-you-go taxation; the act made employers withhold income tax from each paycheck.
7. A: $\$295$, $\$13.41$. B: $\$305$, $\$11.30$. B pays a little more in total; A pays more per hour.
8. For example: "Led a cabin of 8 campers, ages 9–11, for two summers, planning daily activities and teaching swimming basics."
9. He moved to a messenger job, learned the town, came early, practiced the telegraph and learned to read messages by ear, winning promotion. Lessons: treat a job as a school; reliability and skill bring trust and advancement.
10. Profit $\$32{,}500$; SE tax $0.153 \times 0.9235 \times 32{,}500 = \$4{,}592.10$
11. $0.75 \times \$32{,}500 / 1{,}600 = \$15.23$
12. To know true profit and price correctly, and to report income and expenses honestly for taxes (and to prove expenses if asked).
13. $\$1{,}014$; $\$5{,}070$
14. Industry ("Diligence is the mother of good luck"), frugality ("A small leak will sink a great ship"), avoiding debt ("He that goes a borrowing goes a sorrowing").
15. Full cost $\$37{,}000$; $37{,}000 / 8{,}000 = 4.6$, so about 5 years.
16. A strong answer explains vocation as service to God and neighbor in ordinary work; uses Colossians 3:23 to show that even humble work is done heartily for the Lord; weighs real numbers (net pay, job costs, effective hourly rate, or training cost and payback); and mentions skills, reputation and honesty (Carnegie, Proverbs 22:1) as reasons a first job matters beyond its pay.

PORTFOLIO PIECE: MY WORK AND INCOME FILE

Assemble a folder that shows you are ready to earn: your career comparison with its spreadsheet and interview notes, your one-page résumé and reference list, your decoded pay stub and practice W-4, your month of self-employment books (or detailed plan), and your small-leak audit. Add a one-page cover letter to your future employer explaining what kind of worker you intend to be, with one verse and one Franklin maxim you will live by.

LOOK FOR	WHAT IT MEANS
Numbers	All calculations (yearly pay, net pay, net value, profit, effective rate, yearly leak cost) are correct, labeled and shown.
Records	Ledger pages are dated, ruled into columns, complete and honest.
Résumé	One page, free of errors, with action verbs, numbers and no private information.
Reflection	The cover letter connects vocation, Scripture and Franklin's advice to specific habits the student will practice.

UNIT 2

Budgeting, Saving and Giving

A budget is a plan that tells your money where to go before it is gone. In this unit you will build a **zero-based budget** from real take-home pay, the way a sixteen-year-old John D. Rockefeller recorded every cent in his little Ledger A in 1855. You will set up an **emergency fund** on Joseph's pattern of storing up in the good years, and you will plan your **giving** on the pattern Paul taught the Corinthians: purposed in the heart, not grudging, cheerful.

Then you will look at the hardest part of any budget: the thousand small decisions to spend or not to spend. You will learn to weigh **opportunity cost**, **cost per use** and the true cost of ownership, and you will read a Puritan pastor's advice on **contentment**. The unit ends with John Wesley's sermon "The Use of Money" (1760), whose three rules, gain all you can, save all you can, give all you can, are as good a summary of personal finance as any ever written.

PREREQUISITES

- Can calculate net pay from gross pay (Unit 1)
- Can find percents of amounts and percent change
- Can build a simple table in a spreadsheet with sums

MASTERY CHECKLIST

- ☐ I can build a zero-based monthly budget from net income and track planned against actual amounts.
- ☐ I can turn irregular yearly expenses into monthly savings amounts.
- ☐ I can size an emergency fund and plan how many months it will take to build.
- ☐ I can plan regular giving and explain the biblical pattern of generous, cheerful giving.
- ☐ I can compare purchases by unit price, cost per use and total cost of ownership.
- ☐ I can explain Wesley's three rules and apply them to my own budget.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **John Wesley, "The Use of Money" (Sermon 50)**: Free from the Wesley Center at Northwest Nazarene University. Read the whole sermon (about 30 minutes) with Lesson 2.5. Ages 13 and up.
- **Federal Reserve Bank of St. Louis: Econ Lowdown**: Free online lessons from a Federal Reserve bank, including budgeting and saving modules for high school. Fits the whole unit.
- ***Pay Day* (family board game, Winning Moves)**: Ages 8 and up, 2–4 players. A month of bills, mail and paydays; a light way to talk about budgeting with younger siblings. Fits Lesson 2.1.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

2.1	**The Budget: Rockefeller's Ledger A**	3 sessions of 50 minutes
2.2	**Emergency Funds: Joseph's Storehouses**	3 sessions of 50 minutes
2.3	**Tithing and Generosity: The Cheerful Giver**	3 sessions of 50 minutes
2.4	**Spending Decisions and Contentment**	3 sessions of 50 minutes
2.5	**Wesley's "The Use of Money": Gain, Save, Give**	3 sessions of 50 minutes

Unit 2 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars or percents. Where a problem says "in this example," use the figures given. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **6 pts**

   Net income is $2,650. Planned: giving $265, saving $300, rent $900, food $340, transportation $280, phone $40, utilities $120. How much remains to make the budget zero-based?

2. **5 pts**

   Yearly expenses of $540, $1,080 and $360 are covered by sinking funds. What is the total monthly set-aside?

3. **6 pts**

   Budgeted vs actual: food $350/$381; fuel $160/$149; clothing $60/$92. Find each variance and the total, and say what to do about it.

4. **5 pts**

   Apply 50/30/20 to take-home pay of $3,150.

5. **6 pts**

   Essential monthly expenses are $2,340. Find 3- and 6-month emergency funds. With $1,200 saved and $390 saved each month, how long to reach the 3-month fund?

6. **5 pts**

   Name Joseph's three steps that every emergency fund still needs.

7. **5 pts**

   Explain why an emergency fund should be liquid and insured, and why using a credit card instead is costly.

8. **6 pts**

   Gross pay is $4,100, net $3,280. Find a tithe on each, and the yearly difference.

9. **5 pts**

   State Paul's three principles of giving from 1 and 2 Corinthians.

10. **6 pts**

    Detergent A: 92 oz for $11.97. Detergent B: 150 oz for $18.49. Find each unit price and the better buy.

11. **6 pts**

    A $220 pair of work boots lasts 5 years; a $70 pair lasts 1 year. Compare cost per year and say which is the wiser buy.

12. **5 pts**

    At $14.40 take-home pay per hour, how many hours of work is a $612 purchase?

13. **5 pts**

    What did Jeremiah Burroughs mean by calling contentment a “rare jewel,” and why does Paul say he “learned” it?

14. **6 pts**

    Living costs stay at $32,000. Income is $40,000 one year and $52,000 three years later. Find the percent available to save and give in each year.

15. **6 pts**

    State Wesley’s three rules and one limit he put on each.

16. **17 pts**

    Short essay (one or two paragraphs): A friend says, “I’ll start giving and saving when I make more money.” Using Joseph, Paul’s teaching, Wesley’s example and at least one calculation, explain why the time to begin is now.

ANSWER KEY

1. Assigned $2,245; remaining $405
2. $\$1{,}980/12 = \$165$
3. -31, $+11$, -32; total $-\$52$. Cover it from a want line and adjust next month's plan.
4. $1,575/$945/$630
5. $7,020; $14,040; $(7{,}020 - 1{,}200)/390 \approx 14.9$, so 15 months.
6. Save a fixed share in good times; keep the store close and available (liquid); use it only for the emergency it was meant for.
7. It must be available at full value when needed, even if markets fall; a credit card adds high interest, so the emergency costs much more than its price.
8. $410; $328; $984 a year
9. Regularly (each first day of the week), proportionally (as God has prospered), and willingly and cheerfully (2 Corinthians 9:7).
10. A $0.130/oz; B $0.123/oz; B is cheaper per ounce.
11. $44 vs $70 a year; the better boots, if the money is available without debt.
12. 42.5 hours
13. Contentment is precious and uncommon; it is a skill learned by practice and trust in God, not a natural mood.
14. $8{,}000/40{,}000 = 20\%$; $20{,}000/52{,}000 \approx 38.5\%$
15. Gain all you can (without harming health, soul or neighbor); save all you can (by cutting needless expense, not by hoarding); give all you can (after providing what your household needs).
16. A strong answer explains that habits formed with small incomes carry over (Rockefeller's Ledger A, Luke 16:10); Joseph saved in the good years before the need; Paul asked for regular, proportional giving "as God hath prospered"; Wesley's fixed living costs show that a plan set early turns raises into giving; and a calculation (for example, lifestyle creep versus a capped lifestyle, or an emergency fund built month by month) shows that waiting usually means spending grows to match income.

PORTFOLIO PIECE: MY HOUSEHOLD MONEY PLAN

Assemble your zero-based budget with a month of planned and actual figures, your emergency-fund plan and rule, your year's giving plan with the charity analysis, your smart-buyer comparison and 30-day wait record, and your Wesley ten-year spreadsheet. Add a one-page letter to yourself to open in ten years, describing the standard of living you intend to keep and how you will save and give.

LOOK FOR	WHAT IT MEANS
Budget	The budget is zero-based, uses net income, includes sinking funds and giving, and shows variances with an adjustment.
Saving	The emergency-fund goal is correctly sized from essential expenses with a realistic schedule and a clear rule.
Giving	The giving plan is specific and regular, and the charity analysis is calculated correctly.
Judgment	The smart-buyer work and the Wesley plan show careful arithmetic and thoughtful reflection on contentment and stewardship.

2.1 The Budget: Rockefeller's Ledger A

OBJECTIVES

- Build a zero-based monthly budget from net income.
- Turn irregular yearly expenses into monthly amounts.
- Compare planned and actual spending and adjust the plan.

> **Warm-up.** Without looking anything up, write down what you think your family spends in a month on groceries, electricity and fuel. Later, if your parents are willing, compare your guesses with the real numbers.

WATCH

Budgeting Basics!

Two Cents · 5:13

https://www.youtube.com/watch?v=sVKQn2I4HDM

> **WHEN TO WATCH**
> After the story of Ledger A, before the worked examples.

Note: Two Cents (PBS) sometimes uses light humor; the last minute is a promotion for another PBS show and can be skipped.

BACKUP VIDEO

Budgeting and the 50:30:20 rule | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 3:11

https://www.youtube.com/watch?v=LKxOamnP8J4

With worked example 3: the 50/30/20 guideline explained.

KEY TERMS

budget

A written plan for how income will be divided among giving, saving and spending for a period, usually a month.

zero-based budget

A budget in which every dollar of income is assigned a job, so income minus all planned uses equals zero.

fixed and variable expenses

Fixed expenses stay the same each month (rent, insurance); variable expenses change (groceries, fuel, entertainment).

sinking fund

Money set aside each month for a known future expense, such as car repairs, gifts or yearly insurance.

variance

The difference between the budgeted amount and the actual amount spent.

CORE IDEAS

The story. In September 1855, a sixteen-year-old named John D. Rockefeller walked the streets of Cleveland for six weeks looking for work until a produce firm, Hewitt & Tuttle, hired him as an assistant bookkeeper. He was not paid at all for his first three months. Even before that, he had bought a small red notebook for a few cents and named it Ledger A. In it he wrote down every cent he received and every cent he spent: his board, a pair of gloves, the collection plate at the Erie Street Baptist Mission Church, a gift to the poor, a missionary offering. He kept Ledger A all his life and later showed it to young people, saying he had learned from it to handle money carefully.

How they figured it out. Rockefeller's habit was simple: write it down, every time. A ledger tells you what happened; a budget tells you what you intend to happen. Put the two together and you can see where your plan and your life differ. Joseph planned before the harvest (Genesis 41:34-36), and the builder in Jesus' parable "sitteth not down first, and counteth the cost" (Luke 14:28). The business world uses the same tool: every company of any size prepares a yearly budget and compares it month by month with actual results.

The big idea. A **zero-based budget** starts with net (take-home) income and gives every dollar a job until nothing is left unassigned: income − giving − saving − spending = 0. List **fixed expenses** first, then **variable** ones. Turn irregular costs into monthly **sinking funds**: a $600 yearly insurance bill becomes $50 a month. One common guideline, the 50/30/20 split, puts about 50% of take-home pay toward needs, 30% toward wants and 20% toward saving and paying down debt; Christian families often begin with giving and adjust the rest. At the end of each month, compute the **variance** for each line and adjust next month's plan.

In business today. Free tools make budgeting easier than it was for Rockefeller: a spreadsheet, a bank's spending categories, or a paper envelope for each budget line. The method matters more than the tool. Many families find that the budget conversation itself, held calmly once a month, prevents most money quarrels. A budget is not a cage; it is a plan that lets you spend on what matters most without guilt, because the bills, the savings and the giving are already provided for.

Think it through. Rockefeller became the richest man of his age and was criticized for the hard methods of Standard Oil; his habit of careful records and regular giving, begun at sixteen, is still worth copying. A good habit can serve a good or a bad purpose; what we do with it is the test of character.

PICTURE STUDY



The Moneylender and His Wife, Quentin Matsys, 1514 · Oil on panel · Musée du Louvre, Paris

Image: Wikimedia Commons, public domain

Matsys, a painter of Antwerp, showed a moneychanger at work, weighing coins to test their true value. His wife's prayer book lies open beside the money, and the painting has been read for five hundred years as a question about where our attention goes.

Look closely

- Find the balance. What is the man weighing, and why does a moneychanger need to know exact weight?
- Find the prayer book. Where is the woman looking?
- Find the small round mirror on the table. What does it reflect?
- Look at the shelf behind them. What records might be kept there?

Talk about it

1. The man counts carefully. What in this picture is like keeping a budget?
2. The woman's eyes have left her prayer book. What might the painter be saying about money and the heart?
3. How can a budget help keep money in its proper place in a household?

PROJECT

A Real Zero-Based Budget for One Month

You will build a zero-based budget in a spreadsheet for real income (your own, or a realistic first-job income from Unit 1), track every dollar for a month, and compare plan with actual.

You will need

- Free spreadsheet (Google Sheets or LibreOffice Calc)
- Ledger notebook
- Receipts, or a statement reviewed with a parent
- Your net-pay calculation from Lesson 1.2

Steps

1. Write your monthly net income at the top. If you have little income, use the net pay from a realistic first job and budget as if you were living on your own (with a parent's help on real rents and prices).
2. List fixed expenses, then variable expenses, then sinking funds for irregular costs (yearly costs ÷ 12).
3. Put giving and saving lines first. Assign every remaining dollar until the total is exactly zero.
4. Add columns: Budgeted, Actual, Variance (=Budgeted − Actual).
5. Track real spending for four weeks (or, for a pretend budget, use your family's real grocery and utility costs as the actual figures, with permission).
6. At month's end, compute each variance and the total. Shade overspent lines.
7. Write a half page: Which lines were hardest to keep? What will you change next month? What did you learn about your family's real costs?

Tips

- Round planned amounts to whole dollars; it makes tracking easier.
- If a budget line runs over, move money from a want, not from giving or the emergency fund.

Check your work

- ☐ My budget totals exactly zero.
- ☐ I recorded actual amounts and calculated each variance.
- ☐ I can explain one specific change for next month.

LEDGER NOTEBOOK

1. Draw a pie chart of your budget by line with percents.
2. Copy Hannah's budget and mark each line F (fixed), V (variable) or S (sinking fund).
3. Write three things Rockefeller recorded in Ledger A and what each tells you about his priorities.

KEY FORMULAS

$$\text{Net income} - \text{giving} - \text{saving} - \text{spending} = 0$$

$$\text{Monthly sinking fund} = \frac{\text{yearly cost}}{12}$$

$$\text{Variance} = \text{budgeted} - \text{actual}$$

From history. Rockefeller's first wage, when it finally came at the end of 1855, was $50 for more than three months of work. Even that year, Ledger A shows regular small gifts to his church and to charities, a habit he continued all his life.

WORKED EXAMPLES

Example 1. In this example, Hannah takes home $2,800 a month. Her plan: giving 10%, saving 15%, rent $850, groceries $320, transportation $260, phone $45, insurance (yearly $720), utilities $110. How much is left for clothing, entertainment and other variable spending?

Show solution

1. Giving: $0.10 \times \$2{,}800 = \$280$. Saving: $0.15 \times \$2{,}800 = \$420$.
2. Insurance sinking fund: $\$720/12 = \$60$.
3. Total assigned: $280 + 420 + 850 + 320 + 260 + 45 + 60 + 110 = \$2{,}345$.
4. Remaining: $\$2{,}800 - \$2{,}345 = \$455$, which she assigns to clothing, entertainment and miscellaneous until the total is zero.

Answer: $455 to assign, for example $100 clothing, $120 entertainment, $85 gifts and $150 miscellaneous.

Example 2. Hannah's actual spending in the month: groceries $368, transportation $231, entertainment $165 (budgets $320, $260, $120). Find each variance and the net effect.

Show solution

1. Groceries: $320 - 368 = -\$48$ (over).
2. Transportation: $260 - 231 = +\$29$ (under).
3. Entertainment: $120 - 165 = -\$45$ (over).
4. Net: $-48 + 29 - 45 = -\$64$.

Answer: She overspent by $64 in these lines and must cover it from another line (not from her giving or emergency savings) and adjust next month.

Example 3. Using the 50/30/20 guideline on take-home pay of $3,400, how much goes to needs, wants and saving? If a family first gives 10% and then applies 50/30/20 to the remainder, what are the amounts?

Show solution

1. Plain 50/30/20: needs $1,700, wants $1,020, saving $680.
2. Giving first: $340; remainder $3,060.
3. Then: needs $1,530, wants $918, saving $612.

Answer: $1,700/$1,020/$680; or with giving first, $340 giving, then $1,530/$918/$612.

PRACTICE

1. Easy A yearly car registration costs $186. What monthly sinking fund covers it?

   Show answer

   $15.50

2. Easy Classify as fixed or variable: rent, groceries, phone plan, fuel, insurance premium, clothing.

   Show answer

   Fixed: rent, phone plan, insurance premium. Variable: groceries, fuel, clothing.

3. Easy What makes a budget “zero-based”?

Show answer

Every dollar of income is assigned a job, so income minus all planned uses equals zero.

4. Medium Net income is $2,150. Assigned so far: $1,874. How much remains to assign? If $2,240 had been assigned, what would that mean?

Show answer

$276; assigning $2,240 would overspend by $90, so the plan must be cut.

5. Medium Budgeted vs actual: food $300/$342, fuel $150/$128, fun $80/$95. Find each variance and the total.

Show answer

−$42, +$22, −$15; total −$35 (overspent).

6. Medium Apply 50/30/20 to $2,600.

Show answer

Needs $1,300, wants $780, saving $520

7. Medium From the story: name two kinds of entries Rockefeller made in Ledger A, and explain why the habit mattered more than the amounts.

Show answer

Living costs such as board and clothing, and gifts to church, missions and the poor. The habit of recording everything taught him to know exactly where his money went and to plan, which mattered for the rest of his life.

8. Hard Yearly irregular expenses: gifts $480, car repairs $900, insurance $1,140, clothing $600. What total monthly sinking fund covers them, and what percent is that of $3,000 net income?

Show answer

$3,120/12 = $260; about 8.7%

9. Hard A worker's net pay rises from $2,500 to $2,800 a month. She keeps all spending the same and splits the raise: half to saving, a tenth to giving, the rest to a car fund. Find each amount.

Show answer

Raise $300: saving $150, giving $30, car fund $120

10. Hard Explain why "saving what is left over at the end of the month" usually fails, and what a zero-based budget does instead.

Show answer

Spending tends to expand to use whatever money is available, so little is left. A zero-based budget assigns saving and giving first, as planned lines, so they happen before discretionary spending.

11. Challenge Rent must be no more than 30% of net income, and Hannah also wants $1,200 a month for all other costs plus 25% of income for giving and saving. What is the smallest net income that satisfies her plan if rent is $900, and does the 30% rule hold?

Show answer

Let I: $I = 900 + 1{,}200 + 0.25I$, so $0.75I = 2{,}100$ and $I = \$2{,}800$. Rent is $900/2{,}800 = 32\%$, slightly over 30%, so she needs about $3,000 of income or cheaper rent.

COMMON MISTAKES

- Budgeting from gross pay instead of take-home pay.
- Forgetting irregular expenses, then raiding savings when they come.
- Making a budget once and never comparing it with actual spending.

> **Make it a game · Zero Budget Race.** Your parent reads a pretend monthly net income and a list of expenses, including one yearly bill. Turn the yearly bill into a monthly sinking fund amount, then assign every dollar so the leftover is exactly zero. Beat the clock in three minutes. Afterward, your parent names a surprise cost and you say which line you would trim.

2.2 Emergency Funds: Joseph's Storehouses

OBJECTIVES

- Explain the purpose of an emergency fund and size one from essential expenses.
- Plan how many months it will take to build the fund.
- Calculate the cost of meeting an emergency with debt instead of savings.

> **Warm-up.** List three unexpected expenses that have happened to your family or people you know (a broken appliance, a car repair, a medical bill). Guess what each cost.

WATCH

Why You NEED an Emergency Fund!

Two Cents · 7:05

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

> **WHEN TO WATCH**
> After the story of Joseph, before sizing your own fund.

BACKUP VIDEO

Paying yourself first | Budgeting and saving | Financial Literacy | Khan Academy

Khan Academy · 3:58

https://www.youtube.com/watch?v=k-RTEIaYvAg

Optional: why saving should come first in a budget.

KEY TERMS

emergency fund
Savings kept for true emergencies such as job loss, medical bills or urgent repairs, not for planned purchases.

essential expenses
The costs a household cannot avoid: housing, food, utilities, transportation, insurance and minimum debt payments.

liquidity
How quickly and safely an asset can be turned into cash without loss.

high-yield savings account
An insured savings account that pays more interest than a typical account while keeping money available.

pay yourself first

Setting aside savings as soon as you are paid, before spending on anything else.

CORE IDEAS

The story. Pharaoh dreamed of seven fat cows eaten by seven lean ones, and seven full ears of grain swallowed by seven thin ears. Joseph, brought up from prison, told him that seven years of great plenty would be followed by seven of famine, and he gave Pharaoh a plan: appoint officers and "take up the fifth part of the land of Egypt in the seven plenteous years," storing grain in the cities, "and that food shall be for store to the land against the seven years of famine" (Genesis 41:34-36). When the famine came, "all countries came into Egypt to Joseph for to buy corn" (Genesis 41:57), including his own brothers.

How they figured it out. Joseph's plan had three parts that every emergency fund still needs. He saved a **fixed share** (one fifth) during good years, so saving did not depend on mood. He kept the store **close and available**, in the cities where people lived. And he **did not spend it** on anything but the famine it was meant for. The ant in Proverbs does the same: she "provideth her meat in the summer, and gathereth her food in the harvest" (Proverbs 6:8).

The big idea. An **emergency fund** is money set aside for the unplanned: a lost job, a medical bill, a car that will not start. A common first goal is $1,000; a full fund is usually figured as 3 to 6 months of **essential expenses** (more for a single earner or uncertain work). Keep it **liquid** and safe, in an insured savings account, not invested in stocks that might be down when you need them. Build it by paying yourself first: an automatic transfer every payday. Without a fund, an emergency usually goes on a credit card, and at a typical card rate the emergency costs far more than its price.

In business today. Businesses keep cash reserves for the same reason: a slow season, a broken machine, a customer who pays late. Banks are required to hold capital against losses. Families who keep a few months of expenses in savings can lose a job, take time to find the right next one, and avoid debt. Survey after survey finds that many households could not cover a modest unexpected bill from savings; you can be different, starting with your first paycheck.

Try it. Joseph saved 20% of every harvest. If you save 20% of a $400 monthly income from a part-time job, you will have $1,000 in 12.5 months. Write down where you will keep it and the rule for what counts as an emergency.

PICTURE STUDY



Joseph, Overseer of Pharaoh's Granaries, Lawrence Alma-Tadema, 1874 · Oil on panel · Dahesh Museum of Art, New York

Image: Wikimedia Commons, public domain

Alma-Tadema studied Egyptian objects in the British Museum to paint ancient rooms as accurately as he could. He imagines Joseph as Pharaoh's chief steward, hearing a report on the stores of grain from his scribe.

Look closely

- Find Joseph. How does the painter show that he is in charge?
- Find the scribe. What is he recording, and why would Joseph need a record?
- Find the grain. Where is it stored?
- Look at the walls. What might the paintings record?

Talk about it

1. Joseph saved during the good years. Why is the time to build an emergency fund before the emergency?
2. Joseph kept careful records. Why should an emergency fund have its own account or record?
3. Joseph's store fed people from other countries too. How can a family with savings help others in hard times?

PROJECT

Size and Start an Emergency Fund

You will find a household's essential expenses, set a fund goal, write a rule for what counts as an emergency, and start (or plan) your own fund with a schedule.

You will need

- Ledger notebook and calculator
- Your budget from Lesson 2.1
- Optional, with a parent: the family's monthly bills

Steps

1. List essential monthly expenses for your Lesson 2.1 budget (or, with permission, for your family).
2. Compute 3-month and 6-month fund goals, and a starter goal of $1,000 (or one month of essentials if that is smaller for you).
3. Decide where the fund would be kept and why (insured, liquid, separate from spending money).
4. Write a one-paragraph emergency rule: three things that count and three that do not.
5. Choose a monthly or per-paycheck saving amount and build a table of month-by-month balances until each goal is reached.
6. Interview a parent or grandparent about an emergency they faced and how they paid for it.
7. Write a half page comparing your plan with Joseph's three steps.

Tips

- Keep the fund boring: insured savings, not investments.
- If you dip into the fund, the next budget line is "refill the fund."

Check your work

☐ I can calculate an emergency-fund goal from essential expenses.

☐ My table shows when I will reach each goal.

- [ ] My emergency rule clearly separates emergencies from wants.

LEDGER NOTEBOOK

1. Draw Joseph's seven-and-seven years as a bar graph: grain stored rising for seven years and falling for seven.
2. Copy your month-by-month fund table and mark the starter, 3-month and 6-month goals.
3. Write your emergency rule in a box at the top of a page.

KEY FORMULAS

$$\text{Fund goal} = \text{months} \times \text{essential monthly expenses}$$

$$\text{Months to build} = \frac{\text{goal} - \text{current savings}}{\text{monthly saving}}$$

WORKED EXAMPLES

Example 1. A young couple's essential monthly expenses are: rent $1,150, food $520, utilities $190, transportation $310, insurance $240, minimum debt payments $140. Find a 3-month and a 6-month emergency fund.

Show solution

1. Essential total: $1{,}150 + 520 + 190 + 310 + 240 + 140 = \$2{,}550$.
2. 3 months: $3 \times \$2{,}550 = \$7{,}650$.
3. 6 months: $6 \times \$2{,}550 = \$15{,}300$.

Answer: $7,650 to $15,300.

Example 2. They have $1,800 saved and can save $450 a month. How long until they reach the 3-month fund?

Show solution

1. Remaining: $\$7{,}650 - \$1{,}800 = \$5{,}850$.
2. Months: $\$5{,}850 / \$450 = 13$.

Answer: 13 months.

Example 3. In this example, a $1,200 car repair is put on a credit card at 24% APR, and the owner pays $50 a month. Interest is charged monthly at $24\%/12 = 2\%$. How much is owed after the first month's interest and payment, and roughly how much interest is paid in the first year?

Show solution

1. Month 1 interest: $0.02 \times \$1{,}200 = \$24$. Balance after payment: $\$1{,}200 + \$24 - \$50 = \$1{,}174$.
2. Interest falls slowly as the balance falls about $26 a month at first; over 12 months the balance is about $\$1{,}200 - 12 \times 28 \approx \$860$, so the average balance is near $1,030.
3. First-year interest: about $0.24 \times \$1{,}030 \approx \$250$.

Answer: $1,174 after month 1; roughly $250 of interest in the first year, with most of the debt still unpaid. An emergency fund would have cost nothing.

PRACTICE

1. Easy Essential expenses are $1,900 a month. Find a 4-month emergency fund.

   Show answer

   $7,600

2. Easy What share of each harvest did Joseph store?

   Show answer

   One fifth (20%).

3. Easy Give two reasons an emergency fund should be kept in an insured savings account rather than in stocks.

   Show answer

   It is safe from loss and liquid: available quickly at full value when the emergency comes, even if markets are down.

4. Medium A fund goal is $6,000. You have $750 and save $350 a month. How many months to reach the goal?

   Show answer

   $5{,}250/350 = 15$ months

5. **Medium** You want $1,000 in 8 months. How much must you save each week (use 4.33 weeks a month)?

Show answer

$125 a month, about $28.87 a week

6. **Medium** Which of these is a true emergency: a sale on shoes, a dental abscess, a friend's wedding announced months ahead, losing your job, a yearly insurance bill?

Show answer

The dental abscess and losing your job. The wedding and insurance bill are known in advance (sinking funds); the sale is a want.

7. **Medium** In this example, a savings account pays 4% a year. How much interest does a $5,000 fund earn in one year?

Show answer

$200

8. **Hard** A single earner with irregular work spends $2,200 a month on essentials. Why might she aim for 6 months rather than 3, and what is the difference in dollars?

Show answer

With one income and uncertain work, a job loss could last longer and there is no second income. $6 \times 2{,}200 - 3 \times 2{,}200 = \$6{,}600$ more.

9. **Hard** In this example, a $900 emergency is put on a card at 21% APR and paid off in equal payments over 12 months, costing about $105 in interest. If instead you had saved $75 a month for 12 months beforehand, how much would you have, and what did the fund save you?

Show answer

$12 \times 75 = \$900$ saved; the fund saves the $105 of interest (and the stress).

10. Hard Explain the phrase “pay yourself first” and why it works better than saving at the end of the month.

Show answer

Move savings out as soon as you are paid, before spending. It makes saving automatic and protects it from spending that would otherwise use up the money.

11. Challenge Joseph stored one fifth of seven harvests, each of size H, and the famine years produced only one quarter of a normal harvest. If the people needed four fifths of a normal harvest each year to live, did seven years of storage cover seven years of famine?

Show answer

Stored: $7 \times 0.2H = 1.4H$. Each famine year’s shortfall: $0.8H - 0.25H = 0.55H$; seven years: $3.85H$. In this simple model the store covers only about 36% of the need, which fits Genesis 47, where the Egyptians had to sell their livestock and land for grain.

COMMON MISTAKES

- Treating the emergency fund as a vacation or shopping fund.
- Investing the emergency fund in stocks that may be down when you need it.
- Waiting until debts are gone to start any emergency savings. A small starter fund keeps new emergencies from becoming new debt.

Make it a game · Joseph's Jar. Start a bean jar. Each round, add three beans, then roll a die. On a 5 or 6 an emergency removes eight beans, and if the jar is short you must borrow, owing a bean in interest. Play ten rounds, once with a saved jar and once without. Compare the outcomes, then size a fund using a pretend month of essential expenses.

Scripture. “And that food shall be for store to the land against the seven years of famine, which shall be in the land of Egypt; that the land perish not through the famine.” (Genesis 41:36, KJV)

Joseph’s store was set aside for a known kind of trouble and used for nothing else. That is exactly what an emergency fund is for.

2.3 Tithing and Generosity: The Cheerful Giver

OBJECTIVES

- Explain the biblical teaching on the tithe, firstfruits and cheerful giving.
- Plan regular giving as a budget line and calculate it from income.
- Compare giving on gross and net income and plan a yearly giving schedule.

> **Warm-up.** Write down one time someone was generous to you and how it made you feel. Then write one need you know of in your church or neighborhood.

WATCH

Jesus' Perspective on Wealth in 6 Minutes

BibleProject · 6:55

https://www.youtube.com/watch?v=GpqOdHV3dmU

> **WHEN TO WATCH**
> After the story of Paul's collection: Jesus' teaching on wealth and generosity.

Note: An animated summary from BibleProject; parents may wish to discuss its applications together.

BACKUP VIDEO

Charitable giving | Taxes and tax forms | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 1:51

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

Optional, short: how gifts to charity are recorded at tax time (rules change yearly).

KEY TERMS

tithe

A tenth of one's increase given to God, practiced by Abraham (Genesis 14:20), Jacob (Genesis 28:22) and commanded in the law of Moses.

firstfruits

The first and best part of the harvest offered to God before the rest was used (Proverbs 3:9).

offering

A gift given freely beyond any fixed amount.

generosity

Willing, open-handed giving of money, time and goods to meet others' needs.

charitable deduction

A gift to a qualified charity that may, under tax rules for those who itemize, reduce taxable income.

CORE IDEAS

The story. Around AD 55, the church in Jerusalem was poor and suffering from famine, and the apostle Paul spent years organizing a collection for it among the Gentile churches. He wrote to the Corinthians about the churches of Macedonia, who in "a great trial of affliction" and "deep poverty" gave "beyond their power," begging to be allowed to help (2 Corinthians 8:1-4). He asked the Corinthians to set aside something "upon the first day of the week" as God had prospered them (1 Corinthians 16:2), and he sent trusted men to carry the money so that everything would be honest "not only in the sight of the Lord, but also in the sight of men" (2 Corinthians 8:21).

How they figured it out. Paul did not set a percentage. He gave three principles: give **regularly** (each first day of the week), **proportionally** (as God has prospered you), and **willingly**: "Every man according as he purposeth in his heart, so let him give; not grudgingly, or of necessity: for God loveth a cheerful giver" (2 Corinthians 9:7). The Old Testament pattern of the **tithe**, a tenth, and **firstfruits**, giving first and not from leftovers, still guides many Christian families as a starting point, not a ceiling. He also insisted on honest handling: the money was carried by men chosen by the churches.

The big idea. Giving belongs at the top of the budget, not the bottom. A tithe on gross pay is 10% of gross; on net pay it is 10% of take-home. Families decide this before God; what matters is that the giving is planned, regular and cheerful. Generosity also includes offerings beyond the tithe, help to neighbors in need, and gifts of time and skill. Giving teaches the heart that everything belongs to God (Psalm 24:1) and that we are stewards, not owners.

In business today. Churches, missions and charities depend on regular givers. Before you give to any charity, check that it is honest: does it publish its finances, and how much of each dollar reaches its work? In the United States, gifts to qualified charities may be deductible for taxpayers who itemize; tax rules change, so this is a bonus, not a reason to give. Many Christian businesspeople built giving into their companies, among them R. G. LeTourneau, the maker of earth-moving machines, who in later life gave most of his income to Christian work.

Think it through. Jesus watched the rich casting gifts into the treasury and praised a poor widow who gave two mites, “all that she had” (Mark 12:41-44). God measures giving not by the amount but by what it cost the giver and the heart behind it.

PICTURE STUDY



The Widow's Mite, James Tissot, 1886–1894 · Opaque watercolor over graphite on paper · Brooklyn Museum, New York

Image: Wikimedia Commons, public domain

James Tissot, a French painter who returned to the Christian faith in middle age, spent ten years painting the life of Christ, traveling to the Holy Land to make his scenes accurate. Here he shows the widow whom Jesus praised for giving "all her living."

Look closely

- Find the widow. How is she dressed compared with the men?
- Find the men seated along the wall. What might they be thinking?
- Look at the doorway behind her. Where has she just been?
- Look at the light and shade. Where does the painter draw your eye?

Talk about it

1. Why did Jesus say the widow gave more than the rich?
2. What does this story teach about the size of a gift and the heart behind it?
3. How could you plan your own giving so that it is regular and cheerful, not leftover?

PROJECT

A Year's Giving Plan

You will plan a year of giving from your real or planned income, research one charity's finances, and give or do one act of generosity this week with a parent.

You will need

- Your budget from Lesson 2.1
- Ledger notebook and calculator
- A charity's annual report or financial summary, found with a parent

Steps

1. Read 2 Corinthians 8 and 9 and write Paul's principles of giving in your own words.
2. With your parents, decide your giving rate (for example, a tithe on your earnings) and calculate the monthly and yearly amounts.
3. Divide the yearly amount among your church and one or two other causes, with reasons.
4. Choose one charity or mission and look up its most recent financial report with a parent. Calculate the percent spent on programs.
5. Make a 12-month giving table with planned and actual columns.
6. This week, give your first planned gift, or give a gift of time or skill to someone in need (a meal, yard work, a visit).
7. Write a half page: What did you learn about the charity? How did planned giving feel compared with giving from leftovers?

Tips

- Giving should never come from money that belongs to others, such as unpaid bills.
- Ask your church how its budget is used; most are glad to show members.

Check your work

☐ My plan states a rate, monthly and yearly amounts, and where the gifts go.

☐ I calculated a charity's program percentage from its report.

- [ ] I can explain 2 Corinthians 9:7 in my own words.

LEDGER NOTEBOOK

1. Copy 2 Corinthians 9:7 and underline the three words that describe how to give.
2. Draw a bar graph of a year's planned giving by month.
3. Write a list of five ways to be generous that do not cost money.

KEY FORMULAS

$$\text{Tithe} = 0.10 \times \text{income}$$

$$\text{Giving rate} = \frac{\text{total given}}{\text{income}} \times 100\%$$

From history. Abraham gave Melchizedek "tithes of all" after rescuing Lot (Genesis 14:20), and Jacob promised at Bethel, "of all that thou shalt give me I will surely give the tenth unto thee" (Genesis 28:22). Both lived before the law of Moses, which is one reason many Christians see the tithe as a lasting pattern of thankful giving.

WORKED EXAMPLES

Example 1. A worker's gross pay is \$3,600 a month and net pay \$2,930. Find a tithe on gross and on net, and the yearly difference.

Show solution

1. On gross: $0.10 \times \$3{,}600 = \$360$. On net: $0.10 \times \$2{,}930 = \$293$.
2. Monthly difference: \$67; yearly: $12 \times \$67 = \$804$.

Answer: \$360 or \$293 a month; \$804 a year apart. Either can be a faithful plan; decide it before God and keep it.

Example 2. A family gives \$250 a month to its church, \$40 a month to a mission, and \$300 a year in gifts to neighbors in need. Their yearly gross income is \$48,000. Find their giving rate.

Show solution

1. Yearly giving: $12(250 + 40) + 300 = \$3{,}780$.
2. Rate: $3{,}780 / 48{,}000 = 0.0788 \approx 7.9\%$.

Answer: About 7.9% of gross income.

Example 3. A charity reports that in one year it received $2,400,000 and spent $1,980,000 on its programs, $264,000 on administration and $156,000 on fundraising. What percent went to programs?

Show solution

1. Total spent: $1{,}980{,}000 + 264{,}000 + 156{,}000 = \$2{,}400{,}000$.
2. Program share: $1{,}980{,}000 / 2{,}400{,}000 = 82.5\%$.

Answer: 82.5% to programs. A healthy charity spends most of its money on its work and publishes its numbers openly.

PRACTICE

1. Easy Find a tithe on $425.

   Show answer

   $42.50

2. Easy What does “firstfruits” mean, and why does it matter for a budget?

   Show answer

   The first and best of the harvest given to God before using the rest; in a budget, giving comes first, not from leftovers.

3. Easy Name the three principles of giving Paul taught the Corinthians.

   Show answer

   Regularly (each first day of the week), proportionally (as God has prospered you), and willingly or cheerfully (not grudgingly).

4. Medium A teen earns $180 a week for 10 weeks in summer. She gives 10% and saves 40%. How much does she give, save and have left?

   Show answer

   Total $1,800: give $180, save $720, spend $900

5. Medium A family gives $4,200 a year on income of $56,000. What is their giving rate?

   Show answer

   7.5%

6. Medium A charity spends $640,000 of its $1,000,000 on programs. What percent is that? What would you want to know before giving?

Show answer

64%. Ask what the other 36% pays for, whether its reports are audited, and whether its work is effective and honest.

7. Medium From the story: why did Paul send trusted men chosen by the churches to carry the collection?

Show answer

So that the money would be handled honestly and openly, “not only in the sight of the Lord, but also in the sight of men,” leaving no room for suspicion.

8. Hard A worker’s income rises from $40,000 to $46,000. He decides to give 10% of the first $40,000 and 25% of every dollar above it. Find his new giving and rate.

Show answer

$\$4{,}000 + 0.25 \times \$6{,}000 = \$5{,}500$; $5{,}500/46{,}000 \approx 12.0\%$

9. Hard In this example, a taxpayer who itemizes and is in a 12% bracket gives $1,000 to a qualified charity. If the deduction lowers taxable income by $1,000, how much does the gift really cost her? Why should tax savings not be the reason to give?

Show answer

Tax falls by $120, so the net cost is $880. Giving is worship and love of neighbor; tax rules change and many taxpayers do not itemize.

10. Hard Explain how the widow’s two mites (Mark 12:41-44) change the way we measure generosity.

Show answer

God measures giving by its cost to the giver and the heart, not the amount. A small gift that is sacrificial and faithful can be greater than a large gift from surplus.

11. **Challenge** A couple wants to raise their giving rate from 6% to 10% of a $60,000 income over four years, adding the same number of percentage points each year. Find the giving in each of years 1 through 4 if income stays the same.

    Show answer

    Add 1 point a year: 7%, 8%, 9%, 10%: $4,200, $4,800, $5,400, $6,000.

COMMON MISTAKES

- Giving only from what is left after spending.
- Giving to a charity without checking that it is honest and open with its finances.
- Thinking only money counts. Time, skill and hospitality are gifts too.

Make it a game · Firstfruits Envelopes. Your parent names a pretend yearly income. Label three paper envelopes: giving, saving and spending. Calculate the tithe, place the giving amount first, and say what firstfruits means. Then figure the monthly giving line in your budget. Finish by explaining in your own words why Paul tells the cheerful giver in 2 Corinthians to decide in the heart.

Scripture. “Every man according as he purposeth in his heart, so let him give; not grudgingly, or of necessity: for God loveth a cheerful giver.” (2 Corinthians 9:7, KJV)

Paul’s rule for giving is a plan made in advance (“purposeth”), a heart that is willing, and joy in the gift.

2.4 Spending Decisions and Contentment

OBJECTIVES

- Compare purchases by unit price, cost per use and total cost of ownership.
- Apply opportunity cost and a waiting rule to spending decisions.
- Explain the Christian virtue of contentment and how advertising works against it.

> **Warm-up.** Name the last thing you bought (or wanted) that you were excited about. A week later, were you still as happy with it? Write two sentences.

WATCH

A Way To Be Content With What You Have

BibleProject · 4:20

https://www.youtube.com/watch?v=WylKQKFI_4M

> **WHEN TO WATCH**
> After the story of Burroughs: contentment and the commandment against coveting.

Note: An animated Bible study from BibleProject.

BACKUP VIDEO

Psychology of money part 1 | Financial goals | Financial Literacy | Khan Academy

Khan Academy · 4:46

https://www.youtube.com/watch?v=xH_IlU7nIRs

With the big idea: how feelings and habits shape spending decisions.

KEY TERMS

opportunity cost

The value of the next best thing you give up when you make a choice.

unit price

The price per unit of measure (per ounce, per pound, per load), used to compare packages of different sizes.

cost per use

The price of an item divided by the number of times it will be used.

total cost of ownership

Purchase price plus all costs of using and keeping an item (fuel, repairs, supplies, insurance) minus what it can be sold for later.

contentment

A settled satisfaction with what God has given, free from restless craving for more.

CORE IDEAS

The story. In 1648, during years of civil war and hardship in England, the Puritan pastor Jeremiah Burroughs published a book of sermons called *The Rare Jewel of Christian Contentment*. He defined contentment as "that sweet, inward, quiet, gracious frame of spirit, which freely submits to and delights in God's wise and fatherly disposal in every condition." He was preaching on Paul's words from a Roman prison: "I have learned, in whatsoever state I am, therewith to be content" (Philippians 4:11). Burroughs noticed that Paul said he had *learned* it. Contentment is not a mood but a skill, practiced like any other.

How they figured it out. Burroughs taught that a discontented person tries to add to his possessions to satisfy his desires, while a contented person learns to subtract from his desires. The modern economy pushes the other way. Advertising is designed to create a feeling of lack, "buy now" buttons remove the pause between wanting and buying, and comparison with others never ends. Wise spenders put the pause back in: a waiting rule (wait 30 days for any want over a set amount), a written list before shopping, and honest arithmetic about what a purchase really costs.

The big idea. Every dollar spent is a dollar not saved or given: its **opportunity cost**. Three tools make the trade clear. **Unit price** compares packages fairly. **Cost per use** shows that a well-made $120 pair of boots worn 400 times (30¢ a wear) can be cheaper than $40 boots that last 50 wearings (80¢ a wear). **Total cost of ownership** adds the costs of keeping a thing: a "cheap" printer with expensive ink, or a car with high insurance and repairs. Ask, too, what hours of work an item costs: at $15 an hour take-home, a $90 purchase is six hours of your life.

In business today. Stores study shoppers carefully: necessities at the back of the store so you pass everything else, sale signs that create urgency, free shipping thresholds that make you add one more item, and subscriptions that renew quietly. None of this is wicked in itself, but it is not on your side. A contented, informed buyer who knows unit prices and keeps a waiting rule is the customer who forces sellers to compete on real value.

Think it through. "Godliness with contentment is great gain" (1 Timothy 6:6). Contentment does not mean never buying anything nice; it means your joy does not depend on the next purchase, so you can spend thoughtfully, save patiently and give freely.

PICTURE STUDY



The Milkmaid, Johannes Vermeer, c. 1657–1658 · Oil on canvas · Rijksmuseum, Amsterdam

Image: Wikimedia Commons, public domain

Vermeer painted a servant at a simple task in a plain room. Nothing in the scene is costly: bread, milk, a clay jug, a basket. Yet the painting glows with care, and it has become one of the best-loved pictures in the world.

Look closely

- Find everything on the table. Are these luxuries or necessities?
- Look at the maid's face and hands. Is she hurried or careful?
- Look at the wall: the nail, the stains and the small cracks. What do they tell you about the room?
- Find the light. How does it make ordinary things beautiful?

Talk about it

1. How does this painting show contentment in ordinary things?
2. The maid is careful not to waste milk. How is that like careful spending?
3. What would advertising try to make this maid feel she lacked?

PROJECT

The Smart-Buyer Comparison and a 30-Day Wait

You will compare real products by unit price, cost per use and total cost of ownership, and test a 30-day waiting rule on one want of your own.

You will need

- A store visit or store flyers with a parent
- Calculator and ledger notebook
- A want you have been thinking of buying

Steps

1. At a grocery store (with a parent), record the price and size of three sizes or brands of the same product, such as rice, cereal or laundry soap. Compute each unit price.
2. Choose two versions of a durable item (shoes, a backpack, a tool) and estimate how many uses each will last. Compute cost per use.
3. For one bigger item (a printer, a bicycle, a phone plan), list every operating cost and compute total cost of ownership over three years.
4. Write down one want over $25. Record the date, price and how much you want it on a scale of 1 to 10.
5. Wait 30 days. Each week, rate how much you still want it.
6. At the end, decide to buy or not. Compute the hours of work it costs.
7. Write a half page connecting your results to Philippians 4:11 and 1 Timothy 6:6.

Tips

- Watch for “shrinkflation”: packages that shrink while the price stays the same. Unit prices catch it.
- The cheapest unit price is not wise if the food spoils before you use it.

Check your work

- ☐ I can compute and compare unit prices correctly.
- ☐ I can compute cost per use and total cost of ownership.

- [ ] I can describe what happened to my want over 30 days.

LEDGER NOTEBOOK

1. Make a table of your unit-price survey with the best buy circled.
2. Graph your weekly "want" rating over the 30 days.
3. Copy Burroughs's definition of contentment and underline the word that surprises you most.

KEY FORMULAS

$$\text{Unit price} = \frac{\text{price}}{\text{units}}, \qquad \text{Cost per use} = \frac{\text{price}}{\text{number of uses}}$$

$$\text{TCO} = \text{price} + \text{operating costs} - \text{resale value}$$

$$\text{Hours of work} = \frac{\text{price}}{\text{take-home pay per hour}}$$

From history. Burroughs preached his contentment sermons in London in the 1640s, a time of civil war, high prices and loss. He died in 1646 after a fall from a horse, and his friends published the sermons two years later. The book has been reprinted ever since.

WORKED EXAMPLES

Example 1. Cereal A: 18 oz for \$4.29. Cereal B: 27 oz for \$5.99. Which is the better unit price?

Show solution

1. A: $\$4.29/18 = \$0.238$ per oz.
2. B: $\$5.99/27 = \$0.222$ per oz.

Answer: B, by about 1.6¢ an ounce (about 7% cheaper), if you will use it all before it goes stale.

Example 2. Printer X costs \$59 and its ink costs \$38 per 250 pages. Printer Y costs \$179 and its ink costs \$20 per 2,000 pages. Compare total cost for 6,000 pages.

Show solution

1. X: ink cartridges $6{,}000/250 = 24$; cost $59 + 24 \times 38 = \$971$.
2. Y: refills $6{,}000/2{,}000 = 3$; cost $179 + 3 \times 20 = \$239$.

Answer: Y costs \$732 less over 6,000 pages despite the higher price.

Example 3. A student takes home $13.20 an hour and wants a $264 gadget. How many hours of work is it, and what is the opportunity cost if the alternative was adding it to a car fund?

Show solution

1. Hours: $\$264 / \$13.20 = 20$ hours.
2. Opportunity cost: the $264 would cover about one month of the car fund in her budget, delaying the car.

Answer: 20 hours of work, and a month's delay on the car. She may still buy it, but now she knows what it costs.

PRACTICE

1. Easy A 64-oz bottle costs $5.12. Find the unit price per ounce.

   Show answer

   $0.08 per oz

2. Easy A $150 coat is worn 300 times. Find the cost per use.

   Show answer

   $0.50

3. Easy Define opportunity cost and give an example from your own spending.

   Show answer

   The value of the next best alternative given up; for example, buying a game instead of adding the money to savings.

4. Medium Pack A: 12 rolls for $8.99. Pack B: 30 rolls for $21.49. Which is cheaper per roll, and by how much?

   Show answer

   A $0.749, B $0.716; B by about 3.3¢ a roll.

5. Medium Boots X cost $60 and last 1 year; boots Y cost $170 and last 4 years. Compare cost per year.

   Show answer

   X $60 a year; Y $42.50 a year. Y is cheaper over time.

6. Medium At $11.50 take-home pay per hour, how many hours of work is a $345 phone?

Show answer

30 hours

7. Medium From the story: what did Jeremiah Burroughs say the discontented and the contented person each do with their desires?

Show answer

The discontented person tries to add possessions to satisfy desires; the contented person learns to subtract from his desires.

8. Hard A bicycle costs $480, needs $60 a year in upkeep, and can be sold for $150 after 4 years. Find total cost of ownership and the cost per year.

Show answer

$480 + 240 - 150 = \$570$; $142.50 a year

9. Hard A store offers free shipping on orders over $50. Your cart is $42 and shipping is $6.95. You add a $12 item you did not plan to buy. How much more did you spend, and was it "free shipping"?

Show answer

$54 instead of $48.95: $5.05 more. The shipping was not free; you paid for it with an unplanned purchase.

10. Hard Explain how a 30-day waiting rule works against advertising's strategy.

Show answer

Advertising creates urgency and a feeling of lack so you buy at once. Waiting lets the feeling fade, gives time to compare prices and opportunity costs, and leaves only purchases you still truly value.

11. Challenge A family spends $140 a week on groceries. By comparing unit prices they save 8% on 60% of their purchases. How much do they save in a year, and how many hours is that at $18 take-home per hour?

Show answer

Weekly saving $0.08 \times 0.60 \times 140 = \$6.72$; yearly $349.44; about 19.4 hours of work.

COMMON MISTAKES

- Comparing package prices instead of unit prices.
- Buying the cheapest item when a better one costs less per use.
- Confusing contentment with never spending. Contentment means your joy does not depend on spending.

Make it a game · Best Buy Hunt. Go to the pantry and find two sizes of the same item. Race your parent to calculate the unit price of each and name the better buy. Then pick one household tool and figure its cost per use over a year. Finally, name one purchase you would put through a thirty-day wait, and the contentment it protects.

Scripture. "Not that I speak in respect of want: for I have learned, in whatsoever state I am, therewith to be content." (Philippians 4:11, KJV)

Paul wrote this in prison. Contentment is learned, and it frees us to spend wisely instead of anxiously.

2.5 Wesley's "The Use of Money": Gain, Save, Give

OBJECTIVES

- Summarize John Wesley's three rules for money and the limits he placed on each.
- Calculate how a fixed standard of living turns rising income into rising giving.
- Apply Wesley's rules to a personal budget plan.

> **Warm-up.** If your income doubled next year, list what you would do with the extra money. Be honest. Keep the list to compare with Wesley's plan.

WATCH

Life of John Wesley in 5 minutes

Rediscovering Our Methodist Roots · 5:32

https://www.youtube.com/watch?v=gH6Hqu12sDk

> **WHEN TO WATCH**
> Before the story: Wesley's life in five minutes.

BACKUP VIDEO

Two Minute Methodism - The Use of Money (Sermon 50)

Wesley Freedom · 2:36

https://www.youtube.com/watch?v=W0R0uhELAUk

After the big idea: a pastor's two-minute summary of "The Use of Money."

KEY TERMS

steward
A manager of someone else's property. Wesley taught that God is the owner of all we have and we are His stewards.

standard of living
The level of spending a household uses for its needs and comforts.

lifestyle creep
The tendency for spending to rise whenever income rises, leaving no more saved or given than before.

Methodism
The Christian revival movement in the 1700s led by John and Charles Wesley, known for disciplined, "methodical" devotion and care for the poor.

CORE IDEAS

The story. John Wesley (1703–1791), an Anglican clergyman, rode some 250,000 miles on horseback over fifty years, preaching in fields, market squares and mining towns across Britain. He saw thousands of poor workers converted, and he saw something else: as they stopped drinking and wasting money and began to work diligently, many grew prosperous, and some grew proud and worldly. His sermon "The Use of Money," published in 1760, was his answer. It has three rules: "Gain all you can," "Save all you can," and "Give all you can."

How they figured it out. Wesley tested his rules on himself. The often-told story from his Oxford years runs like this: when his income was £30 a year, he lived on £28 and gave away £2. When it rose to £60, he still lived on £28 and gave away £32. When it reached £90 and then £120, he kept living on £28 and gave the rest. Later in life the sale of his books brought him a large income, and he gave nearly all of it away; he wrote that if he left more than ten pounds at his death, "you and all mankind bear witness against me, that I lived and died a thief and a robber."

The big idea. Each rule has a limit. **Gain all you can**, but not at the cost of your health, your soul or your neighbor: no gain is worth harming others or yourself. **Save all you can**, which for Wesley meant "cutting off every expense which serves only to indulge foolish desire," not hoarding: "Not to use, is effectually to throw it away." **Give all you can**: provide first what your family needs, then do good to the household of faith, then to all people. The arithmetic of his own life shows the power of a fixed standard of living: when spending stays level, every raise becomes a raise in giving and saving. The opposite habit, **lifestyle creep**, lets spending grow with income so that nothing changes but the size of the bills.

In business today. Financial planners call Wesley's method "capping your lifestyle," and some families today practice a graduated giving plan, raising the percentage they give as income grows. Wesley's rules also apply to businesses: earn honest profits without harming workers, customers or the community; keep costs lean; and use the surplus well. Many Methodists of the next century became honest merchants, bankers and manufacturers, and Wesley's movement founded schools, dispensaries and loan funds for the poor.

Think it through. Wesley was not against wealth; he was against keeping it for oneself. Compare your warm-up list with his plan. Which of your uses of extra

money would he call needful, and which “foolish desire”?

PICTURE STUDY



John Wesley, Nathaniel Hone the Elder, c. 1766 · Oil on canvas · National Portrait Gallery, London
Image: Wikimedia Commons, public domain

Nathaniel Hone, an Irish-born painter in London, painted Wesley in his sixties, at the height of his travels. Wesley wore the plain gown and bands of a clergyman and never wore a wig, an economy that matched his preaching.

Look closely

- Look at his clothing. Is it rich or plain?
- Look at his hand and expression. What is he doing?
- Notice his own hair instead of a fashionable wig. What might that say about Wesley’s view of spending?

Talk about it

1. How does this portrait fit Wesley’s rule “save all you can”?
2. Wesley rode thousands of miles a year. How might his work have shaped what he thought money was for?
3. Which of Wesley’s three rules do you find hardest, and why?

PROJECT

My Gain, Save, Give Plan

You will read Wesley's sermon, then write a ten-year plan for your own income that sets a standard of living and decides in advance what happens to every raise.

You will need

- Wesley's sermon "The Use of Money" (free online)
- Free spreadsheet
- Your budget from Lesson 2.1

Steps

1. Read the sermon and write each of Wesley's three rules with its limits in your own words.
2. From your Lesson 2.1 budget, set a modest yearly standard of living for a young single adult.
3. In a spreadsheet, list years 1 to 10 with a starting take-home income and a raise of 4% a year.
4. Add a column for living costs that rise only with inflation (use 2% a year in this example).
5. Add columns for saving and giving and choose a rule for splitting the difference (for example, half and half, or giving a rising share).
6. Make a second version where living costs rise as fast as income, and compare the 10-year totals saved and given.
7. Write one page: What standard of living would you commit to, and why? Where do you agree or disagree with Wesley?

Tips

- A plan made before the raise comes is far easier to keep than one made after.
- Wesley provided first for real needs. A plan that leaves no money for food and shelter is not his plan.

Check your work

- ☐ My spreadsheet shows both versions and their 10-year totals.
- ☐ I can explain Wesley's three rules and their limits.
- ☐ My written plan says what I will do with future raises.

LEDGER NOTEBOOK

1. Make a table of Wesley's income, living costs, and amount and percent given at each step.
2. Draw two lines on one graph: income rising and living costs staying flat. Shade the space between and label it "to save and give."
3. Copy one sentence from the sermon that challenges you.

KEY FORMULAS

$$\text{Available to give and save} = \text{income} - \text{fixed standard of living}$$

$$\text{Share given} = \frac{\text{income} - \text{living costs}}{\text{income}} \times 100\%$$

From history. When Wesley died in 1791, his will left little besides his books, his clothes and a few pounds for his funeral. He had asked that six poor men be paid to carry his body to the grave.

WORKED EXAMPLES

Example 1. Use Wesley's figures: living costs stay at £28 while income is £30, £60, £90 and £120. Find the amount and percent given at each income.

Show solution

1. £30: gives £2, $2/30 \approx 6.7\%$.
2. £60: gives £32, $32/60 \approx 53.3\%$.
3. £90: gives £62, $62/90 \approx 68.9\%$.
4. £120: gives £92, $92/120 \approx 76.7\%$.

Answer: As income quadrupled, giving rose from 6.7% to 76.7%, because his standard of living did not rise.

Example 2. In this example, two workers each start at $40,000 of take-home pay and spend $34,000. Each gets a 5% raise every year for 4 years. Worker A keeps spending at $34,000; worker B raises spending by the same 5% each year. Compare what each has left to save and give in year 5.

Show solution

1. Year 5 income for both: $40{,}000 \times 1.05^4 = \$48{,}620.25$.
2. A: $48{,}620.25 - 34{,}000 = \$14{,}620.25$.
3. B: spending $34{,}000 \times 1.05^4 = \$41{,}327.21$; left $7,293.04.

Answer: A has about $14,620 to save and give in year 5; B about $7,293, barely more than the $6,000 both had at the start.

Example 3. Apply Wesley's first rule: a job offer pays $4 an hour more than your current job but requires night work that leaves you sick and missing church most weeks. What does Wesley's rule say?

Show solution

1. Rule 1 says gain all you can, but "without hurting either yourself or your neighbour, in soul or body."
2. The extra pay harms health and soul, so it fails his test.
3. Look for gain that does not have that cost, such as training for a better day job.

Answer: Wesley would say decline it, or leave it as soon as possible: no gain is worth damaging your health or your soul.

PRACTICE

1. Easy State Wesley's three rules for the use of money.

   Show answer

   Gain all you can; save all you can; give all you can.

2. Easy Wesley lived on £28. If his income was £75, how much could he give?

   Show answer

   £47

3. Easy What is lifestyle creep?

Show answer

Spending rising whenever income rises, so no more is saved or given.

4. Medium What limits did Wesley place on “gain all you can”?

Show answer

Not at the expense of your health or life, your soul, or your neighbor; gain must be honest and not harm others.

5. Medium Living costs are $30,000. Income rises from $36,000 to $45,000. What percent of income is available to save and give before and after?

Show answer

Before $6{,}000/36{,}000 = 16.7\%$; after $15{,}000/45{,}000 = 33.3\%$

6. Medium Wesley wrote, “Not to use, is effectually to throw it away.” What did he mean, and how does it guard against a wrong idea of saving?

Show answer

Money hoarded and never used for good is wasted; saving is meant to serve future needs and giving, not to pile up wealth for its own sake.

7. Medium From the story: why did Wesley preach this sermon to people who were becoming more prosperous?

Show answer

As converts worked hard and stopped wasting money they prospered, and he saw that wealth tempted them to arrogance and worldliness; the third rule, give all you can, was his remedy.

8. Hard Income is $50,000 and grows 3% a year for 2 years. Living costs of $38,000 grow 2% a year. Find the amount available to save and give in year 3.

Show answer

Income $50{,}000(1.03)^2 = \$53{,}045$; costs $38{,}000(1.02)^2 = \$39{,}535.20$; available $\$13{,}509.80$

9. Hard Wesley said to provide first for yourself and your household, then the household of faith, then all people. Put these in a budget order and explain why the order matters.

Show answer

1) Needful things for self and family (food, clothing, shelter); 2) the church and fellow believers in need; 3) others in need. The order keeps giving from neglecting one's own family (1 Timothy 5:8) while still reaching outward.

10. Hard Explain how a graduated giving plan (a higher percentage on each higher level of income) follows Wesley's idea.

Show answer

It keeps the standard of living from rising as fast as income, so a growing share of each raise goes to giving, like Wesley's fixed £28.

11. Challenge A family keeps living costs at $42,000 while income rises $2,000 a year from $48,000 in year 1. In what year will the amount available to save and give first exceed the living costs?

Show answer

Income in year n: $48{,}000 + 2{,}000(n-1)$. Available exceeds $42{,}000$ when income exceeds $84{,}000$: $2{,}000(n-1) > 36{,}000$, so $n - 1 > 18$, year 20.

COMMON MISTAKES

- Reading "gain all you can" as permission for greed; Wesley placed strict limits on it.
- Reading "save all you can" as hoarding; Wesley meant cutting waste so there is more to use well.
- Letting every raise disappear into a bigger lifestyle.

> **Make it a game · Wesley's Three Moves.** Create a gesture for each of Wesley's three rules: gain, save and give. Your parent reads a money scenario, and you perform the matching move and name the limit Wesley placed on it. Then calculate: if income rises from forty to fifty thousand and your living costs stay fixed, how much more can you give?

UNIT 2

Budgeting, Saving and Giving

A budget is a plan that tells your money where to go before it is gone. In this unit you will build a **zero-based budget** from real take-home pay, the way a sixteen-year-old John D. Rockefeller recorded every cent in his little Ledger A in 1855. You will set up an **emergency fund** on Joseph's pattern of storing up in the good years, and you will plan your **giving** on the pattern Paul taught the Corinthians: purposed in the heart, not grudging, cheerful.

Then you will look at the hardest part of any budget: the thousand small decisions to spend or not to spend. You will learn to weigh **opportunity cost**, **cost per use** and the true cost of ownership, and you will read a Puritan pastor's advice on **contentment**. The unit ends with John Wesley's sermon "The Use of Money" (1760), whose three rules, gain all you can, save all you can, give all you can, are as good a summary of personal finance as any ever written.

PREREQUISITES

- Can calculate net pay from gross pay (Unit 1)
- Can find percents of amounts and percent change
- Can build a simple table in a spreadsheet with sums

MASTERY CHECKLIST

- ☐ I can build a zero-based monthly budget from net income and track planned against actual amounts.
- ☐ I can turn irregular yearly expenses into monthly savings amounts.
- ☐ I can size an emergency fund and plan how many months it will take to build.
- ☐ I can plan regular giving and explain the biblical pattern of generous, cheerful giving.
- ☐ I can compare purchases by unit price, cost per use and total cost of ownership.
- ☐ I can explain Wesley's three rules and apply them to my own budget.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **John Wesley, "The Use of Money" (Sermon 50)**: Free from the Wesley Center at Northwest Nazarene University. Read the whole sermon (about 30 minutes) with Lesson 2.5. Ages 13 and up.
- **Federal Reserve Bank of St. Louis: Econ Lowdown**: Free online lessons from a Federal Reserve bank, including budgeting and saving modules for high school. Fits the whole unit.
- ***Pay Day* (family board game, Winning Moves)**: Ages 8 and up, 2–4 players. A month of bills, mail and paydays; a light way to talk about budgeting with younger siblings. Fits Lesson 2.1.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

2.1	**The Budget: Rockefeller's Ledger A**	3 sessions of 50 minutes
2.2	**Emergency Funds: Joseph's Storehouses**	3 sessions of 50 minutes
2.3	**Tithing and Generosity: The Cheerful Giver**	3 sessions of 50 minutes
2.4	**Spending Decisions and Contentment**	3 sessions of 50 minutes
2.5	**Wesley's "The Use of Money": Gain, Save, Give**	3 sessions of 50 minutes

Unit 2 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars or percents. Where a problem says "in this example," use the figures given. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **6 pts**

   Net income is $2,650. Planned: giving $265, saving $300, rent $900, food $340, transportation $280, phone $40, utilities $120. How much remains to make the budget zero-based?

2. **5 pts**

   Yearly expenses of $540, $1,080 and $360 are covered by sinking funds. What is the total monthly set-aside?

3. **6 pts**

   Budgeted vs actual: food $350/$381; fuel $160/$149; clothing $60/$92. Find each variance and the total, and say what to do about it.

4. **5 pts**

   Apply 50/30/20 to take-home pay of $3,150.

5. **6 pts**

   Essential monthly expenses are $2,340. Find 3- and 6-month emergency funds. With $1,200 saved and $390 saved each month, how long to reach the 3-month fund?

6. **5 pts**

   Name Joseph's three steps that every emergency fund still needs.

7. **5 pts**

   Explain why an emergency fund should be liquid and insured, and why using a credit card instead is costly.

8. **6 pts**

   Gross pay is $4,100, net $3,280. Find a tithe on each, and the yearly difference.

9. **5 pts**

   State Paul's three principles of giving from 1 and 2 Corinthians.

10. **6 pts**

    Detergent A: 92 oz for $11.97. Detergent B: 150 oz for $18.49. Find each unit price and the better buy.

11. **6 pts**

    A $220 pair of work boots lasts 5 years; a $70 pair lasts 1 year. Compare cost per year and say which is the wiser buy.

12. **5 pts**

    At $14.40 take-home pay per hour, how many hours of work is a $612 purchase?

13. **5 pts**

    What did Jeremiah Burroughs mean by calling contentment a “rare jewel,” and why does Paul say he “learned” it?

14. **6 pts**

    Living costs stay at $32,000. Income is $40,000 one year and $52,000 three years later. Find the percent available to save and give in each year.

15. **6 pts**

    State Wesley’s three rules and one limit he put on each.

16. **17 pts**

    Short essay (one or two paragraphs): A friend says, “I’ll start giving and saving when I make more money.” Using Joseph, Paul’s teaching, Wesley’s example and at least one calculation, explain why the time to begin is now.

ANSWER KEY

1. Assigned $2,245; remaining $405
2. $\$1{,}980/12 = \$165$
3. -31, $+11$, -32; total $-\$52$. Cover it from a want line and adjust next month's plan.
4. $1,575/$945/$630
5. $7,020; $14,040; $(7{,}020 - 1{,}200)/390 \approx 14.9$, so 15 months.
6. Save a fixed share in good times; keep the store close and available (liquid); use it only for the emergency it was meant for.
7. It must be available at full value when needed, even if markets fall; a credit card adds high interest, so the emergency costs much more than its price.
8. $410; $328; $984 a year
9. Regularly (each first day of the week), proportionally (as God has prospered), and willingly and cheerfully (2 Corinthians 9:7).
10. A $0.130/oz; B $0.123/oz; B is cheaper per ounce.
11. $44 vs $70 a year; the better boots, if the money is available without debt.
12. 42.5 hours
13. Contentment is precious and uncommon; it is a skill learned by practice and trust in God, not a natural mood.
14. $8{,}000/40{,}000 = 20\%$; $20{,}000/52{,}000 \approx 38.5\%$
15. Gain all you can (without harming health, soul or neighbor); save all you can (by cutting needless expense, not by hoarding); give all you can (after providing what your household needs).
16. A strong answer explains that habits formed with small incomes carry over (Rockefeller's Ledger A, Luke 16:10); Joseph saved in the good years before the need; Paul asked for regular, proportional giving "as God hath prospered"; Wesley's fixed living costs show that a plan set early turns raises into giving; and a calculation (for example, lifestyle creep versus a capped lifestyle, or an emergency fund built month by month) shows that waiting usually means spending grows to match income.

PORTFOLIO PIECE: MY HOUSEHOLD MONEY PLAN

Assemble your zero-based budget with a month of planned and actual figures, your emergency-fund plan and rule, your year's giving plan with the charity analysis, your smart-buyer comparison and 30-day wait record, and your Wesley ten-year spreadsheet. Add a one-page letter to yourself to open in ten years, describing the standard of living you intend to keep and how you will save and give.

LOOK FOR	WHAT IT MEANS
Budget	The budget is zero-based, uses net income, includes sinking funds and giving, and shows variances with an adjustment.
Saving	The emergency-fund goal is correctly sized from essential expenses with a realistic schedule and a clear rule.
Giving	The giving plan is specific and regular, and the charity analysis is calculated correctly.
Judgment	The smart-buyer work and the Wesley plan show careful arithmetic and thoughtful reflection on contentment and stewardship.

UNIT 3

Banking and Payments

A bank is a business that borrows from savers and lends to borrowers, and it earns its living on the difference. In this unit you will see how that works, starting in 1810 with a Scottish pastor, Henry Duncan, who opened a savings bank in his parish so that poor laborers could put away a few shillings safely and earn interest. You will learn to choose and manage **checking and savings accounts**, to keep a register and reconcile a statement, and to compare interest rates and fees.

Then you will stand outside the American Union Bank in New York in 1931 with a crowd of frightened depositors, and learn how **deposit insurance**, begun in 1934, ended the bank runs that had haunted America. You will trace the ways we pay, from the Bank of Amsterdam's book transfers in 1609 to the first cash machine in 1967 and the card in your wallet, and you will finish by learning to recognize and stop the oldest trick of all: the swindler who asks you to hand over money or information in a hurry.

PREREQUISITES

- Can compute simple interest and percents
- Can keep a running balance in a ledger (Units 1 and 2)
- Has a working budget from Unit 2

MASTERY CHECKLIST

- ☐ I can explain how a bank earns money from deposits and loans, and what reserves are.
- ☐ I can keep a check register and reconcile a bank statement.
- ☐ I can compare savings accounts by APY and fees.
- ☐ I can explain how FDIC insurance works and calculate coverage in simple cases.
- ☐ I can compare payment methods by cost, safety and protection.
- ☐ I can recognize the warning signs of a scam and list the steps to protect my accounts.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **FDIC: Money Smart**: Free lessons from the Federal Deposit Insurance Corporation on bank accounts, payments, credit and protecting yourself from fraud. Fits the whole unit.
- **FDIC Electronic Deposit Insurance Estimator (EDIE)**: Free official tool that shows how deposit insurance applies to different kinds of accounts. Use it with Lesson 3.3 to check your coverage answers.
- **Khan Academy: Financial Literacy**: Free short lessons and practice on banking, payments and scams, from the same course as several of this unit's videos.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

3.1 How Banks Work: Henry Duncan's Parish Bank — 3 sessions of 50 minutes

3.2 Checking and Savings: The Clearing House and the Register
3 sessions of 50 minutes

3.3 Bank Runs and the FDIC, 1933 — 3 sessions of 50 minutes

3.4 Payment Methods: From the Bank of Amsterdam to the Card in Your Wallet
3 sessions of 50 minutes

3.5 Protecting Your Accounts: The Spanish Prisoner and Modern Scams
3 sessions of 50 minutes

Unit 3 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars or percents. Where a problem says "in this example," use the figures given, not current law. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **6 pts**

   A bank has $25 million of deposits at 2.4% and $21 million of loans at 6.9%. Costs are $600,000. Find profit before taxes and loan losses.

2. **6 pts**

   A bank has assets of $80 million, deposits of $72 million and other liabilities of $2 million. Find its capital. If it loses $4 million on bad loans, what is its new capital?

3. **5 pts**

   Who was Henry Duncan, and what did he start in 1810?

4. **6 pts**

   Find the APY of 4.5% compounded monthly, and the interest on $2,000 for one year.

5. **8 pts**

   Register balance $1,206.50; statement balance $1,318.20. Outstanding: check $85.00 and payment $41.70. Unrecorded bank fee $3.00. Deposit in transit $12.00. Reconcile and find any remaining difference.

6. **5 pts**

   Account A: no fee, 0.05% APY. Account B: $10 monthly fee waived above $2,000, 1.0% APY. You keep $1,200. Which is better for one year, and by how much?

7. **6 pts**

   Tell what happened in the banking crisis from 1930 to March 1933 and how the FDIC was meant to stop it.

8. **6 pts**

   Using a $250,000 limit, a single owner has $210,000 in savings and $90,000 in checking at one bank, and a joint account with her husband of $300,000 there. How much is uninsured?

9. **5 pts**

   Why does a bank run cause a sound bank to fail?

10. **5 pts**

    What did the Bank of Amsterdam do in 1609, and how is it like a modern debit-card payment?

11. **6 pts**

    A card earns 1.5% on $1,100 a month and has a $49 annual fee. The owner pays in full every month. Find the net value for the year. What happens if she carries a $1,000 balance at 23% APR all year?

12. **5 pts**

    Compare debit cards and credit cards on fraud protection.

13. **6 pts**

    A text says: “Your bank account is locked! Verify now at this link or it will be closed in 1 hour.” Identify the scam signs and give the safe response.

14. **5 pts**

    How many passwords of length 12 can be made from 62 characters? Write in scientific notation.

15. **6 pts**

    List the first four steps to take if fraud appears on your account.

16. **14 pts**

    Short essay (one or two paragraphs): Trust holds every banking system together. Using at least two stories from this unit (Duncan’s bank, the London clearing house, the 1930s runs, the Bank of Amsterdam, the Spanish prisoner), explain what builds trust in money and what destroys it, and what your part is.

ANSWER KEY

1. $\$1{,}449{,}000 - \$600{,}000 - \$600{,}000 = \$249{,}000$
2. \$6 million; \$2 million
3. A Scottish minister of Ruthwell who opened a parish savings bank where poor laborers could deposit small sums safely and earn interest; it became the model for savings banks worldwide.
4. $(1.00375)^{12} - 1 \approx 4.59\%$; about \$91.88
5. Statement adjusted $1{,}318.20 + 12 - 85 - 41.70 = \$1{,}203.50$; register adjusted $1{,}206.50 - 3 = \$1{,}203.50$. They match.
6. A: $+\$0.60$. B: $\$12 - \$120 = -\$108$. A is better by \$108.60.
7. Rumors and fear caused runs; thousands of banks failed; on March 6, 1933 all banks were closed in a national holiday. The Banking Act of 1933 created the FDIC; from January 1, 1934 insured deposits were guaranteed, so depositors had no reason to run.
8. Single: \$300,000, \$50,000 uninsured. Joint: each share \$150,000, fully insured. Total uninsured \$50,000.
9. Banks lend most deposits and keep only a fraction as reserves, so if many depositors demand cash at once, the bank must sell assets at a loss or cannot pay, even if its loans are good.
10. It took in mixed coins, credited accounts at their true value, and let merchants pay by transferring balances on its books; a debit payment likewise moves balances by ledger entries rather than moving coins.
11. Rewards \$198; net \$149. Carrying the balance adds about \$230 of interest: net $-\$81$.
12. Credit-card fraud uses the issuer's money while disputed and carries very small liability; debit fraud removes your own money until resolved, and protection depends on reporting quickly.
13. Threat, urgency, and a link asking for login information. Do not click; contact the bank using a number or app you already trust.
14. $62^{12} \approx 3.2 \times 10^{21}$
15. Call the bank or issuer using a trusted number; lock or cancel the card; change passwords and enable two-factor authentication; report to the FTC and review statements and credit reports.

16. A strong answer shows that trust is built by honest records, rules and guarantees (Duncan's trustees and published accounts, the clearing house's careful netting, the Wisselbank's honest assay, deposit insurance) and destroyed by fear, secret dealings and fraud (the 1930 runs, the Wisselbank's hidden loans, swindlers); and it names the student's part: keeping accurate records, reconciling accounts, choosing insured institutions, and refusing to be hurried by scams.

PORTFOLIO PIECE: MY BANKING FILE

Assemble your three-bank comparison and parish-bank balance sheet, your register and reconciliation, your bank-run simulation record and coverage calculations, your payment-method audit and payment rules, and your scam-spotter analysis and account protection plan. Add a one-page summary describing the accounts you plan to open as a young adult, why, and how you will protect them.

LOOK FOR	WHAT IT MEANS
Accuracy	Interest, APY, reconciliation, coverage and fee calculations are correct and shown.
Records	The register is complete with a running balance, and every reconciliation difference is explained.
Judgment	Bank, account and payment choices are justified by cost, safety and convenience.
Protection	The security plan is specific, realistic and includes what to do if fraud occurs.

3.1 How Banks Work: Henry Duncan's Parish Bank

OBJECTIVES

- Explain how a bank uses deposits to make loans and earns the interest spread.
- Read a simple bank balance sheet and explain reserves.
- Compare banks and credit unions.

> **Warm-up.** Where is money safest: under a mattress, in a piggy bank, or in a bank? List one advantage and one risk of each.

WATCH

Overview of fractional reserve banking | The monetary system | Macroeconomics | Khan Academy

Khan Academy · 8:28

https://www.youtube.com/watch?v=3mUi9IZb4T4

> **WHEN TO WATCH**
> After the big idea, with worked example 2: how banks lend most of their deposits.

BACKUP VIDEO

Banks vs. Alternatives | Personal Finance 101

Federal Reserve Bank of St. Louis · 5:08

https://www.youtube.com/watch?v=l9dpwIcxs8o

With In business today: why banks and credit unions usually cost less than check-cashing and payday lenders.

KEY TERMS

deposit

Money placed in a bank. To the depositor it is an asset; to the bank it is a liability, money it owes.

loan

Money a bank lends to a borrower, to be repaid with interest. To the bank it is an asset.

interest spread

The difference between the interest rate a bank earns on loans and the rate it pays on deposits.

reserves

Cash and funds a bank keeps on hand or at the central bank to meet withdrawals.

credit union

A not-for-profit financial cooperative owned by its members, who share a common bond such as an employer, church or town.

CORE IDEAS

The story. In 1810 the Reverend Henry Duncan, minister of the parish of Ruthwell in Dumfriesshire, Scotland, looked at the laborers of his poor country parish and saw a problem. Wages were small and uncertain, and a family hit by sickness or a bad harvest had nothing to fall back on but charity. There was nowhere safe for a working man to put a few shillings, and no reward for saving them. So Duncan opened the Ruthwell Parish Bank in a cottage, took small deposits from his parishioners, paid them interest, and lent the funds out safely through a larger bank. He published pamphlets explaining his plan, and within a few years savings banks on his model had spread across Britain and to America, where the first opened in Boston and Philadelphia in 1816.

How they figured it out. Duncan's insight was that small savings become useful when they are pooled. One laborer's few shillings could not build a house, but the deposits of a whole parish, lent to a sound borrower, could earn interest for every depositor. He wrote rules to keep the bank honest: trustees who served without pay, regular accounts, and deposits kept separate from the managers' own money. Jesus' parable assumes the same idea: the master tells the idle servant he should at least have put the money "into the bank, that at my coming I might have required mine own with usury" (Luke 19:23).

The big idea. A bank is a go-between. It takes **deposits** (which it owes to depositors) and makes **loans** (which borrowers owe to it). It pays depositors a low rate and charges borrowers a higher one; the **interest spread** pays the bank's costs and its profit. Because not every depositor withdraws at once, a bank keeps only part of its deposits as **reserves** and lends the rest; this is called fractional-reserve banking. Its

balance sheet must balance: assets (reserves, loans, securities) = liabilities (deposits, borrowings) + owners' capital. The capital is the cushion that absorbs losses when some loans go bad.

In business today. You can choose among large national banks, small community banks, online banks and **credit unions**. Credit unions are owned by their members and often pay a little more on savings and charge a little less on loans, but may have fewer branches. Online banks often pay higher savings rates because they have no branches to run. Look for deposit insurance (FDIC for banks, NCUA for credit unions), low or no monthly fees, convenient ATMs, and honest service. Avoid "alternatives" such as check-cashing shops and payday lenders, which charge far more for the same services.

Who gained? Duncan's depositors gained safety and interest; borrowers gained credit; the community gained families who could weather hard times without charity. Duncan himself gained nothing but work: he served as a trustee without pay. The savings-bank movement he started taught millions of working families to save.

PICTURE STUDY



The Reverend Henry Duncan of Ruthwell, David Octavius Hill and Robert Adamson, 1843–1846 · Calotype (salted-paper photograph) · National Galleries of Scotland, Edinburgh
Image: Wikimedia Commons, public domain

This is one of the earliest photographs ever taken in Scotland. Hill and Adamson photographed the ministers of the Free Church of Scotland in the 1840s, Duncan among them. Henry Duncan (1774–1846) was a minister, writer, geologist and reformer. Besides founding the first savings bank on his new plan, he restored the ancient Ruthwell Cross in his churchyard and edited a newspaper. His bank cottage in Ruthwell is still kept as a small museum.

Look closely

- Look at his clothing. What does it tell you about his work?
- Look at his face and expression. What kind of man does the artist suggest?
- Imagine this man counting a laborer's deposit of a few shillings. How would you expect him to treat that depositor?

Talk about it

1. Why might a pastor, rather than a merchant, have started a bank for the poor?
2. What rules did Duncan make to keep his bank honest, and why do banks still need such rules?
3. How does a savings bank help a whole community and not only one saver?

PROJECT

Compare Three Banks and Build a Bank's Balance Sheet

You will compare three real financial institutions (for example, a large bank, a community bank or credit union, and an online bank) on the features that matter to a young customer, and build a simple balance sheet for an imaginary parish bank.

You will need

- Internet access with a parent, or brochures from local banks
- Ledger notebook and calculator
- Spreadsheet (optional)

Steps

1. Choose three institutions: one large bank, one community bank or credit union, and one online bank.
2. For each, record: deposit insurance (FDIC or NCUA), monthly fee and how to avoid it, minimum balance, savings APY, overdraft fee, ATM network, and branch or app access.
3. Make a comparison table and score each on cost, convenience and service.
4. Imagine you are Henry Duncan in 1810 with 60 depositors who have deposited £240 in all. You keep £40 in reserve and lend £200 at 5% a year; you pay depositors 4%. Compute a year's interest earned and paid, and the margin left for costs.
5. Write your parish bank's balance sheet at the start and end of the year (assume no other costs and that the margin is added to capital).
6. Write a half page: which real institution would you choose for a first account, and why?

Tips

- Fee schedules are often in a document called the account agreement or fee disclosure.
- Ask a parent which bank your family uses and why.

Check your work

- ☐ My comparison table covers all three institutions on the same features.
- ☐ My parish-bank balance sheet balances.
- ☐ I can explain the interest spread and why reserves matter.

LEDGER NOTEBOOK

1. Draw a diagram of money flowing from savers into a bank and out to borrowers, with the interest rates on each arrow.
2. Copy your parish-bank balance sheet in two columns: assets and liabilities plus capital.
3. List three differences between a bank and a credit union.

KEY FORMULAS

$$\text{Assets} = \text{Liabilities} + \text{Capital}$$

$$\text{Interest spread} = r_{\text{loans}} - r_{\text{deposits}}$$

$$\text{Reserve ratio} = \frac{\text{reserves}}{\text{deposits}}$$

From history. Duncan's bank was not the first institution ever called a savings bank, but it was the first run on the plan that spread worldwide: depositors earned interest, trustees served without pay, and the accounts were published. The British Parliament passed a law to regulate savings banks in 1817.

WORKED EXAMPLES

Example 1. In this example, a small bank holds $10 million in deposits paying 2% a year and has lent $8.5 million at 7%. Its yearly operating costs are $250,000. Find the interest earned, interest paid and profit before taxes and loan losses.

Show solution

1. Interest earned: $0.07 \times \$8{,}500{,}000 = \$595{,}000$.
2. Interest paid: $0.02 \times \$10{,}000{,}000 = \$200{,}000$.
3. Profit: $\$595{,}000 - \$200{,}000 - \$250{,}000 = \$145{,}000$.

Answer: $145,000 before taxes and before any loans that go bad.

Example 2. The same bank keeps $1.5 million in reserves and has $1 million of owners' capital. Write its simple balance sheet and find the reserve ratio. (Assume its only other asset is the loans, plus $1 million of securities.)

Show solution

1. Assets: reserves $1.5M + loans $8.5M + securities $1M = $11M.
2. Liabilities + capital: deposits $10M + capital $1M = $11M. It balances.
3. Reserve ratio: $1.5/10 = 15\%$.

Answer: Assets $11M = liabilities $10M + capital $1M; reserve ratio 15%.

Example 3. Suppose $600,000 of the bank's loans go bad and must be written off. What happens to its capital? What if the losses were $1.2 million?

Show solution

1. Losses reduce assets, and since deposits are still owed in full, capital absorbs the loss.
2. $600,000 loss: capital falls from $1,000,000 to $400,000.
3. $1.2M loss: capital would be $-\$200{,}000$: the bank could not repay all depositors. It is insolvent.

Answer: Capital is the cushion. Small losses shrink it; losses larger than capital make the bank insolvent, which is why regulators require banks to keep enough capital.

PRACTICE

1. Easy A bank pays 1.5% on deposits and charges 6.5% on loans. What is the interest spread?

   Show answer

   5 percentage points

2. Easy Is a customer's deposit an asset or a liability to the bank? To the customer?

   Show answer

   A liability to the bank (it owes the money); an asset to the customer.

3. **Easy** In what year and where did Henry Duncan open his parish savings bank?

Show answer

1810, in Ruthwell, Dumfriesshire, Scotland.

4. **Medium** A bank has $40 million of deposits and keeps $4.8 million in reserves. Find the reserve ratio.

Show answer

12%

5. **Medium** Assets are $52 million and deposits $47 million. If there are no other liabilities, what is the bank's capital?

Show answer

$5 million

6. **Medium** In this example, a credit union pays 3.8% on savings and a bank pays 0.5%. How much more interest does $2,500 earn in a year at the credit union (simple interest)?

Show answer

$\$95 - \$12.50 = \$82.50$ more

7. **Medium** From the story: what problem did Henry Duncan see among the poor of his parish, and how did his bank solve it?

Show answer

Laborers had no safe place to keep small savings and no reward for saving, so hard times meant depending on charity. His bank took small deposits, kept them safe, paid interest, and pooled them to lend soundly.

8. **Hard** A bank has loans of $30 million at 6.8%, deposits of $34 million at 2.1 percent, and costs of $900,000. Find its profit before taxes and loan losses.

Show answer

$\$2{,}040{,}000 - \$714{,}000 - \$900{,}000 = \$426{,}000$

9. **Hard** A bank with $3 million of capital suffers $1.8 million of loan losses. What is its new capital, and what fraction of its cushion is gone?

Show answer

$1.2 million; 60% of the cushion is gone.

10. Hard Explain why a bank that keeps only 10% of deposits as reserves can still meet ordinary withdrawals, and what could make it fail.

Show answer

On a normal day only a small share of depositors withdraw, and new deposits come in. It fails if many depositors demand cash at once (a run) or if loan losses exceed its capital.

11. Challenge A new bank wants to earn $300,000 a year. It expects $20 million in deposits at 2.5%, will keep 12% in reserves earning nothing, can lend the rest, and has costs of $500,000. What loan rate must it charge?

Show answer

Loans $17.6M; needed interest $300{,}000 + 500{,}000 + 500{,}000 = \$1{,}300{,}000$; rate $1{,}300{,}000 / 17{,}600{,}000 \approx 7.4\%$

COMMON MISTAKES

- Thinking the bank keeps every depositor's money in a vault. Most deposits are lent out.
- Choosing a bank only for a sign-up bonus while ignoring monthly fees.
- Using check-cashing shops or payday lenders instead of an insured bank or credit union.

Make it a game · Parish Bank Role Play. Be a banker with a jar of beans. Your parent deposits ten beans and then borrows eight to buy something. Charge two beans' worth of interest, and pay one bean to the depositor. Calculate the spread and the reserve left in the jar. Then explain how Henry Duncan's parish bank in Scotland served ordinary people.

Scripture. "Wherefore then gavest not thou my money into the bank, that at my coming I might have required mine own with usury?" (Luke 19:23, KJV)

In the parable, even putting money in the bank to earn interest was better than burying it. Faithful stewards put resources to work.

3.2 Checking and Savings: The Clearing House and the Register

OBJECTIVES

- Explain the purposes of checking and savings accounts and compare them.
- Keep a check register and reconcile it with a bank statement.
- Calculate interest using APY and compare account fees.

> **Warm-up.** Look at a receipt from a recent purchase. Was it paid by cash, card or another way? Write down what record, besides the receipt, shows that the payment happened.

WATCH

Opening a bank account | Banking | Financial Literacy | Khan Academy

Khan Academy · 3:06

https://www.youtube.com/watch?v=UtM1hDlP62o

> **WHEN TO WATCH**
> Before the project: what to look for when opening an account.

BACKUP VIDEO

Managing your bank account | Banking | Financial Literacy | Khan Academy

Khan Academy · 4:34

https://www.youtube.com/watch?v=lRajjjXJVL8

With the register project: managing an account, direct deposits and checks.

KEY TERMS

checking account

A bank account for everyday payments: deposits, debit-card purchases, checks, bill payments and transfers.

savings account

A bank account for money set aside, usually paying more interest and allowing fewer transactions.

APY

Annual percentage yield: the yearly return on a deposit including the effect of compounding.

register

Your own running record of every deposit and withdrawal and the balance after each.

reconciliation

Comparing your register with the bank statement and accounting for every difference.

overdraft

Spending more than the account holds; the bank may refuse the payment or cover it and charge a fee.

CORE IDEAS

The story. By the 1700s London merchants paid one another with written orders to their bankers, the ancestors of the check. Each morning a clerk from every bank had to walk all over the City collecting payment on the checks drawn on other banks. The clerks began meeting in Lombard Street to swap checks with one another, and by about 1773 they had their own room: the London Clearing House. Instead of carrying sacks of coin across town, each bank added up what it owed every other bank and what they owed it, and only the **difference** was paid.

How they figured it out. The clerks saw that most payments cancel out: if Bank A owes Bank B £1,000 and B owes A £900, only £100 needs to move. The system depended on careful records: every check written down, every total checked, every difference explained. Your own account works the same way. You keep a **register**; the bank keeps its record; once a month you **reconcile** them. Any difference must be explained: a check not yet cleared, a deposit in transit, a fee you forgot, or an error by you or the bank.

The big idea. A **checking account** is for flow: money comes in and goes out. A **savings account** is for stock: money you are keeping, earning interest. Compare savings accounts by **APY**, which includes compounding; for an interest rate r compounded n times a year, $\text{APY} = (1 + r/n)^n - 1$. Compare checking accounts by fees: monthly fees, overdraft fees, ATM fees. A $12 monthly fee costs $144 a year, more than many young savers earn in interest. Keep a cushion in checking so you never overdraw.

In business today. Today the clearing is electronic: the Federal Reserve and private networks settle billions of checks and electronic payments a day, still by netting

what banks owe one another. Most banks offer an app that shows your transactions, but an app is not a register. It shows what has cleared, not the check you wrote yesterday or the automatic payment due tomorrow. People who keep their own running balance, even a simple one, almost never pay overdraft fees.

Try it. Reconcile your register this month (or a sample one in this lesson). Start with the statement's ending balance, add deposits in transit, subtract outstanding checks and payments, and see whether you reach your register's balance.

PICTURE STUDY



The Moneychanger and His Wife, Marinus van Reymerswaele, 1539 · Oil on panel · Museo del Prado, Madrid

Image: Wikimedia Commons, public domain

Reymerswaele, a painter from Zeeland, made many versions of this scene, inspired by Quentin Matsys. This one shows a couple keeping accounts: the man weighs and counts, and his wife keeps the book. Scholars still debate whether he is a moneychanger or a tax collector.

Look closely

- Find the account book. Who is keeping it?
- Find the balance and the coins. Why would every coin be weighed?
- Look at the papers on the shelf behind them. What might they be?
- Look at the couple's faces. Are they relaxed or concentrating?

Talk about it

1. How is the woman's ledger like your check register?
2. Why do two people keeping separate records catch more mistakes than one?
3. What would this couple think of a person who never looks at his bank statement?

PROJECT

Run a Register and Reconcile a Month

You will keep a check register for a real account (with a parent) or for a realistic practice month, then reconcile it with a statement and find every difference.

You will need

- A paper register (free printables are easy to find, or rule your own) or a spreadsheet
- A real statement reviewed with a parent, or the practice transactions you create
- Calculator

Steps

1. Rule a register with columns: Date, Description, Payment, Deposit, Balance.
2. Record a month of transactions: your Lesson 2.1 budget items as payments and your income as deposits. Include at least one check, two automatic payments and one fee.
3. With a parent, create a “bank statement” that leaves out two items not yet cleared and includes one fee you did not record.
4. Reconcile: adjust the statement for items in transit and adjust the register for unrecorded fees.
5. Find and explain every difference.
6. Compare the APY and fees of two savings accounts and compute a year’s net result for your planned balance.
7. Write a short paragraph on why an app balance is not the same as your available money.

Tips

- Record transactions the same day, before you forget.
- If the difference is exactly double an amount, look for a sign error.

Check your work

☐ My register has a running balance after every line.

- ☐ My reconciliation explains every difference and ends with matching balances.
- ☐ I can compute APY and compare accounts by net result.

LEDGER NOTEBOOK

1. Draw the London Clearing House as a circle of banks with arrows, and show how netting reduces the coin that must move.
2. Copy your reconciliation in two columns.
3. Make a table of fees from two accounts and their yearly totals.

KEY FORMULAS

$$\text{APY} = \left(1 + \frac{r}{n}\right)^{n} - 1$$

$$\text{Adjusted statement balance} = \text{statement balance} + \text{deposits in transit} - \text{outstanding items}$$

From history. The earliest surviving English checks date from the 1650s and 1660s, written on goldsmith-bankers in London. Printed check forms came later; at first a customer simply wrote a letter asking his banker to pay a sum to a named person.

WORKED EXAMPLES

Example 1. A savings account pays 4.00% compounded monthly. Find the APY, and the interest on \$3,000 left for one year.

Show solution

1. APY: $(1 + 0.04/12)^{12} - 1 = 1.003333^{12} - 1 = 0.04074$, or 4.07%.
2. Interest: $\$3{,}000 \times 0.04074 = \$122.22$.

Answer: APY 4.07%; \$122.22 of interest.

Example 2. Your register shows a balance of $842.17. The statement shows $1,013.40. Check #214 for $95.00 and a debit-card purchase of $63.23 have not cleared. The bank charged a $5.00 fee you have not recorded, and a $18.00 deposit you made is not on the statement. Reconcile.

Show solution

1. Adjust the statement: $\$1{,}013.40 + \$18.00 - \$95.00 - \$63.23 = \$873.17$.
2. Adjust the register: $\$842.17 - \$5.00 = \$837.17$.
3. They differ by $\$873.17 - \$837.17 = \$36.00$. Look for an error of $36 or $\$18 \times 2$: the $18 deposit was subtracted in the register instead of added.

Answer: Correct the register by adding $36 (reversing the error); both sides become $873.17. A difference of exactly twice an amount usually means it was entered with the wrong sign.

Example 3. Account A has no monthly fee and pays 0.10% APY. Account B charges $8 a month unless you keep $1,500, and pays 0.50% APY. You will keep about $1,000. Compare one year's result.

Show solution

1. A: $\$1{,}000 \times 0.001 = \$1.00$.
2. B: interest $5.00, fees $12 \times \$8 = \$96$; net $-\$91$.

Answer: A leaves you $92 better off. Fees matter far more than small rate differences.

PRACTICE

1. Easy Starting balance $430; deposit $150; payments $62.50 and $18.75. Find the ending balance.

   Show answer

   $498.75

2. Easy What is the main purpose of a checking account? Of a savings account?

   Show answer

   Checking: everyday payments and deposits. Savings: keeping money aside and earning interest.

3. Easy A $6 monthly fee costs how much a year?

Show answer

$72

4. Medium Find the APY of 3.6% compounded monthly.

Show answer

$(1.003)^{12} - 1 \approx 3.66\%$

5. Medium Statement balance $612.40; deposit in transit $75; outstanding checks $40 and $22.15. Find the adjusted statement balance.

Show answer

$625.25

6. Medium Bank A owes Bank B $5,200; B owes A $4,750. Under clearing, how much actually moves, and which way?

Show answer

$450 from A to B

7. Medium From the story: what problem did the London bank clerks solve by meeting to exchange checks?

Show answer

Instead of each clerk walking all over the City to collect on every check and carrying coin, they swapped checks in one place and paid only the net differences.

8. Hard Your register says $310.00; the adjusted statement says $356.00. You find a $23 refund you recorded as a payment. Does that explain the difference?

Show answer

Yes. Recording a $23 deposit as a payment makes the register $46 too low; $310 + 46 = 356$.

9. Hard Compare $5,000 for one year in Account X (4.25% compounded daily, 365 days) and Account Y (4.30% compounded annually).

Show answer

X: APY $(1 + 0.0425/365)^{365} - 1 \approx 4.34\%$, about $217.05. Y: $215.00. X earns slightly more.

10. Hard In this example, a bank charges \$35 per overdraft. A student overdraws by \$4 three times in a month. What is the cost, and what effective rate is that on the \$12 borrowed?

    Show answer

    \$105; $105/12 = 875\%$ for a few days' use of \$12. Keep a cushion and track your balance.

11. Challenge Show that APY is always at least the stated rate r when $n \geq 1$, using the first terms of the binomial expansion of $(1 + r/n)^n$.

    Show answer

    $(1 + r/n)^n = 1 + n(r/n) + \binom{n}{2}(r/n)^2 + \cdots = 1 + r + (\text{nonnegative terms})$, so $\text{APY} = (1 + r/n)^n - 1 \geq r$, with equality when $n = 1$.

COMMON MISTAKES

- Trusting the app balance and forgetting checks and automatic payments not yet cleared.
- Comparing accounts by interest rate and ignoring fees.
- Not reconciling, so errors and fraud go unnoticed for months.

> **Make it a game · Find the Difference.** Your parent writes a short check register and a bank statement for a pretend month, with a small difference planted between them. Race to reconcile the two and find the error, such as a missed check or a fee. Say what each account type is for. Then name one way to avoid an overdraft.

3.3 Bank Runs and the FDIC, 1933

OBJECTIVES

- Explain why bank runs happened and how they spread.
- Tell the story of the banking crisis of 1930–1933 and the founding of the FDIC.
- Calculate deposit-insurance coverage in simple cases.

> **Warm-up.** Imagine you heard a rumor that your bank was in trouble. What would you do? What if everyone in town did the same thing at once?

WATCH

FDIC Deposit Insurance

FDICchannel · 3:01

https://www.youtube.com/watch?v=K87lSkrhr8g

> **WHEN TO WATCH**
> After the story of 1933: how deposit insurance works today.

BACKUP VIDEO

Is Your Money Safe in a Bank?

Two Cents · 6:14

https://www.youtube.com/watch?v=KTo0IeqXuZk

Optional, for the whole family: is money safe in a bank? Mentions some recent bank failures as examples.

KEY TERMS

bank run

Many depositors withdrawing at once because they fear the bank will fail; because banks lend most deposits, a run can make a sound bank fail.

bank holiday

A government-ordered closing of banks to stop a run and examine their condition.

deposit insurance

A government guarantee that depositors will be repaid up to a limit if an insured bank fails.

FDIC

The Federal Deposit Insurance Corporation, created by the Banking Act of 1933, which insures deposits at member banks.

ownership category

The way an account is held (single, joint, certain retirement accounts, trusts); FDIC coverage applies separately to each.

CORE IDEAS

The story. In December 1930 a rumor spread through the Bronx that the Bank of United States, a large New York bank with some 400,000 depositors, was refusing to let a customer sell his shares. Crowds gathered at its branches to withdraw their money, and within days the bank was closed. It was one of more than 1,300 banks that failed in 1930. Over the next two years the waves of panic grew. By early 1933 thousands of banks had failed, people were hiding cash at home, and state after state closed its banks. On March 6, 1933, two days after taking office, the new President declared a national bank holiday and closed every bank in the country.

How they figured it out. The banks reopened over the following weeks only after examiners judged them sound, and depositors, reassured, began to bring cash back. But Congress wanted to stop runs for good. The answer, pressed by Representative Henry Steagall of Alabama and others, was **deposit insurance**: if every depositor knows his money is guaranteed, no one has a reason to run. The Banking Act of 1933 created the **FDIC**. Insurance began on January 1, 1934, covering up to $2,500 per depositor (soon raised to $5,000). In 1934 only nine insured banks failed. Since the FDIC began, no depositor has lost a penny of insured deposits.

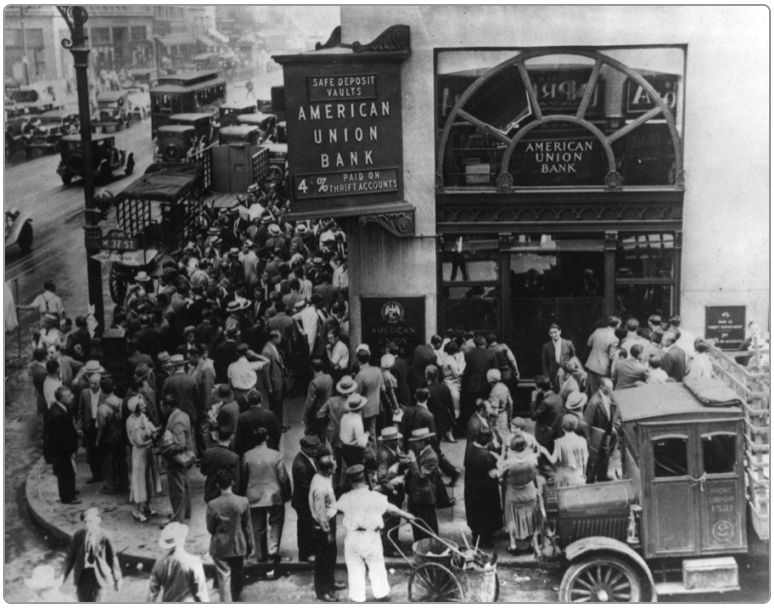
The big idea. A bank run is a problem of **trust**. A bank lends most of its deposits, so even a healthy bank cannot pay everyone at once. If depositors fear a failure, each one is wise to withdraw first, and the fear makes itself come true. Deposit insurance breaks that chain. It is paid for by premiums charged to banks, not by depositors. Coverage has a limit: since 2010 the standard limit has been $250,000 per depositor, per insured bank, for each ownership category (check the FDIC for current rules).

Money in single accounts, joint accounts and certain retirement accounts is insured separately.

In business today. Look for the "Member FDIC" sign at banks or "NCUA" at credit unions. Insurance covers checking, savings, money-market deposit accounts and certificates of deposit; it does not cover stocks, bonds, mutual funds or insurance products, even if bought at a bank. The FDIC also examines banks and, when one fails, usually arranges for another bank to take over its accounts, often over a single weekend, so depositors can use their money the next business day.

Who gained? Depositors gained security; sound banks gained stability; the whole economy gained, because frightened people stopped hoarding cash. The cost was premiums paid by banks and a new layer of examination. It is one of the clearest examples in American history of a rule that fixed a real problem.

PICTURE STUDY



Crowd at New York's American Union Bank, Unknown photographer, 1931 · Photograph · U.S. Social Security Administration historical photograph collection

Image: Wikimedia Commons, public domain

This photograph of a crowd outside the American Union Bank in New York during the banking panics of the early 1930s became one of the best-known images of the Depression. A crowd like this could drain a bank of cash in a day.

Look closely

- Look at the faces you can see. What do they show?
- Find the policeman. Why might one be needed?
- Look at how people are dressed. Are these rich speculators or ordinary working people?
- Count roughly how many people you can see. What would happen if each wanted $100 in cash?

Talk about it

1. Why would a crowd like this make even a healthy bank fail?
2. How does deposit insurance change what each person in this crowd should do?
3. What does this picture teach about trust in a banking system?

PROJECT

A Bank Run Simulation and a Coverage Check

You will run a small bank-run simulation with your family or class, then work out deposit-insurance coverage for several households using the FDIC's rules and check your answers with the FDIC's free estimator.

You will need

- 20 index cards and play money (or slips of paper)
- Ledger notebook and calculator
- Internet access with a parent for the FDIC's EDIE estimator

Steps

1. Play banker: give 10 "depositors" $100 each in play money and have them deposit it. Keep $150 in a reserve box and "lend" $850 to a borrower (put it in an envelope you cannot open for the game).
2. Draw cards each round: most cards say "withdraw $20 for groceries"; one card says "rumor!" and makes every depositor try to withdraw everything.
3. Record each round's withdrawals and reserves. Note the round when the bank cannot pay.
4. Play again with a rule: "deposits are insured." With insurance, depositors who hear the rumor withdraw only what they need. Record what happens.
5. Work out coverage for three sample households (single, joint and retirement accounts at one or two banks) using the lesson's limit as an example.
6. With a parent, check one of your answers in the FDIC's EDIE tool.
7. Write a half page explaining why insurance changed the players' choices.

Tips

- The simulation works because the bank lent most of the money; that is real banking.
- Insurance limits and rules can change. Always check the FDIC for current figures.

Check your work

- ☐ My record shows when the uninsured bank failed and why.
- ☐ I can calculate insured and uninsured amounts by ownership category.
- ☐ I can explain how deposit insurance stops runs.

LEDGER NOTEBOOK

1. Draw a timeline: December 1930, March 6, 1933, the Banking Act of 1933, January 1, 1934.
2. Draw the "chain of fear" in a bank run as a loop, then draw where deposit insurance breaks it.
3. Copy your coverage table for the three households.

KEY FORMULAS

$\text{Insured amount} = \min(\text{balance in category}, \text{limit})$ for each ownership category at each bank

$\text{Uninsured} = \text{total} - \text{insured}$

From history. Between 1930 and 1933 about 9,000 American banks suspended operations. Depositors in failed banks often waited years to recover part of their money. Since 1934, depositors at failed insured banks have usually had access to their insured funds within a few days.

WORKED EXAMPLES

Example 1. Using a limit of $250,000 in this example, Mr. Hale has $180,000 in a single checking account and $120,000 in a single savings account at the same bank. How much is insured?

Show solution

1. Both accounts are in the same category (single) at the same bank, so they are added: $300,000.
2. Insured: $\min(300{,}000, 250{,}000) = \$250{,}000$. Uninsured: $50,000.

Answer: $250,000 insured; $50,000 not.

Example 2. Mr. and Mrs. Hale also have a joint account of $400,000 at that bank. Joint accounts are insured up to the limit for each co-owner's share. How much of the joint account is insured?

Show solution

1. Each owner's share: $200,000.
2. Each share is under $250,000, so all $400,000 is insured, separately from their single accounts.

Answer: All $400,000 is insured.

Example 3. In this example, a bank has $50 million of deposits and keeps 10% as reserves. A rumor causes 30% of depositors to demand their money in one week. Can the bank pay from reserves? What must it do?

Show solution

1. Reserves: $5 million. Demands: $0.30 \times \$50 = \$15$ million.
2. Shortfall: $10 million. It must sell securities or loans quickly, often at a loss, or borrow from the central bank.

Answer: No. A sound bank can be forced into losses or failure by a run. Deposit insurance removes the reason to run.

PRACTICE

1. Easy What does FDIC stand for, and when did its insurance begin?

   Show answer

   Federal Deposit Insurance Corporation; January 1, 1934.

2. Easy Name two things FDIC insurance covers and two it does not.

   Show answer

   Covers: checking, savings, money-market deposit accounts, CDs. Does not: stocks, bonds, mutual funds, annuities or insurance products.

3. Easy What happened on March 6, 1933?

   Show answer

   A national bank holiday closed every bank in the country to stop the panic.

4. Medium Using a $250,000 limit, a single depositor has $140,000 in checking and $160,000 in a CD at one bank. How much is uninsured?

Show answer

$50,000

5. Medium The same depositor moves the CD to a different insured bank. Now how much is uninsured?

Show answer

Nothing; each bank's single-account coverage is separate.

6. Medium A joint account with two owners holds $560,000. With a $250,000 limit per owner's share, how much is insured?

Show answer

Each share $280,000 is insured to $250,000; $500,000 insured, $60,000 not.

7. Medium From the story: what happened at the Bank of United States in December 1930?

Show answer

A rumor led crowds to withdraw their money, and within days the large New York bank was closed, one of over 1,300 failures that year.

8. Hard A bank keeps 8% of $120 million of deposits as reserves. What percent of depositors can withdraw everything before reserves run out?

Show answer

$9.6 million of reserves covers 8% of deposits.

9. Hard Explain why a bank run is called a "self-fulfilling" fear.

Show answer

Because banks lend most deposits, they cannot pay everyone at once; if depositors fear failure and all withdraw, the withdrawals themselves cause the failure.

10. Hard Who pays for deposit insurance, and why does that matter?

Show answer

Insured banks pay premiums to the FDIC. Depositors are protected without paying directly, and banks share the cost of keeping the system trustworthy.

11. **Challenge** In 1934 the limit was raised to $5,000. If prices rose about 23 times from 1934 to 2024 (a rough figure for this example), what would $5,000 of 1934 be in 2024 dollars? Compare with a $250,000 limit.

    Show answer

    About $115,000; the later limit of $250,000 is roughly twice the 1934 limit in real terms.

COMMON MISTAKES

- Thinking investments bought at a bank are FDIC-insured. Only deposits are.
- Assuming two accounts at the same bank in the same name are each insured to the limit. They are added together.
- Panicking at rumors. Insured deposits are safe up to the limit.

> **Make it a game · Bank Run Drama.** Place ten beans as ten depositors' dollars, but keep only two in reserve and lend out the rest. Your parent whispers rumors, and you act as a nervous depositor demanding cash. Count what happens once the reserve runs dry. Then introduce an FDIC card that stops the panic, and explain why 1933 changed things.

3.4 Payment Methods: From the Bank of Amsterdam to the Card in Your Wallet

OBJECTIVES

- Compare cash, checks, debit cards, credit cards and electronic transfers by cost, safety and protection.
- Calculate the cost of fees and the value of rewards honestly.
- Explain how payments move between banks.

> **Warm-up.** List every way your family paid for something this week. Which methods move paper, which move plastic, and which move nothing you can touch?

WATCH

Payment methods intro | Budgeting and saving | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 6:15

https://www.youtube.com/watch?v=uSoAIZTV0Bc

> **WHEN TO WATCH**
> After the story, before the worked examples: cash, checks, debit and credit compared.

BACKUP VIDEO

Digital payment methods | Budgeting and saving | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 3:47

https://www.youtube.com/watch?v=YbE6SDnZrB4

Optional: payment apps and digital wallets.

KEY TERMS

debit card

A card that takes money directly from your checking account at the time of purchase.

credit card

A card that borrows money from the issuer for each purchase, to be repaid later, with interest if the balance is not paid in full.

ACH transfer

An electronic payment between bank accounts through the Automated Clearing House network, used for direct deposit and bill payments.

giro

A payment made by transferring a balance from one account to another on a bank's books, without moving coins.

interchange fee

A fee a merchant's bank pays the card issuer on each card sale, usually a small percent of the price.

CORE IDEAS

The story. In 1609 the city of Amsterdam opened the Wisselbank, the Bank of Amsterdam, in its town hall. Dutch merchants were drowning in coins: hundreds of kinds, many clipped or worn, from every country that traded with the busy port. The bank took them all in, weighed and assayed them, and credited each merchant's account with its true value in a stable money of account. After that, merchants paid one another simply by asking the bank to move a balance from one account to another in its great ledgers. No coins changed hands. For more than a century, bank money in Amsterdam was trusted more than coin.

How they figured it out. The Amsterdam merchants discovered what every payment system since has relied on: a trusted record can replace a physical transfer. Three and a half centuries later, on June 27, 1967, Barclays Bank opened the first cash machine at its branch in Enfield, north of London, invented by a team led by John Shepherd-Barron. Customers used paper vouchers and a PIN. Within a few decades the plastic card, the cash machine and the electronic network had made money nearly weightless, but every card swipe is still, underneath, a ledger entry moving a balance, just as in Amsterdam.

The big idea. Each method has a cost, a speed and a protection. **Cash** is simple and private but cannot be recovered if lost. **Checks** are slow but leave a record. **Debit cards** spend your own money; under federal rules your loss from unauthorized use is limited if you report quickly, but the money is gone from your account while the problem is fixed. **Credit cards** spend the bank's money; they carry the strongest fraud and dispute protections and can build credit, but they charge high interest on unpaid balances. **ACH** transfers and payment apps are cheap and fast, but a payment

sent to the wrong person, or to a scammer, may be impossible to reverse. Card rewards of 1 to 2 percent are worth having only if you pay in full every month.

In business today. Merchants pay for card payments through **interchange** and processing fees, often around 1.5% to 3% of each sale in examples, which is why some small shops prefer cash or add a surcharge. Your paycheck most likely arrives by ACH direct deposit. Banks charge fees for using another bank's ATM, and the ATM owner may add its own. A wise user chooses methods by purpose: debit or cash for everyday budgeted spending, credit only if paid in full, and bank transfers only to people and companies you know.

Think it through. The easier it is to pay, the easier it is to spend. Researchers and retailers have long observed that people tend to spend more with cards than with cash. If your budget leaks, try paying for one budget line in cash for a month.

PICTURE STUDY



The Town Hall on the Dam, Amsterdam, Gerrit Adriaensz. Berckheyde, 1693 · Oil on canvas · Rijksmuseum, Amsterdam

Image: Wikimedia Commons, public domain

Berckheyde painted Amsterdam's town hall, finished in 1665, many times. Inside it, in the cellars and offices, the Wisselbank kept the accounts through which the merchants of the busiest port in Europe paid one another.

Look closely

- Find the town hall and its tower. How does its size compare with the people?
- Find the merchants, porters and carts in the square. What are they doing?
- Look at the church beside the town hall. What does their placement together suggest about Dutch life?
- Imagine the bank's ledgers inside. What has replaced the carts of coin?

Talk about it

1. Why would merchants trust a ledger entry in this building more than a bag of mixed coins?
2. How is a modern debit-card payment like a transfer on the Wisselbank's books?
3. What has to be true of any bank for people to trust its records?

> **Safety first.** Do not record full card or account numbers anywhere in your notebook. Use only the last four digits. Do not use payment apps or transfer money to anyone without a parent's approval.

PROJECT

A Payment-Method Audit

You will track how your family (with permission) or your own budget pays for things for two weeks, calculate what each method costs, and write a set of payment rules for yourself.

You will need

- Ledger notebook and calculator
- A bank's fee schedule and a credit card's disclosure (found with a parent)
- Your Lesson 2.1 budget

Steps

1. For two weeks, record each payment: date, amount, method (cash, check, debit, credit, transfer, app) and purpose.
2. Find the fees for each method from your bank's fee schedule (ATM fees, overdraft fees, transfer fees, card annual fee).
3. Calculate the total fees paid in the two weeks and project them for a year.
4. Make a table rating each method for cost, speed, fraud protection, and how easy it makes overspending.
5. Interview a small-business owner (with a parent) about which payment methods cost the business the most and why.
6. Write five payment rules for yourself, such as "I use credit only for budgeted purchases and pay it in full."

Tips

- Never photograph or share card numbers, even in a school project.
- Payment apps are for people you know. Treat a request from a stranger as a red flag.

Check your work

- ☐ My audit records method and purpose for every payment.
- ☐ I can calculate yearly fees and the net value of rewards.
- ☐ My payment rules are specific and protect my budget.

LEDGER NOTEBOOK

1. Draw a timeline of payments: coins, the Wisselbank (1609), checks, the first ATM (1967), cards, electronic transfers, phones.
2. Copy your payment-method rating table.
3. Draw a debit-card purchase as a ledger entry moving between two banks.

KEY FORMULAS

$$\text{Net value of rewards} = \text{rewards rate} \times \text{spending} - \text{fees} - \text{interest}$$

$$\text{Yearly ATM cost} = \text{fee per use} \times \text{uses per month} \times 12$$

From history. The Bank of Amsterdam's "bank money" was so trusted that for much of the 1600s and 1700s it traded at a premium over coin. Adam Smith described it admiringly in *The Wealth of Nations* (1776). It declined after years of secret, unrecorded loans to the Dutch East India Company were discovered, and it closed in 1820: a lesson that a payment system is only as good as the honesty of its books.

WORKED EXAMPLES

Example 1. In this example, a student withdraws cash at another bank's ATM 6 times a month. Her bank charges $2.50 and the ATM owner charges $3.00 each time. Find the yearly cost.

Show solution

1. Per use: $\$5.50$.
2. Yearly: $\$5.50 \times 6 \times 12 = \$396$.

Answer: $396 a year: enough to switch banks or plan fewer, larger withdrawals.

Example 2. A family spends $1,400 a month on a 1.5% cash-back credit card. In this example, in four months of the year they fail to pay in full and pay $38 of interest each of those months. Find the net value of the card for the year.

Show solution

1. Rewards: $0.015 \times \$1{,}400 \times 12 = \$252$.
2. Interest: $4 \times \$38 = \$152$.
3. Net: $\$252 - \$152 = \$100$.

Answer: $100, and only because the slips were few. Carrying a balance most months would turn the rewards into a loss.

Example 3. A shop owner sells $20,000 a month, 80% by card. In this example card fees average 2.6% of card sales. Find the monthly card cost, and the price increase on a $25 item that would cover it if all sales were by card.

Show solution

1. Card sales: $16,000; fees $0.026 \times \$16{,}000 = \$416$.
2. To keep $25 after a 2.6% fee: $25 / 0.974 = \$25.67$.

Answer: $416 a month; about a 67¢ increase on a $25 item.

PRACTICE

1. Easy A $3 ATM fee is paid 4 times a month. Find the yearly cost.

   Show answer

   $144

2. Easy What is the main difference between a debit card and a credit card?

   Show answer

   A debit card spends money already in your account; a credit card borrows money to be repaid later.

3. Easy Where and when did the first cash machine open?

   Show answer

   At a Barclays branch in Enfield, near London, on June 27, 1967.

4. **Medium** Find the cash-back earned on $9,600 of yearly spending at 2%.

Show answer

$192

5. **Medium** In problem 4, a card has a $95 annual fee. What is the net value? Is it worth more than a no-fee 1.5% card?

Show answer

$97; the 1.5% card earns $144, so the no-fee card is better.

6. **Medium** A merchant pays 2.9% plus $0.30 per card sale. What is the fee on a $12 sale? On a $120 sale?

Show answer

$0.65; $3.78

7. **Medium** From the story: what problem did the Bank of Amsterdam solve for merchants in 1609?

Show answer

Merchants had to deal with hundreds of kinds of worn and clipped coins. The bank credited true values to accounts, and merchants paid one another by transfers on its books instead of moving coins.

8. **Hard** Why might a payment-app transfer to a scammer be harder to recover than a credit-card purchase from a dishonest seller?

Show answer

Credit cards have legal dispute and fraud protections and the issuer can reverse charges; many app and bank transfers are treated like cash once you authorize them, so they may not be reversible.

9. **Hard** A family puts $2,000 a month on a 1.5% card but carries an average balance of $1,500 at 22% APR all year. Find rewards, interest, and net value.

Show answer

Rewards $360; interest about $0.22 \times 1{,}500 = \$330$; net only $30, and the debt remains.

10. Hard Explain how a debit-card purchase at a store is, underneath, similar to a Wisselbank transfer.

Show answer

No money physically moves at the moment of sale; the banks record a decrease in your account and an increase in the store's account, then settle net balances between banks through clearing networks.

11. Challenge A student can avoid all ATM fees by walking 15 minutes to her own bank's machine instead of using a $5.50 machine next door. She withdraws 5 times a month. What is the walk worth per hour, after tax, if she would otherwise pay the fee?

Show answer

Each walk (round trip about 0.5 hour, counting 15 minutes each way) saves $5.50: $11 an hour, tax-free, plus exercise.

COMMON MISTAKES

- Treating rewards as free money while carrying a balance.
- Sending money by app or transfer to someone you do not know.
- Ignoring small fees that repeat every week.

> **Make it a game · Payment Method Cards.** Make five cards: cash, check, debit, credit and electronic transfer. Your parent reads a purchase scenario, such as an online order or a lost wallet. Pick the best method and say what protection it gives. Then calculate whether a card paying 1.5 percent in rewards beats a twenty-five dollar yearly fee on two thousand dollars of spending.

3.5 Protecting Your Accounts: The Spanish Prisoner and Modern Scams

OBJECTIVES

- Recognize the common warning signs of a scam.
- List practical steps to protect accounts, passwords and personal information.
- Know what to do and whom to contact if fraud happens.

> **Warm-up.** Have you or someone you know ever received a message that seemed too good to be true, or that said you must act right away? Write what it said and what made it suspicious.

WATCH

Scam red flags | Scams & fraud | Financial Literacy | Khan Academy

Khan Academy · 3:35

https://www.youtube.com/watch?v=MKGS9HyjvWE

> **WHEN TO WATCH**
> After the story of the Spanish prisoner: the red flags that mark a scam.

BACKUP VIDEO

How Scammers Tell You To Pay | Federal Trade Commission

FTCvideos · 1:55

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

Optional: why scammers ask for gift cards and wire transfers.

KEY TERMS

scam

A dishonest scheme to trick someone into giving up money or information.

phishing

A message pretending to be from a trusted company or person, meant to trick you into revealing passwords, codes or account numbers.

imposter scam

A fraud in which the criminal pretends to be a government agency, a bank, a relative or a company.

credit freeze

A free request to the credit bureaus to block new credit from being opened in your name.

two-factor authentication

A login that requires a second proof, such as a code sent to your phone, in addition to a password.

CORE IDEAS

The story. In the 1800s a letter arrived in the mail of many trusting people in England and America. It came, it said, from a wealthy gentleman imprisoned in Spain under a false name. He had hidden a fortune in a trunk, and he needed a little money to bribe his jailers. If the reader would send it, he would be repaid many times over, and perhaps might marry the prisoner's beautiful daughter, who would otherwise be left alone in the world. Secrecy was essential. Newspapers warned against "the Spanish prisoner" swindle again and again; in 1898 *The New York Times* reported the old trick revived, and its descendants still arrive by email and text today.

How they figured it out. Every version of the Spanish prisoner has the same parts, and so does nearly every scam since: a **story** that stirs the emotions (pity, greed, fear or love), a **promise** or a threat, a demand for **secrecy**, a sense of **urgency**, and a request for **money or information** sent in a way that cannot be traced or reversed. Once you know the pattern, you can see it in a fake message from "your bank," a caller claiming to be from the IRS, a stranger online who asks for gift cards, or a text saying a package cannot be delivered. "The simple believeth every word: but the prudent man looketh well to his going" (Proverbs 14:15).

The big idea. Scammers win by hurrying you past your judgment. The defense is to slow down and verify. Real banks and agencies do not ask for your password, PIN or one-time code; the IRS does not demand payment by gift card; no honest prize requires a fee. If a message worries you, do not click its link or call its number. Contact the company yourself using a number you already know. Protect your accounts with long, unique passwords (a password manager helps), two-factor

authentication, and regular checks of your statements. Under federal rules, losses from unauthorized card use are limited if you report promptly, so speed matters.

In business today. Banks, card companies and the Federal Trade Commission publish warnings about current scams, and most banks can alert you to unusual activity. Adults can place a free **credit freeze** with each of the three major credit bureaus so no one can open new accounts in their name. If fraud happens: call the bank or card issuer at once, change passwords, report it to the FTC at its official reporting site, and check your credit reports. Teenagers are targets too: scams on games, social media and job offers often aim at the young.

Think it through. The Spanish prisoner letter worked on people who were greedy and on people who were kind. A wise person can be both generous and careful: give freely, but give to people and causes you have checked.

PICTURE STUDY



Robert Macaire, Shareholder (from the Robert Macaire series), Honoré Daumier, 1836–1838 · Lithograph · Published in *Le Charivari*, Paris

Image: Wikimedia Commons, public domain

Robert Macaire was a stage villain, a charming crook, whom the French artist Honoré Daumier turned into the hero of a hundred satirical prints. In each one Macaire plays a different respectable role (banker, lawyer, doctor, company promoter) and cheats his trusting victims.

Look closely

- Look at Macaire's clothes and stance. Does he look like a man who could be trusted?
- Look at his gestures and face. How does he answer a complaint?
- Look at the seated man. What has he just discovered?
- Find the caption. It begins with a shareholder asking about his dividends. What do you think Macaire answers?

Talk about it

1. Which parts of the scam pattern (story, promise, secrecy, urgency, request) can you imagine Macaire using?
2. Why do swindlers often dress or speak like respectable people?

3. What would a “prudent man” (Proverbs 14:15) do when Macaire made his offer?

Safety first. Do not click links or call numbers in suspicious messages, even to investigate them. Look at scam examples only on official warning pages, with a parent.

PROJECT

Scam Spotter and Account Protection Plan

You will collect and analyze examples of scam messages (from official warning sites, with a parent), then write a protection plan for your own accounts and devices.

You will need

- Official scam-warning pages from your bank, the FDIC or the FTC, read with a parent
- Ledger notebook
- Your own devices and accounts, reviewed with a parent

Steps

1. With a parent, find five examples of real scam messages described on official warning sites (do not click links in real suspicious messages).
2. For each, mark the five parts of the pattern: story, promise or threat, secrecy, urgency, and request for money or information.
3. Write the safe response to each: what to do and whom to contact using a number you already know.
4. Audit your own security with a parent: Are your passwords long and unique? Is two-factor authentication on for email and any financial account? Are your social media accounts private?
5. Fix at least two weaknesses you find.
6. Write a one-page plan: your rules for messages, passwords, giving out information, and what you will do if something goes wrong.
7. Teach the scam pattern to a younger sibling or a grandparent in five minutes.

Tips

- The safest response to a surprising message is to stop and verify independently.
- Never share a one-time code with anyone who contacts you. That code is the key to your account.

Check your work

- ☐ I can identify the parts of the scam pattern in a real example.
- ☐ I improved at least two security settings.
- ☐ My plan says exactly what I will do if I suspect fraud.

LEDGER NOTEBOOK

1. Draw the five-part scam pattern as a chain and write a modern example beside each link.
2. Make a table comparing PIN and password strengths from the worked example.
3. Write your "If something goes wrong" steps on an index card to keep in your wallet.

KEY FORMULAS

Passwords possible $= c^L$ (for c possible characters and length L)
Expected value of an offer $= \sum(\text{probability} \times \text{payoff}) - \text{cost}$

From history. Swindles like the Spanish prisoner are far older than the telephone or the internet. The same pattern has been used with letters, telegrams, faxes, emails and texts; only the technology changes.

WORKED EXAMPLES

Example 1. How many 4-digit PINs are possible? How many 8-character passwords using 26 lowercase letters? Using 62 characters (upper, lower, digits)? Compare.

Show solution

1. PINs: $10^4 = 10{,}000$.
2. Lowercase, length 8: $26^8 \approx 2.09 \times 10^{11}$.
3. 62 characters, length 8: $62^8 \approx 2.18 \times 10^{14}$, about 1,000 times more than lowercase alone. Length 14 lowercase: $26^{14} \approx 6.45 \times 10^{19}$.

Answer: Length matters most: a long passphrase beats a short complicated password.

Example 2. A message says you have won a $5,000 prize but must pay a $150 "processing fee" by gift card. Even if you thought there was a 1 in 1,000 chance it was real, what is the expected value of paying?

Show solution

1. Expected payoff: $0.001 \times \$5{,}000 = \$5$.
2. Expected value: $\$5 - \$150 = -\$145$. In fact, a real prize never requires a fee, so the true chance is zero.

Answer: About $-\$145$, and really $-\$150$. Any "prize" that costs money to collect is a scam.

Example 3. In this example, federal rules limit a cardholder's liability for unauthorized debit-card use to $50 if reported within 2 business days, and up to $500 if reported later but within 60 days of the statement. A thief spends $1,200 on a stolen debit card. What is the most the owner could lose in each case?

Show solution

1. Reported within 2 business days: at most $50.
2. Reported later, within 60 days: at most $500.
3. After 60 days, losses after that point may not be covered at all.

Answer: $50 versus up to $500 or more: checking your account often and reporting quickly can save hundreds. (Check current rules; credit cards generally offer stronger protection.)

PRACTICE

1. Easy Name four warning signs of a scam.

Show answer

Any four: emotional story, promise of easy money or a threat, demand for secrecy, urgency, request for money or personal information, payment by gift card, wire or app.

2. Easy Does your bank ever need you to tell it your password or one-time code in a call or text it started?

Show answer

No. A request for them is a sign of fraud.

3. Easy What is phishing?

Show answer

A fake message pretending to be from a trusted source to trick you into revealing passwords, codes or account information.

4. Medium How many 6-digit codes are possible? If a thief guesses one per second, how long to try them all?

Show answer

$10^6 = 1{,}000{,}000$; about 11.6 days (systems lock out after a few tries).

5. Medium Compare the number of passwords of length 10 using 26 letters with length 12 using 26 letters. By what factor does length 12 exceed length 10?

Show answer

$26^{12}/26^{10} = 26^2 = 676$ times more.

6. Medium A caller says he is from the IRS and you will be arrested unless you pay today by gift card. List what is wrong and what you should do.

Show answer

Urgency, threat, and gift-card payment are scam signs; the IRS contacts people by mail first and does not demand gift cards. Hang up and, if worried, contact the IRS using its official number.

7. Medium From the story: name the five parts of the Spanish prisoner letter's pattern.

Show answer

An emotional story (the wealthy prisoner and his daughter), a promise (repayment many times over), secrecy, urgency, and a request for money.

8. Hard A job ad offers $600 a week for “reshipping packages from home” but asks you to pay $80 for a starter kit. Explain why this is likely a scam.

Show answer

Real employers do not charge you to work; pay far above the skill required and work “from home” moving packages are common signs of fraud, often used to ship stolen goods.

9. Hard In this example, a credit card limits liability for unauthorized charges to $50, and many issuers waive even that. Why is a credit card safer than a debit card for online shopping?

Show answer

Fraud on a credit card uses the bank’s money while it is disputed, and liability is small; debit fraud takes your own money from your account until it is resolved, and protection depends on how fast you report.

10. Hard List the steps to take, in order, if you discover a charge you did not make.

Show answer

1) Call the bank or card issuer using the number on your card; 2) lock or cancel the card; 3) change passwords and turn on two-factor authentication; 4) report fraud to the FTC; 5) review your statements and credit reports; 6) consider a credit freeze.

11. Challenge A scammer sends 100,000 messages. If 0.05% of recipients respond and 20% of those pay an average of $400, how much does the scammer collect? Why does this show that scammers do not need most people to fall for it?

Show answer

Responses 50; payers 10; $4,000. Messages cost almost nothing, so even a tiny success rate pays; that is why scam messages are everywhere.

COMMON MISTAKES

- Clicking a link in a worrying message to “check” it.
- Using the same short password on many sites.
- Being embarrassed to report a scam. Fast reporting limits losses and protects others.

Make it a game · Spot the Spanish Prisoner. Your parent writes four short messages, three scams and one genuine. Read each one and mark the warning signs: urgency, secrecy, requests for payment in odd forms. Pick out the real message. Then plan a protection checklist covering two-factor authentication and credit freezes, without using any real password. Finish by telling the Spanish Prisoner trick.

Scripture. “The simple believeth every word: but the prudent man looketh well to his going.” (Proverbs 14:15, KJV)

Prudence is not suspicion of everyone; it is checking before trusting, especially when money or private information is asked for.

UNIT 3

Banking and Payments

A bank is a business that borrows from savers and lends to borrowers, and it earns its living on the difference. In this unit you will see how that works, starting in 1810 with a Scottish pastor, Henry Duncan, who opened a savings bank in his parish so that poor laborers could put away a few shillings safely and earn interest. You will learn to choose and manage **checking and savings accounts**, to keep a register and reconcile a statement, and to compare interest rates and fees.

Then you will stand outside the American Union Bank in New York in 1931 with a crowd of frightened depositors, and learn how **deposit insurance**, begun in 1934, ended the bank runs that had haunted America. You will trace the ways we pay, from the Bank of Amsterdam's book transfers in 1609 to the first cash machine in 1967 and the card in your wallet, and you will finish by learning to recognize and stop the oldest trick of all: the swindler who asks you to hand over money or information in a hurry.

PREREQUISITES

- Can compute simple interest and percents
- Can keep a running balance in a ledger (Units 1 and 2)
- Has a working budget from Unit 2

MASTERY CHECKLIST

- ☐ I can explain how a bank earns money from deposits and loans, and what reserves are.
- ☐ I can keep a check register and reconcile a bank statement.
- ☐ I can compare savings accounts by APY and fees.
- ☐ I can explain how FDIC insurance works and calculate coverage in simple cases.
- ☐ I can compare payment methods by cost, safety and protection.
- ☐ I can recognize the warning signs of a scam and list the steps to protect my accounts.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **FDIC: Money Smart**: Free lessons from the Federal Deposit Insurance Corporation on bank accounts, payments, credit and protecting yourself from fraud. Fits the whole unit.
- **FDIC Electronic Deposit Insurance Estimator (EDIE)**: Free official tool that shows how deposit insurance applies to different kinds of accounts. Use it with Lesson 3.3 to check your coverage answers.
- **Khan Academy: Financial Literacy**: Free short lessons and practice on banking, payments and scams, from the same course as several of this unit's videos.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

3.1 How Banks Work: Henry Duncan's Parish Bank — 3 sessions of 50 minutes

3.2 Checking and Savings: The Clearing House and the Register
3 sessions of 50 minutes

3.3 Bank Runs and the FDIC, 1933 — 3 sessions of 50 minutes

3.4 Payment Methods: From the Bank of Amsterdam to the Card in Your Wallet
3 sessions of 50 minutes

3.5 Protecting Your Accounts: The Spanish Prisoner and Modern Scams
3 sessions of 50 minutes

Unit 3 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars or percents. Where a problem says "in this example," use the figures given, not current law. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **6 pts**

   A bank has $25 million of deposits at 2.4% and $21 million of loans at 6.9%. Costs are $600,000. Find profit before taxes and loan losses.

2. **6 pts**

   A bank has assets of $80 million, deposits of $72 million and other liabilities of $2 million. Find its capital. If it loses $4 million on bad loans, what is its new capital?

3. **5 pts**

   Who was Henry Duncan, and what did he start in 1810?

4. **6 pts**

   Find the APY of 4.5% compounded monthly, and the interest on $2,000 for one year.

5. **8 pts**

   Register balance $1,206.50; statement balance $1,318.20. Outstanding: check $85.00 and payment $41.70. Unrecorded bank fee $3.00. Deposit in transit $12.00. Reconcile and find any remaining difference.

6. **5 pts**

   Account A: no fee, 0.05% APY. Account B: $10 monthly fee waived above $2,000, 1.0% APY. You keep $1,200. Which is better for one year, and by how much?

7. **6 pts**

   Tell what happened in the banking crisis from 1930 to March 1933 and how the FDIC was meant to stop it.

8. **6 pts**

   Using a $250,000 limit, a single owner has $210,000 in savings and $90,000 in checking at one bank, and a joint account with her husband of $300,000 there. How much is uninsured?

9. **5 pts**

   Why does a bank run cause a sound bank to fail?

10. **5 pts**

    What did the Bank of Amsterdam do in 1609, and how is it like a modern debit-card payment?

11. **6 pts**

    A card earns 1.5% on $1,100 a month and has a $49 annual fee. The owner pays in full every month. Find the net value for the year. What happens if she carries a $1,000 balance at 23% APR all year?

12. **5 pts**

    Compare debit cards and credit cards on fraud protection.

13. **6 pts**

    A text says: “Your bank account is locked! Verify now at this link or it will be closed in 1 hour.” Identify the scam signs and give the safe response.

14. **5 pts**

    How many passwords of length 12 can be made from 62 characters? Write in scientific notation.

15. **6 pts**

    List the first four steps to take if fraud appears on your account.

16. **14 pts**

    Short essay (one or two paragraphs): Trust holds every banking system together. Using at least two stories from this unit (Duncan’s bank, the London clearing house, the 1930s runs, the Bank of Amsterdam, the Spanish prisoner), explain what builds trust in money and what destroys it, and what your part is.

ANSWER KEY

1. $\$1{,}449{,}000 - \$600{,}000 - \$600{,}000 = \$249{,}000$
2. \$6 million; \$2 million
3. A Scottish minister of Ruthwell who opened a parish savings bank where poor laborers could deposit small sums safely and earn interest; it became the model for savings banks worldwide.
4. $(1.00375)^{12} - 1 \approx 4.59\%$; about \$91.88
5. Statement adjusted $1{,}318.20 + 12 - 85 - 41.70 = \$1{,}203.50$; register adjusted $1{,}206.50 - 3 = \$1{,}203.50$. They match.
6. A: $+\$0.60$. B: $\$12 - \$120 = -\$108$. A is better by \$108.60.
7. Rumors and fear caused runs; thousands of banks failed; on March 6, 1933 all banks were closed in a national holiday. The Banking Act of 1933 created the FDIC; from January 1, 1934 insured deposits were guaranteed, so depositors had no reason to run.
8. Single: \$300,000, \$50,000 uninsured. Joint: each share \$150,000, fully insured. Total uninsured \$50,000.
9. Banks lend most deposits and keep only a fraction as reserves, so if many depositors demand cash at once, the bank must sell assets at a loss or cannot pay, even if its loans are good.
10. It took in mixed coins, credited accounts at their true value, and let merchants pay by transferring balances on its books; a debit payment likewise moves balances by ledger entries rather than moving coins.
11. Rewards \$198; net \$149. Carrying the balance adds about \$230 of interest: net $-\$81$.
12. Credit-card fraud uses the issuer's money while disputed and carries very small liability; debit fraud removes your own money until resolved, and protection depends on reporting quickly.
13. Threat, urgency, and a link asking for login information. Do not click; contact the bank using a number or app you already trust.
14. $62^{12} \approx 3.2 \times 10^{21}$
15. Call the bank or issuer using a trusted number; lock or cancel the card; change passwords and enable two-factor authentication; report to the FTC and review statements and credit reports.

16. A strong answer shows that trust is built by honest records, rules and guarantees (Duncan's trustees and published accounts, the clearing house's careful netting, the Wisselbank's honest assay, deposit insurance) and destroyed by fear, secret dealings and fraud (the 1930 runs, the Wisselbank's hidden loans, swindlers); and it names the student's part: keeping accurate records, reconciling accounts, choosing insured institutions, and refusing to be hurried by scams.

PORTFOLIO PIECE: MY BANKING FILE

Assemble your three-bank comparison and parish-bank balance sheet, your register and reconciliation, your bank-run simulation record and coverage calculations, your payment-method audit and payment rules, and your scam-spotter analysis and account protection plan. Add a one-page summary describing the accounts you plan to open as a young adult, why, and how you will protect them.

LOOK FOR	WHAT IT MEANS
Accuracy	Interest, APY, reconciliation, coverage and fee calculations are correct and shown.
Records	The register is complete with a running balance, and every reconciliation difference is explained.
Judgment	Bank, account and payment choices are justified by cost, safety and convenience.
Protection	The security plan is specific, realistic and includes what to do if fraud occurs.

UNIT 4

Credit and Debt

Borrowing lets you use tomorrow's income today, and it always has a price. In this unit you will learn to read that price. You will see why Congress passed the Truth in Lending Act in 1968 so that every borrower could compare loans by one number, the **APR**. You will follow the credit card from a forgotten wallet at a New York restaurant in 1949 to the card in millions of pockets, and you will calculate exactly how long a minimum payment takes to clear a balance.

Then you will meet Lewis Tappan, a New York merchant who in 1841 started the first credit-reporting agency, and learn how today's **credit reports and scores** work. You will weigh **student loans** against the career they pay for. Last, you will follow Mark Twain, bankrupt at fifty-nine, around the world on a lecture tour until he had paid every creditor in full, and you will compare the snowball and avalanche methods for getting out of debt. "The borrower is servant to the lender" (Proverbs 22:7).

PREREQUISITES

- Can compute simple and compound interest and APY (Unit 3)
- Can use exponents and logarithms on a calculator (logarithms are explained where used)
- Has a working budget (Unit 2)

MASTERY CHECKLIST

- ☐ I can compare loans by APR and calculate the effective annual rate.
- ☐ I can calculate a credit card's monthly interest and how long a fixed payment takes to pay off a balance.
- ☐ I can explain what goes into a credit report and score and how to build good credit.
- ☐ I can use the loan-payment formula and judge whether a student loan is affordable.
- ☐ I can build a debt-payoff plan and compare the snowball and avalanche methods.
- ☐ I can explain the Bible's warnings about debt and its call to repay what we owe.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **AnnualCreditReport.com**: The official site for free credit reports from the three national credit bureaus. Adults only; parents can show a student what a report looks like with Lesson 4.3.
- **CFPB: Credit reports and scores**: Free explanations from the Consumer Financial Protection Bureau of what is in a credit report, how scores work and how to dispute errors. Fits Lesson 4.3.
- **StudentAid.gov**: The U.S. Department of Education's official site for federal student aid, loan types and repayment calculators. Use with a parent for Lesson 4.4.
- ***Following the Equator*, by Mark Twain (1897)**: Free. Twain's humorous account of the lecture tour he made to pay his debts. Read the opening chapter with Lesson 4.5. Ages 14 and up; a few passages reflect the attitudes of his day and are worth discussing with a parent.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

4.1	**Interest and APR: The Truth in Lending Act**	3 sessions of 50 minutes
4.2	**Credit Cards: From Diners Club to the Minimum Payment**	3 sessions of 50 minutes
4.3	**Credit Reports and Scores: Lewis Tappan's Mercantile Agency**	3 sessions of 50 minutes
4.4	**Student Loans: Counting the Cost of Training**	3 sessions of 50 minutes
4.5	**Getting Out of Debt: Mark Twain Pays in Full**	3 sessions of 50 minutes

Unit 4 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars, percents or months. Where a

problem says “in this example,” use the figures given. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **5 pts**
   Find the simple interest on $3,200 at 7.5% for 30 months.

2. **6 pts**
   A card has 22.8% APR compounded monthly. Find the periodic rate and the effective annual rate.

3. **6 pts**
   A $1,200 “add-on” loan at 8% for one year is repaid in 12 equal payments. Find the payment and estimate the APR.

4. **5 pts**
   What does the Truth in Lending Act (1968) require, and why?

5. **7 pts**
   A $2,500 balance at 24% APR is paid at $100 a month. Find the months to pay off and the approximate interest.

6. **5 pts**
   Explain the grace period and how a cardholder can avoid all interest.

7. **5 pts**
   Tell how Diners Club (1950) differed from the BankAmericard (1958).

8. **6 pts**
   Cards: limits $1,000 and $4,000; balances $700 and $300. Find overall utilization and explain how to improve it.

9. **5 pts**
   Name the five factors of a FICO-style score with their approximate weights.

10. **5 pts**
    Who was Lewis Tappan, and what did he start in 1841?

11. **7 pts**

    Find the monthly payment on a $22,000 student loan at 6% over 10 years, and the total interest.

12. **5 pts**

    In this example, a $6,000 unsubsidized loan at 5% accrues simple interest for 4.5 years. Find the accrued interest.

13. **5 pts**

    In what order should a family fill the gap in college costs, from best to worst?

14. **6 pts**

    Debts: $450 at 19%, $3,200 at 24%, $1,100 at 12%. Give the snowball and avalanche orders, and say which saves the most interest.

15. **6 pts**

    Gross income $5,000; debt payments $1,450 a month. Find the debt-to-income ratio. Is it under 36%?

16. **16 pts**

    Short essay (one or two paragraphs): Using Mark Twain's story, Proverbs 22:7 and at least one calculation from this unit, explain how a Christian should think about borrowing and about repaying.

ANSWER KEY

1. $3{,}200 \times 0.075 \times 2.5 = \$600$
2. 1.9% a month; $(1.019)^{12} - 1 \approx 25.3\%$
3. Interest \$96; payment \$108; APR $\approx 2(12)(96)/(1{,}200 \times 13) \approx 14.8\%$
4. That lenders disclose the APR and finance charge in a standard form before signing, so borrowers can compare loans honestly.
5. $rB/P = 0.5$; $n = -\ln(0.5)/\ln(1.02) \approx 35.0$; interest $\approx 3{,}500 - 2{,}500 = \$1{,}000$
6. Between the statement and due date no interest is charged on purchases if the full statement balance is paid; paying in full every month avoids interest.
7. Diners Club was a charge card for restaurants, billed monthly and paid in full; the BankAmericard offered open-end credit that could be carried with interest.
8. $1{,}000/5{,}000 = 20\%$; pay down balances (especially the 70% card) and keep the accounts open.
9. Payment history 35%, amounts owed 30%, length of history 15%, new credit 10%, credit mix 10%.
10. A New York silk merchant and Christian philanthropist who founded the Mercantile Agency, the first credit-reporting agency, later R. G. Dun & Co.
11. $M = 22{,}000(0.005)/(1 - 1.005^{-120}) = 110/0.4504 \approx \$244.23$; interest $\approx \$7{,}307$
12. \$1,350
13. Savings and work; grants and scholarships; federal subsidized loans; federal unsubsidized loans; private loans last.
14. Snowball: 450, 1,100, 3,200. Avalanche: 24%, 19%, 12% (3,200, 450, 1,100). The avalanche saves the most interest.
15. 29%; yes.
16. A strong answer explains that debt limits freedom (Proverbs 22:7) and that the righteous repay (Psalm 37:21); uses Twain's choice to repay in full when not legally required as an example of honor; shows with numbers how interest and minimum payments make debt costly (for example, a card balance taking years to clear); distinguishes reasonable borrowing from consumer debt; and states a personal policy of borrowing rarely and repaying faithfully.

PORTFOLIO PIECE: MY CREDIT AND DEBT FILE

Assemble your three-offer comparison, your credit-card payoff spreadsheet, your credit-report study and credit-building plan, your two-path education cost and loan plan, and your snowball-and-avalanche spreadsheet with your personal debt policy. Add a one-page letter to your eighteen-year-old self about the borrowing you will and will not do.

LOOK FOR	WHAT IT MEANS
Calculations	APR, EAR, payoff months, loan payments, utilization and debt-to-income are correct and shown.
Spreadsheets	Month-by-month tables are correct, labeled and run to zero.
Judgment	Recommendations weigh total cost, risk and the option not to borrow.
Character	The debt policy and letter connect clearly to Scripture and to Twain's example of keeping one's word.

4.1 Interest and APR: The Truth in Lending Act

OBJECTIVES

- Compute simple and compound interest on a loan and convert APR to an effective annual rate.
- Explain why the Truth in Lending Act requires lenders to state the APR.
- Compare loans with different rate quotes and fees.

> **Warm-up.** A store sign says, "Only $10 a week!" for a $399 television. What else would you need to know before deciding whether this is a good deal? List three questions.

WATCH

Annual Percentage Rate (APR) and effective APR | Finance & Capital Markets | Khan Academy

Khan Academy · 7:12

https://www.youtube.com/watch?v=RuPMsK0mQC8

> **WHEN TO WATCH**
> With worked example 3: APR and the effective annual rate on a credit card.

BACKUP VIDEO

Credit 101: What is APR and why does it matter? | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 3:26

https://www.youtube.com/watch?v=MqqXTrEEZ7Y

Before the project: what APR is and why it matters.

KEY TERMS

principal

The amount borrowed, not counting interest.

interest

The price paid for borrowing money, usually stated as a yearly percentage of the principal.

APR

Annual percentage rate: the yearly cost of credit including interest and most required fees, stated in a standard way so loans can be compared.

effective annual rate

The true yearly rate after compounding: $(1 + \text{APR}/n)^n - 1$ for n compounding periods a year.

finance charge

The total dollar cost of credit: all interest and fees over the life of the loan.

CORE IDEAS

The story. In the 1950s and 1960s Americans bought cars, furniture and appliances on credit as never before, and lenders quoted their prices in dozens of confusing ways. One store offered "6% add-on," another "1½% a month," another simply "$10 a week." A shopper could not tell which was cheaper. Senator Paul Douglas of Illinois, a former economics professor, introduced a bill to require honest, uniform disclosure in 1960 and kept pressing it for eight years. In 1968 Congress passed the Consumer Credit Protection Act, whose first part, the **Truth in Lending Act**, requires lenders to state the cost of credit as an **annual percentage rate** and a total **finance charge** before you sign.

How they figured it out. The problem with many old quotes was that they hid how interest really worked. An "add-on" loan charges interest on the whole original amount for the whole term, even though you pay part of it back every month, so the true rate is nearly double the quoted one. Truth in Lending did not set interest rates; it required that they be told plainly. The principle is ancient: honest weights and honest measures (Leviticus 19:35-36). A price you cannot understand is not an honest measure.

The big idea. Simple interest is $I = Prt$. Most consumer credit compounds: a credit card with a 24% APR charges a **periodic rate** of 2% a month on the balance, and compounding makes the **effective annual rate** $(1.02)^{12} - 1 \approx 26.8\%$. Compare loans by APR first, then by total finance charge and term. A lower monthly payment over a longer term usually means a larger total cost. Short-term lenders reveal how high the price can be: in a common example, a $15 fee for a two-week $100 payday loan is an APR of about 390%.

In business today. Every loan agreement, credit-card application and car-finance contract must show the APR and finance charge in a standard box. Read it. Lenders price loans by risk: borrowers with strong credit histories get lower rates. Interest rates in the whole economy rise and fall with conditions and with the Federal Reserve's policy, so the rates in this lesson are examples. What does not change is the method: convert every offer to APR and total cost, and borrow only when the thing bought is worth more to you than its price plus interest.

Think it through. The law of Moses forbade charging interest to a poor neighbor in need (Exodus 22:25), while allowing commercial lending. Interest is not wrong in itself, but taking advantage of someone's desperation is. Wise borrowers ask not only "Can I afford the payment?" but "Should I borrow at all?"

PICTURE STUDY



The Parable of the Rich Fool, Rembrandt van Rijn, 1627 · Oil on panel · Gemäldegalerie, Berlin

Image: Wikimedia Commons, public domain

The young Rembrandt, about twenty-one, painted an old man examining a coin by candlelight, surrounded by account books and bags of money. The picture has long been connected with Jesus' parable of the rich man who said, "Soul, thou hast much goods laid up for many years" (Luke 12:19).

Look closely

- Find the coin and the candle. Why is he holding the coin so close?
- Find the ledgers and papers. What might be written in them?
- Look at where the light falls and where it does not. What does the darkness suggest?
- Look at his hands and face. Is he at peace?

Talk about it

1. A lender makes money from interest. How can lending be honest service, and when does it become greed?
2. Why would the Truth in Lending Act want every borrower to see clearly what this man sees: the true numbers?
3. What does the parable teach about trusting in money?

PROJECT

Compare Three Real Credit Offers

You will collect three real credit offers (for example, a store financing ad, a credit-card disclosure and an auto loan quote), convert each to APR and total cost, and write a recommendation.

You will need

- Credit advertisements or disclosures (from mail, stores or websites, found with a parent)
- Calculator and spreadsheet
- Ledger notebook

Steps

1. Collect three offers with a parent. Never apply; you are only reading.
2. For each, record the amount, APR (if stated), fees, term, payment and total paid.
3. If an offer gives only a weekly or monthly payment, compute the total paid and the finance charge, then estimate the APR.
4. Convert each APR to an effective annual rate.
5. Rank the offers by APR and by total finance charge. Do the rankings agree?
6. Find and copy the Truth in Lending disclosure box on one offer, labeling each line.
7. Write a half page: Which offer is best, which is worst, and when would it be wiser not to borrow at all?

Tips

- “Same as cash” and “0% for 12 months” offers often charge all the deferred interest if the balance is not paid in full by the deadline. Read the terms.
- Fees count. A loan with a low rate and a large fee can cost more than one with no fee.

Check your work

☐ I converted each offer to APR, EAR and total finance charge.

- ☐ I can read a Truth in Lending disclosure.
- ☐ My recommendation weighs cost and the choice not to borrow.

LEDGER NOTEBOOK

1. Make a table of your three offers with APR, EAR, payment, term and total cost.
2. Graph the balance of a $1,000 debt growing at 2% a month for 24 months with no payments.
3. Copy the Truth in Lending box from one disclosure and label it.

KEY FORMULAS

$$I = Prt$$

$$\text{Periodic rate} = \frac{\text{APR}}{n}, \qquad \text{EAR} = \left(1 + \frac{\text{APR}}{n}\right)^{n} - 1$$

$$\text{APR} \approx \frac{2\,m\,F}{P\,(N+1)}$$ (for an installment loan: m payments a year, F finance charge, N total payments)

From history. Paul Douglas served in the Marines in his fifties during the Second World War before becoming a senator. He called his bill the “truth in lending” bill from the start, and by the time it passed in 1968 he had left the Senate; the law is often remembered as his work.

WORKED EXAMPLES

Example 1. Find the simple interest on a $2,400 loan at 8% for 18 months.

Show solution

1. $t = 1.5$ years.
2. $I = 2{,}400 \times 0.08 \times 1.5 = \$288$.

Answer: $288

Example 2. A store offers a \$1,000 loan at "6% add-on" for 12 months: interest is $6\% \times \$1{,}000 = \$60$, and you repay \$1,060 in 12 equal payments. Estimate the APR with the constant-ratio formula.

Show solution

1. $m = 12$, $F = 60$, $P = 1{,}000$, $N = 12$.
2. $\text{APR} \approx \dfrac{2(12)(60)}{1{,}000(13)} = \dfrac{1{,}440}{13{,}000} = 11.1\%$.
3. (An exact calculation gives about 10.9%.)

Answer: About 11%, nearly double the advertised "6%," because you repay part of the principal each month but pay interest on all of it.

Example 3. A credit card has an APR of 21.9% compounded monthly. Find the monthly periodic rate, the effective annual rate, and the interest charged in one month on a \$1,850 average balance.

Show solution

1. Periodic: $21.9\%/12 = 1.825\%$.
2. EAR: $(1.01825)^{12} - 1 \approx 24.2\%$.
3. Month's interest: $0.01825 \times \$1{,}850 = \$33.76$.

Answer: 1.825% a month; about 24.2% a year effective; \$33.76 of interest this month.

PRACTICE

1. Easy Find the simple interest on \$800 at 9% for 2 years.

   Show answer

   \$144

2. Easy A card's APR is 18%. What is its monthly periodic rate?

   Show answer

   1.5%

3. Easy What does the Truth in Lending Act require lenders to do?

Show answer

Disclose the cost of credit as an APR and a total finance charge, in a standard form, before the borrower signs.

4. Medium Find the effective annual rate of 18% APR compounded monthly.

Show answer

$(1.015)^{12} - 1 \approx 19.6\%$

5. Medium A \$500 loan is repaid with 12 monthly payments of \$47. Find the finance charge and estimate the APR with the constant-ratio formula.

Show answer

Total \$564, finance charge \$64; APR $\approx 2(12)(64)/(500 \times 13) = 23.6\%$

6. Medium In a common example, a payday lender charges \$15 per \$100 for 14 days. Find the APR (use 26 two-week periods in a year).

Show answer

$15\% \times 26 = 390\%$

7. Medium From the story: why did lenders' old ways of quoting prices make it hard to compare loans?

Show answer

They used different forms (add-on rates, monthly rates, weekly payments) that hid the true yearly cost; add-on rates in particular understated the real rate.

8. Hard Loan A: \$10,000, 6.0% APR, 36 months, payment \$304.22. Loan B: same amount, 5.5% APR, 60 months, payment \$191.01. Find the total finance charge for each. Which costs less in total?

Show answer

A: $36 \times 304.22 - 10{,}000 = \$951.92$. B: $60 \times 191.01 - 10{,}000 = \$1{,}460.60$. A costs less despite the higher rate, because the term is shorter.

9. Hard A balance of $2,000 grows at 2% a month with no payments. Find the balance after 12 months and after 36 months.

   Show answer

   $2{,}000(1.02)^{12} \approx \$2{,}536.48$; $2{,}000(1.02)^{36} \approx \$4{,}079.77$

10. Hard Explain how Exodus 22:25 distinguishes between lending to a poor neighbor and ordinary commercial lending, and what principle it teaches for today.

    Show answer

    It forbids taking interest from a poor neighbor in need, so as not to profit from his hardship; it does not forbid all lending. The principle: do not exploit desperation; lend fairly and help the needy.

11. Challenge Show that a balance growing at monthly rate r doubles in about $0.693/r$ months, and use it to find how long a 2%-a-month debt takes to double.

    Show answer

    Solve $(1+r)^n = 2$: $n = \ln 2 / \ln(1+r) \approx 0.693/r$ for small r. For 2%: about 35 months (exactly 35.0).

COMMON MISTAKES

- Comparing loans by monthly payment instead of APR and total cost.
- Assuming an advertised “add-on” or monthly rate is the same as the APR.
- Ignoring fees, which are part of the true cost of credit.

> **Make it a game · Interest Estimation Duel.** Each of you secretly estimates the interest owed on a thousand-dollar loan at twenty percent for three years, once simple and once compounded. Write your guesses, then calculate with a calculator. Closest to each answer wins a point. Then convert a pretend monthly rate into an effective annual rate and explain why the Truth in Lending Act requires stating the APR.

4.2 Credit Cards: From Diners Club to the Minimum Payment

OBJECTIVES

- Explain how a credit card works: limit, statement, grace period, minimum payment and interest.
- Calculate how long a fixed payment takes to pay off a balance and the total interest.
- Write rules for using a credit card wisely, or not at all.

> **Warm-up.** If you owed $3,000 on a card at 24% APR and paid $90 a month, guess how many months it would take to pay it off. Write your guess; you will calculate it in this lesson.

WATCH

Reading a credit card statement | Consumer credit | Financial Literacy | Khan Academy

Khan Academy · 5:04

https://www.youtube.com/watch?v=6V2z_KtcfP0

> **WHEN TO WATCH**
> Before the project: reading every line of a credit-card statement.

BACKUP VIDEO

Cost of using credit cards | Consumer credit | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 3:52

https://www.youtube.com/watch?v=pBM7Mf65axo

With the worked examples: the cost of using a credit card.

KEY TERMS

credit limit

The maximum balance the issuer allows on a card.

statement balance

The amount owed at the close of the billing cycle.

grace period

The time between the statement date and the due date during which no interest is charged on new purchases if the full statement balance is paid.

minimum payment

The smallest payment that keeps the account in good standing, often a small percent of the balance plus interest; paying only this keeps you in debt for years.

open-end credit

Credit that can be used again and again up to a limit as it is repaid, like a credit card, as opposed to a single installment loan.

CORE IDEAS

The story. As the story is told, one evening in 1949 a New York businessman named Frank McNamara finished dinner at Major's Cabin Grill and realized he had left his wallet in another suit. His wife paid. Embarrassed, he and his partner Ralph Schneider started a new kind of club. In February 1950 Diners Club issued cardboard cards that its members could use at 27 New York restaurants; once a month the club paid the restaurants (less a fee) and sent each member one bill, to be paid in full. In 1958 the Bank of America mailed 60,000 unsolicited BankAmericards to households in Fresno, California, with a credit line that did not have to be paid off each month. That card later became Visa.

How they figured it out. Diners Club made its money from the merchants' fee and members' dues; the bill was paid in full monthly. The bank card added something new: **open-end credit**. A cardholder could carry a balance from month to month and pay interest on it. That made the card far more profitable for banks, and far more dangerous for careless borrowers. The Fresno mailing was a costly lesson too: many recipients ran up debts they could not pay, and fraud was common. Congress later banned mailing unrequested cards (in 1970) and in 2009 required statements to show how long minimum payments would take to clear a balance.

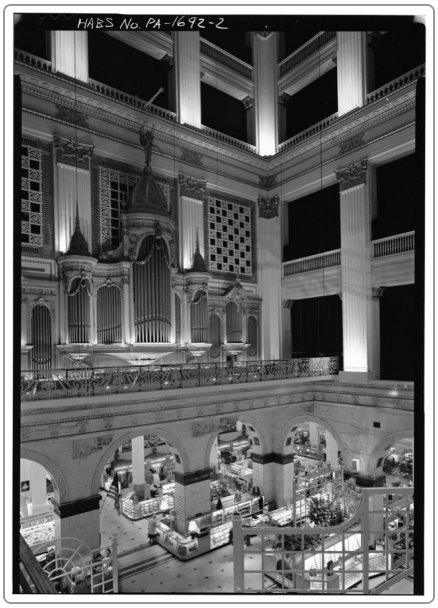
The big idea. A credit card is a short-term loan for every purchase. If you pay the **full statement balance** by the due date, the **grace period** means you pay no interest at all. If you pay less, interest is charged on the balance, usually at a high APR. With a monthly rate r, a balance B and a fixed payment P, the number of months to pay off

is $n = -\dfrac{\ln(1 - rB/P)}{\ln(1 + r)}$. If $P \le rB$, the balance never falls. Small payments make large interest bills.

In business today. Card issuers earn interest from people who carry balances, fees (annual, late, cash advance, foreign transaction), and interchange fees from merchants. Rewards are paid from those earnings. For a disciplined person who pays in full, a card offers fraud protection, convenience and a credit history. For anyone who carries a balance, it is one of the most expensive ways to borrow. Many wise families use debit cards and cash for everyday spending and keep one card, paid in full, for emergencies and building credit. Others choose not to use credit cards at all.

Try it. Return to the warm-up. At 24% APR (2% a month), a $3,000 balance with $90 payments takes about 55 months, and the borrower pays about $2,000 in interest. With $200 payments it takes about 18 months and costs about $600 in interest.

PICTURE STUDY



Interior Court, John Wanamaker Store, Philadelphia, Historic American Buildings Survey photographer, 20th century (store opened 1911) · Photograph · Library of Congress, Historic American Buildings Survey
Image: Wikimedia Commons, public domain

John Wanamaker, a Christian merchant and Sunday-school superintendent, built one of the first great department stores. Stores like his offered customers charge accounts long before credit cards: a shopper could take goods home and pay at the end of the month. The card in your wallet grew from that habit of buying now and paying later.

Look closely

- Count the floors of galleries. How many departments might the store have held?
- Find the organ. Why would a store install one?
- Imagine the shoppers. How would a charge account change how much they bought?

Talk about it

1. Wanamaker was famous for honest prices. How is a clear credit-card disclosure a kind of honest price?
2. What is the difference between a charge account paid in full each month and open-end credit?
3. Why might a store want customers to buy on credit?

> **Safety first.** Students under 18 should not apply for credit cards. If your parents choose to add you as an authorized user, follow their rules exactly and never share the card number.

PROJECT

A Credit Card Payoff Spreadsheet

You will build a spreadsheet that shows month by month how a credit-card balance falls (or does not) under three payment plans, and you will read a real card disclosure with a parent.

You will need

- Free spreadsheet
- A real credit-card disclosure or statement, viewed with a parent (account numbers covered)
- Ledger notebook

Steps

1. Set up columns: Month, Starting balance, Interest (balance × monthly rate), Payment, Ending balance.
2. Use a starting balance of $3,000 at 24% APR. Build Plan A (pay $90 a month), Plan B (pay $200 a month) and Plan C (minimum = interest + 1 percent of balance).
3. Run each plan until the balance is zero (or for 120 months), and total the interest.
4. Check Plans A and B against the formula from this lesson.
5. With a parent, read a real card disclosure: APR for purchases, cash advances and penalties; grace period; fees; and the minimum-payment warning on a statement.
6. Write a half page with three rules for using a card, or your reasons for not using one.

Tips

- In the spreadsheet, the next month's starting balance is the previous ending balance.
- Use the ROUND function to keep money to two decimals.

Check your work

☐ My spreadsheet shows all three plans with total interest.

- [ ] My Plan A and B results agree with the formula within a month.
- [ ] I can explain the grace period and why paying in full avoids interest.

LEDGER NOTEBOOK

1. Graph the three plans' balances on one set of axes.
2. Draw a timeline from Diners Club (1950) to the BankAmericard (1958) to the 2009 minimum-payment warning.
3. Write your three credit-card rules in a box.

KEY FORMULAS

$$\text{Monthly interest} = r \times \text{balance}, \qquad r = \frac{\text{APR}}{12}$$

$$n = -\frac{\ln\left(1 - \dfrac{rB}{P}\right)}{\ln(1+r)} \quad \text{(months to pay off balance } B \text{ with fixed payment } P\text{)}$$

$$\text{Total interest} \approx nP - B$$

From history. The Credit CARD Act of 2009 requires monthly statements to show how long it would take, and how much it would cost, to pay off the balance by making only minimum payments, and how much to pay each month to clear it in three years.

WORKED EXAMPLES

Example 1. A balance of \$3,000 at 24% APR is paid at \$90 a month with no new charges. How many months does payoff take, and how much interest is paid?

Show solution

1. $r = 0.02$; $rB/P = 60/90 = 0.6667$.
2. $n = -\ln(0.3333)/\ln(1.02) = 1.0986/0.01980 = 55.5$ months.
3. Total paid about $55.5 \times 90 = \$4{,}993$; interest about \$1,993.

Answer: About 56 months (4 years 8 months) and nearly \$2,000 of interest.

Example 2. The same balance is paid at $200 a month. Find the months and interest.

Show solution

1. $rB/P = 60/200 = 0.3$.
2. $n = -\ln(0.7)/\ln(1.02) = 0.3567/0.01980 = 18.0$ months.
3. Total about $3,602; interest about $602.

Answer: 18 months and about $600 of interest: paying a little more than twice as much each month saves about $1,390.

Example 3. A card requires a minimum payment of interest plus 1 percent of the balance. On a $3,000 balance at 24% APR, what is the first minimum payment? Why does this rule keep the borrower in debt so long?

Show solution

1. Interest: $0.02 \times 3{,}000 = \$60$; 1 percent of balance: $30; minimum $90.
2. Only $30 reduces the balance; as the balance shrinks, the minimum shrinks too, so the payoff slows further.

Answer: $90, of which only $30 is principal. Because the minimum falls with the balance, paying only the minimum can take well over a decade.

PRACTICE

1. Easy At 18% APR, what interest is charged in one month on a $1,200 balance?

   Show answer

   $18

2. Easy What is a grace period?

   Show answer

   The time between the statement and due date when no interest is charged on purchases if the full statement balance is paid.

3. Easy When and how did Diners Club begin?

Show answer

In 1950 in New York; Frank McNamara and Ralph Schneider issued cards members could use at 27 restaurants, billed once a month to be paid in full.

4. Medium A $\$1{,}500$ balance at 20% APR is paid at $\$75$ a month. How many months to pay it off?

Show answer

$r = 0.016667$; $rB/P = 0.3333$; $n = -\ln(0.6667)/\ln(1.016667) \approx 24.5$ months.

5. Medium In problem 4, about how much interest is paid?

Show answer

$24.5 \times 75 - 1{,}500 \approx \$338$

6. Medium A $\$2{,}000$ balance at 24% APR is paid at $\$40$ a month. What happens?

Show answer

Monthly interest is $\$40$, so the payment covers only interest and the balance never falls.

7. Medium From the story: what was new about the BankAmericard compared with Diners Club, and what went wrong in Fresno?

Show answer

It offered open-end credit that could be carried month to month with interest. Many recipients of the unrequested cards ran up debts they could not pay, and fraud was common.

8. Hard What fixed monthly payment pays off $\$4{,}000$ at 21% APR in exactly 24 months? (Use $P = Br/(1-(1+r)^{-n})$.)

Show answer

$r = 0.0175$; $(1.0175)^{-24} \approx 0.6594$; $P = 70/0.3406 \approx \$205.53$

9. Hard A student buys a $600 laptop on a card and pays the full statement balance on time. How much interest is paid? What if she pays only $100 of it, at 24% APR, and pays the rest next month?

Show answer

None if paid in full. Otherwise interest of about $0.02 \times 500 = \$10$ on the carried balance (and she may lose the grace period on new purchases until it is paid in full).

10. Hard Explain why a card issuer can afford to give 1.5% cash back.

Show answer

Merchants pay interchange fees on every purchase, and many cardholders pay interest and fees; rewards come out of those earnings, largely paid by people who carry balances.

11. Challenge Prove the payoff formula: if balance B_k follows $B_{k+1} = (1+r)B_k - P$, then $B_n = (1+r)^n B - P\dfrac{(1+r)^n - 1}{r}$. Set $B_n = 0$ and solve for n.

Show answer

Unrolling the recurrence gives a geometric series:
$B_n = (1+r)^n B - P[1 + (1+r) + \cdots + (1+r)^{n-1}]$. Setting $B_n = 0$:
$(1+r)^n(P - rB) = P$, so $(1+r)^{-n} = 1 - rB/P$ and
$n = -\ln(1 - rB/P) / \ln(1+r)$.

COMMON MISTAKES

- Paying only the minimum and thinking the debt is under control.
- Thinking that carrying a balance is needed to build credit. It is not; paying in full builds credit too.
- Taking cash advances, which usually charge a fee and higher interest from the first day.

> **Make it a game · Minimum Payment Marathon.** Start a pretend card balance of five hundred dollars. Each month, add two percent interest, then subtract a payment, playing ten rounds with a twenty-five dollar payment and ten with fifty. Track both balances on paper. Compare total interest, then explain the grace period, statement balance and why the minimum payment is a trap.

4.3 Credit Reports and Scores: Lewis Tappan's Mercantile Agency

OBJECTIVES

- Explain what a credit report contains and how a credit score is calculated.
- Describe the history of credit reporting from 1841 to today.
- Plan how to build good credit and fix errors.

> **Warm-up.** If you were going to lend $500 to someone you had never met, what would you want to know about him first? List five things.

WATCH

What Goes Into Your Credit Score?

Two Cents · 4:54

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

> **WHEN TO WATCH**
> After the story of Tappan: what goes into a credit score.

BACKUP VIDEO

Reading a credit report | Consumer credit | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 5:23

https://www.youtube.com/watch?v=ahV1nQ_cRMI

Before the project: reading a sample credit report.

KEY TERMS

credit report

A record kept by a credit bureau of a person's credit accounts, balances, payment history, inquiries and certain public records.

credit bureau

A company that collects and sells credit information; the three national bureaus in the U.S. are Equifax, Experian and TransUnion.

credit score

A number calculated from a credit report that predicts how likely a borrower is to repay; common scores range from 300 to 850.

credit utilization

The share of available open-end credit in use: total card balances ÷ total card limits.

hard inquiry

A lender's check of your credit when you apply for new credit; many in a short time can lower a score slightly.

CORE IDEAS

The story. Lewis Tappan was a New York silk merchant and an earnest evangelical Christian who gave much of his wealth to missions and reform causes. When the Panic of 1837 ruined his firm, he learned firsthand how hard it was for a city merchant to know which distant shopkeepers could be trusted with goods on credit. In 1841 he founded the Mercantile Agency. He hired correspondents across the country, often local lawyers, to report on the character, capital and habits of merchants in their towns, and he sold the reports to wholesalers deciding whom to trust. The agency later became R. G. Dun & Company, and eventually Dun & Bradstreet.

How they figured it out. Tappan's reports answered the old lender's questions in a systematic way: Does he pay his debts? How much does he owe? Is he sober and diligent? Some early reports were careless or unfair gossip, and people often did not know what was said about them. A century later, in 1970, Congress passed the Fair Credit Reporting Act, giving people the right to see their reports and to dispute errors. In 1989 Fair Isaac and Company introduced the FICO score, turning the report into a single number calculated by a published method.

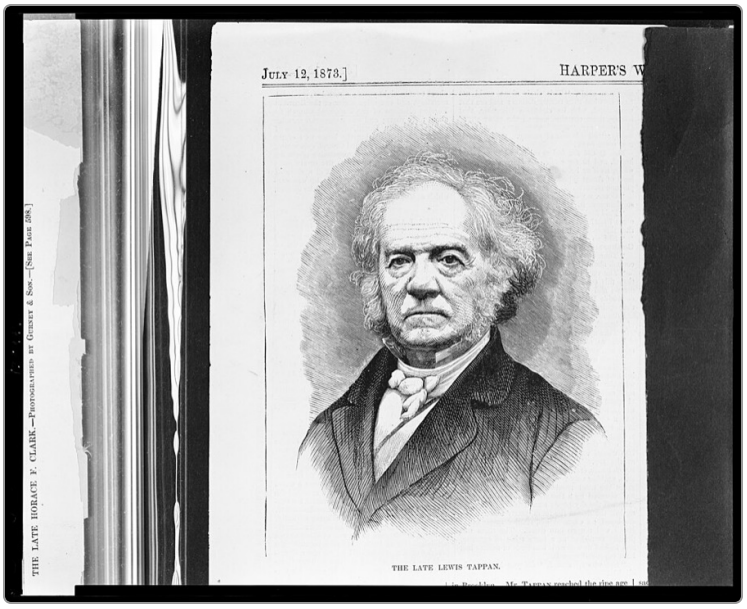
The big idea. Your **credit report** lists your accounts and how you have paid them. Your **credit score** summarizes it. FICO describes its general weighting this way: payment history about 35%, amounts owed about 30%, length of credit history about 15%, new credit about 10%, and credit mix about 10%. So the habits that build good credit are simple: pay every bill on time, keep balances low compared with limits (low **utilization**, often under 30% and better under 10%), keep old accounts open, and apply for new credit only when needed. Your score is not in your report until

you have credit; a young person often starts as an authorized user on a parent's card or with a small secured card.

In business today. Lenders, landlords, insurers and sometimes employers use credit reports. A higher score can mean a lower interest rate, which on a mortgage can save tens of thousands of dollars. You can get free reports from each of the three bureaus at AnnualCreditReport.com, the official site. Check them for errors and dispute any mistakes. Beware of companies that promise to "repair" your credit for a fee: you can do everything they do for free, and no one can legally remove accurate negative information.

Think it through. A credit report is a record of keeping your word. "A good name is rather to be chosen than great riches" (Proverbs 22:1). The surest way to good credit is not a trick but a character: owe little, pay on time, and tell the truth.

PICTURE STUDY



The Late Lewis Tappan, Unknown engraver, c. 1873 · Wood engraving in *Harper's Weekly*, July 12, 1873 · Library of Congress, Prints and Photographs Division

Image: Wikimedia Commons, public domain

This memorial portrait was printed around the time of Tappan's death in 1873. He had spent his life as a merchant, a founder of the first credit-reporting agency, and a generous supporter of missions, schools and reform causes.

Look closely

- Look at his face. What kind of character does the artist show?
- Look at his clothing. Is it showy or plain?
- Notice the word "late" in the title. What does it tell you about when the print was made?

Talk about it

1. Tappan built a business on judging other people's trustworthiness. What would make such a business fair or unfair?
2. How did the Fair Credit Reporting Act fix a weakness in early credit reports?
3. What would a credit report say about the character of someone who always keeps his word?

PROJECT

Read a Credit Report and Build a Credit Plan

You will study a sample credit report (or a parent's, with permission and personal details hidden), calculate utilization and identify what helps and hurts the score, and write a plan for building good credit as a young adult.

You will need

- A sample credit report from the CFPB website, or a parent's report viewed with permission
- Ledger notebook and calculator

Steps

1. Find each section of the report: personal information, accounts, payment history, inquiries and public records.
2. List each account with its type, limit or original amount, balance and payment status.
3. Calculate overall card utilization and utilization on each card.
4. Identify three things that help the score and anything that hurts it.
5. Find one item that might be an error and write a sample dispute letter (do not send it).
6. Research the free official site for credit reports and the three bureaus' freeze pages.
7. Write a one-page plan for building credit from age 18 to 25 without carrying debt.

Tips

- Never share a real report outside your family. It contains private information.
- Paying on time is the single most important habit.

Check your work

☐ I can name the five factors in a FICO-style score and their weights.

☐ I can calculate utilization correctly.

- [ ] My plan builds credit without paying interest.

LEDGER NOTEBOOK

1. Draw a pie chart of the five score factors and their weights.
2. Copy your utilization calculations in a table.
3. Write a timeline: 1841 Mercantile Agency, 1970 Fair Credit Reporting Act, 1989 FICO score.

KEY FORMULAS

$$\text{Utilization} = \frac{\text{total card balances}}{\text{total card limits}} \times 100\%$$

$$\text{Weighted score factor} = \sum(\text{weight} \times \text{factor rating})$$

From history. Lewis Tappan and his brother Arthur were among the most generous Christian philanthropists of their day, supporting the American Bible Society, missionary societies and schools such as Oberlin College. Lewis is also remembered for organizing the legal defense of the Africans of the ship *Amistad*, whose freedom was upheld by the Supreme Court in 1841.

WORKED EXAMPLES

Example 1. Maria has two cards: limits \$1,500 and \$2,500, balances \$600 and \$400. Find her overall utilization. What if she closes the \$2,500 card after paying it off?

Show solution

1. Now: $(600 + 400)/(1{,}500 + 2{,}500) = 1{,}000/4{,}000 = 25\%$.
2. After paying the second card and closing it: $600/1{,}500 = 40\%$.

Answer: 25% now; 40% after closing the card, which could lower her score. Paying down balances helps; closing unused cards can hurt.

Example 2. A simplified scoring model rates each factor from 0 to 100 and weights them as FICO describes (35/30/15/10/10). A borrower's ratings: payment history 95, amounts owed 70, length 40, new credit 80, mix 60. Find the weighted rating.

Show solution

1. $0.35(95) + 0.30(70) + 0.15(40) + 0.10(80) + 0.10(60)$
2. $= 33.25 + 21 + 6 + 8 + 6 = 74.25.$

Answer: 74.25 out of 100 in this simplified model. Payment history and amounts owed together make up 65% of the weight.

Example 3. In this example, a borrower with a high score is offered a 30-year $250,000 mortgage at 6.0% (payment $1,498.88); a borrower with a lower score is offered 7.0% (payment $1,663.26). Find the difference in monthly payment and total interest.

Show solution

1. Monthly difference: $164.38.
2. Over 360 months: $360 \times 164.38 = \$59{,}176.80$.

Answer: About $164 a month and nearly $59,000 over the loan: a good name has a dollar value.

PRACTICE

1. Easy Name the three national credit bureaus.

   Show answer

   Equifax, Experian and TransUnion.

2. Easy Which factor has the largest weight in a FICO score?

   Show answer

   Payment history (about 35%).

3. Easy Balances $450, limit $3,000. Find utilization.

   Show answer

   15%

4. **Medium** Cards: limits $2,000, $3,000, $5,000; balances $1,800, $300, $0. Find overall utilization and the highest single-card utilization.

Show answer

Overall $2{,}100/10{,}000 = 21\%$; first card 90%.

5. **Medium** How much must be paid down in problem 4 to bring overall utilization to 10%?

Show answer

Target $1,000; pay down $1,100.

6. **Medium** What rights does the Fair Credit Reporting Act give consumers?

Show answer

To see their credit reports, to know when a report is used against them, and to dispute and correct inaccurate information.

7. **Medium** From the story: what experience led Lewis Tappan to start the Mercantile Agency in 1841?

Show answer

His silk business was ruined in the Panic of 1837, and he saw how hard it was for merchants to know which distant customers could be trusted with credit.

8. **Hard** Using the simplified 35/30/15/10/10 model, ratings are 100, 50, 30, 90, 70. Which single factor's improvement by 20 points raises the weighted rating most, and by how much?

Show answer

Payment history is already 100; amounts owed: $0.30 \times 20 = 6$ points, the most of the improvable factors.

9. **Hard** In this example, a $20,000 car loan for 60 months costs $386.66 a month at 6% and $424.94 at 10%. How much more does the lower-score borrower pay in total?

Show answer

$60 \times 38.28 = \$2{,}296.80$

10. Hard A company offers to “erase” late payments from your report for $499. What should you know?

Show answer

No one can legally remove accurate negative information; you can dispute real errors yourself for free. Such offers are often scams.

11. Challenge A young adult opens a secured card with a $500 limit, charges $40 of budgeted groceries each month and pays in full. What is her utilization at each statement, how much interest does she pay in a year, and why does this build credit?

Show answer

$40/500 = 8\%$; no interest, since she pays in full during the grace period. Each on-time payment adds to her payment history, the largest factor, while low utilization and a growing history help too.

COMMON MISTAKES

- Thinking you must carry a balance and pay interest to build credit.
- Closing your oldest card, which can shorten your history and raise utilization.
- Never checking your reports, so errors or fraud go unnoticed.

> **Make it a game · Credit Report Detective.** Your parent writes a pretend credit report with one planted error, such as an account that does not belong to the owner. Find the error and say how you would dispute it. Calculate credit utilization on two cards. Then tell how Lewis Tappan's Mercantile Agency began credit reporting in 1841.

4.4 Student Loans: Counting the Cost of Training

OBJECTIVES

- Explain the main types of student aid and the difference between grants, scholarships and loans.
- Calculate interest that accrues during school and the monthly payment after school.
- Judge whether a student loan is affordable using a debt-to-income guideline.

> **Warm-up.** Guess the total cost (tuition, room, board and books) of one year at a state university near you. Write your guess, then look it up with a parent.

WATCH

Financial Aid for College Students | What You Need to Know

Federal Reserve Bank of St. Louis · 8:37

https://www.youtube.com/watch?v=6U91VRMGyt0

> **WHEN TO WATCH**
> After the story, before the worked examples: grants, scholarships, work-study and loans.

Note: Program names and amounts change; check StudentAid.gov.

BACKUP VIDEO

Real life talk about student loans | Careers and personal finance | Khan Academy

Careers and Personal Finance by Khan Academy · 2:38

https://www.youtube.com/watch?v=DqqvY1N1P0M

Optional: young adults talk honestly about repaying student loans.

KEY TERMS

grant and scholarship

Money for education that does not have to be repaid; grants are usually need-based and scholarships are usually merit-based.

subsidized loan

A federal student loan on which the government pays the interest while the student is in school at least half-time.

unsubsidized loan

A loan on which interest accrues from the day it is paid out, including during school.

capitalization

Adding unpaid interest to the principal, so that future interest is charged on it.

FAFSA

The Free Application for Federal Student Aid, used to apply for federal grants, work-study and loans.

CORE IDEAS

The story. In October 1957 the Soviet Union launched Sputnik, the first artificial satellite, and Americans worried that their schools were falling behind in science and engineering. Less than a year later, in September 1958, Congress passed the National Defense Education Act. Among other things it created the first large federal student-loan program, National Defense Student Loans, at low interest, to help capable students who could not otherwise afford college, especially in science, mathematics, engineering and languages, and to train teachers. Federal student lending grew from there into the large system of grants and loans that exists today.

How they figured it out. The 1958 loans rested on a sound idea: education is an investment in **human capital**, and a loan makes sense when the training raises future earnings by more than its cost. Some borrowers of the first loans who became teachers had part of their loans forgiven. But the idea works only when the numbers work. A student who borrows heavily for a degree that does not raise his income, or who does not finish, carries the debt without the payoff.

The big idea. Fill the gap in this order: family savings and work, then free money (grants and scholarships), then the cheapest loans (federal subsidized, then unsubsidized), and private loans last if at all. On an **unsubsidized** loan, interest accrues during school; if unpaid, it may be **capitalized**. After school, a standard loan is repaid in equal monthly payments found by the loan-payment formula $M = \dfrac{Pr}{1-(1+r)^{-n}}$. A common rule of thumb: keep total student debt below your expected first-year salary, so payments on a ten-year plan stay near 10% to 15% of gross pay.

In business today. Federal loan rates, limits and repayment options are set by law and change; check StudentAid.gov for current figures. Every family can file the FAFSA, even if it expects little aid, because many scholarships require it. The cheapest college is often not the one with the lowest sticker price but the one whose aid offer leaves the smallest net cost. Community college for the first two years, living at home, working part-time, earning credit in high school, and choosing a paid apprenticeship are all ways families reduce or avoid borrowing.

Think it through. "For which of you, intending to build a tower, sitteth not down first, and counteth the cost" (Luke 14:28)? A degree is a tower. Count the cost of the training and the debt, and compare it with the calling and income it leads to, before you begin.

PICTURE STUDY



Reading Room, Low Memorial Library, Columbia University, Unknown photographer (Detroit Publishing Company), c. 1900–1910 · Photograph · Library of Congress

Image: Wikimedia Commons, public domain

Low Memorial Library, finished in 1897, was built as the centerpiece of Columbia University's new campus in New York. Great libraries like this one were built to say that learning is a treasure worth a great price.

Look closely

- Look at the desks arranged in circles. What were students expected to do here?
- Find the central desk and the shelves. Who worked there?
- Look at the columns, galleries and high windows. What feeling does the room give?
- Imagine a student at one of these desks. What is he paying for, and what might he be borrowing?

Talk about it

1. Why do colleges build grand buildings, and who pays for them?
2. How can a student gain the learning without carrying too much debt?
3. What is the difference between the value of an education and its price?

PROJECT

Net Cost and Loan Plan for Two Paths

You will compare the full net cost of two education or training paths (for example, a four-year university and a community-college transfer path, or a degree and an apprenticeship), plan how to pay, and calculate the loan payments that would follow.

You will need

- College or training program websites viewed with a parent (cost of attendance and net-price calculators)
- StudentAid.gov (for current loan types and rates)
- Spreadsheet and calculator

Steps

1. Choose two paths that fit a career from Lesson 1.1.
2. For each, find the cost of attendance per year and use the program's net-price calculator with a parent to estimate grants and scholarships.
3. Subtract family savings and expected work earnings to find the gap.
4. Assume the gap is filled with federal loans at an example rate (state the rate and year you used). Calculate accrued interest during school and the capitalized balance.
5. Calculate the 10-year monthly payment, total interest, and debt-to-income ratio using a realistic starting salary for the career.
6. Make a side-by-side table of the two paths.
7. Write one page recommending a path and a plan to borrow as little as possible.

Tips

- Net price, not sticker price, is what matters.
- Ask what happens if you do not finish. The debt remains.

Check your work

- ☐ My table shows net cost, loans, payments and debt-to-income for both paths.
- ☐ I used the loan-payment formula correctly.
- ☐ My plan names specific ways to reduce borrowing.

LEDGER NOTEBOOK

1. Draw the order for paying for school as a ladder: savings and work, grants and scholarships, subsidized loans, unsubsidized loans, private loans.
2. Copy your side-by-side comparison table.
3. Graph a $27,000 loan balance over 10 years of payments.

KEY FORMULAS

$$\text{Accrued interest (simple)} = P \times r \times t$$

$$M = \frac{P\,r}{1-(1+r)^{-n}} \quad \text{(monthly rate } r\text{, } n \text{ monthly payments)}$$

$$\text{Debt-to-income} = \frac{\text{yearly loan payments}}{\text{yearly gross income}}$$

From history. The 1958 act also funded new science laboratories in schools, graduate fellowships and foreign-language study. Its loans were made through colleges, and teachers could have up to half of their loans forgiven for years of teaching.

WORKED EXAMPLES

Example 1. In this example, a freshman borrows $5,500 unsubsidized at 5.5% simple interest. Interest accrues for 4.5 years (four years of school plus a six-month grace period). How much interest accrues, and what is the balance if it is capitalized?

Show solution

1. $I = 5{,}500 \times 0.055 \times 4.5 = \$1{,}361.25$.
2. Capitalized balance: $6,861.25.

Answer: $1,361.25 of interest before the first payment; balance $6,861.25.

Example 2. A graduate owes \$27,000 at 5.5% on a 10-year standard plan. Find the monthly payment, total paid and total interest.

Show solution

1. $r = 0.055/12 = 0.0045833$, $n = 120$.
2. $(1.0045833)^{-120} \approx 0.57768$.
3. $M = 27{,}000 \times 0.0045833/(1 - 0.57768) = 123.75/0.42232 \approx \$293.02$.
4. Total: $120 \times 293.02 = \$35{,}162$; interest \$8,162.

Answer: About \$293 a month; \$8,162 of interest over ten years.

Example 3. The graduate's starting salary is \$42,000. Find the debt-to-income ratio for the loan payments, and check the rule of thumb.

Show solution

1. Yearly payments: $12 \times 293.02 = \$3{,}516.24$.
2. Ratio: $3{,}516.24/42{,}000 = 8.4\%$.
3. Total debt \$27,000 is below the \$42,000 salary.

Answer: 8.4% of gross pay: affordable by the rule of thumb. The same debt with a \$25,000 salary would be 14%, a heavy burden.

PRACTICE

1. Easy What is the difference between a grant and a loan?

   Show answer

   A grant does not have to be repaid; a loan must be repaid with interest.

2. Easy What law created the first large federal student-loan program, and when?

   Show answer

   The National Defense Education Act of 1958.

3. Easy Find simple interest on \$4,000 at 6% for 4 years.

   Show answer

   \$960

4. **Medium** Find the monthly payment on $15,000 at 6% for 10 years.

Show answer

$r = 0.005$; $(1.005)^{-120} \approx 0.5496$; $M = 75/0.4504 \approx \$166.53$

5. **Medium** In problem 4, find total interest.

Show answer

$120 \times 166.53 - 15{,}000 \approx \$4{,}984$

6. **Medium** Explain the difference between subsidized and unsubsidized federal loans.

Show answer

On subsidized loans the government pays the interest while the student is in school at least half-time; on unsubsidized loans interest accrues the whole time.

7. **Medium** From the story: what event led Congress to pass the National Defense Education Act, and what kinds of students did it especially aim to help?

Show answer

The 1957 Sputnik launch; capable students in need, especially in science, mathematics, engineering and languages, and future teachers.

8. **Hard** A student expects a $36,000 starting salary. Using the rule "total student debt below first-year salary," what is her limit? What monthly payment would that be at 6% over 10 years?

Show answer

$36,000; $M = 36{,}000 \times 0.005/0.4504 \approx \$399.67$, about 13.3% of gross pay.

9. **Hard** Path A: two years of community college at $4,000 a year net, then two years at a university at $18,000 net. Path B: four years at the university at $18,000 net. How much does Path A save?

Show answer

A: $44,000; B: $72,000; saves $28,000.

10. Hard Why can borrowing for a degree you do not finish be the worst outcome financially?

    Show answer

    You carry the debt and its interest without the higher earnings the degree was meant to bring, so there is cost with no payoff.

11. Challenge Show that for a loan with monthly rate r and n payments, the total interest is $P\left[\dfrac{nr}{1-(1+r)^{-n}}-1\right]$, and compute it for $P=\$20{,}000$, $r=0.005$, $n=120$.

    Show answer

    Total paid is $nM = nPr/(1-(1+r)^{-n})$; subtract P. Here $20{,}000[0.6/0.4504-1]\approx\$6{,}643$.

COMMON MISTAKES

- Comparing colleges by sticker price instead of net price after aid.
- Borrowing the maximum offered instead of the minimum needed.
- Forgetting that unsubsidized interest grows during school.

> **Make it a game · Study Loan Dice.** Roll two dice and multiply by a thousand for a pretend four-year student loan. Calculate the interest that builds up on an unsubsidized loan while you study at six percent, and say what capitalization does. Race your parent through three rolls. Then sort four examples into grants, scholarships, subsidized and unsubsidized loans.

4.5 Getting Out of Debt: Mark Twain Pays in Full

OBJECTIVES

- Build a debt-payoff plan and compare the snowball and avalanche methods.
- Tell how Mark Twain repaid his creditors after bankruptcy.
- Explain the Bible's teaching on debt and on repaying what we owe.

> **Warm-up.** Write down two reasons people go into debt that seem wise and two that seem unwise. What makes the difference?

WATCH

Tips For Getting Out of Debt

Two Cents · 5:23

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

> **WHEN TO WATCH**
> After the story of Twain, before comparing the snowball and avalanche.

BACKUP VIDEO

Debt | Loans and debt | Financial Literacy | Khan Academy

Khan Academy · 4:34

https://www.youtube.com/watch?v=MFCdA2vGVh4

Optional: good and bad uses of debt.

KEY TERMS

debt snowball

Paying minimums on all debts and putting every extra dollar on the smallest balance first, then rolling that payment to the next smallest.

debt avalanche

Paying minimums on all debts and putting every extra dollar on the highest interest rate first.

bankruptcy

A legal process for people or businesses who cannot pay their debts, in which a court divides their assets among creditors and may discharge remaining debts.

creditor

A person or business to whom money is owed.

debt-to-income ratio

Monthly debt payments divided by monthly gross income.

CORE IDEAS

The story. By 1894 Mark Twain, the most famous writer in America, was ruined. He had poured a fortune into the Paige typesetting machine, a marvelous invention that never worked reliably, and his publishing firm, Charles L. Webster & Company, collapsed in the Panic of 1893. The firm went bankrupt owing roughly $100,000, and under the law Twain did not have to repay more than the bankruptcy court could collect. He refused that way out. In 1895, at fifty-nine and in poor health, he set out with his wife and a daughter on a lecture tour around the world: across America, to Australia, New Zealand, India and South Africa. He turned the trip into a book, *Following the Equator* (1897). By early 1898 he had paid every creditor in full.

How they figured it out. Twain's wife, Olivia, insisted that the debts be paid to the last dollar, and Twain agreed: "Honor is a harder master than the law," he wrote. A friend, the businessman Henry H. Rogers, managed his finances, negotiated with creditors and made sure lecture and book income went first to repayment. The plan was simple and painful: earn more, spend less, and pay in a fixed order until it was done. Twain's reputation, damaged by the failure, was restored and even raised by his honesty.

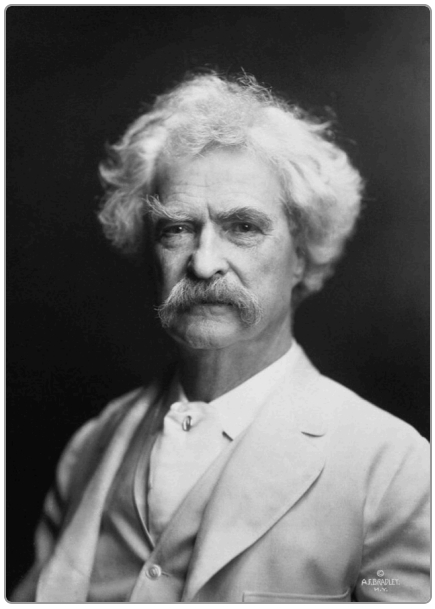
The big idea. Debt makes the borrower "servant to the lender" (Proverbs 22:7), and "the wicked borroweth, and payeth not again" (Psalm 37:21). Getting free starts with a list: every debt, its balance, rate and minimum payment. Stop adding new debt. Then choose a method. The **avalanche** pays extra on the highest rate first and always costs the least interest. The **snowball** pays the smallest balance first, giving quick victories that help many people keep going, at a modest extra cost. Either method

works if you stick with it; the worst method is having none. Free up money by cutting expenses and earning more, as Twain did.

In business today. Some debt can be a tool: a reasonable mortgage, a modest loan for training that raises income, a business loan with a clear plan. Consumer debt for things that lose value (clothes, vacations, electronics) is rarely wise. Lenders look at your **debt-to-income ratio**; many mortgage lenders, for example, prefer total debt payments under about 36% of gross income. If debts become unmanageable, nonprofit credit counseling agencies can help arrange a plan; beware of "debt settlement" firms that charge large fees and damage credit.

Think it through. Twain could have walked away legally. He paid because he believed a promise was a promise. "Owe no man any thing, but to love one another" (Romans 13:8).

PICTURE STUDY



Mark Twain, A. F. Bradley, 1907 · Photograph · Library of Congress

Image: Wikimedia Commons, public domain

This famous portrait was taken in New York in 1907, about nine years after Twain finished paying his debts. By then he was beloved around the world, his honor restored.

Look closely

- Look at his eyes and expression. What do they suggest about his character?
- Look at his white suit, which he liked to wear in later life. What impression did he want to give?
- Imagine him at fifty-nine, setting out on a year-long lecture tour. What would that have cost him?

Talk about it

1. Twain was not legally required to pay his debts in full. Why did he?
2. What did his honesty do for his reputation?
3. What would you be willing to give up to keep a promise?

PROJECT

A Debt-Free Plan in a Spreadsheet

You will build a spreadsheet that pays off a set of realistic debts by both the snowball and avalanche methods, compare them, and write a debt policy for your own life.

You will need

- Free spreadsheet
- Ledger notebook
- Optional: *Following the Equator*, chapter 1

Steps

1. Create three realistic debts (for example, a store card, a credit card and a car loan) with balances, APRs and minimum payments.
2. Choose a total monthly payment that is more than the sum of the minimums.
3. Build a month-by-month table for the avalanche method: interest on each debt, minimums, and extra to the highest rate. When a debt is paid off, roll its payment to the next.
4. Copy the sheet and change the order to the snowball method.
5. Record the month each debt is paid off and the total interest for each method.
6. Find three ways a young adult could free up $100 more a month, and rerun the faster plan.
7. Write a one-page personal debt policy: what you will and will not borrow for, and how you will repay.

Tips

- Use the MIN function so the last payment does not overpay a debt.
- Check that each month's payments add up to your chosen total.

Check your work

☐ Both methods run to zero with correct monthly interest.

☐ I can state which method costs less and why.

- [ ] My debt policy is specific and connects to Scripture.

LEDGER NOTEBOOK

1. Graph the total debt balance month by month under both methods on one chart.
2. Copy Proverbs 22:7 and Romans 13:8 and write one sentence on each.
3. Draw a map of Twain's lecture route: America, Australia, New Zealand, India, South Africa, England.

KEY FORMULAS

$$\text{Debt-to-income} = \frac{\text{monthly debt payments}}{\text{monthly gross income}} \times 100\%$$

$$\text{Monthly interest on each debt} = \frac{\text{APR}}{12} \times \text{balance}$$

From history. Twain's lecture tour was hard on him: he suffered from carbuncles and a bad cold, and he spoke night after night in halls across four continents. The tour, and the book that came from it, earned enough to pay the creditors in full in less than three years, and the public that had laughed at his business failure came to honor him for his honesty.

WORKED EXAMPLES

Example 1. Ben has Card A: $600, 15% APR, minimum $25; Card B: $4,000, 25% APR, minimum $100. He can pay $325 a month in total. Which card does each method attack first, and what is the first month's interest on each?

Show solution

1. Snowball: smallest balance first, Card A. Avalanche: highest rate first, Card B.
2. Month 1 interest: A $0.15/12 \times 600 = \$7.50$; B $0.25/12 \times 4{,}000 = \$83.33$.

Answer: Snowball: Card A first. Avalanche: Card B first. Card B is producing eleven times as much interest each month.

Example 2. A month-by-month spreadsheet of Ben's plan gives these results. Snowball: Card A paid off in month 3, all debt gone in month 17, total interest $893.91. Avalanche: Card B paid off in month 16, all gone in month 17, total interest $830.25. Compare.

Show solution

1. Both finish in 17 months.
2. Avalanche saves $\$893.91 - \$830.25 = \$63.66$.
3. Snowball gives a first victory in month 3 instead of month 16.

Answer: The avalanche saves about $64; the snowball gives an early win. Either is far better than paying minimums.

Example 3. A worker earns $4,200 a month gross and pays $380 (car), $290 (student loan) and $150 (cards) monthly. Find the debt-to-income ratio. With a proposed $1,100 mortgage payment, is it under 36%?

Show solution

1. Current: $820/4{,}200 = 19.5\%$.
2. With mortgage: $1{,}920/4{,}200 = 45.7\%$.

Answer: 19.5% now; 45.7% with the mortgage, well above 36%. Pay down debts first or buy a less expensive home.

PRACTICE

1. Easy Which debt does the snowball method pay first? The avalanche?

   Show answer

   Snowball: the smallest balance. Avalanche: the highest interest rate.

2. Easy Monthly debt payments are $540 on gross income of $3,600. Find the debt-to-income ratio.

   Show answer

   15%

3. Easy What did Mark Twain do about his debts after his publishing firm failed?

Show answer

He made a lecture tour around the world and paid all his creditors in full by 1898, though the law did not require it.

4. Medium Find the first month's interest on $2,400 at 19.2% APR and on $8,000 at 6% APR.

Show answer

$38.40; $40.00

5. Medium Debts: $300 at 22%, $1,800 at 14%, $900 at 27%. List the payoff order for each method.

Show answer

Snowball: $300, $900, $1,800. Avalanche: 27% ($900), 22% ($300), 14% ($1,800).

6. Medium Why does the avalanche always cost the least interest (when all debts get at least their minimum)?

Show answer

Each extra dollar goes where it stops the most interest, the highest rate, so total interest is minimized.

7. Medium From the story: who managed Twain's finances during his repayment, and what was the plan?

Show answer

Henry H. Rogers; earn through lectures and books, spend little, and send income first to the creditors until all were paid.

8. Hard A $5,000 balance at 18% APR is paid at $150 a month. How many months to pay off? How many at $250?

Show answer

$r = 0.015$. \$150: $n = -\ln(0.5)/\ln(1.015) \approx 46.6$. \$250: $n = -\ln(0.7)/\ln(1.015) \approx 24.0$.

9. Hard In problem 8, how much interest does the larger payment save?

Show answer

$(46.6 \times 150 - 5{,}000) - (24.0 \times 250 - 5{,}000) \approx 1{,}990 - 1{,}000 = \$990$

10. Hard Give one example of debt that can be a reasonable tool and one that is rarely wise, and explain the difference.

Show answer

Reasonable: a modest mortgage or a training loan that raises income, because it buys a lasting asset or earning power. Rarely wise: consumer debt for things that lose value quickly, because you pay interest on something soon worth little.

11. Challenge Twain's firm owed about $100,000. If he could set aside $3,000 a month from lectures and books, and creditors charged no interest after the settlement, how long would repayment take? If prices have risen about 37 times since 1895 (a rough figure for this example), what is the debt in today's dollars?

Show answer

About 33 months (under three years); roughly $3.7 million today.

COMMON MISTAKES

- Paying off debt while still adding new debt.
- Having no plan, only minimum payments.
- Using savings meant for emergencies so fully that the next emergency becomes new debt. Keep a small starter fund.

Make it a game · Snowball Versus Avalanche. Make three pretend debt cards with balances and rates. You pay them off the snowball way; your parent uses the avalanche way, with the same monthly total in beans. Play six rounds, tracking balances. Compare who paid less interest and who felt the first win sooner. Then tell how Mark Twain repaid his creditors.

Scripture. "The rich ruleth over the poor, and the borrower is servant to the lender." (Proverbs 22:7, KJV)

Debt limits your freedom: the lender has a claim on your future work. Getting free of debt restores that freedom.

UNIT 4

Credit and Debt

Borrowing lets you use tomorrow's income today, and it always has a price. In this unit you will learn to read that price. You will see why Congress passed the Truth in Lending Act in 1968 so that every borrower could compare loans by one number, the **APR**. You will follow the credit card from a forgotten wallet at a New York restaurant in 1949 to the card in millions of pockets, and you will calculate exactly how long a minimum payment takes to clear a balance.

Then you will meet Lewis Tappan, a New York merchant who in 1841 started the first credit-reporting agency, and learn how today's **credit reports and scores** work. You will weigh **student loans** against the career they pay for. Last, you will follow Mark Twain, bankrupt at fifty-nine, around the world on a lecture tour until he had paid every creditor in full, and you will compare the snowball and avalanche methods for getting out of debt. "The borrower is servant to the lender" (Proverbs 22:7).

PREREQUISITES

- Can compute simple and compound interest and APY (Unit 3)
- Can use exponents and logarithms on a calculator (logarithms are explained where used)
- Has a working budget (Unit 2)

MASTERY CHECKLIST

- ☐ I can compare loans by APR and calculate the effective annual rate.
- ☐ I can calculate a credit card's monthly interest and how long a fixed payment takes to pay off a balance.
- ☐ I can explain what goes into a credit report and score and how to build good credit.
- ☐ I can use the loan-payment formula and judge whether a student loan is affordable.
- ☐ I can build a debt-payoff plan and compare the snowball and avalanche methods.
- ☐ I can explain the Bible's warnings about debt and its call to repay what we owe.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **AnnualCreditReport.com**: The official site for free credit reports from the three national credit bureaus. Adults only; parents can show a student what a report looks like with Lesson 4.3.
- **CFPB: Credit reports and scores**: Free explanations from the Consumer Financial Protection Bureau of what is in a credit report, how scores work and how to dispute errors. Fits Lesson 4.3.
- **StudentAid.gov**: The U.S. Department of Education's official site for federal student aid, loan types and repayment calculators. Use with a parent for Lesson 4.4.
- ***Following the Equator*, by Mark Twain (1897)**: Free. Twain's humorous account of the lecture tour he made to pay his debts. Read the opening chapter with Lesson 4.5. Ages 14 and up; a few passages reflect the attitudes of his day and are worth discussing with a parent.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

4.1	**Interest and APR: The Truth in Lending Act**	3 sessions of 50 minutes
4.2	**Credit Cards: From Diners Club to the Minimum Payment**	3 sessions of 50 minutes
4.3	**Credit Reports and Scores: Lewis Tappan's Mercantile Agency**	3 sessions of 50 minutes
4.4	**Student Loans: Counting the Cost of Training**	3 sessions of 50 minutes
4.5	**Getting Out of Debt: Mark Twain Pays in Full**	3 sessions of 50 minutes

Unit 4 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars, percents or months. Where a

problem says “in this example,” use the figures given. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **5 pts**
   Find the simple interest on $3,200 at 7.5% for 30 months.

2. **6 pts**
   A card has 22.8% APR compounded monthly. Find the periodic rate and the effective annual rate.

3. **6 pts**
   A $1,200 “add-on” loan at 8% for one year is repaid in 12 equal payments. Find the payment and estimate the APR.

4. **5 pts**
   What does the Truth in Lending Act (1968) require, and why?

5. **7 pts**
   A $2,500 balance at 24% APR is paid at $100 a month. Find the months to pay off and the approximate interest.

6. **5 pts**
   Explain the grace period and how a cardholder can avoid all interest.

7. **5 pts**
   Tell how Diners Club (1950) differed from the BankAmericard (1958).

8. **6 pts**
   Cards: limits $1,000 and $4,000; balances $700 and $300. Find overall utilization and explain how to improve it.

9. **5 pts**
   Name the five factors of a FICO-style score with their approximate weights.

10. **5 pts**
    Who was Lewis Tappan, and what did he start in 1841?

11. **7 pts**

    Find the monthly payment on a $22,000 student loan at 6% over 10 years, and the total interest.

12. **5 pts**

    In this example, a $6,000 unsubsidized loan at 5% accrues simple interest for 4.5 years. Find the accrued interest.

13. **5 pts**

    In what order should a family fill the gap in college costs, from best to worst?

14. **6 pts**

    Debts: $450 at 19%, $3,200 at 24%, $1,100 at 12%. Give the snowball and avalanche orders, and say which saves the most interest.

15. **6 pts**

    Gross income $5,000; debt payments $1,450 a month. Find the debt-to-income ratio. Is it under 36%?

16. **16 pts**

    Short essay (one or two paragraphs): Using Mark Twain's story, Proverbs 22:7 and at least one calculation from this unit, explain how a Christian should think about borrowing and about repaying.

ANSWER KEY

1. $3{,}200 \times 0.075 \times 2.5 = \$600$
2. 1.9% a month; $(1.019)^{12} - 1 \approx 25.3\%$
3. Interest \$96; payment \$108; APR $\approx 2(12)(96)/(1{,}200 \times 13) \approx 14.8\%$
4. That lenders disclose the APR and finance charge in a standard form before signing, so borrowers can compare loans honestly.
5. $rB/P = 0.5$; $n = -\ln(0.5)/\ln(1.02) \approx 35.0$; interest $\approx 3{,}500 - 2{,}500 = \$1{,}000$
6. Between the statement and due date no interest is charged on purchases if the full statement balance is paid; paying in full every month avoids interest.
7. Diners Club was a charge card for restaurants, billed monthly and paid in full; the BankAmericard offered open-end credit that could be carried with interest.
8. $1{,}000/5{,}000 = 20\%$; pay down balances (especially the 70% card) and keep the accounts open.
9. Payment history 35%, amounts owed 30%, length of history 15%, new credit 10%, credit mix 10%.
10. A New York silk merchant and Christian philanthropist who founded the Mercantile Agency, the first credit-reporting agency, later R. G. Dun & Co.
11. $M = 22{,}000(0.005)/(1 - 1.005^{-120}) = 110/0.4504 \approx \$244.23$; interest $\approx \$7{,}307$
12. \$1,350
13. Savings and work; grants and scholarships; federal subsidized loans; federal unsubsidized loans; private loans last.
14. Snowball: 450, 1,100, 3,200. Avalanche: 24%, 19%, 12% (3,200, 450, 1,100). The avalanche saves the most interest.
15. 29%; yes.
16. A strong answer explains that debt limits freedom (Proverbs 22:7) and that the righteous repay (Psalm 37:21); uses Twain's choice to repay in full when not legally required as an example of honor; shows with numbers how interest and minimum payments make debt costly (for example, a card balance taking years to clear); distinguishes reasonable borrowing from consumer debt; and states a personal policy of borrowing rarely and repaying faithfully.

PORTFOLIO PIECE: MY CREDIT AND DEBT FILE

Assemble your three-offer comparison, your credit-card payoff spreadsheet, your credit-report study and credit-building plan, your two-path education cost and loan plan, and your snowball-and-avalanche spreadsheet with your personal debt policy. Add a one-page letter to your eighteen-year-old self about the borrowing you will and will not do.

LOOK FOR	WHAT IT MEANS
Calculations	APR, EAR, payoff months, loan payments, utilization and debt-to-income are correct and shown.
Spreadsheets	Month-by-month tables are correct, labeled and run to zero.
Judgment	Recommendations weigh total cost, risk and the option not to borrow.
Character	The debt policy and letter connect clearly to Scripture and to Twain's example of keeping one's word.

UNIT 5

Insurance and Risk

Some losses are small enough to pay from savings; others could ruin a family in a day. **Insurance** is the ancient answer: many people each pay a small, certain amount so that the few who suffer a large loss are made whole. In this unit you will watch the idea grow in a London coffee house in the 1680s, where Edward Lloyd's customers signed their names under the risks of merchant voyages. You will learn the arithmetic insurers use: probability, **expected loss**, the law of large numbers, premiums and deductibles.

Then you will study the insurance a young adult actually buys. **Auto insurance** began with a single policy in 1897; **health insurance** grew from a plan for Dallas schoolteachers in 1929; **home and renter's insurance** rose from the ashes of the Great Fire of London in 1666; and **life and disability insurance** owe much to two Scottish ministers who, in 1744, worked out how to provide for their colleagues' widows. "Bear ye one another's burdens" (Galatians 6:2).

PREREQUISITES

- Can compute percents, averages and simple probabilities
- Has an emergency-fund plan (Unit 2)
- Can read a table of numbers carefully

MASTERY CHECKLIST

- ☐ I can explain how insurance pools risk and calculate an expected loss and a fair premium.
- ☐ I can choose among risk strategies: avoid, reduce, keep or transfer.
- ☐ I can read an auto policy's coverages and compare deductibles.
- ☐ I can calculate what a patient pays under a health plan's deductible, copay, coinsurance and out-of-pocket maximum.
- ☐ I can explain replacement cost and actual cash value and inventory my belongings for renter's insurance.
- ☐ I can estimate life-insurance needs and explain why disability insurance matters for a worker.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Khan Academy: Financial Literacy, Insurance unit**: Free short videos and practice on how insurance works and on auto, health, property, life and disability coverage. Several of this unit's videos come from it.
- **Federal Reserve Bank of St. Louis: Econ Lowdown**: Free online modules, including insurance and risk management, from a Federal Reserve bank.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

5.1	**Risk and Insurance: Edward Lloyd's Coffee House**	3 sessions of 50 minutes
5.2	**Auto Insurance: The First Policy, 1897**	3 sessions of 50 minutes
5.3	**Health Insurance: The Baylor Plan, 1929**	3 sessions of 50 minutes
5.4	**Home and Renter's Insurance: After the Great Fire of London**	3 sessions of 50 minutes
5.5	**Life and Disability Insurance: The Ministers' Widows' Fund**	3 sessions of 50 minutes

Unit 5 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars or percents. Where a problem says "in this example," use the figures given, not current rules or prices. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **6 pts**
   Losses: $1,000 with probability 0.08 and $50,000 with probability 0.002. Find the expected loss, and the premium if the insurer adds 35%.

2. **5 pts**
   Name the four ways to handle risk and give an example of each for a teenage driver.

3. **5 pts**

   Explain the law of large numbers and why it makes insurance possible.

4. **5 pts**

   What happened at Edward Lloyd's coffee house, and where does the word "underwriter" come from?

5. **7 pts**

   With 50/100/50 limits, a driver injures two people ($70,000 and $35,000) and causes $20,000 of property damage. How much does the insurer pay and how much does the driver owe?

6. **6 pts**

   Raising a deductible from $500 to $1,500 saves $240 a year. Find the break-even claim frequency, and state what the driver must have before choosing it.

7. **7 pts**

   A plan has a $2,000 deductible, 20% coinsurance and a $6,500 out-of-pocket maximum. Find what the patient pays on a first covered bill of $12,000 and on a first covered bill of $50,000.

8. **6 pts**

   Plan A: $210/month, out-of-pocket max $3,500. Plan B: $120/month, out-of-pocket max $7,000. Compare worst-case yearly totals.

9. **5 pts**

   What was the Baylor plan of 1929, and what did it grow into?

10. **6 pts**

    A 5-year-old refrigerator would cost $1,500 to replace; useful life 15 years. Find replacement cost and ACV, and the payment under each with a $250 deductible.

11. **5 pts**

    Why does a renter need renter's insurance even though the building is insured?

12. **5 pts**

    How did the Great Fire of London (1666) lead to fire insurance, and what did Barbon's fire office do?

13. **6 pts**

In this example, the probability of death this year is 0.0015. Estimate the expected cost and the premium (with a 30% load) for $300,000 of term coverage.

14. **6 pts**

A worker earning $5,000 a month is disabled for 7 months. Her policy pays 60% after a 90-day wait. Find benefits and uncovered income.

15. **5 pts**

What did Wallace and Webster's fund (1744) show about predicting the future of a large group?

16. **5 pts**

Short answer: Give one reason most young families are better served by term life insurance than by whole life.

17. **10 pts**

Short essay: Using Galatians 6:2 or 1 Timothy 5:8, explain how insurance can be an act of love for neighbors and family, and give one way it can be misused.

ANSWER KEY

1. $80 + 100 = \$180$; premium $243
2. Avoid (not driving in an ice storm), reduce (no phone use, seat belt), keep (pay a small scrape from savings), transfer (buy auto insurance).
3. As the number of similar cases grows, average losses come close to the expected loss, so an insurer covering many policies can predict claims and set premiums.
4. Merchants and ship owners gathered for shipping news; men wrote their names under descriptions of voyages to share the risk for a premium.
5. Injuries: $\$50{,}000 + \$35{,}000 = \$85{,}000$ (under $100,000); property $20,000. Insurer $105,000; driver owes $20,000.
6. $1{,}000/240 \approx 4.2$ years; an emergency fund of at least $1,500.
7. $2{,}000 + 2{,}000 = \$4{,}000$; $2{,}000 + 9{,}600 = 11{,}600$, capped at $6,500.
8. A $6,020; B $8,440; A by $2,420.
9. Dallas teachers paid 50 cents a month for up to 21 days of hospital care at Baylor University Hospital; such plans spread and became Blue Cross.
10. ACV $1,000; payments $1,250 (replacement) and $750 (ACV).
11. The landlord's policy covers the building, not the tenant's belongings, liability or extra living expenses.
12. The fire destroyed about 13,200 houses with no way to recover losses; Barbon's office pooled fire risk, priced it by construction, kept firefighters and marked insured houses.
13. $450; $585
14. Benefits: 4 months × $3,000 = $12,000; uncovered $23,000.
15. That although no single death can be foreseen, deaths and widowhood among many ministers could be predicted closely enough to set fair contributions and pensions.
16. Term provides much more death benefit per dollar during the years children depend on the parent; the money saved can be saved or invested separately.
17. A strong answer explains pooling as bearing burdens together so no family is ruined, and buying coverage as providing for one's household; misuse includes fraud, over-insuring small risks, buying costly products one does not understand, or trusting insurance instead of God.

PORTFOLIO PIECE: MY FAMILY RISK AND INSURANCE PLAN

Assemble your household risk map and pooling-game record, your auto-policy comparison, your health-plan comparison, your home inventory and renter's estimate, and your life and disability needs analysis. Add a one-page summary listing the insurance you expect to need at ages 18, 25 and 35, with reasons and the risks you will keep with savings instead.

LOOK FOR	WHAT IT MEANS
Calculations	Expected loss, premiums, deductibles, out-of-pocket costs, ACV and needs are calculated correctly.
Understanding	Coverages are explained accurately in the student's own words.
Judgment	Recommendations insure large risks, keep small ones and fit each person's situation.
Records	The home inventory and comparisons are complete, labeled and clear.

5.1 Risk and Insurance: Edward Lloyd's Coffee House

OBJECTIVES

- Explain how insurance pools risk and why the law of large numbers makes it work.
- Calculate expected loss and a premium that covers it plus expenses.
- Choose among four ways to handle risk: avoid, reduce, keep or transfer.

> **Warm-up.** List five things that could go wrong in the next year that would cost your family money. Next to each, write whether it would cost a little, a lot, or a ruinous amount.

WATCH

How insurance works | Insurance | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 3:37

https://www.youtube.com/watch?v=i4FAekxeS_o

> **WHEN TO WATCH**
> After the story of Lloyd's: how insurance pools risk.

BACKUP VIDEO

Insurance - No-Frills Money Skills

Federal Reserve Bank of St. Louis · 6:42

https://www.youtube.com/watch?v=OdWNmmn89Wk

With In business today: premiums, deductibles and claims.

KEY TERMS

risk
The chance of a loss.

premium
The price paid for an insurance policy, usually monthly or yearly.

expected loss

The average loss per person over many cases: probability × size of loss, summed over all possible losses.

law of large numbers

The principle that as the number of similar cases grows, the actual average loss comes closer to the expected loss, making it predictable.

underwriter

A person or company that accepts a risk in return for a premium; originally a merchant who wrote his name under the description of a voyage.

deductible

The part of a loss the policyholder pays before insurance pays.

CORE IDEAS

The story. In 1688 a London newspaper carried an advertisement offering a reward for information about stolen watches, to be given at "Mr. Edward Lloyd's Coffee-house in Tower Street." Lloyd's coffee house was a favorite of sea captains, ship owners and merchants, and Lloyd made it more so by collecting reliable news of ships' arrivals, departures and losses. A merchant who wanted to protect a cargo would write out the details of the ship and the voyage on a slip of paper, and wealthy men who were willing to share the risk would write their names under it, each promising to pay part of any loss in return for part of the premium. They were called **underwriters**. In 1734 the house began publishing *Lloyd's List* of shipping news, and in 1771 the underwriters formed the Society of Lloyd's.

How they figured it out. No single merchant could afford to lose a whole ship, but a ship owner could afford a premium, and an underwriter who shared small parts of many voyages could afford the occasional loss. The more voyages each underwriter covered, the more predictable his results became: this is the **law of large numbers**. Good news mattered as much as money: an underwriter who knew which ships were sound, which captains careful and which routes dangerous could price risks fairly. Honest dealing was essential; a promise to pay was worthless if the underwriter would not keep it.

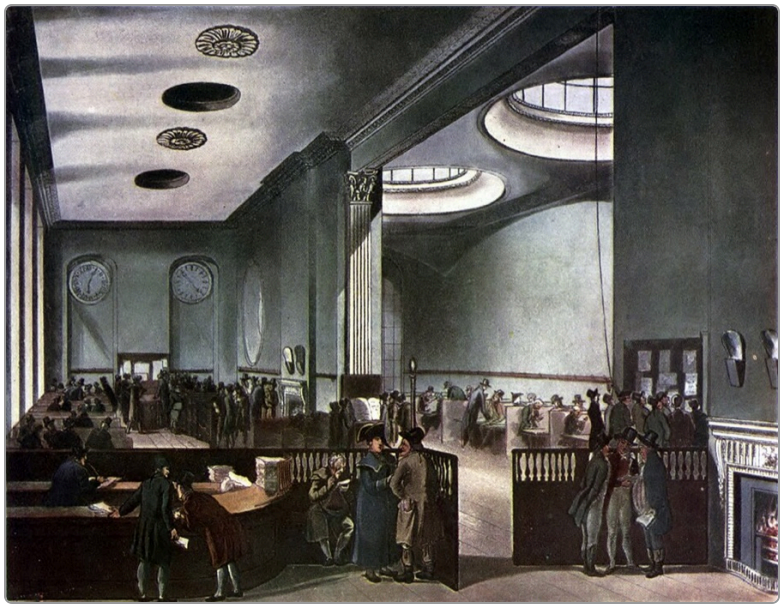
The big idea. Insurance turns a large, uncertain loss into a small, certain cost. If 1 in 1,000 houses burns each year at an average loss of $200,000, the **expected loss** per house is $200. An insurer covering many houses can charge each owner $200 plus its expenses and profit and expect to pay its claims. You have four ways to handle any

risk: **avoid** it (do not do the risky thing), **reduce** it (smoke detectors, careful driving), **keep** it (pay small losses from your emergency fund) or **transfer** it (buy insurance). The rule of thumb: insure what you cannot afford to lose, and keep what you can.

In business today. Lloyd's of London still operates as a marketplace where groups of investors underwrite unusual and large risks, from ships and aircraft to satellites. Ordinary insurance companies pool millions of policies. Insurers collect premiums, pay claims and expenses, and invest the money they hold in the meantime. They also use deductibles so that customers keep small losses and take care to avoid them. Because insurers profit on average, insurance always costs more than the expected loss. That is why you should not insure small things you could easily replace, such as a phone case or an inexpensive appliance.

Think it through. Insurance is a modern form of an old Christian practice: neighbors bearing one another's burdens so that no one family is crushed by misfortune (Galatians 6:2). Many early insurance societies, and some today, began as mutual-aid groups in churches and trades.

PICTURE STUDY



Lloyd's Subscription Room, Thomas Rowlandson and Augustus Charles Pugin, 1809 · Hand-colored aquatint, from *The Microcosm of London* · Published by Rudolph Ackermann, London

Image: Wikimedia Commons, public domain

By 1809 Lloyd's had moved from its coffee house into rooms at the Royal Exchange. Pugin drew the architecture and Rowlandson the crowd. The men here are underwriters and brokers, reading shipping news and agreeing on risks.

Look closely

- Find the notice boards. What news would be posted on them?
- Find groups of men talking. What might they be agreeing on?
- Look for clocks or anything that measures time. Why would timing matter to marine insurers?
- Count the people. Why does insurance need many underwriters?

Talk about it

1. Why did shipping news make Lloyd's the natural place for marine insurance?
2. How did spreading a risk among many underwriters make each one safer?
3. What would happen to this market if underwriters stopped keeping their promises?

PROJECT

A Household Risk Map

You will list the risks your household faces, estimate their likelihood and cost, decide how to handle each, and play a small pooling game that shows the law of large numbers.

You will need

- Ledger notebook and calculator
- A die or a spreadsheet random-number function
- Your emergency-fund plan from Unit 2

Steps

1. List at least ten risks (illness, car accident, house fire, lost phone, job loss, broken appliance, lawsuit after an accident, and so on).
2. For each, estimate the cost (small, medium, large, ruinous) and how likely it is (rare, occasional, common), with a parent's help.
3. Make a grid: likelihood across the top, cost down the side. Place each risk in the grid.
4. Decide for each: avoid, reduce, keep, or transfer (insure). Explain why.
5. Pooling game: each player is a "ship owner" with a ship worth $1,000. Roll a die for each ship; a 1 means the ship is lost. First play with no insurance, then with each player paying $200 into a pool that pays any losses. Record results over 10 rounds for 6 players.
6. Compare how much each player's results varied with and without the pool.
7. Write a half page on which risks your family should insure and which it can keep.

Tips

- The ruinous risks are the most important to insure, even if they are rare.
- Reducing risk (seat belts, smoke detectors) is often cheaper than insuring it.

Check your work

☐ My grid places every risk and states a strategy.

- [ ] My pooling game records show how pooling evens out losses.
- [ ] I can calculate expected loss and a premium.

LEDGER NOTEBOOK

1. Draw your risk grid with each risk placed.
2. Graph the pooling-game results: each player's money over 10 rounds, with and without the pool.
3. Write the four risk strategies with one example each.

KEY FORMULAS

$$E[\text{loss}] = \sum p_i L_i$$

$$\text{Premium} \approx E[\text{loss}] + \text{expenses} + \text{profit}$$

$$\text{Loss ratio} = \frac{\text{claims paid}}{\text{premiums collected}}$$

From history. Edward Lloyd died in 1713 without ever being an underwriter himself. He sold coffee and news. The name of his coffee house has outlived him by three centuries, a reminder that trustworthy information is itself a valuable service.

WORKED EXAMPLES

Example 1. In this example, in a town of 5,000 houses, each house has a 0.2% chance of a fire in a year, and an average fire costs $150,000. Find the expected number of fires, total expected losses, and the expected loss per house.

Show solution

1. Expected fires: $0.002 \times 5{,}000 = 10$.
2. Total expected losses: $10 \times \$150{,}000 = \$1{,}500{,}000$.
3. Per house: $\$1{,}500{,}000 / 5{,}000 = \$300$.

Answer: 10 fires, $1.5 million, $300 per house.

Example 2. The insurer adds 25% of the expected loss for expenses and 5% for profit. What premium does it charge? What is its loss ratio if claims come in exactly as expected?

Show solution

1. Premium: $\$300 \times 1.30 = \$390$.
2. Loss ratio: $300/390 \approx 76.9\%$.

Answer: \$390; loss ratio about 77%.

Example 3. A phone costs \$600. A protection plan costs \$12 a month with a \$150 deductible per claim. If there is a 15% chance per year of needing one claim, compare the expected yearly cost of buying the plan with keeping the risk yourself.

Show solution

1. Plan: $12 \times 12 = \$144$ plus expected deductible $0.15 \times 150 = \$22.50$: \$166.50.
2. Keep the risk: expected loss $0.15 \times \$600 = \$90$.

Answer: On average the plan costs about \$76 a year more than keeping the risk. Keep small risks with an emergency fund and careful use; insure large ones.

PRACTICE

1. Easy A loss of \$10,000 has a 3% chance of happening. Find the expected loss.

   Show answer

   \$300

2. Easy Name the four ways to handle a risk.

   Show answer

   Avoid, reduce, keep (retain), transfer (insure).

3. Easy What did the word “underwriter” originally mean?

   Show answer

   A person who wrote his name under the description of a ship and voyage, agreeing to pay part of any loss for part of the premium.

4. **Medium** Two possible losses: \$2,000 with probability 0.05 and \$20,000 with probability 0.01. Find the expected loss.

   Show answer

   $100 + 200 = \$300$

5. **Medium** An insurer collects \$8 million in premiums and pays \$5.6 million in claims. Find the loss ratio.

   Show answer

   70%

6. **Medium** Which should you insure: a \$40 lamp or your liability if you injure someone in a car accident? Why?

   Show answer

   The liability: it could be ruinous. The lamp is a small loss you can easily replace.

7. **Medium** From the story: why was Lloyd's coffee house a natural place for marine insurance to grow?

   Show answer

   Ship owners, captains and merchants gathered there, and Lloyd collected reliable shipping news, which underwriters needed to judge and price risks.

8. **Hard** In this example, 2,000 drivers each face a 4% chance of a \$9,000 claim. The insurer's expenses are \$150 per policy and it wants \$20 profit per policy. What premium should it charge?

   Show answer

   $0.04 \times 9{,}000 + 150 + 20 = \$530$

9. **Hard** Explain why a single underwriter covering one ship faces more uncertainty than one covering small shares of 100 ships, even if the expected loss is the same.

   Show answer

   With one ship the result is all or nothing; with many small shares the losses average out (law of large numbers), so actual results stay close to the expected loss.

10. Hard Why does insurance always cost more than the expected loss, and why is it still wise for large risks?

Show answer

The insurer must cover expenses and earn a profit. But for large, rare losses, paying a little extra to avoid a ruinous loss is worth it, because the harm of the large loss to a family is far greater than its average cost.

11. Challenge A ship worth $\$1{,}000$ has a $1/6$ chance of loss. Find the expected loss and the standard deviation of the loss for one ship. If 36 owners pool their risk equally, what is the standard deviation of each owner's share?

Show answer

Expected $\$166.67$; SD $1{,}000\sqrt{(1/6)(5/6)} \approx \$372.68$; pooled share SD $372.68/\sqrt{36} \approx \$62.11$

COMMON MISTAKES

- Insuring small, affordable losses while leaving large ones uninsured.
- Thinking insurance is a waste of money if you never file a claim. You bought protection from ruin.
- Forgetting that reducing risk is often cheaper than insuring it.

Make it a game · Pool the Risk. Place ten beans as ten homes, each paying a premium of one bean into a middle pot. Roll a die for each home, and on a 1 the home has a loss of six beans from the pot. Play ten rounds. Find the average loss, and say what premium covers it plus expenses. Then tell what Lloyd's coffee house did.

Scripture. "Bear ye one another's burdens, and so fulfil the law of Christ." (Galatians 6:2, KJV)

Insurance at its best is neighbors bearing one another's burdens so that no one carries a crushing loss alone.

5.2 Auto Insurance: The First Policy, 1897

OBJECTIVES

- Explain the main auto coverages: liability, collision, comprehensive, and uninsured motorist.
- Read split liability limits and compare deductibles and premiums.
- Identify factors that raise or lower premiums, especially for young drivers.

> **Warm-up.** Guess what it costs per year to insure a teenage driver in your family's car. Then ask a parent (if they are willing to share) and compare.

WATCH

Car Insurance Explained | Coverage and Cost

Federal Reserve Bank of St. Louis · 6:25

https://www.youtube.com/watch?v=Ee-WuN-UjBI

> **WHEN TO WATCH**
> After the big idea: car-insurance coverages and what affects their cost.

BACKUP VIDEO

Car insurance basics | Insurance | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 4:22

https://www.youtube.com/watch?v=cWEiafGi4QE

Before the project: car insurance basics.

KEY TERMS

liability coverage

Pays for injuries and property damage you cause to others; required in nearly every state.

collision coverage

Pays to repair or replace your own car after a crash, minus the deductible.

comprehensive coverage

Pays for damage to your car from causes other than collision: theft, fire, hail, flood, hitting an animal.

split limits

Liability limits written as three numbers, such as 50/100/50: thousands of dollars per injured person, per accident for all injuries, and for property damage.

uninsured motorist coverage

Pays for your injuries if you are hit by a driver who has no insurance or too little.

CORE IDEAS

The story. In 1897, when automobiles were a rare and noisy novelty, the Travelers Insurance Company of Hartford wrote what it has long described as the first automobile insurance policy, for a Buffalo, New York doctor named Truman Martin. His worry was not his own car but the frightened horses and pedestrians he might injure. As cars multiplied, so did crashes and lawsuits, and many injured people could not collect from drivers with no money. In 1925 Massachusetts passed the first law requiring car owners to carry liability insurance (it took effect in 1927), and other states followed with their own rules.

How they figured it out. Early insurers had no records to tell them how often cars would crash, so they learned by counting claims year after year. They found that the risk depended on who drove, where, how far and in what car, and they began to price policies accordingly. The public problem, drivers too poor to pay for the harm they caused, was solved by law: if you drive, you must be able to pay. That is still the core of auto insurance: **liability coverage** protects other people from you.

The big idea. A policy is a bundle of coverages. **Liability** is written as split limits: 50/100/50 means up to $50,000 per injured person, $100,000 for all injuries in one accident, and $50,000 for property damage. State minimums are often low; a serious accident can cost far more, and you are personally responsible for the rest. **Collision** and **comprehensive** cover your own car, minus a **deductible**; on an old, inexpensive car they may cost more than they could ever pay. A higher deductible lowers the premium; keep the deductible in your emergency fund. Premiums depend on age,

driving record, miles, location, the car and sometimes credit history; young drivers pay the most because, as a group, they crash the most.

In business today. Insurers reward safe drivers: good-student discounts, safe-driving discounts, driver-education discounts, and multi-car and bundling discounts. Some offer devices or apps that track driving habits. After an accident, stay safe, call for help if anyone is hurt, exchange information, take photographs, and report the claim promptly; never admit fault or agree to pay on the spot. A single at-fault accident or speeding ticket can raise premiums for years.

Who gained? Mandatory liability insurance protected pedestrians, other drivers and their families. It also protected careful drivers from ruin by a single accident. The cost is a premium every year; the best way to lower it is to drive with care, which is also the best way to love your neighbor on the road.

PICTURE STUDY



Traffic Accident, Valdemar Andersen, 1910s · Oil on canvas · Painted for the Danish insurance company Hafnia (private collection)

Image: Wikimedia Commons, public domain

The Danish painter Valdemar Andersen made a set of five paintings for the Hafnia insurance company, each showing a kind of accident (a fire, a shipwreck, a train wreck, a traffic accident) where insurance might bring relief. Here the old world of horses and the new world of motorcars and trams collide.

Look closely

- Find the motorcar, the tram and the horse. Which is new and which is old?
- Look at the people. Are they hurt, or frightened?
- Look at the light. What time of day is it, and why might that matter for accidents?
- Imagine you are the insurer. Whose losses might you be asked to pay?

Talk about it

1. Why would an insurance company want a painting like this?
2. Dr. Truman Martin's first auto policy covered harm to others. Who in this painting might be harmed by the car's driver?
3. How does a careful driver serve his neighbors as well as himself?

> **Safety first.** Never use a phone while driving. The best auto-insurance discount is a clean record.

PROJECT

Compare Two Auto Policies

With a parent, you will read your family's auto policy declarations page (or a sample), explain every coverage, and compare two realistic options for a young driver.

You will need

- A declarations page (personal details covered) or a sample from an insurer's website
- Online quote tools viewed with a parent (do not submit personal information)
- Ledger notebook and calculator

Steps

1. Find and explain each coverage on the declarations page: liability limits, collision, comprehensive, uninsured motorist, medical payments, and the deductibles.
2. Look up your state's minimum liability limits and compare them with the family's limits.
3. With a parent, get or estimate two quotes for adding a young driver: Option A with state-minimum liability and a $500 deductible; Option B with 100/300/100 liability and a $1,000 deductible.
4. List every discount that might apply (good student, driver education, multi-car).
5. Work out what each option would pay in two sample accidents: a minor crash causing $4,000 of damage to your car, and a serious at-fault crash causing $90,000 of injuries to one person.
6. Write a recommendation with reasons.

Tips

- Do not enter personal information on quote sites. A parent can do that if the family wishes.

- The cost of higher liability limits is usually small compared with the protection.

Check your work

- ☐ I can explain each coverage on a declarations page.
- ☐ I calculated what each option pays in both sample accidents.
- ☐ My recommendation weighs premium, deductible and protection.

LEDGER NOTEBOOK

1. Draw a diagram of an accident showing which coverage pays for which loss.
2. Make a table comparing Options A and B.
3. Copy the meaning of 25/50/25 and 100/300/100.

KEY FORMULAS

$$\text{Insurer pays} = \min(\text{covered loss} - \text{deductible}, \text{limit})$$

$$\text{Break-even claims} = \frac{\text{premium saved by higher deductible}}{\text{increase in deductible}}$$

From history. Early automobile insurance was often sold by companies that already insured horses and carriages, and some early policies excluded damage caused by frightened horses. Within a few decades, auto insurance had become one of the largest kinds of insurance in America.

WORKED EXAMPLES

Example 1. A driver with 25/50/25 liability limits causes an accident that injures two people (medical bills of $40,000 and $15,000) and does $32,000 of property damage. How much does the insurer pay, and how much is the driver personally responsible for?

Show solution

1. Person 1: limit $25,000; pays $25,000. Person 2: $15,000. Injury total $\$40{,}000 \le \$50{,}000$ per accident.
2. Property: limit $25,000.
3. Insurer pays $65,000. Driver owes $(40{,}000 - 25{,}000) + (32{,}000 - 25{,}000) = \$22{,}000$.

Answer: Insurer $65,000; the driver personally owes $22,000. Higher limits are cheap compared with that risk.

Example 2. In this example, collision coverage with a $500 deductible costs $880 a year; with a $1,000 deductible it costs $720. How many years without a claim make the higher deductible pay off?

Show solution

1. Yearly saving: $160. Extra risk per claim: $500.
2. $500/160 \approx 3.1$ years.

Answer: If you file a collision claim less than about once every three years, the $1,000 deductible saves money, provided you have $1,000 in your emergency fund.

Example 3. A 13-year-old car is worth $3,200. Collision and comprehensive cost $620 a year with a $1,000 deductible. What is the most they could ever pay on a total loss, and is the coverage worth it?

Show solution

1. Maximum payout: $\$3{,}200 - \$1{,}000 = \$2{,}200$.
2. Premium is $620/2{,}200 \approx 28\%$ of the maximum payout each year.

Answer: At most $2,200. Paying 28% of that every year is rarely worth it; many owners drop these coverages on an old car and keep liability, saving the premium toward the next car.

PRACTICE

1. Easy What do the three numbers in 50/100/25 mean?

   Show answer

   Up to $50,000 per injured person, $100,000 for all injuries in one accident, $25,000 for property damage.

2. Easy Which coverage pays if your parked car is damaged by hail?

   Show answer

   Comprehensive.

3. Easy A $2,600 covered repair with a $500 deductible. What does the insurer pay?

   Show answer

   $2,100

4. Medium With 25/50/25 limits, you injure three people with bills of $20,000, $20,000 and $20,000. How much does the insurer pay for injuries, and how much do you owe?

   Show answer

   Each is under $25,000, but the per-accident limit is $50,000; you owe $10,000.

5. Medium Raising a deductible from $250 to $1,000 saves $210 a year. Find the break-even claim frequency.

Show answer

$750/210 \approx 3.6$ years: worthwhile if claims are less frequent.

6. Medium List four factors that raise auto premiums.

Show answer

Any four: young age, accidents or tickets, more miles, expensive or high-theft car, high-crime or crowded area, low deductibles, high coverage.

7. Medium From the story: what did Dr. Truman Martin's 1897 policy mainly protect against, and what did Massachusetts require starting in 1927?

Show answer

Injuries and damage he might cause to others (frightened horses, pedestrians); Massachusetts required car owners to carry liability insurance.

8. Hard In this example, a family pays $1,400 a year to insure two adults. Adding a 16-year-old driver raises it 80%, and a good-student discount takes 10% off the increase. Find the new premium.

Show answer

Increase $1,120, less 10% is $1,008; new premium $2,408

9. Hard An at-fault accident raises your premium by $450 a year for 3 years. You also paid a $500 deductible. What did the accident cost you in total?

Show answer

$500 + 3 \times 450 = \$1{,}850$

10. Hard Explain why carrying only the state-minimum liability limits can be risky for a driver who owns a home or has savings.

Show answer

Serious injuries can cost far more than minimum limits; the driver is personally responsible for the excess, so savings, wages or property could be taken to pay a judgment.

11. **Challenge** An insurer finds that drivers aged 16–19 file claims at 3 times the rate of drivers aged 30–59, with the same average claim. If a 30–59 driver's expected loss is $400 and premiums equal expected loss × 1.35, what premium does a teen driver pay? How much would a 25% reduction in teen claim frequency save?

Show answer

Teen expected loss $1,200; premium $1,620. 25% fewer claims: expected loss $900, premium $1,215, saving $405.

COMMON MISTAKES

- Buying only the legal minimum liability limits.
- Keeping a low deductible without an emergency fund to cover a higher one.
- Paying for collision coverage on a car worth less than a few years of premiums.

> **Make it a game · Which Coverage Pays?.** Write liability, collision, comprehensive and uninsured motorist on four cards. Your parent acts out a driving mishap with toy cars, such as a deer, a fender bender or a hit by an uninsured driver. Slap the card that pays. Then read a split limit such as 50/100/25 aloud and explain each number.

5.3 Health Insurance: The Baylor Plan, 1929

OBJECTIVES

- Explain premiums, deductibles, copays, coinsurance and the out-of-pocket maximum.
- Calculate what a patient pays for a medical bill under a health plan.
- Compare two plans for a year of expected and unexpected care.

> **Warm-up.** Guess what a one-night hospital stay costs in your state before insurance. Write the guess, then look up a published estimate with a parent.

WATCH

Health insurance terms explained | Insurance | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 3:54

https://www.youtube.com/watch?v=jKcxY82-RG8

> **WHEN TO WATCH**
> With worked examples 1 and 2: deductibles, copays and coinsurance.

BACKUP VIDEO

HMOs, PPOs, EPOs and HSAs | Insurance | Financial Literacy | Khan Academy

Khan Academy · 7:05

https://www.youtube.com/watch?v=n8R4h64cPCM

Optional: kinds of health plans and health savings accounts.

KEY TERMS

premium

The regular payment for the health plan, paid whether or not you use care.

deductible

The amount you pay each year for covered care before the plan begins to share costs.

copay

A fixed amount paid for a service, such as $30 for an office visit.

coinsurance

Your percentage share of costs after the deductible, such as 20%.

out-of-pocket maximum

The most you pay in a year for covered care (deductible, copays and coinsurance); after that the plan pays 100% of covered costs.

network

The doctors and hospitals that have contracts with the plan; care outside it usually costs much more.

CORE IDEAS

The story. In 1929 Justin Ford Kimball, an administrator of Baylor University Hospital in Dallas and a former school superintendent, was troubled by the hospital's unpaid bills. Many patients simply could not pay when illness struck. Looking at the records, he found that Dallas schoolteachers were among those with unpaid accounts. He offered the city's teachers a plan: pay 50 cents a month, and if you need it, you can stay in the hospital for up to 21 days a year. About 1,300 teachers signed up. The Baylor plan worked so well that other hospitals copied it, and in the 1930s these hospital plans adopted a common symbol, a blue cross.

How they figured it out. Kimball turned an unpredictable, crushing hospital bill into a small, predictable monthly payment, the same pooling principle as Lloyd's underwriters. A teacher's chance of a long hospital stay in any one year was small, but the cost could be more than a year's savings. By gathering many teachers, the hospital could predict how many beds would be used and be paid steadily. Later, employers began offering health coverage as a benefit, and today most Americans under 65 with private insurance get it through work.

The big idea. A health plan shares costs in layers. You pay the **premium** all year. For covered care, you pay the **deductible** first, then **coinsurance** (a percentage) or **copays** (fixed amounts), until you reach the **out-of-pocket maximum**; after that the plan pays 100% of covered care for the rest of the year. A plan with a low premium usually has a high deductible, and the reverse. To compare plans, add the yearly premiums to the out-of-pocket costs for a healthy year, a typical year and a worst-case year. Some high-deductible plans can be paired with a **health savings account (HSA)**, which lets you save pre-tax money for medical costs.

In business today. Health insurance rules, subsidies and limits change, and they differ by employer and state, so this lesson teaches the arithmetic, not today's rules. Young adults can often stay on a parent's plan for some years, and employers usually pay a large share of the premium for their workers. Always use in-network doctors

when you can, ask for prices before non-urgent care, read every bill and explanation of benefits, and ask about errors. Many Christian families also take part in health-sharing ministries, which are not insurance and work by different rules; read their guidelines carefully.

Think it through. Jesus healed the sick freely, and Christians have founded hospitals for centuries. Paying for care fairly and helping neighbors who cannot are both part of loving our neighbor.

PICTURE STUDY



The Doctor, Luke Fildes, 1891 · Oil on canvas · Tate Britain, London

Image: Wikimedia Commons, public domain

Fildes painted this scene in memory of the doctor who cared for his own son, who died in 1877. The painting shows the care of a doctor in a poor family's home, long before health insurance. It became one of the most famous pictures in Victorian England.

Look closely

- Find the doctor. What does his posture say about his care for the child?
- Find the parents. What are they feeling?
- Look at the room. Is this a rich family or a poor one?
- Find the medicine bottle and the lamp. What do they suggest about the long night?

Talk about it

1. How might this family have paid the doctor? What would happen if the illness lasted months?
2. How did plans like Kimball's Baylor plan help families in this situation?
3. What does the doctor's attention teach about serving others in our work?

PROJECT

Compare Two Health Plans

You will compare two real or sample health plans (for example, a parent's employer options or plans described on an insurer's website) under three scenarios, and explain which is better for different people.

You will need

- A summary of benefits and coverage for two plans (from a parent's employer or a sample online), personal details hidden
- Spreadsheet and calculator

Steps

1. Record for each plan: monthly premium, deductible, coinsurance, copays for an office visit and a prescription, and out-of-pocket maximum.
2. Build three scenarios: a healthy year (two office visits and one prescription), a moderate year (a $6,000 outpatient procedure), and a worst-case year (a $60,000 hospital stay).
3. Calculate out-of-pocket costs and total yearly cost (premiums plus out-of-pocket) for each plan in each scenario.
4. Graph total cost for both plans across the three scenarios.
5. Decide which plan you would recommend for a healthy 24-year-old with $3,000 saved, and for a family expecting a baby.
6. Write a half page, including how an HSA could help with the high-deductible plan if one is offered.

Tips

- Copays usually do not count toward the deductible but often count toward the out-of-pocket maximum. Check the plan's rules.
- The worst-case column is the reason to have insurance at all.

Check your work

☐ I calculated out-of-pocket and total costs correctly for all scenarios.

☐ My graph compares the plans clearly.

- [ ] My recommendations fit each person's situation.

LEDGER NOTEBOOK

1. Draw a staircase of shared costs: premium, deductible, coinsurance, out-of-pocket maximum, then 100% covered.
2. Copy your comparison table.
3. Write a timeline: Baylor plan 1929, the blue cross symbol in the 1930s, employer coverage growing in the 1940s and 1950s.

KEY FORMULAS

You pay $= \min\left(D + c\,(B - D),\ \text{OOP max}\right)$ for a bill $B \geq D$ (deductible D, coinsurance c), starting the year at zero

Total yearly cost $= 12 \times$ monthly premium $+$ out-of-pocket costs

From history. Hospital service plans spread quickly in the 1930s, and the American Hospital Association adopted the blue cross as their symbol. Plans covering doctors' fees, later called Blue Shield, followed. Many of these plans began as nonprofit community efforts.

WORKED EXAMPLES

Example 1. In this example, a plan has a $1,500 deductible, 20% coinsurance and a $5,000 out-of-pocket maximum. A patient with no earlier costs this year has a $9,000 covered hospital bill. What does she pay?

Show solution

1. Deductible: $1,500.
2. Coinsurance on the rest: $0.20 \times (9{,}000 - 1{,}500) = \$1{,}500$.
3. Total $3,000, under the $5,000 maximum.

Answer: $3,000; the plan pays $6,000.

Example 2. Later that year she has a $30,000 covered surgery. What does she pay for it?

Show solution

1. She has paid $3,000 so far; room left under the maximum: $2,000.
2. Her deductible is met, so she owes 20%: $0.20 \times 30{,}000 = \$6{,}000$, but capped at $2,000.

Answer: $2,000; the plan pays $28,000. The out-of-pocket maximum is what protects a family from ruin.

Example 3. Plan A: premium $180 a month, deductible $500, out-of-pocket max $3,000. Plan B: premium $95 a month, deductible $3,000, out-of-pocket max $6,000. Compare total yearly cost for a healthy year ($300 of care, all under the deductible) and a worst-case year.

Show solution

1. Healthy year: A $2{,}160 + 300 = \$2{,}460$; B $1{,}140 + 300 = \$1{,}440$.
2. Worst case: A $2{,}160 + 3{,}000 = \$5{,}160$; B $1{,}140 + 6{,}000 = \$7{,}140$.

Answer: B saves $1,020 in a healthy year; A saves $1,980 in a worst-case year. A healthy young adult with a strong emergency fund may prefer B; a family expecting heavy care may prefer A.

PRACTICE

1. Easy Define deductible, copay and coinsurance.

   Show answer

   Deductible: what you pay before the plan shares costs; copay: a fixed fee per service; coinsurance: your percentage share after the deductible.

2. Easy A $240 monthly premium costs how much a year?

   Show answer

   $2,880

3. Easy What did Dallas teachers pay under the 1929 Baylor plan, and what did they get?

Show answer

50 cents a month for up to 21 days of hospital care a year.

4. Medium Deductible $1,000, coinsurance 30%, out-of-pocket max $4,000. A first covered bill of $5,000: what does the patient pay?

Show answer

$1{,}000 + 0.30 \times 4{,}000 = \$2{,}200$

5. Medium Same plan: a first covered bill of $20,000. What does the patient pay?

Show answer

$1{,}000 + 5{,}700 = \$6{,}700$, capped at $4,000

6. Medium Why does a plan with a lower premium usually have a higher deductible?

Show answer

The patient carries more of the cost of care, so the insurer expects to pay less and can charge less.

7. Medium From the story: what problem was Justin Ford Kimball trying to solve?

Show answer

Unpaid hospital bills from patients, including Dallas teachers, who could not pay a large bill when illness struck.

8. Hard Plan X: premium $150/month, out-of-pocket max $4,000. Plan Y: premium $90/month, out-of-pocket max $7,000. In a worst-case year, which costs less, and by how much?

Show answer

X: $1{,}800 + 4{,}000 = \$5{,}800$; Y: $1{,}080 + 7{,}000 = \$8{,}080$; X by $2,280.

9. Hard In problem 8, at what out-of-pocket spending do the plans cost the same (assume both charge the same share of each bill until their maximums)?

Show answer

Y's premiums are $720 lower, so with equal shares of each bill Y is cheaper until X's out-of-pocket hits its $4,000 cap and Y keeps rising; they are equal when Y's out-of-pocket is $4,720.

10. Hard Why should a young person still have health insurance even if healthy?

Show answer

Accidents and sudden illnesses happen to the young too, and one hospital stay can cost tens of thousands of dollars; the out-of-pocket maximum protects against ruin.

11. Challenge In this example, a worker in a 22% tax bracket puts $2,000 pre-tax into an HSA and later spends it on medical bills. Compared with paying the bills from after-tax pay, how much tax does she save? (Ignore payroll taxes.)

Show answer

$$0.22 \times 2{,}000 = \$440$$

COMMON MISTAKES

- Choosing a plan by premium alone.
- Going out of network without checking costs.
- Paying a medical bill without comparing it with the plan's explanation of benefits.

> **Make it a game · Medical Bill Math.** Your parent invents a health plan: a deductible, a coinsurance rate and an out-of-pocket maximum. Then three pretend medical bills arrive. Calculate what you pay on each in sixty seconds. Beat your own time on the next round. Finally, explain premium, copay and network in your own words, and tell about the Baylor plan.

5.4 Home and Renter's Insurance: After the Great Fire of London

OBJECTIVES

- Explain what homeowner's and renter's policies cover: dwelling, belongings, liability and additional living expenses.
- Compare replacement cost and actual cash value.
- Make a home inventory and estimate renter's coverage needs.

> **Warm-up.** Walk through your bedroom and guess the total cost to replace everything in it if it were lost in a fire tomorrow. Write your guess.

WATCH

Introduction to property insurance | Insurance | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 3:14

https://www.youtube.com/watch?v=5rkw5Pz57bI

> **WHEN TO WATCH**
> After the story of the Great Fire: what property insurance covers.

BACKUP VIDEO

Features of property insurance | Insurance | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 2:57

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

With worked example 1: features of property policies.

KEY TERMS

homeowner's insurance
A policy covering the house, other structures, belongings, liability and extra living expenses after a covered loss.

renter's insurance
A policy for tenants covering their belongings, liability and extra living expenses; the landlord insures the building.

replacement cost

Coverage that pays what it costs to buy a new item of like kind and quality today.

actual cash value

Coverage that pays replacement cost minus depreciation: what the used item was worth.

home inventory

A list, with photos and values, of the belongings in a home, used to prove a claim.

CORE IDEAS

The story. Early on Sunday, September 2, 1666, a fire started in Thomas Farriner's bakery in Pudding Lane, London. Driven by a strong east wind through streets of timber houses, it burned for four days. It destroyed about 13,200 houses, 87 parish churches and St. Paul's Cathedral, and left tens of thousands of people homeless. Most had no way to recover their losses. In the years after, a builder and economist named Nicholas Barbon, who was rebuilding much of the city, opened the first fire-insurance office in about 1680. His company kept its own team of firefighters and marked insured houses with a metal plaque, a **fire mark**.

How they figured it out. Barbon saw that fire, like shipwreck, was a risk that could be pooled. He charged premiums based on the house's rent and whether it was built of brick or timber, because brick burned less. Fire offices soon competed, and their firefighters protected insured buildings first; in time cities created public fire brigades. In 1752 Benjamin Franklin helped found the Philadelphia Contributionship for the Insurance of Houses from Loss by Fire, a mutual company owned by its policyholders, which still operates today. Its inspectors would not insure houses with trees too close, because trees made fires hard to fight: early insurers reduced risk as well as pooling it.

The big idea. A homeowner's policy covers the **dwelling**, other structures, **personal property**, **liability** (if someone is hurt on your property) and **additional living expenses** if you must live elsewhere during repairs. A tenant needs **renter's insurance**, because the landlord's policy covers the building, not your belongings or your liability. Check whether belongings are covered at **replacement cost** or **actual cash value** (replacement cost minus depreciation). Standard policies usually exclude floods and earthquakes, which need separate coverage. Mortgage lenders require

homeowner's insurance, and renter's insurance is typically inexpensive for what it covers.

In business today. Insurers price home policies by the cost to rebuild, location, construction, fire protection nearby, past claims and the deductible. Smoke detectors, sprinklers, deadbolts and alarm systems can earn discounts. After a loss, the claim goes far more smoothly if you have a **home inventory**: photos or video of every room, receipts for valuable items, and serial numbers, stored somewhere other than the house. Floods are a common surprise; the federal National Flood Insurance Program and some private insurers offer flood coverage.

Who gained? After 1666, London rebuilt in brick and stone with wider streets, and fire insurance spread through the world's cities. Families who had lost everything in one night could, for a small premium, rebuild their lives.

PICTURE STUDY



The Great Fire of London, Lieve Verschuier, 1666 · Oil on canvas

Image: Wikimedia Commons, public domain

The Dutch painter Lieve Verschuier painted the fire as it might have looked from the river, with Londoners escaping by boat. Paintings like this spread the news of the disaster across Europe.

Look closely

- Find the boats on the river. Why were people fleeing to the water?
- Find the church towers. What does the fire reach?
- Look at the smoke and the wind's direction. What helped the fire spread?
- Imagine the morning after. What would families need first?

Talk about it

1. Why did the Great Fire lead to fire insurance?
2. How did early insurers reduce risk as well as pool it?
3. If you rented a home that burned, whose insurance would replace your belongings?

PROJECT

A Home Inventory and Renter's Insurance Estimate

You will make a home inventory of your own room (or, with permission, a whole room of the house), estimate replacement cost and actual cash value, and choose a renter's-insurance coverage amount for your first apartment.

You will need

- A phone or camera
- Ledger notebook or spreadsheet
- Store websites or catalogs for replacement prices

Steps

1. Photograph or video every part of your room, opening closets and drawers.
2. List each item worth $20 or more with its age, replacement cost, expected useful life and serial number if it has one.
3. Calculate actual cash value for each item using straight-line depreciation.
4. Total the replacement cost and the actual cash value. Compare with your warm-up guess.
5. Estimate the belongings you will have in a first apartment and choose a renter's coverage amount.
6. With a parent, look up an example renter's premium for that coverage and the deductible.
7. Store a copy of your inventory somewhere outside the house (with a parent's help), and write a half page on what you learned.

Tips

- Most people underestimate the value of their belongings, especially clothing.
- Update the inventory once a year.

Check your work

- ☐ My inventory lists items with replacement cost and ACV.
- ☐ I can explain the difference between the two values with an example.
- ☐ I chose a coverage amount with a reason.

LEDGER NOTEBOOK

1. Draw a house and label what a homeowner's policy covers: dwelling, other structures, belongings, liability, living expenses.
2. Copy your inventory totals in a small table.
3. Draw a fire mark, the plaque early insurers put on insured houses.

KEY FORMULAS

$$\text{ACV} = \text{replacement cost} \times \left(1 - \frac{\text{age}}{\text{useful life}}\right) \quad \text{(straight-line depreciation)}$$

$$\text{Payment} = \text{covered value} - \text{deductible}$$

From history. Sir Christopher Wren, the architect who rebuilt St. Paul's Cathedral and 51 city churches after the fire, is buried in the cathedral. His epitaph reads, in Latin, "Reader, if you seek his monument, look around you."

WORKED EXAMPLES

Example 1. A fire destroys a 4-year-old sofa that would cost $1,200 to replace. Its useful life is 10 years. Find the payment under replacement cost and actual cash value, before the deductible.

Show solution

1. Replacement cost: $1,200.
2. ACV: $1{,}200 \times (1 - 4/10) = \$720$.

Answer: $1,200 vs $720: replacement-cost coverage pays $480 more on this item.

Example 2. A renter's belongings would cost $22,000 to replace. A fire destroys everything. Her policy has $25,000 of replacement-cost personal property coverage and a $500 deductible. In this example the premium is $15 a month. What does she receive, and how many years of premiums equal that payment?

Show solution

1. Payment: $\$22{,}000 - \$500 = \$21{,}500$.
2. Yearly premium $180; $21{,}500/180 \approx 119$ years.

Answer: $21,500, equal to about 119 years of premiums.

Example 3. During repairs after a covered fire, a family must rent an apartment for 5 months at $1,600 a month; their normal mortgage and costs continue. Their policy's additional living expense coverage is $10,000. How much is paid?

Show solution

1. Extra cost: $5 \times 1{,}600 = \$8{,}000$.
2. Within the $10,000 limit.

Answer: $8,000, so the family can keep paying its mortgage while living elsewhere.

PRACTICE

1. Easy Who insures a tenant's belongings: the landlord or the tenant?

   Show answer

   The tenant, with renter's insurance.

2. Easy A $900 TV is 3 years old with a 6-year useful life. Find its ACV.

   Show answer

   $450

3. Easy When did the Great Fire of London begin, and where?

   Show answer

   September 2, 1666, in Thomas Farriner's bakery in Pudding Lane.

4. Medium A theft takes items with replacement cost $3,400 and ACV $1,900. With a $500 deductible, what is paid under each type of coverage?

   Show answer

   Replacement cost $2,900; ACV $1,400

5. Medium Name four parts of a standard homeowner's policy.

   Show answer

   Dwelling, other structures, personal property, liability, additional living expenses (any four).

6. Medium Which two common disasters are usually excluded from standard home policies?

Show answer

Floods and earthquakes.

7. Medium From the story: how did Nicholas Barbon price fire insurance, and what did his company do besides pay claims?

Show answer

By the house's rent and construction (brick or timber); it kept its own firefighters and marked insured houses with fire marks.

8. Hard A guest slips on an icy step and has $18,000 of medical bills. The homeowner has $300,000 of liability coverage. Who pays, and why might higher liability limits be wise?

Show answer

The homeowner's policy pays (subject to its terms). Lawsuits can exceed small limits; higher liability (or an umbrella policy) protects savings and future income.

9. Hard In this example, a renter pays $16 a month for $20,000 of coverage. If the chance of a total loss in a year is 0.3% and the chance of a $3,000 theft is 2%, find the expected yearly loss (before the $500 deductible) and compare with the premium.

Show answer

$0.003 \times 20{,}000 + 0.02 \times 3{,}000 = 60 + 60 = \$120$; premium $192. The insurer covers costs and profit; the renter is protected from a ruinous loss.

10. Hard Explain why Franklin's Philadelphia Contributionship refused to insure houses with trees close by.

Show answer

Trees near houses helped fires spread and made them harder to fight, raising the risk; the insurer reduced its risk by insuring only safer houses.

11. **Challenge** A home costs $320,000 to rebuild. Some policies pay a partial loss in full only if the house is insured for at least 80% of its rebuilding cost; otherwise they pay (insured amount ÷ required amount) × loss. The owner insured it for $200,000. A fire causes $60,000 of damage. What is paid (ignore the deductible)?

    Show answer

    Required $0.8 \times 320{,}000 = \$256{,}000$; paid $(200{,}000/256{,}000) \times 60{,}000 = \$46{,}875$

COMMON MISTAKES

- Assuming the landlord's insurance covers the tenant's belongings.
- Never making a home inventory, then being unable to prove a claim.
- Assuming floods are covered by a standard policy.

> **Make it a game · Home Inventory Hunt.** Go room by room with a notebook and list as many belongings as you can in five minutes, with a rough replacement value for each. Total them. Then take three items and estimate their actual cash value after wear. Say which payout you would want. Finish by telling what the Great Fire of London taught about property loss.

5.5 Life and Disability Insurance: The Ministers' Widows' Fund

OBJECTIVES

- Explain term and permanent life insurance and disability insurance.
- Estimate how much life insurance a family needs.
- Use a mortality rate to estimate the cost of term insurance.

> **Warm-up.** If the main earner in a family could no longer work, what bills would still have to be paid? List them.

WATCH

Introduction to life insurance | Insurance | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 7:20

https://www.youtube.com/watch?v=wYPee7aczTE

> **WHEN TO WATCH**
> After the story of the widows' fund: term and permanent life insurance.

BACKUP VIDEO

Disability and long term care insurance | Insurance | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 2:13

https://www.youtube.com/watch?v=3ULlocLanC8

With In business today: disability and long-term care insurance.

KEY TERMS

term life insurance

Life insurance for a set period (such as 20 years) that pays a death benefit only if the insured dies during the term; it has no savings value and costs the least.

permanent life insurance

Life insurance (such as whole life) that lasts for life and builds a cash value; it costs much more than term for the same death benefit.

beneficiary

The person named to receive the death benefit.

disability insurance

Insurance that replaces part of a worker's income if illness or injury prevents him from working.

actuary

A mathematician who uses probability and statistics to measure risk and set insurance prices.

CORE IDEAS

The story. In the 1740s two ministers of the Church of Scotland, Robert Wallace and Alexander Webster, worried about the widows and orphans of their fellow pastors, who were often left in poverty when a minister died. Instead of asking for charity, they designed a fund. Every minister would pay in each year; the money would be invested; and widows would receive a pension. The question was how much to charge. With help from the mathematician Colin Maclaurin, they gathered records of how many ministers there were, how many died each year, how many left widows, and how long widows lived. The Scottish Ministers' Widows' Fund began in 1744. Their projections for the fund's growth over the next twenty years proved remarkably close to what actually happened.

How they figured it out. Wallace and Webster built on earlier work, such as the astronomer Edmond Halley's table of 1693 showing, from the birth and death records of the city of Breslau, how many people of each age could be expected to die each year. They saw that while no one can know when a particular minister will die, the deaths among hundreds of ministers can be predicted closely. That is the foundation of all life insurance and of the profession of the **actuary**. Their fund still exists, and life-insurance companies around the world use the same reasoning.

The big idea. Life insurance replaces income that a family depends on. A single person with no dependents usually needs little or none. A parent whose income supports a family needs enough to pay debts, final expenses and years of living costs. A common rough guide is 10 to 12 times yearly income; a better method adds up the family's actual needs and subtracts savings. **Term** insurance is the least expensive way to buy a large death benefit for the years when children are young; the price comes from the probability of death: if the chance of dying this year is 1 in 1,000, the

expected cost of $500,000 of coverage is about $500, plus expenses. **Disability insurance** protects the worker's greatest asset, the ability to earn, and many workers have some through their employer.

In business today. Many employers offer group life and disability coverage as a benefit. Permanent policies such as whole life combine insurance with a savings feature and are sold aggressively; they can fit some situations, but for most young families, term insurance with separate saving and investing provides more protection for the money. Compare policies by the death benefit, the premium, the term and the strength of the company, and as an adult consult a qualified professional who explains costs plainly. Keep beneficiary designations current.

Think it through. "If any provide not for his own, and specially for those of his own house, he hath denied the faith" (1 Timothy 5:8). Life and disability insurance are ways a parent provides for his household even if he cannot be there to earn.

PICTURE STUDY



Edmond Halley, Thomas Murray, c. 1687 · Oil on canvas · The Royal Society, London

Image: Wikimedia Commons, public domain

Edmond Halley is famous for the comet that bears his name, but in 1693 he also published one of the first reliable life tables, built from the birth and death records of Breslau. He showed how to use it to price annuities fairly, laying a foundation for life insurance.

Look closely

- Find the paper in his hand. What might a scientist record on it?
- Look at his face. What qualities does the painter suggest?
- Notice his age. He was young when he did much of his important work.

Talk about it

1. How could the same man study comets and death rates? What do the two kinds of work have in common?
2. Why does a life insurer need a table of deaths by age?
3. How did Wallace and Webster use the same kind of reasoning to care for widows?

PROJECT

A Life and Disability Insurance Needs Analysis

You will estimate the life and disability insurance needs of a sample family (or, with permission, your own), compare term and permanent coverage, and check a premium with a mortality rate.

You will need

- Ledger notebook and spreadsheet
- A published period life table (the Social Security Administration publishes one) viewed with a parent
- Sample term and whole-life premiums from an insurer's website or a parent's policy

Steps

1. Create (or use with permission) a family profile: ages, incomes, debts, savings, existing coverage and goals.
2. Compute life-insurance needs for each earner with the needs formula, and compare with the 10–12 times income rule.
3. Look up the probability of death for each earner's age in a life table (tables list men and women separately), and estimate the expected yearly cost of the needed term coverage.
4. Compare a sample 20-year term premium with a whole-life premium for the same death benefit; compute the yearly difference.
5. Calculate what that difference would grow to if invested at an example 6% for 20 years (use a spreadsheet).
6. Estimate disability needs: monthly expenses, existing employer coverage, waiting period and emergency fund.
7. Write a one-page recommendation for the family and note that real decisions should be made with a qualified professional.

Tips

- Life tables give the probability of death in the next year at each age; they are averages for a population.

- Disability is more likely than death during working years for many people; do not overlook it.

Check your work

- ☐ My needs analysis is complete and correctly added.
- ☐ I used a life-table probability to estimate a premium.
- ☐ I can explain the difference between term and permanent insurance.

LEDGER NOTEBOOK

1. Draw a family's needs as a stack of blocks: debts, final costs, years of income, education, minus savings.
2. Plot the probability of death by age from the life table for ages 20 to 70.
3. Write a timeline: Halley's table 1693, the Scottish fund 1744, today's actuaries.

KEY FORMULAS

Expected cost of term coverage $\approx q \times$ death benefit (q = probability of death this year)

Need = debts + final costs + income needed × years + future goals − savings and existing coverage

From history. The Scottish fund's first managers recorded that by 1765 the fund had grown to within a pound or so of what Wallace and Webster had projected twenty years earlier, an extraordinary result that convinced many that the future of a large group could be calculated even though no one could foresee a single life.

WORKED EXAMPLES

Example 1. In this example, the probability that a healthy 30-year-old dies within a year is about 0.0012. Estimate the expected yearly cost of a $400,000 one-year term policy, and the premium if the insurer adds 40% for expenses and profit.

Show solution

1. Expected cost: $0.0012 \times 400{,}000 = \$480$.
2. Premium: $480 \times 1.40 = \$672$.

Answer: About $672 a year in this example; real prices vary with age, health and the length of the term.

Example 2. A father earning $55,000 has a $180,000 mortgage, $12,000 of other debt and $25,000 of savings. He wants to replace $40,000 a year of income for 15 years and set aside $60,000 for his children's education, plus $15,000 of final costs. Ignoring investment growth, estimate his need.

Show solution

1. Debts: $192,000. Income: $40{,}000 \times 15 = \$600{,}000$.
2. Total: $192{,}000 + 600{,}000 + 60{,}000 + 15{,}000 = \$867{,}000$.
3. Less savings: $842,000.

Answer: About $840,000, roughly 15 times his income. (Counting investment growth would lower the figure somewhat.)

Example 3. A worker earning $4,000 a month has a disability policy that replaces 60% of income after a 90-day waiting period. She is disabled for 9 months. How much income does she lose, and how much does the policy pay?

Show solution

1. Lost income: $9 \times 4{,}000 = \$36{,}000$.
2. Benefit months: $9 - 3 = 6$; benefit $6 \times 0.60 \times 4{,}000 = \$14{,}400$.
3. Uncovered: $21,600.

Answer: The policy pays $14,400; her emergency fund must cover the waiting period and the gap.

PRACTICE

1. Easy What is the main difference between term and permanent life insurance?

   Show answer

   Term covers a set period with no cash value and costs less; permanent lasts for life and builds cash value at a much higher price.

2. Easy Who needs life insurance most: a single 22-year-old with no dependents, or a parent of three young children? Why?

   Show answer

   The parent, because the children depend on that income.

3. **Easy** Who founded the Scottish Ministers' Widows' Fund, and when?

Show answer

Robert Wallace and Alexander Webster, with Colin Maclaurin's help, in 1744.

4. **Medium** In this example, the chance of death in a year is 0.0009. Find the expected yearly cost of $250,000 of coverage.

Show answer

$225

5. **Medium** Use the 10–12 times rule for a worker earning $48,000.

Show answer

$480,000 to $576,000

6. **Medium** A disability policy replaces 60% of $3,500 a month after a 60-day wait. For a 6-month disability, what does it pay?

Show answer

4 months × $2,100 = $8,400

7. **Medium** From the story: what problem were Wallace and Webster trying to solve, and why did they need data?

Show answer

Ministers' widows and orphans were left in poverty; to set fair contributions and pensions, they needed records of how many ministers died each year, left widows, and how long widows lived.

8. **Hard** In this example, 20-year term costs $40 a month and whole life costs $380 a month for the same $500,000 death benefit. Find the yearly difference.

Show answer

$\$340 \times 12 = \$4{,}080$

9. **Hard** If the yearly difference in problem 8 is invested at the end of each year at 6% for 20 years, how much accumulates? (Use $FV = P[(1+r)^n - 1]/r$.)

Show answer

$4{,}080 \times (1.06^{20} - 1)/0.06 \approx 4{,}080 \times 36.786 \approx \$150{,}087$

10. Hard Why is disability insurance especially important for a young worker?

Show answer

Future earnings are the young worker's largest asset; a long disability could cost decades of income, and disability during working years is more likely than death.

11. Challenge Out of 10,000 men aged 40, a table predicts 9,980 alive at 41. An insurer sells 10,000 one-year policies of $100,000 each. Find the expected claims and the break-even premium per policy (ignore expenses and interest).

Show answer

Deaths 20; claims $2,000,000; break-even $200 per policy

COMMON MISTAKES

- Buying life insurance for a child or a single person with no dependents while a parent with dependents has too little.
- Buying expensive permanent insurance and too little coverage because of the high premium.
- Ignoring disability, the more likely risk to income during working years.

Make it a game · Insurance Riddles. Your parent reads clues and you guess the term: pays only for a set number of years, builds cash value, names who gets the money, replaces wages when you cannot work, or studies statistics to set the prices. Then swap roles, writing five riddles of your own. Finally, estimate the life insurance a pretend family might need.

Scripture. "But if any provide not for his own, and specially for those of his own house, he hath denied the faith, and is worse than an infidel." (1 Timothy 5:8, KJV)

Providing for one's family is a Christian duty. Planning for death or disability is one way of keeping it.

UNIT 5

Insurance and Risk

Some losses are small enough to pay from savings; others could ruin a family in a day. **Insurance** is the ancient answer: many people each pay a small, certain amount so that the few who suffer a large loss are made whole. In this unit you will watch the idea grow in a London coffee house in the 1680s, where Edward Lloyd's customers signed their names under the risks of merchant voyages. You will learn the arithmetic insurers use: probability, **expected loss**, the law of large numbers, premiums and deductibles.

Then you will study the insurance a young adult actually buys. **Auto insurance** began with a single policy in 1897; **health insurance** grew from a plan for Dallas schoolteachers in 1929; **home and renter's insurance** rose from the ashes of the Great Fire of London in 1666; and **life and disability insurance** owe much to two Scottish ministers who, in 1744, worked out how to provide for their colleagues' widows. "Bear ye one another's burdens" (Galatians 6:2).

PREREQUISITES

- Can compute percents, averages and simple probabilities
- Has an emergency-fund plan (Unit 2)
- Can read a table of numbers carefully

MASTERY CHECKLIST

- ☐ I can explain how insurance pools risk and calculate an expected loss and a fair premium.
- ☐ I can choose among risk strategies: avoid, reduce, keep or transfer.
- ☐ I can read an auto policy's coverages and compare deductibles.
- ☐ I can calculate what a patient pays under a health plan's deductible, copay, coinsurance and out-of-pocket maximum.
- ☐ I can explain replacement cost and actual cash value and inventory my belongings for renter's insurance.
- ☐ I can estimate life-insurance needs and explain why disability insurance matters for a worker.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Khan Academy: Financial Literacy, Insurance unit**: Free short videos and practice on how insurance works and on auto, health, property, life and disability coverage. Several of this unit's videos come from it.
- **Federal Reserve Bank of St. Louis: Econ Lowdown**: Free online modules, including insurance and risk management, from a Federal Reserve bank.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

5.1	**Risk and Insurance: Edward Lloyd's Coffee House**	3 sessions of 50 minutes
5.2	**Auto Insurance: The First Policy, 1897**	3 sessions of 50 minutes
5.3	**Health Insurance: The Baylor Plan, 1929**	3 sessions of 50 minutes
5.4	**Home and Renter's Insurance: After the Great Fire of London**	3 sessions of 50 minutes
5.5	**Life and Disability Insurance: The Ministers' Widows' Fund**	3 sessions of 50 minutes

Unit 5 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars or percents. Where a problem says "in this example," use the figures given, not current rules or prices. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **6 pts**
   Losses: $1,000 with probability 0.08 and $50,000 with probability 0.002. Find the expected loss, and the premium if the insurer adds 35%.

2. **5 pts**
   Name the four ways to handle risk and give an example of each for a teenage driver.

3. **5 pts**

   Explain the law of large numbers and why it makes insurance possible.

4. **5 pts**

   What happened at Edward Lloyd's coffee house, and where does the word "underwriter" come from?

5. **7 pts**

   With 50/100/50 limits, a driver injures two people ($70,000 and $35,000) and causes $20,000 of property damage. How much does the insurer pay and how much does the driver owe?

6. **6 pts**

   Raising a deductible from $500 to $1,500 saves $240 a year. Find the break-even claim frequency, and state what the driver must have before choosing it.

7. **7 pts**

   A plan has a $2,000 deductible, 20% coinsurance and a $6,500 out-of-pocket maximum. Find what the patient pays on a first covered bill of $12,000 and on a first covered bill of $50,000.

8. **6 pts**

   Plan A: $210/month, out-of-pocket max $3,500. Plan B: $120/month, out-of-pocket max $7,000. Compare worst-case yearly totals.

9. **5 pts**

   What was the Baylor plan of 1929, and what did it grow into?

10. **6 pts**

    A 5-year-old refrigerator would cost $1,500 to replace; useful life 15 years. Find replacement cost and ACV, and the payment under each with a $250 deductible.

11. **5 pts**

    Why does a renter need renter's insurance even though the building is insured?

12. **5 pts**

    How did the Great Fire of London (1666) lead to fire insurance, and what did Barbon's fire office do?

13. **6 pts**

In this example, the probability of death this year is 0.0015. Estimate the expected cost and the premium (with a 30% load) for $300,000 of term coverage.

14. **6 pts**

A worker earning $5,000 a month is disabled for 7 months. Her policy pays 60% after a 90-day wait. Find benefits and uncovered income.

15. **5 pts**

What did Wallace and Webster's fund (1744) show about predicting the future of a large group?

16. **5 pts**

Short answer: Give one reason most young families are better served by term life insurance than by whole life.

17. **10 pts**

Short essay: Using Galatians 6:2 or 1 Timothy 5:8, explain how insurance can be an act of love for neighbors and family, and give one way it can be misused.

ANSWER KEY

1. $80 + 100 = \$180$; premium $243
2. Avoid (not driving in an ice storm), reduce (no phone use, seat belt), keep (pay a small scrape from savings), transfer (buy auto insurance).
3. As the number of similar cases grows, average losses come close to the expected loss, so an insurer covering many policies can predict claims and set premiums.
4. Merchants and ship owners gathered for shipping news; men wrote their names under descriptions of voyages to share the risk for a premium.
5. Injuries: $\$50{,}000 + \$35{,}000 = \$85{,}000$ (under $100,000); property $20,000. Insurer $105,000; driver owes $20,000.
6. $1{,}000/240 \approx 4.2$ years; an emergency fund of at least $1,500.
7. $2{,}000 + 2{,}000 = \$4{,}000$; $2{,}000 + 9{,}600 = 11{,}600$, capped at $6,500.
8. A $6,020; B $8,440; A by $2,420.
9. Dallas teachers paid 50 cents a month for up to 21 days of hospital care at Baylor University Hospital; such plans spread and became Blue Cross.
10. ACV $1,000; payments $1,250 (replacement) and $750 (ACV).
11. The landlord's policy covers the building, not the tenant's belongings, liability or extra living expenses.
12. The fire destroyed about 13,200 houses with no way to recover losses; Barbon's office pooled fire risk, priced it by construction, kept firefighters and marked insured houses.
13. $450; $585
14. Benefits: 4 months × $3,000 = $12,000; uncovered $23,000.
15. That although no single death can be foreseen, deaths and widowhood among many ministers could be predicted closely enough to set fair contributions and pensions.
16. Term provides much more death benefit per dollar during the years children depend on the parent; the money saved can be saved or invested separately.
17. A strong answer explains pooling as bearing burdens together so no family is ruined, and buying coverage as providing for one's household; misuse includes fraud, over-insuring small risks, buying costly products one does not understand, or trusting insurance instead of God.

PORTFOLIO PIECE: MY FAMILY RISK AND INSURANCE PLAN

Assemble your household risk map and pooling-game record, your auto-policy comparison, your health-plan comparison, your home inventory and renter's estimate, and your life and disability needs analysis. Add a one-page summary listing the insurance you expect to need at ages 18, 25 and 35, with reasons and the risks you will keep with savings instead.

LOOK FOR	WHAT IT MEANS
Calculations	Expected loss, premiums, deductibles, out-of-pocket costs, ACV and needs are calculated correctly.
Understanding	Coverages are explained accurately in the student's own words.
Judgment	Recommendations insure large risks, keep small ones and fit each person's situation.
Records	The home inventory and comparisons are complete, labeled and clear.

UNIT 6

Taxes

Taxes are the price of living under a government that builds roads, keeps courts and defends the country, and nearly every dollar you earn, spend or own is taxed somewhere along the way. In this unit you will look at taxes as Scripture does ("Render therefore unto Caesar the things which are Caesar's; and unto God the things that are God's," Matthew 22:21) and as Adam Smith did, with his four rules for a good tax. You will learn how the federal **income tax** began in 1913, how tax brackets really work, and how to complete a simple practice return.

Then you will meet Ida May Fuller of Ludlow, Vermont, who in 1940 received the first monthly Social Security check, and you will calculate the **payroll taxes** that fund Social Security and Medicare. You will figure **sales and property taxes**, from William the Conqueror's Domesday Book of 1086 to your county's tax bill, and you will finish with **records and honesty**: Zacchaeus the tax collector, Romans 13:7, and the habits that make tax time simple. Tax brackets, deductions and limits change every year, so every number marked "in this example" is for practice; the method is what you will keep.

PREREQUISITES

- Can read a pay stub and calculate net pay (Unit 1)
- Can work with percents and piecewise calculations
- Has kept records for a month (Units 1–3)

MASTERY CHECKLIST

- ☐ I can explain why governments tax, list the main kinds of taxes, and state Adam Smith's four rules for a good tax.
- ☐ I can calculate income tax with brackets and distinguish marginal and average tax rates.
- ☐ I can complete a simple practice return from a W-2: income, standard deduction, taxable income, tax, refund or amount owed.
- ☐ I can calculate Social Security and Medicare taxes for an employee and a self-employed worker.
- ☐ I can calculate sales tax and property tax from a rate.
- ☐ I can keep tax records honestly and explain the Christian duty to pay what we owe.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **IRS: About Form 1040**: Free. The current Form 1040 and its instructions, for the practice return in Lesson 6.2. Use it for practice only.
- **Khan Academy: Financial Literacy, Taxes unit**: Free short videos and practice on brackets, forms, payroll taxes and local taxes.
- ***The Wealth of Nations*, by Adam Smith (1776), Book V, Chapter 2**: Free on Project Gutenberg. Smith's four maxims of taxation open Part II of this chapter. Read the maxims with Lesson 6.1. Ages 15 and up.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

6.1	**Why and How Taxes Are Paid: The Tribute Money**	3 sessions of 50 minutes
6.2	**Income Tax Basics and a Simple Return: 1913 and Form 1040**	3 sessions of 50 minutes
6.3	**Payroll Taxes: Ida May Fuller and Social Security**	3 sessions of 50 minutes
6.4	**Sales and Property Taxes: From the Domesday Book to Your County**	3 sessions of 50 minutes
6.5	**Records and Honesty: Zacchaeus and Romans 13:7**	3 sessions of 50 minutes

Unit 6 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars or percents. All brackets, rates and limits are examples given in each problem, not current law. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **5 pts**
   Name the main tax each level of government relies on: federal, state, local.

2. **5 pts**
   State Adam Smith’s four maxims of taxation.

3. **6 pts**
   Brackets (example): 10% to $12,000; 12% to $48,000; 22% to $100,000. Find the tax on $33,000 of taxable income and the average rate.

4. **6 pts**
   Same brackets: find the tax on $70,000 and the marginal and average rates.

5. **8 pts**

   Practice return (example figures): wages $41,000, interest $200, standard deduction $15,000, withholding $2,700. Using the brackets above, find taxable income, tax and refund or amount owed.

6. **5 pts**

   Explain why moving into a higher bracket never lowers after-tax income.

7. **5 pts**

   What did the Sixteenth Amendment do, and what was the top rate in 1913?

8. **6 pts**

   At 6.2% and 1.45%, find an employee's Social Security and Medicare taxes and the employer's match on $36,000.

9. **6 pts**

   With an example wage base of $170,000, find employee SS and Medicare taxes on wages of $200,000.

10. **5 pts**

    Tell Ida May Fuller's story in two or three sentences and explain what it shows about pay-as-you-go.

11. **5 pts**

    Find the total cost of a $650 purchase with 6% state and 1.5% local sales tax.

12. **6 pts**

    Market value $320,000; assessment ratio 75%; rate 24 mills. Find yearly and monthly property tax.

13. **5 pts**

    What was the Domesday Book, and why does every property tax need something like it?

14. **6 pts**

    In this example, $1,500 of tax is paid 8 months late with a 0.5% monthly penalty and 8% yearly simple interest. Find the total owed.

15. **6 pts**

    List five records a young worker should keep, and state the general IRS rule of thumb for how long.

16. **5 pts**

    What did Zacchaeus promise, and what does his story teach about money and repentance?

17. **10 pts**

    Short essay (one paragraph): Using Matthew 22:21 and Romans 13:7, explain how a Christian should think about paying taxes, including taxes he may think are too high.

ANSWER KEY

1. Federal: income and payroll taxes; state: income and sales taxes; local: property taxes.
2. Proportion to ability, certainty, convenience, economy of collection.
3. $1{,}200 + 0.12 \times 21{,}000 = \$3{,}720$; 11.3%
4. $1{,}200 + 4{,}320 + 4{,}840 = \$10{,}360$; marginal 22%; average 14.8%
5. Taxable \$26,200; tax $1{,}200 + 0.12 \times 14{,}200 = \$2{,}904$; owes \$204.
6. Only the dollars above the bracket line are taxed at the higher rate; every extra dollar still leaves something after tax.
7. It allowed a federal income tax (ratified February 3, 1913); the top rate was 7 percent.
8. SS \$2,232; Medicare \$522; employer matches \$2,754.
9. SS \$10,540; Medicare \$2,900
10. A Vermont secretary who received the first monthly check in 1940 (\$22.54) after paying \$24.75 in taxes, and collected about \$22,889 by age 100. Early retirees received far more than they paid because current workers' taxes fund current benefits.
11. \$698.75
12. Assessed \$240,000; tax \$5,760; \$480 a month
13. William I's 1086 survey of who held land in England and what it was worth; a tax on property needs a recorded owner, an assessed value and a published rate.
14. $1{,}500 + 60 + 80 = \$1{,}640$
15. W-2s, 1099s, receipts for deductions or credits, self-employment records, a copy of the return; generally at least three years after filing, longer for property and some other cases.
16. Half his goods to the poor and fourfold restitution of anything wrongly taken; true repentance changes how we handle money and repairs wrongs.
17. A strong answer explains that lawful government may tax and Christians pay what is owed honestly (render to Caesar), while belonging wholly to God; that disagreement is expressed through lawful means, not by cheating; and that taking lawful deductions is not dishonest.

PORTFOLIO PIECE: MY TAX FILE

Assemble your household tax map, your practice Form 1040 with your bracket calculations, your payroll-tax spreadsheet and retirement-gap estimate, your local tax detective report, and your records system with its guide. Add a one-page letter to your future self about the kind of taxpayer you intend to be, using Matthew 22:21 and the story of Zacchaeus.

LOOK FOR	WHAT IT MEANS
Calculations	Bracket, payroll, sales, property and penalty calculations are correct and clearly labeled as example or current figures.
Forms	The practice return is complete and consistent with the instructions.
Records	The records system is organized, current and secure.
Character	The letter shows understanding of honest taxpaying grounded in Scripture.

6.1 Why and How Taxes Are Paid: The Tribute Money

OBJECTIVES

- Explain what taxes pay for and the Christian teaching on paying them.
- Name the main kinds of taxes and who collects each.
- State Adam Smith's four maxims of taxation and calculate a household's overall tax burden.

> **Warm-up.** List ten things you used this week that were paid for, at least in part, by taxes (for example, a road, a library, a fire station). Which surprised you?

WATCH

Taxes you pay | Taxes and tax forms | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 5:52

https://www.youtube.com/watch?v=SfKSOU729fM

> **WHEN TO WATCH**
> After the story of the tribute money: the kinds of taxes a household pays.

BACKUP VIDEO

Taxes intro | Taxes and tax forms | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 2:48

https://www.youtube.com/watch?v=L8zPRF3JsE4

Optional: a short introduction to taxes.

KEY TERMS

tax

A required payment to a government, not in exchange for a specific good, used to pay for public services.

income tax

A tax on wages, salaries, business profits, interest and other income, collected by the federal government and most states.

payroll tax

A tax on wages, such as Social Security and Medicare, usually withheld by the employer.

sales and excise taxes

Taxes on purchases: a sales tax is a percent of most retail sales; an excise tax falls on particular goods such as gasoline.

property tax

A yearly tax on the value of land and buildings, collected mainly by local governments to fund schools and services.

CORE IDEAS

The story. One day in the Temple courts, the Pharisees and the Herodians tried to trap Jesus. If He said Jews should pay the Roman tax, He would anger the people; if He said they should not, He could be accused of rebellion. “Shew me the tribute money,” He said, and they brought Him a denarius. “Whose is this image and superscription?” “Caesar’s.” “Render therefore unto Caesar the things which are Caesar’s; and unto God the things that are God’s” (Matthew 22:15-22). Paul later wrote to the Christians in Rome, the capital of that same empire, “For for this cause pay ye tribute also” (Romans 13:6).

How they figured it out. Jesus’ answer did two things. It recognized that a lawful government may tax, and it set a limit: the coin bears Caesar’s image, but people bear God’s image, and they belong to God. Seventeen centuries later, in *The Wealth of Nations* (1776), Adam Smith asked what makes a tax just and workable, and gave four maxims that are still taught: taxes should be in **proportion** to ability to pay; **certain**, not arbitrary, so the taxpayer knows what and when to pay; **convenient** in timing and manner; and **economical**, costing little to collect beyond what reaches the treasury.

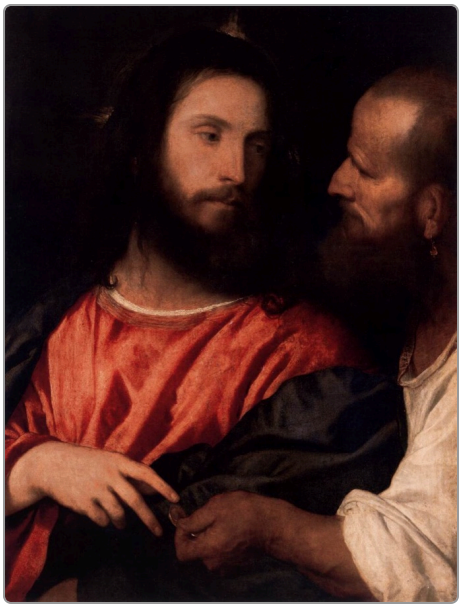
The big idea. American households pay many kinds of taxes to several governments. The federal government relies mainly on **income** and **payroll** taxes; states on income and **sales** taxes; local governments on **property** taxes. There are also **excise** taxes on fuel and some goods, and customs duties on imports. To see your whole burden, add up all of them and divide by income. Taxes pay for roads, courts, police and fire protection, national defense, public schools, and programs for the elderly and

needy. How large these should be is a matter citizens debate; paying what the law requires is a duty.

In business today. Businesses collect much of the tax that individuals pay: employers withhold income and payroll taxes, stores collect sales tax, and both send the money to the government. That is why Smith's "convenience" rule matters: withholding and sales taxes are paid in small pieces at the moment of income or purchase. Good citizens also take every deduction and credit the law allows; Christians are called to pay what is owed, not more than the law requires.

Think it through. Jesus paid the Temple tax too, sending Peter to find a coin in a fish's mouth "lest we should offend them" (Matthew 17:24-27). Christians pay taxes honestly even when they disagree with how some money is spent, and they honor God first with their whole lives.

PICTURE STUDY



The Tribute Money, Titian, 1516 · Oil on panel · Gemäldegalerie Alte Meister, Dresden

Image: Wikimedia Commons, public domain

The young Titian painted the moment the Pharisee shows Jesus the coin. The contrast between the two faces and the two hands, Christ's pale and still, the questioner's dark and grasping, carries the whole story.

Look closely

- Find the coin. Who is holding it, and how?
- Compare the two hands. What does each suggest?
- Compare the two faces. Who is calm and who is scheming?
- Notice how little else is in the picture. Why might Titian leave out the crowd?

Talk about it

1. What did Jesus mean by "the things which are Caesar's" and "the things that are God's"?
2. How does this story guide a Christian's attitude toward paying taxes?
3. Whose image is on you, according to Genesis 1:27, and what does that say about what you owe God?

PROJECT

Our Household's Tax Map

You will identify every kind of tax a household pays, estimate the total for a sample (or, with permission, your own) household, and judge one tax by Adam Smith's four maxims.

You will need

- Ledger notebook and calculator
- Receipts, a utility bill, a pay stub and a property-tax notice (or samples)
- Smith's four maxims (free online)

Steps

1. Find taxes on real documents: income and payroll taxes on a pay stub, sales tax on receipts, taxes on a utility or phone bill, and property tax on a tax notice or rent figure.
2. Look up your state's sales-tax rate and whether it taxes groceries.
3. Using a sample household income of $65,000 (or real figures with permission), estimate each tax for a year.
4. Compute the total and the overall burden, and make a pie chart by type.
5. Choose one tax and grade it on each of Smith's four maxims.
6. List five services your taxes pay for in your town.
7. Write a half page connecting Matthew 22:21 and Romans 13:7 to your findings.

Tips

- Taxes appear on many bills under names like "fee," "surcharge" or "excise." Read the fine print.
- Property tax is often hidden in rent, but tenants pay it indirectly.

Check your work

- ☐ My map includes at least five kinds of taxes with estimates.
- ☐ My overall burden calculation is correct.
- ☐ I can state and apply Smith's four maxims.

LEDGER NOTEBOOK

1. Draw a pie chart of the sample household's taxes.
2. Copy Smith's four maxims in your own words.
3. Draw the denarius from Matthew 22 and write the verse beneath it.

KEY FORMULAS

$$\text{Total tax burden} = \frac{\text{all taxes paid}}{\text{total income}} \times 100\%$$

$$\text{Tax} = \text{rate} \times \text{base}$$

From history. The denarius in Jesus' hand was most likely a coin of the emperor Tiberius, with his portrait and the words "Tiberius Caesar, son of the divine Augustus." To a faithful Jew, that inscription was itself a challenge, which made Jesus' answer all the more striking.

WORKED EXAMPLES

Example 1. In this example, a family earning $\$70{,}000$ pays federal income tax $\$4{,}600$, state income tax $\$2{,}450$, payroll tax 7.65% of wages, property tax $\$3{,}200$, and sales tax of 6% on $\$18{,}000$ of taxable purchases. Find the total and the overall burden.

Show solution

1. Payroll: $0.0765 \times 70{,}000 = \$5{,}355$. Sales: $0.06 \times 18{,}000 = \$1{,}080$.
2. Total: $4{,}600 + 2{,}450 + 5{,}355 + 3{,}200 + 1{,}080 = \$16{,}685$.
3. Burden: $16{,}685 / 70{,}000 \approx 23.8\%$.

Answer: $\$16{,}685$, about 23.8% of income, though the federal income tax alone was only 6.6%.

Example 2. Classify each tax by the government that usually collects it: Social Security tax, county property tax, state sales tax, federal gasoline tax, city income tax.

Show solution

1. Social Security: federal (payroll).
2. Property tax: local (county, city, school district).
3. Sales tax: state (often with a local add-on).
4. Gasoline excise: federal and state.
5. City income tax: local (in some cities).

Answer: Federal: Social Security, federal gasoline tax. State: sales tax. Local: property tax, city income tax.

Example 3. Apply Adam Smith's four maxims to payroll withholding. Which does it satisfy well?

Show solution

1. Certainty: the amount is figured by a published table.
2. Convenience: paid in small pieces as wages are earned.
3. Economy: employers collect it at little extra cost to the government.
4. Proportion: it rises with income, though how fair a particular rate is remains a matter of debate.

Answer: Withholding satisfies certainty, convenience and economy especially well.

PRACTICE

1. Easy Find the sales tax at 7% on a $64 purchase.

   Show answer

   $4.48

2. Easy Which level of government relies most on property taxes?

   Show answer

   Local government (counties, cities, school districts).

3. Easy State Adam Smith's four maxims of taxation.

Show answer

Proportion to ability, certainty, convenience, economy of collection.

4. Medium A worker earns $40,000 and pays $2,100 federal income tax, $1,200 state income tax and 7.65% payroll tax. Find total income and payroll taxes and their percent of income.

Show answer

Payroll $3,060; total $6,360; 15.9%

5. Medium An item costs $85.60 including 7% sales tax. What was the price before tax?

Show answer

$85.60 / 1.07 = \$80.00$

6. Medium Gasoline excise taxes total 45 cents a gallon in this example. A driver uses 600 gallons a year. How much excise tax does she pay?

Show answer

$270

7. Medium From the story: what trap did the Pharisees set for Jesus, and how did His answer avoid it?

Show answer

They asked whether to pay the tax to Caesar, so that either answer would anger the people or the Romans; He showed Caesar's image on the coin and said to give Caesar what is his and God what is God's.

8. Hard Family A earns $30,000 and spends $24,000 on taxable goods; Family B earns $150,000 and spends $60,000. With a 6% sales tax, what percent of income does each pay in sales tax?

Show answer

A: $1{,}440 / 30{,}000 = 4.8\%$; B: $3{,}600 / 150{,}000 = 2.4\%$. A sales tax takes a larger share of income from those who spend most of what they earn.

9. Hard Explain the difference between paying the tax the law requires and paying more than required. Is taking a lawful deduction dishonest?

Show answer

Honest citizens pay what the law requires; taking deductions and credits the law provides is not dishonest. Dishonesty is hiding income or claiming false deductions.

10. Hard Grade a property tax on Smith's maxim of certainty and convenience.

Show answer

Fairly certain (published rate and assessed value), but less convenient: it comes in one or two large bills a year unless paid monthly through a mortgage escrow account.

11. Challenge A household's income rises 10%, from \$60,000 to \$66,000. Its sales-tax spending rises only 4% (from \$1,500), while its income tax rises 20% (from \$3,000). Find each tax's share of income before and after.

Show answer

Sales: 2.5% to $1{,}560/66{,}000 = 2.36\%$; income: 5.0% to $3{,}600/66{,}000 = 5.45\%$.

COMMON MISTAKES

- Counting only federal income tax as "my taxes."
- Forgetting that sales tax is added at the register, so prices on the shelf are not the full cost.
- Treating lawful deductions as cheating, or cheating as a deduction.

Make it a game · Three Corner Tax Map. Label three corners of a room: federal, state and local. Your parent calls a tax, such as income, payroll, sales, excise or property, and you move to the right corner and name what it pays for. Score a point for each right answer. Finish by explaining what Jesus meant when he answered about the tribute money.

Scripture. "Render therefore unto Caesar the things which are Caesar's; and unto God the things that are God's." (Matthew 22:21, KJV)

Taxes are owed to lawful government; our whole selves are owed to God.

6.2 Income Tax Basics and a Simple Return: 1913 and Form 1040

OBJECTIVES

- Tell how the federal income tax began with the Sixteenth Amendment in 1913.
- Calculate tax using brackets, and find marginal and average rates.
- Complete a simple practice return from a W-2 using example figures.

> **Warm-up.** True or false: if a raise moves you into a higher tax bracket, you could take home less money than before. Write your answer and a reason; you will check it in this lesson.

WATCH

How Do Tax Brackets Actually Work?

Two Cents · 6:55

https://www.youtube.com/watch?v=6cRg9bnSnvg

> **WHEN TO WATCH**
> Before the worked examples; pause when brackets appear and predict each step. The brackets shown are from one past year.

Note: Two Cents (PBS); the brackets in the video are examples from 2018–19.

BACKUP VIDEO

First Time Filing a Tax Return?

IRSvideos · 3:39

https://www.youtube.com/watch?v=fQwp-wJ9CWo

Before the practice return: the IRS's own advice for first-time filers.

KEY TERMS

gross income

All income from wages, interest, business and other sources, before deductions.

standard deduction

A fixed amount, set by law and adjusted yearly, that most taxpayers subtract from income instead of itemizing deductions.

taxable income

Income after deductions, on which tax is figured.

tax bracket

A range of taxable income taxed at a given rate; each rate applies only to the income within its range.

marginal and average tax rate

The marginal rate is the rate on your next dollar; the average (effective) rate is total tax ÷ income.

tax credit

An amount subtracted directly from tax owed, worth more dollar for dollar than a deduction.

CORE IDEAS

The story. For most of its history the United States government lived mainly on customs duties on imports and excise taxes. An income tax was used during the Civil War and then ended, and when Congress passed another in 1894, the Supreme Court struck it down the next year. The answer was a constitutional amendment. The Sixteenth Amendment, giving Congress power "to lay and collect taxes on incomes," was ratified on February 3, 1913, and that October Congress passed an income tax. The first Form 1040 was a few pages including instructions. A single person paid nothing on the first $3,000 of income, a sum far above most workers' wages; above that the normal tax was 1 percent, with an added surtax on large incomes, rising to a top rate of 7 percent. Only about 358,000 returns were filed for 1913.

How they figured it out. The 1913 law already had the idea of **brackets**: higher rates applied only to income above certain levels. Over the following decades the tax reached more and more Americans, rates rose and fell with wars and changing laws, and withholding (Lesson 1.2) made collection automatic. Through all the changes, the basic method of a simple return has stayed the same: add up income, subtract deductions, apply the brackets, subtract credits, and compare the tax with what was already paid.

The big idea. Income tax is figured in steps: **gross income** → minus certain adjustments → minus the **standard deduction** (or itemized deductions) → **taxable income** → tax from the brackets → minus **credits** → tax owed, compared with withholding to find a refund or a balance due. Each bracket rate applies only to the income inside that bracket. So moving into a higher bracket raises the tax only on the dollars above the line: a raise never lowers your after-tax pay. Your **marginal rate** is the rate on your next dollar; your **average rate** is your total tax divided by your

income, and it is always lower than the top rate you reach. Brackets and the standard deduction change every year; this lesson uses example figures.

In business today. Most young workers with a W-2 and a little interest file a simple return, often for free with IRS-approved software or the IRS's own tools; check IRS.gov for current options. Keep your W-2s, 1099s and records of any deductions. File by the deadline (usually in mid-April), even if you expect a refund, and pay any balance on time to avoid penalties and interest. If your return is complicated, a trustworthy tax preparer or a free volunteer clinic can help.

Try it. Answer the warm-up: false. In the third worked example, a $2,000 raise that crosses into a higher bracket still leaves the worker $1,660 richer.

PICTURE STUDY



Two Tax Gatherers, Workshop of Marinus van Reymerswaele, c. 1540 · Oil on oak panel · National Gallery, London

Image: Wikimedia Commons, public domain

Reymerswaele and his workshop painted many versions of officials counting money. The faces are exaggerated, almost cartoons. The ledger the clerk is writing in records taxes collected. Viewers in the 1500s would have recognized a warning about greed in the gatherers' expressions.

Look closely

- Find the ledger. What is being written in it?
- Look at the faces. How does the painter feel about these men?
- Find the coins. Whose money is it really?
- Look at the papers pinned up behind them. What might they be?

Talk about it

1. What does a tax collector owe the people he collects from?
2. How does a clear, published tax table protect taxpayers from greedy or arbitrary collectors (Smith's maxim of certainty)?
3. What did John the Baptist tell tax collectors in Luke 3:12-13?

PROJECT

A Practice Form 1040

You will complete a practice federal return for a fictional young worker, using the current year's Form 1040 and instructions from IRS.gov, then compare it with the lesson's simplified method.

You will need

- Current Form 1040 and instructions printed from IRS.gov (practice only)
- A sample W-2 (the IRS publishes samples, or create one) and a sample Form 1099-INT
- Calculator and ledger notebook

Steps

1. Create a fictional single filer: wages of $38,500 on a W-2 with federal withholding of $2,950, and $85 of bank interest on a 1099-INT.
2. Using the current instructions, find the standard deduction for a single filer and write the tax year next to it.
3. Fill in the income lines, the standard deduction and taxable income on the practice form.
4. Find the tax from the current tax table or rate schedule.
5. Compare the tax with withholding and compute the refund or amount owed.
6. Redo the calculation with the lesson's example brackets, and explain why the answers differ.
7. Write a short checklist of documents a young worker should save for tax time.

Tips

- Never put a real Social Security number on a practice form. Use zeros.
- Read the instructions line by line; most of a simple return is copying numbers carefully.

Check your work

☐ My practice return has correct income, deduction, taxable income and tax.

- ☐ I can explain marginal and average rates using my return.
- ☐ My document checklist is complete.

LEDGER NOTEBOOK

1. Draw the brackets as stairs and shade how much of a $40,000 taxable income falls on each step.
2. Copy the steps of a return as a flow chart: gross income → deductions → taxable income → tax → credits → withholding → refund or owe.
3. Write a timeline: 1861 Civil War income tax, 1895 Court decision, 1913 Sixteenth Amendment, 1943 withholding.

KEY FORMULAS

$$\text{Taxable income} = \text{gross income} - \text{adjustments} - \text{deduction}$$

$$\text{Tax} = \sum_{\text{brackets}} \text{rate} \times (\text{income in that bracket})$$

$$\text{Average rate} = \frac{\text{total tax}}{\text{income}}$$

> **From history.** The 1913 Form 1040 asked for total income from salaries, interest, rents and businesses, allowed deductions for business expenses, interest paid, other taxes, bad debts and losses. Most of its basic lines are still recognizable on the form today.

WORKED EXAMPLES

Example 1. In this example, the brackets for a single filer are: 10% on taxable income up to $12,000; 12% from $12,000 to $48,000; 22% from $48,000 to $100,000. Find the tax on $40,000 of taxable income and the marginal and average rates.

Show solution

1. First bracket: $0.10 \times 12{,}000 = \$1{,}200$.
2. Second: $0.12 \times (40{,}000 - 12{,}000) = 0.12 \times 28{,}000 = \$3{,}360$.
3. Total $4,560. Marginal 12%; average $4{,}560 / 40{,}000 = 11.4\%$.

Answer: $4,560; marginal 12%, average 11.4%.

Example 2. A practice return, in this example: wages on Form W-2 $46,000, bank interest $120, standard deduction $15,000, no credits, federal tax withheld $3,900. Use the brackets above. Find the refund or amount owed.

Show solution

1. Gross income: $46,120. Taxable: $46{,}120 - 15{,}000 = \$31{,}120$.
2. Tax: $1{,}200 + 0.12 \times 19{,}120 = 1{,}200 + 2{,}294.40 = \$3{,}494.40$.
3. Withheld $3,900; refund $405.60.

Answer: A refund of $405.60. (Real returns round to whole dollars and use the IRS tax table.)

Example 3. With the same brackets, a worker's taxable income rises from $47,000 to $49,000 after a raise. Find the tax before and after, and how much of the raise she keeps (income tax only).

Show solution

1. Before: $1{,}200 + 0.12 \times 35{,}000 = \$5{,}400$.
2. After: $1{,}200 + 0.12 \times 36{,}000 + 0.22 \times 1{,}000 = 1{,}200 + 4{,}320 + 220 = \$5{,}740$.
3. Extra tax $340; she keeps $1,660.

Answer: She keeps $1,660 of the $2,000 raise. Only the $1,000 above the bracket line is taxed at 22%.

PRACTICE

1. Easy Using the lesson's example brackets, find the tax on $10,000 of taxable income.

   Show answer

   $1,000

2. Easy Gross income $29,000; example standard deduction $15,000. Find taxable income.

   Show answer

   $14,000

3. **Easy** What did the Sixteenth Amendment (1913) allow?

Show answer

Congress to lay and collect taxes on incomes without dividing them among the states by population.

4. **Medium** Using the example brackets, find the tax on $\$25{,}000$ of taxable income and the average rate.

Show answer

$1{,}200 + 0.12 \times 13{,}000 = \$2{,}760$; 11.04%

5. **Medium** Using the example brackets, find the tax on $\$60{,}000$ of taxable income, and the marginal and average rates.

Show answer

$1{,}200 + 4{,}320 + 0.22 \times 12{,}000 = \$8{,}160$; marginal 22%; average 13.6%

6. **Medium** A $\$1{,}000$ deduction and a $\$1{,}000$ credit: which lowers the tax more for someone in the 12% bracket, and by how much each?

Show answer

The credit lowers tax by $\$1{,}000$; the deduction by $\$120$.

7. **Medium** From the story: what was the top income-tax rate in 1913, and how many returns were filed for that year?

Show answer

7 percent; about 358,000 returns.

8. **Hard** In this example, a worker's W-2 shows $\$52{,}000$ of wages and $\$5{,}600$ withheld; she has no other income and takes a $\$15{,}000$ standard deduction. Using the example brackets, find her refund or balance due.

Show answer

Taxable $\$37{,}000$; tax $1{,}200 + 0.12 \times 25{,}000 = \$4{,}200$; refund $\$1{,}400$.

9. **Hard** Explain why the statement "I turned down a raise because it would put me in a higher bracket" is a mistake.

Show answer

The higher rate applies only to income above the bracket line, so after-tax income still rises with the raise.

10. Hard In this example, a worker in the 22% bracket contributes $3,000 to a pre-tax retirement plan. How much does this lower her income tax, and what is the real cost of the contribution to her take-home pay?

Show answer

Tax falls by $660; real cost $2,340 (before payroll taxes, which still apply).

11. Challenge With the example brackets, find the taxable income at which the average rate is exactly 11.5%.

Show answer

Between 12,000 and 48,000: $1{,}200 + 0.12(x - 12{,}000) = 0.115x$ gives $0.005x = 240$, so $x = \$48{,}000$, the top of the 12% bracket.

COMMON MISTAKES

- Applying the top bracket rate to all income.
- Confusing deductions (which lower taxable income) with credits (which lower tax).
- Using an old year's brackets or standard deduction. Always check the current year.

> **Make it a game · Bracket Buckets.** Set out cups as tax brackets, each with a rate. Your parent names a taxable income in beans. Pour beans into the first cup until it fills, then the next, and compute the tax from each. Add them and find the marginal and average rates. Then explain what the Sixteenth Amendment did in 1913.

6.3 Payroll Taxes: Ida May Fuller and Social Security

OBJECTIVES

- Explain what Social Security and Medicare taxes pay for and how they began.
- Calculate payroll taxes for an employee, an employer and a self-employed worker, including a wage base limit.
- Explain why Social Security is a supplement and not a complete retirement plan.

> **Warm-up.** Ask a grandparent or older adult (with your parents' help) when they first paid Social Security tax and when they began receiving benefits, if they are willing to share.

WATCH

FICA tax | American civics | US government and civics | Khan Academy

Khan Academy · 7:30

https://www.youtube.com/watch?v=UP9xy2eVj7s

> **WHEN TO WATCH**
> With worked examples 1 and 2: Social Security and Medicare taxes worked step by step.

BACKUP VIDEO

Social security intro | American civics | US government and civics | Khan Academy

Khan Academy · 6:29

https://www.youtube.com/watch?v=gLHUCUv1e5Y

Optional: how Social Security works.

KEY TERMS

Social Security

The federal program, begun in 1935, that pays retirement, disability and survivor benefits to workers and their families, funded mainly by payroll taxes.

Medicare

The federal health-insurance program for people 65 and older and some people with disabilities, begun in 1965.

wage base limit

The maximum yearly wages subject to Social Security tax; it is adjusted each year. Medicare tax has no such limit.

work credits

Units earned by working and paying Social Security tax; a worker generally needs a certain number to qualify for retirement benefits.

pay-as-you-go

A system in which today's workers' taxes pay today's retirees' benefits.

CORE IDEAS

The story. Ida May Fuller was a legal secretary in Rutland, Vermont, who retired in November 1939, at age 65. On her way to run errands, she stopped at the Social Security office to ask whether she might be eligible for the new program. In January 1940 she received the very first monthly Social Security retirement check, number 00-000-001, for $22.54. She had worked under the system for only three years and had paid a total of $24.75 in Social Security taxes. She lived to be 100, and by her death in 1975 she had collected $22,888.92 in benefits.

How they figured it out. The Social Security Act was signed on August 14, 1935, after the Great Depression left millions of older Americans without savings or income. Taxes began in 1937: 1 percent from workers and 1 percent from employers on the first $3,000 of wages. Monthly benefits began in 1940. From the start the system was largely **pay-as-you-go**: current workers' taxes pay current retirees. Ida May Fuller's story shows how that worked for the first retirees, who received far more than they had paid in. In 1965 Medicare added health insurance for people 65 and over, funded by its own payroll tax.

The big idea. Payroll taxes are figured on wages, not taxable income, and are taken from the first dollar. For many years the employee's rates have been 6.2% for Social Security (on wages up to a yearly **wage base limit**) and 1.45% for Medicare (on all wages), with the employer paying the same again; the self-employed pay both shares. These rates and the wage base are set by law and the wage base rises each year, so check the Social Security Administration for current figures. Benefits depend on your earnings record over your working life, and they replace only part of

a worker's income in retirement, so Social Security works best as one leg of a plan that also includes personal savings.

In business today. Employers withhold and match these taxes and report your wages to the government; your earnings record is kept under your Social Security number. Once you are working, create an account at the Social Security Administration's website with a parent's help (or as an adult) and check your earnings record every year; mistakes are easiest to fix early. Protect your Social Security number: never carry the card, never share the number with anyone who calls you, and give it only when truly required. How to keep the program financially sound for the long run is a matter Congress will debate; this course teaches how it works today.

Who gained? The first generation of retirees, like Ida May Fuller, gained security in old age when many had lost their savings. Workers gain disability and survivor protection for their families as well as retirement benefits. The cost is a substantial tax on every paycheck, shared with employers.

PICTURE STUDY



A Monthly Check to You, Social Security Board, 1936–1937 · Poster · U.S. Social Security Administration and National Archives

Image: Wikimedia Commons, public domain

The new Social Security Board printed posters like this to explain the program to millions of workers who had never had a federal account number. Workers needed to sign up for a number so their wages could be recorded.

Look closely

- Read the headline. What promise is the poster making?
- Find the age mentioned. Why that age?
- Find the hand and the check. Who is giving and who is receiving?
- Find the instructions at the bottom. What did workers have to do?

Talk about it

1. Why would the government need to advertise a new program?
2. What did a 1937 worker have to give up from each paycheck for this promise?
3. Why is Social Security alone not enough for a comfortable retirement?

PROJECT

Payroll Tax Calculator and a Retirement Gap

You will build a spreadsheet that calculates payroll taxes for any wage, use it for several workers, and estimate how much of a retiree's income Social Security might replace in an example.

You will need

- Free spreadsheet
- The current Social Security wage base and rates from the Social Security Administration (look up with a parent)
- Ledger notebook

Steps

1. Build columns: Wages, SS tax (employee), Medicare tax (employee), Employer match, Total, Effective rate. Put the rates and wage base in separate cells so they are easy to update.
2. Use the MIN function so Social Security tax stops at the wage base.
3. Test with wages of $20,000, $55,000, $120,000 and $250,000.
4. Add a row for a self-employed worker with $55,000 of net profit using the 92.35% method.
5. In this example, suppose Social Security replaces about 40% of a middle earner's final pay. For a worker retiring at $60,000, find the yearly benefit and the gap to an income goal of 75% of final pay.
6. Write a half page on what that gap means for saving (preview of Unit 10).

Tips

- Label every input cell with its source and year.
- Check one row by hand to make sure the formulas are right.

Check your work

- ☐ My spreadsheet handles the wage base correctly.
- ☐ I can explain employee, employer and self-employed shares.
- ☐ I calculated a retirement gap in the example.

LEDGER NOTEBOOK

1. Draw a timeline: 1935 Act, 1937 taxes begin, 1940 Ida May Fuller's first check, 1965 Medicare.
2. Make a table of your spreadsheet results for the five workers.
3. Write three rules for protecting your Social Security number.

KEY FORMULAS

$\text{SS tax} = 0.062 \times \min(\text{wages}, \text{wage base}), \qquad \text{Medicare tax} = 0.0145 \times \text{wages}$

Self-employed: $0.153 \times 0.9235 \times$ net profit (up to the wage base for the Social Security part)

From history. Beginning in November 1936 the Social Security Board, working through the post offices, had to issue account numbers to tens of millions of workers in a few months. The records were kept by hand and on punched cards, one of the largest bookkeeping tasks attempted up to that time.

WORKED EXAMPLES

Example 1. A worker earns $48,000 in wages. Using the lesson's rates, find her Social Security and Medicare taxes, her employer's matching share, and the total paid on her wages.

Show solution

1. SS: $0.062 \times 48{,}000 = \$2{,}976$. Medicare: $0.0145 \times 48{,}000 = \$696$.
2. Employee total $3,672; employer matches $3,672.
3. Combined: $7,344.

Answer: $3,672 from her pay, $3,672 from her employer, $7,344 in all.

Example 2. In this example, the wage base is $170,000. An engineer earns $210,000. Find his employee Social Security and Medicare taxes and his effective payroll-tax rate.

Show solution

1. SS: $0.062 \times 170{,}000 = \$10{,}540$. Medicare: $0.0145 \times 210{,}000 = \$3{,}045$.
2. Total $13,585; rate $13{,}585/210{,}000 \approx 6.47\%$.

Answer: $13,585, about 6.47% of wages, because wages above the base pay only Medicare tax. (Very high earners also owe an additional Medicare tax under current law.)

Example 3. Ida May Fuller paid $24.75 in Social Security taxes and received $22,888.92 in benefits. What was the ratio of benefits to taxes? Why could later generations not receive the same ratio?

Show solution

1. Ratio: $22{,}888.92/24.75 \approx 925$.
2. She paid taxes for only three years at a low rate, while benefits were paid from the taxes of many younger workers.

Answer: About 925 to 1. In a pay-as-you-go system the first retirees gain enormously; later workers pay taxes for their whole careers, so their benefits are much closer to what they paid in.

PRACTICE

1. Easy Using the lesson's rates, find an employee's Social Security and Medicare taxes on $30,000.

   Show answer

   SS $1,860; Medicare $435

2. Easy What does Medicare provide, and when did it begin?

   Show answer

   Health insurance mainly for people 65 and older; 1965.

3. Easy Who received the first monthly Social Security retirement check, and for how much?

Show answer

Ida May Fuller of Vermont, in January 1940, for $22.54.

4. Medium In this example, the wage base is $170,000. Find employee SS and Medicare taxes on wages of $185,000.

Show answer

SS $10,540; Medicare $2,682.50

5. Medium Find the self-employment tax (lesson method) on $40,000 of net profit.

Show answer

$0.153 \times 0.9235 \times 40{,}000 = \$5{,}651.82$

6. Medium In 1937 the rate was 1 percent each for worker and employer on the first $3,000 of wages. What was the most a worker could pay in a year? The most both together?

Show answer

$30; $60

7. Medium From the story: why did the first retirees, like Ida May Fuller, receive far more than they had paid in?

Show answer

They paid taxes for only a few years at low rates, but benefits were paid from current workers' taxes in a pay-as-you-go system.

8. Hard An employer has 12 workers each paid $42,000 a year. Find the employer's yearly cost of matching Social Security and Medicare.

Show answer

$12 \times 0.0765 \times 42{,}000 = \$38{,}556$

9. Hard Explain why payroll tax takes a smaller percentage of wages from someone earning far above the wage base.

Show answer

Social Security tax stops at the wage base, so earnings above it pay only Medicare tax, and the overall percentage falls.

10. Hard Why should a young worker check his Social Security earnings record each year?

Show answer

Benefits depend on recorded earnings; errors are easier to correct soon after they happen, and checking can reveal fraud using his number.

11. Challenge In this example, a worker earns $40,000 in year 1 with 3% raises for 40 years. Find total employee Social Security tax paid over the career, at 6.2%, assuming every year is under the wage base. (Use the geometric series sum.)

Show answer

Total wages $40{,}000 \times (1.03^{40} - 1)/0.03 \approx 40{,}000 \times 75.40 = \$3{,}016{,}000$; tax $\approx \$187{,}000$

COMMON MISTAKES

- Thinking payroll taxes are figured on taxable income after the standard deduction. They apply to wages from the first dollar.
- Forgetting the employer share when comparing self-employment with a job.
- Planning to live on Social Security alone.

> **Make it a game · Three Paychecks, One Cap.** Roll dice to set the wages of an employee, an employer share and a self-employed worker. Calculate the Social Security and Medicare taxes for each, watching for the wage base limit. Race your parent and compare answers. Then explain what Ida May Fuller received and why pay-as-you-go matters.

6.4 Sales and Property Taxes: From the Domesday Book to Your County

OBJECTIVES

- Calculate sales tax with combined state and local rates.
- Calculate property tax from assessed value and a mill rate.
- Explain how property taxes fund local services and how renters pay them indirectly.

> **Warm-up.** Look at three receipts. Find the sales-tax line on each and calculate the rate (tax ÷ taxable amount).

WATCH

Local taxes | Taxes and tax forms | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 5:19

https://www.youtube.com/watch?v=gnjGfQU6FlI

> **WHEN TO WATCH**
> After the story of the Domesday Book: sales and property taxes.

BACKUP VIDEO

Tax, discount and tip examples

Khan Academy · 5:48

https://www.youtube.com/watch?v=jb_RwR_Eso4

Optional practice: tax and discount problems.

KEY TERMS

sales tax

A percentage tax on retail sales, collected by the seller at the register and sent to the state and local governments.

use tax

A tax owed on items bought without sales tax (for example, from out of state) to be used in your state.

assessed value

The value a local assessor assigns to a property for tax purposes, often a percentage of market value.

escrow

An account through which a mortgage lender collects part of the property tax and insurance with each monthly payment and pays the bills when due.

mill rate

Property-tax rate in mills: one mill is $1 of tax per $1,000 of assessed value.

CORE IDEAS

The story. At Christmas 1085, King William the Conqueror, twenty years after he won England, held council at Gloucester and, as the *Anglo-Saxon Chronicle* records, "had very deep speech with his council about this land." He sent royal commissioners into every county to find out who held every piece of land, how many ploughs, mills, hayfields, pigs and people it had, what it had been worth before the Conquest and what it was worth now. The result, finished in 1086, was the Domesday Book, a survey so thorough that the English said it was like the Day of Judgment: there was no appeal from it. Among its purposes was to show the king what each landholder could pay in tax.

How they figured it out. William's commissioners understood that a tax on land needs an honest, recorded **assessment**. They took sworn testimony from juries of local men in every hundred, wrote it down, and checked it against other sources. Every modern property tax rests on the same three steps: a public record of who owns what, an assessed value, and a published rate. Sales taxes are much newer: in America, statewide retail sales taxes spread during the 1930s, when the Depression cut property-tax collections and states needed new revenue. Mississippi's sales tax of 1932 is usually counted as the first modern general one.

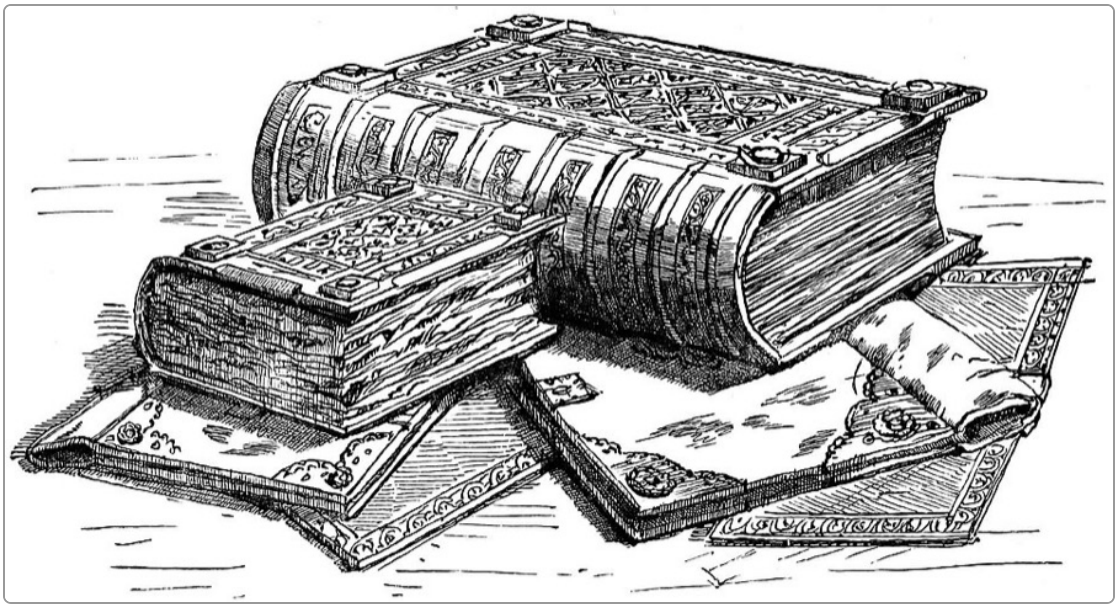
The big idea. Sales tax is a percentage of the price, often a state rate plus county and city rates; some states tax groceries and some do not, and a few states have no sales tax at all. **Property tax** is figured as assessed value × rate. Rates are often stated in **mills**: 25 mills means $25 per $1,000 of assessed value, or 2.5%. Property taxes fund schools, roads, police, fire protection and libraries, so they vary greatly from place to

place. Homeowners usually pay them through an **escrow** account with each mortgage payment; renters pay them indirectly in their rent.

In business today. Stores must collect the right sales tax for each place they sell to, which keeps accountants busy, especially for online sellers. Property owners receive an assessment notice and can appeal if the value is wrong; many states also offer homestead exemptions that reduce taxes on a family's own home. When you compare places to live, compare total costs: a house with a lower price but higher property taxes can cost more each month.

Try it. Find your county's property-tax rate (with a parent) and compute the tax on a $250,000 home in your area. Then compute the monthly amount that would be added to a mortgage payment.

PICTURE STUDY



The Domesday Book, Royal clerks of William I, 1086 · Engraving of the manuscript volumes (the original is ink on parchment, 1086) · The National Archives, Kew, London

Image: Wikimedia Commons, public domain

The Domesday Book survives in two volumes, "Great Domesday" and "Little Domesday," kept today at The National Archives in England. Written in abbreviated Latin, it records about 13,000 places. It is still consulted by historians and was once used in courts to settle questions about land.

Look closely

- Look at the two volumes. Why might the survey need more than one book?
- Look at the bindings. What do they tell you about how the books were valued?
- Imagine the pages inside. What kinds of things were counted?

Talk about it

1. Why does a property tax need a written record like this?
2. Why did the English compare the survey to the Day of Judgment?
3. How is your county's property record a modern Domesday Book?

PROJECT

Local Tax Detective

With a parent, you will find the real sales-tax and property-tax rates where you live, calculate taxes on real purchases and a real (or typical) home, and learn what the property tax pays for.

You will need

- Your county or city website (with a parent)
- Receipts
- Calculator and ledger notebook

Steps

1. Find your state and local sales-tax rates and whether groceries and clothing are taxed.
2. Check three receipts: compute the rate from each and compare with the published rate.
3. Find your county's property-tax rate (or the rate for a typical home) and how assessments are made.
4. Calculate the yearly and monthly property tax on a typical home in your area.
5. Find a breakdown of where property taxes go (schools, county, city, other districts) and make a pie chart.
6. Compare one nearby county or state with different rates.
7. Write a half page on how sales and property taxes affect where families choose to live and what they buy.

Tips

- Many counties publish property-tax rates in mills or per $100 of value. Convert carefully.
- School districts usually receive the largest share of property taxes.

Check your work

☐ My sales-tax calculations match my receipts.

- ☐ I calculated property tax correctly from assessed value and rate.
- ☐ My pie chart shows where local property taxes go.

LEDGER NOTEBOOK

1. Copy the formula for property tax with mills and work one example.
2. Draw your property-tax pie chart.
3. Draw a timeline: 1086 Domesday Book, 1932 Mississippi sales tax, today's local rates.

KEY FORMULAS

$$\text{Sales tax} = (\text{state rate} + \text{local rate}) \times \text{taxable price}$$

$$\text{Property tax} = \text{assessed value} \times \frac{\text{mills}}{1{,}000}$$

$$\text{Assessed value} = \text{market value} \times \text{assessment ratio}$$

From history. The survey's name came later: the English called it "Domesday" after the Last Judgment because its findings could not be appealed. The king's officials simply called it the description of England.

WORKED EXAMPLES

Example 1. In this example, a state sales tax of 6% is added to a county rate of 1 percent and a city rate of 0.75%. Find the tax and total on a $349 purchase.

Show solution

1. Combined rate: 7.75%.
2. Tax: $0.0775 \times 349 = \$27.05$. Total $376.05.

Answer: $27.05 tax; $376.05 total.

Example 2. A home has a market value of $300,000. In this example, the county assesses at 80% of market value and the total rate is 28 mills, with a $25,000 homestead exemption from assessed value. Find the yearly tax and the monthly escrow amount.

Show solution

1. Assessed: $0.80 \times 300{,}000 = \$240{,}000$; less exemption $\$215{,}000$.
2. Tax: $215{,}000 \times 28/1{,}000 = \$6{,}020$.
3. Monthly: $6{,}020/12 = \$501.67$.

Answer: $6,020 a year, about $502 a month through escrow.

Example 3. House A costs $260,000 in a town with property tax of 2.4% of market value; House B costs $280,000 in a town with 1.2%. Compare yearly property taxes. Over 10 years, how much more tax does A cost?

Show solution

1. A: $0.024 \times 260{,}000 = \$6{,}240$. B: $0.012 \times 280{,}000 = \$3{,}360$.
2. Difference $2,880 a year; over 10 years $28,800.

Answer: The cheaper house costs $28,800 more in taxes over 10 years, more than its $20,000 price advantage.

PRACTICE

1. Easy Find the tax and total at 8.25% on a $120 purchase.

   Show answer

   $9.90; $129.90

2. Easy Convert 30 mills to a percentage.

   Show answer

   3%

3. Easy When was the Domesday Book made, and for whom?

   Show answer

   1086, for King William I (the Conqueror).

4. **Medium** Assessed value $180,000; rate 22 mills. Find the yearly property tax.

Show answer

$3,960

5. **Medium** A receipt shows $4.20 tax on a $60 purchase. What is the tax rate?

Show answer

7%

6. **Medium** A rate is quoted as $1.85 per $100 of assessed value. Find the tax on $210,000 of assessed value and express the rate in mills.

Show answer

$3,885; 18.5 mills

7. **Medium** From the story: what three things did William's commissioners record that every property tax still needs?

Show answer

Who held each property, what it contained and was worth (an assessed value), and a written record that could be checked, so tax could be set at a known rate.

8. **Hard** A landlord pays $4,800 a year in property tax on a 4-unit building. If the tax is passed on equally to tenants, how much of each tenant's monthly rent goes to property tax?

Show answer

$100 a month

9. **Hard** A family buys $1,200 of furniture online with no sales tax charged, in a state with a 6% sales and use tax. What do they owe, and why?

Show answer

$72 of use tax; the law taxes goods used in the state even if the seller did not collect sales tax.

10. Hard Home value rises from \$250,000 to \$275,000 while the rate stays 2.0% of market value. Find the increase in tax. If the town cuts the rate to keep the tax the same, what new rate is needed?

Show answer

Increase \$500; rate $5{,}000/275{,}000 \approx 1.82\%$

11. Challenge Town X: home price \$240,000, tax 2.2%. Town Y: price \$270,000, tax 1.3%. A buyer plans to stay n years. For what n is Y cheaper in price plus total tax (ignore interest and value changes)?

Show answer

X: $240{,}000 + 5{,}280n$; Y: $270{,}000 + 3{,}510n$. Y cheaper when $1{,}770n > 30{,}000$, so $n \geq 17$ years.

COMMON MISTAKES

- Confusing mills (per \$1,000) with percent (per \$100).
- Comparing house prices without comparing property taxes.
- Forgetting use tax on untaxed out-of-state purchases.

> **Make it a game · Local Tax Detective.** Find a store receipt or write a pretend one with a combined state and local sales tax. Estimate the tax in your head, then calculate it and compare. Next, take a home's assessed value and a mill rate and figure the yearly property tax. Closest estimate wins. Finish by saying what the Domesday Book recorded.

> **Scripture.** “For for this cause pay ye tribute also: for they are God’s ministers, attending continually upon this very thing.” (Romans 13:6, KJV)
>
> Paul tells Christians to pay taxes because rulers are appointed by God to keep order, even rulers as imperfect as Rome’s.

6.5 Records and Honesty: Zacchaeus and Romans 13:7

OBJECTIVES

- Organize the records needed for taxes and know how long to keep them.
- Calculate the cost of penalties and interest for late or dishonest returns in examples.
- Explain the Christian duty of honesty in taxes from Scripture and the story of Zacchaeus.

> **Warm-up.** Where would you look right now if you needed last year's pay stubs or receipts? Write down how long it would take you to find them.

WATCH

Recordkeeping

IRSvideos · 4:47

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

> **WHEN TO WATCH**
> After the story of Zacchaeus, before setting up your records.

Note: A short dramatized scene produced by the IRS.

KEY TERMS

tax records

Documents that prove income, deductions and credits: W-2s, 1099s, receipts, statements and copies of returns.

audit

An IRS review of a return to check that income, deductions and credits are reported correctly.

penalty

An extra charge for filing or paying late, or for underreporting tax.

restitution

Paying back what was wrongly taken, often with something added.

statute of limitations

The period after which the IRS generally cannot assess additional tax on a return; it is longer in some cases, including fraud.

CORE IDEAS

The story. Zacchaeus was the chief tax collector of Jericho and rich, which in his day meant he had grown wealthy by collecting more than Rome required and keeping the difference. When Jesus came through the town, the small man climbed a sycamore tree to see Him, and Jesus stopped and said, “Zacchaeus, make haste, and come down; for to day I must abide at thy house.” The crowd grumbled that He had gone to be the guest of a sinner. But Zacchaeus stood and said, “Behold, Lord, the half of my goods I give to the poor; and if I have taken any thing from any man by false accusation, I restore him fourfold” (Luke 19:1-10).

How they figured it out. Zacchaeus could offer to restore fourfold only because he could figure out what he owed and to whom: he knew his accounts. John the Baptist had given tax collectors a simple rule: “Exact no more than that which is appointed you” (Luke 3:13). Paul gave taxpayers the matching rule: “Render therefore to all their dues: tribute to whom tribute is due; custom to whom custom” (Romans 13:7). Honesty on both sides, collector and taxpayer, depends on clear, kept records.

The big idea. Good records make honest taxes easy. Keep a folder (paper or digital) for each tax year with your W-2s, 1099s, receipts for anything you deduct or claim, records of self-employment income and expenses, and a copy of the return. The IRS publishes how long to keep records; for most returns it is at least three years after filing, longer in some situations, and records for property and investments should be kept until several years after you sell them. Honesty means reporting all income, including cash and side jobs, and claiming only true deductions. Mistakes happen; correct them with an amended return. Fraud is a crime.

In business today. Employers, banks and businesses report what they pay you to the IRS, which matches those reports against returns, so unreported income is often caught. Late filing and late payment bring penalties and interest that grow each month. In an audit, records are your defense: a deduction you cannot prove may be

disallowed. Beware of tax preparers who promise huge refunds or ask you to sign a blank return; you are responsible for what your return says.

Think it through. Zacchaeus did not merely start obeying the law; he made **restitution** and gave generously. Honest taxes are not the whole of righteousness, but dishonest taxes are a clear sin. “Provide things honest in the sight of all men” (Romans 12:17).

PICTURE STUDY



Zacchaeus in the Sycamore Awaiting the Passage of Jesus, James Tissot, 1886–1894 · Opaque watercolor over graphite on paper · Brooklyn Museum, New York

Image: Wikimedia Commons, public domain

Tissot painted Zacchaeus at the moment before Jesus looks up and calls him by name. The rich tax collector, despised by his neighbors, has climbed a tree like a boy to see the Teacher.

Look closely

- Find Zacchaeus. What does his posture tell you about his eagerness?
- Look at his clothing. Does he look rich?
- Look at the road below. Who is about to come?
- Imagine the crowd. What do they think of him?

Talk about it

1. Why did people in Jericho dislike Zacchaeus?
2. What did Zacchaeus do after Jesus came to his house, and why does it matter that he could calculate what he owed?
3. What does his story teach about honesty with money and taxes?

Safety first. Tax records contain private numbers. Keep them in a safe place at home, never carry them around, and shred documents with Social Security or account numbers when they are no longer needed.

PROJECT

My Tax Records System

You will set up a simple, real records system for this year's income and expenses, and write a one-page guide for keeping records honestly as an adult.

You will need

- An accordion folder, a box with labeled folders, or a secure digital folder set up with a parent
- Your pay stubs, receipts and the self-employment ledger from Unit 1
- IRS recordkeeping guidance found on IRS.gov with a parent

Steps

1. Create folders for the current tax year: Income (W-2s, 1099s, pay stubs), Self-employment (ledger and receipts), Giving receipts, Education costs, Other, and Copy of return.
2. File everything you already have, in date order.
3. Make a one-page summary sheet that you update monthly: total wages, other income, self-employment profit and giving.
4. Look up the IRS's guidance on how long to keep records and write the main rules on the folder.
5. Write down a plan for storing records safely (and securely shredding old ones when the time comes).
6. Work the penalty examples from this lesson with your own numbers: what would a month of late payment cost on your likely tax?
7. Write a one-page guide for your adult self, connecting Romans 13:7 and Zacchaeus to your habits.

Tips

- A record you cannot find is almost as bad as no record.
- Keep digital copies backed up in two places.

Check your work

☐ My folders are set up and current documents are filed.

- ☐ My summary sheet is up to date.
- ☐ My guide states how long to keep records and why honesty matters.

LEDGER NOTEBOOK

1. Draw your folder system as a labeled diagram.
2. Copy Romans 13:7 and Luke 3:13 and write how each applies to you.
3. Make a table: document, why it matters, how long to keep it.

KEY FORMULAS

Simple monthly penalty $=$ rate per month $\times$ months late $\times$ unpaid tax (examples only; actual IRS rules have caps and rates that change)

Restitution (Zacchaeus) $= 4 \times$ amount wrongly taken

> **From history.** In Jesus' day, the right to collect taxes in a district was often sold to the highest bidder, who then had every reason to squeeze as much as he could from the people. That system is why tax collectors were so hated, and why John's instruction to take no more than appointed was so pointed.

WORKED EXAMPLES

Example 1. In this example, a late-payment penalty is 0.5% of unpaid tax per month and interest is 8% a year, simple, on $1,200 of unpaid tax. What is owed after 10 months?

Show solution

1. Penalty: $0.005 \times 10 \times 1{,}200 = \$60$.
2. Interest: $1{,}200 \times 0.08 \times 10/12 = \$80$.
3. Total: $1{,}200 + 60 + 80 = \$1{,}340$.

Answer: $1,340: $140 of avoidable cost from paying late.

Example 2. A student mowed lawns for $2,600 cash and did not report it. In this example, an IRS notice adds the income, self-employment tax by the lesson method, income tax at 10%, and a 20% accuracy penalty on the extra tax. Find the extra tax and penalty.

Show solution

1. SE tax: $0.153 \times 0.9235 \times 2{,}600 = \$367.37$.
2. Income tax: $0.10 \times 2{,}600 = \$260$. (A full calculation would subtract half of SE tax first; this example skips it.)
3. Extra tax $627.37; penalty $125.47; total $752.84, plus interest.

Answer: About $753 plus interest, and the stress of the notice. Reporting it honestly would have cost the $627 without the penalty.

Example 3. Zacchaeus promised to restore fourfold anything taken by false accusation. If he had overcharged three people 40, 25 and 60 denarii, what would he repay? Compare with Exodus 22:1, which required a thief to repay four or five times for a stolen sheep or ox.

Show solution

1. Total taken: 125 denarii.
2. Fourfold: 500 denarii.

Answer: 500 denarii. Zacchaeus applied to himself the strictest restitution the law required of a thief, a sign of true repentance.

PRACTICE

1. Easy Name four documents you should keep for your tax return.

   Show answer

   Any four: W-2s, 1099s, receipts for deductions or credits, self-employment records, giving receipts, a copy of the return.

2. Easy What did John the Baptist tell tax collectors?

   Show answer

   “Exact no more than that which is appointed you” (Luke 3:13).

3. Easy If Zacchaeus had wrongly taken 30 denarii from a man, how much would he restore?

Show answer

120 denarii.

4. Medium In this example, a penalty is 0.5% per month on $800 unpaid for 6 months, plus 7% yearly simple interest. Find the total owed.

Show answer

$800 + 24 + 28 = \$852$

5. Medium Why does the IRS usually discover unreported wages or interest?

Show answer

Employers and banks report payments on W-2s and 1099s, and the IRS matches them against returns.

6. Medium You find a mistake on last year's return that underreported income by $400. What should you do?

Show answer

File an amended return and pay the extra tax (and any interest); correcting it promptly is honest and limits penalties.

7. Medium From the story: what two things did Zacchaeus promise, and what did Jesus say about him?

Show answer

To give half his goods to the poor and to restore fourfold anything wrongly taken; Jesus said salvation had come to his house and that He came to seek and save the lost.

8. Hard A tutor earns $3,000 in cash and claims a fake $1,000 expense. Explain two ways this is wrong and one practical risk.

Show answer

It is lying and taking what is owed to the government (Romans 13:7). Practically, he has no receipt for the expense, so in an audit it would be disallowed with penalties.

9. Hard Explain why records for a house or investments should be kept longer than records for ordinary yearly income.

Show answer

When you sell them, you need the purchase price and improvements to calculate the gain or loss, which may be many years later.

10. Hard A tax preparer promises a refund "twice as big as anyone else's" and asks you to sign before he fills in the numbers. What should you do, and why?

Show answer

Refuse and find an honest preparer. You are responsible for your return; signing a blank return invites fraud in your name.

11. Challenge In this example, unpaid tax of $\$2{,}000$ grows by a 0.5% monthly penalty (capped at 25% of the tax) plus 8% yearly simple interest. After how many months does the penalty reach its cap, and what is owed then?

Show answer

Cap $\$500$; $0.005 \times 2{,}000 = \$10$ a month, so 50 months. Interest: $2{,}000 \times 0.08 \times 50/12 \approx \$666.67$; total about $\$3{,}166.67$.

COMMON MISTAKES

- Throwing away W-2s and receipts after filing.
- Thinking cash income does not need to be reported.
- Ignoring an IRS letter. Respond promptly; most notices are easily resolved.

Make it a game · Keep or Shred Relay. Your parent makes a pile of mixed papers: receipts, old bills, pay stubs and junk mail. Race to sort them into keep for a year, keep for seven years and shred. Then calculate a pretend penalty and interest for a late return. Finish by telling how Zacchaeus made restitution in Luke 19.

Scripture. "Render therefore to all their dues: tribute to whom tribute is due; custom to whom custom; fear to whom fear; honour to whom honour." (Romans 13:7, KJV)

Paul lists taxes beside honor and respect: paying what we owe is part of giving everyone his due.

UNIT 6

Taxes

Taxes are the price of living under a government that builds roads, keeps courts and defends the country, and nearly every dollar you earn, spend or own is taxed somewhere along the way. In this unit you will look at taxes as Scripture does ("Render therefore unto Caesar the things which are Caesar's; and unto God the things that are God's," Matthew 22:21) and as Adam Smith did, with his four rules for a good tax. You will learn how the federal **income tax** began in 1913, how tax brackets really work, and how to complete a simple practice return.

Then you will meet Ida May Fuller of Ludlow, Vermont, who in 1940 received the first monthly Social Security check, and you will calculate the **payroll taxes** that fund Social Security and Medicare. You will figure **sales and property taxes**, from William the Conqueror's Domesday Book of 1086 to your county's tax bill, and you will finish with **records and honesty**: Zacchaeus the tax collector, Romans 13:7, and the habits that make tax time simple. Tax brackets, deductions and limits change every year, so every number marked "in this example" is for practice; the method is what you will keep.

PREREQUISITES

- Can read a pay stub and calculate net pay (Unit 1)
- Can work with percents and piecewise calculations
- Has kept records for a month (Units 1–3)

MASTERY CHECKLIST

- ☐ I can explain why governments tax, list the main kinds of taxes, and state Adam Smith's four rules for a good tax.
- ☐ I can calculate income tax with brackets and distinguish marginal and average tax rates.
- ☐ I can complete a simple practice return from a W-2: income, standard deduction, taxable income, tax, refund or amount owed.
- ☐ I can calculate Social Security and Medicare taxes for an employee and a self-employed worker.
- ☐ I can calculate sales tax and property tax from a rate.
- ☐ I can keep tax records honestly and explain the Christian duty to pay what we owe.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **IRS: About Form 1040**: Free. The current Form 1040 and its instructions, for the practice return in Lesson 6.2. Use it for practice only.
- **Khan Academy: Financial Literacy, Taxes unit**: Free short videos and practice on brackets, forms, payroll taxes and local taxes.
- ***The Wealth of Nations*, by Adam Smith (1776), Book V, Chapter 2**: Free on Project Gutenberg. Smith's four maxims of taxation open Part II of this chapter. Read the maxims with Lesson 6.1. Ages 15 and up.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

6.1	**Why and How Taxes Are Paid: The Tribute Money**	3 sessions of 50 minutes
6.2	**Income Tax Basics and a Simple Return: 1913 and Form 1040**	3 sessions of 50 minutes
6.3	**Payroll Taxes: Ida May Fuller and Social Security**	3 sessions of 50 minutes
6.4	**Sales and Property Taxes: From the Domesday Book to Your County**	3 sessions of 50 minutes
6.5	**Records and Honesty: Zacchaeus and Romans 13:7**	3 sessions of 50 minutes

Unit 6 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars or percents. All brackets, rates and limits are examples given in each problem, not current law. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **5 pts**
   Name the main tax each level of government relies on: federal, state, local.

2. **5 pts**
   State Adam Smith’s four maxims of taxation.

3. **6 pts**
   Brackets (example): 10% to $12,000; 12% to $48,000; 22% to $100,000. Find the tax on $33,000 of taxable income and the average rate.

4. **6 pts**
   Same brackets: find the tax on $70,000 and the marginal and average rates.

5. **8 pts**

   Practice return (example figures): wages $41,000, interest $200, standard deduction $15,000, withholding $2,700. Using the brackets above, find taxable income, tax and refund or amount owed.

6. **5 pts**

   Explain why moving into a higher bracket never lowers after-tax income.

7. **5 pts**

   What did the Sixteenth Amendment do, and what was the top rate in 1913?

8. **6 pts**

   At 6.2% and 1.45%, find an employee's Social Security and Medicare taxes and the employer's match on $36,000.

9. **6 pts**

   With an example wage base of $170,000, find employee SS and Medicare taxes on wages of $200,000.

10. **5 pts**

    Tell Ida May Fuller's story in two or three sentences and explain what it shows about pay-as-you-go.

11. **5 pts**

    Find the total cost of a $650 purchase with 6% state and 1.5% local sales tax.

12. **6 pts**

    Market value $320,000; assessment ratio 75%; rate 24 mills. Find yearly and monthly property tax.

13. **5 pts**

    What was the Domesday Book, and why does every property tax need something like it?

14. **6 pts**

    In this example, $1,500 of tax is paid 8 months late with a 0.5% monthly penalty and 8% yearly simple interest. Find the total owed.

15. **6 pts**

    List five records a young worker should keep, and state the general IRS rule of thumb for how long.

16. **5 pts**

    What did Zacchaeus promise, and what does his story teach about money and repentance?

17. **10 pts**

    Short essay (one paragraph): Using Matthew 22:21 and Romans 13:7, explain how a Christian should think about paying taxes, including taxes he may think are too high.

ANSWER KEY

1. Federal: income and payroll taxes; state: income and sales taxes; local: property taxes.
2. Proportion to ability, certainty, convenience, economy of collection.
3. $1{,}200 + 0.12 \times 21{,}000 = \$3{,}720$; 11.3%
4. $1{,}200 + 4{,}320 + 4{,}840 = \$10{,}360$; marginal 22%; average 14.8%
5. Taxable \$26,200; tax $1{,}200 + 0.12 \times 14{,}200 = \$2{,}904$; owes \$204.
6. Only the dollars above the bracket line are taxed at the higher rate; every extra dollar still leaves something after tax.
7. It allowed a federal income tax (ratified February 3, 1913); the top rate was 7 percent.
8. SS \$2,232; Medicare \$522; employer matches \$2,754.
9. SS \$10,540; Medicare \$2,900
10. A Vermont secretary who received the first monthly check in 1940 (\$22.54) after paying \$24.75 in taxes, and collected about \$22,889 by age 100. Early retirees received far more than they paid because current workers' taxes fund current benefits.
11. \$698.75
12. Assessed \$240,000; tax \$5,760; \$480 a month
13. William I's 1086 survey of who held land in England and what it was worth; a tax on property needs a recorded owner, an assessed value and a published rate.
14. $1{,}500 + 60 + 80 = \$1{,}640$
15. W-2s, 1099s, receipts for deductions or credits, self-employment records, a copy of the return; generally at least three years after filing, longer for property and some other cases.
16. Half his goods to the poor and fourfold restitution of anything wrongly taken; true repentance changes how we handle money and repairs wrongs.
17. A strong answer explains that lawful government may tax and Christians pay what is owed honestly (render to Caesar), while belonging wholly to God; that disagreement is expressed through lawful means, not by cheating; and that taking lawful deductions is not dishonest.

PORTFOLIO PIECE: MY TAX FILE

Assemble your household tax map, your practice Form 1040 with your bracket calculations, your payroll-tax spreadsheet and retirement-gap estimate, your local tax detective report, and your records system with its guide. Add a one-page letter to your future self about the kind of taxpayer you intend to be, using Matthew 22:21 and the story of Zacchaeus.

LOOK FOR	WHAT IT MEANS
Calculations	Bracket, payroll, sales, property and penalty calculations are correct and clearly labeled as example or current figures.
Forms	The practice return is complete and consistent with the instructions.
Records	The records system is organized, current and secure.
Character	The letter shows understanding of honest taxpaying grounded in Scripture.

UNIT 7

Investing Basics

Saving keeps money safe; investing puts it to work. In this unit you will learn the mathematics that makes patient investing powerful, the **time value of money**, starting with Luca Pacioli's "rule of 72" in 1494 and Benjamin Franklin's two-hundred-year gift to Boston and Philadelphia. Then you will meet the two great families of investments. **Stocks** are shares of ownership, born when the Dutch East India Company sold shares to the public in 1602. **Bonds** are loans, as old as the Dutch water board whose bond of 1648 still pays interest today.

You will learn how **mutual funds** pool many investors' money and how John Bogle's first index fund of 1976, mocked at the time as "Bogle's Folly," changed investing by keeping costs low. Last, you will study **risk, return and diversification**, and the ancient advice of Ecclesiastes 11:2: "Give a portion to seven, and also to eight." All investing in this course is done in pretend portfolios. The course names no investments to buy; real decisions belong to you and your parents and, as an adult, a qualified professional.

PREREQUISITES

- Can compute compound interest and use exponents (Units 3 and 4)
- Can use a spreadsheet with formulas
- Has an emergency-fund plan (Unit 2): investing comes after the emergency fund

MASTERY CHECKLIST

- ☐ I can calculate future value, present value and the future value of regular deposits, and use the rule of 72.
- ☐ I can explain what a stock is and calculate total return and dividend yield.
- ☐ I can explain what a bond is and why bond prices fall when interest rates rise.
- ☐ I can explain mutual funds and index funds and calculate the long-run cost of fees.
- ☐ I can explain risk, return and diversification and calculate a portfolio's weighted return.
- ☐ I can keep a pretend portfolio and explain why I chose its mix, without naming investments to buy.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Investor.gov: Introduction to Investing**: Free from the U.S. Securities and Exchange Commission. Plain explanations of stocks, bonds, funds, fees and fraud. Fits the whole unit.
- **Investor.gov Compound Interest Calculator**: Free official calculator. Use it to check your spreadsheet in Lessons 7.1 and 7.4.
- **Federal Reserve Bank of St. Louis: Econ Lowdown**: Free modules on saving, investing and the stock market from a Federal Reserve bank.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

7.1 The Time Value of Money: Pacioli's Rule of 72 and Franklin's Gift

3 sessions of 50 minutes

7.2	**Stocks: From the Dutch East India Company to Today**	3 sessions of 50 minutes
7.3	**Bonds: A 1648 Water Board Bond and Hamilton's Debt**	3 sessions of 50 minutes
7.4	**Mutual Funds and Index Funds: John Bogle's "Folly"**	3 sessions of 50 minutes
7.5	**Risk, Return and Diversification: "A Portion to Seven, and Also to Eight"**	3 sessions of 50 minutes

Unit 7 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars, percents or years. All rates are examples given in each problem. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **5 pts**
   Find the future value of $3,000 at 5% compounded yearly for 15 years.
2. **5 pts**
   Find the present value of $20,000 due in 12 years at 6%.
3. **6 pts**
   Find the future value of $150 deposited monthly for 30 years at 0.5% a month, and the total deposited.
4. **5 pts**
   Use the rule of 72 for 4% and 12%, and give the exact doubling time at 4%.
5. **5 pts**
   What did Franklin leave to Boston and Philadelphia, and what did he calculate?
6. **6 pts**
   Bought at $54, sold at $58.32 a year later with $1.62 of dividends. Find dividend yield and total return.

7. **5 pts**

   Explain what the Dutch East India Company invented in 1602 and why a stock market followed.

8. **6 pts**

   A 3-year, 5% coupon $1,000 bond (yearly coupons). Find its price at a 7% yield.

9. **5 pts**

   Explain why bond prices fall when interest rates rise.

10. **5 pts**

    What did Hamilton's 1790 funding plan do for American credit?

11. **6 pts**

    A fund has $84 million of assets, $1 million of liabilities and 4 million shares. Find the NAV and the shares bought with $2,500.

12. **6 pts**

    $15,000 grows at 7% gross for 35 years. Find the ending values with expense ratios of 0.05% and 1.25%, and the difference.

13. **5 pts**

    State Bogle's arithmetic argument for index funds.

14. **6 pts**

    A portfolio is 50% stocks (7%), 40% bonds (4%), 10% cash (2%). Find its expected return and its return in a year when stocks fall 30% and bonds and cash rise 2%.

15. **6 pts**

    Each of 3 independent ships carrying equal shares of a cargo has a 15% chance of loss. Find the expected fraction lost and the probability of losing everything. Compare with one ship.

16. **18 pts**

    Essay (two or three paragraphs): A friend has $5,000 and says he will put it all into one exciting company's stock because it doubled last year. Using the time value of money, diversification, costs, time horizon and Ecclesiastes 11:2, explain what you would tell him. Do not name any specific investment.

ANSWER KEY

1. $3{,}000 \times 1.05^{15} \approx \$6{,}236.78$
2. $20{,}000 / 1.06^{12} \approx \$9{,}939.39$
3. $150 \times (1.005^{360} - 1)/0.005 \approx \$150{,}677$; deposited $\$54{,}000$
4. 18 and 6 years; exact $\ln 2 / \ln 1.04 \approx 17.7$ years
5. £1,000 each, lent at 5% to young tradesmen; he calculated each would grow to about £131,000 in 100 years.
6. 3%; $(4.32 + 1.62)/54 = 11\%$
7. Shares sold to the public in a company with long-term capital; investors who needed money had to sell shares to others, so trading in shares grew into a stock market.
8. $50/1.07 + 50/1.07^2 + 1{,}050/1.07^3 \approx 46.73 + 43.67 + 857.10 = \$947.51$
9. Existing bonds pay fixed coupons below new market rates, so buyers will pay less for them until their yield matches new bonds.
10. It funded the national debt in full and assumed state war debts with taxes to pay interest, restoring trust so the nation could borrow.
11. $\$20.75$; about 120.48 shares
12. $15{,}000 \times 1.0695^{35} \approx \$157{,}550$; $15{,}000 \times 1.0575^{35} \approx \$106{,}146$; difference about $\$51{,}400$
13. All investors together earn the market return before costs; after costs the average investor earns less, so low-cost funds that match the market beat most high-cost funds over time.
14. 5.3%; $0.5(-30) + 0.5(2) = -14\%$
15. Expected 15% either way; all three lost $0.15^3 \approx 0.0034$, versus 0.15 for one ship.
16. A strong answer explains that past returns do not guarantee future ones; one stock carries company risk that diversification removes without lowering expected return (Markowitz, the ships example); money needed soon should not be in stocks, while long-horizon money benefits from time and compounding; low costs matter enormously over decades; an emergency fund and no high-interest debt come first; and Ecclesiastes 11:2 teaches humility about the future. It recommends talking with parents and, as an adult, a qualified professional.

PORTFOLIO PIECE: MY INVESTING NOTEBOOK

Assemble your compound-growth spreadsheet and rule-of-72 table, your four-week pretend stock portfolio, your bond price table and graph, your fund-cost comparison, and your three pretend portfolios with their defense. Add a one-page "investment policy" for your future self: when you will begin investing, what must come first, how you will diversify, how you will keep costs low, and how you will stay patient, with no specific investments named.

LOOK FOR	WHAT IT MEANS
Mathematics	Future value, present value, returns, bond prices, NAV and fee calculations are correct and shown.
Records	The pretend portfolio is tracked accurately with returns calculated each week.
Judgment	Portfolio mixes fit time horizons and are defended with diversification and cost reasoning.
Stewardship	The investment policy reflects patience, humility (Ecclesiastes 11:2) and the priority of emergency savings and avoiding debt.

7.1 The Time Value of Money: Pacioli's Rule of 72 and Franklin's Gift

OBJECTIVES

- Explain why a dollar today is worth more than a dollar in the future.
- Calculate future value, present value and the future value of regular deposits.
- Use the rule of 72 and check it against the exact formula.

> **Warm-up.** Would you rather have $1,000 today or $1,100 a year from now? What would change your answer? Write two reasons.

WATCH

Time value of money | Interest and debt | Finance & Capital Markets | Khan Academy

Khan Academy · 8:16

https://www.youtube.com/watch?v=733mgqrzNKs

> **WHEN TO WATCH**
> With worked example 2: present and future value explained.

BACKUP VIDEO

The time value of money - German Nande

TED-Ed · 3:37

https://www.youtube.com/watch?v=MhvjCWfy-lw

Optional, before the lesson: a short animated introduction.

KEY TERMS

time value of money

The principle that money available now is worth more than the same amount later, because it can earn a return in the meantime.

future value

What a sum today will grow to at a given rate over a given time.

present value

What a future sum is worth today, found by discounting it at a given rate.

annuity

A series of equal payments or deposits made at regular intervals.

rule of 72

A shortcut: the years for money to double are about 72 divided by the yearly percentage rate.

CORE IDEAS

The story. In 1494 the Franciscan friar Luca Pacioli published in Venice his *Summa de arithmetica*, the great book of merchant mathematics that also gave the world its first printed description of double-entry bookkeeping. In a section on interest, Pacioli gave a rule for finding how many years it takes money to double: divide 72 by the yearly rate of interest. He did not explain where it came from; it was simply a rule merchants used. Nearly three hundred years later, Benjamin Franklin put compound growth to work for his cities. His will of 1789, with a codicil of 1790, left £1,000 each to Boston and Philadelphia, to be lent at 5% interest to young married tradesmen who had finished their apprenticeships. He calculated that if the loans were repaid and relent for a hundred years, each fund would grow to about £131,000.

How they figured it out. Franklin worked out the arithmetic himself: £1,000 at 5% compounded for 100 years is £1,000 × 1.05^{100}, about £131,500. He directed that after a century most of the money be spent on public works and the rest be lent for another hundred years. The funds did not grow as fast as he hoped (not every borrower repaid, and fewer tradesmen applied as times changed), but both cities used the century's growth for public purposes, and when the funds were finally distributed around 1990, two hundred years after his death, they were worth millions of dollars. Compounding over long periods is powerful, and patience is its secret ingredient.

The big idea. A dollar today can be invested, so it is worth more than a dollar promised later. Future value: $FV = PV(1+r)^n$. Present value works backward: $PV = FV/(1+r)^n$. For regular deposits P each period, $FV = P\,\dfrac{(1+r)^n - 1}{r}$. The **rule of 72** estimates doubling time: at 6% money doubles in about 12 years, at 9% in about 8. The two most important variables are the **rate** and, above all, the **time**, which is why starting young matters so much.

In business today. Every financial decision has a time value: a business deciding whether to buy a machine compares the present value of future savings with its price; a prize winner chooses between a lump sum and payments over decades; a pension promises future payments whose present value must be funded today. For

you, the lesson is simple: small amounts saved early, and left alone, grow far more than larger amounts saved late.

Think it through. The servant in Jesus' parable who buried his talent was told, "Thou oughtest therefore to have put my money to the exchangers, and then at my coming I should have received mine own with usury" (Matthew 25:27). Faithful stewards put resources to work over time.

PICTURE STUDY



Portrait of Luca Pacioli, Attributed to Jacopo de' Barbari, c. 1495 · Oil on panel · Museo di Capodimonte, Naples

Image: Wikimedia Commons, public domain

This is the only known portrait of Pacioli, painted around the time his *Summa* was published. He is shown teaching geometry. The young man behind him may be his patron, and the hanging glass solid is a marvel of painting.

Look closely

- Find the slate and the book. What is Pacioli doing?
- Find the tools on the table: compass, pen, models. What do they tell you about his work?
- Find the hanging glass polyhedron. What do you see reflected in it?
- Look at the young man. How does he differ from the friar?

Talk about it

1. Why would a friar write a mathematics book for merchants?
2. How might a rule like "72 divided by the rate" have helped a Venetian merchant?
3. What does this painting suggest about the value the Renaissance placed on mathematics?

PROJECT

A Compound Growth Spreadsheet

You will build a spreadsheet that shows money growing year by year, test the rule of 72, and model Franklin's fund and your own savings plan.

You will need

- Free spreadsheet
- Ledger notebook
- Optional: the Investor.gov compound interest calculator to check your work

Steps

1. Make columns: Year, Starting balance, Deposit, Growth (balance × rate), Ending balance. Put the rate and deposit in separate input cells.
2. Model £1,000 at 5% for 100 years with no deposits and check that year 100 is about £131,500.
3. Test the rule of 72: for rates of 2%, 4%, 6%, 8%, 10% and 12%, find the exact doubling time with the formula and compare with 72 ÷ rate.
4. Model your own plan: a monthly deposit you could realistically make from your Unit 2 budget, at an example rate of 6%, from now until age 65.
5. Graph the balance and, on the same graph, the total of deposits alone.
6. Compute the present value today of $1,000,000 at age 65 at 6%.
7. Write a half page on what the graph teaches about starting early.

Tips

- Use an absolute reference (such as B1) for the rate so it does not shift when you copy the formula down.
- Rates here are examples. Real investments do not grow at a steady rate.

Check your work

- ☐ My spreadsheet reproduces Franklin's figure.
- ☐ My rule-of-72 table compares estimates with exact values.
- ☐ My graph shows the gap between deposits and balance growing over time.

LEDGER NOTEBOOK

1. Draw your balance and deposits graph and shade the gap labeled “growth.”
2. Copy the rule-of-72 table.
3. Write Franklin’s plan in three sentences, with his numbers.

KEY FORMULAS

$$FV = PV(1+r)^n, \qquad PV = \frac{FV}{(1+r)^n}$$

$$FV_{\text{annuity}} = P\,\frac{(1+r)^n - 1}{r}$$

$$\text{Doubling time} \approx \frac{72}{\text{rate in percent}}, \qquad \text{exact: } n = \frac{\ln 2}{\ln(1+r)}$$

From history. When Franklin’s Boston fund reached its first hundred years, part of it helped found the Franklin Institute of Boston, a trade school that still trains young people in technical skills, fitting the purpose of a gift meant for young tradesmen.

WORKED EXAMPLES

Example 1. Check Franklin’s calculation: what does £1,000 grow to at 5% compounded yearly for 100 years? Compare with his estimate of £131,000.

Show solution

1. $FV = 1{,}000 \times 1.05^{100}$.
2. $1.05^{100} \approx 131.50$, so $FV \approx £131{,}501$.

Answer: About £131,500. Franklin’s figure was right.

Example 2. A family will need $10,000 in 10 years. In this example, money earns 5% a year. How much must they set aside today?

Show solution

1. $PV = 10{,}000 / 1.05^{10}$.
2. $1.05^{10} \approx 1.62889$; $PV \approx \$6{,}139.13$.

Answer: $6,139.13 today grows to $10,000 in 10 years at 5%.

Example 3. A young worker saves \$100 a month for 40 years. In this example, the money earns 6% a year compounded monthly (0.5% a month). Find the future value, the total deposited, and the growth. Then use the rule of 72 to estimate how long one deposit takes to double.

Show solution

1. $FV = 100 \times \dfrac{1.005^{480} - 1}{0.005}$; $1.005^{480} \approx 10.957$.
2. $FV \approx 100 \times 1{,}991.5 = \$199{,}149$.
3. Deposited: $480 \times 100 = \$48{,}000$; growth \$151,149.
4. Doubling: $72/6 = 12$ years.

Answer: About \$199,000 from \$48,000 of deposits; each deposit doubles roughly every 12 years.

PRACTICE

1. Easy Use the rule of 72 to estimate doubling time at 9%.

   Show answer

   8 years

2. Easy Find the future value of \$500 at 4% for 3 years, compounded yearly.

   Show answer

   $500 \times 1.04^3 = \$562.43$

3. Easy In one sentence, why is a dollar today worth more than a dollar a year from now?

   Show answer

   A dollar today can be invested to earn a return, so it grows to more than a dollar by next year.

4. Medium Find the present value of \$5,000 due in 8 years at 6%.

   Show answer

   $5{,}000/1.06^8 \approx \$3{,}137.06$

5. **Medium** Find the exact doubling time at 6% and compare with the rule of 72.

Show answer

$\ln 2 / \ln 1.06 \approx 11.9$ years; the rule gives 12.

6. **Medium** Find the future value of \$1,200 deposited at the end of each year for 10 years at 5%.

Show answer

$1{,}200 \times (1.05^{10} - 1)/0.05 \approx \$15{,}093.47$

7. **Medium** From the story: what did Franklin leave to Boston and Philadelphia, and on what terms?

Show answer

£1,000 each, to be lent at 5% to young married tradesmen who had finished apprenticeships, relent for 100 years, then mostly spent on public works, with the rest lent for another century.

8. **Hard** How much must be saved each month for 30 years at 0.5% a month to reach \$250,000?

Show answer

$1.005^{360} \approx 6.0226$; factor $1{,}004.52$; $P \approx 250{,}000/1{,}004.52 \approx \$248.88$

9. **Hard** A lump sum of \$600,000 today or \$50,000 a year for 20 years starting in one year: which is worth more today at 5%?

Show answer

PV of payments $50{,}000(1 - 1.05^{-20})/0.05 \approx \$623{,}111$; the payments are worth slightly more at 5%.

10. **Hard** Why did Franklin's funds grow less than his calculation predicted?

Show answer

Not all loans were repaid, fewer young tradesmen borrowed as times changed, and money sat idle at times, so the actual rate and time invested were lower than 5% every year.

11. **Challenge** Show why the rule of 72 works: use $\ln(1+r) \approx r$ for small r to show doubling time is about $69.3/R$ where R is the rate in percent, and explain why 72 is used instead.

    Show answer

    $n = \ln 2 / \ln(1+r) \approx 0.693/r = 69.3/R$. Because $\ln(1+r)$ is slightly less than r for typical rates, the true value is a little higher, and 72 is close and divisible by 2, 3, 4, 6, 8, 9 and 12.

COMMON MISTAKES

- Using simple interest when money compounds.
- Forgetting to match the rate to the period (monthly rate with monthly deposits).
- Treating example rates as guaranteed. Real investments rise and fall.

> **Make it a game · Rule of 72 Duel.** Your parent calls out interest rates. Race to say how many years it takes money to double using the Rule of 72, then check with a calculator. The closest estimate wins the round. Next, estimate what one hundred dollars grows to over forty years at seven percent. Finish with Franklin's gift and what time did to it.

7.2 Stocks: From the Dutch East India Company to Today

OBJECTIVES

- Explain what a share of stock is and how stock exchanges began.
- Calculate total return, dividend yield and the effect of price changes.
- Explain why stocks are risky in the short run and why owners expect higher returns.

> **Warm-up.** If you owned a small share of a bakery in your town, how could you make money from it? List two ways. How could you lose money?

WATCH

How does the stock market work? - Oliver Elfenbaum

TED-Ed · 4:30

https://www.youtube.com/watch?v=p7HKvqRI_Bo

> **WHEN TO WATCH**
> Before the story: how the stock market began with the Dutch East India Company.

BACKUP VIDEO

Stocks | How Equity Earns You Money

The Plain Bagel · 7:50

https://www.youtube.com/watch?v=vZCGsi5pfso

After the big idea: what owning a stock means. The video names a few companies only as examples.

KEY TERMS

stock (share)

A unit of ownership in a corporation, giving a claim on part of its profits and assets and usually a voice in choosing the company's directors.

dividend

A share of profits paid by a company to its shareholders.

capital gain

The increase in an investment's price above what you paid for it.

limited liability

The rule that a shareholder can lose no more than the amount invested, even if the company owes more.

stock exchange

An organized market where shares are bought and sold.

CORE IDEAS

The story. In 1602 the Dutch government joined several rival trading companies into one, the Vereenigde Oostindische Compagnie (VOC), the Dutch East India Company, with a monopoly on Dutch trade with Asia. To pay for its fleets, the company did something new: it invited anyone, not just a few rich partners, to buy shares, and over a thousand people in Amsterdam did, from merchants to servants. Because the company's capital was locked in for many years, shareholders who needed their money had to sell their shares to someone else. Buyers and sellers began meeting on the Dam and then at the new Exchange building (the Beurs, opened in 1611), and the world's first stock market was born. Nearly two centuries later, on May 17, 1792, twenty-four brokers met under a buttonwood tree on Wall Street and signed the agreement that began the New York Stock Exchange.

How they figured it out. The VOC's founders solved two problems at once. Long voyages needed more money than any family could risk, and investors needed a way out before the voyages ended. Shares divided ownership into small, equal, transferable pieces. Investors earned dividends when ships returned with spices, and they could sell their shares at a price set by buyers and sellers. The company was also a cautionary tale: it was enormously profitable for a long time, but its monopoly, its wars and its harsh treatment of peoples in Asia stained its history, and corruption and debt brought it down in 1799.

The big idea. A share of **stock** is part-ownership of a business. Shareholders earn a return in two ways: **dividends** (a share of profits paid out) and **capital gains** (a rise in the share price).
Total return $=$ (ending price $-$ starting price $+$ dividends)/starting price. Stock prices move every day with news, profits and the moods of buyers and sellers, so in

any one year they may fall sharply. Over long periods, broad groups of American stocks have historically returned more than bonds or savings accounts, because owners bear more risk. Past returns do not guarantee future ones.

In business today. Companies sell shares to raise money for growth; after that, investors trade the shares among themselves on exchanges. Owning a single company's stock is risky: any one company can fail. That is why most ordinary investors own many companies at once through funds (Lesson 7.4). Before investing, have an emergency fund and no high-interest debt, invest money you will not need for at least five years, and never invest in something you do not understand. In this course you will practice with a pretend portfolio only.

Who gained? Shares let ordinary people share in the profits of great enterprises and let builders gather capital from many savers. Owners also bear responsibility: shareholders of a company share in its moral record, which is one reason to know what a company does, not only what it earns.

PICTURE STUDY



The Courtyard of the Exchange in Amsterdam, Emanuel de Witte, 1653 · Oil on panel · Museum Boijmans Van Beuningen, Rotterdam

Image: Wikimedia Commons, public domain

The Amsterdam Exchange, opened in 1611, was a courtyard surrounded by covered arcades, with numbered pillars where traders in particular goods met. Here merchants traded grain, spices and VOC shares, and here the first stock market grew up.

Look closely

- Find the groups of men. What might each group be trading?
- Look for numbers or signs on the pillars. Why would traders meet at fixed places?
- Find the tower and the clock. Why did the Exchange keep strict hours?
- Find the dog. Why might the painter include ordinary details?

Talk about it

1. Why do buyers and sellers need a common place, or system, to trade shares?
2. What did VOC shareholders gain, and what risks did they carry?
3. How is today's stock market like and unlike this courtyard?

PROJECT

A Pretend Stock Portfolio

You will create a pretend portfolio of $10,000 divided among five companies whose products you understand, track it for four weeks, and calculate returns. This is practice only; no real money is invested, and the companies you choose are examples, not recommendations.

You will need

- Free spreadsheet
- Stock prices from a financial website viewed with a parent
- Ledger notebook

Steps

1. Choose five well-known companies in different industries whose products you use. Write one sentence on how each makes money.
2. Divide $10,000 of pretend money among them and record shares (dollars ÷ price) on day 1.
3. Each week for four weeks, record each price and any dividend. Calculate each holding's value and the portfolio's total.
4. Calculate each stock's return and the portfolio's return for the four weeks.
5. Find which stock moved most and look for the news that explains it.
6. Compare your portfolio's return with a broad market index over the same weeks.
7. Write a half page: What did you learn about short-term price swings? Would you have slept well with real money?

Tips

- Four weeks is far too short to judge an investment. The point is to watch how prices move.
- Include dividends in returns.

Check your work

☐ My spreadsheet calculates values and returns correctly.

- ☐ I can explain why my stocks moved.
- ☐ I understand this was practice only and not advice.

LEDGER NOTEBOOK

1. Draw a timeline: 1602 VOC shares, 1611 Amsterdam Exchange, 1792 Buttonwood Agreement, today.
2. Graph your pretend portfolio's value over four weeks.
3. Write the total-return formula and one example from your portfolio.

KEY FORMULAS

$$\text{Total return} = \frac{P_1 - P_0 + D}{P_0}$$

$$\text{Dividend yield} = \frac{\text{yearly dividend per share}}{\text{share price}}$$

$$\text{Market value} = \text{shares} \times \text{price}$$

From history. The Buttonwood Agreement was only two sentences long. The brokers promised to trade only with one another and to charge a commission of one quarter of one percent. For years they met outdoors or in coffee houses before moving indoors.

WORKED EXAMPLES

Example 1. A pretend investor buys 20 shares at $45 each. A year later the price is $49.50 and the company has paid $1.35 per share in dividends. Find the dividend yield (on the purchase price), the capital gain and the total return.

Show solution

1. Dividend yield: $1.35/45 = 3\%$.
2. Capital gain per share: $4.50, or 10%.
3. Total return: $(49.50 - 45 + 1.35)/45 = 5.85/45 = 13\%$. In dollars: $20 \times 5.85 = \$117$.

Answer: 3% dividend yield, 10% capital gain, 13% total return ($117).

Example 2. The next year the price falls from \$49.50 to \$37.13 and the dividend is \$1.35 again. Find the total return. What percent rise would the price then need to return to \$49.50?

Show solution

1. Total return: $(37.13 - 49.50 + 1.35)/49.50 = -11.02/49.50 \approx -22.3\%$.
2. Needed rise: $49.50/37.13 - 1 \approx 33.3\%$.

Answer: About -22.3%; a 25% price drop needs a 33% rise to recover. Losses are harder to undo than gains are to win.

Example 3. The VOC's founding capital was about 6.4 million guilders, divided among more than a thousand subscribers. If 1,143 investors had subscribed equally, about how much would each have put in?

Show solution

1. $6{,}400{,}000/1{,}143 \approx 5{,}599$ guilders.
2. In reality subscriptions ranged from very small to very large.

Answer: About 5,600 guilders on average, but the point of shares was that small savers could take part with much less.

PRACTICE

1. Easy A share bought at \$30 is sold at \$36 with \$0.60 in dividends. Find the total return.

   Show answer

   $6.60/30 = 22\%$

2. Easy Find the dividend yield of a \$2.40 yearly dividend on an \$80 share.

   Show answer

   3%

3. Easy What year did the Dutch East India Company first sell shares, and when was the Buttonwood Agreement signed?

   Show answer

   1602; May 17, 1792.

4. Medium You own 40 shares worth \$62 each. The price falls 15%. Find the new value and the dollar loss.

Show answer

\$2,108; loss \$372

5. Medium After a 50% drop, what percent rise is needed to return to the original price?

Show answer

100%

6. Medium Explain limited liability and why it made investing in companies more attractive.

Show answer

Shareholders can lose no more than they invested, even if the company's debts are larger, so savers could invest without risking everything they owned.

7. Medium From the story: why did VOC shareholders need a market to sell their shares?

Show answer

The company kept its capital for many years, so investors who needed money could get it only by selling shares to other people.

8. Hard A stock returns $+20\%$ one year and -20% the next. Starting with \$1,000, what is the ending value? Is the average return a good summary?

Show answer

$1{,}000 \times 1.2 \times 0.8 = \$960$; the average return is 0% but you lost 4%, so averages hide the effect of volatility.

9. Hard A company earns \$5 per share and pays out 40% as dividends. Its share price is \$100. Find the dividend per share and the yield.

Show answer

\$2; 2%

10. Hard Give three reasons a young person should have an emergency fund and no high-interest debt before investing in stocks.

Show answer

Stocks can fall just when cash is needed; selling at a loss for emergencies destroys returns; high-interest debt costs more than stocks are likely to earn, so paying it off is a better "return."

11. Challenge A stock's value over three years: $+25\%$, -10%, $+8\%$. Find the cumulative return and the average yearly (geometric) return.

Show answer

$1.25 \times 0.9 \times 1.08 = 1.215$, so 21.5%; geometric average $1.215^{1/3} - 1 \approx 6.7\%$ a year.

COMMON MISTAKES

- Thinking a stock price is the value of the company's products rather than of owning a share of its future profits.
- Judging an investment by a few weeks of price changes.
- Putting all your money in one company you like.

> **Make it a game · Pretend Share Ticker.** Make price cards for three pretend companies. Pretend you buy one hundred pretend dollars of each. Your parent flips a card each round showing price changes and dividends. Calculate total return and dividend yield for each company after five rounds. Then tell how the Dutch East India Company's shares were traded on the first exchange.

7.3 Bonds: A 1648 Water Board Bond and Hamilton's Debt

OBJECTIVES

- Explain what a bond is: face value, coupon, maturity and issuer.
- Calculate coupon income and current yield.
- Explain and calculate why bond prices fall when interest rates rise.

> **Warm-up.** If you lent a friend $100 and he promised to pay you $5 every year and the $100 back in ten years, would you rather the promise be in writing? What else would you want to know about him?

WATCH

Understanding Bonds - No-Frills Money Skills

Federal Reserve Bank of St. Louis · 12:44

https://www.youtube.com/watch?v=7t6o-wahxF4

> **WHEN TO WATCH**
> After the story: bond terms, prices and kinds of bonds.

BACKUP VIDEO

Bonds | Using Debt to Invest

The Plain Bagel · 7:05

https://www.youtube.com/watch?v=V-fg5phkl1g

Optional: bonds explained simply.

KEY TERMS

bond

A loan to a government or company in exchange for regular interest payments and repayment of the face value at maturity.

face value (par)

The amount the issuer promises to repay at maturity, often $1,000.

coupon rate

The yearly interest rate a bond pays on its face value.

maturity

The date the bond's face value is repaid.

yield

The return an investor earns on a bond at its current price; when prices fall, yields rise.

credit risk

The risk that the issuer will not pay interest or principal as promised.

CORE IDEAS

The story. In 1648 the Lekdijk Bovendams, a water board responsible for maintaining a stretch of dikes along the Lek River in Holland, needed money to repair its dikes. It issued a bond: a piece of goatskin promising to pay its holder interest every year, forever. The bond passed from owner to owner for centuries, and each new owner had the payments recorded on the document itself, and later on paper attached to it. In 2003 Yale University bought the bond for its collection of financial history, presented it to the water board's successor, and collected the interest due. The bond is still paying, more than 375 years after it was written.

How they figured it out. The Dutch learned that a government or public body that always pays its debts can borrow cheaply from its own citizens. The young United States learned the same lesson. After the War for Independence, the country owed large debts, and its old certificates traded at a fraction of their value because people doubted they would be paid. In 1790 the first Secretary of the Treasury, Alexander Hamilton, persuaded Congress to fund the national debt in full with new bonds and to take over the states' war debts as well, with taxes set aside to pay the interest. American credit was restored, and the new bonds became the foundation of the country's financial markets.

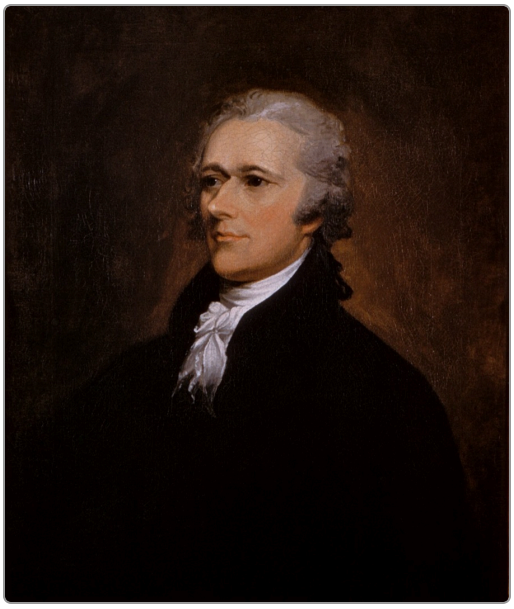
The big idea. A **bond** is a loan. The investor lends the **face value** (say $1,000), receives **coupon** interest (say 4%, or $40 a year), and gets the $1,000 back at **maturity**. Bonds are usually less risky than stocks but earn less over long periods. Bonds can be bought and sold before maturity, and their prices move opposite to interest rates: if new bonds pay 6%, no one will pay $1,000 for an old bond paying 4%, so its price falls until its **yield** matches the market. The longer the time to maturity, the more the price moves. Bonds also carry **credit risk**: U.S. Treasury bonds are considered among the safest; bonds of weaker companies pay more because they might default.

In business today. Governments issue bonds to pay for roads, schools and their budgets; companies issue bonds to build factories. Ordinary savers often own bonds

through funds or retirement plans. U.S. savings bonds, sold directly by the Treasury, are a simple way some families save for children. Bonds tend to steady a portfolio, because they often hold their value when stocks fall, which is why a portfolio usually shifts toward more bonds as its owner nears the time to use the money.

Who gained? Hamilton's plan rewarded those who held the debt when it was funded, including speculators who had bought old certificates cheaply from soldiers and farmers; that unfairness was debated fiercely at the time. But a nation that paid its debts could borrow, and the whole country gained from honest credit. "The wicked borroweth, and payeth not again" (Psalm 37:21): nations, too, are known by whether they keep their promises.

PICTURE STUDY



Alexander Hamilton, John Trumbull, 1806 · Oil on canvas

Image: Wikimedia Commons, public domain

John Trumbull, who had served in the War for Independence and painted many of its leaders, painted Hamilton after his death in 1804, working from an earlier likeness. Hamilton's face appears today on the ten-dollar bill.

Look closely

- Look at his expression. What qualities does Trumbull want you to see?
- Look at his clothes. Are they a merchant's, a soldier's or a statesman's?
- Notice the plain background. Where does the painter put all the attention?

Talk about it

1. Why did paying the old war debts in full matter for the new nation's future borrowing?
2. Who gained and who lost when old certificates were redeemed at full value?
3. How is a nation's credit like a person's good name?

PROJECT

A Bond Price Table

You will build a spreadsheet that prices a bond at different interest rates and maturities, graph how prices move, and compare a bond holding with a savings account.

You will need

- Free spreadsheet
- Ledger notebook
- Current Treasury yields from the U.S. Treasury website, viewed with a parent (for comparison only)

Steps

1. Set up input cells: face value $1,000, coupon rate, years to maturity, market yield.
2. Use the price formula (or the spreadsheet's PV function) to compute the price.
3. Make a table of prices for a 4% coupon bond at yields from 2% to 8% for maturities of 2, 10 and 30 years.
4. Graph price against yield for each maturity on one chart.
5. Describe which bond's price changes most and why.
6. Look up today's yields on 2-year, 10-year and 30-year Treasuries and write them with the date.
7. Write a half page on when an investor would prefer a short bond and when a long one.

Tips

- In many spreadsheets, PV(rate, nper, pmt, fv) gives a negative number; add a minus sign.
- Rates and yields here are examples, except the Treasury yields you look up.

Check your work

☐ My table shows prices falling as yields rise.

- ☐ My graph shows long bonds moving more than short ones.
- ☐ I can explain current yield and yield to maturity.

LEDGER NOTEBOOK

1. Draw a seesaw with “bond prices” on one end and “interest rates” on the other.
2. Copy your price table for the 10-year bond.
3. Write a timeline: 1648 water-board bond, 1790 Hamilton’s funding, today’s Treasury bonds.

KEY FORMULAS

$$\text{Coupon} = \text{coupon rate} \times \text{face value}$$

$$\text{Current yield} = \frac{\text{yearly coupon}}{\text{price}}$$

$$\text{Price} = C\,\frac{1-(1+y)^{-n}}{y} + \frac{F}{(1+y)^{n}} \quad \text{(yearly coupon } C\text{, face } F\text{, yield } y\text{, years } n\text{)}$$

From history. Water boards are among the oldest self-governing institutions in the Netherlands, going back to the Middle Ages: landowners along a river shared the cost of the dikes that protected them all, and borrowed together when repairs were urgent.

WORKED EXAMPLES

Example 1. A \$1,000 bond pays a 4% coupon yearly for 10 years. Find the yearly coupon and total cash received if held to maturity.

Show solution

1. Coupon: $0.04 \times 1{,}000 = \$40$.
2. Total: $10 \times 40 + 1{,}000 = \$1{,}400$.

Answer: \$40 a year; \$1,400 in all.

Example 2. Right after purchase, market rates for similar bonds rise to 6%. Using the price formula, what is the 10-year, 4% bond now worth? What if rates had fallen to 3%?

Show solution

1. At 6%: $40 \times \dfrac{1 - 1.06^{-10}}{0.06} + \dfrac{1{,}000}{1.06^{10}} = 40(7.3601) + 558.39 \approx \$852.80.$
2. At 3%: $40 \times \dfrac{1 - 1.03^{-10}}{0.03} + \dfrac{1{,}000}{1.03^{10}} \approx \$1{,}085.30.$

Answer: About $852.80 if rates rise to 6%; about $1,085.30 if they fall to 3%. Prices move opposite to rates.

Example 3. Find the current yield of the 4% bond at a price of $852.80. Explain why a buyer at that price is happy with it.

Show solution

1. Current yield: $40/852.80 \approx 4.69\%$.
2. The buyer also gains $147.20 at maturity when the bond repays $1,000; with that included, the total yield to maturity is 6%, matching new bonds.

Answer: 4.69% current yield, plus a gain at maturity: in all, 6%.

PRACTICE

1. Easy A $1,000 bond has a 5% coupon. What is the yearly interest?

   Show answer

   $50

2. Easy If market interest rates rise, what happens to the price of existing bonds?

   Show answer

   It falls.

3. Easy What is unusual about the Lekdijk Bovendams bond of 1648?

   Show answer

   It still pays interest more than 375 years later, and Yale collected interest on it after buying it in 2003.

4. Medium Find the current yield of a 6% coupon $1,000 bond priced at $1,100.

Show answer

$60/1{,}100 \approx 5.45\%$

5. Medium Price a 2-year, 5% coupon $1,000 bond (yearly coupons) at a 4% yield.

Show answer

$50/1.04 + 1{,}050/1.04^2 \approx 48.08 + 970.78 = \$1{,}018.86$

6. Medium Why do bonds of weaker companies pay higher interest than U.S. Treasury bonds?

Show answer

They carry more credit risk, the chance of not being repaid, so investors demand more interest.

7. Medium From the story: what did Hamilton's 1790 plan do, and why did it matter?

Show answer

It funded the national debt in full with new bonds and assumed the states' war debts, with taxes to pay interest; it restored American credit so the nation could borrow.

8. Hard Price a 5-year, 5% coupon $1,000 bond at a 4% yield, and explain why it is above $1,000.

Show answer

About $1,044.52; its coupon is higher than market rates, so buyers pay a premium.

9. Hard A 30-year bond and a 2-year bond both pay 4%. Rates rise to 5%. Which loses more value, and why?

Show answer

The 30-year bond, because its below-market coupon is locked in for many more years, so more of its payments are discounted at the higher rate.

10. Hard Explain why a portfolio usually holds more bonds as its owner approaches the time he needs the money.

Show answer

Bonds tend to be steadier than stocks, so a large stock drop just before the money is needed would do more harm; shifting to bonds reduces that risk.

11. Challenge A bond that pays \$25 a year forever (a perpetuity) is priced at C/y. Find its price at yields of 2.5% and 5%. What happens to the price when the yield doubles?

Show answer

\$1,000; \$500; the price halves.

COMMON MISTAKES

- Thinking bonds cannot lose value. Their prices fall when rates rise, and issuers can default.
- Comparing bonds by coupon instead of yield.
- Forgetting credit risk when a bond's yield looks unusually high.

Make it a game · Water Board Bonds. You are the water board in 1648. Write a paper bond with a face value, a coupon rate, a maturity and a signature. Your parent buys it with beans and you pay coupons each round. At maturity return the face value. Then drop the price and calculate the current yield. Say what credit risk means.

Scripture. "The wicked borroweth, and payeth not again: but the righteous sheweth mercy, and giveth." (Psalm 37:21, KJV)

A borrower who keeps his promises, whether a person, a company or a nation, is trusted; one who does not is soon unable to borrow.

7.4 Mutual Funds and Index Funds: John Bogle's "Folly"

OBJECTIVES

- Explain how mutual funds pool money and what an index fund is.
- Calculate a fund's net asset value and the long-run cost of expense ratios.
- Explain why low costs and broad diversification matter for ordinary investors.

> **Warm-up.** If you and nine friends each put $100 into a pool and bought shares in 50 companies together, how would you decide each person's share when someone wanted to leave? Write your idea.

WATCH

What The Heck Is An Index Fund?

Two Cents · 7:08

https://www.youtube.com/watch?v=u5eewhr7KKY

> **WHEN TO WATCH**
> After the story of Bogle: what an index fund is.

Note: Two Cents (PBS); the video mentions some fund companies as examples, not recommendations.

BACKUP VIDEO

Stock Indices & Index Fund Investing

The Plain Bagel · 8:31

https://www.youtube.com/watch?v=5A4lp_oZ5zg

With the big idea: stock indexes and index funds.

KEY TERMS

mutual fund

A company that pools money from many investors to buy a portfolio of stocks, bonds or other assets, each investor owning shares of the fund.

net asset value (NAV)

A fund's assets minus liabilities, divided by the number of fund shares: the value of one share.

index fund

A fund that holds the securities in a market index (such as an index of large U.S. companies) to match the index's return, rather than trying to beat it.

exchange-traded fund (ETF)

A fund whose shares trade on an exchange throughout the day like a stock; many ETFs follow indexes.

expense ratio

The yearly fee a fund charges, as a percentage of the money invested.

CORE IDEAS

The story. In 1949 a Princeton student named John Bogle read a magazine article about the young mutual-fund industry and chose it as the subject of his senior thesis. He concluded that most funds could not expect to beat the market as a whole, and that investors would be better served by low costs. After a career in the industry, he founded the Vanguard Group in 1975 with an unusual structure: the company would be owned by its funds, and so by their investors, so profits would go to lowering costs. In August 1976 he launched the First Index Investment Trust, which simply bought the stocks in a broad index of 500 large American companies. Critics called it "Bogle's Folly"; one competitor's ad said index funds were "un-American." It raised only about $11 million, far below its goal.

How they figured it out. Bogle's reasoning was arithmetic, not prediction. All investors together own the whole market, so before costs their average return must equal the market's return. After costs, the average investor must earn less than the market by the amount of the costs. Funds that try to pick winning stocks charge more and trade more, and most fail to beat the index over long periods once costs are counted. An index fund accepts the market's return and keeps costs very low. Over the following decades index funds grew to hold trillions of dollars, and fees across the whole industry fell.

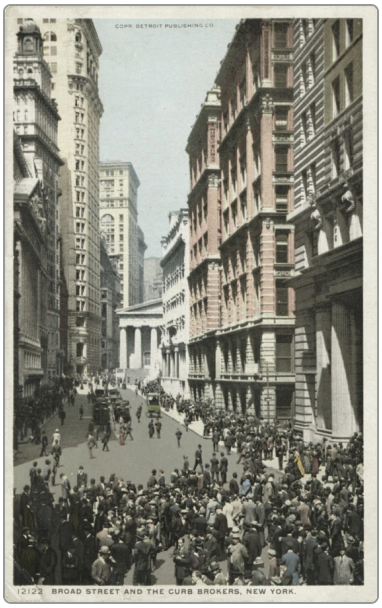
The big idea. A **mutual fund** lets a small investor own a slice of many companies (diversification) with professional management, for a fee. Its share value is the **net asset value**: total holdings ÷ shares. An **index fund** holds everything in an index. The fee, the **expense ratio**, comes out every year, so its effect compounds: a difference of a percentage point a year can cost a third or more of a portfolio's growth over forty

years. When comparing funds, look first at what they hold, then at their costs, and be wary of sales charges and high fees.

In business today. Most workplace retirement plans offer a menu of mutual funds, often including index funds and "target-date" funds that hold a mix of stocks and bonds that becomes more conservative over time. Fund companies must give investors a prospectus describing holdings, risks and fees. Some Christian investors also screen funds by what the companies do, avoiding businesses whose main products are sinful; such funds exist, and their costs and holdings should be read as carefully as any others. This course names no funds to buy.

Who gained? Bogle's idea did not make him the richest man in his industry; Vanguard's structure sent its profits back to fund owners as lower fees. Millions of ordinary savers, teachers and factory workers among them, gained by keeping more of their returns.

PICTURE STUDY



Broad Street and the Curb Brokers, New York, Detroit Publishing Company, c. 1905–1915 · Photograph · Library of Congress

Image: Wikimedia Commons, public domain

Before they had a building of their own, the "curb brokers" traded shares outdoors on Broad Street, next to the New York Stock Exchange, signaling to clerks in the windows above. The curb market later moved indoors and became the American Stock Exchange.

Look closely

- Find the crowd of brokers. How do they communicate?
- Find the Stock Exchange building. What does its architecture suggest?
- Imagine an ordinary saver in 1910. How easy would it be for him to own shares of many companies?
- Look at the windows above. Who might be watching from them?

Talk about it

1. Why was it hard for a small saver in 1910 to diversify?
2. How do mutual funds and index funds solve that problem?
3. Why do costs matter so much to the small saver?

PROJECT

Read a Fund's Facts and Compare Costs

You will read the fact sheets of two real funds (one index fund and one actively managed fund, chosen with a parent as examples only), compare their holdings and costs, and model the long-run effect of the cost difference.

You will need

- Two fund fact sheets or prospectus summaries from fund companies' websites, viewed with a parent
- Free spreadsheet
- Ledger notebook

Steps

1. For each fund record: objective, number of holdings, top holdings, expense ratio, any sales charges, and turnover.
2. Compare what each fund owns. Are they really different?
3. Model $5,000 invested for 40 years at an example 7% gross return with each fund's expense ratio. Make a year-by-year table and graph.
4. Calculate the dollar difference at 10, 20, 30 and 40 years.
5. Add $100 a month of contributions and recalculate.
6. Write a half page on what you learned about costs, and note that this is not a recommendation to buy either fund.

Tips

- Expense ratios are percentages per year. Convert to decimals for formulas.
- Sales charges (loads) are taken when you buy or sell; include them.

Check your work

☐ I recorded and compared holdings and costs correctly.

☐ My model shows the cost difference over time.

☐ I can explain Bogle's arithmetic in my own words.

LEDGER NOTEBOOK

1. Draw a mutual fund as a basket holding many companies, with investors' coins going in.
2. Graph the two funds' growth from your model.
3. Write Bogle's arithmetic in three lines.

KEY FORMULAS

$$\text{NAV} = \frac{\text{assets} - \text{liabilities}}{\text{fund shares outstanding}}$$

$FV = PV(1 + r - e)^n$ (yearly return r, expense ratio e, approximately)

From history. Bogle's 1951 Princeton thesis, "The Economic Role of the Investment Company," already argued that funds should be run for their shareholders and should not claim to be able to beat the market averages. He spent the rest of his career trying to make the industry live up to it.

WORKED EXAMPLES

Example 1. A fund holds stocks worth \$52.4 million and cash of \$1.6 million, owes \$0.4 million in expenses, and has 2.5 million shares outstanding. Find the NAV. How many shares does a \$1,000 investment buy?

Show solution

1. Net assets: $52.4 + 1.6 - 0.4 = \$53.6$ million.
2. NAV: $53.6 / 2.5 = \$21.44$.
3. Shares: $1{,}000 / 21.44 \approx 46.64$.

Answer: NAV \$21.44; about 46.64 shares.

Example 2. In this example, $10,000 earns 7% a year before costs for 40 years. Compare a fund with a 0.05% expense ratio and one with a 1.05% expense ratio.

Show solution

1. Low-cost: $10{,}000 \times 1.0695^{40} \approx \$146{,}971$.
2. High-cost: $10{,}000 \times 1.0595^{40} \approx \$100{,}934$.
3. Difference: $46,037.

Answer: The extra one percentage point of fees costs about $46,000, nearly a third of the low-cost result.

Example 3. Use Bogle's arithmetic: suppose the whole market returns 8% in a year, and the average actively managed dollar pays 1.2% in fees and trading costs while the average index dollar pays 0.1 percent. What is each group's average net return?

Show solution

1. Before costs, both average the market: 8%.
2. Active: $8 - 1.2 = 6.8\%$. Index: $8 - 0.1 = 7.9\%$.

Answer: 6.8% versus 7.9%. Some active managers will beat the market in any year, but on average they cannot, after costs.

PRACTICE

1. Easy A fund has net assets of $30 million and 1.5 million shares. Find the NAV.

   Show answer

   $20

2. Easy What does an index fund try to do?

   Show answer

   Match the return of a market index by holding its securities, rather than trying to beat it.

3. Easy When did John Bogle found Vanguard, and when did he launch his first index fund?

Show answer

1975; August 1976.

4. Medium Find the yearly fee on $40,000 at an expense ratio of 0.04% and at 0.95%.

Show answer

$16; $380

5. Medium A fund has a 5% front-end sales charge. How much of a $2,000 investment is actually invested?

Show answer

$1,900

6. Medium Explain why the average investor cannot beat the market after costs.

Show answer

All investors together own the market, so before costs they average the market return; costs then reduce the average below it.

7. Medium From the story: why was the first index fund called “Bogle’s Folly,” and how did it turn out?

Show answer

Critics thought settling for the market’s return was foolish, and it raised only about $11 million at first; index funds later grew to hold trillions and pushed fees down across the industry.

8. Hard In this example, $20,000 grows at 6% gross for 30 years. Find the ending value with a 0.10% fee and with a 1.50% fee, and the difference.

Show answer

$20{,}000 \times 1.059^{30} \approx \$111{,}663$; $20{,}000 \times 1.045^{30} \approx \$74{,}906$; difference about $\$36{,}757$

9. Hard A fund's NAV rises from \$18.20 to \$19.75 in a year and it pays \$0.42 per share in distributions. Find the total return.

   Show answer

   $(19.75 - 18.20 + 0.42)/18.20 \approx 10.8\%$

10. Hard Why might a Christian investor want to know what companies a fund holds, not just its return and cost?

    Show answer

    Owning shares is owning part of a business; a steward may wish to avoid profiting from businesses whose main products are harmful or sinful, while still keeping costs and risks in view.

11. Challenge Show that for small e, the fraction of final wealth lost to fees over n years is about $1 - e^{-ne/(1+r)}$, and estimate it for $e = 0.01$, $r = 0.07$, $n = 40$.

    Show answer

    Ratio $\left(\frac{1+r-e}{1+r}\right)^{n} = \left(1 - \frac{e}{1+r}\right)^{n} \approx e^{-ne/(1+r)}$. Here $e^{-0.374} \approx 0.688$, so about 31% of final wealth is lost.

COMMON MISTAKES

- Choosing a fund because of last year's high return.
- Ignoring expense ratios and sales charges.
- Owning several funds that all hold the same companies and thinking you are diversified.

> **Make it a game · The Bean Fund.** Pool beans from everyone into one jar and call each person's share a fund share. Add and remove beans to simulate gains, losses and a small expense fee, then calculate the net asset value per share. Then make an index fund by scooping a little of every kind of bean. Estimate how a one percent fee affects thirty years.

7.5 Risk, Return and Diversification: "A Portion to Seven, and Also to Eight"

OBJECTIVES

- Explain the relationship between risk and expected return.
- Calculate a portfolio's expected return and show how diversification reduces risk.
- Choose a stock-and-bond mix for a pretend portfolio based on time horizon.

> **Warm-up.** A merchant must send $100,000 of goods across a dangerous sea. Would you put it all on one ship or split it among five? Why? What would you give up by splitting it?

WATCH

How Diversification Works

The Plain Bagel · 10:54

https://www.youtube.com/watch?v=Pmlsa5-ruMk

> **WHEN TO WATCH**
> After the story of Markowitz: how diversification lowers risk.

BACKUP VIDEO

Risk and reward introduction | Finance & Capital Markets | Khan Academy

Khan Academy · 11:39

https://www.youtube.com/watch?v=mv5zucjq60k

Optional: risk and reward introduced at a whiteboard.

KEY TERMS

risk

In investing, the uncertainty of returns: the chance that results will differ from what you expect, including losses.

expected return

The probability-weighted average of possible returns.

diversification

Spreading money among many investments whose results do not all move together, to reduce risk.

asset allocation

How a portfolio is divided among broad kinds of investments such as stocks, bonds and cash.

time horizon

How long until the money will be needed.

CORE IDEAS

The story. Long before stock markets, the Teacher of Ecclesiastes gave this advice about trade: “Cast thy bread upon the waters: for thou shalt find it after many days. Give a portion to seven, and also to eight; for thou knowest not what evil shall be upon the earth” (Ecclesiastes 11:1-2). Merchants of the ancient world and of Renaissance Venice and Amsterdam followed it by spreading their cargoes across many ships. In 1599, when the second Dutch fleet to the East Indies returned to Amsterdam loaded with pepper and spices, the city rang its bells. The first expedition, a few years earlier, had lost a ship and most of its men and barely covered its costs. In 1952 a young economist, Harry Markowitz, published a paper called “Portfolio Selection” that turned the ancient advice into mathematics, work for which he later received a Nobel Prize.

How they figured it out. Markowitz showed that what matters is not only each investment’s risk and return but how they move **together**. If two investments rise and fall at different times, holding both makes the whole portfolio steadier than either alone, without giving up average return. The merchant who splits his cargo among five ships expects to lose about the same amount on average, but he is far less likely to lose everything. Diversification is the one way to reduce risk that does not require accepting a lower expected return.

The big idea. Higher expected returns come with higher **risk**: savings accounts are safe and pay little; bonds are steadier and pay more; stocks swing widely and, over long periods, have paid the most. **Diversification** removes the risk of any one company or industry, but not the risk of the whole market falling together. **Asset allocation**, the mix of stocks, bonds and cash, should fit your **time horizon**: money needed within a few years belongs in safe places; money for decades from now can

ride out the swings of stocks. The expected return of a portfolio is the weighted average of its parts: $E[R_p] = w_1 E[R_1] + w_2 E[R_2] + \cdots$.

In business today. Investment advisers ask clients about their goals, time horizons and how they would feel in a bad year, then recommend a mix. Target-date funds shift from stocks toward bonds as the target year approaches. The biggest mistakes ordinary investors make are concentrating in one stock (often their employer's), chasing whatever went up last year, and selling in a panic after a fall. Wise investing is dull: diversified, low-cost, steady contributions, held for a long time.

Think it through. Ecclesiastes gives its reason humbly: "thou knowest not what evil shall be upon the earth." Diversification is an admission that we do not know the future. Only God does, and the wise plan carefully while trusting Him (James 4:13-15).

PICTURE STUDY



The Return to Amsterdam of the Second Expedition to the East Indies, Hendrick Cornelisz. Vroom, c. 1599 · Oil on canvas · Rijksmuseum, Amsterdam

Image: Wikimedia Commons, public domain

Vroom, the first great Dutch marine painter, recorded the triumphant return in July 1599 of the fleet that brought a rich cargo of spices from the East. The voyage's success helped lead to the founding of the Dutch East India Company three years later.

Look closely

- Count the large ships. Why would investors send several ships instead of one?
- Find the small boats. Who might be rowing out to meet the fleet?
- Look at the flags and sails. What do they tell you about the mood of the day?
- Find the city on the horizon. Who was waiting there?

Talk about it

1. How does a fleet of several ships illustrate diversification?
2. What risks did the investors in this voyage face?
3. Why does Ecclesiastes give the reason "thou knowest not what evil shall be upon the earth"?

PROJECT

Build and Defend a Pretend Portfolio

You will design three pretend portfolios for different time horizons, calculate their expected returns, test them against a bad year, and defend your choices. No real money is invested and no specific investments are recommended.

You will need

- Free spreadsheet
- Ledger notebook
- Example returns given in this lesson

Steps

1. Set example expected returns: stocks 7%, bonds 4%, cash 2%; and example bad-year returns: stocks −30%, bonds +2%, cash +2%.
2. Design three portfolios: for money needed in 2 years (a car), in 10 years (a house down payment) and in 45 years (retirement).
3. Calculate each portfolio's expected return and its return in the bad year.
4. For a $20,000 portfolio, calculate the dollar loss in the bad year for each.
5. Explain which loss each owner could afford, given when he needs the money.
6. Show how adding a second, unrelated stock to a one-stock portfolio changes the chance of a large loss, using a two-stock example like the lesson's.
7. Write one page defending your three mixes using Ecclesiastes 11:2 and Markowitz's idea.

Tips

- Time horizon is the most important question in choosing a mix.
- A portfolio you will abandon in a panic is worse than a steadier one you will keep.

Check your work

☐ My three portfolios fit their time horizons.

☐ My expected-return and bad-year calculations are correct.

- [ ] My defense uses both Scripture and the mathematics of diversification.

LEDGER NOTEBOOK

1. Draw a risk-and-return ladder: cash, bonds, stocks.
2. Draw three pie charts for your three portfolios.
3. Copy Ecclesiastes 11:1-2 and write how it applies to a portfolio.

KEY FORMULAS

$E[R] = \sum p_i R_i$
$E[R_p] = \sum w_j E[R_j]$ (weights w_j add to 1)

From history. Markowitz later said he got the idea while reading in a library: an analysis of stocks that looked only at expected returns would tell an investor to put everything in one stock, yet no sensible investor did. The missing ingredient was risk, and how investments move together.

WORKED EXAMPLES

Example 1. In this example, Company A (a beach-resort company) returns $+30\%$ in a sunny year and -10% in a rainy year; Company B (an umbrella maker) returns -10% in a sunny year and $+30\%$ in a rainy year. Each kind of year has probability 0.5. Find each stock's expected return and the return of a 50/50 portfolio in each kind of year.

Show solution

1. A: $0.5(30) + 0.5(-10) = 10\%$. B: also 10%.
2. Sunny: $0.5(30) + 0.5(-10) = 10\%$. Rainy: $0.5(-10) + 0.5(30) = 10\%$.

Answer: Each stock expects 10% but swings between +30% and -10%; the 50/50 portfolio earns 10% every year. Diversification kept the return and removed the risk.

Example 2. A pretend portfolio is 60% stocks (expected return 7% in this example), 30% bonds (4%) and 10% cash (2%). Find its expected return. What is the expected value after 20 years for $10,000?

Show solution

1. $0.6(7) + 0.3(4) + 0.1(2) = 4.2 + 1.2 + 0.2 = 5.6\%$.
2. $10{,}000 \times 1.056^{20} \approx \$29{,}736$.

Answer: 5.6% a year in this example; about $29,700 after 20 years, though actual results would vary year to year.

Example 3. A merchant ships $100,000 of goods. Each ship has a 10% chance of being lost. Compare one ship with five ships carrying $20,000 each (losses independent): expected loss, and the probability of losing everything.

Show solution

1. Expected loss either way: $0.10 \times 100{,}000 = \$10{,}000$.
2. One ship: chance of losing everything 10%.
3. Five ships: $0.1^5 = 0.00001$, 1 in 100,000.

Answer: Same expected loss; the chance of ruin falls from 1 in 10 to 1 in 100,000. That is Ecclesiastes 11:2 in numbers.

PRACTICE

1. Easy Find the expected return if outcomes are $+20\%$ with probability 0.5 and -4% with probability 0.5.

   Show answer

   8%

2. Easy Put in order from lowest to highest risk: stocks, savings account, bonds.

   Show answer

   Savings account, bonds, stocks.

3. Easy What did Harry Markowitz publish in 1952?

   Show answer

   “Portfolio Selection,” the mathematical theory of diversification.

4. **Medium** A portfolio is 70% stocks (8% expected) and 30% bonds (4%). Find its expected return.

Show answer

6.8%

5. **Medium** In a year stocks fall 25% and bonds rise 3%. What is the return of a 70/30 portfolio? Of a 30/70 portfolio?

Show answer

$-16.6\%;\ -5.4\%$

6. **Medium** Why does diversification not protect against a fall in the whole market?

Show answer

When the whole market falls, most stocks fall together, so spreading among them does not offset the loss; that market risk remains.

7. **Medium** From the story: how did merchants follow Ecclesiastes 11:2 before stock markets existed?

Show answer

By spreading cargoes and investments across many ships and voyages, so one loss would not ruin them.

8. **Hard** Each of 4 independent ventures has a 20% chance of total loss. What is the probability that all four fail? That at least one succeeds?

Show answer

$0.2^4 = 0.0016;\ 1 - 0.0016 = 0.9984$

9. **Hard** A worker holds 80% of his retirement savings in his employer's stock. Explain two dangers.

Show answer

If the company fails, he may lose his job and most of his savings at once; one company is far riskier than a diversified fund.

10. Hard A student needs $8,000 for college in 18 months. Should it be in stocks? Explain with numbers from this lesson.

Show answer

No: in a bad year stocks might fall 30%, leaving about $5,600, with no time to recover. Short-horizon money belongs in safe, insured savings.

11. Challenge Two stocks each have expected return 10% and standard deviation 20%. If their returns are uncorrelated, the standard deviation of a 50/50 portfolio is $\sqrt{0.5^2(20^2) + 0.5^2(20^2)}$. Compute it, and the result for n equally weighted uncorrelated stocks.

Show answer

$\sqrt{100 + 100} \approx 14.1\%$; for n: $20/\sqrt{n}\%$, with expected return still 10%.

COMMON MISTAKES

- Thinking owning several funds that hold the same stocks is diversification.
- Choosing a mix by last year's returns instead of by time horizon.
- Taking stock-market risk with money needed soon.

Make it a game · Eggs in Many Baskets. Make four pretend companies on cards, each with a different risk. Roll a die for each, with a payoff rule you set. Compare putting every bean in one company against splitting them four ways across ten rounds. Calculate the portfolio's expected return. Then explain Ecclesiastes 11:2, a portion to seven, and also to eight.

Scripture. "Give a portion to seven, and also to eight; for thou knowest not what evil shall be upon the earth." (Ecclesiastes 11:2, KJV)

Diversification is the humble investor's answer to an unknown future.

UNIT 7

Investing Basics

Saving keeps money safe; investing puts it to work. In this unit you will learn the mathematics that makes patient investing powerful, the **time value of money**, starting with Luca Pacioli's "rule of 72" in 1494 and Benjamin Franklin's two-hundred-year gift to Boston and Philadelphia. Then you will meet the two great families of investments. **Stocks** are shares of ownership, born when the Dutch East India Company sold shares to the public in 1602. **Bonds** are loans, as old as the Dutch water board whose bond of 1648 still pays interest today.

You will learn how **mutual funds** pool many investors' money and how John Bogle's first index fund of 1976, mocked at the time as "Bogle's Folly," changed investing by keeping costs low. Last, you will study **risk, return and diversification**, and the ancient advice of Ecclesiastes 11:2: "Give a portion to seven, and also to eight." All investing in this course is done in pretend portfolios. The course names no investments to buy; real decisions belong to you and your parents and, as an adult, a qualified professional.

PREREQUISITES

- Can compute compound interest and use exponents (Units 3 and 4)
- Can use a spreadsheet with formulas
- Has an emergency-fund plan (Unit 2): investing comes after the emergency fund

MASTERY CHECKLIST

- ☐ I can calculate future value, present value and the future value of regular deposits, and use the rule of 72.
- ☐ I can explain what a stock is and calculate total return and dividend yield.
- ☐ I can explain what a bond is and why bond prices fall when interest rates rise.
- ☐ I can explain mutual funds and index funds and calculate the long-run cost of fees.
- ☐ I can explain risk, return and diversification and calculate a portfolio's weighted return.
- ☐ I can keep a pretend portfolio and explain why I chose its mix, without naming investments to buy.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Investor.gov: Introduction to Investing**: Free from the U.S. Securities and Exchange Commission. Plain explanations of stocks, bonds, funds, fees and fraud. Fits the whole unit.
- **Investor.gov Compound Interest Calculator**: Free official calculator. Use it to check your spreadsheet in Lessons 7.1 and 7.4.
- **Federal Reserve Bank of St. Louis: Econ Lowdown**: Free modules on saving, investing and the stock market from a Federal Reserve bank.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

7.1 The Time Value of Money: Pacioli's Rule of 72 and Franklin's Gift

3 sessions of 50 minutes

7.2	**Stocks: From the Dutch East India Company to Today**	3 sessions of 50 minutes
7.3	**Bonds: A 1648 Water Board Bond and Hamilton's Debt**	3 sessions of 50 minutes
7.4	**Mutual Funds and Index Funds: John Bogle's "Folly"**	3 sessions of 50 minutes
7.5	**Risk, Return and Diversification: "A Portion to Seven, and Also to Eight"**	3 sessions of 50 minutes

Unit 7 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars, percents or years. All rates are examples given in each problem. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **5 pts**
   Find the future value of $3,000 at 5% compounded yearly for 15 years.

2. **5 pts**
   Find the present value of $20,000 due in 12 years at 6%.

3. **6 pts**
   Find the future value of $150 deposited monthly for 30 years at 0.5% a month, and the total deposited.

4. **5 pts**
   Use the rule of 72 for 4% and 12%, and give the exact doubling time at 4%.

5. **5 pts**
   What did Franklin leave to Boston and Philadelphia, and what did he calculate?

6. **6 pts**
   Bought at $54, sold at $58.32 a year later with $1.62 of dividends. Find dividend yield and total return.

7. **5 pts**

   Explain what the Dutch East India Company invented in 1602 and why a stock market followed.

8. **6 pts**

   A 3-year, 5% coupon $1,000 bond (yearly coupons). Find its price at a 7% yield.

9. **5 pts**

   Explain why bond prices fall when interest rates rise.

10. **5 pts**

    What did Hamilton's 1790 funding plan do for American credit?

11. **6 pts**

    A fund has $84 million of assets, $1 million of liabilities and 4 million shares. Find the NAV and the shares bought with $2,500.

12. **6 pts**

    $15,000 grows at 7% gross for 35 years. Find the ending values with expense ratios of 0.05% and 1.25%, and the difference.

13. **5 pts**

    State Bogle's arithmetic argument for index funds.

14. **6 pts**

    A portfolio is 50% stocks (7%), 40% bonds (4%), 10% cash (2%). Find its expected return and its return in a year when stocks fall 30% and bonds and cash rise 2%.

15. **6 pts**

    Each of 3 independent ships carrying equal shares of a cargo has a 15% chance of loss. Find the expected fraction lost and the probability of losing everything. Compare with one ship.

16. **18 pts**

    Essay (two or three paragraphs): A friend has $5,000 and says he will put it all into one exciting company's stock because it doubled last year. Using the time value of money, diversification, costs, time horizon and Ecclesiastes 11:2, explain what you would tell him. Do not name any specific investment.

ANSWER KEY

1. $3{,}000 \times 1.05^{15} \approx \$6{,}236.78$
2. $20{,}000 / 1.06^{12} \approx \$9{,}939.39$
3. $150 \times (1.005^{360} - 1)/0.005 \approx \$150{,}677$; deposited $\$54{,}000$
4. 18 and 6 years; exact $\ln 2 / \ln 1.04 \approx 17.7$ years
5. £1,000 each, lent at 5% to young tradesmen; he calculated each would grow to about £131,000 in 100 years.
6. 3%; $(4.32 + 1.62)/54 = 11\%$
7. Shares sold to the public in a company with long-term capital; investors who needed money had to sell shares to others, so trading in shares grew into a stock market.
8. $50/1.07 + 50/1.07^2 + 1{,}050/1.07^3 \approx 46.73 + 43.67 + 857.10 = \$947.51$
9. Existing bonds pay fixed coupons below new market rates, so buyers will pay less for them until their yield matches new bonds.
10. It funded the national debt in full and assumed state war debts with taxes to pay interest, restoring trust so the nation could borrow.
11. $\$20.75$; about 120.48 shares
12. $15{,}000 \times 1.0695^{35} \approx \$157{,}550$; $15{,}000 \times 1.0575^{35} \approx \$106{,}146$; difference about $\$51{,}400$
13. All investors together earn the market return before costs; after costs the average investor earns less, so low-cost funds that match the market beat most high-cost funds over time.
14. 5.3%; $0.5(-30) + 0.5(2) = -14\%$
15. Expected 15% either way; all three lost $0.15^3 \approx 0.0034$, versus 0.15 for one ship.
16. A strong answer explains that past returns do not guarantee future ones; one stock carries company risk that diversification removes without lowering expected return (Markowitz, the ships example); money needed soon should not be in stocks, while long-horizon money benefits from time and compounding; low costs matter enormously over decades; an emergency fund and no high-interest debt come first; and Ecclesiastes 11:2 teaches humility about the future. It recommends talking with parents and, as an adult, a qualified professional.

PORTFOLIO PIECE: MY INVESTING NOTEBOOK

Assemble your compound-growth spreadsheet and rule-of-72 table, your four-week pretend stock portfolio, your bond price table and graph, your fund-cost comparison, and your three pretend portfolios with their defense. Add a one-page "investment policy" for your future self: when you will begin investing, what must come first, how you will diversify, how you will keep costs low, and how you will stay patient, with no specific investments named.

LOOK FOR	WHAT IT MEANS
Mathematics	Future value, present value, returns, bond prices, NAV and fee calculations are correct and shown.
Records	The pretend portfolio is tracked accurately with returns calculated each week.
Judgment	Portfolio mixes fit time horizons and are defended with diversification and cost reasoning.
Stewardship	The investment policy reflects patience, humility (Ecclesiastes 11:2) and the priority of emergency savings and avoiding debt.

UNIT 8

Markets Through History

Markets are made of people, and people can be wise or foolish, patient or greedy, calm or terrified. In this unit you will study the great manias, crashes and frauds of financial history, not to frighten you away from investing but to teach you what to expect and how to behave. You will watch Dutch buyers bid up tulip bulbs in 1637 and Londoners pour their savings into the South Sea Company in 1720. You will follow the crash of 1929 into the Great Depression, and the crashes of 1987, 2000 and 2008 that came after.

Then you will meet two of the most famous swindlers in history, Charles Ponzi and Bernard Madoff, and learn the warning signs of every "sure thing." Last, you will meet a Vermont gas-station attendant and janitor named Ronald Read, who quietly saved and invested for decades and left millions to his town's library and hospital. The lesson of the whole unit is the lesson of Proverbs: "he that maketh haste to be rich shall not be innocent" (Proverbs 28:20), and "he that gathereth by labour shall increase" (Proverbs 13:11).

PREREQUISITES

- Understands stocks, bonds, funds and diversification (Unit 7)
- Can compute percent change and compound growth
- Knows how banks and deposit insurance work (Unit 3)

MASTERY CHECKLIST

- ☐ I can describe the pattern of a speculative bubble and give historical examples.
- ☐ I can calculate percentage rises, falls, the gains needed to recover, and the effect of borrowing on margin.
- ☐ I can explain the causes and lessons of the crashes of 1929, 1987, 2000 and 2008 as history.
- ☐ I can explain how a Ponzi scheme works and list the warning signs of investment fraud.
- ☐ I can calculate the results of steady, patient investing and explain why behavior matters as much as knowledge.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- ***Memoirs of Extraordinary Popular Delusions and the Madness of Crowds*, by Charles Mackay (1841)**: Free. Read only the chapters on the Mississippi Scheme, the South Sea Bubble and Tulipomania with Lesson 8.1; skip the chapters on alchemy and fortune-telling. Mackay exaggerates some details, which modern historians have corrected; discuss this with a parent. Ages 15 and up.
- **Federal Reserve History: The Stock Market Crash of 1929**: Free essay from the Federal Reserve's history site. Fits Lesson 8.2. Its companion essays on the 1987 crash and the 2007–09 recession fit Lesson 8.3.
- **Investor.gov: Ponzi Schemes**: Free from the SEC. The official list of Ponzi-scheme warning signs. Fits Lesson 8.4.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

8.1	**Tulips and the South Sea Bubble**	3 sessions of 50 minutes
8.2	**1929 and the Great Depression**	3 sessions of 50 minutes
8.3	**1987, 2000 and 2008: Three Modern Crashes**	3 sessions of 50 minutes
8.4	**Frauds: Charles Ponzi and Bernard Madoff**	3 sessions of 50 minutes
8.5	**The Patient Investor: Ronald Read of Brattleboro**	3 sessions of 50 minutes

Unit 8 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars, percents or years. Historical figures are given in each problem; other rates are examples. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **5 pts**

   A price rises from 50 to 175, then falls to 35. Find the percent rise, the percent fall from the peak, and the overall change.

2. **5 pts**

   What gain is needed to recover from losses of 50%, 75% and 85%?

3. **6 pts**

   Describe the pattern of a speculative bubble using the South Sea Bubble of 1720.

4. **6 pts**

   $8,000 of stock is bought with $2,000 down. Find the equity and percent change on the investor's money if the price rises 15% and if it falls 15%.

5. **6 pts**

   The Dow fell from 381.17 to 41.22 between 1929 and 1932. Find the percent fall and the gain needed to recover.

6. **6 pts**

   Name three rules adopted after 1929 and what each was meant to do.

7. **5 pts**

   What happened on October 19, 1987, and what happened over the next two years?

8. **6 pts**

   The Nasdaq fell from 5,048.62 to 1,114.11. Find the drawdown and explain why a concentrated technology investor might never recover.

9. **6 pts**

   In this example, stocks fall 45% and bonds rise 4%. Compare $50,000 in 100% stocks with a 60/40 mix.

10. **6 pts**

    Explain how a Ponzi scheme works and why it must collapse.

11. **5 pts**

    A scheme promises 4% a month. What is the compounded yearly rate?

12. **6 pts**

    List five warning signs of investment fraud and two verification steps.

13. **6 pts**

    $400 is invested monthly at prices of $40, $25, $32 and $40. Find total shares and average cost per share.

14. **6 pts**

    Find the future value of $150 a month for 45 years at an example 0.5% a month.

15. **5 pts**

    Tell Ronald Read's story in two or three sentences and name the habits that made it possible.

16. **15 pts**

    Essay (one or two paragraphs): Using at least one mania, one crash and one fraud from this unit, and Proverbs 13:11 or 28:20, explain what history teaches a young investor about character.

ANSWER KEY

1. +250%; −80%; −30%
2. 100%, 300%, about 567%
3. A novelty (taking over the national debt) drew attention; prices rose and drew new buyers who cared only about rising prices; credit fed the rise and new companies were floated; buyers stopped coming and prices collapsed from about £1,000 to below £200, ruining many.
4. Up: equity $3,200, +60%. Down: equity $800, −60%.
5. About −89.2%; about 825%
6. Securities Act of 1933 and Exchange Act of 1934 (honest disclosure, SEC); Federal Reserve limits on margin (less borrowing to speculate); deposit insurance (no bank runs).
7. The Dow fell 22.6% in one day; it recovered within about two years.
8. About −77.9%; many individual technology companies failed or never regained their prices.
9. All stocks $27,500; 60/40 $30{,}000(0.55) + 20{,}000(1.04) = 16{,}500 + 20{,}800 = \$37{,}300$
10. It pays earlier investors with newer investors' money instead of real profits; the payouts require ever more new money, and when new money slows, it cannot pay and collapses.
11. $1.04^{12} - 1 \approx 60.1\%$
12. High returns with little risk, overly consistent returns, unregistered investments or sellers, secret or complex strategies, trouble getting paid or paperwork, pressure to act or recruit; verify registration (BrokerCheck, SEC search) and confirm an independent custodian.
13. $10 + 16 + 12.5 + 10 = 48.5$ shares; average cost $1{,}600/48.5 \approx \$32.99$, below the average price of $34.25
14. $150 \times (1.005^{540} - 1)/0.005 \approx \$413{,}400$
15. A Vermont gas-station attendant and janitor who lived simply, invested steadily in many established companies for decades, reinvested dividends and never borrowed; he left about $8 million, mostly to his town's library and hospital.
16. A strong answer shows that greed and haste fed the manias (tulips, South Sea), leverage and panic deepened crashes (1929, 2008), and the hope of easy, steady gains enabled frauds (Ponzi, Madoff); it contrasts these with patient, honest,

diversified saving like Ronald Read's; and it ties the lesson to Proverbs 13:11 or 28:20.

PORTFOLIO PIECE: MY MARKET HISTORY FILE

Assemble your bubble anatomy report, your 1929 margin simulation and family interview, your three-crashes comparison and crash plan, your Ponzi simulation and fraud checklist, and your lifetime investing model. Add a one-page letter to yourself to be read during the next market crash.

LOOK FOR	WHAT IT MEANS
History	Dates, prices and events are accurate and sourced.
Calculations	Percent changes, recovery gains, margin, drawdowns and investing models are correct.
Discernment	The fraud checklist and crash plan are specific and usable.
Character	The letter reflects patience, contentment and honesty grounded in Scripture.

8.1 Tulips and the South Sea Bubble

OBJECTIVES

- Describe the stages of a speculative bubble using tulip mania (1637) and the South Sea Bubble (1720).
- Calculate percentage rises and falls and the gain needed to recover a loss.
- Explain why bubbles happen and how Scripture warns against haste to be rich.

> **Warm-up.** Have you ever seen something become suddenly popular (a toy, a card, a shoe) and its price shoot up, then fall? Describe what happened and why people bought it.

WATCH

When a tulip bulb cost as much as a house: The Tulip Mania of 1637

The History Guy: History Deserves to Be Remembered · 11:00

https://www.youtube.com/watch?v=EreCgy4ECpA

> **WHEN TO WATCH**
> Before the story: the history of tulip mania, with many period paintings.

KEY TERMS

bubble

A period when the price of an asset rises far above any reasonable estimate of its value, driven by buyers expecting to sell to someone else at a higher price, followed by a collapse.

intrinsic value

An estimate of what an asset is worth based on the income or use it will provide.

joint-stock company

A company owned by shareholders who can buy and sell their shares.

speculation

Buying mainly in hope of a quick price rise rather than for the income or use of the thing bought.

greater-fool reasoning

Buying something overpriced on the belief that someone else will pay even more for it later.

The story. In the 1630s the Dutch fell in love with tulips, especially rare "broken" varieties with flamed and feathered petals. Prices for the rarest bulbs climbed through the winter of 1636–37, and people who had never grown a flower began trading promises to buy bulbs that were still in the ground, often in taverns. In early February 1637, at an auction in Haarlem, buyers suddenly failed to appear, and prices collapsed within days. Eighty years later, in 1720, London went through a far larger mania. The South Sea Company, which held a monopoly on British trade with Spanish America but earned little from it, offered to take over much of the national debt in exchange for its own shares. Its share price rose from about £128 in January 1720 to about £1,000 by the summer. Scores of other new companies were floated, some for absurd purposes. By December the price had fallen below £200, and thousands of families were ruined.

How they figured it out. Historians have since corrected some of the wilder tales told about tulip mania (most buyers were wealthy merchants, and fewer were ruined than legend says), but the pattern in both episodes is clear. A real novelty attracts attention; rising prices draw in buyers who care only that prices are rising; borrowing and easy credit feed the rise; people stop asking what the thing is worth and ask only who will buy it from them; and when buyers stop coming, prices collapse faster than they rose. Even Sir Isaac Newton is said to have sold his South Sea shares at a profit, bought back in near the top, and lost a large sum. Parliament had passed the Bubble Act in June 1720, restricting new joint-stock companies (partly to protect the South Sea Company from rivals); after the crash it investigated the directors and punished them.

The big idea. An asset's **intrinsic value** comes from what it will produce: a tulip bulb's flowers and offsets, a company's profits. When price races far beyond value on the hope of selling to a "greater fool," it is a **bubble**. The arithmetic of a crash is cruel: a fall from £1,000 to £150 is an 85% loss, and recovering it would require a 567% gain. Bubbles repeat because human nature does not change. Proverbs names the root: "He that hasteth to be rich hath an evil eye, and considereth not that poverty shall come upon him" (Proverbs 28:22).

In business today. Bubbles have appeared in canal and railway shares, land, technology stocks, houses and speculative digital assets. The signs are similar: prices

rising faster than any income could justify, talk that "this time is different," stories of easy riches, people borrowing to buy, and fear of missing out. A wise investor values things by what they produce, diversifies, avoids borrowing to speculate, and is content to miss a mania.

Who gained? Early sellers and promoters gained; late buyers lost. The South Sea Company's directors were investigated and had estates confiscated, and the scandal led to reforms in how Parliament oversaw the public finances. The lasting gain was a lesson: a nation and its people learned, painfully, to distrust promises of easy wealth.

PICTURE STUDY



Satire on Tulip Mania, Jan Brueghel the Younger, c. 1640 · Oil on panel · Frans Hals Museum, Haarlem

Image: Wikimedia Commons, public domain

A few years after the tulip crash, Jan Brueghel the Younger painted the traders as monkeys, a traditional way of mocking human folly. Every part of the mania is here: buying, selling, counting, celebrating, being hauled to court and ruin.

Look closely

- Find the monkeys weighing tulips and coins. What does this say about how they valued the flowers?
- Find the monkey writing in a ledger. What might he be recording?
- Find a monkey who has lost everything. What is happening to him?
- Why might the painter have chosen monkeys instead of people?

Talk about it

1. What does this satire say about crowds who stop asking what something is worth?
2. How does Proverbs 28:22 describe the speculators in this picture?
3. Can you think of a modern mania that someone could paint this way?

PROJECT

Anatomy of a Bubble

You will chart the price of the South Sea Company in 1720 from historical data, mark the stages of the bubble, and compare it with one other bubble from history, writing a report on the common pattern.

You will need

- Free spreadsheet
- Historical price data for South Sea Company shares in 1720 (from a library book or a university history page found with a parent)
- Ledger notebook

Steps

1. Find and record at least eight dated prices of South Sea stock during 1720, writing the source.
2. Graph the price over the year.
3. Label the stages on the graph: novelty, rising prices and new buyers, euphoria, the turn, panic, and the aftermath.
4. Calculate the rise to the peak, the fall from the peak, and the gain needed to recover.
5. Choose a second bubble (tulips, the Mississippi Company of 1719–20, the railway mania of the 1840s or the technology bubble of 2000) and find three facts about its rise and fall.
6. Make a table comparing the two bubbles stage by stage.
7. Write one page on the common pattern and on how a Christian investor can avoid being swept up, using Proverbs 28:20 or 28:22.

Tips

- Historical prices vary by source; record the source for every number.
- Notice how little time passed between the peak and the collapse.

Check your work

☐ My graph is dated and sourced, with stages labeled.

- [ ] My percent calculations are correct.
- [ ] My report identifies the pattern and a wise response.

LEDGER NOTEBOOK

1. Draw the shape of a bubble on a graph and label its stages.
2. Copy your comparison table.
3. Write Proverbs 28:20 and 28:22 and underline the word “haste.”

KEY FORMULAS

$$\text{Percent change} = \frac{\text{new} - \text{old}}{\text{old}} \times 100\%$$

$$\text{Gain needed to recover a loss of } L = \frac{L}{1 - L}$$

From history. The same year, 1720, saw the collapse of John Law’s Mississippi Company in France, a bubble in shares of a company that held a monopoly on trade with French Louisiana and took over the French national debt. Its collapse left France distrustful of banks and paper money for generations.

WORKED EXAMPLES

Example 1. South Sea shares rose from about £128 in January 1720 to about £1,000 in the summer, then fell to about £150 by December. Find the percent rise, the percent fall from the peak, and the change for the whole year.

Show solution

1. Rise: $(1{,}000 - 128)/128 \approx 681\%$.
2. Fall: $(150 - 1{,}000)/1{,}000 = -85\%$.
3. Year: $(150 - 128)/128 \approx +17\%$.

Answer: Up about 681%, then down 85%; a January buyer who held all year gained about 17%, but a summer buyer lost 85%.

Example 2. A summer buyer paid £1,000 a share. What gain would be needed to recover from £150? If the shares then grew 5% a year, how long would recovery take?

Show solution

1. Needed gain: $1{,}000/150 - 1 \approx 567\%$.
2. Years: $n = \ln(1{,}000/150)/\ln(1.05) \approx 38.9$.

Answer: A 567% gain, about 39 years at 5% a year.

Example 3. In this example, a tulip trader agrees in December to buy a bulb for 1,000 guilders in spring, intending to resell it. By February the price is 2,500 guilders; then it falls 90%. What is the bulb worth, and what is the trader's loss if he must still pay the contract?

Show solution

1. After the fall: $2{,}500 \times 0.10 = 250$ guilders.
2. Loss on the contract: $1{,}000 - 250 = 750$ guilders.

Answer: The bulb is worth 250 guilders, and he loses 750. (In fact many such contracts were later settled for a small fraction of their price, and many were never enforced.)

PRACTICE

1. Easy A price rises from 40 to 100. Find the percent rise.

   Show answer

   150%

2. Easy A price falls from 100 to 40. Find the percent fall.

   Show answer

   60%

3. Easy In what years did tulip mania and the South Sea Bubble collapse?

   Show answer

   1637 and 1720.

4. Medium What gain is needed to recover from a 60% loss? From an 80% loss?

Show answer

150%; 400%

5. Medium Define intrinsic value and explain how a bubble ignores it.

Show answer

The worth of an asset based on the income or use it provides; in a bubble, buyers ignore that and pay only because they expect to sell higher.

6. Medium List four warning signs that a market may be in a bubble.

Show answer

Any four: prices rising far faster than income or use can justify, "this time is different" talk, many new inexperienced buyers, heavy borrowing to buy, stories of easy riches, fear of missing out, flood of new companies or products.

7. Medium From the story: what did the South Sea Company offer the British government, and what happened to its share price in 1720?

Show answer

To take over much of the national debt in exchange for its shares; the price rose from about £128 to about £1,000 and then fell below £200 by December.

8. Hard An investor puts £500 into South Sea stock at £300 and £500 more at £900. The price falls to £150. Find his shares, his average cost per share and his loss.

Show answer

Shares $500/300 + 500/900 \approx 1.667 + 0.556 = 2.222$; average cost $1{,}000/2.222 = £450$; value $2.222 \times 150 = £333$; loss £667.

9. Hard Explain "greater-fool reasoning" and why it must eventually fail.

Show answer

Buying an overpriced asset expecting someone else to pay more. Eventually the supply of new buyers willing to pay more runs out, and the price must fall to what the asset is worth.

10. Hard Newton is said to have lost heavily in the South Sea Bubble. What does this teach about intelligence and investing?

Show answer

Brilliance does not protect against greed, fear and crowd behavior; temperament, patience and humility matter as much as knowledge.

11. Challenge A price triples in 6 months and then falls 75% in 2 months. Find the overall change, and the monthly growth rate during the rise.

Show answer

$3 \times 0.25 = 0.75$, a 25% overall loss; monthly growth $3^{1/6} - 1 \approx 20.1\%$.

COMMON MISTAKES

- Believing that a rising price proves something is valuable.
- Thinking a large loss can be made back by an equally large percentage gain.
- Buying because everyone else is buying.

Make it a game · Tulip Auction. Use a paper tulip and a pile of paper chips. Take turns bidding it up each round; the first player who refuses to pay more is left holding the tulip and must say what it is really worth. Then crash the price by half. Calculate the gain needed to recover from a fifty percent loss. Tell the South Sea Bubble story.

Scripture. “A faithful man shall abound with blessings: but he that maketh haste to be rich shall not be innocent.” (Proverbs 28:20, KJV)

The speculator’s haste is the opposite of faithful, patient work. Proverbs warns that haste to be rich leads to sin and ruin.

8.2 1929 and the Great Depression

OBJECTIVES

- Describe the stock-market crash of 1929 and the Great Depression that followed.
- Calculate the effect of buying stocks on margin and the depth and length of the decline.
- Explain the lessons drawn from 1929, including the rules created afterward, as history.

> **Warm-up.** If you borrowed $9 to add to your own $1 and bought $10 of something, what would happen to your $1 if the price fell 10%? Work it out.

WATCH

The Federal Reserve and the Great Depression

Atlanta Fed · 5:36

https://www.youtube.com/watch?v=FOwHFf4pg7U

> **WHEN TO WATCH**
> After the story of 1929: an Atlanta Fed economist on the Federal Reserve and the Great Depression.

KEY TERMS

margin

Buying securities partly with money borrowed from a broker, using the securities as collateral.

margin call

A broker's demand for more money when the value of securities bought on margin falls; if not met, the broker sells them.

leverage

Using borrowed money to increase the size of an investment, which magnifies both gains and losses.

Dow Jones Industrial Average

An index of the stock prices of a group of large American companies, published since 1896.

depression

A severe, long-lasting decline in economic activity, with high unemployment.

CORE IDEAS

The story. Through the 1920s American stock prices climbed, and by 1929 shoeshine boys and clerks were said to be trading tips. Many investors bought on **margin**, putting down a small part of the price and borrowing the rest from their brokers. The Dow Jones Industrial Average peaked at 381.17 on September 3, 1929. On Thursday, October 24, a wave of selling hit the exchange; bankers met and bought shares to steady the market. But on Monday and Tuesday, October 28 and 29, prices collapsed again, with record volumes of shares sold as brokers sold out customers who could not meet margin calls. The decline went on for nearly three years. By July 8, 1932, the Dow stood at 41.22, about 89% below its peak, and it did not regain its 1929 high until November 1954.

How they figured it out. The crash did not by itself cause the Great Depression, but it was followed by a terrible chain of events: bank failures (Unit 3), a shrinking money supply, collapsing trade, falling prices and wages, and unemployment that reached about a quarter of the workforce by 1933. Economists still study and debate the causes; the Federal Reserve itself has acknowledged that its policies in those years made things worse. Congress responded with lasting rules: the Securities Act of 1933 and the Securities Exchange Act of 1934 required companies to tell investors the truth about their finances and created the Securities and Exchange Commission (SEC); the Federal Reserve gained power to limit margin borrowing; and deposit insurance protected bank savers.

The big idea. Leverage magnifies everything. With 10% down and 90% borrowed, a 10% fall wipes out the investor's entire stake, and a margin call forces a sale at the bottom. That is why the 1929 crash was so destructive to individuals: they could not wait for recovery because they did not own their shares outright. The depth of a decline also matters: a fall of 89% requires a gain of over 800% to recover. Even an investor who held through 1929–1932 without borrowing, and collected dividends, waited many years to be made whole, though a person who kept buying steadily through the 1930s did far better.

In business today. Margin lending still exists, but with legal limits; in general, the initial margin for stocks has long been 50%. Companies must publish audited financial statements, and the SEC investigates fraud. The Federal Reserve now acts as a lender of last resort in a panic. None of this prevents prices from falling, but it makes the system more honest and less fragile. For individuals, the lesson is unchanged: do not borrow to buy stocks, keep an emergency fund, diversify, and invest money you will not need for many years.

Who gained? Almost no one gained from the Depression. But the rules that came out of it, honest disclosure, insured deposits and limits on borrowing to speculate, are taught today as some of the most successful reforms in American financial history.

PICTURE STUDY



Crowd Outside the New York Stock Exchange, October 1929, Unknown photographer, 1929 · Photograph · U.S. Social Security Administration historical photograph collection

Image: Wikimedia Commons, public domain

As news of the crash spread, crowds gathered on Wall Street outside the Stock Exchange. Most could do nothing but watch; their fortunes were being decided inside.

Look closely

- Look at the crowd. What are they waiting for?
- Find the Stock Exchange building. How does its grandeur contrast with the mood?
- Look at the people's clothing. Who were these people?
- Imagine the conversations. What news would they be passing along?

Talk about it

1. Why could many investors in 1929 not simply wait for prices to recover?
2. How did the rules of 1933 and 1934 try to make markets more honest?
3. What would you tell a friend tempted to borrow to buy stocks?

PROJECT

The 1929 Margin Simulation and a Family History

You will simulate a margin investor and a cash investor through the actual path of the Dow from 1928 to 1936, and, if possible, interview an older relative about family stories of the Depression.

You will need

- Free spreadsheet
- Year-end or monthly Dow Jones values 1928–1936 (from a library, Federal Reserve History or a university page, found with a parent)
- Ledger notebook

Steps

1. Record the Dow's value at least every six months from January 1928 to December 1936, with the source.
2. Investor A buys $10,000 of the index in January 1929 with $1,000 down. Assume the broker sells him out if his equity falls below 25% of the value. Track his equity and find when he is sold out.
3. Investor B buys $1,000 of the index with cash in January 1929 and holds. Track his value.
4. Investor C invests $100 every six months starting January 1929. Track her shares and value.
5. Graph all three and compare at the end of 1936.
6. Interview a grandparent or older relative (with your parents' help) about what their parents or grandparents told them about the Depression.
7. Write one page on the lessons of 1929 for an investor today.

Tips

- Ignore dividends to keep the simulation simple, and say so.
- Real margin rules varied by broker in 1929.

Check your work

☐ My spreadsheet uses sourced historical values.

- ☐ I found when Investor A was sold out and compared all three results.
- ☐ My report connects the numbers to lasting lessons.

LEDGER NOTEBOOK

1. Graph the Dow from 1928 to 1936 and mark September 3, 1929, October 29, 1929 and July 8, 1932.
2. Draw a balance with “your money” and “borrowed money” on one side and “stock” on the other, showing what happens when the stock falls.
3. List three rules created after 1929 and what each does.

KEY FORMULAS

$$\text{Equity} = \text{value of securities} - \text{loan}$$

$$\text{Return on equity with leverage} \approx \frac{\text{change in value}}{\text{own money invested}}$$

From history. On October 24, 1929, bankers led by Thomas Lamont of J. P. Morgan & Co. met and pooled money to buy stocks; Richard Whitney, vice president of the Exchange, walked onto the floor and placed large orders to steady prices. It worked for a day. Whitney was later convicted of embezzlement and sent to prison in 1938, a reminder that even trusted leaders must be held to honest accounts.

WORKED EXAMPLES

Example 1. In 1929 an investor buys $10,000 of stock with $1,000 of his own money and a $9,000 broker loan. What is his equity, and his percent gain or loss, if the stock rises 10%? If it falls 10%? If it falls 20%?

Show solution

1. Up 10%: value $11,000, equity $2,000: a 100% gain.
2. Down 10%: value $9,000, equity $0: a 100% loss.
3. Down 20%: value $8,000, equity $-$1,000: he owes the broker $1,000 beyond his lost stake.

Answer: Leverage turned a 10% move into a 100% gain or loss, and a 20% fall left him in debt.

Example 2. The Dow fell from 381.17 (September 3, 1929) to 41.22 (July 8, 1932). Find the percent fall and the gain needed to recover.

Show solution

1. Fall: $(41.22 - 381.17)/381.17 \approx -89.2\%$.
2. Gain needed: $381.17/41.22 - 1 \approx 825\%$.

Answer: About 89% down; an 825% rise was needed to recover, which took until 1954 for the index price.

Example 3. In this example, an investor without debt buys $1,000 of a broad index at its 1929 peak, and another invests $100 a year at the end of each year from 1930 to 1939 at whatever prices prevail. Explain in words (no calculation) why the second investor's average cost per share is far lower.

Show solution

1. The first investor bought everything at the highest price.
2. The second bought some shares at the low prices of 1931–1933, getting many more shares per dollar.

Answer: Buying steadily through a decline lowers the average cost, so the steady buyer recovers much sooner. This is the idea behind dollar-cost averaging (Lesson 8.5).

PRACTICE

1. Easy With 10% margin, how much of a $5,000 stock purchase is borrowed?

   Show answer

   $4,500

2. Easy What was Black Tuesday?

   Show answer

   October 29, 1929, one of the worst days of the crash.

3. Easy What did the Securities Exchange Act of 1934 create?

   Show answer

   The Securities and Exchange Commission (SEC).

4. **Medium** $4,000 of stock is bought with $2,000 down (50% margin). The price falls 30%. Find the equity and the percent loss on the investor's own money.

Show answer

Value $2,800; equity $800; loss 60%

5. **Medium** A stock falls 89%. What percent gain is needed to recover?

Show answer

About 809%

6. **Medium** Why did margin buying make the 1929 crash worse?

Show answer

Falling prices triggered margin calls; investors who could not pay were sold out, and those forced sales pushed prices down further.

7. **Medium** From the story: when did the Dow peak in 1929, and when did it reach its low?

Show answer

September 3, 1929 at 381.17; July 8, 1932 at 41.22.

8. **Hard** An investor holds $20,000 of stock bought with $5,000 down. The broker requires equity of at least 25% of value. Below what value is he called?

Show answer

Loan $15,000; equity $V - 15{,}000 \geq 0.25V$ means $V \geq \$20{,}000$, so any fall at all triggers a call. (He starts exactly at the limit.)

9. **Hard** Explain why the crash and the Depression are not the same thing.

Show answer

The crash was a fall in stock prices; the Depression was a long, severe decline in the whole economy, made worse by bank failures, a shrinking money supply, falling trade and prices, and policy mistakes.

10. **Hard** Give two reasons a person who did not borrow and who kept a steady job could have come through 1929–1932 better than a margin investor.

Show answer

He was never forced to sell at the bottom, and he could keep buying at low prices, lowering his average cost.

11. **Challenge** If an index fell 89% and then grew 12% a year, how many years would it take to regain its peak? Compare with the actual 25 years (1929–1954) and suggest why they differ.

    Show answer

    $\ln(1/0.11)/\ln(1.12) \approx 19.5$ years; the actual recovery took longer because growth was uneven (another sharp fall in 1937–38 and slow years in the 1940s), and the index price ignores dividends, which shortened real recovery for those who reinvested them.

COMMON MISTAKES

- Borrowing to buy stocks.
- Assuming a market that has fallen a lot cannot fall further.
- Confusing a stock-market crash with an economic depression.

> **Make it a game · Margin Call.** Borrow beans from your parent to buy more pretend shares than you could afford. Your parent flips cards showing the market rising, then falling. Calculate your gain on the way up and your loss and margin call on the way down. Count how long recovery takes. Then describe the crash of 1929 in three sentences.

8.3 1987, 2000 and 2008: Three Modern Crashes

OBJECTIVES

- Describe the 1987 crash, the technology bubble of 2000 and the financial crisis of 2008 as history.
- Calculate declines and recoveries and compare a concentrated and a diversified portfolio.
- Explain what a patient, diversified investor should do in a crash.

> **Warm-up.** Ask a parent or grandparent whether they remember any of these: October 1987, the year 2000, or the fall of 2008. What do they remember about money from that time?

WATCH

The 2008 Financial Crisis - 5 Minute History Lesson

The Plain Bagel · 5:35

https://www.youtube.com/watch?v=eD9ry2Lgglw

> **WHEN TO WATCH**
> After the story, before the worked examples: how the 2008 crisis unfolded.

Note: Begins with a brief sponsor message, which can be skipped.

KEY TERMS

bear market

A decline of 20% or more in a broad market index from its peak.

Nasdaq Composite

An index of stocks listed on the Nasdaq exchange, heavy in technology companies.

subprime mortgage

A home loan made to a borrower with weak credit, usually at a higher rate.

mortgage-backed security

A bond whose payments come from a pool of home mortgages.

recession

A significant decline in economic activity lasting more than a few months.

CORE IDEAS

The story. On Monday, October 19, 1987, the Dow Jones Industrial Average fell 22.6% in a single day, still its largest one-day percentage drop. Computer-driven selling strategies and panic fed on each other. Yet within two years the market had recovered. In the late 1990s, excitement over the internet drove technology stocks to extraordinary prices; many new companies with little or no profit were valued in the billions. The Nasdaq Composite peaked on March 10, 2000, at 5,048.62, then fell about 78% by October 2002, and did not regain that peak until 2015. In 2006 and 2007 American house prices, which had been driven up by easy lending, began to fall. Banks and investors around the world held securities built on risky mortgages. On September 15, 2008, the investment bank Lehman Brothers filed for bankruptcy, and a worldwide financial panic followed. The broad U.S. stock market fell more than half from its 2007 peak to its low in March 2009.

How they figured it out. Each crisis had its own causes, but historians and regulators drew common lessons. In 1987 the exchanges added "circuit breakers" that pause trading after very large drops. After 2000, investors relearned that a company's value depends on its future profits, not on excitement. After 2008, lessons about borrowing too much, lending to people who could not repay, and hiding risk in complicated securities led to new rules for banks and mortgage lenders. (How well those rules work is still debated; this course teaches the events as history.) In every case, investors who sold in panic near the bottom locked in their losses, while patient, diversified investors who kept their jobs and kept investing eventually recovered.

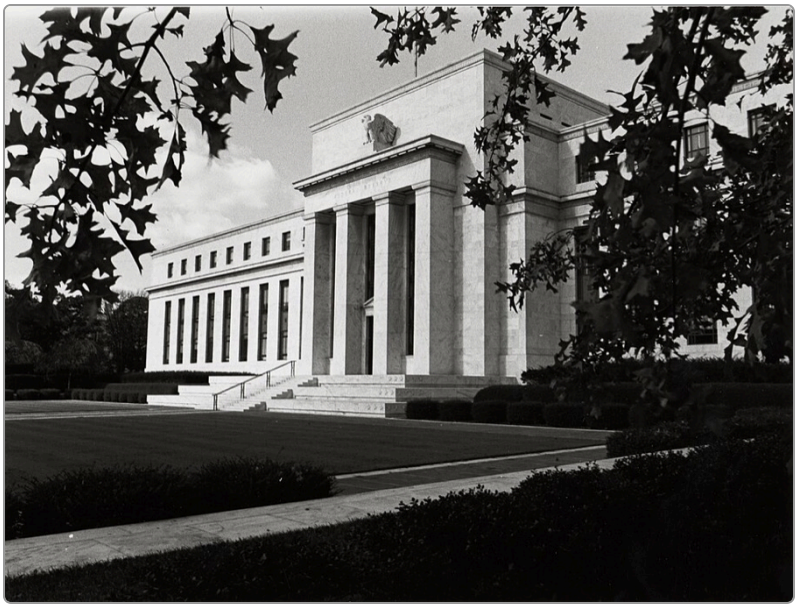
The big idea. Crashes are a normal, if painful, part of investing. Broad markets have fallen 20% or more many times and have recovered every time so far, though recovery can take years. A **concentrated** investor, such as someone who owned only technology stocks in 2000, may never recover; a **diversified** investor's losses are smaller and recovery faster. Leverage again made the worst crisis worse: in 2008 many families who had borrowed nearly the whole price of a house owed more than it was worth. The behaviors that protect you are the same every time: an emergency

fund, little debt, diversification, a mix fitted to your time horizon, and the discipline not to sell in panic.

In business today. Financial news is loud during a crash, and it is designed to hold your attention. Wise investors prepare beforehand by deciding their mix of investments and writing down what they will do in a crash (usually: keep contributing, rebalance, do not sell in panic). They remember that a crash is the time when steady buyers purchase shares at low prices. “Be patient therefore… Behold, the husbandman waiteth for the precious fruit of the earth” (James 5:7).

Who gained? Those who kept their jobs, kept saving and kept investing through each crash gained over time. Those who borrowed heavily, concentrated their bets or sold in fear lost the most. The crises also hurt many who had done nothing wrong, workers who lost jobs and savers near retirement, which is why prudence and charity toward neighbors both matter in hard times.

PICTURE STUDY



The Federal Reserve Board Building, Washington, Unknown photographer, 1937 · Photograph · Federal Reserve Board

Image: Wikimedia Commons, public domain

The Federal Reserve Board's headquarters in Washington was completed in 1937, in the years after the banking crisis. In 1987, 2008 and other panics, decisions made in this building about lending to banks and setting interest rates were central to how the crises unfolded.

Look closely

- Look at the architecture. What feelings is a building like this meant to give?
- Find the eagle above the entrance. What does it symbolize?
- Notice the plain, solid style. Why might a central bank want to look steady?

Talk about it

1. Why does a central bank matter during a financial panic?
2. What can a central bank do, and what can it not do, for an individual investor?
3. What does an investor's own "steadiness" in a crisis depend on?

PROJECT

Three Crashes, Three Portfolios

You will use historical index data to see how three pretend portfolios (concentrated, all-stock diversified, and balanced) fared through 1987, 2000–2002 and 2007–2009, and write your own crash plan.

You will need

- Free spreadsheet
- Historical index values for the three periods (Federal Reserve History, a university page or a library source, found with a parent)
- Ledger notebook

Steps

1. Record the peak, trough and dates for the Dow in 1987, the Nasdaq in 2000–2002 and a broad index in 2007–2009, with sources.
2. Compute each drawdown and the gain needed to recover.
3. Using example returns, compare three portfolios through 2000–2002: 100% technology, 100% broad stocks, and 60% broad stocks / 40% bonds.
4. Find how long each index took to regain its previous peak.
5. Write a one-page crash plan for your future self: your mix, what you will do (and not do) when markets fall, and how you will keep your emergency fund and income safe.
6. Discuss your plan with a parent.

Tips

- Record whether index values include dividends; most quoted index levels do not.
- Your crash plan should be short enough to read in a minute when you are afraid.

Check your work

☐ My drawdowns and recovery gains are correct and sourced.

☐ My comparison shows the effect of concentration and diversification.

- [ ] My crash plan is specific and realistic.

LEDGER NOTEBOOK

1. Draw the three crashes as dips on a timeline from 1985 to 2015.
2. Copy your portfolio comparison table.
3. Write your three-line crash rule in a box.

KEY FORMULAS

$$\text{Drawdown} = \frac{\text{trough} - \text{peak}}{\text{peak}}$$

$$\text{Recovery gain} = \frac{\text{peak}}{\text{trough}} - 1$$

From history. After the 1987 crash, the Federal Reserve announced the next morning that it stood ready to provide liquidity to support the financial system. Markets steadied, and the crash did not lead to a recession, a contrast with 1929 that economists have studied closely.

WORKED EXAMPLES

Example 1. On October 19, 1987, the Dow fell 508 points to close at 1,738.74. Find the previous close and confirm the percent drop.

Show solution

1. Previous close: $1{,}738.74 + 508 = 2{,}246.74$.
2. Drop: $508 / 2{,}246.74 \approx 22.6\%$.

Answer: About 2,246.74 before; a 22.6% one-day fall.

Example 2. The Nasdaq Composite fell from 5,048.62 (March 10, 2000) to 1,114.11 (October 9, 2002). Find the drawdown and the gain needed to recover.

Show solution

1. Drawdown: $(1{,}114.11 - 5{,}048.62) / 5{,}048.62 \approx -77.9\%$.
2. Recovery: $5{,}048.62 / 1{,}114.11 - 1 \approx 353\%$.

Answer: About 78% down; a 353% gain was needed, which took until 2015.

Example 3. In this example, during 2008–09 stocks fell 50% and high-quality bonds rose 5%. Compare $100,000 in 100% stocks with a 60/40 stock-bond mix. Then suppose stocks rise 70% from the bottom and bonds 3%. Compare again.

Show solution

1. All stocks: $50,000; 60/40:
   $60{,}000(0.5) + 40{,}000(1.05) = 30{,}000 + 42{,}000 = \$72{,}000.$
2. Recovery: all stocks $50{,}000(1.7) = \$85{,}000$; 60/40 (without rebalancing)
   $30{,}000(1.7) + 42{,}000(1.03) = 51{,}000 + 43{,}260 = \$94{,}260.$

Answer: The 60/40 mix lost 28% instead of 50% and stood higher after this partial recovery. (Over very long periods, stocks have usually earned more; the mix trades some growth for steadiness.)

PRACTICE

1. Easy What percent did the Dow fall on October 19, 1987?

   Show answer

   22.6%

2. Easy Define a bear market.

   Show answer

   A decline of 20% or more from a market's peak.

3. Easy What firm's bankruptcy on September 15, 2008, set off a worldwide panic?

   Show answer

   Lehman Brothers.

4. Medium An index falls from 1,565 to 677. Find the drawdown and the gain needed to recover.

   Show answer

   About 56.7% down; about 131% needed

5. Medium A portfolio is 50% stocks and 50% bonds. Stocks fall 40%; bonds rise 4%. Find the portfolio's change.

   Show answer

   $0.5(-40) + 0.5(4) = -18\%$

6. Medium Why did borrowing make the 2008 crisis worse for many homeowners?

Show answer

Those who had borrowed nearly the full price owed more than their houses were worth when prices fell, and many lost their homes.

7. Medium From the story: when did the Nasdaq peak in 2000, and how long did it take to regain that level?

Show answer

March 10, 2000, at 5,048.62; it did not regain that level until 2015.

8. Hard An investor sells everything at the bottom after a 50% fall, then buys back after the market has risen 40% from the bottom. Compared with holding, what fraction of the recovery did he miss?

Show answer

He missed the first 40% rise; holding, he would have the 40% gain on his remaining value, so he is 40% behind the holder from then on (for example, $50,000 becomes $70,000 for the holder but stays $50,000 for him).

9. Hard Explain why a concentrated technology investor in 2000 might never recover, while a broad-market investor did.

Show answer

Many individual technology companies went bankrupt or never regained their prices, while a broad index included many industries and companies whose growth eventually lifted it past its old peak.

10. Hard Give three things a young worker should do before a crash ever comes.

Show answer

Keep an emergency fund, avoid high-interest and excessive debt, choose a diversified mix suited to the time horizon, and write a plan not to sell in panic (any three).

11. **Challenge** A saver invests $500 a month. Prices are 100 in month 1, fall to 50 in month 2, and return to 100 in month 3. Find her shares, average cost per share, and portfolio value at month 3.

    Show answer

    Shares $5 + 10 + 5 = 20$; average cost $1{,}500/20 = 75$; value $20 \times 100 = \$2{,}000$, a 33% gain though the price only returned to where it started.

COMMON MISTAKES

- Selling in panic after a fall and missing the recovery.
- Concentrating in the hottest industry.
- Treating the news as investment advice.

> **Make it a game · Crash Match.** Make six cards: 1987, 2000, 2008 and three event cards for the Black Monday crash, the technology bubble and the subprime crisis. Match them as a memory game. Then calculate a thirty percent fall and the gain needed to recover. Compare a pretend portfolio in one company with one in ten.

8.4 Frauds: Charles Ponzi and Bernard Madoff

OBJECTIVES

- Explain how a Ponzi scheme works and why it must collapse.
- Calculate how fast a Ponzi scheme needs new money.
- List the warning signs of investment fraud and the steps to verify an adviser or investment.

> **Warm-up.** Someone promises you 50% interest in 45 days, guaranteed. Write down three questions you would ask before handing over a dollar.

WATCH

5 Common Investment Scams (And How to Avoid Them)

The Plain Bagel · 13:04

https://www.youtube.com/watch?v=Ls2DCdfwjF0

> **WHEN TO WATCH**
> After the story of Ponzi and Madoff: five common investment scams and how to spot them.

Note: Begins with a sponsor message (about a minute), which can be skipped.

BACKUP VIDEO

Pyramid Schemes and Ponzi Schemes Explained in One Minute

One Minute Economics · 1:30

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

With the big idea: a one-minute animation of how pyramid and Ponzi schemes collapse.

KEY TERMS

Ponzi scheme

A fraud that pays earlier investors "returns" with money from newer investors rather than from real profits, and collapses when new money slows.

pyramid scheme

A fraud in which participants earn mainly by recruiting others rather than by selling real products.

affinity fraud

Fraud that targets members of a group (a church, a community, a club) by exploiting their trust in one another.

custodian

An independent firm that holds investors' assets, so the adviser cannot simply take them.

due diligence

Careful checking of an investment or adviser before committing money.

CORE IDEAS

The story. In 1919 an Italian-born clerk in Boston named Charles Ponzi noticed that an international postal reply coupon, bought cheaply in one country, could be exchanged for postage worth more in another. He promised investors a 50% return in 45 days. Money poured in: by the summer of 1920 people lined up outside his office, and he took in millions of dollars. But the coupon trade could never have produced such returns at that scale; Ponzi was simply paying old investors with new investors' money. In August 1920 a newspaper investigation and an audit exposed him, his company collapsed, several banks failed, and Ponzi went to prison. Nearly ninety years later, on December 11, 2008, Bernard Madoff, a former chairman of the Nasdaq stock market and a respected Wall Street figure, was arrested. For decades he had reported smooth, steady returns to thousands of investors, charities and pension funds, while making few or no real trades. Investors' account statements showed about $65 billion that did not exist. He was sentenced to 150 years in prison.

How they figured it out. Both frauds were exposed when the flow of new money could not keep up with withdrawals. Ponzi's ended within a year; Madoff's lasted decades because he promised modest, believable returns and few investors withdrew. Madoff was also exposed by people who looked at the numbers: a financial analyst named Harry Markopolos repeatedly warned the SEC, beginning in 2000, that Madoff's returns were mathematically impossible for the strategy he claimed. Madoff kept custody of his clients' assets himself and used a tiny, unknown auditing firm, two classic warning signs.

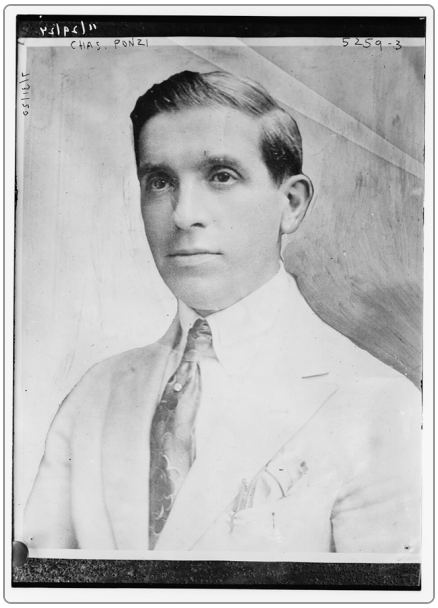
The big idea. A **Ponzi scheme** must grow to survive: every promised payment requires new money. The arithmetic makes collapse certain; promising 50% in 45 days requires the money to double in less than a quarter of a year. The **warning signs**

of fraud, listed by the SEC, are steady: high returns with little or no risk; returns that are overly consistent; unregistered investments or unlicensed sellers; secretive or complicated strategies; trouble getting paperwork or getting paid; and pressure to recruit others or to act quickly. Frauds often spread through **affinity** groups, including churches, because people trust friends instead of checking.

In business today. Protect yourself with **due diligence**: check that an adviser is registered (FINRA's BrokerCheck and the SEC's adviser search are free), that your money is held by an independent **custodian** and you receive statements directly from it, that an investment is registered, and that its returns and strategy make sense. Be most careful when someone you trust is enthusiastic. Fraud is a sin against the neighbor (Leviticus 19:13), and checking is not a lack of love; it protects both you and the person who may himself have been deceived.

Who gained? Only the swindlers and early withdrawers, and even they often lost in the end: court-appointed trustees can recover payments from those who received "profits" that were really other investors' money. The victims of Madoff included charities, universities and retirees; after years of work, a trustee recovered a large share of the money investors had actually put in, but not the imaginary profits.

PICTURE STUDY



Charles Ponzi, Bain News Service, c. 1920 · Photograph · Library of Congress, Prints and Photographs Division

Image: Wikimedia Commons, public domain

Newspaper photographers followed Ponzi everywhere in the summer of 1920. He dressed expensively, smiled for the cameras and was cheered by crowds who thought he had made them rich, weeks before his scheme collapsed.

Look closely

- Look at his clothes. What impression is he trying to make?
- Look at his expression. Does he look worried?
- Imagine the crowds who cheered him. Why would they trust him?

Talk about it

1. Why do swindlers so often look prosperous and confident?
2. What questions could Ponzi's investors have asked that would have revealed the fraud?
3. How does Proverbs 14:15 apply to them?

PROJECT

A Ponzi Scheme Simulation and a Fraud Checklist

You will simulate a Ponzi scheme in a spreadsheet to see exactly when it must collapse, and build a fraud checklist you will use for the rest of your life.

You will need

- Free spreadsheet
- The SEC's list of Ponzi-scheme warning signs (Investor.gov)
- FINRA BrokerCheck and the SEC adviser search, viewed with a parent

Steps

1. Set up months 1 to 24. Start with $100,000 from early investors promised 5% a month.
2. Assume new deposits grow by 20% a month at first, then stop growing in month 12 and fall 20% a month after that. Also assume 3% of balances are withdrawn each month.
3. Each month compute promised payouts, withdrawals, new deposits and the cash left in the scheme. Find the month cash runs out.
4. Repeat with honest investing at a steady 0.6% a month real return and no new deposits after month 1. Compare.
5. Look up one adviser or firm (with a parent) on BrokerCheck to see what information is public.
6. Write a one-page fraud checklist: questions to ask, records to check, and promises that should make you walk away.
7. Present your simulation and checklist to your family.

Tips

- Change the growth of new deposits and see how the collapse date moves; it always comes.
- Never contact a real suspicious offer to "test" it.

Check your work

☐ My simulation shows the month the scheme collapses and why.

- ☐ My checklist includes the SEC's warning signs and verification steps.
- ☐ I can explain why Ponzi schemes must fail.

LEDGER NOTEBOOK

1. Draw a Ponzi scheme as a pyramid of investors with money flowing up from the bottom layer.
2. Graph the scheme's cash balance from your simulation.
3. Copy your fraud checklist in a box.

KEY FORMULAS

$$\text{New money needed} = \text{promised payouts} - \text{real earnings}$$

$$\text{Annualized rate} = (1 + r_{\text{period}})^{\text{periods per year}} - 1$$

From history. The phrase "Ponzi scheme" entered the language in 1920, but the trick was older. Ponzi spent years in prison and was later deported to Italy. He died poor in Brazil in 1949.

WORKED EXAMPLES

Example 1. Ponzi promised 50% in 45 days. If an investment really earned that and was reinvested, what yearly return would it imply? (Use 365/45 ≈ 8.1 periods.)

Show solution

1. $1.5^{8.1} - 1$.
2. $1.5^{8.1} \approx 26.7$, so about 2,570% a year.

Answer: About 2,570% a year, absurdly beyond any honest business. The promise itself was the warning sign.

Example 2. In this example, a scheme takes in $1 million in month 1 and promises 10% a month, paid out. It earns nothing real. How much new money is needed each month just to pay the promised returns on the original $1 million? If each new investor is also promised 10% a month, what happens?

Show solution

1. Payout on $1 million: $100,000 a month, all from new money.
2. Each new investor adds to the monthly payout, so the required new money grows every month.

Answer: At least $100,000 a month at first, and the need keeps growing until new money cannot keep up. Collapse is certain.

Example 3. Madoff reported about 1 percent a month with almost no losing months for years. In this example, a real fund with 10% yearly average return has a typical yearly swing (standard deviation) of 15%. Why should near-perfect smoothness have raised suspicion?

Show solution

1. Real markets go up and down; steady returns of about 12% a year with almost no losing months do not match how any real strategy behaves.
2. Markopolos showed that the options trading Madoff claimed to use could not have produced those results at that size.

Answer: Returns that are “too consistent” are an SEC warning sign; real investing has bad months.

PRACTICE

1. Easy What return did Ponzi promise, and over what period?

   Show answer

   50% in 45 days.

2. **Easy** Name four SEC warning signs of investment fraud.

Show answer

Any four: high returns with little risk; overly consistent returns; unregistered investments; unlicensed sellers; secretive or complex strategies; trouble with paperwork or getting paid; pressure to act fast or recruit.

3. **Easy** When was Bernard Madoff arrested, and about how much did his clients' statements falsely show?

Show answer

December 11, 2008; about $65 billion.

4. **Medium** A scheme promises 3% a month. What yearly return is that when compounded?

Show answer

$1.03^{12} - 1 \approx 42.6\%$

5. **Medium** What is affinity fraud, and why does it work?

Show answer

Fraud targeting a trusting group such as a church or community; members trust one another and skip checking.

6. **Medium** Why is an independent custodian an important protection?

Show answer

Your assets are held and reported by a separate firm, so the adviser cannot secretly take them or fake statements.

7. **Medium** From the story: who warned the SEC about Madoff, and on what grounds?

Show answer

Harry Markopolos, beginning in 2000; he showed Madoff's returns were mathematically impossible for the strategy he claimed.

8. Hard A scheme has $2 million of investor money and promises 2% a month. It earns nothing. Without new money, how many months until the cash is gone if all promised returns are paid out in cash?

Show answer

Payouts $40,000 a month; $2{,}000{,}000/40{,}000 = 50$ months (and investors would get none of their principal back).

9. Hard Explain why a Ponzi scheme promising modest returns can last much longer than one promising huge returns.

Show answer

Modest returns need less new money each month, seem believable, and attract investors who leave money in rather than withdraw, so the cash drains slowly.

10. Hard A friend at church invites you into an "exclusive" investment paying 2% a month "guaranteed," and says you must decide this week. List what you would do.

Show answer

Do not decide quickly; ask for written documents; check registration of the investment and seller (SEC, FINRA BrokerCheck); ask who holds the money; ask how the returns are earned; talk with parents or a trusted professional; walk away if answers are vague. Guaranteed high returns and pressure are warning signs.

11. Challenge A pyramid needs each member to recruit 6 new members. Starting with 1 person, how many levels until the pyramid would need more people than the roughly 8 billion on earth?

Show answer

Level k has 6^k people; $6^{12} \approx 2.2 \times 10^9$, $6^{13} \approx 1.3 \times 10^{10}$, so level 13.

COMMON MISTAKES

- Trusting a person instead of checking the investment.
- Believing that a respected, wealthy or religious person cannot be a fraud.
- Thinking that receiving steady payments proves an investment is real.

Make it a game · Ponzi Pass-Along. Be the pretend manager of a scheme. Promise each early investor twenty beans back for every ten. Pay them only from new investors' beans, while your parent plays the investors. Count how many new investors you need each round, and watch the scheme fail. Then write a five-point fraud checklist.

Scripture. “Wealth gotten by vanity shall be diminished: but he that gathereth by labour shall increase.” (Proverbs 13:11, KJV)

Wealth from empty promises vanishes; wealth built by honest labor and patience grows.

8.5 The Patient Investor: Ronald Read of Brattleboro

OBJECTIVES

- Tell the story of Ronald Read and draw lessons about patience and steady investing.
- Calculate the results of regular investing and dollar-cost averaging.
- Explain why behavior (patience, steadiness, contentment) matters as much as knowledge.

> **Warm-up.** Which takes more strength: doing something exciting once, or doing something ordinary every month for fifty years? Give an example of each.

WATCH

When Is the Best Time To Buy Stocks?

Two Cents · 6:14

https://www.youtube.com/watch?v=3i0xitaOOps

> **WHEN TO WATCH**
> After the story of Ronald Read: why steady investing beats trying to time the market.

BACKUP VIDEO

Waiting to Invest is Costing You... A Lot

The Plain Bagel · 12:49

https://www.youtube.com/watch?v=4gn4F1VmTvM

Optional: the cost of waiting to invest.

KEY TERMS

dollar-cost averaging

Investing a fixed amount at regular intervals regardless of price, so more shares are bought when prices are low.

buy and hold

Buying investments to keep for many years rather than trading them often.

dividend reinvestment

Using dividends to buy more shares automatically.

compounding

Earning returns on past returns, so growth accelerates over time.

estate

Everything a person owns at death.

CORE IDEAS

The story. Ronald Read was born in Dummerston, Vermont, in 1921, and grew up in a farm family of modest means. He walked or hitchhiked miles to high school in Brattleboro and was the first in his family to graduate. After serving in the Army in the Second World War, he came home and worked for about 25 years at a gas station, and later as a janitor at a J. C. Penney store. He drove a used car, chopped his own firewood, and lived simply. When he died in 2014, at 92, his neighbors were astonished: he left an estate of about $8 million. His will gave $4.8 million to the Brooks Memorial Library in Brattleboro and $1.2 million to Brattleboro Memorial Hospital.

How they figured it out. Read had no secret formula. For decades he bought shares in well-established companies, held them for many years, reinvested the dividends, and kept careful records; when he died, his family found a stack of stock certificates in a safe-deposit box. He spread his money among many companies. He never borrowed to invest, never needed to sell in a panic because he lived below his means, and let compounding work for more than half a century. His story shows the arithmetic of Unit 7 joined to the character of Proverbs: “he that gathereth by labour shall increase” (Proverbs 13:11).

The big idea. Ordinary people who become wealthy usually do it slowly: they spend less than they earn, invest the difference regularly, diversify, keep costs low and stay patient through crashes. **Dollar-cost averaging**, investing a fixed sum every month, buys more shares when prices are low and fewer when they are high, lowering the average cost and removing the temptation to guess the market. The longer the time, the more compounding matters: $200 a month for 50 years at an example 7% grows to more than $1 million, while the same deposits for 25 years grow to about $157,000.

In business today. Workplace retirement plans make dollar-cost averaging automatic: a percentage of every paycheck is invested before you see it. The hardest

part is not the arithmetic but staying the course, especially during crashes, when news and fear urge you to stop. Patient investors are not careless; they review their plans each year and adjust their mix as their time horizon shortens. Read's story also reminds us that money is not the goal: his patience became a gift to his whole town.

Think it through. "Let us not be weary in well doing: for in due season we shall reap, if we faint not" (Galatians 6:9). Patience is a fruit of the Spirit, and in money as in all things it bears fruit slowly.

PICTURE STUDY



The Sower, Jean-François Millet, 1850 · Oil on canvas · Museum of Fine Arts, Boston

Image: Wikimedia Commons, public domain

Millet painted a farmer sowing his field by hand, a scene older than history. The sower throws out seed he will not see grow for months, trusting the slow work of soil, rain and season.

Look closely

- Find the seed bag and the sower's hand. What is he doing?
- Look at his stride. Is he hesitant or confident?
- Find the birds. What might they take?
- Look at the light. What time of day is it?

Talk about it

1. How is investing like sowing seed?
2. What must the sower have before he can sow, and what must he do while he waits?
3. How does Galatians 6:9 speak to a patient investor?

PROJECT

A Lifetime Investing Plan and a Patience Test

You will model a lifetime of regular investing from your first job to retirement, test how missing years or panicking changes the result, and write about the character it takes.

You will need

- Free spreadsheet
- Your budget from Unit 2
- Ledger notebook

Steps

1. Choose a realistic monthly investment for your first full-time job (for example, 10% of take-home pay).
2. Model monthly investing from age 22 to 67 at an example 7% yearly return, with the monthly amount rising 3% each year.
3. Scenario A: invest every month. Scenario B: skip the first 10 years, then invest. Scenario C: stop for 2 years after a crash (use −35% in one year) and restart.
4. Compare the ending values and the total amounts invested in each scenario.
5. Model dollar-cost averaging through a crash using a price path you invent (for example, 100, 80, 60, 70, 90, 110).
6. Write one page on Ronald Read's habits and which of them you intend to practice.

Tips

- Use separate input cells for rate, deposit and raise so you can test changes easily.
- Example returns are not predictions.

Check your work

☐ My model includes rising contributions and all three scenarios.

☐ I can explain why starting early matters so much.

- [ ] My essay connects Read's habits with Scripture.

LEDGER NOTEBOOK

1. Graph Scenarios A, B and C on one chart.
2. Make a table of your dollar-cost averaging example.
3. List Ronald Read's five habits.

KEY FORMULAS

$$FV = P\,\frac{(1+r)^n - 1}{r} \quad \text{(regular deposits)}$$

$$\text{Average cost per share} = \frac{\text{total invested}}{\text{total shares}}$$

From history. Brattleboro's Brooks Memorial Library used Read's gift as an endowment, so that its income supports the library year after year: a gift that, like his investments, keeps working. Read had been a regular patron, often reading financial newspapers there.

WORKED EXAMPLES

Example 1. In this example, an investor puts $200 a month into a diversified fund earning 7% a year (about 0.5654% a month). Find the value after 25 years and after 50 years.

Show solution

1. Monthly rate: $r = 1.07^{1/12} - 1 \approx 0.005654$.
2. 25 years (300 months): $200 \times (1.005654^{300} - 1)/0.005654 \approx \$156{,}600$.
3. 50 years (600 months): $200 \times (1.005654^{600} - 1)/0.005654 \approx \$1{,}006{,}600$.

Answer: About $157,000 after 25 years and over $1 million after 50: doubling the time multiplied the result more than six times.

Example 2. Dollar-cost averaging: \$300 is invested each month for four months at prices of \$30, \$20, \$25 and \$30. Find the shares bought, the average cost per share, and compare with the average price.

Show solution

1. Shares: $10 + 15 + 12 + 10 = 47$.
2. Average cost: $1{,}200/47 \approx \$25.53$.
3. Average price: $(30 + 20 + 25 + 30)/4 = \$26.25$.

Answer: 47 shares at an average cost of \$25.53, below the average price, because more shares were bought when prices were low.

Example 3. In this example, Read's estate of about \$8 million grew over about 60 years of investing. If he had invested a steady amount each year at an average 8% return, about how much per year would produce \$8 million after 60 years?

Show solution

1. Annuity factor: $(1.08^{60} - 1)/0.08 \approx (101.26 - 1)/0.08 \approx 1{,}253$.
2. Yearly amount: $8{,}000{,}000/1{,}253 \approx \$6{,}385$.

Answer: About \$6,400 a year in this rough model (his actual investing was irregular), showing how a modest, steady sum can grow over a lifetime.

PRACTICE

1. Easy Where did Ronald Read live, and what work did he do?

   Show answer

   Brattleboro, Vermont; he worked at a gas station and later as a janitor at a J. C. Penney store.

2. Easy What is dollar-cost averaging?

   Show answer

   Investing a fixed amount at regular intervals regardless of price.

3. Easy \$100 buys shares at \$20 and then at \$25. How many shares in all?

   Show answer

   $5 + 4 = 9$ shares

4. Medium In problem 3, find the average cost per share and compare with the average price.

Show answer

$200/9 \approx \$22.22$, below the average price of $\$22.50$

5. Medium Find the future value of $\$2{,}400$ a year for 40 years at 7%.

Show answer

$2{,}400 \times (1.07^{40} - 1)/0.07 \approx \$479{,}100$

6. Medium Name three habits of Ronald Read that made his investing succeed.

Show answer

Any three: living below his means; investing regularly; holding for decades; reinvesting dividends; diversifying among many companies; never borrowing to invest; keeping records.

7. Medium From the story: what did Read leave to his town?

Show answer

$4.8 million to the Brooks Memorial Library and $1.2 million to Brattleboro Memorial Hospital.

8. Hard Saver A invests $\$2{,}000$ a year from 25 to 34 (10 years), then stops; Saver B invests $\$2{,}000$ a year from 35 to 64 (30 years). At 7%, who has more at 65?

Show answer

A: $2{,}000 \times (1.07^{10} - 1)/0.07 \times 1.07^{30} \approx \$210{,}300$; B: $2{,}000 \times (1.07^{30} - 1)/0.07 \approx \$188{,}900$. A has more with one-third of the deposits.

9. Hard Why is staying invested through a crash easier for someone like Ronald Read, who lived below his means?

Show answer

He never needed to sell to pay bills, had no debt forcing sales, and was content, so fear and need did not push him to sell at the bottom.

10. Hard Read held individual stocks. Why does this course suggest most ordinary investors use diversified funds instead?

Show answer

Picking and monitoring many individual companies takes time and skill, and a few bad choices can hurt badly; low-cost diversified funds give broad diversification simply.

11. Challenge Show that doubling an investing period from 25 to 50 years at 7% multiplies a lump sum by 1.07^{25} again, and compute that factor. Why does the regular-deposit result grow by an even larger factor?

Show answer

$1.07^{50} = (1.07^{25})^2$; $1.07^{25} \approx 5.43$. With regular deposits, the first 25 years' balance grows by 5.43 and the second 25 years' deposits are added on top, so the total rises about 6.6 times.

COMMON MISTAKES

- Waiting to invest until you have "enough" money.
- Stopping contributions during a crash, when shares are cheapest.
- Thinking wealth requires a high income instead of steady habits.

> **Make it a game · Patient Investor Dice.** Each month roll a die for a share price from one to six. Invest ten beans a month for twelve months, then calculate your average cost with dollar-cost averaging. Compare it with putting everything in at the first roll. Then tell Ronald Read's story and name the lessons from his patient, steady investing.

UNIT 8

Markets Through History

Markets are made of people, and people can be wise or foolish, patient or greedy, calm or terrified. In this unit you will study the great manias, crashes and frauds of financial history, not to frighten you away from investing but to teach you what to expect and how to behave. You will watch Dutch buyers bid up tulip bulbs in 1637 and Londoners pour their savings into the South Sea Company in 1720. You will follow the crash of 1929 into the Great Depression, and the crashes of 1987, 2000 and 2008 that came after.

Then you will meet two of the most famous swindlers in history, Charles Ponzi and Bernard Madoff, and learn the warning signs of every "sure thing." Last, you will meet a Vermont gas-station attendant and janitor named Ronald Read, who quietly saved and invested for decades and left millions to his town's library and hospital. The lesson of the whole unit is the lesson of Proverbs: "he that maketh haste to be rich shall not be innocent" (Proverbs 28:20), and "he that gathereth by labour shall increase" (Proverbs 13:11).

PREREQUISITES

- Understands stocks, bonds, funds and diversification (Unit 7)
- Can compute percent change and compound growth
- Knows how banks and deposit insurance work (Unit 3)

MASTERY CHECKLIST

- ☐ I can describe the pattern of a speculative bubble and give historical examples.
- ☐ I can calculate percentage rises, falls, the gains needed to recover, and the effect of borrowing on margin.
- ☐ I can explain the causes and lessons of the crashes of 1929, 1987, 2000 and 2008 as history.
- ☐ I can explain how a Ponzi scheme works and list the warning signs of investment fraud.
- ☐ I can calculate the results of steady, patient investing and explain why behavior matters as much as knowledge.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- *Memoirs of Extraordinary Popular Delusions and the Madness of Crowds*, by Charles Mackay (1841): Free. Read only the chapters on the Mississippi Scheme, the South Sea Bubble and Tulipomania with Lesson 8.1; skip the chapters on alchemy and fortune-telling. Mackay exaggerates some details, which modern historians have corrected; discuss this with a parent. Ages 15 and up.
- Federal Reserve History: The Stock Market Crash of 1929: Free essay from the Federal Reserve's history site. Fits Lesson 8.2. Its companion essays on the 1987 crash and the 2007–09 recession fit Lesson 8.3.
- Investor.gov: Ponzi Schemes: Free from the SEC. The official list of Ponzi-scheme warning signs. Fits Lesson 8.4.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

8.1	**Tulips and the South Sea Bubble**	3 sessions of 50 minutes
8.2	**1929 and the Great Depression**	3 sessions of 50 minutes
8.3	**1987, 2000 and 2008: Three Modern Crashes**	3 sessions of 50 minutes
8.4	**Frauds: Charles Ponzi and Bernard Madoff**	3 sessions of 50 minutes
8.5	**The Patient Investor: Ronald Read of Brattleboro**	3 sessions of 50 minutes

Unit 8 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars, percents or years. Historical figures are given in each problem; other rates are examples. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **5 pts**

   A price rises from 50 to 175, then falls to 35. Find the percent rise, the percent fall from the peak, and the overall change.

2. **5 pts**

   What gain is needed to recover from losses of 50%, 75% and 85%?

3. **6 pts**

   Describe the pattern of a speculative bubble using the South Sea Bubble of 1720.

4. **6 pts**

   $8,000 of stock is bought with $2,000 down. Find the equity and percent change on the investor's money if the price rises 15% and if it falls 15%.

5. **6 pts**

   The Dow fell from 381.17 to 41.22 between 1929 and 1932. Find the percent fall and the gain needed to recover.

6. **6 pts**

   Name three rules adopted after 1929 and what each was meant to do.

7. **5 pts**

   What happened on October 19, 1987, and what happened over the next two years?

8. **6 pts**

   The Nasdaq fell from 5,048.62 to 1,114.11. Find the drawdown and explain why a concentrated technology investor might never recover.

9. **6 pts**

   In this example, stocks fall 45% and bonds rise 4%. Compare $50,000 in 100% stocks with a 60/40 mix.

10. **6 pts**

    Explain how a Ponzi scheme works and why it must collapse.

11. **5 pts**

    A scheme promises 4% a month. What is the compounded yearly rate?

12. **6 pts**

    List five warning signs of investment fraud and two verification steps.

13. **6 pts**

    $400 is invested monthly at prices of $40, $25, $32 and $40. Find total shares and average cost per share.

14. **6 pts**

    Find the future value of $150 a month for 45 years at an example 0.5% a month.

15. **5 pts**

    Tell Ronald Read's story in two or three sentences and name the habits that made it possible.

16. **15 pts**

    Essay (one or two paragraphs): Using at least one mania, one crash and one fraud from this unit, and Proverbs 13:11 or 28:20, explain what history teaches a young investor about character.

ANSWER KEY

1. +250%; −80%; −30%
2. 100%, 300%, about 567%
3. A novelty (taking over the national debt) drew attention; prices rose and drew new buyers who cared only about rising prices; credit fed the rise and new companies were floated; buyers stopped coming and prices collapsed from about £1,000 to below £200, ruining many.
4. Up: equity $3,200, +60%. Down: equity $800, −60%.
5. About −89.2%; about 825%
6. Securities Act of 1933 and Exchange Act of 1934 (honest disclosure, SEC); Federal Reserve limits on margin (less borrowing to speculate); deposit insurance (no bank runs).
7. The Dow fell 22.6% in one day; it recovered within about two years.
8. About −77.9%; many individual technology companies failed or never regained their prices.
9. All stocks $27,500; 60/40 $30{,}000(0.55) + 20{,}000(1.04) = 16{,}500 + 20{,}800 = \$37{,}300$
10. It pays earlier investors with newer investors' money instead of real profits; the payouts require ever more new money, and when new money slows, it cannot pay and collapses.
11. $1.04^{12} - 1 \approx 60.1\%$
12. High returns with little risk, overly consistent returns, unregistered investments or sellers, secret or complex strategies, trouble getting paid or paperwork, pressure to act or recruit; verify registration (BrokerCheck, SEC search) and confirm an independent custodian.
13. $10 + 16 + 12.5 + 10 = 48.5$ shares; average cost $1{,}600/48.5 \approx \$32.99$, below the average price of $34.25
14. $150 \times (1.005^{540} - 1)/0.005 \approx \$413{,}400$
15. A Vermont gas-station attendant and janitor who lived simply, invested steadily in many established companies for decades, reinvested dividends and never borrowed; he left about $8 million, mostly to his town's library and hospital.
16. A strong answer shows that greed and haste fed the manias (tulips, South Sea), leverage and panic deepened crashes (1929, 2008), and the hope of easy, steady gains enabled frauds (Ponzi, Madoff); it contrasts these with patient, honest,

diversified saving like Ronald Read's; and it ties the lesson to Proverbs 13:11 or 28:20.

PORTFOLIO PIECE: MY MARKET HISTORY FILE

Assemble your bubble anatomy report, your 1929 margin simulation and family interview, your three-crashes comparison and crash plan, your Ponzi simulation and fraud checklist, and your lifetime investing model. Add a one-page letter to yourself to be read during the next market crash.

LOOK FOR	WHAT IT MEANS
History	Dates, prices and events are accurate and sourced.
Calculations	Percent changes, recovery gains, margin, drawdowns and investing models are correct.
Discernment	The fraud checklist and crash plan are specific and usable.
Character	The letter reflects patience, contentment and honesty grounded in Scripture.

UNIT 9

Big Purchases

The largest financial decisions most people make are where to live and what to drive, and both usually involve contracts and loans that last for years. In this unit you will learn to buy a **car** wisely, comparing new and used, cash and credit, as Henry Ford urged his customers to save for their cars in 1923 while his rivals sold them on credit. You will learn to **rent** a first home safely, following the reformer Jacob Riis, whose photographs of New York tenements helped bring the Tenement House Act of 1901.

Then you will study **buying a home**: how the short, risky mortgages of the 1920s gave way to the long, fully paid-off mortgages most Americans use today, and how to tell what a family can afford. You will build a complete **amortization** schedule in a spreadsheet, seeing month by month how a loan is paid down, as the members of America's first building and loan association did in 1831. Last, you will read **contracts and fine print** with the care Jacob needed when he dealt with Laban, and you will learn to let your yes be yes.

PREREQUISITES

- Can use the loan-payment formula (Unit 4)
- Can build a spreadsheet with formulas copied down rows (Units 4 and 7)
- Has a budget and understands insurance and property taxes (Units 2, 5 and 6)

MASTERY CHECKLIST

- ☐ I can compare the total cost of owning new and used cars, including depreciation, insurance and loan interest.
- ☐ I can set a rent budget, list move-in costs and read the key terms of a lease.
- ☐ I can calculate a mortgage payment, PITI and affordability ratios, and compare 15- and 30-year loans.
- ☐ I can build an amortization schedule and show the effect of extra payments.
- ☐ I can read a contract for key terms, fees and traps, and explain the duty to keep my word.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **CFPB: Owning a Home**: Free tools and explanations from the Consumer Financial Protection Bureau for every step of buying a home, including loan estimates and closing disclosures. Fits Lessons 9.3 and 9.4.
- **CFPB: Auto Loans**: Free guidance on shopping for an auto loan and reading the contract. Fits Lesson 9.1.
- ***How the Other Half Lives*, by Jacob A. Riis (1890)**: Free. Riis's account of New York's tenements. Some chapters describe crime and hardship frankly; parents should choose passages. Fits Lesson 9.2. Ages 15 and up with a parent.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

9.1 Buying a Car: Ford's Weekly Purchase Plan and the Car Loan

3 sessions of 50 minutes

9.2 Renting: Jacob Riis and the Tenement House Act 3 sessions of 50 minutes

9.3 Buying a Home and the Mortgage: From Five-Year Loans to Thirty

3 sessions of 50 minutes

9.4 Amortization: The Building and Loan Association of 1831

3 sessions of 50 minutes

9.5 Contracts and Fine Print: Jacob, Laban and Your Signature

3 sessions of 50 minutes

Unit 9 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars, percents or months. All rates and prices are examples given in each problem. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **6 pts**

   Find the payment and total interest on an $18,000 car loan at 6% for 48 months.

2. **5 pts**

   A $28,000 car loses 18% of its value each year. What is it worth after 4 years?

3. **5 pts**

   Explain the difference between Ford's 1923 Weekly Purchase Plan and buying on credit.

4. **6 pts**

   Monthly gross income $3,800. Find the 30% rent ceiling. An apartment at $1,100 requires first month, a one-month deposit and a $60 fee. Find move-in cash.

5. **5 pts**

   What did Jacob Riis do, and what did the Tenement House Act of 1901 require?

6. **7 pts**

   A $320,000 home with 20% down. Find the 30-year payment at 6%, and PITI with taxes of $3,600 and insurance of $1,440 a year.

7. **6 pts**

   The family in problem 6 earns $90,000 and has $400 of other debt payments. Find both ratios and say whether they meet 28/36.

8. **6 pts**

   Compare total interest on a $200,000 loan: 30 years at 6% (payment $1,199.10) and 15 years at 5.5% (payment $1,634.17).

9. **5 pts**

   How did mortgages change between the 1920s and the 1950s, and why?

10. **7 pts**

    For a $150,000 loan at 0.5% a month with payment $899.33, find interest, principal and balance for months 1 and 2.

11. **5 pts**

    Why do extra payments early in a loan save so much interest?

12. **5 pts**

    What was the Oxford Provident Building Association (1831), and how did it work?

13. **6 pts**

    A gym is “$15 a month” with a $59 sign-up fee, a $39 yearly fee and a 12-month minimum. Find the true monthly cost for the first year.

14. **6 pts**

    A rent-to-own TV is $18 a week for 52 weeks; store price $450. Find the total, the extra paid, and the approximate APR.

15. **5 pts**

    List five things to check in any contract before signing.

16. **15 pts**

    Short essay (one paragraph): Using Jacob and Laban and Matthew 5:37, explain why a Christian reads contracts carefully and then keeps them.

ANSWER KEY

1. $M = 18{,}000(0.005)/(1 - 1.005^{-48}) \approx \$422.73$; interest $\approx \$2{,}291$
2. $28{,}000 \times 0.82^{4} \approx \$12{,}659$
3. Ford's plan had buyers save in a bank until they could pay cash, earning interest; credit gave the car at once but added interest and debt.
4. $\$1{,}140$; $\$2{,}260$
5. He photographed and wrote about New York tenements (*How the Other Half Lives*, 1890); the act required windows in every room, courtyards, toilets in each apartment and fire escapes.
6. Loan $\$256{,}000$; $M \approx \$1{,}534.85$; PITI $\approx \$1{,}954.85$
7. Front $1{,}954.85/7{,}500 \approx 26.1\%$; back 31.4%; both meet the guideline.
8. 30-year $\approx \$231{,}676$; 15-year $\approx \$94{,}151$; savings about $\$137{,}500$
9. From short, interest-only loans with large down payments and balloons to long, fully amortizing loans with smaller down payments, after the Depression's foreclosures led to the HOLC (1933) and FHA (1934).
10. Month 1: $\$750.00$, $\$149.33$, $\$149{,}850.67$. Month 2: $\$749.25$, $\$150.08$, $\$149{,}700.59$.
11. They reduce the balance on which every later month's interest is charged, for the entire remaining term.
12. The first U.S. building and loan; members paid monthly into a fund, took turns borrowing to buy homes, and repaid in installments with interest.
13. $(180 + 59 + 39)/12 \approx \$23.17$
14. $\$936$; $\$486$; $2(52)(486)/(450 \times 53) \approx 212\%$
15. Total cost and fees; length and renewal; how to cancel and penalties; warranty or refund terms; dispute terms; whether oral promises are written in; any cosigning (any five).
16. A strong answer contrasts Laban's deception with Jacob's later specific agreement, explains that careful reading protects against being beguiled and makes honest keeping possible, and connects Matthew 5:37 and Psalm 15:4 to being a person whose yes means yes.

PORTFOLIO PIECE: MY BIG-PURCHASE PLAN

Assemble your car-buying plan with its five-year cost of ownership, your apartment comparison and move-in budget, your home-affordability analysis, your full amortization schedule with extra-payment comparisons, and your contract checklist. Add a one-page plan for your housing and transportation from age 18 to 30: when you will rent, what you will drive, how you will save, and when, if ever, you will buy.

LOOK FOR	WHAT IT MEANS
Calculations	Loan payments, PITI, ratios, TCO and amortization are correct and shown.
Spreadsheets	The amortization schedule runs correctly to zero and compares extra payments.
Judgment	Choices weigh total cost, flexibility and risk, not just monthly payments.
Integrity	The contract checklist and plan reflect careful reading and the intention to keep promises.

9.1 Buying a Car: Ford's Weekly Purchase Plan and the Car Loan

OBJECTIVES

- Compare the total cost of owning a new and a used car.
- Calculate car-loan payments and interest, and see the cost of longer terms.
- Use a simple affordability rule and plan to buy a car with cash or a small loan.

> **Warm-up.** List every cost of owning a car you can think of besides the price. Ask a parent to add anything you missed.

WATCH

Introduction to car buying | Car buying | Financial Literacy | Khan Academy

Khan Academy · 5:49

https://www.youtube.com/watch?v=p0mQOJvbT78

> **WHEN TO WATCH**
> After the story of Ford's plan, before the worked examples.

BACKUP VIDEO

The real cost of owning a car | Car buying | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 4:54

https://www.youtube.com/watch?v=L8KmT-ZX9GU

With the project: the real cost of owning a car.

KEY TERMS

depreciation

The loss in a car's value over time; it is steepest in the first years.

down payment

Cash paid up front, reducing the amount borrowed.

total cost of ownership

Purchase price plus fuel, insurance, maintenance, repairs, registration and interest, minus resale value.

upside down (negative equity)

Owing more on a loan than the car is worth.

pre-approval

A loan offer from a bank or credit union obtained before shopping, used to compare with dealer financing.

CORE IDEAS

The story. By the 1920s Americans wanted cars, and few could pay cash. In 1919 General Motors created the General Motors Acceptance Corporation to lend money to buyers of its cars, and installment buying spread quickly. Henry Ford, who disliked debt, tried another way. In 1923 Ford launched a "Weekly Purchase Plan": a customer could deposit as little as $5 a week in a local bank, earning interest, until he had saved enough for a Model T, and then drive it home owned outright. Many families used it, but buying on credit proved more popular because it gave people the car right away. Ford eventually offered financing too.

How they figured it out. The two plans reveal the choice every car buyer still faces. Credit gives the car now but adds interest, and the car loses value while you pay. Saving first takes patience but costs nothing in interest and earns some. In the decades since, the arithmetic has not changed: a car is a **depreciating** asset, often losing a large share of its value in the first few years. A buyer who borrows heavily for a long term on a new car can owe more than the car is worth for years, being **upside down**.

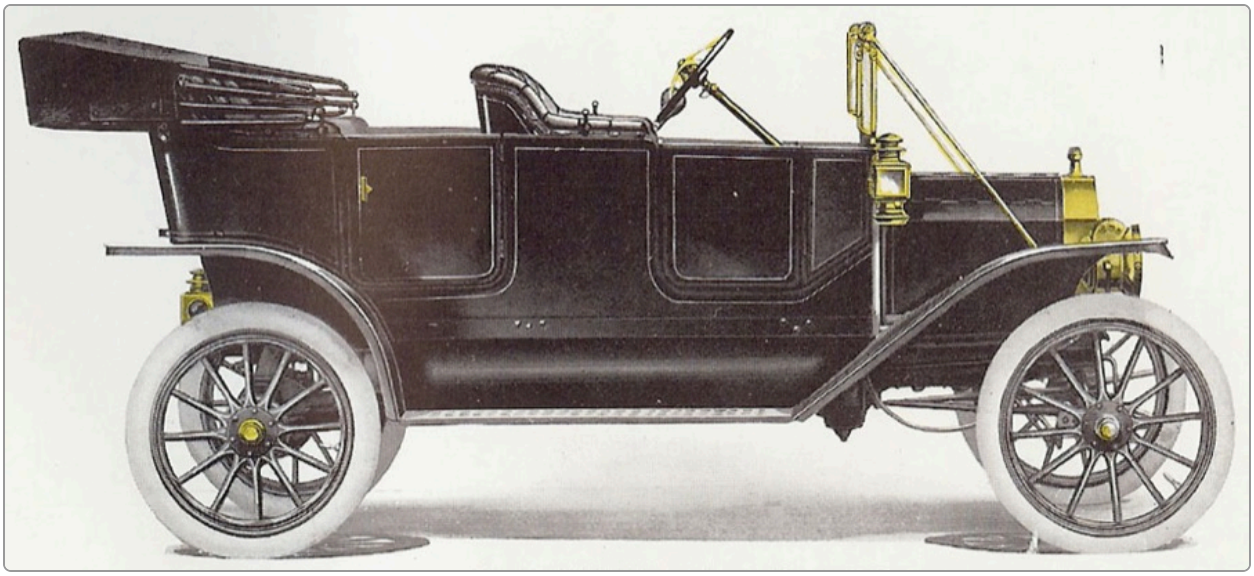
The big idea. Judge a car by its **total cost of ownership**, not its monthly payment. A reliable used car a few years old lets the first owner absorb the steepest depreciation. If you borrow, make a real down payment, choose a short term, and compare a **pre-approved** bank or credit-union loan with dealer financing. One common guideline (the "20/4/10" rule) suggests at least 20% down, no more than four years of financing, and total car costs (payment, insurance, fuel) under about 10% of gross income. Better still, follow Ford's plan: save first and pay cash for a modest car, then keep making "payments" to yourself for the next one.

In business today. Dealers earn money on the car, on financing, on trade-ins and on add-ons such as extended warranties and service packages. Negotiate the price of the car first, separately from financing and trade-in. Get a used car inspected by an independent mechanic and check its history report. Read the contract before signing: the price, APR, term, total of payments and every add-on. Remember

insurance: a sporty car or a young driver can cost as much to insure as the loan payment.

Think it through. A car is a tool for work, church, school and service, not a statement of who you are. A modest, reliable car paid for in cash gives freedom that a shiny car with a long loan cannot.

PICTURE STUDY



Ford Model T Touring Car, Ford Motor Company, 1912 · Catalog illustration · Ford Motor Company catalog, April 1912

Image: Wikimedia Commons, public domain

Ford's catalogs showed the Model T plainly, with prices and specifications. The car's price fell year after year as the assembly line improved, from $850 in 1908 to about $260 by the mid-1920s, so that ordinary families could afford one.

Look closely

- Look at the car's design. Is it fancy or practical?
- Find the features: top, lamps, running boards. What was each for?
- Imagine the family who bought it. What did it change for them?

Talk about it

1. Why did Ford want customers to save for a car rather than borrow?
2. What does a car's falling price over time mean for a buyer today (depreciation)?
3. How would you decide between a car you can pay for now and one you must borrow for?

PROJECT

A Car-Buying Plan

You will plan your first car purchase: research two realistic cars (one newer, one older), calculate the total cost of ownership for five years, compare financing with saving first, and choose.

You will need

- Car listings and price guides (viewed with a parent)
- Insurance estimates (with a parent)
- Free spreadsheet

Steps

1. Choose a newer car and an older, reliable used car that would meet your needs.
2. Record price, expected yearly depreciation, fuel economy, insurance estimate, and typical maintenance and repairs.
3. Assume 10,000 miles a year and a fuel price you look up; compute yearly fuel cost.
4. Compute five-year total cost of ownership for each, including resale value.
5. Compare two ways to pay for the cheaper car: a 48-month loan at an example rate, or saving a monthly amount until you can pay cash. How many months of saving would it take?
6. Write a checklist for inspecting a used car and reading a purchase contract.
7. Write a half page with your choice and reasons.

Tips

- Ask a trusted mechanic what makes and models are reliable.
- Insurance can change the answer; get real estimates.

Check your work

- ☐ My five-year TCO is complete for both cars.
- ☐ I compared borrowing with saving first, with numbers.
- ☐ My checklist covers inspection and contract terms.

LEDGER NOTEBOOK

1. Graph the value of a $22,000 car losing 20% a year for 10 years.
2. Copy your TCO table.
3. Write the 20/4/10 rule and your own version of it.

KEY FORMULAS

$$M = \frac{P\,r}{1-(1+r)^{-n}}$$

$$\text{TCO} = \text{price} + \text{interest} + \text{insurance} + \text{fuel} + \text{maintenance} - \text{resale value}$$

$V_t = V_0(1-d)^t$ (depreciation at rate d per year)

From history. Installment buying of cars became so common in the 1920s that by the end of the decade a large majority of new cars were bought on credit. GMAC's lending helped General Motors pass Ford as the largest automaker, a reminder that easy credit sells products, whether or not it serves the buyer.

WORKED EXAMPLES

Example 1. In this example, a buyer borrows $22,000 for a new car. Compare a 60-month loan at 6.5% with a 72-month loan at 7.5%: monthly payments and total interest.

Show solution

1. 60 months: $r = 0.065/12$; $M \approx \$430.46$; interest $60(430.46) - 22{,}000 \approx \$3{,}827$.
2. 72 months: $M \approx \$380.38$; interest $72(380.38) - 22{,}000 \approx \$5{,}388$.

Answer: The longer loan lowers the payment by about $50 but costs about $1,560 more interest, and keeps the buyer in debt a year longer.

Example 2. If the new car loses 20% of its value each year in this example, what is a $22,000 car worth after 5 years? Compare with a 3-year-old used car bought for $12,000 with a 48-month loan at 7%.

Show solution

1. New car after 5 years: $22{,}000 \times 0.8^5 \approx \$7{,}209$: it lost about $14,791.
2. Used car loan: $M \approx \$287.35$; interest $\approx \$1{,}793$.

Answer: The new car loses nearly $15,000 in five years; the used car costs far less to buy and finance. A careful used-car buyer lets someone else pay for the steepest depreciation.

Example 3. Apply the 20/4/10 guideline for a worker earning $48,000 a year with expected insurance of $110 and fuel of $140 a month. What is the largest car payment that fits?

Show solution

1. 10% of monthly gross: $0.10 \times 4{,}000 = \$400$.
2. Payment limit: $400 - 110 - 140 = \$150$.

Answer: About $150 a month, which over 48 months at 7% borrows only about $6,300: a strong reason to save and buy a modest used car.

PRACTICE

1. Easy A $15,000 car loses 15% of its value in a year. What is it worth?

   Show answer

   $12,750

2. Easy What does “upside down” on a car loan mean?

   Show answer

   Owing more on the loan than the car is worth.

3. Easy What was Ford’s 1923 Weekly Purchase Plan?

   Show answer

   Customers saved as little as $5 a week in a bank until they could buy a Model T outright.

4. Medium Find the payment on a $10,000 loan at 6% for 36 months.

Show answer

$10{,}000(0.005)/(1-1.005^{-36}) \approx \$304.22$

5. Medium A car costs $18,000, gets 30 miles per gallon and is driven 12,000 miles a year with fuel at $3.40 a gallon. Find the yearly fuel cost.

Show answer

$400 \times 3.40 = \$1{,}360$

6. Medium How long does saving $350 a month take to reach $8,400 (ignore interest)?

Show answer

24 months

7. Medium From the story: why did buying on credit prove more popular than Ford's savings plan?

Show answer

Credit let buyers drive the car right away instead of waiting months or years while they saved.

8. Hard A buyer owes $16,000 on a car worth $12,500 and trades it in on a new car, rolling the difference into the new loan. How much negative equity is added, and why is this dangerous?

Show answer

$3,500; the new loan starts upside down, so he pays interest on money for a car he no longer owns and may stay upside down for years.

9. Hard A dealer offers 0% financing for 60 months or a $2,500 cash rebate on a $25,000 car. A credit union offers 5% for 60 months. Which is cheaper? (Payment at 5% on $22,500 is about $424.60.)

Show answer

0%: total $25,000. Rebate and 5%: $60 \times 424.60 = \$25{,}476$. The 0% offer is cheaper by about $476.

10. Hard Why should you negotiate the price of the car separately from financing and trade-in?

Show answer

Combining them lets a seller hide a higher price in a lower monthly payment, a longer term or a low trade-in value; separating them makes each number clear.

11. Challenge Instead of a $430 monthly car payment for 5 years, a driver keeps his paid-off car and invests $430 a month at 0.5% a month for those 5 years. How much does he have? Over 40 years of repeating this every 5 years (8 cycles), what does the habit suggest?

Show answer

$430 \times (1.005^{60} - 1)/0.005 \approx \$30{,}001$ in 5 years; repeated over a working life, the habit of driving paid-off cars can build wealth worth hundreds of thousands of dollars.

COMMON MISTAKES

- Shopping by monthly payment instead of total price and total cost.
- Buying the most car the lender will finance.
- Skipping an independent inspection of a used car.

> **Make it a game · Draw the Depreciation.** Draw a new car's value over five years as a curve, and a used car's beside it. Your parent guesses which is which and names the lesson. Calculate the loan payments and total interest for a five-year and a seven-year loan. Finally, say what upside down means, and why Ford's weekly purchase plan mattered.

9.2 Renting: Jacob Riis and the Tenement House Act

OBJECTIVES

- Set a rent budget and calculate move-in costs.
- Read the key terms of a lease and know a tenant's and landlord's duties.
- Compare apartments by total monthly cost, including commuting and utilities.

> **Warm-up.** List what you would need to move into your own apartment the first week (deposits, furniture, dishes, utilities). Guess the total.

WATCH

Things to consider when renting a home | Housing | Financial Literacy | Khan Academy

Khan Academy · 5:24

https://www.youtube.com/watch?v=Md4C2Wsu4A8

> **WHEN TO WATCH**
> After the big idea: what to consider when renting.

BACKUP VIDEO

Housing costs for renters and owners | Housing | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 5:53

https://www.youtube.com/watch?v=l6lswwsrLC0

With worked example 2: comparing housing costs for renters and owners.

KEY TERMS

lease

A contract between landlord and tenant setting the rent, term, rules and duties of each.

security deposit

Money held by the landlord to cover unpaid rent or damage, returned (less proper deductions) at the end of the lease.

renter's insurance

Insurance for a tenant's belongings and liability (Lesson 5.4).

move-in inspection

A written and photographed record of a unit's condition when the tenant moves in.

rent-to-income ratio

Monthly rent divided by monthly gross income; many landlords and planners use about 30% as a ceiling.

CORE IDEAS

The story. In the late 1800s, hundreds of thousands of New Yorkers lived in crowded tenements: narrow buildings with dark interior rooms, few windows, shared toilets in yards and little protection from fire. Jacob Riis, a Danish-born newcomer who had known poverty himself and become a police reporter, carried a camera with new magnesium flash powder into those rooms at night and photographed what he found. His book *How the Other Half Lives* (1890) shocked readers. Riis, a devout Christian, wrote and lectured for years, and reformers built on his work. The New York State Tenement House Act of 1901 required new buildings to have windows in every room, courtyards for light and air, a toilet in every apartment and fire escapes, and it created a department to enforce the rules.

How they figured it out. Riis and the reformers showed that a fair rental market needs honest rules: landlords must provide safe, sound housing, and tenants must pay rent, care for the property and obey the lease. Today every state has landlord-tenant laws covering security deposits, repairs, entry and eviction, and cities have building and fire codes. These rules protect renters, especially the poor, from the dangers Riis photographed, while letting owners earn a fair return for providing homes.

The big idea. Renting is not "throwing money away"; it buys housing, flexibility and freedom from repairs and property taxes. Budget about 30% of gross income or less for rent, and remember the other costs: utilities, renter's insurance, parking, internet and commuting. Moving in usually takes first month's rent, a **security deposit**, application fees and sometimes last month's rent. Read the **lease** before signing: term, rent and due date, late fees, deposit rules, who pays which utilities,

rules on guests, pets and subletting, and how to end the lease. Do a **move-in inspection** with photos to protect your deposit.

In business today. Landlords check applicants' income, rental history and credit. Rental scams are common: never send money for a place you have not seen in person, and confirm that the person renting it really owns or manages it. Roommates can cut costs but need clear written agreements about rent, bills and chores. A good tenant who pays on time and leaves the unit clean earns a reference that makes the next rental easier.

Who gained? Tenement reform gave millions of families light, air, plumbing and safety from fire. Owners had to spend more to build, and some argued the rules raised rents; but the basic standards of safe housing that Riis fought for are now taken for granted.

PICTURE STUDY



The Courtyard of a House in Delft, Pieter de Hooch, 1658 · Oil on canvas · National Gallery, London

Image: Wikimedia Commons, public domain

De Hooch painted ordinary Dutch homes with loving care: clean brick, open doors, light and air. Dutch towns of his day were known across Europe for their orderly, well-kept houses.

Look closely

- Find the light. Where does it come from, and how much of the house does it reach?
- Look at the bricks and paving. Are they well kept?
- Find the people. What are they doing?
- Look at the doorway to the street. How does the house connect to the town?

Talk about it

1. What did Riis find missing from New York's tenements that this house has?
2. What makes a home safe and healthy, whether rented or owned?
3. What duties does a tenant have to keep a home like this one in good order?

Safety first. Do not visit rental listings alone or give personal or financial information to a landlord online; a parent should handle any real contact. Rental scams are common.

PROJECT

Find and Budget a First Apartment

With a parent, you will research real apartments in a city where you might live, compare three by total cost, read a sample lease, and plan your move-in budget.

You will need

- Rental listings viewed with a parent
- A sample lease (many state or tenant-rights organizations publish samples)
- Your first-job budget from Unit 2
- Spreadsheet

Steps

1. Choose a city and a realistic first-job income; compute your 30% rent ceiling.
2. Find three apartments under or near the ceiling. Record rent, deposit, fees, utilities, parking, distance from work and commuting cost.
3. Compute total monthly housing cost and move-in cash for each.
4. Read a sample lease and summarize ten key terms in plain words.
5. List the furniture and household items you would need and price them (used where wise).
6. Choose an apartment and write your move-in budget and a savings plan to reach it.
7. Write a half page on what Jacob Riis's work means for your rights and duties as a tenant.

Tips

- Never send money for an apartment you have not seen in person.
- Ask about the average utility bill for the unit.

Check your work

☐ My comparison includes total monthly cost, not just rent.

☐ My lease summary covers deposit, term, fees, utilities and ending the lease.

- [ ] My move-in budget and savings plan are realistic.

LEDGER NOTEBOOK

1. Copy your three-apartment comparison table.
2. List your ten lease terms in plain words.
3. Draw a floor plan of your chosen apartment and label where light and fire exits are.

KEY FORMULAS

$$\text{Rent ceiling} \approx 0.30 \times \text{monthly gross income}$$
$$\text{Move-in cash} = \text{first month} + \text{deposit} + \text{fees} + \text{other required payments}$$
$$\text{Total housing cost} = \text{rent} + \text{utilities} + \text{insurance} + \text{commuting} + \text{parking}$$

From history. Riis became a friend of reformers in city government, who called him "the most useful citizen of New York." A park and a school in New York are named for him.

WORKED EXAMPLES

Example 1. A worker earns $42,000 a year. Find the 30% rent ceiling. An apartment rents for $1,050 with a deposit equal to one month's rent, a $50 application fee and a $150 utility deposit. Find the move-in cash needed.

Show solution

1. Ceiling: $0.30 \times 3{,}500 = \$1{,}050$.
2. Move-in: $1{,}050 + 1{,}050 + 50 + 150 = \$2{,}300$.

Answer: Rent ceiling $1,050; move-in cash $2,300, before furniture.

Example 2. Apartment A: rent $1,100, utilities included, 10 minutes from work. Apartment B: rent $900, utilities $140, 35 minutes away, adding $120 a month of fuel and 18 hours a month of driving. Compare total monthly cost and time.

Show solution

1. A: $1,100. B: $900 + 140 + 120 = \$1{,}160$.
2. B also costs about 18 extra hours a month.

Answer: B is $60 more a month and costs 18 hours. The lower rent was not the better deal.

Example 3. Three roommates rent a $2,100 apartment. The large bedroom has its own bathroom, and they agree its occupant pays 40% while the other two split the rest. Utilities of $210 are split equally. Find each person's cost.

Show solution

1. Large room: $0.40 \times 2{,}100 + 70 = \$910$.
2. Others: $0.30 \times 2{,}100 + 70 = \$700$ each.

Answer: $910, $700, $700. Put the agreement in writing.

PRACTICE

1. Easy Find the 30% rent ceiling for a monthly gross income of $3,200.

   Show answer

   $960

2. Easy What is a security deposit for?

   Show answer

   To cover unpaid rent or damage beyond normal wear; it is returned, less proper deductions, at the end of the lease.

3. Easy What did the Tenement House Act of 1901 require in new buildings?

   Show answer

   Windows in every room, courtyards for light and air, a toilet in every apartment, and fire escapes, with inspections.

4. Medium Rent $1,200; deposit 1.5 months; first and last month due at signing; $75 fee. Find move-in cash.

   Show answer

   $1{,}800 + 2{,}400 + 75 = \$4{,}275$

5. Medium A late fee is $50 plus $10 a day after the 5th. Rent is paid on the 12th. What is the fee?

   Show answer

   $50 + 7 \times 10 = \$120$

6. Medium Why should a tenant photograph the apartment at move-in?

Show answer

To prove the existing condition, so the landlord cannot charge the deposit for damage the tenant did not cause.

7. Medium From the story: how did Jacob Riis bring tenement conditions to the public's attention?

Show answer

He photographed the tenements at night with new flash powder and published *How the Other Half Lives* (1890), then wrote and lectured for reform.

8. Hard Rent rises 4% a year from $1,000. What is the rent after 5 years, and the total paid over the 5 years?

Show answer

Year 6 rent $1{,}000 \times 1.04^5 \approx \$1{,}216.65$; total over years 1–5 $12 \times 1{,}000 \times (1.04^5 - 1)/0.04 \approx \$64{,}996$

9. Hard A listing offers a large apartment far below normal rent, the "owner" is out of the country, and asks you to wire a deposit before seeing it. What is wrong?

Show answer

Price too good to be true, owner unavailable, payment by wire before viewing: classic rental-scam signs. Do not pay; verify ownership and see it in person.

10. Hard Give two reasons renting can be wiser than buying for a young worker.

Show answer

Flexibility to move for work, no large down payment, no repair or property-tax bills, and time to build savings and learn where to settle (any two).

11. Challenge Breaking a 12-month lease after 7 months costs two months' rent ($1,000 each). A new job 30 minutes closer would save $130 a month in fuel and give 20 hours a month. Over the remaining 5 months, is it worth breaking the lease (count only money)? What if you will stay 24 more months?

Show answer

5 months: save $650 vs $2,000 fee: not worth it. 24 months: save $3,120 vs $2,000: worth it, plus the time.

COMMON MISTAKES

- Choosing the lowest rent without counting utilities and commuting.
- Signing a lease without reading it.
- Skipping renter’s insurance.

> **Make it a game · Move-In Inspection.** Walk through one room as a new tenant and write five flaws a landlord should note on the move-in inspection, such as a scuff or a loose handle. Then calculate pretend move-in costs: first month's rent, security deposit and renter's insurance. Finally, check if the rent fits the rent-to-income ratio. Tell the Tenement House Act story.

9.3 Buying a Home and the Mortgage: From Five-Year Loans to Thirty

OBJECTIVES

- Explain how mortgages changed from short balloon loans to long amortizing loans.
- Calculate a mortgage payment, PITI and affordability ratios.
- Compare 15- and 30-year mortgages and the costs of buying.

> **Warm-up.** Ask a parent or grandparent how old they were when they bought (or first rented) a home, and what surprised them about the cost.

WATCH

Mortgage Explained | Personal Finance 101

Federal Reserve Bank of St. Louis · 6:54

https://www.youtube.com/watch?v=l4J5RvGB-iM

> **WHEN TO WATCH**
> After the story of the 30-year mortgage: how a mortgage works.

BACKUP VIDEO

Renting versus Buying a home | Housing | Finance & Capital Markets | Khan Academy

Khan Academy · 11:37

https://www.youtube.com/watch?v=JNL6f1xkie4

Optional: renting versus buying, worked carefully.

KEY TERMS

mortgage
A loan to buy real estate, secured by the property, which the lender can take through foreclosure if the loan is not paid.

down payment
The part of the price paid in cash; the rest is borrowed.

PITI

Principal, interest, taxes and insurance: the full monthly housing payment for an owner.

balloon payment

A large final payment of the remaining principal at the end of a loan.

closing costs

Fees and charges paid when a home purchase is completed: loan fees, appraisal, title insurance, recording and others.

equity

The home's value minus what is owed on it.

CORE IDEAS

The story. In the 1920s a typical American home loan was very different from today's. Buyers usually had to pay about half the price in cash, and the loan ran only five to ten years, with interest paid along the way and the whole principal due at the end in a **balloon payment**. Borrowers expected to refinance when the balloon came due. When the Depression struck, banks could not or would not refinance, many homeowners lost their jobs, and foreclosures swept the country. In 1933 Congress created the Home Owners' Loan Corporation, which bought about a million troubled mortgages and replaced them with long-term loans that were paid down in equal monthly installments. In 1934 the new Federal Housing Administration began insuring long-term, low-down-payment loans, and after the Second World War the fully **amortizing** 30-year mortgage became the American standard.

How they figured it out. The new loans solved the balloon problem by making every monthly payment include both interest and a little principal, so that the debt shrank steadily to zero. Longer terms made payments affordable for working families. Lenders, protected by insurance and by a borrower's growing equity, could accept smaller down payments. The result was that home ownership spread widely in the decades after the war. The 2008 crisis (Lesson 8.3) showed the danger of forgetting the old lesson: loans made with little down and little regard for whether the borrower could pay.

The big idea. A mortgage payment comes from the loan formula. The full owner's cost is **PITI**, plus maintenance (often figured at 1 to 2 percent of the home's value a year in examples) and any association dues. Lenders often use two ratios: housing costs no more than about 28% of gross income, and all debt payments no more than

about 36%. A larger down payment (20% avoids mortgage insurance on many loans) lowers payments and risk. A 15-year loan has higher payments but a lower rate and far less total interest than a 30-year loan. Buying makes most sense when you expect to stay several years, because buying and selling a home costs thousands in **closing costs** and agents' fees.

In business today. Before you shop for a house, get your credit in order (Lesson 4.3), save a down payment and an emergency fund, and get pre-approved. Compare Loan Estimates from several lenders; federal rules require standard forms that make rates and fees comparable. Have the home inspected. At closing you will sign a stack of documents; read the Closing Disclosure carefully and ask about anything you do not understand. Rates and rules in this lesson are examples; check current ones.

Think it through. "Prepare thy work without, and make it fit for thyself in the field; and afterwards build thine house" (Proverbs 24:27). Establish your work and your savings first, then buy a home you can afford.

PICTURE STUDY



The Little Street, Johannes Vermeer, c. 1658 · Oil on canvas · Rijksmuseum, Amsterdam

Image: Wikimedia Commons, public domain

Vermeer painted a plain old house in his hometown, with its cracks, patched brick and whitewash. People are going about their daily work. It is one of only two street scenes he painted.

Look closely

- Find the cracks and patches in the brickwork. What do they say about the age of the house and the work of keeping it?
- Find the woman in the doorway and the maid in the alley. What are they doing?
- Find the children. What makes this a home and not just a building?
- Look at the gable and windows. What kind of family might live here?

Talk about it

1. What costs of owning a home, beyond the mortgage, can you see in this painting?
2. Why might a family that expects to stay many years choose to buy rather than rent?
3. How does Proverbs 24:27 apply to buying a home?

PROJECT

How Much House Can a Family Afford?

You will analyze a realistic home purchase for a sample family (or, with permission, your own area's prices), testing affordability, comparing loan terms and counting every cost of buying.

You will need

- Home listings viewed with a parent
- Current example mortgage rates (from a bank or the CFPB, with the date)
- Property-tax and insurance estimates
- Spreadsheet

Steps

1. Create a sample family: income, debts, savings.
2. Find three homes for sale in your area at different prices.
3. For each, compute the down payment (try 10% and 20%), loan amount, 30-year and 15-year payments, PITI and both ratios.
4. Estimate closing costs (use an example 3% of the loan) and a maintenance budget (1 percent of value a year).
5. Decide which homes the family can afford under the 28/36 guideline and with an emergency fund left over.
6. Compare the total interest on 15- and 30-year loans for the chosen home.
7. Write one page with your recommendation, including whether the family should keep renting for now.

Tips

- Lenders may approve more than is wise; your budget, not the approval, should set the limit.
- Keep the emergency fund separate from the down payment.

Check your work

☐ My calculations of payment, PITI and ratios are correct.

☐ I included closing and maintenance costs.

- [ ] My recommendation is grounded in the numbers and the family's goals.

LEDGER NOTEBOOK

1. Draw a timeline: 1920s balloon loans, 1933 HOLC, 1934 FHA, the postwar 30-year loan, 2008.
2. Copy your affordability table.
3. Graph total interest for 15- and 30-year loans on the chosen home.

KEY FORMULAS

$$M = \frac{P\,r}{1-(1+r)^{-n}}$$

$$\text{PITI} = M + \frac{\text{yearly property tax} + \text{yearly insurance}}{12}$$

$$\text{Front-end ratio} = \frac{\text{PITI}}{\text{gross monthly income}}, \qquad \text{back-end ratio} = \frac{\text{PITI} + \text{other debt payments}}{\text{gross monthly income}}$$

From history. The Home Owners' Loan Corporation finished its work and closed in 1951, having been repaid by most of the families it helped. Its long, steady loans set the pattern that most American homeowners still use.

WORKED EXAMPLES

Example 1. In this example, a family buys a $350,000 home with 20% down. Compare a 30-year loan at 6.5% and a 15-year loan at 6.0%: monthly payment and total interest.

Show solution

1. Loan: $280,000.
2. 30-year: $M \approx \$1{,}769.79$; interest $360(1{,}769.79) - 280{,}000 \approx \$357{,}125$.
3. 15-year: $M \approx \$2{,}362.80$; interest $\approx \$145{,}304$.

Answer: The 15-year loan costs about $593 more a month but saves about $211,800 of interest. Over 30 years, the 30-year loan's interest exceeds the amount borrowed.

Example 2. With the 30-year loan, property taxes are $4,200 a year and insurance $1,500 a year. The family earns $105,000 and has a $350 car payment. Find PITI and both ratios.

Show solution

1. PITI: $1{,}769.79 + (4{,}200 + 1{,}500)/12 = 1{,}769.79 + 475 = \$2{,}244.79$.
2. Monthly gross: $8,750. Front-end: $2{,}244.79/8{,}750 \approx 25.7\%$.
3. Back-end: $(2{,}244.79 + 350)/8{,}750 \approx 29.7\%$.

Answer: PITI about $2,245; ratios 25.7% and 29.7%, within the 28%/36% guidelines.

Example 3. Before 1933, a typical loan might be 50% down and 5 years, interest only, with a balloon. For a $6,000 house at 6%, find the down payment, the yearly interest, and the balloon due in year 5.

Show solution

1. Down payment $3,000; loan $3,000.
2. Yearly interest: $0.06 \times 3{,}000 = \$180$.
3. Balloon at the end: the full $3,000 (plus the last interest).

Answer: $3,000 down, $180 a year in interest, and the entire $3,000 due in year 5, which ruined borrowers who could not refinance in the Depression.

PRACTICE

1. Easy A $300,000 home with 20% down. Find the down payment and loan.

   Show answer

   $60,000; $240,000

2. Easy What does PITI stand for?

   Show answer

   Principal, interest, taxes, insurance.

3. Easy What was a balloon payment in a 1920s mortgage?

   Show answer

   The entire remaining principal due at the end of a short loan.

4. Medium Find the payment on a $200,000 loan at 6% for 30 years.

Show answer

$\approx \$1{,}199.10$

5. Medium In problem 4, find the total interest.

Show answer

$360 \times 1{,}199.10 - 200{,}000 \approx \$231{,}676$

6. Medium Gross income $6,000 a month. Under 28/36, what are the maximum PITI and total debt payments?

Show answer

$1,680; $2,160

7. Medium From the story: what did the Home Owners' Loan Corporation (1933) do?

Show answer

It bought about a million troubled mortgages and replaced them with long-term loans paid down in equal monthly installments.

8. Hard Find the payment on a $150,000 loan at 5% for 30 years, then PITI with taxes of $2,400 and insurance of $1,200 a year.

Show answer

$M \approx \$805.23$; PITI $\approx \$1{,}105.23$

9. Hard Closing costs to buy are 3% of a $250,000 price and selling costs 7% of the price. If the home's value rises 3% a year, how many years until a sale covers these costs (ignore everything else)?

Show answer

Costs $\$7{,}500 + \$17{,}500 = \$25{,}000$ (10% of the price); $1.03^n \geq 1.10$ gives $n \approx 3.2$, about 4 years (more, since selling cost grows with price).

10. Hard Why can a 30-year mortgage be wise even though a 15-year mortgage saves interest?

Show answer

Lower required payments leave room in the budget for an emergency fund, retirement saving and giving; extra payments can still be made when possible.

11. **Challenge** Show that for a fixed-rate loan, total interest over the full term is $nM - P$, and explain why it grows faster than the term when rates are high.

    Show answer

    Total paid is nM; subtract principal. With a high rate, early payments are mostly interest and principal falls slowly, so stretching the term adds many years of interest on a balance that has barely shrunk.

COMMON MISTAKES

- Buying as much house as a lender will approve.
- Forgetting taxes, insurance, maintenance and closing costs.
- Draining the emergency fund for the down payment.

Make it a game · The Balloon Payment. Act out the old mortgage. Your parent is a lender in the 1920s with a five-year interest-only loan. When the balloon payment comes due, you cannot pay. Replay with a thirty-year amortizing loan. Then calculate a monthly payment, PITI and affordability ratios for a pretend income of sixty thousand dollars.

Scripture. “Prepare thy work without, and make it fit for thyself in the field; and afterwards build thine house.” (Proverbs 24:27, KJV)

Establish income and savings before taking on the costs of a house.

9.4 Amortization: The Building and Loan Association of 1831

OBJECTIVES

- Build an amortization schedule showing interest, principal and balance each month.
- Explain why early payments are mostly interest.
- Calculate the effect of extra principal payments on payoff time and interest.

> **Warm-up.** On a 30-year mortgage, guess how much of the first monthly payment goes to interest and how much to paying down the loan.

WATCH

Amortization schedules and time to pay off | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 4:07

https://www.youtube.com/watch?v=QEdQw9pZV14

> **WHEN TO WATCH**
> With worked example 1: reading an amortization schedule.

BACKUP VIDEO

Monthly payment versus total cost | Car buying | Financial Literacy | Khan Academy

Khan Academy · 3:46

https://www.youtube.com/watch?v=XQm3v-15BHI

With worked example 2: monthly payment versus total cost.

KEY TERMS

amortization

Paying off a loan by regular payments that cover each period's interest and reduce the principal.

amortization schedule

A table showing, for each payment, the interest, the principal paid and the remaining balance.

prepayment

Paying extra principal before it is due, which shortens the loan and reduces interest.

building and loan association

A cooperative in which members pooled regular savings and took turns borrowing to buy or build homes.

equity

The part of the home the owner truly owns: value minus loan balance.

CORE IDEAS

The story. On January 3, 1831, a group of workingmen in Frankford, then a mill village near Philadelphia, met at Thomas Sidebotham's inn and organized the Oxford Provident Building Association, the first building and loan association in the United States. Each member agreed to pay into a common fund every month. When enough had accumulated, a member could borrow to buy or build a home, and he repaid the loan in regular installments, with interest, while continuing his dues. The first loan, of $375, went to Comly Rich, a lamplighter, who bought a small frame house that still stands. When every member had been helped and the loans repaid, the association dissolved, having done its work.

How they figured it out. The Frankford workers could not get loans from ordinary banks, which served merchants. By pooling small monthly payments, they created their own source of credit, and by requiring regular installments, they made sure the debt was actually paid down instead of rolled over. Building and loan associations spread across the country; they were the ancestors of savings and loan associations, and their habit of steady monthly payments is the heart of every **amortized** loan today.

The big idea. In an amortized loan, every payment is the same, but its parts change. Each month, interest = balance × monthly rate; the rest of the payment reduces the principal. Early on, the balance is large, so most of each payment is interest; as the balance shrinks, more goes to principal. On a 30-year loan at 6.5%, the first payment on $280,000 is about $1,517 of interest and only $253 of principal. An **amortization schedule** in a spreadsheet shows this month by month. **Prepayments** go entirely to principal, so even small extra payments early in a loan save large amounts of interest and years of payments.

In business today. Mortgage, car and student loans are all amortized. Your lender's statement shows how each payment was split. If you make extra payments, confirm they are applied to principal and that the loan has no prepayment penalty. Paying off a mortgage early is a worthy goal, but not before building an emergency fund, saving for retirement, and paying off higher-rate debts.

Who gained? The members of the Oxford Provident gained homes they could not otherwise have bought; their neighbors gained a stable community of owners. The idea, ordinary people pooling savings so that each could become an owner, spread to thousands of associations and helped millions of families.

PICTURE STUDY



The Syndics of the Drapers' Guild, Rembrandt van Rijn, 1662 · Oil on canvas · Rijksmuseum, Amsterdam

Image: Wikimedia Commons, public domain

The syndics were officials elected each year to check the quality of cloth dyed in Amsterdam. Rembrandt shows them at their table with an open book of records, looking up as if someone has just come in to ask a question about their accounts.

Look closely

- Find the open book. What might be recorded in it?
- Look at the faces. How do they seem to respond to the viewer?
- Count the men. Why might a group, not one man, keep these records?
- Look at the rug and the paneling. What do they suggest about the guild?

Talk about it

1. Why did the Frankford building association, like this guild, depend on careful, shared records?
2. How is an amortization schedule a kind of honest record between borrower and lender?
3. Why should a borrower check his own loan records rather than simply trust the lender?

PROJECT

Build a Full Amortization Schedule

You will build a complete amortization schedule in a spreadsheet for a realistic mortgage, add an extra-payment option, and graph how interest and principal change over time.

You will need

- Free spreadsheet
- Your chosen home and loan from Lesson 9.3
- Ledger notebook

Steps

1. Set input cells: loan amount, yearly rate, years, extra monthly payment.
2. Compute the regular payment with the formula (or the spreadsheet's PMT function).
3. Build columns: Month, Starting balance, Interest, Principal, Extra, Ending balance. Copy down 360 rows.
4. Check that the balance reaches zero at month 360 with no extra payment.
5. Add $100, then $200, then $500 extra a month; record payoff month and total interest for each.
6. Graph the interest and principal parts of each payment over the life of the loan.
7. Write a half page on what you learned, and when extra payments make sense in a family's priorities.

Tips

- Use the MIN function so the final payment does not overshoot.
- Check month 1 by hand.

Check your work

- ☐ My schedule runs to zero and month 1 matches my hand calculation.
- ☐ My table compares several extra-payment amounts.
- ☐ My graph shows interest falling and principal rising over time.

LEDGER NOTEBOOK

1. Copy the first three and last three rows of your schedule.
2. Draw your interest-and-principal graph.
3. Write the story of the Oxford Provident Building Association in four sentences.

KEY FORMULAS

$$I_k = r \times B_{k-1}, \qquad \text{Principal}_k = M - I_k, \qquad B_k = B_{k-1} - \text{Principal}_k$$

$$B_k = P(1+r)^k - M\,\frac{(1+r)^k - 1}{r} \quad \text{(balance after } k \text{ payments)}$$

From history. Comly Rich's little house at 4276 Orchard Street in Frankford still stands and carries a historical marker, a reminder that the first American building and loan was built by and for ordinary working people.

WORKED EXAMPLES

Example 1. For the $280,000 loan at 6.5% for 30 years (payment $1,769.79), find the interest, principal and balance for the first three payments.

Show solution

1. Monthly rate $0.065/12 \approx 0.0054167$.
2. Month 1: interest $280{,}000 \times 0.0054167 = \$1{,}516.67$; principal $253.12; balance $279,746.88.
3. Month 2: interest $1,515.30; principal $254.49; balance $279,492.38.
4. Month 3: interest $1,513.92; principal $255.87; balance $279,236.51.

Answer: In the first payment, about 86% is interest. Principal grows a little each month as the balance shrinks.

Example 2. The same borrower pays an extra \$200 of principal every month from the start. A spreadsheet shows the loan is paid off in 273 months with total interest of about \$255,841. Compare with the regular schedule.

Show solution

1. Regular: 360 months, interest about \$357,125.
2. Time saved: 87 months (over 7 years).
3. Interest saved: $\approx$ \$101,284.

Answer: An extra \$200 a month saves over 7 years and about \$101,000 of interest.

Example 3. Use the balance formula to find the balance on the \$280,000 loan after 10 years (120 payments) of regular payments.

Show solution

1. $(1.0054167)^{120} \approx 1.9122$.
2. $B = 280{,}000(1.9122) - 1{,}769.79 \times (1.9122 - 1)/0.0054167$
3. $\approx 535{,}416 - 1{,}769.79 \times 168.40 \approx 535{,}416 - 298{,}034 = \$237{,}382$.

Answer: About \$237,400 remains after 10 years: only about \$42,600 of principal paid out of about \$212,400 of payments.

PRACTICE

1. Easy A \$100,000 balance at a monthly rate of 0.5%. What is this month's interest?

   Show answer

   \$500

2. Easy If the payment is \$599.55 in problem 1, how much goes to principal?

   Show answer

   \$99.55

3. Easy What was the first U.S. building and loan association, and when was it founded?

Show answer

The Oxford Provident Building Association, Frankford, Pennsylvania, January 3, 1831.

4. Medium Continue problem 2: find the new balance and next month's interest.

Show answer

Balance \$99,900.45; interest $\approx$ \$499.50

5. Medium Why is most of an early mortgage payment interest?

Show answer

Interest is charged on the remaining balance, which is largest at the start, so interest takes most of the fixed payment.

6. Medium A borrower prepays \$5,000 of principal in month 1 of a 6% loan. About how much interest does that save in the first year alone?

Show answer

$0.06 \times 5{,}000 = \$300$ (and much more over the life of the loan).

7. Medium From the story: how did the Frankford workers get credit that banks would not give them?

Show answer

They pooled monthly savings into a common fund and took turns borrowing from it, repaying in regular installments with interest.

8. Hard Use the balance formula to find the balance after 5 years on a \$200,000 loan at 6% for 30 years (payment \$1,199.10).

Show answer

$1.005^{60} \approx 1.34885$; $200{,}000(1.34885) - 1{,}199.10 \times 69.770 \approx 269{,}770 - 83{,}661 = \$186{,}109$

9. Hard Over the first 5 years in problem 8, how much was paid in total, and how much of it was interest?

Show answer

Paid $60 \times 1{,}199.10 = \$71{,}946$; principal \$13,891; interest about \$58,055

10. Hard Give two reasons a family might not pay extra on a low-rate mortgage, even though it saves interest.

Show answer

They may lack an emergency fund, have higher-rate debts, need to save for retirement (with an employer match) or want to give; those come first.

11. Challenge Show that in month k, the principal paid equals the first month's principal times $(1+r)^{k-1}$.

Show answer

Principal $p_k = M - rB_{k-1}$. Then $p_{k+1} = M - rB_k = M - r(B_{k-1} - p_k) = p_k + rp_k = (1+r)p_k$, so $p_k = p_1(1+r)^{k-1}$.

COMMON MISTAKES

- Thinking each payment reduces the balance by the full payment amount.
- Making extra payments without confirming they go to principal.
- Paying extra on a mortgage before building an emergency fund.

> **Make it a game · Schedule by Hand.** Build the first three rows of an amortization schedule on paper for a thousand-dollar loan at one percent monthly interest and a hundred-dollar payment. Find the interest, principal and balance. Race your parent, then beat your own time. Explain why early payments are mostly interest, and what the 1831 building and loan did.

9.5 Contracts and Fine Print: Jacob, Laban and Your Signature

OBJECTIVES

- Identify the essential parts of a contract and read one for key terms and traps.
- Calculate the real cost of fees, automatic renewals, warranties and rent-to-own agreements.
- Explain the biblical duty to keep one's word and to deal honestly in agreements.

> **Warm-up.** Find any terms-of-service agreement you have clicked "I agree" to. Estimate how many words it has. Did you read it?

WATCH

Contracts | Scams & fraud | Financial Literacy | Khan Academy

Khan Academy · 4:32

https://www.youtube.com/watch?v=DQN0Zqzqgqg

> **WHEN TO WATCH**
> After the story of Jacob and Laban: what makes a contract.

BACKUP VIDEO

Consumer protection 101 | Scams & fraud | Financial Literacy | Khan Academy

Khan Academy · 4:05

https://www.youtube.com/watch?v=7I6MTgRxg00

Optional: consumer protection basics.

KEY TERMS

contract

A legally enforceable agreement: an offer, an acceptance, something of value exchanged by each side, parties able to agree, and a lawful purpose.

fine print

Detailed terms, often in small type, that set fees, limits, renewals and remedies.

automatic renewal

A term that continues a contract (and charges) unless the customer cancels by a deadline.

cosigner

A person who promises to pay another's debt if he does not; the cosigner is fully responsible.

extended warranty

A service contract sold separately to cover repairs after the manufacturer's warranty ends.

CORE IDEAS

The story. Jacob loved Rachel, the younger daughter of his uncle Laban, and agreed to work seven years for her. "And they seemed unto him but a few days, for the love he had to her" (Genesis 29:20). But on the wedding night Laban gave him the elder daughter, Leah, instead. When Jacob objected, "Wherefore then hast thou beguiled me?", Laban pointed to a custom he had not mentioned: "It must not be so done in our country, to give the younger before the firstborn." Jacob had to work seven more years for Rachel. Later Laban changed Jacob's wages "ten times" (Genesis 31:7). Laban was the first recorded master of the fine print.

How they figured it out. Jacob learned to make his next agreement with Laban specific and checkable: which animals would be his wages, marked by their colors, so there could be no dispute (Genesis 30:31-33). English law later drew the same lesson. The Statute of Frauds of 1677 required certain contracts, such as those for land or for promises to pay another's debt, to be in writing and signed, so that people could not be cheated by false claims about what had been agreed. Today, written contracts are everywhere: leases, car loans, phone plans, gym memberships, apps and jobs.

The big idea. A **contract** is a set of promises the law will enforce. Before you sign, read it, and look especially for: the total cost and every fee; the length of the commitment and how to cancel; **automatic renewals**; penalties for late payment or early termination; what happens if something goes wrong (warranties, returns, how disputes are settled); and any promise to pay someone else's debt (**cosigning**; see Proverbs 22:26). Get oral promises written into the contract. Never sign anything blank or under pressure. Calculate the real cost: a "free" trial that renews at $14.99 a month is a $180-a-year contract if you forget to cancel.

In business today. Federal and state laws require clear disclosure for many contracts (loans, leases, auto sales) and give cooling-off periods for some sales, such as certain door-to-door sales. But no law can protect someone who does not read. Keep copies of every contract you sign and a list of subscriptions and their renewal dates. If a contract is unclear or the amount is large, ask a parent or, as an adult, a lawyer to read it with you.

Think it through. Jesus said, "Let your communication be, Yea, yea; Nay, nay" (Matthew 5:37), and the psalmist praised the man who "sweareth to his own hurt, and changeth not" (Psalm 15:4). Christians read contracts carefully not to find loopholes but because they intend to keep every promise they sign.

PICTURE STUDY



The Mayflower Compact, 1620, Jean Leon Gerome Ferris, c. 1899 · Oil painting (reproduced as a print) · Library of Congress (print)

Image: Wikimedia Commons, public domain

Before landing at Plymouth in November 1620, the men of the Mayflower signed a short agreement to "combine ourselves together into a civil body politic" and obey just laws for the general good. Ferris painted the scene nearly three centuries later.

Look closely

- Find the document and the quill. Who is signing?
- Look at the faces of those waiting. How seriously do they take the signing?
- Find the women and children. Who would be bound by this agreement?
- Look at the cabin. Why might they sign before going ashore?

Talk about it

1. Why did the Pilgrims put their agreement in writing and sign it?
2. What makes a written agreement more trustworthy than a spoken one?
3. How does Matthew 5:37 apply to a person who signs a contract?

Safety first. Do not sign up for anything or enter personal or payment information while doing this project. Read only.

PROJECT

Read the Fine Print

You will read three real contracts or agreements (for example, a phone plan, a gym membership and an app's terms of service, found with a parent), find their key terms and costs, and write a contract checklist.

You will need

- Three agreements (printed or on screen, with a parent)
- Highlighters
- Ledger notebook and calculator

Steps

1. For each agreement, highlight: total cost and every fee, length and renewal, how to cancel, penalties, warranty or refund terms, how disputes are handled, and anything about how your data is used.
2. Calculate the total cost of each agreement over its minimum term and over one renewal.
3. Find one term in each that could surprise a customer.
4. Count or estimate the number of words in one terms-of-service agreement and how long it would take to read at 250 words a minute.
5. List all subscriptions and recurring charges in your household (with permission) and their renewal dates.
6. Write a one-page contract checklist you will use before signing anything.
7. Write a short paragraph on Jacob and Laban, and on keeping your own word.

Tips

- If a term confuses you, ask before signing; confusion is a reason to wait.
- Calendar reminders before renewal dates prevent unwanted charges.

Check your work

- ☐ I found and explained the key terms in three agreements.
- ☐ My cost calculations include all fees.
- ☐ My checklist is specific and usable.

LEDGER NOTEBOOK

1. Copy your contract checklist.
2. Make a table of household subscriptions and renewal dates.
3. Draw the story of Jacob and Laban as a simple timeline of agreements.

KEY FORMULAS

$$\text{Total contract cost} = \text{monthly charge} \times \text{months} + \text{fees}$$

$$\text{Expected value of a warranty} = \sum p_i \times \text{repair cost}_i - \text{price}$$

From history. Twenty years after the wedding-night deception, Jacob and Laban made a covenant at Galeed and set up a heap of stones as a witness: “The LORD watch between me and thee, when we are absent one from another” (Genesis 31:49). Their last agreement was public, specific and witnessed.

WORKED EXAMPLES

Example 1. A gym offers a “$10 a month” membership with a $49 sign-up fee, a $45 yearly maintenance fee, a 12-month minimum, and a $99 early-cancellation fee. Find the first-year cost, and the cost if you quit after 4 months.

Show solution

1. Full year: $10 \times 12 + 49 + 45 = \$214$.
2. Quit after 4 months: $10 \times 4 + 49 + 45 + 99 = \$233$.

Answer: $214 for the year, or $233 if you quit after 4 months: “$10 a month” really costs more than $17 a month.

Example 2. In this example, a store offers a 3-year extended warranty on a $600 appliance for $129. The chance of a covered repair in those years is about 10%, and the average repair costs $250. Find the expected value of buying the warranty.

Show solution

1. Expected repair cost: $0.10 \times 250 = \$25$.
2. Expected value: $25 - 129 = -\$104$.

Answer: About $-$104. Extended warranties on affordable items are usually poor value; keep the money in your emergency fund (Lesson 5.1).

Example 3. A rent-to-own store offers a \$500 television for \$20 a week for 52 weeks. Find the total cost and the extra paid. Estimate the APR as if it were a 12-month loan of \$500 repaid in 52 weekly payments.

Show solution

1. Total: $20 \times 52 = \$1{,}040$; extra \$540.
2. Constant-ratio APR: $\dfrac{2(52)(540)}{500(53)} \approx 212\%$.

Answer: \$1,040 for a \$500 TV, about 212% APR. Saving \$20 a week for 25 weeks would buy it outright.

PRACTICE

1. Easy Name four elements of a valid contract.

   Show answer

   Offer, acceptance, something of value exchanged (consideration), parties able to agree, lawful purpose (any four).

2. Easy A \$12.99 monthly subscription renews automatically. What does it cost in a year?

   Show answer

   $\$155.88$

3. Easy What did Laban do to Jacob, and what excuse did he give?

   Show answer

   He gave Leah instead of Rachel, saying their custom did not allow the younger to marry before the firstborn.

4. Medium A phone plan is \$45 a month for 24 months plus a \$35 activation fee and taxes of 8% on the monthly charge. Find the total cost.

   Show answer

   $45 \times 1.08 \times 24 + 35 = \$1{,}201.40$

5. Medium What does the Statute of Frauds (1677) require, and why?

   Show answer

   That certain contracts (such as for land or to pay another's debt) be in writing and signed, to prevent fraud and false claims about what was agreed.

6. Medium Why is cosigning a loan dangerous? What does Proverbs 22:26 say?

Show answer

The cosigner must pay the whole debt if the borrower does not, and it can damage his credit and relationships. Proverbs 22:26 warns against being a surety for debts.

7. Medium From the story: how did Jacob make his later wage agreement with Laban harder to cheat?

Show answer

He defined his wages by specific, visible marks (the colors of the animals), so they could be checked and not disputed.

8. Hard A "free" 30-day trial renews at $19.99 a month. A family forgets three such trials for 7 months each. What did they pay?

Show answer

$3 \times 7 \times 19.99 = \$419.79$

9. Hard A $1,200 laptop has a 2-year protection plan for $249. If there is a 15% chance of a $600 repair, find the expected value of the plan. When might it still make sense?

Show answer

$0.15 \times 600 - 249 = -\$159$; it might make sense only if a repair would be impossible to afford, which an emergency fund should prevent.

10. Hard Explain Psalm 15:4 ("He that sweareth to his own hurt, and changeth not") in terms of contracts.

Show answer

A righteous person keeps a promise even when it turns out to cost him, rather than looking for a way out; so read carefully before you sign, and then keep your word.

11. Challenge A rent-to-own sofa costs $25 a week for 78 weeks; its store price is $900. Estimate the APR with the constant-ratio formula for weekly payments ($m = 52$).

Show answer

Total $1,950; finance charge $1,050; $\text{APR} \approx 2(52)(1{,}050)/(900 \times 79) \approx 154\%$

COMMON MISTAKES

- Signing without reading, or trusting spoken promises not written into the contract.
- Forgetting free trials and automatic renewals.
- Cosigning a loan to be kind without realizing you owe the whole debt.

Make it a game · Fine Print Hunt. Find a household paper with fine print, such as a warranty or a subscription. Hunt for fees, automatic renewal and a cancellation rule. Then calculate the cost of a rent-to-own item at twenty-five dollars a week for a year, against a six hundred dollar price tag. Tell how Laban's contract with Jacob changed in Genesis.

Scripture. “But let your communication be, Yea, yea; Nay, nay: for whatsoever is more than these cometh of evil.” (Matthew 5:37, KJV)

A Christian’s word should be reliable without loopholes. Careful reading before signing makes faithful keeping possible.

UNIT 9

Big Purchases

The largest financial decisions most people make are where to live and what to drive, and both usually involve contracts and loans that last for years. In this unit you will learn to buy a **car** wisely, comparing new and used, cash and credit, as Henry Ford urged his customers to save for their cars in 1923 while his rivals sold them on credit. You will learn to **rent** a first home safely, following the reformer Jacob Riis, whose photographs of New York tenements helped bring the Tenement House Act of 1901.

Then you will study **buying a home**: how the short, risky mortgages of the 1920s gave way to the long, fully paid-off mortgages most Americans use today, and how to tell what a family can afford. You will build a complete **amortization** schedule in a spreadsheet, seeing month by month how a loan is paid down, as the members of America's first building and loan association did in 1831. Last, you will read **contracts and fine print** with the care Jacob needed when he dealt with Laban, and you will learn to let your yes be yes.

PREREQUISITES

- Can use the loan-payment formula (Unit 4)
- Can build a spreadsheet with formulas copied down rows (Units 4 and 7)
- Has a budget and understands insurance and property taxes (Units 2, 5 and 6)

MASTERY CHECKLIST

- ☐ I can compare the total cost of owning new and used cars, including depreciation, insurance and loan interest.
- ☐ I can set a rent budget, list move-in costs and read the key terms of a lease.
- ☐ I can calculate a mortgage payment, PITI and affordability ratios, and compare 15- and 30-year loans.
- ☐ I can build an amortization schedule and show the effect of extra payments.
- ☐ I can read a contract for key terms, fees and traps, and explain the duty to keep my word.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **CFPB: Owning a Home**: Free tools and explanations from the Consumer Financial Protection Bureau for every step of buying a home, including loan estimates and closing disclosures. Fits Lessons 9.3 and 9.4.
- **CFPB: Auto Loans**: Free guidance on shopping for an auto loan and reading the contract. Fits Lesson 9.1.
- ***How the Other Half Lives*, by Jacob A. Riis (1890)**: Free. Riis's account of New York's tenements. Some chapters describe crime and hardship frankly; parents should choose passages. Fits Lesson 9.2. Ages 15 and up with a parent.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

9.1 Buying a Car: Ford's Weekly Purchase Plan and the Car Loan

3 sessions of 50 minutes

9.2 Renting: Jacob Riis and the Tenement House Act 3 sessions of 50 minutes

9.3 Buying a Home and the Mortgage: From Five-Year Loans to Thirty

3 sessions of 50 minutes

9.4 Amortization: The Building and Loan Association of 1831

3 sessions of 50 minutes

9.5 Contracts and Fine Print: Jacob, Laban and Your Signature

3 sessions of 50 minutes

Unit 9 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars, percents or months. All rates and prices are examples given in each problem. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **6 pts**

   Find the payment and total interest on an $18,000 car loan at 6% for 48 months.

2. **5 pts**

   A $28,000 car loses 18% of its value each year. What is it worth after 4 years?

3. **5 pts**

   Explain the difference between Ford's 1923 Weekly Purchase Plan and buying on credit.

4. **6 pts**

   Monthly gross income $3,800. Find the 30% rent ceiling. An apartment at $1,100 requires first month, a one-month deposit and a $60 fee. Find move-in cash.

5. **5 pts**

   What did Jacob Riis do, and what did the Tenement House Act of 1901 require?

6. **7 pts**

   A $320,000 home with 20% down. Find the 30-year payment at 6%, and PITI with taxes of $3,600 and insurance of $1,440 a year.

7. **6 pts**

   The family in problem 6 earns $90,000 and has $400 of other debt payments. Find both ratios and say whether they meet 28/36.

8. **6 pts**

   Compare total interest on a $200,000 loan: 30 years at 6% (payment $1,199.10) and 15 years at 5.5% (payment $1,634.17).

9. **5 pts**

   How did mortgages change between the 1920s and the 1950s, and why?

10. **7 pts**

    For a $150,000 loan at 0.5% a month with payment $899.33, find interest, principal and balance for months 1 and 2.

11. **5 pts**

    Why do extra payments early in a loan save so much interest?

12. **5 pts**

    What was the Oxford Provident Building Association (1831), and how did it work?

13. **6 pts**

    A gym is “$15 a month” with a $59 sign-up fee, a $39 yearly fee and a 12-month minimum. Find the true monthly cost for the first year.

14. **6 pts**

    A rent-to-own TV is $18 a week for 52 weeks; store price $450. Find the total, the extra paid, and the approximate APR.

15. **5 pts**

    List five things to check in any contract before signing.

16. **15 pts**

    Short essay (one paragraph): Using Jacob and Laban and Matthew 5:37, explain why a Christian reads contracts carefully and then keeps them.

ANSWER KEY

1. $M = 18{,}000(0.005)/(1 - 1.005^{-48}) \approx \$422.73$; interest $\approx \$2{,}291$
2. $28{,}000 \times 0.82^{4} \approx \$12{,}659$
3. Ford's plan had buyers save in a bank until they could pay cash, earning interest; credit gave the car at once but added interest and debt.
4. $\$1{,}140$; $\$2{,}260$
5. He photographed and wrote about New York tenements (*How the Other Half Lives*, 1890); the act required windows in every room, courtyards, toilets in each apartment and fire escapes.
6. Loan $\$256{,}000$; $M \approx \$1{,}534.85$; PITI $\approx \$1{,}954.85$
7. Front $1{,}954.85/7{,}500 \approx 26.1\%$; back 31.4%; both meet the guideline.
8. 30-year $\approx \$231{,}676$; 15-year $\approx \$94{,}151$; savings about $\$137{,}500$
9. From short, interest-only loans with large down payments and balloons to long, fully amortizing loans with smaller down payments, after the Depression's foreclosures led to the HOLC (1933) and FHA (1934).
10. Month 1: $\$750.00$, $\$149.33$, $\$149{,}850.67$. Month 2: $\$749.25$, $\$150.08$, $\$149{,}700.59$.
11. They reduce the balance on which every later month's interest is charged, for the entire remaining term.
12. The first U.S. building and loan; members paid monthly into a fund, took turns borrowing to buy homes, and repaid in installments with interest.
13. $(180 + 59 + 39)/12 \approx \$23.17$
14. $\$936$; $\$486$; $2(52)(486)/(450 \times 53) \approx 212\%$
15. Total cost and fees; length and renewal; how to cancel and penalties; warranty or refund terms; dispute terms; whether oral promises are written in; any cosigning (any five).
16. A strong answer contrasts Laban's deception with Jacob's later specific agreement, explains that careful reading protects against being beguiled and makes honest keeping possible, and connects Matthew 5:37 and Psalm 15:4 to being a person whose yes means yes.

PORTFOLIO PIECE: MY BIG-PURCHASE PLAN

Assemble your car-buying plan with its five-year cost of ownership, your apartment comparison and move-in budget, your home-affordability analysis, your full amortization schedule with extra-payment comparisons, and your contract checklist. Add a one-page plan for your housing and transportation from age 18 to 30: when you will rent, what you will drive, how you will save, and when, if ever, you will buy.

LOOK FOR	WHAT IT MEANS
Calculations	Loan payments, PITI, ratios, TCO and amortization are correct and shown.
Spreadsheets	The amortization schedule runs correctly to zero and compares extra payments.
Judgment	Choices weigh total cost, flexibility and risk, not just monthly payments.
Integrity	The contract checklist and plan reflect careful reading and the intention to keep promises.

UNIT 10

Stewardship for Life

The last unit looks down the whole road of a working life and beyond it. You will learn how **retirement accounts** turn decades of steady saving into income for old age, beginning with the first American company pension in 1875 and the workplace savings plans that grew from a 1978 law. You will learn why every adult needs a **will**, from the example of Abraham Lincoln, a lawyer who died without one. And you will consider **giving and legacy** through George Müller, who cared for more than ten thousand orphans in Bristol without ever asking anyone but God for money, and published every penny received.

Then you will face the oldest temptation in this course: the promise of riches without work. You will study the Louisiana Lottery of the 1800s and the mathematics of **games of chance and get-rich-quick schemes**, and you will see why Scripture warns that "they that will be rich fall into temptation and a snare" (1 Timothy 6:9). The course ends with your **capstone financial plan**: a written plan for earning, giving, saving, spending, borrowing, insuring, investing and leaving a legacy, made with your parents and grounded in the hope of hearing, "Well done, thou good and faithful servant."

PREREQUISITES

- Can calculate future value and regular-deposit growth (Unit 7)
- Understands payroll taxes and Social Security (Unit 6)
- Has the budget, giving plan and investing work from Units 2 and 7

MASTERY CHECKLIST

- ☐ I can explain employer plans and IRAs, traditional and Roth, and calculate the value of an employer match and of starting early.
- ☐ I can estimate a retirement savings goal from an income target, Social Security and a withdrawal rate (using example figures).
- ☐ I can explain what a will, beneficiary designations and powers of attorney do, and why every adult needs them.
- ☐ I can plan lifetime giving and explain biblical generosity and legacy.
- ☐ I can calculate the expected value of games of chance and recognize get-rich-quick schemes.
- ☐ I can write a complete personal financial plan with goals, a budget, a net-worth statement and a giving, saving and investing strategy.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- ***The Life of Trust: Being a Narrative of the Lord's Dealings with George Müller***: Free on Project Gutenberg. Müller's own account of the Bristol orphan houses, with his records of gifts received. Read a chapter with Lesson 10.3. Ages 13 and up.
- ***George Müller of Bristol*, by A. T. Pierson (1899)**: Free. A readable biography of Müller by a friend, fits Lesson 10.3. Ages 14 and up.
- **Investor.gov: Introduction to Investing**: Free SEC resource on retirement accounts, fees and fraud, for Lessons 10.1 and 10.4.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

10.1 Retirement Accounts and Compound Growth Over Decades
3 sessions of 50 minutes

10.2 Wills and Estate Planning, Simply: Lincoln Dies Without a Will
3 sessions of 50 minutes

10.3 Giving and Legacy: George Müller's Orphan Houses 3 sessions of 50 minutes

10.4 Avoiding Get-Rich Schemes and Games of Chance 3 sessions of 50 minutes

10.5 A Capstone Financial Plan: "Well Done, Thou Good and Faithful Servant"
3 sessions of 50 minutes

Unit 10 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars, percents or years. All rates, limits and odds are examples given in each problem. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **6 pts**
   Salary $60,000; employer matches 50% of contributions up to 6% of pay. Find the contribution needed for the full match and the match.

2. **6 pts**
   At 7%, compare $3,000 a year from 25 to 34 (then held to 65) with $3,000 a year from 35 to 64.

3. **6 pts**
   A retiree wants $40,000 a year from savings. Using an example 4% withdrawal rate, what savings goal is needed?

4. **5 pts**
   Explain when a Roth account is better than a traditional account.

5. **5 pts**

   What happened to Abraham Lincoln’s estate because he had no will?

6. **6 pts**

   Assets $380,000; debts $210,000; final expenses $10,000. Find the net estate and divide it by the lesson’s example intestacy rule between a spouse and two children.

7. **5 pts**

   Why must beneficiary designations be kept current?

8. **6 pts**

   An endowment of $750,000 pays out 4.5%. Find the yearly support. If it earns 6.5%, what is its value after 10 years?

9. **5 pts**

   Tell how George Müller funded and accounted for the Bristol orphan houses.

10. **6 pts**

    A $1 ticket has a 1 in 100 chance of $40 and a 1 in 10,000 chance of $1,000. Find the expected value and the house edge.

11. **6 pts**

    $20 a week spent on games of chance for 30 years: total spent, and the value if $1,040 a year were invested at 7%.

12. **5 pts**

    Give two reasons, one moral and one mathematical, for refusing games of chance.

13. **5 pts**

    What happened to the Louisiana Lottery after 1890?

14. **6 pts**

    Assets $14,200; liabilities $22,600. Find net worth. If she adds $4,200 a year to net worth, how long until it is positive?

15. **6 pts**

Find the monthly saving needed for $8,000 in 30 months at 0.4% a month.

16. **16 pts**

Essay (two or three paragraphs): Using the parable of the talents and at least four units of this course, describe the steward you intend to be over your lifetime: how you will earn, give, save, borrow, insure, invest and plan for the end of life. Include at least two numbers from your own work this year.

ANSWER KEY

1. \$3,600; \$1,800
2. Early: $3{,}000 \times 13.816 \times 7.612 \approx \$315{,}500$; late: $3{,}000 \times 94.461 \approx \$283{,}400$. The early saver has more with one third of the deposits.
3. \$1,000,000
4. When the tax rate in retirement is expected to be higher than today's, because Roth contributions are taxed now and qualified withdrawals are tax-free.
5. Judge David Davis administered it in court, and Illinois law divided it among his widow and two sons; the family waited for a court to do what a will could have done.
6. Net \$160,000; spouse $100{,}000 + 30{,}000 = \$130{,}000$; children \$15,000 each
7. They pass life insurance and retirement accounts directly to the named people, overriding the will.
8. \$33,750; $750{,}000 \times 1.02^{10} \approx \$914{,}246$
9. He prayed and asked no one for money; gifts came from many people, and he published a yearly account of every gift and expense.
10. $0.40 + 0.10 - 1 = -\$0.50$; 50%
11. \$31,200; $1{,}040 \times 94.461 \approx \$98{,}240$
12. Moral: they feed covetousness and seek gain from others' losses (1 Timothy 6:9). Mathematical: their expected value is negative, so players lose over time.
13. Congress banned lottery material from the mail; its charter was not renewed, and it moved out of the country and closed.
14. $-\$8{,}400$; 2 years
15. $(1.004^{30} - 1)/0.004 \approx 31.807$; $8{,}000/31.807 \approx \$251.52$
16. A strong answer explains stewardship from Matthew 25 (the money is God's, an account will be given, act now); draws specific commitments from at least four units (vocation and diligent work; budgeting, emergency fund and cheerful giving; avoiding needless debt; insurance against ruin; honest taxes; patient, diversified, low-cost investing; wise big purchases; a will and planned giving; refusing get-rich schemes); cites real numbers from the student's projects; and ends with the goal of faithfulness rather than wealth.

PORTFOLIO PIECE: MY TEN-YEAR FINANCIAL PLAN

Your capstone plan is this unit's portfolio: the statement of purpose, net-worth statement and projections, five goals, first-year budget, policies on giving, debt, insurance, investing, records and estate documents, the ten-year timeline, and the notes and revisions from your presentation. Add your retirement model, your estate-readiness checklist, your lifetime giving plan and your easy-money analysis as appendices.

LOOK FOR	WHAT IT MEANS
Completeness	Every part of a financial plan is present and connected to earlier units.
Accuracy	Net worth, goals, budgets and projections are calculated correctly, with example assumptions labeled.
Wisdom	Priorities follow sound order (giving, emergency fund, match, high-interest debt, and so on) and avoid needless risk.
Stewardship	The plan and presentation show a clear Christian understanding of money as a trust from God and aim at faithfulness and generosity.

10.1 Retirement Accounts and Compound Growth Over Decades

OBJECTIVES

- Explain pensions, employer savings plans and IRAs, and the difference between traditional and Roth accounts.
- Calculate the value of an employer match and the effect of starting early.
- Estimate a retirement savings goal using example figures.

> **Warm-up.** Ask an older relative (with your parents' help) how they planned for retirement, or how their parents did. Write one thing they did well and one thing they would change.

WATCH

What The Heck Is an IRA?

Two Cents · 6:51

https://www.youtube.com/watch?v=vMJ2dkSc8Ok

> **WHEN TO WATCH**
> After the story: IRAs and the difference between traditional and Roth. Contribution limits shown are from one past year.

Note: Two Cents (PBS); limits and dollar figures change every year.

BACKUP VIDEO

Saving enough for retirement | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 5:19

https://www.youtube.com/watch?v=6JxWW4hLS1U

With worked example 1: saving enough for retirement.

KEY TERMS

pension (defined-benefit plan)

A plan in which an employer promises a set monthly income in retirement, usually based on years of service and pay.

defined-contribution plan

A workplace savings plan, such as a 401(k) or 403(b), in which the worker (and often the employer) contributes, and the benefit depends on how the investments grow.

employer match

Money an employer adds to a worker's plan, such as 50 cents for each dollar the worker saves up to a limit.

IRA

Individual retirement account: a personal tax-advantaged retirement account.

traditional and Roth

Traditional accounts give a tax break now and are taxed at withdrawal; Roth accounts are funded with taxed money and qualified withdrawals are tax-free.

vesting

The schedule by which a worker gains full ownership of employer contributions.

CORE IDEAS

The story. In 1875 the American Express Company, then a freight and express-delivery business, created what is usually called the first private pension plan in the United States, for long-serving workers who had grown too old or disabled to work. Railroads, utilities and large manufacturers soon followed, and for much of the twentieth century many workers retired on a company pension plus Social Security. In 1974 Congress passed the Employee Retirement Income Security Act (ERISA), which set rules to protect pension promises and created the IRA. Then a short section added by the Revenue Act of 1978, section 401(k) of the tax code, allowed workers to set aside part of their pay before tax. Around 1980 a benefits consultant named Ted Benna saw that it could be used for an ordinary savings plan with an employer match, and the 401(k) spread across American workplaces.

How they figured it out. The shift from pensions to savings plans moved the responsibility from employer to worker. A pension's promise depends on the company's health; a 401(k) belongs to the worker and goes with him from job to job, but its size depends on how much he saves, how it is invested and how patient he is.

The tax law adds two rewards: contributions grow without yearly tax, and employers often add a **match**. The great lesson of the last fifty years is that workers who start early, contribute steadily, capture the full match and leave the money alone usually retire well.

The big idea. Time is the most powerful ingredient. In this unit's example at 7% a year, a saver who invests $2,000 a year from age 25 to 34 and then stops has more at 65 than one who invests $2,000 a year from 35 to 64: about $210,000 versus $189,000, with one third of the deposits. Always contribute at least enough to get the full employer match; it is an immediate 50% or 100% return. Choose **traditional** (tax break now) or **Roth** (tax-free later) by comparing your tax rate today with what you expect in retirement. Contribution limits, income limits and tax rules change each year; check the IRS for current figures.

In business today. Many employers now enroll new workers automatically and offer target-date funds. Plans charge fees, so compare fund costs (Lesson 7.4). Avoid cashing out a plan when changing jobs; roll it over to a new plan or an IRA instead, because withdrawals before retirement age usually bring taxes and penalties. Retirement in Scripture is not idleness. The Levites stepped back from heavy labor at fifty but kept serving (Numbers 8:25-26); saving for old age frees a person to serve family, church and neighbors when paid work ends.

Think it through. "Go to the ant... Which having no guide, overseer, or ruler, provideth her meat in the summer" (Proverbs 6:6-8). No one will force you to save for old age. The summer of your working years is the time to gather.

PICTURE STUDY



Arrangement in Grey and Black No. 1 (Whistler's Mother), James McNeill Whistler, 1871 · Oil on canvas · Musée d'Orsay, Paris

Image: Wikimedia Commons, public domain

Whistler painted his mother, Anna, in London when she was in her sixties. The calm, upright figure became one of the most famous American paintings, a picture of dignity in old age.

Look closely

- Look at her posture and folded hands. What do they suggest about her?
- Look at the plain room. Is it wealthy or modest?
- Find the picture on the wall and the curtain. How does the painter balance the composition?

Talk about it

1. What does a dignified old age require, besides money?
2. How can saving in youth make old age a time of service rather than worry?
3. What would you want your own later years to look like, and what must you do now to prepare?

PROJECT

My Retirement Plan Model

You will build a retirement model for yourself from your first full-time job to age 67, including an employer match, and estimate what income your savings could provide, using clearly labeled example figures.

You will need

- Free spreadsheet
- Your career and salary estimate from Unit 1
- Current contribution limits and Social Security estimates, looked up with a parent (write the year)

Steps

1. Set inputs: starting salary, yearly raise (example 3%), your contribution rate, match rate and limit, return (example 7%), starting age, retirement age.
2. Build yearly rows: salary, your contribution, match, starting balance, growth, ending balance.
3. Find your balance at 67. Then estimate yearly income from it with an example 4% withdrawal rate.
4. In this example, assume Social Security replaces 40% of your final salary. Add it to your savings income and compare with a goal of 75% of final salary.
5. Test three changes: starting five years later, contributing 3 percentage points more, and missing the match.
6. Write a half page on the choices that matter most and the habits you will need.

Tips

- Keep every assumption in an input cell with a label and source.
- These are example returns and rates; real results will differ.

Check your work

☐ My model includes salary growth, contributions and match.

☐ I estimated retirement income and compared it with a goal.

- [ ] I tested at least three changes and explained them.

LEDGER NOTEBOOK

1. Graph Saver A and Saver B on one chart.
2. Write a timeline: 1875 first private pension, 1935 Social Security, 1974 ERISA and the IRA, 1978 section 401(k).
3. Copy Proverbs 6:6-8 and write how it applies to retirement.

KEY FORMULAS

$$FV = P\,\frac{(1+r)^n - 1}{r}$$

$$\text{Savings goal} \approx \frac{\text{yearly income needed from savings}}{\text{withdrawal rate}}$$ (for example, a 4% rate in this course's examples)

$$\text{Match} = \text{match rate} \times \min(\text{your contribution}, \text{match limit})$$

From history. Ted Benna later said his first plan, for his own consulting firm's employees, was built from a reading of the new law that no one had tried before. Within a few years the Treasury issued rules confirming it, and the 401(k) became the most common retirement plan in American workplaces.

WORKED EXAMPLES

Example 1. Saver A invests $2,000 at the end of each year from 25 to 34, then stops; Saver B invests $2,000 a year from 35 to 64. At an example 7%, compare their balances at 65.

Show solution

1. A after 10 years: $2{,}000 \times (1.07^{10} - 1)/0.07 \approx \$27{,}633$; grows 30 more years: $27{,}633 \times 1.07^{30} \approx \$210{,}349$.
2. B: $2{,}000 \times (1.07^{30} - 1)/0.07 \approx \$188{,}922$.

Answer: A has about $210,000 from $20,000 of deposits; B about $189,000 from $60,000. Starting early wins.

Example 2. A worker earns $50,000. The employer matches 50 cents per dollar on contributions up to 6% of pay. How much should she contribute to get the full match, and what is the match worth each year?

Show solution

1. Contribute 6%: $0.06 \times 50{,}000 = \$3{,}000$.
2. Match: $0.5 \times 3{,}000 = \$1{,}500$, an instant 50% return.

Answer: Contribute $3,000; the employer adds $1,500 a year. Not taking it leaves free money on the table.

Example 3. In this example, a worker in a 22% tax bracket now expects a 12% rate in retirement. Compare $5,000 of pre-tax pay put in a traditional account with the same pay taxed first and put in a Roth (both grow at 7% for 30 years).

Show solution

1. Traditional: $5{,}000 \times 1.07^{30} \approx \$38{,}061$; after 12% tax $\approx \$33{,}494$.
2. Roth: after 22% tax only $3,900 is invested; $3{,}900 \times 1.07^{30} \approx \$29{,}688$, tax-free.

Answer: Traditional wins when your tax rate will be lower later; Roth wins when it will be higher; if the rates are equal, the results are the same. Young workers in low brackets often favor Roth.

PRACTICE

1. Easy Salary $40,000; employer matches 100% up to 4% of pay. How much must you contribute to get the full match, and what is the match?

   Show answer

   $1,600; $1,600

2. Easy What is the main tax difference between traditional and Roth accounts?

   Show answer

   Traditional: tax break now, taxed at withdrawal. Roth: taxed now, qualified withdrawals tax-free.

3. Easy Which company is usually credited with the first private pension plan in the United States, and when?

Show answer

American Express, in 1875.

4. Medium Using an example 4% withdrawal rate, how much savings would provide $30,000 a year?

Show answer

$750,000

5. Medium How much must be invested each year for 40 years at 7% to reach $525,000?

Show answer

$525{,}000 / 199.635 \approx \$2{,}630$ a year (about $219 a month)

6. Medium Why should a worker changing jobs usually roll over a 401(k) rather than cash it out?

Show answer

Cashing out usually brings income tax and an early-withdrawal penalty and ends decades of tax-advantaged growth; rolling over keeps the money invested.

7. Medium From the story: what did section 401(k) of the 1978 tax law allow, and who first used it for an ordinary savings plan?

Show answer

Workers could set aside part of their pay before tax; benefits consultant Ted Benna designed the first such savings plan with an employer match around 1980.

8. Hard In this example, a worker retiring at $70,000 wants 75% of final pay. Social Security replaces 40% of final pay. Using a 4% withdrawal rate, what savings goal is needed?

Show answer

Goal income $52,500; Social Security $28,000; gap $24,500; savings $24{,}500 / 0.04 = \$612{,}500$

9. Hard Investing $300 a month for 45 years at an example 7% a year (monthly rate about 0.5654%) gives about $1,061,000. What does $100 a month give over the same time? Why is the answer one third?

Show answer

About $353,800; the future-value formula is proportional to the deposit.

10. Hard Explain how the shift from pensions to 401(k)s changed who carries the risk.

Show answer

With pensions the employer promised a fixed income and bore investment risk; with 401(k)s the worker owns the account but bears the risk of saving too little or investing poorly.

11. Challenge In the traditional-versus-Roth example, show algebraically that if the tax rate is the same now and later, both choices give the same after-tax amount.

Show answer

Traditional: $P(1+r)^n(1-t)$. Roth: $P(1-t)(1+r)^n$. Multiplication is commutative, so they are equal.

COMMON MISTAKES

- Waiting until "later" to start retirement saving.
- Contributing less than needed to get the full employer match.
- Cashing out retirement accounts when changing jobs.

Make it a game · Match Day Race. Your parent states a salary, a match rate and a savings rate. Race to calculate the employer match in dollars. Then each of you guesses how much more a saver who starts at twenty-five has at sixty-five than one who starts at thirty-five. Reveal the arithmetic. Explain traditional and Roth accounts in one sentence each.

Scripture. "Provideth her meat in the summer, and gathereth her food in the harvest." (Proverbs 6:8, KJV)

The ant saves in the season of plenty for the season when she cannot gather. Working years are the summer of a life.

10.2 Wills and Estate Planning, Simply: Lincoln Dies Without a Will

OBJECTIVES

- Explain what a will, beneficiary designations, powers of attorney and guardianship provisions do.
- Describe what happens when someone dies without a will.
- Prepare a simple estate inventory and a list of documents every adult should have.

> **Warm-up.** If a family's parents died suddenly, who would care for the children? Who would know where the bank accounts are? Write the questions a family would face.

WATCH

Estate planning introduction | Insurance | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 5:42

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

> **WHEN TO WATCH**
> After the story of Lincoln: what estate planning includes.

BACKUP VIDEO

Power of attorney, living will and medical directive | Insurance | Financial Literacy | Khan Academy

Khan Academy · 4:06

https://www.youtube.com/watch?v=W6aIk5QpcxU

With In business today: powers of attorney, living wills and medical directives.

KEY TERMS

will
A legal document stating how a person's property is to be distributed at death and, for parents, whom they choose as guardian for minor children.

intestate
Dying without a valid will; state law then decides who inherits.

executor

The person named in a will to carry out its instructions.

probate

The court process of proving a will, paying debts and distributing an estate.

beneficiary designation

A form naming who receives a life-insurance policy or retirement account at death; it usually overrides the will.

power of attorney

A document authorizing someone to act for you in financial or health matters if you cannot.

CORE IDEAS

The story. Abraham Lincoln was a skilled lawyer who had drawn up wills for clients and settled many estates. Yet when he was shot on April 14, 1865, and died the next morning, he left no will. His widow, Mary, and his sons Robert and Tad had no document telling how his property should be divided. Lincoln's friend Judge David Davis of the Supreme Court took charge as administrator, and under Illinois law the estate was divided among Mary and the two sons. Davis managed the estate carefully for more than two years, and it grew while in his care, but the family had to wait for a court to do what a page of Lincoln's own writing could have done.

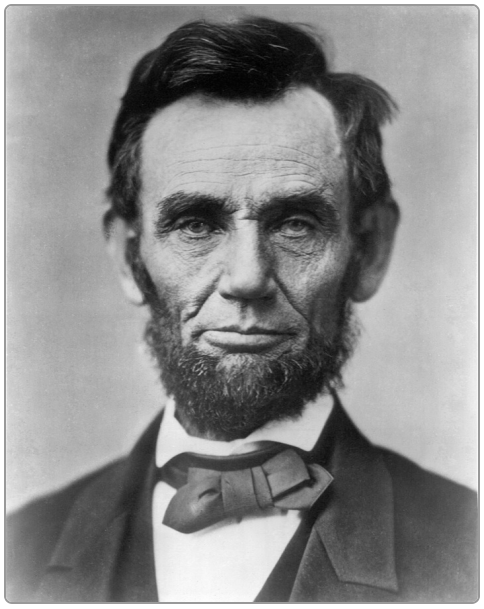
How they figured it out. The law has long provided for people who die **intestate**: each state has a fixed order of heirs, usually a spouse and children first. But a fixed rule cannot know a family. It cannot name a guardian for children, leave a gift to a church or a friend, choose a trusted executor, or say who should handle a family business. A **will** does those things. Scripture assumes that wise people plan for their households after death: "A good man leaveth an inheritance to his children's children" (Proverbs 13:22), and Hezekiah was told, "Set thine house in order; for thou shalt die" (Isaiah 38:1).

The big idea. Every adult needs a few documents: a **will** (with a guardian named for any minor children), **beneficiary designations** on life insurance and retirement accounts (which pass directly, outside the will, so they must be kept current), a financial **power of attorney**, and a health-care directive naming who decides for you if you cannot. An estate passes through **probate**, which can take months and cost money; good planning makes it simpler. Large estates may owe estate taxes, but the thresholds are high and change by law, so most families owe none. Just as important as the documents is a simple list telling your family where to find everything.

In business today. Lawyers prepare wills and trusts; some states also accept simple handwritten or statutory wills, and online tools exist, but the rules for signing and witnessing must be followed exactly or the will may fail. A young single adult with few assets may need only beneficiary designations, a simple will and powers of attorney; parents of young children especially need a will to name guardians and often life insurance (Lesson 5.5). Review documents after marriage, the birth of a child, a move to another state or a death in the family.

Think it through. Estate planning is an act of love: it spares grieving families confusion and conflict, and it lets your stewardship continue after you are gone. A family that has prayed and talked about these things is far better prepared than one that has avoided them.

PICTURE STUDY



Abraham Lincoln, Alexander Gardner, 1863 · Photograph (albumen print) · Library of Congress
Image: Wikimedia Commons, public domain

Alexander Gardner photographed Lincoln several times in Washington. This portrait was made in November 1863, eleven days before the Gettysburg Address. Lincoln had less than two years to live, and he had no will.

Look closely

- Look at his face. What does it show of the burdens of the war years?
- Look at his clothing. Is it showy or plain?
- Imagine his family looking at this photograph after his death. What questions would they face?

Talk about it

1. Why might even a careful lawyer like Lincoln put off writing his own will?
2. What could a will have settled for the Lincoln family?
3. What documents should you sign when you become an adult, and why?

Safety first. Do not write account numbers, passwords or Social Security numbers in your notebook. Use the template only; real information belongs in your parents' secure records.

PROJECT

A Family Estate Readiness File

With your parents, you will prepare a sample (or, if they wish, real) list of what an adult needs for estate planning, a household information sheet, and your own adult-documents checklist. You will not write a legal will; you will learn what one needs.

You will need

- Ledger notebook
- A sample will from a state bar association or library (with a parent)
- Your family's permission and help for any real information

Steps

1. Read a sample simple will and label its parts: identification, revocation of earlier wills, executor, guardian, gifts, residue, signatures and witnesses.
2. Make a household information sheet template: accounts, insurance policies, retirement accounts and their beneficiaries, property, debts, digital accounts, where documents are kept, and key contacts (do not fill in account numbers).
3. Calculate a net estate for a sample family using the formula.
4. Use an example intestacy rule to divide it, then write how the family might divide it differently in a will and why.
5. Write your own checklist of documents to sign at 18 (powers of attorney, health-care directive, beneficiary forms) and to update at marriage and parenthood.
6. Discuss with your parents whether their documents are up to date (they need not share details).
7. Write a half page connecting Proverbs 13:22 and Lincoln's story.

Tips

- Keep any real family information private and stored securely.
- Rules for wills differ by state; a lawyer should prepare real documents.

Check your work

- ☐ I can identify the parts of a will.
- ☐ My information-sheet template is complete without private numbers.
- ☐ I can explain why beneficiary designations must be kept current.

LEDGER NOTEBOOK

1. Draw a diagram of how property passes at death: will, beneficiary designations, joint ownership.
2. Copy your adult-documents checklist.
3. Copy Proverbs 13:22 and Isaiah 38:1.

KEY FORMULAS

$$\text{Net estate} = \text{assets} - \text{debts} - \text{final expenses}$$
$$\text{Share} = \text{fraction} \times \text{net estate}$$

From history. Mary Lincoln's share of the estate, together with a pension later granted by Congress, supported her for the rest of her life. Robert Lincoln, who became a successful lawyer and businessman, made sure his own affairs were carefully arranged.

WORKED EXAMPLES

Example 1. A man dies owning a home worth \$260,000, savings of \$40,000, a car worth \$9,000 and household goods of \$15,000. He owes \$150,000 on the mortgage and \$4,000 on a card; final expenses are \$12,000. Find the net estate.

Show solution

1. Assets: $260{,}000 + 40{,}000 + 9{,}000 + 15{,}000 = \$324{,}000$.
2. Less debts and expenses: $150{,}000 + 4{,}000 + 12{,}000 = \$166{,}000$.
3. Net: \$158,000.

Answer: \$158,000.

Example 2. In this example, a state's law for someone who dies without a will leaves the first $100,000 plus half the rest to the spouse and the remainder equally to the children. Divide the $158,000 estate between a spouse and two children. (Rules differ by state.)

Show solution

1. Spouse: $100{,}000 + 0.5 \times 58{,}000 = \$129{,}000$.
2. Children: $29,000 split equally, $14,500 each, held under court supervision if they are minors.

Answer: Spouse $129,000; each child $14,500, which may not be what the parents wanted, and no guardian was named.

Example 3. The man's will left everything to his wife, but his $300,000 life-insurance policy still named his parents as beneficiaries from before his marriage. Who receives the insurance?

Show solution

1. Beneficiary designations pass outside the will.
2. The policy goes to the named beneficiaries: his parents.

Answer: His parents receive the $300,000, not his wife. Keeping beneficiary forms current is as important as writing the will.

PRACTICE

1. Easy What does "intestate" mean?

   Show answer

   Dying without a valid will.

2. Easy Name four documents every adult should consider having.

   Show answer

   A will, beneficiary designations, a financial power of attorney, and a health-care directive.

3. Easy Who administered Abraham Lincoln's estate, and why was it needed?

   Show answer

   Judge David Davis, because Lincoln died without a will.

4. Medium Assets $412,000; debts $185,000; final expenses $15,000. Find the net estate.

Show answer

$212,000

5. Medium Using the lesson's example rule, divide $212,000 between a spouse and three children.

Show answer

Spouse $100{,}000 + 56{,}000 = \$156{,}000$; children $\$56{,}000/3 \approx \$18{,}667$ each

6. Medium Why is naming a guardian one of the most important reasons for parents to have a will?

Show answer

Without it, a court decides who raises the children; a will lets parents choose people who share their faith and values.

7. Medium From the story: why is it striking that Lincoln had no will?

Show answer

He was an experienced lawyer who had drawn wills for others and settled estates, yet he neglected his own.

8. Hard A woman's will leaves everything to her church, but her retirement account names her brother as beneficiary and her house is jointly owned with her sister with right of survivorship. Who receives each?

Show answer

The retirement account goes to her brother; the house to her sister; only the remaining probate assets pass under the will to the church.

9. Hard Probate costs average 3% of a $250,000 estate in this example and take 9 months. If careful planning reduces probate assets to $80,000, how much in fees is saved?

Show answer

$0.03 \times (250{,}000 - 80{,}000) = \$5{,}100$

10. Hard Explain how a will can continue a person's stewardship after death.

Show answer

It directs property to family needs, guardians, churches and charities according to the person's values, rather than leaving it to a fixed legal formula.

11. Challenge In this example, a parent leaves $90,000 in trust for a 6-year-old, invested at 5%, to be paid out at age 25. What will it be worth then? If instead the child received it outright at 18 with no plan, what risk would that create?

Show answer

$90{,}000 \times 1.05^{19} \approx \$227{,}426$; an 18-year-old with a large sum and no guidance might spend it unwisely, which is why parents often use trusts with trustees.

COMMON MISTAKES

- Thinking only the wealthy need a will.
- Forgetting to update beneficiary designations after marriage or children.
- Hiding financial information so well that the family cannot find it.

Make it a game · Will Terms Drawing. Take turns drawing a will term without words: executor, beneficiary, power of attorney, guardian, probate or intestate. The other guesses and defines it. Score points for correct definitions. Then your parent plays a judge who asks what happens to a family when someone dies without a will, the way Lincoln did.

Scripture. "A good man leaveth an inheritance to his children's children: and the wealth of the sinner is laid up for the just." (Proverbs 13:22, KJV)

Planning what you leave behind, in faith, character and property, is part of being faithful to the generations after you.

10.3 Giving and Legacy: George Müller's Orphan Houses

OBJECTIVES

- Tell the story of George Müller and R. G. LeTourneau and what they teach about giving.
- Plan lifetime giving, including regular, special and planned gifts.
- Calculate the effect of giving plans and the ongoing income of an endowment.

> **Warm-up.** Name a person whose generosity shaped your family, church or town. What did he or she give, and what difference did it make?

WATCH

Charitable contributions as tax deductions | Financial mathematics (TX TEKS) | Khan Academy

Khan Academy · 5:37

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

> **WHEN TO WATCH**
> With In business today: how charitable gifts are counted at tax time, worked step by step (rules change yearly).

KEY TERMS

legacy
What a person leaves behind: character, faith, relationships and property.

endowment
A permanent fund whose investment earnings support a church, school or charity year after year.

stewardship
Managing what belongs to God for His purposes.

bequest
A gift made through a will.

payout rate
The percentage of an endowment spent each year.

CORE IDEAS

The story. George Müller, a German-born pastor in Bristol, England, opened his first home for orphans in 1836 in a rented house on Wilson Street. Over the next sixty years he built five large orphan houses on Ashley Down and cared for more than ten thousand children, giving them food, clothing, schooling and training for work. He resolved never to ask any person for money, but to pray and to make his needs known only to God. Gifts came, sometimes at the last moment, from rich and poor alike. And every year he published a careful account, a *Narrative*, listing the gifts received and how they were spent, so that everyone could see the money was handled honestly. In the twentieth century, R. G. LeTourneau, an inventor of giant earth-moving machines, became known as a "reverse tither": as his business prospered he gave away most of his income, eventually around 90%, through a foundation that supported missions and education.

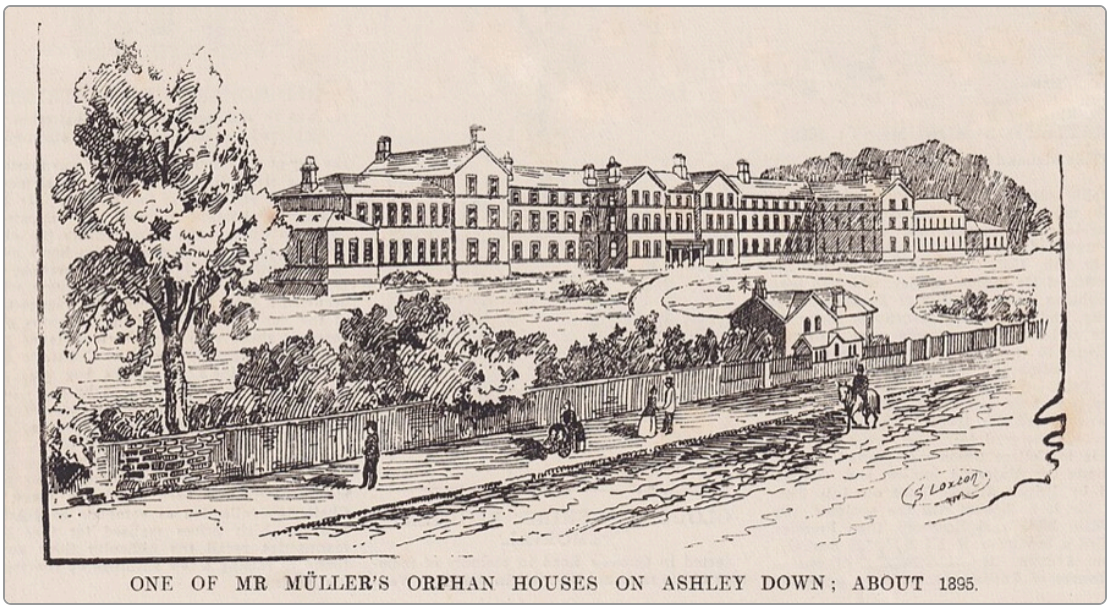
How they figured it out. Müller wanted to show that God can be trusted, and he understood that a ministry funded by the public must keep public accounts. His records, kept to the penny, are one reason his work was trusted for generations. LeTourneau learned to give more as he earned more, like Wesley (Lesson 2.5); he said the question was not how much of his money he gave to God, but how much of God's money he kept for himself. Both men saw giving not as a loss but as investing in what lasts: "Lay not up for yourselves treasures upon earth… But lay up for yourselves treasures in heaven" (Matthew 6:19-20).

The big idea. A lifetime of giving has three parts: **regular** giving from income (Lesson 2.3), **special** gifts for particular needs, and **planned** giving, such as **bequests** in a will or gifts to an **endowment** that keeps giving after you are gone. An endowment that pays out about 4% to 5% a year can support a work indefinitely. Give to ministries and charities that, like Müller, keep honest, open accounts. And remember that legacy is more than money: the faith and character you pass on matter most.

In business today. Families and businesses give through churches, foundations and donor funds; many companies match employees' gifts. Tax rules can encourage giving (Lesson 6.2), but they change and are never the main reason. Some of the most effective giving is personal: hospitality, mentoring, caring for widows and orphans (James 1:27), and helping a neighbor through hard times.

Think it through. Paul told Timothy to charge the rich "that they do good, that they be rich in good works, ready to distribute, willing to communicate; Laying up in store for themselves a good foundation against the time to come" (1 Timothy 6:18-19). Generosity is the purpose to which all the saving in this course points.

PICTURE STUDY



The New Orphan Houses, Ashley Down, Bristol, Unknown illustrator, c. 1895 · Engraving · Bristol, England

Image: Wikimedia Commons, public domain

By the 1870s Müller's five orphan houses on Ashley Down could shelter about two thousand children at once. The plain, solid buildings were paid for entirely by gifts. They still stand and are used today for homes and a college.

Look closely

- Count the buildings. How many children might live in them?
- Look at the windows and the open land around. Why might Müller have chosen this hill?
- Notice the plain style. What does it suggest about how the money was spent?

Talk about it

1. Why did Müller publish every gift and expense each year?
2. How could ordinary people's small gifts build something this large?
3. What legacy would you like your giving to leave?

PROJECT

My Lifetime Giving and Legacy Plan

You will plan giving for your whole life: regular giving, special gifts and planned gifts, and research one ministry's financial openness, as Müller set the example.

You will need

- Your giving plan from Lesson 2.3
- Free spreadsheet
- One ministry's or charity's annual report (with a parent)
- *The Life of Trust* (optional, free online)

Steps

1. Estimate your income at ages 25, 35, 45 and 55 using your career choice and example 3% raises.
2. Choose a giving pattern (a fixed tithe, a rising percentage, or a graduated plan like LeTourneau's) and calculate giving at each age and the lifetime total.
3. Plan one special gift you would like to make someday (for example, helping build a church, a scholarship, or support for a missionary) and the savings plan to make it.
4. Design a planned gift: a bequest to an endowment. Choose an amount and calculate its yearly payout at 4.5%.
5. Read one ministry's annual report and compare its openness with Müller's published accounts.
6. Read one chapter of Müller's narrative (optional) and copy a sentence that moves you.
7. Write one page describing the legacy you hope to leave, in faith, character and gifts.

Tips

- Plans can change. The habit of planned generosity is what matters.
- Ask your church how it reports its finances to members.

Check your work

- ☐ My plan includes regular, special and planned giving with calculations.
- ☐ I analyzed one ministry’s financial openness.
- ☐ My legacy essay connects to 1 Timothy 6:17-19.

LEDGER NOTEBOOK

1. Graph your planned giving by age.
2. Draw Müller’s five orphan houses and write how many children they cared for.
3. Copy 1 Timothy 6:18-19.

KEY FORMULAS

$$\text{Endowment payout} = \text{payout rate} \times \text{endowment value}$$
$$\text{Lifetime giving} = \sum(\text{giving rate} \times \text{income})$$

From history. Müller’s records show that the orphan work received about £1.5 million in gifts during his lifetime, an enormous sum then. At the age of seventy he began preaching tours that took him to forty-two countries. He died in 1898 at ninety-two, owning almost nothing.

WORKED EXAMPLES

Example 1. In this example, a church receives a $500,000 bequest to establish an endowment for missionary support with a 4.5% yearly payout. Find the first year’s support. If the fund earns 6.5% and pays out 4.5%, about how large is the fund after 20 years?

Show solution

1. Payout: $0.045 \times 500{,}000 = \$22{,}500$.
2. Net growth 2% a year: $500{,}000 \times 1.02^{20} \approx \$742{,}974$.

Answer: $22,500 the first year; the fund grows to about $743,000, so its yearly support also grows, to about $33,400.

Example 2. A worker earns \$45,000 at 25 with 3% yearly raises until 65 (40 years). She gives 10% every year. Find her lifetime giving.

Show solution

1. Total income: $45{,}000 \times (1.03^{40} - 1)/0.03 \approx 45{,}000 \times 75.40 \approx \$3{,}393{,}000$.
2. Giving: $10\% \approx \$339{,}300$.

Answer: About \$339,000 given over a working life from an ordinary income.

Example 3. LeTourneau's pattern: suppose a man gives 10% of income up to \$60,000, 50% of income from \$60,000 to \$150,000, and 90% above that. What does he give on \$100,000 and on \$300,000?

Show solution

1. \$100,000: $6{,}000 + 0.5 \times 40{,}000 = \$26{,}000$ (26%).
2. \$300,000: $6{,}000 + 45{,}000 + 0.9 \times 150{,}000 = \$186{,}000$ (62%).

Answer: \$26,000 and \$186,000; his living costs grow slowly while his giving grows fast, like Wesley's.

PRACTICE

1. Easy Find the yearly payout of a \$200,000 endowment at 4%.

   Show answer

   \$8,000

2. Easy What is a bequest?

   Show answer

   A gift made through a will.

3. Easy About how many orphans did George Müller care for, and how did he fund the work?

   Show answer

   More than ten thousand; through gifts given in answer to prayer, without asking anyone for money, with every gift published.

4. **Medium** A worker gives 12% of $55,000 a year for 30 years with no raises. Find total giving.

   Show answer

   $198,000

5. **Medium** An endowment of $1,000,000 pays out 5%. How many $2,500 scholarships does it fund each year?

   Show answer

   $50{,}000 / 2{,}500 = 20$

6. **Medium** Why did Müller publish his accounts, and why does that matter for givers today?

   Show answer

   To show the gifts were used honestly and to give glory to God; givers should support ministries that are open about their finances.

7. **Medium** From the story: what is a “reverse tither,” and who was known as one?

   Show answer

   Someone who gives away most of his income and lives on a small part; R. G. LeTourneau, who eventually gave around 90%.

8. **Hard** An endowment earns 7% and pays out 5%. Starting at $300,000, what is the payout in year 1 and about how much in year 20?

   Show answer

   Year 1 $15,000; value grows 2% a year, so year 20 payout $\approx 15{,}000 \times 1.02^{19} \approx$ $21,852

9. **Hard** Using the lesson’s graduated plan, what is given on $150,000 of income, and what percent is that?

   Show answer

   $6{,}000 + 45{,}000 = \$51{,}000$; 34%

10. Hard Explain how Matthew 6:19-21 changes the purpose of saving and investing.

    Show answer

    Earthly wealth is temporary; saving and investing are means to serve God and others, and treasure laid up in heaven through generosity is what lasts.

11. Challenge What constant payout rate lets an endowment earning 6.5% a year keep its real value if prices rise 2.5% a year? Explain.

    Show answer

    About 4%: $1.065/1.025 - 1 \approx 3.9\%$; paying out more would shrink the fund's purchasing power over time.

COMMON MISTAKES

- Thinking giving is only for the wealthy or only for later.
- Giving to causes without checking their honesty.
- Forgetting that a legacy of faith and character matters more than money.

Make it a game · Legacy Ledger. Set a one-minute timer and list every kind of giving you can name: regular, special, planned, bequest and endowment. Then calculate what an endowment of one hundred thousand dollars gives at a four percent payout rate. Finish by telling how George Müller trusted God for the orphan houses.

Scripture. "Charge them that are rich in this world, that they be not highminded, nor trust in uncertain riches, but in the living God, who giveth us richly all things to enjoy; That they do good, that they be rich in good works, ready to distribute, willing to communicate; Laying up in store for themselves a good foundation against the time to come, that they may lay hold on eternal life." (1 Timothy 6:17-19, KJV)

Paul does not condemn wealth; he tells the wealthy what it is for: doing good, generosity and treasure that lasts.

10.4 Avoiding Get-Rich Schemes and Games of Chance

OBJECTIVES

- Calculate the expected value of games of chance and explain why they lose money over time.
- Recognize the marks of get-rich-quick schemes, including pyramid-style sales plans.
- Explain the biblical warnings about haste to be rich and the alternative of patient work.

> **Warm-up.** Write down three ads or messages you have seen that promised easy money. What did each want from the viewer?

WATCH

Can You Really Get Rich Quick?

Two Cents · 6:52

https://www.youtube.com/watch?v=7iww5zIuzyA

> **WHEN TO WATCH**
> After the story of the Louisiana Lottery: the tricks of get-rich-quick promoters.

Note: Two Cents (PBS).

BACKUP VIDEO

Expected profit from lottery ticket | Probability and Statistics | Khan Academy

Khan Academy · 9:18

https://www.youtube.com/watch?v=6vlBOHckmzU

With worked example 1: Sal Khan calculates the expected profit of a lottery ticket.

KEY TERMS

expected value

The average result per play over many plays: the sum of each outcome times its probability, minus the cost.

house edge

The share of each dollar wagered that the operator of a game of chance expects to keep over time.

gambling

Risking money on a game of chance in hope of a gain that comes from others' losses rather than from work or the creation of value.

get-rich-quick scheme

Any offer of large, fast gains with little work or risk; nearly always a path to loss.

multi-level marketing

A sales plan in which participants earn from recruiting others as well as from sales; most participants earn little or lose money.

CORE IDEAS

The story. In 1868 the Louisiana legislature chartered the Louisiana Lottery Company and gave it a monopoly for twenty-five years. Its tickets were sold across the whole country, largely by mail, and its drawings were held with great show in New Orleans. The company grew enormously rich, while millions of mostly working people bought tickets they could not afford. It was widely accused of buying influence, and churches and reformers across the nation campaigned against it. In 1890 Congress banned lottery tickets and advertising from the U.S. mail; the company's charter was not renewed, and by the mid-1890s it had moved its operations out of the country before closing.

How they figured it out. The reformers' case rested partly on morals and partly on arithmetic. A lottery pays out in prizes much less than it takes in; the difference is the operator's profit. Every ticket, on average, loses money: its **expected value** is less than its price. The same is true of every game run for profit, which is why the operators always win in the long run. Get-rich schemes work the same way: the promoters gain from the many who pay in. Scripture names the deeper problem: "they that will be rich fall into temptation and a snare" (1 Timothy 6:9), and "he that maketh haste to be rich shall not be innocent" (Proverbs 28:20).

The big idea. Compare three ways to try to gain money. **Work and trade** create value: both sides gain. **Investing** shares in the profits of real businesses and loans, with real risk but a positive expected return over time. **Gambling** creates nothing: one person's gain is another's loss, and the operator takes a cut, so the expected value is negative. A $2 ticket that returns on average 60 to 70 cents in prizes loses more than a dollar each time, and $10 a week spent on tickets for forty years, if invested instead

at an example 7%, could grow to over $100,000. Many people who win large prizes are no better off within a few years. **Get-rich-quick schemes**, including many **multi-level marketing** plans, promise large incomes but typically leave most participants with little or a loss.

In business today. Games of chance are now advertised everywhere and available on phones, and they target the young. Warning signs of trouble include chasing losses, hiding losses, borrowing to play, and thinking about it constantly; anyone struggling should talk with a parent, pastor or counselor. Get-rich offers use the same tactics as frauds (Lesson 8.4): testimonials of sudden wealth, pressure, and the promise that you can quit your job soon. The wise response is simple: refuse the game, and put the money to work in honest saving and giving.

Think it through. The Christian objection to gambling is not only that it loses money. It feeds covetousness (Exodus 20:17), it seeks gain from neighbors' losses rather than from serving them, and it treats God's provision as luck. Contentment and patient work are the alternatives (Philippians 4:11; Proverbs 13:11).

PICTURE STUDY



California Gold Miners with a Long Tom, Unknown photographer, c. 1850–1852 · Daguerreotype · Library of Congress

Image: Wikimedia Commons, public domain

After gold was found at Sutter's Mill in 1848, some three hundred thousand people rushed to California. A few struck it rich; most worked brutally hard for little and went home poorer. Many who did best were not miners at all but merchants who sold them shovels, food and work pants.

Look closely

- Look at the miners' clothes and faces. How hard was this work?
- Find the long tom. How did it separate gold from gravel?
- Count the miners. If only a few found much gold, what happened to the rest?

Talk about it

1. Why do "rushes" and get-rich promises attract so many people?
2. Who earned steady income in the gold rush, and how?
3. How does 1 Timothy 6:9 describe the danger of the rush to be rich?

PROJECT

The Arithmetic of Easy Money

You will calculate the expected value of a real game of chance from its published odds and prize tables, simulate thousands of plays in a spreadsheet, and analyze one get-rich offer, then write about a better use of the same money.

You will need

- Free spreadsheet
- A published prize table and odds for a lottery game (from its official website, viewed with a parent)
- One advertisement for an income opportunity (found with a parent)

Steps

1. Copy the game's prize table and odds. Calculate the expected value of one ticket and the house edge (ignore taxes, then estimate them).
2. In a spreadsheet, simulate 10,000 tickets using random numbers and the published odds (use a smaller example game if the odds are too small to simulate). Compare the simulated average with your expected value.
3. Calculate what a habit of spending $5 a week on the game for 40 years would cost, and what investing it at an example 7% could produce.
4. Analyze the income advertisement: what does it promise, what does it require, and what do its own disclosures (if any) say about typical earnings?
5. List the warning signs it shows from Lessons 8.4 and 10.4.
6. Write one page explaining, with your numbers and Scripture, why you will not take part, and what you will do with the money instead.

Tips

- Published odds already include all prize levels; read them carefully.
- Be honest in the simulation: record what the random numbers produce.

Check your work

☐ My expected-value calculation is correct and matches my simulation.

☐ I calculated the cost of the habit and its invested alternative.

- [ ] My analysis of the offer identifies its warning signs.

LEDGER NOTEBOOK

1. Graph the simulated running average of 10,000 tickets approaching the expected value.
2. Draw the pyramid from the third worked example with the number of people at each level.
3. Copy 1 Timothy 6:9 and Proverbs 13:11 side by side.

KEY FORMULAS

$$E[\text{net}] = \sum p_i \times \text{prize}_i - \text{cost}$$

$$\text{House edge} = \frac{-E[\text{net}]}{\text{cost}}$$

From history. Before the Louisiana Lottery, many American states and colleges had used lotteries to raise money, but scandals led nearly every state to ban them by the late 1800s. The national fight over the Louisiana Lottery was one of the largest moral reform campaigns of its time, led in large part by churches.

WORKED EXAMPLES

Example 1. In this example, a \$2 ticket has a 1 in 300,000,000 chance at a \$100,000,000 jackpot, and the smaller prizes return an average of \$0.30 per ticket. Find the expected value of buying one ticket and the house edge (ignore taxes and shared jackpots).

Show solution

1. Jackpot part: $100{,}000{,}000/300{,}000{,}000 \approx \$0.333$.
2. Expected prizes: $0.333 + 0.30 = \$0.633$. Net: $0.633 - 2 = -\$1.367$.
3. House edge: $1.367/2 \approx 68\%$.

Answer: Each \$2 ticket loses about \$1.37 on average, a 68% edge, before taxes on any winnings make it worse.

Example 2. A person spends $10 a week on tickets for 40 years. Find the total spent and what $520 a year would grow to at an example 7% a year.

Show solution

1. Spent: $520 \times 40 = \$20{,}800$.
2. Invested: $520 \times (1.07^{40} - 1)/0.07 \approx 520 \times 199.64 \approx \$103{,}810$.

Answer: About $20,800 spent (with most of it lost) versus about $104,000 if invested.

Example 3. In this example, a sales plan says each member must buy $100 of products a month and recruit 5 members, earning 10% of their purchases. If 1 person recruits 5, who each recruit 5, who each recruit 5, how many people are at level 3, and how much does a level-3 member earn from recruits he has not yet found?

Show solution

1. Level 1: 5; level 2: 25; level 3: 125.
2. Level-3 members have no recruits yet: they earn nothing and spend $100 a month.
3. At level 10 the plan would need $5^{10} \approx 9.8$ million new members.

Answer: Most participants are always at the bottom, paying in and earning little. The structure guarantees that most lose.

PRACTICE

1. Easy A $1 game pays $5 with probability 0.1 and nothing otherwise. Find the expected net value.

   Show answer

   $0.5 - 1 = -\$0.50$

2. Easy Why does the operator of a game of chance always win in the long run?

   Show answer

   Prizes are set so that, on average, less is paid out than taken in; the house edge guarantees profit over many plays.

3. **Easy** What did Congress do in 1890 that hurt the Louisiana Lottery?

Show answer

It banned lottery tickets and advertising from the U.S. mail.

4. **Medium** A game pays even money (win $1, lose $1) with a 47.4% chance of winning. Find the expected value per $1 and the expected result of 1,000 plays.

Show answer

$0.474 - 0.526 = -\$0.052$; about $-\$52$

5. **Medium** $15 a week on games of chance for a year is how much? Invested monthly at 0.5% for 10 years (about $65 a month), what would it grow to?

Show answer

$\$780$; $65 \times (1.005^{120} - 1)/0.005 \approx \$10{,}652$

6. **Medium** List four warning signs of a get-rich-quick scheme.

Show answer

Promises of large fast income, little work or risk, pressure to join quickly, emphasis on recruiting, upfront fees or required purchases, testimonials instead of data (any four).

7. **Medium** From the story: why did churches and reformers campaign against the Louisiana Lottery?

Show answer

It drew money from mostly working people who could not afford it, made its owners enormously rich, and was accused of buying influence with lawmakers.

8. **Hard** A jackpot is $50 million with odds 1 in 175 million on a $1 ticket. Ignoring other prizes and taxes, find the expected value. At what jackpot would the expected value of the jackpot part equal the ticket price?

Show answer

$50/175 - 1 \approx -\$0.71$; $175 million (and taxes and shared prizes would still make it negative).

9. Hard Explain the moral difference between investing in a business and gambling, even though both involve risk.

Show answer

Investing supplies capital to produce real goods and services, so gains come from value created; gambling creates nothing, and one person's gain comes from others' losses, feeding covetousness.

10. Hard A sales plan reports that its typical participant earned $300 last year but spent $1,200 on required products and fees. What is the typical participant's result, and what should a prospective member conclude?

Show answer

A loss of $900; the plan does not provide real income for most, regardless of the stories of top earners.

11. Challenge A player starts with $100 and bets $10 at a time on a game with a 47.4% chance to win even money. Explain using expected value why the more he plays, the more certain he is to lose, and estimate his expected loss after 200 plays.

Show answer

Each play has expected value $-0.052 \times 10 = -\$0.52$; after 200 plays the expected loss is about $104, more than his stake. Short-run luck evens out, and the edge dominates in the long run.

COMMON MISTAKES

- Thinking a game is "due" to pay off after losses.
- Counting only the jackpot and ignoring the odds.
- Believing testimonials of sudden riches instead of typical results.

> **Make it a game · House Edge Lab.** Play a pretend bean game with your parent. You pay one bean to play, roll a die, and win four beans on a 6. Play twenty rounds and record the totals. Then calculate the expected value and the house edge. Finish by listing three warning signs of a get-rich-quick scheme.

> **Scripture.** “But they that will be rich fall into temptation and a snare, and into many foolish and hurtful lusts, which drown men in destruction and perdition.” (1 Timothy 6:9, KJV)
>
> The desire to be rich quickly is itself a trap. Contentment and honest work are the way of freedom.

10.5 A Capstone Financial Plan: "Well Done, Thou Good and Faithful Servant"

OBJECTIVES

- Prepare a personal net-worth statement and a set of written financial goals.
- Combine the course's parts into a complete financial plan for the next ten years.
- Present the plan to parents and explain how it reflects faithful stewardship.

> **Warm-up.** Write down the three most important money lessons you have learned this year, and one habit you have already begun.

WATCH

Do I Need A Financial Advisor?

Two Cents · 5:07

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

> **WHEN TO WATCH**
> Before presenting your plan: when and how to choose a trustworthy financial professional.

Note: Two Cents (PBS); the video names some professional credentials and fee types as examples.

BACKUP VIDEO

Short, medium and long term financial goals | Financial goals | Financial Literacy | Khan Academy

Khan Academy · 3:28

https://www.youtube.com/watch?v=nzIAe8WSSqE

Before writing your goals: short, medium and long-term financial goals.

KEY TERMS

net worth

What you own (assets) minus what you owe (liabilities).

financial goal

A specific, measurable target with an amount and a date, such as "save $3,000 for an emergency fund by June 2028."

financial plan

A written plan covering income, giving, saving, spending, debt, insurance, investing and estate planning, with goals and steps.

savings rate

The share of income saved: savings ÷ income.

stewardship

Faithful management of what God has entrusted to us, for His purposes.

CORE IDEAS

The story. In Jesus' parable of the talents (Matthew 25:14-30), a master going on a long journey entrusted his servants with his money: five talents to one, two to another, one to a third, "to every man according to his several ability." Two traded diligently and doubled what they had been given. The third, afraid, dug a hole and hid his master's money. When the master returned, he said to each faithful servant, "Well done, thou good and faithful servant: thou hast been faithful over a few things, I will make thee ruler over many things: enter thou into the joy of thy lord." The fearful servant lost even what he had.

How they figured it out. The faithful servants knew three things: the money was not theirs; they would give an account; and the time to act was now, before the master returned. Every lesson in this course has applied those truths: work as a calling (Unit 1), budgeting, saving and giving (Unit 2), banking and honest records (Unit 3), avoiding needless debt (Unit 4), insuring against ruin (Unit 5), paying what is owed (Unit 6), investing patiently (Units 7 and 8), buying wisely (Unit 9), and planning for the end of life and beyond (Unit 10). A written plan turns those lessons into steps.

The big idea. A personal financial plan has a few parts: a **net-worth statement** (where you are), **goals** (where you are going, each with an amount and date), a **budget** that gives every dollar a job, a **giving** plan, an **emergency fund** and **debt** policy, **insurance** needs, a **saving and investing** plan matched to time horizons, and **estate** documents. A commonly taught order of priorities is: give first; build a starter emergency fund; capture any employer match; pay off high-interest debt; build a full emergency fund; save for retirement and other goals; then build wealth and generosity over time. Review the plan once a year and after any major life change.

In business today. Businesses make strategic plans and review them every year; families should too. As an adult, you may want help from a qualified, trustworthy professional, such as a certified financial planner who explains fees plainly, especially for complex decisions. But the plan's values are yours to set. A good plan is simple enough to remember, specific enough to act on, and flexible enough to change when God's providence changes your circumstances (James 4:13-15).

Think it through. The goal of this whole course is not wealth but faithfulness. "He that is faithful in that which is least is faithful also in much" (Luke 16:10). The habits you begin now with small sums will shape what you do with larger ones.

PICTURE STUDY



The Harvesters, Pieter Bruegel the Elder, 1565 · Oil on wood · Metropolitan Museum of Art, New York

Image: Wikimedia Commons, public domain

Bruegel painted the harvest as part of a series on the seasons. The workers have labored since spring; now the grain is ripe. Some still work, some rest and share their food, and the whole landscape seems to rejoice in the fruit of patient labor.

Look closely

- Find the workers cutting grain. Find those resting and eating. What does the painter say about work and rest?
- Find the bundles of grain. What will they become?
- Find the church. Where is it in the landscape?
- Look at the distant village and harbor. Where will this harvest go?

Talk about it

1. How is a life of faithful work and saving like the year that leads to this harvest?
2. What will your own "harvest" be used for: yourself, your family, your neighbors, God's work?
3. How does the master's "Well done" in Matthew 25 relate to this painting?

PROJECT

My Ten-Year Financial Plan (Capstone)

You will write a complete personal financial plan for ages 18 to 28, using the work you have done all year, and present it to your parents (and, if possible, a trusted mentor).

You will need

- Your portfolios from Units 1–9
- Free spreadsheet
- Ledger notebook
- A quiet hour with your parents

Steps

1. Write a one-paragraph statement of purpose: what you believe money is for, with one verse.
2. Prepare your current net-worth statement and project it at ages 22, 25 and 28.
3. Set five specific goals with amounts and dates (for example: emergency fund, car paid in cash, no credit-card debt, retirement saving started with full match, a giving goal).
4. Build a first-year budget for your expected first full-time job, with giving, saving, spending and debt payments.
5. Write your policies: debt, insurance needs, investing approach (diversified, low-cost, time-horizon based, no specific investments named), records and taxes, and estate documents at 18.
6. Make a ten-year timeline with milestones and the order of priorities you will follow.
7. Present the plan to your parents for 15–20 minutes and record their questions and advice. Revise the plan.

Tips

- Use the order of priorities from the lesson as your outline.
- A plan you will actually follow beats a perfect plan you will not.

Check your work

- ☐ My plan includes net worth, goals, budget, giving, debt, insurance, investing, records and estate parts.
- ☐ Every goal has an amount and a date, and the numbers add up.
- ☐ I presented the plan and revised it after discussion.

LEDGER NOTEBOOK

1. Copy your net-worth statement and your five goals.
2. Draw your ten-year timeline.
3. Write Matthew 25:21 at the top of a clean page and, below it, the three habits you most want to keep.

KEY FORMULAS

$$\text{Net worth} = \text{assets} - \text{liabilities}$$

$$\text{Savings rate} = \frac{\text{amount saved}}{\text{income}}$$

$$\text{Monthly saving for a goal} = \frac{\text{goal} \times r}{(1+r)^{n} - 1}$$

From history. A talent in Jesus' day was a weight of silver worth roughly twenty years of a laborer's wages. Even the servant given one talent was trusted with a great deal; every reader of this course has likewise been entrusted with more than he may realize.

WORKED EXAMPLES

Example 1. A 22-year-old has $2,400 in checking and savings, a car worth $6,500, a retirement account of $1,800, a car loan of $4,200 and a student loan of $14,000. Find her net worth.

Show solution

1. Assets: $2{,}400 + 6{,}500 + 1{,}800 = \$10{,}700$.
2. Liabilities: $4{,}200 + 14{,}000 = \$18{,}200$.
3. Net worth: $-\$7{,}500$.

Answer: $-\$7{,}500$. A negative net worth is common at the start; the plan's job is to make it rise steadily.

Example 2. She sets a goal of $12,000 for a home down payment in 4 years, saving monthly at an example 0.4% a month. How much must she save each month?

Show solution

1. $n = 48$, $(1.004)^{48} \approx 1.2112$.
2. Monthly $= 12{,}000 \times 0.004 / (1.2112 - 1) \approx 48 / 0.2112 \approx \$227.27$.

Answer: About $227 a month.

Example 3. Her take-home pay is $3,100 a month. She gives $310, saves $227 for the house and $200 for retirement, and pays an extra $100 on her student loan. Find her savings rate (counting retirement and house savings) and what is left for living costs.

Show solution

1. Saved: $427; rate $427 / 3{,}100 \approx 13.8\%$.
2. Left: $3{,}100 - 310 - 427 - 100 = \$2{,}263$.

Answer: A savings rate of about 13.8%, with $2,263 for living costs and loan minimums, which her budget must fit.

PRACTICE

1. Easy Assets $18,500; liabilities $11,200. Find net worth.

   Show answer

   $7,300

2. Easy Saving $450 a month on take-home pay of $3,000. Find the savings rate.

   Show answer

   15%

3. Easy Rewrite as a specific goal: “I want to save some money.”

   Show answer

   For example: “Save $2,000 for an emergency fund by December 2027 by setting aside $170 a month.”

4. **Medium** How much must be saved monthly at 0.5% a month to reach $6,000 in 3 years?

   Show answer

   $6{,}000 \times 0.005/(1.005^{36} - 1) \approx 30/0.19668 \approx \$152.53$

5. **Medium** List the commonly taught order of financial priorities from this lesson.

   Show answer

   Give; starter emergency fund; employer match; pay off high-interest debt; full emergency fund; retirement and other goals; build wealth and generosity.

6. **Medium** Net worth rises from $-\$7{,}500$ to $\$4{,}500$ in three years. What is the average yearly increase?

   Show answer

   $4,000 a year

7. **Medium** From the parable: what three things did the faithful servants understand?

   Show answer

   The money was their master's, they would give an account, and the time to act was before he returned.

8. **Hard** A plan has goals of $3,000 in 12 months and $10,000 in 36 months, saving at 0.4% a month. Find the total monthly saving needed. (Factors: $(1.004^{12} - 1)/0.004 \approx 12.267$; $(1.004^{36} - 1)/0.004 \approx 38.638$.)

   Show answer

   $3{,}000/12.267 + 10{,}000/38.638 \approx 244.56 + 258.81 = \$503.37$

9. **Hard** Why should a financial plan be reviewed every year and after major life changes?

   Show answer

   Income, family, prices, laws and goals change; regular review keeps the plan realistic and faithful to current circumstances.

10. Hard Explain how James 4:13-15 shapes the way a Christian makes long-range financial plans.

Show answer

Plans should be made humbly, saying "If the Lord will," holding them loosely, and adjusting as God's providence directs, while still planning diligently.

11. Challenge A 22-year-old's net worth is $-\$7{,}500$. She adds $\$6{,}000$ a year to net worth (savings plus debt payoff) and her invested assets grow at an example 5% a year once net worth is positive. Roughly when does net worth reach $\$50{,}000$?

Show answer

About 1.25 years to reach zero; then $6{,}000(1.05^n - 1)/0.05 = 50{,}000$ gives $1.05^n \approx 1.417$, $n \approx 7.1$; so around age 30 (about 8.4 years).

COMMON MISTAKES

- Writing goals with no amounts or dates.
- Making a plan and never reviewing it.
- Treating the plan as a path to wealth rather than a tool of stewardship.

Make it a game · Postcard From Year Ten. Write a postcard dated ten years from now describing your finances in three numbers: net worth, savings rate and yearly giving. Your parent asks three questions about how you got there. Then write one sentence on what being a faithful steward means, with Matthew 25:21 in mind.

Scripture. "His lord said unto him, Well done, thou good and faithful servant: thou hast been faithful over a few things, I will make thee ruler over many things: enter thou into the joy of thy lord." (Matthew 25:21, KJV)

The aim of a financial plan is faithfulness with what has been entrusted, and the reward is the master's joy, not merely more money.

UNIT 10

Stewardship for Life

The last unit looks down the whole road of a working life and beyond it. You will learn how **retirement accounts** turn decades of steady saving into income for old age, beginning with the first American company pension in 1875 and the workplace savings plans that grew from a 1978 law. You will learn why every adult needs a **will**, from the example of Abraham Lincoln, a lawyer who died without one. And you will consider **giving and legacy** through George Müller, who cared for more than ten thousand orphans in Bristol without ever asking anyone but God for money, and published every penny received.

Then you will face the oldest temptation in this course: the promise of riches without work. You will study the Louisiana Lottery of the 1800s and the mathematics of **games of chance and get-rich-quick schemes**, and you will see why Scripture warns that "they that will be rich fall into temptation and a snare" (1 Timothy 6:9). The course ends with your **capstone financial plan**: a written plan for earning, giving, saving, spending, borrowing, insuring, investing and leaving a legacy, made with your parents and grounded in the hope of hearing, "Well done, thou good and faithful servant."

PREREQUISITES

- Can calculate future value and regular-deposit growth (Unit 7)
- Understands payroll taxes and Social Security (Unit 6)
- Has the budget, giving plan and investing work from Units 2 and 7

MASTERY CHECKLIST

- ☐ I can explain employer plans and IRAs, traditional and Roth, and calculate the value of an employer match and of starting early.
- ☐ I can estimate a retirement savings goal from an income target, Social Security and a withdrawal rate (using example figures).
- ☐ I can explain what a will, beneficiary designations and powers of attorney do, and why every adult needs them.
- ☐ I can plan lifetime giving and explain biblical generosity and legacy.
- ☐ I can calculate the expected value of games of chance and recognize get-rich-quick schemes.
- ☐ I can write a complete personal financial plan with goals, a budget, a net-worth statement and a giving, saving and investing strategy.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- ***The Life of Trust: Being a Narrative of the Lord's Dealings with George Müller***: Free on Project Gutenberg. Müller's own account of the Bristol orphan houses, with his records of gifts received. Read a chapter with Lesson 10.3. Ages 13 and up.
- ***George Müller of Bristol*, by A. T. Pierson (1899)**: Free. A readable biography of Müller by a friend, fits Lesson 10.3. Ages 14 and up.
- **Investor.gov: Introduction to Investing**: Free SEC resource on retirement accounts, fees and fraud, for Lessons 10.1 and 10.4.

Not required. Every project in this unit works without them. School Launch has no ties to these authors, publishers or companies.

LESSONS IN THIS UNIT

10.1 Retirement Accounts and Compound Growth Over Decades
3 sessions of 50 minutes

10.2 Wills and Estate Planning, Simply: Lincoln Dies Without a Will
3 sessions of 50 minutes

10.3 Giving and Legacy: George Müller's Orphan Houses 3 sessions of 50 minutes

10.4 Avoiding Get-Rich Schemes and Games of Chance 3 sessions of 50 minutes

10.5 A Capstone Financial Plan: "Well Done, Thou Good and Faithful Servant"
3 sessions of 50 minutes

Unit 10 test

Calculators are allowed. Show your work for every calculation: write the formula, substitute the numbers, and give answers in dollars, percents or years. All rates, limits and odds are examples given in each problem. Answer the concept questions in complete sentences. The test is worth 100 points.

1. **6 pts**
   Salary $60,000; employer matches 50% of contributions up to 6% of pay. Find the contribution needed for the full match and the match.

2. **6 pts**
   At 7%, compare $3,000 a year from 25 to 34 (then held to 65) with $3,000 a year from 35 to 64.

3. **6 pts**
   A retiree wants $40,000 a year from savings. Using an example 4% withdrawal rate, what savings goal is needed?

4. **5 pts**
   Explain when a Roth account is better than a traditional account.

5. **5 pts**

   What happened to Abraham Lincoln’s estate because he had no will?

6. **6 pts**

   Assets $380,000; debts $210,000; final expenses $10,000. Find the net estate and divide it by the lesson’s example intestacy rule between a spouse and two children.

7. **5 pts**

   Why must beneficiary designations be kept current?

8. **6 pts**

   An endowment of $750,000 pays out 4.5%. Find the yearly support. If it earns 6.5%, what is its value after 10 years?

9. **5 pts**

   Tell how George Müller funded and accounted for the Bristol orphan houses.

10. **6 pts**

    A $1 ticket has a 1 in 100 chance of $40 and a 1 in 10,000 chance of $1,000. Find the expected value and the house edge.

11. **6 pts**

    $20 a week spent on games of chance for 30 years: total spent, and the value if $1,040 a year were invested at 7%.

12. **5 pts**

    Give two reasons, one moral and one mathematical, for refusing games of chance.

13. **5 pts**

    What happened to the Louisiana Lottery after 1890?

14. **6 pts**

    Assets $14,200; liabilities $22,600. Find net worth. If she adds $4,200 a year to net worth, how long until it is positive?

15. **6 pts**

Find the monthly saving needed for $8,000 in 30 months at 0.4% a month.

16. **16 pts**

Essay (two or three paragraphs): Using the parable of the talents and at least four units of this course, describe the steward you intend to be over your lifetime: how you will earn, give, save, borrow, insure, invest and plan for the end of life. Include at least two numbers from your own work this year.

ANSWER KEY

1. \$3,600; \$1,800
2. Early: $3{,}000 \times 13.816 \times 7.612 \approx \$315{,}500$; late: $3{,}000 \times 94.461 \approx \$283{,}400$. The early saver has more with one third of the deposits.
3. \$1,000,000
4. When the tax rate in retirement is expected to be higher than today's, because Roth contributions are taxed now and qualified withdrawals are tax-free.
5. Judge David Davis administered it in court, and Illinois law divided it among his widow and two sons; the family waited for a court to do what a will could have done.
6. Net \$160,000; spouse $100{,}000 + 30{,}000 = \$130{,}000$; children \$15,000 each
7. They pass life insurance and retirement accounts directly to the named people, overriding the will.
8. \$33,750; $750{,}000 \times 1.02^{10} \approx \$914{,}246$
9. He prayed and asked no one for money; gifts came from many people, and he published a yearly account of every gift and expense.
10. $0.40 + 0.10 - 1 = -\$0.50$; 50%
11. \$31,200; $1{,}040 \times 94.461 \approx \$98{,}240$
12. Moral: they feed covetousness and seek gain from others' losses (1 Timothy 6:9). Mathematical: their expected value is negative, so players lose over time.
13. Congress banned lottery material from the mail; its charter was not renewed, and it moved out of the country and closed.
14. $-\$8{,}400$; 2 years
15. $(1.004^{30} - 1)/0.004 \approx 31.807$; $8{,}000/31.807 \approx \$251.52$
16. A strong answer explains stewardship from Matthew 25 (the money is God's, an account will be given, act now); draws specific commitments from at least four units (vocation and diligent work; budgeting, emergency fund and cheerful giving; avoiding needless debt; insurance against ruin; honest taxes; patient, diversified, low-cost investing; wise big purchases; a will and planned giving; refusing get-rich schemes); cites real numbers from the student's projects; and ends with the goal of faithfulness rather than wealth.

PORTFOLIO PIECE: MY TEN-YEAR FINANCIAL PLAN

Your capstone plan is this unit's portfolio: the statement of purpose, net-worth statement and projections, five goals, first-year budget, policies on giving, debt, insurance, investing, records and estate documents, the ten-year timeline, and the notes and revisions from your presentation. Add your retirement model, your estate-readiness checklist, your lifetime giving plan and your easy-money analysis as appendices.

LOOK FOR	WHAT IT MEANS
Completeness	Every part of a financial plan is present and connected to earlier units.
Accuracy	Net worth, goals, budgets and projections are calculated correctly, with example assumptions labeled.
Wisdom	Priorities follow sound order (giving, emergency fund, match, high-interest debt, and so on) and avoid needless risk.
Stewardship	The plan and presentation show a clear Christian understanding of money as a trust from God and aim at faithfulness and generosity.

COURSE EXAM

Midterm Exam

Covers Units 1–5. Time: 100 minutes.

You have 100 minutes. A calculator is allowed; no notes. All tax rates, limits and interest rates are examples given in the problems, not current law. For every calculation write the formula, substitute the numbers, and give the answer in dollars, percents or months; correct work earns partial credit even if the final number slips. Answer concept questions in complete sentences. The exam has 25 problems worth a total of 100 points.

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1. **3 pts** **Lesson 1.1**

   Convert $21.50 an hour, 40 hours a week, 52 weeks a year, to yearly and monthly pay.

2. **4 pts** **Lesson 1.2**

   A worker earns $19 an hour and works 45 hours. Find gross pay with time and a half over 40, and net pay if federal withholding is $61, state tax $28 and FICA 7.65%.

3. **3 pts** **Lesson 1.2**

   What did the Current Tax Payment Act of 1943 change, and why?

4. **4 pts** **Lesson 1.3**

   Offer A: take-home $330, costs $20, 24 hours with travel. Offer B: take-home $380, costs $55, 30 hours with travel. Compare net value and effective hourly rate.

5. **4 pts** **Lesson 1.4**

   A self-employed tutor has $18,000 of net profit. Estimate self-employment tax using the course's example method (15.3% of 92.35% of profit).

6. **3 pts** **Lesson 1.5**

   Name Franklin's three rules in *The Way to Wealth* and compute the yearly cost of a $4.25 purchase made 5 days a week for 50 weeks.

7. **4 pts** **Lesson 2.1**

   Net income $2,900. Planned: giving 10%, saving 12%, rent $950, food $360, transportation $300, insurance (yearly $840), phone $50. How much remains to assign?

8. **4 pts** **Lesson 2.2**

   Essential expenses are $2,100 a month. Find a 4-month emergency fund, and the months to build it from $900 saving $375 a month.

9. **3 pts** **Lesson 2.3**

   State Paul's principles of giving and quote 2 Corinthians 9:7.

10. **4 pts** **Lesson 2.4**

    Brand A: 40 oz for $6.80; Brand B: 64 oz for $10.24. Find unit prices. A $180 coat lasting 6 years or a $55 coat lasting 1.5 years: compare cost per year.

11. **4 pts** **Lesson 2.5**

    Wesley lived on £28. Find the percent of income he gave at incomes of £40 and £100. State his three rules.

12. **4 pts** **Lesson 3.1**

    A bank has $40 million of deposits at 2% and $34 million of loans at 6.5%, with costs of $900,000. Find its profit before taxes and loan losses.

13. **4 pts** **Lesson 3.2**

    Find the APY of 4.8% compounded monthly, and reconcile: statement $905.30, deposit in transit $60, outstanding check $112.40; register $857.90 with an unrecorded $5 fee.

14. **4 pts** **Lesson 3.3**

    Using an example $250,000 limit, a single owner has $190,000 in savings and $95,000 in checking at one bank. How much is uninsured? Why did deposit insurance end bank runs?

15. **3 pts** **Lesson 3.4**

    A card earns 2% on $900 a month and has a $95 annual fee. Find the net value for a year if paid in full.

16. **3 pts** **Lesson 3.5**

List the five parts of the scam pattern from the Spanish prisoner story.

17. **4 pts** **Lesson 4.1**

A card's APR is 15% compounded monthly. Find the effective annual rate. A $1,000 loan is repaid in 12 payments of $92; estimate its APR.

18. **5 pts** **Lesson 4.2**

A $2,000 balance at 18% APR is paid at $80 a month. Find the months to pay off and the approximate interest.

19. **4 pts** **Lesson 4.3**

Cards: limits $1,500 and $3,500; balances $900 and $350. Find overall utilization and name the largest factor in a FICO-style score.

20. **4 pts** **Lesson 4.4**

Find the monthly payment and total interest on a $12,000 loan at 6% for 4 years.

21. **4 pts** **Lesson 4.5**

Debts: $700 at 16%, $2,800 at 26%, $5,000 at 8%. Give the snowball and avalanche orders and say which saves more interest.

22. **4 pts** **Lesson 5.1**

Losses of $2,000 (probability 0.06) and $80,000 (probability 0.001). Find the expected loss and the premium with a 30% load.

23. **4 pts** **Lesson 5.2**

With 30/60/25 limits, a driver injures one person ($45,000) and causes $18,000 of property damage. Find what the insurer pays and what the driver owes.

24. **4 pts** **Lesson 5.3**

Deductible $1,200, coinsurance 20%, out-of-pocket max $4,500. What does the patient pay on a first covered bill of $9,200 and on one of $30,000?

25. **9 pts** **Lesson 5.4–5.5**

Short essay: Using the Great Fire of London or the Scottish ministers' widows' fund, and one calculation (actual cash value, expected loss or life-insurance need), explain how insurance can express love for neighbor and family.

ANSWER KEY

1. $44,720; $3,726.67
2. Gross $760 + 142.50 = \$902.50$; FICA $69.04; net $744.46
3. It made employers withhold income tax from each paycheck, because millions of new taxpayers could not pay a year's tax in a lump sum.
4. A: $310, $12.92. B: $325, $10.83. B pays a little more in total; A pays more per hour.
5. $0.153 \times 0.9235 \times 18{,}000 \approx \$2{,}543.32$
6. Industry, frugality, avoiding debt; $1,062.50
7. Giving $290, saving $348, insurance $70; assigned $2,368; remaining $532
8. $8,400; $7{,}500/375 = 20$ months
9. Regular, proportional, willing and cheerful. "Every man according as he purposeth in his heart, so let him give; not grudgingly, or of necessity: for God loveth a cheerful giver."
10. A $0.170/oz, B $0.160/oz; coats $30 vs about $36.67 a year
11. 30%; 72%. Gain all you can; save all you can; give all you can.
12. $2{,}210{,}000 - 800{,}000 - 900{,}000 = \$510{,}000$
13. APY $1.004^{12} - 1 \approx 4.91\%$; statement adjusted $852.90; register adjusted $852.90; they match.
14. $35,000; insured depositors no longer had reason to rush to withdraw, so fear could not bring down sound banks.
15. $216 - 95 = \$121$
16. An emotional story, a promise or threat, secrecy, urgency, and a request for money or information.
17. $1.0125^{12} - 1 \approx 16.1\%$; finance charge $104, APR $\approx 2(12)(104)/(1{,}000 \times 13) \approx 19.2\%$
18. $n = -\ln(1 - 0.015 \times 2{,}000/80)/\ln 1.015 \approx 31.6$; interest $\approx 31.6 \times 80 - 2{,}000 \approx \$528$
19. 25%; payment history.
20. $\approx \$281.82$; interest $\approx \$1{,}527$
21. Snowball: 700, 2,800, 5,000. Avalanche: 26%, 16%, 8%. The avalanche saves more interest.

22. $120 + 80 = \$200$; $260
23. Injury: insurer $30,000, driver $15,000; property: insurer $18,000. Insurer $48,000; driver $15,000.
24. $1{,}200 + 1{,}600 = \$2{,}800$; $1{,}200 + 5{,}760 = 6{,}960$, capped at $4,500
25. A strong answer tells the story accurately, explains pooling as bearing one another's burdens (Galatians 6:2) or providing for one's household (1 Timothy 5:8), and includes a correct calculation, such as a depreciated value, an expected loss, or a needs estimate.

COURSE EXAM

Final Exam

Covers Units 1–10. Time: 120 minutes.

You have 120 minutes. A calculator is allowed; no notes. All tax rates, limits, interest rates and returns are examples given in the problems. For every calculation write the formula, substitute the numbers, and give the answer in dollars, percents or years; correct work earns partial credit even if the final number slips. Answer concept questions in complete sentences. The exam has 28 problems worth a total of 100 points.

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1. **3 pts** **Lesson 1.2**

   Gross pay $2,400; 5% pre-tax retirement; federal withholding 8% of the remaining taxable pay; FICA 7.65% of gross. Find net pay.

2. **3 pts** **Lesson 1.5**

   Explain Franklin's warning that the crowd "approved the doctrine, and immediately practised the contrary." What does it teach?

3. **3 pts** **Lesson 2.1**

   Apply 50/30/20 to $3,600 after giving 10% first.

4. **3 pts** **Lesson 2.5**

   Living costs stay at $36,000; income rises from $45,000 to $60,000. Find the percent available to save and give at each income.

5. **3 pts** **Lesson 3.3**

   Why can a run make a sound bank fail, and what began on January 1, 1934?

6. **3 pts** **Lesson 3.5**

   List four steps to take, in order, if you find a fraudulent charge.

7. **4 pts** **Lesson 4.2**

   A $4,500 balance at 21% APR is paid at $150 a month. Find the months to pay off.

8. **4 pts** **Lesson 4.4**

   Find the payment on a $24,000 loan at 7.2% for 60 months, and the total interest.

9. 3 pts **Lesson 4.5**

   Why did Mark Twain pay his creditors in full when the law did not require it?

10. 4 pts **Lesson 5.3**

    Plan A: $190/month, out-of-pocket max $3,000. Plan B: $110/month, out-of-pocket max $6,500. Compare worst-case yearly totals.

11. 3 pts **Lesson 5.5**

    In this example, the probability of death this year is 0.002. Estimate the expected cost of $350,000 of term coverage and explain who needs it most.

12. 4 pts **Lesson 6.2**

    Example brackets: 10% to $12,000; 12% to $48,000; 22% to $100,000. Wages $58,000, standard deduction $15,000, withholding $5,000. Find tax and refund or amount owed.

13. 3 pts **Lesson 6.3**

    Find employee Social Security (6.2%) and Medicare (1.45%) on wages of $2,400, and the employer's match.

14. 3 pts **Lesson 6.4**

    Assessed value $210,000; rate 26 mills. Find yearly and monthly property tax.

15. 3 pts **Lesson 6.5**

    What did Zacchaeus promise, and what does Romans 13:7 require of taxpayers?

16. 4 pts **Lesson 7.1**

    Find the future value of $250 a month for 10 years at 0.5% a month, and the present value of $300,000 due in 20 years at 6%.

17. 3 pts **Lesson 7.2**

    Bought at $80, sold at $86 with $2 of dividends. Find the total return.

18. 4 pts **Lesson 7.3**

    Price a 2-year, 4% coupon $1,000 bond (yearly coupons) at a 6% yield, and explain why it is below face value.

19. **4 pts** **Lesson 7.4**

$10,000 grows at 7% gross for 40 years. Compare expense ratios of 0.05% and 1.05%.

20. **3 pts** **Lesson 7.5**

Portfolio: 60% stocks (7%), 35% bonds (4%), 5% cash (2%). Find the expected return, and the return in a year when stocks fall 30% and bonds and cash rise 2%.

21. **4 pts** **Lesson 8.1–8.3**

A price falls 78%. What gain is needed to recover? Name the episode from this course with about that fall, and one lesson from it.

22. **4 pts** **Lesson 8.2**

$6,000 of stock is bought with $1,500 down. Find the equity and the percent change on the investor's money if the price falls 20%.

23. **3 pts** **Lesson 8.4**

List four SEC warning signs of investment fraud.

24. **4 pts** **Lesson 9.3–9.4**

A $240,000 mortgage at 6.5% for 30 years has a payment of about $1,516.96. Find the interest and principal in the first payment and the total interest over the loan.

25. **3 pts** **Lesson 9.5**

A $600 appliance has a $110 extended warranty; the chance of a $300 repair is 12%. Find the expected value of the warranty.

26. **4 pts** **Lesson 10.1**

In this example, a worker needs $28,000 a year from savings. Using a 4% withdrawal rate, what is the goal? How much a year for 40 years at 7% reaches it? ($(1.07^{40} - 1)/0.07 \approx 199.64$)

27. **3 pts** **Lesson 10.4**

A $2 ticket returns on average $0.90 in prizes. Find the expected value and house edge, and give one moral reason to refuse it.

28. **8 pts** **Lesson 10.5**

Essay (two or three paragraphs): Using the parable of the talents and at least five units of this course, describe the order of financial priorities you will follow as a young adult and why, and how you will hold money as a steward rather than an owner.

ANSWER KEY

1. Retirement \$120; federal \$182.40; FICA \$183.60; net \$1,914
2. The crowd agreed with Father Abraham's advice and then spent freely at the auction; knowing good rules is not the same as keeping them.
3. Giving \$360; then \$1,620/\$972/\$648
4. 20%; 40%
5. Banks lend most deposits, so they cannot pay everyone at once; federal deposit insurance (FDIC) began, removing the reason to run.
6. Call the issuer at a trusted number; lock or cancel the card; change passwords and enable two-factor authentication; report to the FTC and check statements and credit reports.
7. $r = 0.0175$; $n = -\ln(1 - 78.75/150)/\ln 1.0175 \approx -\ln(0.475)/0.01735 \approx 42.9$ months
8. $\approx$ \$477.50; interest $\approx$ \$4,650
9. He and his wife believed honor required repaying every dollar; "Honor is a harder master than the law."
10. A \$5,280; B \$7,820; A by \$2,540
11. \$700; a parent whose income supports dependents.
12. Taxable \$43,000; tax $1{,}200 + 0.12 \times 31{,}000 = \$4{,}920$; refund \$80
13. \$148.80; \$34.80; employer matches \$183.60
14. \$5,460; \$455
15. Half his goods to the poor and fourfold restitution; to render to all their dues, including taxes (tribute and custom).
16. $\approx$ \$40,970; $\approx$ \$93,541
17. 10%
18. $40/1.06 + 1{,}040/1.06^2 \approx \$963.33$; its coupon is below the market rate.
19. $\approx$ \$146,971; $\approx$ \$100,934; difference about \$46,000
20. 5.7%; $-18 + 0.7 + 0.1 = -17.2\%$
21. About 355%; the Nasdaq from 2000 to 2002; for example, concentration in a hot industry is dangerous, and value depends on profits, not excitement.
22. Value \$4,800; loan \$4,500; equity \$300; −80%

23. High returns with little risk; overly consistent returns; unregistered investments or sellers; secret or complex strategies; trouble getting paid; pressure to act or recruit (any four).
24. Interest $240{,}000 \times 0.065/12 = \$1{,}300$; principal $\$216.96$; total interest $\approx 360 \times 1{,}516.96 - 240{,}000 \approx \$306{,}106$
25. $36 - 110 = -\$74$
26. $\$700{,}000$; $700{,}000/199.64 \approx \$3{,}506$ a year
27. $-\$1.10$; 55%; it feeds covetousness and seeks gain from others' losses (1 Timothy 6:9).
28. A strong answer grounds stewardship in Matthew 25 (the money is God's, an account will be given, act now); lays out a sound order of priorities (give; starter emergency fund; employer match; pay off high-interest debt; full emergency fund; insure against ruin; save for retirement and goals with diversified, low-cost investing; wise housing and transportation; a will and planned giving); uses specific lessons and numbers from at least five units; and warns against debt, get-rich schemes and love of money.