

SPORTS & GAMES OF THE WORLD

First edition

6 units

30 lessons + exams

A video for every lesson

FIRST EDITION

COURSE GUIDE

Sports & Games of the World is a one-semester elective for students in grades 8–12. It tells the history of play from the oldest board games we can still play to the global sports of today. Students meet the Royal Game of Ur and the clay tablet that preserved its rules, the senet boxes of Egypt, the stadion footrace of the ancient Games, Rome's chariots, and the rubber-ball game of ancient Mexico; follow chess from India to Spain's new queen of about 1475, Go from China to Japan's great Go houses, and mancala across Africa; and watch kings ban football and golf, a Tudor parliament command archery, and English gentlemen write the first Laws of Cricket in 1744.

The second half of the course follows the great age of rule-making. Railways, schools and clubs turned folk pastimes into codified sports: the Football Association of 1863 and the rugby split of 1871, Wimbledon in 1877, the Knickerbocker rules of baseball, and the muscular Christianity of *Tom Brown's School Days* and the YMCA. From that movement came James Naismith's basketball (1891) and William Morgan's volleyball (1895), alongside Walter Camp's football, softball and Coubertin's modern Olympics. The course ends with sport around the world today, from the first World Cup in 1930 to cricket in India and the Caribbean, hockey in Canada, and Eric Liddell's refusal to run on the Lord's Day in 1924.

Every lesson moves from **the story**, a real moment with names, dates and places, to **how it changed**, **how it is played** and **why it matters**. Students do history with their hands: they build and play ancient board games, run a stadion, play cricket by the Laws of 1744, test the bounce of rubber balls, play Naismith's original thirteen rules, and keep a scorebook of real data. Worked examples and practice sets use real numbers: dice chances, dates across BC and AD, field dimensions, speeds, batting averages and tournament arithmetic. Scripture is woven in lightly, from Paul's

runner who strives for an incorruptible crown to the prophet's streets "full of boys and girls playing."

Videos were chosen lesson by lesson, most often from museums and official bodies (the British Museum, Historic Royal Palaces, the halls of fame, World Curling, the Olympic channel, FIFA), from university and art-history channels such as Smarthistory, and from careful independent historians and game teachers. Every video was previewed frame by frame and its description read. Videos showing ancient athletes or statues without clothing were rejected, as were channels with unsuitable sponsors or advertising. A few smaller channels were chosen because they teach the lesson's exact game or event clearly; the "when" note says when to watch, and a parent note flags anything to know in advance.

Start with Lesson 1.1 →

WHO IT IS FOR

Grades 8–12. The prerequisite is pre-algebra: fractions, decimals, percents and unit conversions. An 8th grader can follow every lesson, while the hard and challenge problems stretch an 11th grader. Students read the lessons and work the examples largely on their own; a parent checks the practice sets against the answers and discusses the essays. Nothing needs to be bought beyond ordinary household items: dice, coins, beans, card, a soft ball, a tape measure and a stopwatch.

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 scorebook. Session 3: the practice set, checked against the answers, with every missed problem reworked. 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 semester of 20 weeks.
2. **Story, change, play, meaning.** Read the core ideas in order. *The story* gives a real moment with names, dates and places; *how it changed* traces the game across time; *how it is played* explains the rules and the skills; *why it matters* asks what the game shows about the people who played it and how it bears on our own lives. Cover the solution to each worked example, try it yourself, and compare.

3. **Picture study.** Each lesson has one public-domain painting, manuscript page, print, museum object or historic photograph. Look at it quietly for two minutes, put it away and describe what you saw, then work through the “look for” items and the questions, which point back to the lesson’s game or sport.
4. **The scorebook habit.** Keep one bound graph-paper notebook for the semester: your scorebook. In it go the timelines, board drawings, rules you write, tallies, times, measurements and results of every game you play. Record what actually happened, not what you hoped would happen.
5. **Practice sets and corrections.** 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. Check against the answers the same day and rework every miss.
6. **Unit tests, midterm and final.** Each unit test is worth 100 points and mixes dates, explanations, calculations and one short essay. The midterm (after Unit 3) and the final (after Unit 6) are each worth 100 points. Calculators are allowed, and all work must be shown.
7. **How we handle hard history.** The course tells the truth plainly but briefly. Ancient games often belonged to pagan festivals, and the course says so once, without detail. Games of chance are taught as games of skill and counting, with points, never money. Battles are kept in the background, and off-field controversies of modern sport are left out.
8. **Optional books and games.** Some units list free books on Project Gutenberg, free game sites, official rule books and museums. They are never required; every project works without them.
9. **Safety for active projects.** Several projects involve running, throwing, kicking or hitting a soft ball. Warm up first, use soft balls indoors, keep clear of windows and people, wear proper shoes, carry water outdoors, and stop and tell a parent if anything hurts. A parent supervises any trip to a park, court or field.

SCOPE AND SEQUENCE

UNIT 1 • WEEKS 1–4

Play in the Ancient World

The oldest games we can still tell the story of: the Royal Game of Ur and Finkel's rule tablet, senet in Egypt, the ancient Olympic Games and Paul's athletic imagery, Rome's chariots in the Circus Maximus, and the rubber-ball game of Mesoamerica.

- 1.1 The Royal Game of Ur
- 1.2 Senet in Egypt
- 1.3 Olympia and the Ancient Games
- 1.4 Rome's Chariots and the Circus Maximus
- 1.5 The Mesoamerican Ballgame

UNIT 3 • WEEKS 7–10

Medieval and Early Modern Sport

Sport between the Middle Ages and the railway: kings who banned football and golf, real tennis, archery at the butts, cricket's first Laws of 1744, and curling, bandy and the Highland games.

- 3.1 The Kings Who Banned Football and Golf
- 3.2 Real Tennis and the Jeu de Paume
- 3.3 Archery and the Longbow Butts
- 3.4 Cricket's First Laws, 1744
- 3.5 Curling, Bandy and the Highland Games

UNIT 2 • WEEKS 4–7

The Great Board Games

Board games that outlasted empires: chess from chaturanga to the modern queen, Go and its 19 × 19 board, mancala across Africa, tafl and nine men's morris, and backgammon with Alfonso X's Book of Games of 1283.

- 2.1 Chess: From Chaturanga to the Modern Queen
- 2.2 Go and the 19 × 19 Board
- 2.3 Mancala Across Africa
- 2.4 Tafl in the Viking North and Nine Men's Morris
- 2.5 Backgammon, Tables and the Book of Games

UNIT 4 • WEEKS 11–14

The Rule-Makers

The great age of rule-making: why sports were codified in the 1800s, the Football Association and the rugby split, Wimbledon and the lawn-tennis rules, baseball's real origins, and muscular Christianity.

- 4.1 Why Sports Were Codified in the 1800s
- 4.2 The Football Association and the Rugby Split
- 4.3 Wimbledon and the Lawn-Tennis Rules
- 4.4 Baseball's Real Origins
- 4.5 Muscular Christianity and Tom Brown's School Days

UNIT 5 • WEEKS 14–17

American Inventions

Games invented in America and spread to the world: Naismith's basketball, Morgan's volleyball, Walter Camp's football and the reforms of 1905–06, softball and baseball abroad, and Coubertin's modern Olympics.

- 5.1 Naismith's Thirteen Rules
- 5.2 Morgan's Mintonette Becomes Volleyball
- 5.3 Walter Camp and the Football Reforms of 1905–06
- 5.4 Softball and Baseball Around the World
- 5.5 Coubertin and the Modern Olympics, Athens 1896

UNIT 6 • WEEKS 17–20

Sport Around the World Today

- 6.1 The World Cup and Football's Global Reach
- 6.2 Cricket in India, Australia and the Caribbean
- 6.3 Hockey and Canada
- 6.4 Eric Liddell and the Virtue of Sport
- 6.5 Capstone: The History of a Game

WEEKLY PACING CALENDAR

WEEK	PLAN
1	- Day 1: Lesson 1.1 The Royal Game of Ur: 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 Senet in Egypt: video, teaching and worked examples - Day 5: Lesson 1.2: project and notebook <i>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.</i>
2	- Day 1: Lesson 1.2: practice set and corrections - Day 2: Lesson 1.3 Olympia and the Ancient Games: video, teaching and worked examples - Day 3: Lesson 1.3: project and notebook - Day 4: Lesson 1.3: practice set and corrections - Day 5: Lesson 1.4 Rome's Chariots and the Circus Maximus: 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 The Mesoamerican Ballgame: video, teaching and worked examples

WEEK	PLAN
	- 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 Chess: From Chaturanga to the Modern Queen: 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 Go and the 19 × 19 Board: 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 Mancala Across Africa: 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 Tafl in the Viking North and Nine Men's Morris: 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 Backgammon, Tables and the Book of Games: 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 The Kings Who Banned Football and Golf: video, teaching and worked examples - Day 4: Lesson 3.1: project and notebook - Day 5: Lesson 3.1: practice set and corrections
8	- Day 1: Lesson 3.2 Real Tennis and the Jeu de Paume: 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 Archery and the Longbow Butts: video, teaching and worked examples - Day 5: Lesson 3.3: project and notebook

WEEK	PLAN
9	• Day 1: Lesson 3.3: practice set and corrections • Day 2: Lesson 3.4 Cricket's First Laws, 1744: 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 Curling, Bandy and the Highland Games: 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: Review day for the midterm • Day 5: Midterm exam
11	• Day 1: Lesson 4.1 Why Sports Were Codified in the 1800s: video, teaching and worked examples • Day 2: Lesson 4.1: project and notebook • Day 3: Lesson 4.1: practice set and corrections • Day 4: Lesson 4.2 The Football Association and the Rugby Split: video, teaching and worked examples • Day 5: Lesson 4.2: project and notebook
12	• Day 1: Lesson 4.2: practice set and corrections • Day 2: Lesson 4.3 Wimbledon and the Lawn-Tennis Rules: video, teaching and worked examples • Day 3: Lesson 4.3: project and notebook • Day 4: Lesson 4.3: practice set and corrections • Day 5: Lesson 4.4 Baseball's Real Origins: video, teaching and worked examples
13	• Day 1: Lesson 4.4: project and notebook • Day 2: Lesson 4.4: practice set and corrections • Day 3: Lesson 4.5 Muscular Christianity and Tom Brown's School Days: video, teaching and worked examples • Day 4: Lesson 4.5: project and notebook • Day 5: Lesson 4.5: practice set and corrections
14	• Day 1: Unit 4 test • Day 2: Lesson 5.1 Naismith's Thirteen Rules: video, teaching and worked examples • Day 3: Lesson 5.1: project and notebook

WEEK	PLAN
	- Day 4: Lesson 5.1: practice set and corrections - Day 5: Lesson 5.2 Morgan's Mintonette Becomes Volleyball: video, teaching and worked examples
15	- Day 1: Lesson 5.2: project and notebook - Day 2: Lesson 5.2: practice set and corrections - Day 3: Lesson 5.3 Walter Camp and the Football Reforms of 1905–06: video, teaching and worked examples - Day 4: Lesson 5.3: project and notebook - Day 5: Lesson 5.3: practice set and corrections
16	- Day 1: Lesson 5.4 Softball and Baseball Around the World: video, teaching and worked examples - Day 2: Lesson 5.4: project and notebook - Day 3: Lesson 5.4: practice set and corrections - Day 4: Lesson 5.5 Coubertin and the Modern Olympics, Athens 1896: video, teaching and worked examples - Day 5: Lesson 5.5: project and notebook
17	- Day 1: Lesson 5.5: practice set and corrections - Day 2: Unit 5 test - Day 3: Lesson 6.1 The World Cup and Football's Global Reach: video, teaching and worked examples - Day 4: Lesson 6.1: project and notebook - Day 5: Lesson 6.1: practice set and corrections
18	- Day 1: Lesson 6.2 Cricket in India, Australia and the Caribbean: 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 Hockey and Canada: 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 Eric Liddell and the Virtue of Sport: video, teaching and worked examples - Day 3: Lesson 6.4: project and notebook - Day 4: Lesson 6.4: practice set and corrections

WEEK	PLAN
	Day 5: Lesson 6.5 Capstone: The History of a Game: 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: Review day for the final - Day 5: Final exam

MATERIALS

Dice, coins and dried beans

Two ordinary dice, four coins and about 50 beans or pebbles are enough for every board-game project.

Card, paper, ruler and coloured pencils

For making the boards of the Royal Game of Ur, senet, Go, tablut, morris and backgammon.

An egg carton for 12 eggs

Becomes an oware board in Lesson 2.3.

A soft ball, a balloon and a bucket or basket

For the ball games, the bounce test, cricket, tennis, basketball and volleyball projects. A foam or inflatable ball is safest.

A tape measure and a stopwatch (or a phone)

For measuring fields, courts and pitches and timing runs and throws.

A calculator

Any calculator; a log key helps in Lesson 2.2.

A bound graph-paper notebook (the scorebook)

For timelines, board drawings, rules, tallies and results.

A chess set (optional)

A drawn board and paper pieces work too.

GRADING

Grades come from the practice sets, the projects, the scorebook, the six unit tests, the midterm and the final. A history answer earns full credit when its names, dates and places are right and its reasoning is clear; a calculation earns full credit when

the setup, the arithmetic and the units are shown. A project earns full credit for honest records of real play and a thoughtful conclusion.

PART	%
Practice sets (completed and corrected)	15
Projects (play, records, conclusions)	25
Scorebook (organisation, honesty, completeness)	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 correct reasoning even if a date or number slips. An answer with no work or explanation earns at most half credit.
- A project earns full marks when it has real records (games played, times, measurements), a comparison or calculation, and a written conclusion with a reason.
- For a high-school transcript this course is one half credit of history elective (history of sport and games). Keep the scorebook, the portfolios and the unit tests as the record of work.

A NOTE TO PARENTS

You do not need to know any of these games to supervise this course well. Your jobs are to keep the rhythm (three sessions per lesson), check the practice sets against the answers, play the games with your student, and be present for the outdoor projects. The best question you can ask is “How do you know?” A student who can point to the evidence, a tablet, a painting, a rule book or his own scorebook, is learning history.

The course handles hard history with care. It says plainly, once, that the ancient Games honoured Zeus and that the Mesoamerican ballgame sometimes ended in sacrifice, and then moves on. It uses no pictures of Greek vases or sculptures and no videos showing ancient athletes without clothing. Games of chance are treated as games of counting and skill, scored in points. The off-field controversies of modern sport are left out entirely.

This is also a course about character. Again and again the story of sport is a story of rules written so that people can compete fairly, and of honour where the rules are silent: the spirit of cricket, the courtesy of curling, Naismith's and Morgan's Christian purpose, and Eric Liddell's quiet conviction. Scripture says that the streets of the restored city "shall be full of boys and girls playing," and Paul tells us to run so as to obtain an incorruptible crown. Enjoy the games together, and praise good sportsmanship as much as good play.

UNIT 1

PLAY IN THE ANCIENT WORLD

People have always played. This unit begins with the oldest games and sports whose stories we can still tell: a board game from the royal tombs of Ur whose rules were read from a clay tablet, the senet boxes of Egypt, the footraces at Olympia, the chariots of the Circus Maximus, and the rubber-ball game of ancient Mexico. Each lesson asks the historian's questions: what is the evidence, what changed over time, how was it played, and why does it matter?

You will make and play two ancient board games, measure your chances with dice and throwsticks, run a stadion and time it, build a tabletop chariot race, and test how high different balls bounce. Along the way you will learn to separate what we know from what we infer, and you will meet the apostle Paul, who used the athletes of his day to teach about the Christian life.

PREREQUISITES

- Fractions, decimals and percents
- Reading a timeline with BC and AD dates
- Using a tape measure and a stopwatch

MASTERY CHECKLIST

- ☐ I can tell the stories of the Royal Game of Ur, senet, the ancient Games at Olympia, the Circus Maximus and the Mesoamerican ballgame with correct names, places and dates.
- ☐ I can count outcomes for binary dice and throwsticks and use the chances to choose a move.
- ☐ I can count years across BC and AD correctly, remembering that there is no year 0.
- ☐ I can sort facts about an ancient game into what is known, what is inferred and what is unknown.
- ☐ I can explain Paul's use of athletic imagery in 1 Corinthians 9:24-27.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Penn Museum (University of Pennsylvania Museum of Archaeology and Anthropology)**: Free website of the museum that excavated Ur together with the British Museum (1922–1934); its collection pages show finds from the Royal Cemetery, including one of the game boards, for Lesson 1.1. A visit to Philadelphia is optional. Ages 12+.

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 The Royal Game of Ur	3 sessions of 50 minutes
1.2 Senet in Egypt	3 sessions of 50 minutes
1.3 Olympia and the Ancient Games	3 sessions of 50 minutes
1.4 Rome's Chariots and the Circus Maximus	3 sessions of 50 minutes
1.5 The Mesoamerican Ballgame	3 sessions of 50 minutes

UNIT 1 TEST

Calculators are allowed. Show your work for every calculation: write what you are counting, the numbers you used and the answer with a sentence explaining it. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **5 pts**

Who excavated the Royal Cemetery at Ur, and who recovered the rules of the Royal Game of Ur? From what kind of source did he recover them?

2. **7 pts**

Four binary dice each score 0 or 1 with equal chance. Find the chance of a total of 3, as a fraction and a percent.

3. (7 pts)

Find the average throw of the four binary dice. Show the calculation.

4. (6 pts)

Describe a senet board and explain how the throwsticks gave a move in Kendall's reconstruction.

5. (6 pts)

Give one thing we know, one we infer and one we do not know about senet.

6. (6 pts)

List the order in which these events joined the Games at Olympia: pentathlon, stadion, chariot racing, diaulos.

7. (7 pts)

How many festivals were held at Olympia from 776 BC to AD 393, counting both, every four years? Show why there is no year 0 in your work.

8. (7 pts)

A runner covers the 192.3 m stadion in 26 seconds. Find his average speed in m/s and km/h.

9. (6 pts)

What were the sacred truce and the kotinos?

10. (7 pts)

Diocles started 4,257 races and won 1,462. Find his win rate, and explain why it is impressive.

11. (6 pts)

Explain the purpose of the spina, the metae and the curved carceres.

12. (7 pts)

A ball dropped from 120 cm rebounds to 84 cm. Find its rebound ratio and the height of its second bounce.

13. (6 pts)

What did Hosler, Burkett and Tarkanian discover about Mesoamerican rubber?

14. **8 pts**

Name the oldest known ballcourt and the oldest rubber balls, with their approximate dates.

15. **9 pts**

Short essay. In about 150 words, compare two of this unit's games or sports.

What does each tell us about the people who played it, and what does Paul's use of the athlete in 1 Corinthians 9 add to our understanding of why sport matters?

ANSWER KEY

1. Leonard Woolley excavated it (1922–1934). Irving Finkel recovered the rules from a Babylonian cuneiform tablet written in 177 BC.
2. 4 ways out of 16: $4/16 = 25\%$.
3. $(0 \times 1 + 1 \times 4 + 2 \times 6 + 3 \times 4 + 4 \times 1) \div 16 = 32 \div 16 = 2$.
4. Thirty squares in three rows of ten, travelled in an S-shape. Four sticks are thrown; the number of light sides (1–4) gives the move, and all dark gives 5.
5. Known: thirty squares, throwsticks, about 3,000 years of use. Inferred: the S-shaped path, meanings of marked squares. Unknown: the exact original rules.
6. Stadion (776 BC), diaulos (724 BC), pentathlon (708 BC), chariot racing (680 BC).
7. Span: $776 + 393 - 1 = 1,168$ years (1 BC is followed by AD 1). $1,168 \div 4 = 292$ intervals; 293 festivals.
8. $192.3 \div 26 \approx 7.40$ m/s; $\times 3.6 \approx 26.6$ km/h.
9. The truce (ekecheiria) protected travellers to and from the festival; the kotinos was the wreath of wild olive given to winners.
10. $1,462 \div 4,257 \approx 34.3\%$. Each race had several rivals (four to twelve), so an average driver would win far less often, perhaps one race in eight (12.5%).
11. The spina was the central barrier the chariots raced around; the metae were the turning posts at its ends; the curved starting gates gave every driver a fair distance at the start.
12. $84 \div 120 = 0.7$; second bounce $84 \times 0.7 = 58.8$ cm.
13. That Mesoamericans made tough, bouncy rubber by mixing latex from the Castilla elastica tree with morning-glory juice, varying the mixture for different uses, thousands of years before modern vulcanization.
14. The court at Paso de la Amada, Chiapas (about 1650 BC); balls from El Manatí, Veracruz (about 1600 BC).
15. Answers vary. A strong essay compares two activities accurately (for example the household board game of senet and the vast public spectacle of the Circus), draws a reasonable conclusion about each people's values, and explains Paul's point that discipline is good but the lasting prize is spiritual.

PORTFOLIO PIECE: AN ANCIENT GAMES EXHIBIT

Prepare a small museum exhibit, at home or as a folder of pages, on two of the ancient games or sports in this unit. For each, make (1) a playable or working model (a board with pieces, a track, a court or a ball test); (2) a label card of about 150 words giving the date, place, evidence and how it was played; (3) a short data panel from your own projects (dice tallies, run times or bounce ratios) with one calculation; and (4) a “Known / Inferred / Unknown” panel. Present the exhibit to your family and teach them to play one of the games.

LOOK FOR	WHAT IT MEANS
Accuracy	Dates, places and names are correct, and evidence is described honestly.
Models	Both models work and match the evidence, with rules written clearly.
Data	Real data from the student’s projects, organised in a table with a correct calculation.
Historical judgement	The Known / Inferred / Unknown panels separate evidence from guesswork carefully.
Presentation	The family was taught to play one game, and the label cards are neat and readable.

1.1 THE ROYAL GAME OF UR

OBJECTIVES

- Tell how the Royal Game of Ur was found in the Royal Cemetery at Ur and how Irving Finkel recovered its rules from a Babylonian tablet written in 177 BC.
- Describe the board of twenty squares, the four pyramid dice and the rosette squares, and explain how the rules shape a player's choices.
- Calculate the chances of each throw of four two-sided dice and use them to choose a move.
- Explain why a game that lasted more than two thousand years tells us something about the people who played it.

Warm-up. Flip four coins together twenty times and count the heads on each throw (0, 1, 2, 3 or 4). Before you start, predict which number will come up most often. Keep the tally: you will need it in the worked examples.

WATCH

Deciphering the world's oldest rule book | Irving Finkel | Curator's Corner S1 Ep1 [PILOT]

The British Museum · 7:02

<https://www.youtube.com/watch?v=wHjznvH54Cw>

WHEN TO WATCH

After the story paragraph. Dr Finkel explains in his own words how he read the rules on the tablet.

BACKUP VIDEO

Tom Scott vs Irving Finkel: The Royal Game of Ur | PLAYTHROUGH | International Tabletop Day 2017

The British Museum · 25:33

<https://www.youtube.com/watch?v=WZskjLq040I>

During session 2, before you play your own board. Watch how each player decides which piece to move after every throw.

KEY TERMS

Royal Cemetery at Ur

A burial ground in the ancient Sumerian city of Ur, in southern Iraq, excavated by Leonard Woolley between 1922 and 1934; it held several game boards from about 2600–2400 BC.

race game

A board game in which each player tries to move all his pieces along a track and off the board before his opponent does.

binary die

A die with only two possible results; each of the Ur pyramid dice has two of its four tips marked, so it scores 1 or 0 with equal chance.

cuneiform

The wedge-shaped writing pressed into clay tablets in ancient Mesopotamia.

rosette square

One of the five flower-marked squares on the Ur board; in Finkel's reconstruction a piece landing there earns another throw and cannot be captured.

CORE IDEAS

The story. Between 1922 and 1934 the British archaeologist Leonard Woolley led a joint expedition of the British Museum and the University of Pennsylvania at Ur, in what is now southern Iraq. In the Royal Cemetery his team found several wooden game boards inlaid with shell, red limestone and blue lapis lazuli, made around 2600–2400 BC. Each board had twenty squares: a block of twelve, a narrow bridge of two and a block of six. Nobody knew the rules. The game sat in a museum case for half a century, beautiful and silent.

How it changed. Irving Finkel became a curator of cuneiform tablets at the British Museum in 1979. Among its tens of thousands of tablets he noticed one with a drawing of a twenty-square grid. It had been copied by a Babylonian scribe named Itti-Marduk-balāṭu and dated to 177 BC, more than two thousand years after the Ur boards were made. By reading it carefully Finkel recovered enough of the rules to play: two players each race their pieces along a shared path, throw four pyramid-

shaped dice to see how far to move, capture an opponent's piece by landing on it, and use the rosette squares for safety and an extra throw. The same twenty-square game was painted on the backs of Egyptian senet boxes, scratched into stone across the Near East, and, as Finkel later found, survived in a related form among the Jewish community of Kochi in southern India into the twentieth century.

How it is played. Each player has seven pieces that enter the board on his own side, run through the shared middle row and leave by his own side again. A throw of the four dice gives 0, 1, 2, 3 or 4. Because every choice depends on the throw, the game mixes luck and skill: luck decides the number, but the player decides which piece to move. Good players keep pieces on rosettes, avoid landing just in front of an enemy piece, and capture when the chance comes. That balance of chance and choice is why a child and a grandfather can both enjoy it.

Why it matters. The Royal Game of Ur is one of the oldest board games whose rules we can actually play. It shows that people in the ancient world, made in the image of a God who rested on the seventh day, set aside time for play just as we do. It also shows how history is recovered: by careful digging, patient reading and honest reconstruction. Finkel's rules are an informed best guess, and good historians say so plainly.

PICTURE STUDY



Game Box for Playing Senet and Twenty Squares (the twenty-squares side), Unknown Egyptian craftsman, about 1635–1458 BC · Wood with ivory and ebony inlay · The Metropolitan Museum of Art, New York

Image: [Wikimedia Commons](#), public domain

This box was made in Egypt about a thousand years after the Ur boards, yet its top carries the same twenty-square game: a block of twelve squares and a long single row. The other side of the box is a senet board, the subject of the next lesson. Families who owned it could choose either game.

The game had travelled from Mesopotamia to Egypt and changed shape a little on the way, as games always do.

Look closely

- Find the block of squares at one end and the long single row. Count them. Do you get twenty?
- Look at the carved panels beside the row. What animals do you see, and what might they suggest about a game of racing?
- On the Ur boards five squares carry rosettes. Can you find any marked squares here? If not, how might players have remembered the safe squares?
- The box has a drawer for pieces and throwing sticks. Why is that a sensible design for a game that is carried about?

Talk about it

1. This board looks different from the Ur boards but uses the same twenty squares. What does that tell you about how games spread from one people to another?

2. Why might an Egyptian craftsman put two different games on one box?
3. If you had only this box and no rule book, what could you guess about the game, and what could you not know?

PROJECT

Make and Play the Royal Game of Ur

You will make a board from paper, play at least six games using Finkel's rules, and record how often each throw appears and where captures happen.

You will need

- Card or heavy paper, ruler and colored pencils
- Seven light and seven dark counters (coins, buttons or beans)
- Four coins as dice (heads = 1, tails = 0), or four small paper pyramids with two tips marked
- Your scorebook

Steps

1. Draw the board: a 3×4 block of squares, a 1×2 bridge, and a 3×2 block, joined in a line as on the Ur boards (twenty squares). Square size 4 cm works well.
2. Mark the five rosettes: the two outer corner squares at the far end of the block of twelve, the two outer corner squares at the far end of the block of six, and the square of the shared middle row that sits just before the bridge (check the British Museum board in the video).
3. Write the rules in your scorebook: each player enters on his own outer row, runs down the shared middle row and leaves by his own side; land on an enemy piece to send it home; a rosette gives another throw and is safe; you must throw the exact number to bear off.
4. Play six games with a family member. Throw the four coins together each turn.
5. Keep a tally of every throw (0–4) for all six games.
6. Mark on a small drawing of the board every square where a capture happened.
7. At the end, compare your tally with the 1 : 4 : 6 : 4 : 1 pattern from the worked examples.

8. Write one paragraph: which decisions mattered most, and how much did luck decide the winners?

Tips

- Use a cup to throw the coins so they spin fairly.
- If a throw gives no legal move, the turn passes. Record it anyway.

Check your work

- ☐ My board has twenty squares and five rosettes.
- ☐ I recorded every throw for six games and compared the totals with the expected pattern.
- ☐ I marked where captures happened and wrote what I learned about safe squares.

SCOREBOOK

1. Draw the Ur board to scale and label the entry, the shared row, the rosettes and the exit for each player.
2. Make a frequency table of your throws with columns for count, fraction of all throws, and expected fraction (1/16, 4/16, 6/16, 4/16, 1/16).
3. “What I would decide and why”: you throw a 2 and can either capture an enemy piece or move a different piece onto a rosette. Which do you choose, and why?

From history. Finkel also identified the game scratched into one of the great stone gateway figures from the Assyrian palace at Khorsabad, where guards seem to have played it to pass the time. A game board cut into a palace guardian is a reminder that real people, bored on duty, made these games their own.

WORKED EXAMPLES

Example 1. Each of the four Ur dice scores 1 or 0 with equal chance. How many different ordered results are there for the four dice, and how many of them give a total of exactly 2?

Show solution

1. Each die has 2 results, so four dice give $2 \times 2 \times 2 \times 2 = 16$ ordered results.
2. A total of 2 means exactly two dice score. Choose which two: 1&2, 1&3, 1&4, 2&3, 2&4, 3&4.
3. That is 6 ways out of 16.

Answer: 16 results in all; 6 of them total 2, so the chance of throwing a 2 is $6/16 = 3/8 = 0.375 = 37.5\%$.

Example 2. Find the chance of every throw (0 to 4) and the average throw.

Show solution

1. Counting as in example 1: total 0 in 1 way, 1 in 4 ways, 2 in 6 ways, 3 in 4 ways, 4 in 1 way ($1 + 4 + 6 + 4 + 1 = 16$).
2. Chances: 0 is $1/16 = 6.25\%$, 1 is $4/16 = 25\%$, 2 is $6/16 = 37.5\%$, 3 is $4/16 = 25\%$, 4 is $1/16 = 6.25\%$.
3. Average = $(0 \times 1 + 1 \times 4 + 2 \times 6 + 3 \times 4 + 4 \times 1) \div 16 = 32 \div 16 = 2$.

Answer: The average throw is 2 squares, and a 2 is the single most likely result. A 4 or a 0 comes only once in sixteen throws.

Example 3. Your opponent's piece sits exactly 2 squares behind your piece on the shared row. Your piece is not on a rosette. What is the chance that he can capture it on his next throw if he chooses to?

Show solution

1. He captures by landing exactly on your square, so he needs a throw of exactly 2.
2. From example 2, the chance of a 2 is 6/16.

Answer: $6/16 = 37.5\%$. Sitting two squares in front of an enemy piece is the most dangerous place on the board, which is why good players avoid it.

Example 4. The Ur boards were made about 2500 BC and Itti-Marduk-balātu copied his tablet in 177 BC. About how many years separate them? (There is no year zero, but for dates this far apart the difference is tiny.)

Show solution

1. Both dates are BC, so subtract: $2500 - 177 = 2323$.

Answer: About 2,300 years: the game was still being played and written about after a span longer than the time from the birth of Christ to today.

PRACTICE

1. Easy Who excavated the Royal Cemetery at Ur, and in which years?

Show answer

Leonard Woolley, between 1922 and 1934.

2. Easy How many squares are on the Ur board, and how are they grouped?

Show answer

Twenty: a block of twelve, a bridge of two and a block of six.

3. Easy Why were the rules of the game unknown when the boards were found?

Show answer

No rules were buried with them; the rules were only recovered when Irving Finkel read a much later Babylonian tablet.

4. **Medium** Using the four binary dice, what is the chance of throwing a 0? Give it as a fraction, a decimal and a percent.

Show answer

$$1/16 = 0.0625 = 6.25\%.$$

5. **Medium** What is the chance of throwing at least 3?

Show answer

$$(4 + 1)/16 = 5/16 = 31.25\%.$$

6. **Medium** You can move a piece onto a rosette with a throw of 4, or you can land 1 square in front of an enemy piece with any other choice. Which squares are safest, and why?

Show answer

The rosette, because a piece there cannot be captured in Finkel's rules. A piece 1 square in front of an enemy can be captured by a throw of 1, which comes 25% of the time.

7. **Medium** In your warm-up, how close was your tally to the 1 : 4 : 6 : 4 : 1 pattern? Why might twenty throws not match it exactly?

Show answer

Answers vary. Twenty throws is a small sample, so chance can make some totals come up more or less often than the long-run pattern.

8. **Medium** Name two places outside Ur where the twenty-square game has been found or played.

Show answer

Any two: the backs of Egyptian senet boxes; boards scratched into stone across the Near East (including one cut into a gateway figure at Khorsabad); the Jewish community of Kochi in India into the twentieth century.

9. **Hard** Your piece is 1 square ahead of one enemy piece and 3 squares ahead of another. What is the chance that at least one of them can capture you on the next throw?

Show answer

$$\text{He needs a 1 or a 3: } 4/16 + 4/16 = 8/16 = 50\%.$$

10. **Hard** Finkel calls his rules a reconstruction. Explain in two or three sentences why a careful historian uses that word.

Show answer

The tablet is partly broken and was written for readers who already knew the game, so some rules must be inferred. Calling it a reconstruction admits that the rules are the best reading of the evidence, not a certainty.

11. **Challenge** Suppose instead of four binary dice the game used one ordinary six-sided die. Which would give more control to a skilful player, and why? Use the chances of the extreme throws in your answer.

Show answer

The four binary dice. Their results cluster around 2 (75% of throws are 1, 2 or 3), so a player can plan safe distances. One six-sided die gives every result from 1 to 6 an equal 1/6 chance, so extreme throws are far more common and planning is harder.

COMMON MISTAKES

- Thinking every total from 0 to 4 is equally likely. There are six ways to make 2 but only one way to make 0.
- Treating Finkel's rules as certain. They are a careful reconstruction from a partly broken tablet.
- Confusing the date of the boards (about 2600–2400 BC) with the date of the rule tablet (177 BC).

Make it a game • Order the Dig. Write five key facts about the Royal Game of Ur on separate slips of paper from memory: where it was found, what the tablet is, its date, who recovered the rules, and how it is played. Your parent shuffles them. Put them in story order and tell the tale aloud. Your parent sneaks in one wrong slip, and you must catch it.

Scripture. “And the streets of the city shall be full of boys and girls playing in the streets thereof.” (Zechariah 8:5, KJV)

The prophet pictures a restored Jerusalem whose streets are full of children at play. Play is not a waste of time; in Scripture it is a sign of peace and blessing.

1.2 SENET IN EGYPT

OBJECTIVES

- Describe what the evidence tells us about senet: its thirty squares, its throwsticks and the boards found in Egyptian tombs from about 3000 BC to Roman times.
- Explain why the original rules are lost and how modern scholars such as Timothy Kendall and R. C. Bell reconstructed playable versions.
- Calculate the chances of each throw of four throwsticks and compare senet's randomness with the Royal Game of Ur.
- Distinguish what we know, what we reasonably infer and what we simply do not know about an ancient game.

Warm-up. Colour one side of four craft sticks (or mark one side of four strips of card). Throw them twenty times and record how many coloured sides land up. Predict first: will “all four plain” be rare or common?

WATCH

Board Game Invented 3500 BCE. How To Play Senet?

[History with Kayleigh](#) · 19:57

https://www.youtube.com/watch?v=__DoZXO-seM

WHEN TO WATCH

After the story paragraph. The presenter shows real senet boxes and plays a reconstructed version. Note that the date in the title is earlier than most scholars would claim; this lesson gives the careful date.

Note: The description links to the channel's merchandise and membership pages; the video itself is a plain history and demonstration.

BACKUP VIDEO

Senet - How to play this ancient game

[tarsasoznijo](#) · 8:30

<https://www.youtube.com/watch?v=ikfRHqw46jE>

Before session 2. A clear, step-by-step animation of one modern rule set, the version used in the project.

KEY TERMS

senet

An ancient Egyptian race game played on a board of thirty squares in three rows of ten; the name means “passing.”

boustrophedon

A path that runs along one row, turns, and comes back along the next, “as the ox turns” when ploughing; senet pieces probably moved in this S-shaped path.

throwsticks

Flat sticks, light on one side and dark on the other, thrown together instead of dice.

reconstruction

A playable set of rules worked out by scholars from incomplete evidence such as boards, pictures and texts.

CORE IDEAS

The story. In November 1922 Howard Carter opened the tomb of the young pharaoh Tutankhamun. Among the treasures were several game boxes for senet, one of them of ebony and ivory on a little stand with runners like a sledge. The king had been buried with his games. Senet was already very old by then: pieces of boards turn up in Egyptian burials from about 3000 BC, and the game is painted in the tomb of an official named Hesy about 2650 BC. It was still being played in Roman times, a history of roughly three thousand years.

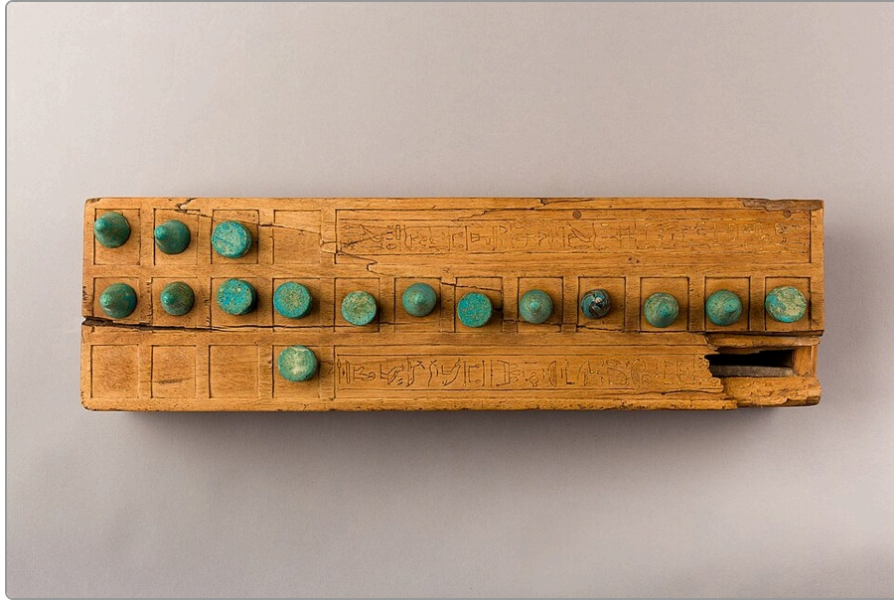
How it changed. Early senet was a pastime, shown being played by ordinary people as well as nobles. During the New Kingdom (about 1550–1070 BC) Egyptians also came to give the game a religious meaning connected with their beliefs about the afterlife, so boards were placed in tombs and certain squares were marked with special signs. Queen Nefertari, wife of Ramesses II, is painted at a senet board in her tomb. The rules themselves were never written down in any text that survives in full. Modern players use reconstructions, the best known by the British games historian R. C. Bell and by the American Egyptologist Timothy Kendall (1978), who studied the boards, the marked squares and scraps of text.

How it is played. In Kendall’s version each player has five pieces (some versions use seven), set out alternately on the first row. Four throwsticks are thrown: count the light sides for a move of 1, 2, 3 or 4, and if all four show dark, move 5. Pieces travel in an S-shape along the three rows. Two pieces of the same colour side by side protect each other; a lone piece can be attacked by landing on it, and the two pieces change

places. The marked squares near the end, among them a square of water, decide much of the drama. The first player to move all his pieces off the board wins.

Why it matters. Senet teaches a lesson about evidence. We can be certain of the board, the sticks and the long life of the game. We can reasonably infer the S-shaped path. We do not know the exact rules the Egyptians used, and a good historian says so instead of filling the gaps with confident guesses. The game also reminds us that ancient people mixed their play with their beliefs; Christians can admire the craftsmanship and enjoy the game while recognising that the Egyptians' hopes about the afterlife were not the hope the gospel gives.

PICTURE STUDY



Game Box Inscribed for Taia and His Family, Unknown Egyptian craftsman, about 1390–1352 BC (reigns of Thutmose IV to Amenhotep III) · Wood with blue-green faience playing pieces · The Metropolitan Museum of Art, New York

Image: [Wikimedia Commons](#), public domain

This box belonged to an official named Taia and his family. Its top is a senet board of thirty squares, and the blue-green faience pieces are still with it. A drawer once held the pieces and throwsticks when the game was put away.

Much of what we know about senet comes from boxes like this, made to be used by a real household.

Look closely

- Count the rows and the squares in each row.
- Look at the pieces. How many are there? Can you tell two sets apart, or would the players have needed different shapes or colours?
- Find the inscription. Why might a family put its name on a game box?
- Look at the wear on the wood. What does it suggest about how much the box was used?

Talk about it

1. If you found only this box, what could you learn about the rules of senet, and what would remain a mystery?

2. Why do you think so many senet boxes survive compared with other wooden household objects?
3. How is this box like a modern family's favourite board game kept on a shelf?

PROJECT

Senet: Test a Reconstruction

You will make a senet board and throwsticks, play Kendall's reconstruction, and test one rule change to see how it changes the game.

You will need

- Card or paper (a 3×10 grid of 4 cm squares)
- Five light and five dark counters
- Four craft sticks or card strips marked on one side
- Your scorebook

Steps

1. Draw the 3×10 board and number the squares 1–30 in an S-shape: 1–10 left to right on the top row, 11–20 right to left on the middle row, 21–30 left to right on the bottom row.
2. Mark square 15 (the square a piece returns to when it falls into the water), 26 (the “beautiful house,” which every piece must land on exactly), 27 (water) and 28–30.
3. Write the rules in your scorebook from the video and this lesson: five pieces each set alternately on squares 1–10; moves of 1–5 from the throwsticks; a lone enemy piece can be attacked by landing on it, and the two pieces swap; two pieces of the same colour together are safe; a piece landing on 27 goes back to 15; pieces leave the board from the last row.
4. Play five games. Record the number of throws in each game and the winner.
5. Now change one rule (for example: a throw of all dark sides counts as 0 instead of 5, as in the Ur game). Play five more games.
6. Compare the average number of throws per game under the two rules.
7. Write a paragraph: which version felt more like a game people would play for three thousand years, and why?

Tips

- Throw the sticks from a little height onto a cloth so they tumble fairly.
- Let a younger brother or sister play: senet is easy to learn.

Check your work

- ☐ I made a numbered 30-square board and four throwsticks.
- ☐ I played ten games, five under each rule, and recorded throws and winners.
- ☐ I compared the two rule sets with numbers and wrote my judgement.

SCOREBOOK

1. Draw the senet board with arrows showing the S-shaped path and the special squares.
2. Tally your throwstick results from the warm-up and project and compare them with 4/16, 6/16, 4/16, 1/16, 1/16.
3. Make a three-column table, “Known / Inferred / Unknown,” and place at least three facts about senet in each column.

From history. Senet was not the only game in Egyptian homes. A game called mehen, played on a coiled board shaped like a snake, and the twenty-squares game from Lesson 1.1 were played too, and many senet boxes carry the twenty-squares game on their other side.

WORKED EXAMPLES

Example 1. Four throwsticks each land light side up or dark side up with equal chance. In Kendall’s rules, 1 to 4 light sides give a move of 1 to 4, and 0 light sides gives a move of 5. Find the chance of each move.

Show solution

1. As with the Ur dice there are $2^4 = 16$ equally likely ordered results.
2. Light sides: 0 in 1 way, 1 in 4 ways, 2 in 6 ways, 3 in 4 ways, 4 in 1 way.
3. So: move 1 is 4/16, move 2 is 6/16, move 3 is 4/16, move 4 is 1/16, move 5 (all dark) is 1/16.

Answer: 1: 25%; 2: 37.5%; 3: 25%; 4: 6.25%; 5: 6.25%.

Example 2. Find the average move per throw in Kendall's senet and compare it with the Royal Game of Ur (average 2).

Show solution

1. Average = $(1 \times 4 + 2 \times 6 + 3 \times 4 + 4 \times 1 + 5 \times 1) \div 16$.

2. = $(4 + 12 + 12 + 4 + 5) \div 16 = 37 \div 16 \approx 2.31$.

Answer: About 2.31 squares per throw, a little more than Ur's 2, because the rare "no light sides" throw counts as 5 instead of 0. In senet no throw is ever wasted.

Example 3. A senet board has 30 squares. If each player must move five pieces the full length of the board, roughly how many throws will one player need, ignoring captures and blocks?

Show solution

1. Each piece travels about 30 squares; five pieces need about $5 \times 30 = 150$ squares of movement. (Pieces start on the first row, so the true figure is a little less.)

2. At about 2.31 squares a throw: $150 \div 2.31 \approx 65$ throws.

Answer: Roughly 60–65 throws each, so a game takes well over a hundred throws in all: a long, patient game, which suits a pastime for a quiet evening.

PRACTICE

1. Easy How many squares are on a senet board, and how are they arranged?

Show answer

Thirty, in three rows of ten.

2. Easy Who discovered Tutankhamun's tomb, and in what year?

Show answer

Howard Carter, in 1922.

3. Easy What did Egyptians use instead of dice in senet?

Show answer

Throwsticks: flat sticks, light on one side and dark on the other (knucklebones were also sometimes used).

4. **Medium** What is the chance of throwing all four sticks dark? Give a fraction and a percent.

Show answer

$1/16 = 6.25\%$.

5. **Medium** What is the chance of a move of 3 or more in Kendall's rules?

Show answer

Moves 3, 4 and 5: $(4 + 1 + 1)/16 = 6/16 = 37.5\%$.

6. **Medium** Name one thing we know for certain about senet, one thing scholars reasonably infer, and one thing we do not know.

Show answer

Known: thirty squares, throwsticks, long use in Egypt. Inferred: the S-shaped path, the meaning of some marked squares. Not known: the exact original rules (number of pieces, how captures worked in every period).

7. **Medium** About how many years did Egyptians play senet, from the earliest evidence to Roman times?

Show answer

About 3,000 years (from about 3000 BC into the first centuries AD).

8. **Medium** Why does protecting a piece by placing another of your own beside it change a player's decisions?

Show answer

A protected pair cannot be attacked, so a player must weigh moving fast against keeping pieces together. Breaking a pair to race ahead leaves both pieces open.

9. **Hard** In the Royal Game of Ur a throw of 0 means no move. In Kendall's senet the same throw means 5. Explain how this small rule change affects the game's pace and its luck.

Show answer

Senet never wastes a turn, so the game moves a little faster (average 2.31 instead of 2). But the rare 5 is a big jump, so it can suddenly carry a piece past danger or onto a key square, adding a dash of luck.

10. **Hard** Two scholars publish different senet rules. How would you decide which is more trustworthy?

Show answer

Ask which rules fit more of the evidence (board markings, pictures, texts from different periods), which admits its guesses honestly, and which makes a game that actually plays well, as a game played for three thousand years surely did.

11. **Challenge** Suppose the throwsticks were not fair: each lands light side up with probability 0.6. Find the chance of a 5 (all dark) and of a 4 (all light). Which is now more common?

Show answer

All dark: $0.4^4 = 0.0256$ (2.56%). All light: $0.6^4 = 0.1296$ (12.96%). A 4 is now about five times as common as a 5, so uneven sticks change the game noticeably.

COMMON MISTAKES

- Saying “the Egyptian rules of senet were...” as if they survive complete. All modern rules are reconstructions.
- Assuming one rule set was used for three thousand years. Games change over time.
- Forgetting that all-dark is a single result out of sixteen, not one out of five.

Make it a game · Evidence or Guess?. Your parent states three claims about senet: two backed by evidence, such as the thirty squares or the boards in tombs, and one invented. You name the tall tale, then sort the true ones into things we know and things reconstructed. Swap roles. Add a point for every claim you can tie to throwsticks or boustrophedon. Play to seven.

1.3 OLYMPIA AND THE ANCIENT GAMES

OBJECTIVES

- Tell the story of the ancient Games at Olympia from the traditional first festival of 776 BC to their end in the late fourth century AD.
- Explain the sacred truce, the stadion footrace, the olive wreath and the four-year cycle.
- Convert between ancient measurements and modern units, and count festivals across BC and AD dates.
- Explain how Paul used the athlete's training and prize to teach about the Christian life (1 Corinthians 9:24-27).

Warm-up. Guess the length of the ancient stadion footrace in metres, then guess how long the fastest runner in your family would take to run it. Write both guesses down; you will check them in the worked examples.

WATCH

Peloponnese, Greece: The Sanctuary of Olympia - Rick Steves' Europe Travel Guide - Travel Bite

Rick Steves' Europe · 3:22

<https://www.youtube.com/watch?v=OgjLFDZGoLk>

WHEN TO WATCH

After the story paragraph. A short walk through the ruins of the sanctuary, the temple of Zeus and the stadium, which you will picture as you read the rest of the lesson.

KEY TERMS

stadion

The oldest event at Olympia, a sprint of one length of the stadium, 600 feet, which at Olympia measured about 192 metres; our word “stadium” comes from it.

Olympiad

The four-year period between one festival and the next, used by Greek historians to count years.

ekecheiria

The sacred truce announced by heralds before each festival so that athletes and visitors could travel to Olympia safely.

kotinos

The wreath of wild olive, cut from a sacred tree at Olympia, given as the only official prize to each winner.

Altis

The sacred grove and enclosure at Olympia containing the temples of Zeus and Hera.

CORE IDEAS

The story. Greek tradition dated the first Games at Olympia to 776 BC, when a cook named Koroibos of Elis won the stadion, a single sprint the length of the stadium. Olympia was a sanctuary in the western Peloponnese, beside the Alpheios river, not a city. Every four years, in high summer, heralds travelled through the Greek world to announce a sacred truce so that athletes and spectators could journey there in safety. The Games were a religious festival in honour of Zeus, whose great temple in the sanctuary held a famous seated statue by the sculptor Phidias.

How it changed. For decades the stadion was the only event. Then came the diaulos (two lengths, 724 BC), the long footrace (720 BC), the pentathlon and wrestling (708 BC), and chariot racing (680 BC). By 520 BC there was even a footrace in armour carrying a shield. Winners received no money from the festival, only a wreath of wild olive cut with a golden sickle from a sacred tree, though their home cities often honoured them richly afterward. The Games continued under Roman rule for centuries. They are traditionally said to have ended about AD 393, when the Christian emperor Theodosius I forbade the old pagan festivals. Earthquakes and floods later buried the site under river silt, until French scholars dug there in 1829 and a German team under Ernst Curtius excavated it from 1875.

How it was played. Runners started from a stone sill with grooves for their toes, still visible at Olympia today, and ran straight down the track toward the far end; longer races turned around posts. Judges from Elis, dressed in purple, enforced the rules, and athletes swore before the festival that they would compete fairly. Cheaters were fined, and the fines paid for bronze statues of Zeus lining the path into the stadium, each inscribed with the offender's name, a lasting public warning.

Why it matters. Corinth hosted its own Isthmian Games, and the Christians there knew athletes well. So when the apostle Paul wrote to them he used pictures they understood: runners who all run though only one wins, athletes who are “temperate in all things,” and a wreath that withers. Christians, he said, strive for an incorruptible crown. The ancient Games show both the dignity of training and its limits: discipline is good, but the prize of a lasting faith is better than any wreath.

PICTURE STUDY



Olympia, Guillaume-Abel Blouet (engraved for the *Expédition scientifique de Morée*), 1831 · Engraving · Published in Paris in the expedition's volumes, 1831–1838

Image: [Wikimedia Commons](#), public domain

In 1829 a French scientific expedition came to the Peloponnese, and its architect, Guillaume-Abel Blouet, made careful drawings of what he found. This is how the valley of Olympia looked to him: quiet farmland, with almost nothing of the great sanctuary showing above the ground.

Beneath that soil lay the temple of Zeus, the stadium and the treasuries, buried by floods and earthquakes. The engraving is a picture of a lost place just before it was found again.

Look closely

- Find the river in the distance. Two rivers met at Olympia; how might they have buried the site?
- Look for any sign of temples or a stadium. What can you see, and what is hidden?
- Find the two small figures. What are they doing, and how does their size change the feeling of the landscape?
- Compare this view with the ruins in the video. What did a century of digging uncover?

Talk about it

1. Why might it matter that the ancient Games were held in a quiet valley rather than inside a great city?
2. What would you have needed to know in 1831 to guess that a stadium lay under these fields?
3. The Games lasted over a thousand years and then vanished under the mud. What does that suggest about the fame of athletes, and about Paul's "corruptible crown"?

Safety first. Run the stadion only on a flat, clear path or field with a parent present. Warm up first with easy jogging, wear proper shoes, carry water on a hot day, and stop if anything hurts and tell a parent.

PROJECT

Run and Measure the Stadion

You will mark out a stadion of 192 metres (or a scaled half-stadion of 96 metres if space is short), time several runs, and compute speeds just as you did in the worked examples.

You will need

- A tape measure (or a measuring wheel, or a phone map that measures distance)
- Stopwatch or phone timer
- Four markers (cones, shirts or sticks)
- A helper to time
- Your scorebook

Steps

1. With a parent, find a safe straight path, field or park track. Measure 192 m (or 96 m) and mark the start and finish.
2. Warm up for five minutes with easy jogging and a few short strides.
3. Run the stadion three times with full rest between runs; a helper times each run to the nearest tenth of a second.
4. If family members join, time them too. Record every time in a table.
5. Compute each runner's average speed in m/s and km/h.
6. Run one diaulos (out to a post, turn, and back). Compare its average speed with your stadion speed.
7. Compare your actual times with your warm-up guesses.
8. Write a paragraph about what you noticed: where you were fastest, how the turn slowed you, and how ancient runners without watches would have judged who won.

Tips

- Use the same starting signal each time ("Ready, go!").

- If you have no tape measure, pace the distance after measuring your stride over 10 m.

Check your work

- ☐ I measured the distance and recorded at least three timed runs.
- ☐ I calculated speeds in m/s and km/h correctly.
- ☐ I compared the diaulos with the stadion and wrote what I learned.

SCOREBOOK

1. Draw a plan of the stadium at Olympia: a long rectangle with a starting sill at each end and grassy banks for spectators. Label the length.
2. Make a timeline from 776 BC to AD 393 marking when each event was added.
3. Write out 1 Corinthians 9:24-25 and, beside it, three ways a training athlete is “temperate in all things.”

From history. The stone starting sills at Olympia still have two parallel grooves for each runner’s feet. Visitors today can stand at the line where runners waited nearly three thousand years ago.

WORKED EXAMPLES

Example 1. The stadion at Olympia was 600 Olympic feet long and measured about 192.3 metres. How long was an Olympic foot?

Show solution

1. Foot = $192.3 \text{ m} \div 600$.
2. = 0.3205 m, about 32 cm.

Answer: About 32 cm, a little longer than the modern foot of 30.48 cm.

Feet varied from city to city, which is why stadiums in different places had different lengths.

Example 2. A strong high-school sprinter averages about 7.5 metres per second over a long sprint. How long would he take to run the 192.3 m stadion? How long for the diaulos (two lengths)?

Show solution

1. Time = distance $\div$ speed = $192.3 \div 7.5 \approx 25.6$ s.
2. The diaulos is $2 \times 192.3 = 384.6$ m. At a slightly slower 7.0 m/s, $384.6 \div 7.0 \approx 54.9$ s.

Answer: About 26 seconds for the stadion and about 55 seconds for the diaulos (these speeds are illustrative; no ancient times were recorded).

Example 3. If the Games were held every four years from 776 BC to AD 393 without a break, how many festivals were there? (Remember there is no year 0.)

Show solution

1. From 776 BC to AD 1 is 776 years, because 1 BC is followed directly by AD 1. From AD 1 to AD 393 is 392 years. Total span: $776 + 392 = 1,168$ years.
2. Festivals every 4 years: $1,168 \div 4 = 292$ intervals.
3. Count the first festival too: $292 + 1 = 293$.

Answer: 293 festivals, which matches the ancient count: AD 393 was the 293rd Olympiad.

PRACTICE

1. Easy In what year did the Greeks date the first Games at Olympia, and who is said to have won?

Show answer

776 BC; Koroibos of Elis, winner of the stadion.

2. Easy What was the official prize for a winner at Olympia?

Show answer

A wreath of wild olive (the kotinos).

3. **Easy** What was the purpose of the sacred truce?

Show answer

To let athletes and visitors travel to and from Olympia safely during the festival.

4. **Medium** Put these in order: chariot racing added; first stadion; footrace in armour added; diaulos added.

Show answer

First stadion (776 BC), diaulos (724 BC), chariot racing (680 BC), footrace in armour (520 BC).

5. **Medium** How many years before the first festival was the Game of Ur board from Lesson 1.1 made (use 2500 BC)?

Show answer

$2500 - 776 = 1,724$ years.

6. **Medium** A runner covers the stadion in 24 seconds. What is his average speed in metres per second and in kilometres per hour?

Show answer

$192.3 \div 24 \approx 8.0$ m/s; $8.0 \times 3.6 \approx 28.8$ km/h.

7. **Medium** What did officials at Olympia do with the fines paid by cheaters? Why was this an effective punishment?

Show answer

They paid for bronze statues of Zeus inscribed with the cheaters' names, set along the way into the stadium. Every athlete walked past a permanent record of dishonour.

8. **Medium** Why was the site of Olympia lost for centuries, and when was it excavated?

Show answer

Earthquakes and floods buried it under silt from the rivers; French scholars dug there in 1829 and a German team led by Ernst Curtius excavated it from 1875.

9. **Hard** Count the festivals from 776 BC to 480 BC, counting both (the year of the Battle of Salamis was also a festival year).

Show answer

Span $776 - 480 = 296$ years; $296 \div 4 = 74$ intervals; $74 + 1 = 75$ festivals (480 BC was the 75th).

10. **Hard** In 1 Corinthians 9 Paul says athletes run for “a corruptible crown.” Explain what he meant and why the image would be vivid to the Corinthians.

Show answer

The wreaths given at the games (olive at Olympia, pine or celery at the Isthmian Games near Corinth) withered within days. Corinth hosted the Isthmian Games, so his readers had seen athletes train hard for a prize that soon decayed, which made the contrast with an incorruptible crown easy to grasp.

11. **Challenge** Ancient writers dated events “in the second year of the 80th Olympiad.” Convert this to a year BC.

Show answer

The 80th Olympiad began in $776 - 4 \times 79 = 776 - 316 = 460$ BC. Its second year is 459 BC (counting down by one year).

COMMON MISTAKES

- Forgetting that there is no year 0 when counting from BC to AD.
- Thinking the ancient Games were held in Athens. They were held at Olympia, a sanctuary in the western Peloponnese.
- Assuming winners received money at the festival. The official prize was only an olive wreath.

Make it a game · Herald of Olympia. Stand up and speak as a herald announcing the Games. Within sixty seconds, name as many facts as you can: the first festival in 776 BC, the stadion, the Altis, the sacred truce called ekecheiria, the olive wreath called the kotinos, and the end of the Games. Your parent counts the facts. Beat your own count in a second round.

Scripture. “Know ye not that they which run in a race run all, but one receiveth the prize? So run, that ye may obtain. And every man that striveth for the mastery is temperate in all things. Now they do it to obtain a corruptible crown; but we an incorruptible.” (1 Corinthians 9:24-25, KJV)

Paul wrote to a city that hosted the Isthmian Games. He honours the athlete’s discipline and then points past the withering wreath to a crown that lasts.

1.4 ROME'S CHARIOTS AND THE CIRCUS MAXIMUS

OBJECTIVES

- Describe the Circus Maximus: its setting between the Palatine and Aventine hills, its central barrier and turning posts, its starting gates and its vast crowds.
- Explain how chariot racing was organised into the four factions and why the inside line mattered.
- Use the inscription of Gaius Appuleius Diocles to calculate a career win rate and compare it with modern athletes.
- Reflect on the difference between a sport that builds a people and a spectacle that only entertains them.

Warm-up. Draw a long oval track on paper with a straight barrier down the middle. Put four counters at the start. Which counter would you rather be: closest to the barrier or farthest out? Write down your reason before reading on.

WATCH

What happened in the Circus Maximus?

[Ancient Rome Live](#) · 13:03

<https://www.youtube.com/watch?v=Q2KuGQuXpng>

WHEN TO WATCH

After the story paragraph. The archaeologist Darius Arya walks the site and shows reconstructions, reliefs and mosaics of the races.

Note: The video briefly mentions other spectacles held in Rome; it shows ancient reliefs and mosaics but nothing gruesome.

KEY TERMS

Circus Maximus

Rome's great track for chariot racing, about 600 metres long, in the valley between the Palatine and Aventine hills.

spina

The long central barrier down the middle of the track, decorated with monuments, around which the chariots raced.

metae

The turning posts at each end of the spina, where the most dangerous and decisive moments of a race happened.

carceres

The row of starting gates at one end of the circus, set on a curve so that no driver began with an unfair advantage.

faction

One of the four racing companies, the Reds, Whites, Greens and Blues, which owned horses and employed drivers; Romans followed them passionately.

quadriga

A light chariot pulled by four horses abreast.

CORE IDEAS

The story. Romans said chariot races had been run in the valley between the Palatine and Aventine hills since the days of the kings. Julius Caesar rebuilt the Circus Maximus in stone, Augustus set an Egyptian obelisk in the middle of it in 10 BC, and later emperors enlarged it until it was about 600 metres long. The Greek historian Dionysius of Halicarnassus, who saw it under Augustus, put its seating at 150,000, and later writers gave even larger figures. It was by far the largest sports building of the ancient world.

How it changed. In the Republic, races were part of religious festivals held on certain days. Under the emperors they became a regular, enormous public entertainment, paid for by the state, with as many as twenty-four races in a day. Four companies, the factions, owned the horses and hired the drivers: the Reds, Whites, Greens and Blues. Fans followed colours more than men, much as people follow a team today. The last recorded races in the Circus Maximus were held in AD 549 under the Ostrogothic king Totila; in Constantinople the races and their factions lasted centuries longer.

How it was played. Twelve drivers could start from the carceres, staggered gates set on a curve so that each had a fair distance to the first turn. A race normally ran seven laps, counter-clockwise, around the spina. Officials counted the laps by lowering one of seven large bronze dolphins (and in earlier days seven wooden eggs) as each lap finished. The shortest path hugged the spina, but turning too tightly at the metae could wreck a chariot, while turning too wide lost ground. Drivers wrapped the reins around their waists and carried a knife to cut themselves free in

a crash. Strategy mattered: a team from one faction might work together to box in a rival.

Why it matters. The most famous driver we know, Gaius Appuleius Diocles, raced for twenty-four years in the second century AD. An inscription set up in AD 146 records that he started 4,257 races and won 1,462 of them. Yet the Circus also shows the danger of sport as mere spectacle: the satirist Juvenal complained that the Roman people, who once handed out power and armies, now longed anxiously for only two things, bread and the races. Sport that trains and strengthens is good; sport that merely distracts a people from their duties is not.

PICTURE STUDY



The Chariot Race, Jean-Léon Gérôme, 1876 · Oil on panel · The Art Institute of Chicago

Image: [Wikimedia Commons](#), public domain

The French painter Jean-Léon Gérôme studied ancient sources and ruins to imagine the Circus Maximus at the height of the empire. Here the chariots sweep around the far turning post while the emperor's palaces on the Palatine rise behind the stands.

Gérôme was painting a reconstruction, not a photograph, but much of what he shows matches what archaeologists know.

Look closely

- Find the spina and the obelisk. Where are the turning posts?
- Look at the chariots on the turn. Which driver has the inside line? Which one is taking a risk?
- Look at the size of the crowd. How does Gérôme make it feel enormous?
- Find the palaces on the hill. Why would an emperor want to watch from there?

Talk about it

1. The painting shows the moment at the turn rather than the finish. Why is that the most exciting place to look?

2. What details do you think Gérôme took from ancient evidence, and what might he have invented?
3. Does this painting make chariot racing look like sport, spectacle or both? Explain.

PROJECT

A Tabletop Circus Maximus

You will build a tabletop chariot-racing game with dice and test whether the inside lane really wins more often.

You will need

- A large sheet of paper or card
- Four counters in four colours (the factions)
- Two ordinary dice
- Seven small markers per race (beans) to count laps
- Your scorebook

Steps

1. Draw an oval track with a central barrier and four lanes. Divide each lane into spaces; the inside lane should have 24 spaces per lap, then 26, 28 and 30 going outward, because outer lanes are longer.
2. Each turn a player rolls two dice and moves that many spaces. At each turning post a player may cut inside by one lane by rolling 7 or more on a separate “risk” roll; on a roll of 2 or 3 he crashes and loses 5 spaces.
3. Use seven beans for the lap counter, removing one each time the leader completes a lap.
4. Play twelve races with the factions starting in different lanes, rotating so each colour starts in each lane three times.
5. Record the starting lane and the finishing place of every chariot.
6. Make a table of average finishing place by starting lane.
7. Write a paragraph: how much did the inside lane help, and did the risk of cutting in pay off?

Tips

- Keep the rules written down so every race uses the same ones.
- Rotating starting lanes makes the test fair; this is the same idea as the curved starting gates.

Check your work

- ☐ I played twelve races and rotated starting lanes fairly.
- ☐ I recorded results in a table and calculated averages by lane.
- ☐ My conclusion uses my numbers.

SCOREBOOK

1. Draw a plan of the Circus Maximus: the carceres, the spina with its obelisk and lap counters, and the two metae. Label the length.
2. Record your tabletop results and draw a bar chart of average finishing place by lane.
3. Write three sentences comparing the Roman factions with modern team loyalty.

From history. The obelisk Augustus set on the spina in 10 BC had been carved for the pharaohs more than a thousand years before. It now stands in the Piazza del Popolo in Rome, where it was set up again in 1589.

WORKED EXAMPLES

Example 1. Diocles started 4,257 races and won 1,462. What was his win rate? If an average race had about 8 starters, what win rate would an ordinary driver expect?

Show solution

1. Win rate = $1,462 \div 4,257 \approx 0.343$, or 34.3%.
2. With 8 starters of equal skill, each wins about 1 race in 8 = 12.5%. (The number of starters is illustrative; races had from 4 to 12.)
3. $34.3 \div 12.5 \approx 2.7$.

Answer: Diocles won about 34% of his races, roughly 2.7 times the share an average driver would expect in an eight-chariot field.

Example 2. Suppose one lap around the spina was about 800 metres (scholars' estimates vary). How far did a seven-lap race cover, and how long would it take at an average speed of 35 km/h?

Show solution

1. Distance = $7 \times 800 \text{ m} = 5,600 \text{ m} = 5.6 \text{ km}$.
2. Time = $5.6 \text{ km} \div 35 \text{ km/h} = 0.16 \text{ h}$.
3. $0.16 \times 60 = 9.6$ minutes.

Answer: About 5.6 km in roughly 9 or 10 minutes, if the estimates are right.

Example 3. On a turn, the driver on the inside travels around a half-circle of radius 10 m, while a driver one chariot-width farther out travels around a half-circle of radius 14 m. How much farther does the outside driver travel at each turn, and over the fourteen turns of a seven-lap race?

Show solution

1. Half-circle length = πr .
2. Inside: $\pi \times 10 \approx 31.4 \text{ m}$. Outside: $\pi \times 14 \approx 44.0 \text{ m}$. Difference $\approx 12.6 \text{ m}$ per turn.
3. Seven laps have two turns each: $14 \times 12.6 \approx 176 \text{ m}$.

Answer: About 12.6 m per turn and about 176 m over the race (illustrative radii): several chariot lengths, which is why drivers fought for the inside line.

PRACTICE

1. Easy Between which two hills of Rome did the Circus Maximus lie?

Show answer

The Palatine and the Aventine.

2. Easy Name the four factions.

Show answer

The Reds, Whites, Greens and Blues.

3. **Easy** How did officials show the crowd how many laps were left?

Show answer

By lowering one of seven bronze dolphins (or, earlier, removing one of seven eggs) at the end of each lap.

4. **Medium** Why were the starting gates set on a curve rather than in a straight line?

Show answer

So that every driver had about the same distance to the point where the race began in earnest, making the start fair.

5. **Medium** Diocles raced for 24 years. On average, how many races did he start and win each year?

Show answer

Starts: $4,257 \div 24 \approx 177$ per year. Wins: $1,462 \div 24 \approx 61$ per year.

6. **Medium** If a race day had 24 races with 12 chariots each, how many chariot starts were there that day?

Show answer

$24 \times 12 = 288$ starts.

7. **Medium** Explain the trade-off a driver faced at each turning post.

Show answer

Turning close to the post saved distance but risked hitting it or overturning; turning wide was safer but lost ground to rivals.

8. **Medium** Compare 150,000 spectators with a modern stadium holding 100,000. How many times larger was the Circus crowd?

Show answer

$150,000 \div 100,000 = 1.5$ times larger.

9. **Hard** Diocles is said to have won 1,462 of 4,257 races. A modern baseball pitcher wins 300 of 500 decisions. Which win rate is higher, and why is the comparison unfair?

Show answer

The pitcher's rate (60%) is higher than Diocles's 34.3%. But a pitcher faces one opponent per decision while a charioteer faced several rivals at once, so an average charioteer would expect far fewer wins; relative to his field Diocles was outstanding.

10. **Hard** Juvenal wrote that the people now longed for only "bread and circuses." In a short paragraph, explain what he meant and whether the danger exists today.

Show answer

Answers vary. He meant that Romans had given up caring about public duty and were content to be fed and entertained. A strong answer notes that sport can still become a distraction when it takes the place of work, worship, family and responsibility, while recognising that sport in its place is good.

11. **Challenge** Using the turn radii in worked example 3, how much wider would the outside driver's turn need to be (radius in metres) to lose a full 300 m over fourteen turns?

Show answer

He must lose $300 \div 14 \approx 21.4$ m per turn: $\pi(r - 10) = 21.4$, so $r - 10 \approx 6.8$ and $r \approx 16.8$ m.

COMMON MISTAKES

- Confusing the Circus Maximus with the Colosseum. The Circus was a long racetrack; the Colosseum was an amphitheatre built later for other shows.
- Treating the crowd figures as exact counts. They are ancient estimates and vary from writer to writer.
- Forgetting that a win rate means little until it is compared with the number of rivals in each race.

Make it a game • Circus Sketch Race. Draw the Circus Maximus from memory in ninety seconds: the two hills, the long central barrier called the spina, the turning posts called metae, the starting gates called carceres, and a four-horse quadriga. Your parent guesses what each label is without seeing your key. Count correct labels. Swap, then compare the two drawings.

1.5 THE MESOAMERICAN BALLGAME

OBJECTIVES

- Describe the oldest evidence for the Mesoamerican ballgame: rubber balls from El Manatí and the court at Paso de la Amada, both from about 1650–1600 BC.
- Explain how Mesoamericans made rubber from latex and morning-glory juice, and what MIT researchers learned when they tested the recipe.
- Describe how the game was played with the hips in an I-shaped court, including the great court at Chichén Itzá.
- Measure and compare the bounce of different balls and connect it to the history of rubber.

Warm-up. Drop three different balls (for example a tennis ball, a rubber ball and a foam ball) from the same height onto a hard floor. Predict which bounces highest before you drop them. Then watch.

WATCH

The Mesoamerican Ballgame and a Classic Veracruz yoke

[Smarthistory](https://www.youtube.com/watch?v=4dpE80AU-ol) · 7:13

<https://www.youtube.com/watch?v=4dpE80AU-ol>

WHEN TO WATCH

After the story paragraph. Two art historians examine a stone ballgame belt and show ballcourts, ballplayer figurines and an ancient rubber ball.

KEY TERMS

latex

The milky sap of certain trees, such as *Castilla elastica*, which can be turned into rubber.

vulcanization

Any process that makes raw rubber stronger and bouncier by changing its chemistry; Charles Goodyear patented a method using sulphur and heat in 1844, but Mesoamericans had their own method thousands of years earlier.

ballcourt

A long, narrow alley between two sloping or vertical walls, often shaped like a capital I, where the ballgame was played.

yoke

A thick, U-shaped belt worn around the hips to hit the heavy ball; stone versions were carved as ceremonial copies.

ulama

A modern form of the ancient game, still played with the hips in the Mexican state of Sinaloa.

CORE IDEAS

The story. In 1988 Mexican archaeologists working at El Manatí, a spring-fed bog in Veracruz, found rubber balls preserved in the wet mud, the oldest about 3,600 years old. At Paso de la Amada, near the Pacific coast of Chiapas, archaeologists later identified a long earthen ballcourt built about 1650 BC. These finds show that people in Mexico were playing with bouncing rubber balls more than three thousand years before any European had seen rubber at all. When the Spanish arrived in the sixteenth century they were astonished that the balls seemed to jump as if alive, and in 1528 Hernán Cortés brought ballplayers to Spain to perform for the court of Charles V.

How it changed. The game spread across Mesoamerica for three thousand years, from the Olmec to the Maya and the Aztecs, and archaeologists have found well over a thousand ballcourts. Courts grew from earthen alleys to great stone buildings. The largest, at Chichén Itzá in Yucatán, is about 168 metres long, with stone rings set high in its side walls. At many times and places the game carried religious meaning, and at some it sometimes ended in human sacrifice. The game was also simply a sport, played for honour and enjoyment, and its hip-ball form survives today as ulama in Sinaloa.

How it was played. Players struck a heavy solid rubber ball, often weighing a few kilograms, mostly with their hips, protected by thick belts and padding. Touching the ball with the hands was usually forbidden. Teams tried to keep the ball moving and to drive it into the opponents' end of the court; passing the ball through a stone ring, set high on the wall, was so hard that it was rare and could end a game at once.

Rules varied across so many centuries and peoples, and much of what we know comes from Spanish accounts, carvings and painted pottery.

Why it matters. The ball itself is a triumph of chemistry. In 1999 researchers at MIT, Dorothy Hosler, Sandra Burkett and Michael Tarkanian, showed that Mesoamericans mixed the latex of the *Castilla elastica* tree with juice from a morning-glory vine, which made raw rubber tough and bouncy. Later work showed they changed the proportions for different uses: an even mixture for the bounciest balls and more latex for hard-wearing sandal soles. Long before modern laboratories, careful people learned by testing, a reminder that the created world rewards patient observation.

PICTURE STUDY



The Great Ball Court, Chichén Itzá, Jerome O. Kilmartin (U.S. Geological Survey), February 13, 1924 ·

Black-and-white photograph · Chichén Itzá, Yucatán, Mexico

Image: [Wikimedia Commons](#), public domain

In 1924 a surveyor from the U.S. Geological Survey photographed the Great Ball Court at Chichén Itzá before it was fully cleared and restored. His caption notes that the stone ring on the east wall was still in place, while the one on the west wall had fallen to the ground. Two members of the survey team stand beneath the ring.

The photograph lets you judge the size of the court by comparing it with the men.

Look closely

- Find the men in the photograph. Use them to estimate the height of the walls.
- Look for the ring high on the wall. How hard would it be to send a heavy ball through it with your hips?
- Find the temple at the far end. Why might a ballcourt be built beside temples?
- Look at the rubble and plants. What work would archaeologists need to do before studying the court?

Talk about it

1. Why might the walls of the court be so long and high? Think about the ball, the players and the spectators.
2. This photograph was taken by a survey team, not an artist. What makes a working photograph like this valuable to historians?
3. If you were a player, where on this court would you stand to defend your end?

Safety first. Use only a soft or inflatable ball for any hip-ball game, play outdoors or in a clear room away from windows, and never use a heavy ball. Stop if anything hurts and tell a parent.

PROJECT

The Bounce Test and a Hip-Ball Game

You will measure the rebound ratio of at least five different balls, rank them, and then play a short hip-ball game with a soft ball to feel why the ancient game demanded such skill.

You will need

- Five or more different balls (tennis, rubber, foam, ping-pong, a ball of rubber bands)
- A tape measure taped upright against a wall
- A phone camera (optional, for slow-motion video)
- A soft inflatable ball for the game
- Chalk or string to mark a court
- Your scorebook

Steps

1. Tape the measure upright against a wall on a hard floor.
2. Drop each ball from exactly 100 cm (bottom of the ball at the mark) without throwing.
3. Record the rebound height, using a helper's eye at floor level or a slow-motion video to read it.
4. Repeat three drops per ball and average them.
5. Compute each ball's rebound ratio and rank the balls from bounciest to least bouncy.
6. Optional: make a ball of rubber bands and test it too. How does it compare with a manufactured rubber ball?
7. Outdoors, mark a court about 10 m long and 3 m wide with a centre line. With a soft inflatable ball, play a rally game: the ball may be struck only with the hips or thighs, never the hands; score a point when the ball stops in the other side's end.
8. Play for ten minutes, then write a paragraph comparing your experience with the ancient game played with a ball weighing several kilograms.

Tips

- Drop from the same height every time; small changes in height change the result.
- Slow-motion video makes the top of the bounce much easier to read.

Check your work

- ☐ I tested at least five balls three times each and computed averages.
- ☐ I calculated rebound ratios and ranked the balls.
- ☐ I played the hip-ball game safely and wrote my comparison.

SCOREBOOK

1. Draw an I-shaped ballcourt in plan view and a cross-section showing the sloping walls and the ring.
2. Make a table of your bounce results: ball, three heights, average, rebound ratio, rank.
3. Write a short note: what does the Mesoamerican rubber recipe show about learning from careful testing?

From history. The English word “rubber” comes from the fact that eighteenth-century Europeans used the new material to rub out pencil marks; the chemist Joseph Priestley noted this use in 1770. Mesoamericans had been bouncing balls of it for over three thousand years.

WORKED EXAMPLES

Example 1. A ball dropped from 100 cm rebounds to 64 cm. A second ball dropped from the same height rebounds to 36 cm. Find each ball’s rebound ratio (rebound height $\div$ drop height).

Show solution

1. Ball 1: $64 \div 100 = 0.64$.
2. Ball 2: $36 \div 100 = 0.36$.

Answer: 0.64 and 0.36. Ball 1 returns almost two-thirds of its drop height, Ball 2 just over one-third. (A useful fact from physics: the coefficient of restitution is the square root of this ratio, 0.8 and 0.6.)

Example 2. If Ball 1 keeps bouncing with the same ratio, how high is its third bounce?

Show solution

1. Each bounce reaches 0.64 of the height before.
 2. First: 64 cm; second: $64 \times 0.64 \approx 41.0$ cm; third: $41.0 \times 0.64 \approx 26.2$ cm.
-

Answer: About 26 cm.

Example 3. The Great Ballcourt at Chichén Itzá is about 168 m long and 70 m wide overall. A soccer field is about 105 m by 68 m. Compare their areas.

Show solution

1. Ballcourt: $168 \times 70 = 11,760$ m².
 2. Soccer field: $105 \times 68 = 7,140$ m².
 3. Ratio: $11,760 \div 7,140 \approx 1.65$.
-

Answer: The great court's overall area is about 1.65 times a soccer field's (the playing alley itself was narrower than the whole structure).

Example 4. How many years passed between the court at Paso de la Amada (about 1650 BC) and Cortés's ballplayers in Spain (1528)?

Show solution

1. From 1650 BC to AD 1 is 1,650 years (no year 0).
 2. From AD 1 to AD 1528 is 1,527 years.
 3. Total: $1,650 + 1,527 = 3,177$.
-

Answer: About 3,177 years.

PRACTICE

1. Easy Where were the oldest known rubber balls found, and about how old are they?

Show answer

At El Manatí, a bog in Veracruz, Mexico; the oldest are about 3,600 years old (about 1600 BC).

2. **Easy** With what part of the body was the ball usually struck?

Show answer

The hips.

3. **Easy** What two plant products did Mesoamericans mix to make rubber?

Show answer

Latex from the Castilla elastica tree and juice from a morning-glory vine.

4. **Medium** A ball dropped from 150 cm rebounds to 90 cm. What is its rebound ratio?

Show answer

$90 \div 150 = 0.6$.

5. **Medium** Why did the MIT researchers' discovery surprise many people?

Show answer

It showed that Mesoamericans had a working method of processing rubber about three thousand years before Charles Goodyear's 1844 patent, so they were skilled practical chemists.

6. **Medium** Why was passing the ball through a stone ring so rare?

Show answer

The rings were set high on the walls and the opening was small, and the heavy ball had to be struck with the hips, not thrown, so it was extremely difficult.

7. **Medium** Name two kinds of evidence historians use to learn how the ballgame was played.

Show answer

Any two: ballcourts; rubber balls; stone yokes and carved belts; carvings and painted pottery of players; Spanish written accounts; the living game of ulama.

8. **Medium** A ball with rebound ratio 0.5 is dropped from 2 m. How high is its second bounce?

Show answer

First: 1 m; second: 0.5 m.

9. **Hard** Explain why the game cannot be described by one set of rules.

Show answer

It was played for about three thousand years by many different peoples across a large region, with courts of different shapes and sizes; rules, equipment and meaning changed from place to place and age to age.

10. **Hard** A ball has rebound ratio 0.64. After how many bounces does its height first fall below 10% of the drop height?

Show answer

$0.64^n < 0.1$: $0.64^5 \approx 0.107$, $0.64^6 \approx 0.069$. After the 6th bounce.

11. **Challenge** Total distance travelled: a ball is dropped from 1 m with rebound ratio 0.64 and bounces forever. Show that the total up-and-down distance is finite and find it.

Show answer

Distance = $1 + 2(0.64 + 0.64^2 + \dots) = 1 + 2 \times 0.64 \div (1 - 0.64) = 1 + 1.28 \div 0.36 \approx 1 + 3.56 = 4.56$ m.

COMMON MISTAKES

- Measuring the rebound from the top of the ball on one drop and the bottom on another. Always use the same point.
- Thinking the ballgame was a single game with fixed rules. It varied over three thousand years.
- Assuming ancient peoples could not do chemistry. They learned by observation and testing.

Make it a game • Twenty Questions: Rubber Ball. Think of one item from the lesson: a ball from El Manatí, the court at Paso de la Amada, latex, a yoke, or a ballcourt. Your parent has twenty yes-or-no questions to guess it. Fewer questions used means more points. Swap roles. After each round, state one fact about how the ancient rubber ball was made.

UNIT 1

PLAY IN THE ANCIENT WORLD

People have always played. This unit begins with the oldest games and sports whose stories we can still tell: a board game from the royal tombs of Ur whose rules were read from a clay tablet, the senet boxes of Egypt, the footraces at Olympia, the chariots of the Circus Maximus, and the rubber-ball game of ancient Mexico. Each lesson asks the historian's questions: what is the evidence, what changed over time, how was it played, and why does it matter?

You will make and play two ancient board games, measure your chances with dice and throwsticks, run a stadion and time it, build a tabletop chariot race, and test how high different balls bounce. Along the way you will learn to separate what we know from what we infer, and you will meet the apostle Paul, who used the athletes of his day to teach about the Christian life.

PREREQUISITES

- Fractions, decimals and percents
- Reading a timeline with BC and AD dates
- Using a tape measure and a stopwatch

MASTERY CHECKLIST

- ☐ I can tell the stories of the Royal Game of Ur, senet, the ancient Games at Olympia, the Circus Maximus and the Mesoamerican ballgame with correct names, places and dates.
- ☐ I can count outcomes for binary dice and throwsticks and use the chances to choose a move.
- ☐ I can count years across BC and AD correctly, remembering that there is no year 0.
- ☐ I can sort facts about an ancient game into what is known, what is inferred and what is unknown.
- ☐ I can explain Paul's use of athletic imagery in 1 Corinthians 9:24-27.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Penn Museum (University of Pennsylvania Museum of Archaeology and Anthropology)**: Free website of the museum that excavated Ur together with the British Museum (1922–1934); its collection pages show finds from the Royal Cemetery, including one of the game boards, for Lesson 1.1. A visit to Philadelphia is optional. Ages 12+.

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 The Royal Game of Ur	3 sessions of 50 minutes
1.2 Senet in Egypt	3 sessions of 50 minutes
1.3 Olympia and the Ancient Games	3 sessions of 50 minutes
1.4 Rome's Chariots and the Circus Maximus	3 sessions of 50 minutes
1.5 The Mesoamerican Ballgame	3 sessions of 50 minutes

UNIT 1 TEST

Calculators are allowed. Show your work for every calculation: write what you are counting, the numbers you used and the answer with a sentence explaining it. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **5 pts**

Who excavated the Royal Cemetery at Ur, and who recovered the rules of the Royal Game of Ur? From what kind of source did he recover them?

2. **7 pts**

Four binary dice each score 0 or 1 with equal chance. Find the chance of a total of 3, as a fraction and a percent.

3. (7 pts)

Find the average throw of the four binary dice. Show the calculation.

4. (6 pts)

Describe a senet board and explain how the throwsticks gave a move in Kendall's reconstruction.

5. (6 pts)

Give one thing we know, one we infer and one we do not know about senet.

6. (6 pts)

List the order in which these events joined the Games at Olympia: pentathlon, stadion, chariot racing, diaulos.

7. (7 pts)

How many festivals were held at Olympia from 776 BC to AD 393, counting both, every four years? Show why there is no year 0 in your work.

8. (7 pts)

A runner covers the 192.3 m stadion in 26 seconds. Find his average speed in m/s and km/h.

9. (6 pts)

What were the sacred truce and the kotinos?

10. (7 pts)

Diocles started 4,257 races and won 1,462. Find his win rate, and explain why it is impressive.

11. (6 pts)

Explain the purpose of the spina, the metae and the curved carceres.

12. (7 pts)

A ball dropped from 120 cm rebounds to 84 cm. Find its rebound ratio and the height of its second bounce.

13. (6 pts)

What did Hosler, Burkett and Tarkanian discover about Mesoamerican rubber?

14. **8 pts**

Name the oldest known ballcourt and the oldest rubber balls, with their approximate dates.

15. **9 pts**

Short essay. In about 150 words, compare two of this unit's games or sports.

What does each tell us about the people who played it, and what does Paul's use of the athlete in 1 Corinthians 9 add to our understanding of why sport matters?

ANSWER KEY

1. Leonard Woolley excavated it (1922–1934). Irving Finkel recovered the rules from a Babylonian cuneiform tablet written in 177 BC.
2. 4 ways out of 16: $4/16 = 25\%$.
3. $(0 \times 1 + 1 \times 4 + 2 \times 6 + 3 \times 4 + 4 \times 1) \div 16 = 32 \div 16 = 2$.
4. Thirty squares in three rows of ten, travelled in an S-shape. Four sticks are thrown; the number of light sides (1–4) gives the move, and all dark gives 5.
5. Known: thirty squares, throwsticks, about 3,000 years of use. Inferred: the S-shaped path, meanings of marked squares. Unknown: the exact original rules.
6. Stadion (776 BC), diaulos (724 BC), pentathlon (708 BC), chariot racing (680 BC).
7. Span: $776 + 393 - 1 = 1,168$ years (1 BC is followed by AD 1). $1,168 \div 4 = 292$ intervals; 293 festivals.
8. $192.3 \div 26 \approx 7.40$ m/s; $\times 3.6 \approx 26.6$ km/h.
9. The truce (ekecheiria) protected travellers to and from the festival; the kotinos was the wreath of wild olive given to winners.
10. $1,462 \div 4,257 \approx 34.3\%$. Each race had several rivals (four to twelve), so an average driver would win far less often, perhaps one race in eight (12.5%).
11. The spina was the central barrier the chariots raced around; the metae were the turning posts at its ends; the curved starting gates gave every driver a fair distance at the start.
12. $84 \div 120 = 0.7$; second bounce $84 \times 0.7 = 58.8$ cm.
13. That Mesoamericans made tough, bouncy rubber by mixing latex from the Castilla elastica tree with morning-glory juice, varying the mixture for different uses, thousands of years before modern vulcanization.
14. The court at Paso de la Amada, Chiapas (about 1650 BC); balls from El Manatí, Veracruz (about 1600 BC).
15. Answers vary. A strong essay compares two activities accurately (for example the household board game of senet and the vast public spectacle of the Circus), draws a reasonable conclusion about each people's values, and explains Paul's point that discipline is good but the lasting prize is spiritual.

PORTFOLIO PIECE: AN ANCIENT GAMES EXHIBIT

Prepare a small museum exhibit, at home or as a folder of pages, on two of the ancient games or sports in this unit. For each, make (1) a playable or working model (a board with pieces, a track, a court or a ball test); (2) a label card of about 150 words giving the date, place, evidence and how it was played; (3) a short data panel from your own projects (dice tallies, run times or bounce ratios) with one calculation; and (4) a “Known / Inferred / Unknown” panel. Present the exhibit to your family and teach them to play one of the games.

LOOK FOR	WHAT IT MEANS
Accuracy	Dates, places and names are correct, and evidence is described honestly.
Models	Both models work and match the evidence, with rules written clearly.
Data	Real data from the student’s projects, organised in a table with a correct calculation.
Historical judgement	The Known / Inferred / Unknown panels separate evidence from guesswork carefully.
Presentation	The family was taught to play one game, and the label cards are neat and readable.

UNIT 2

THE GREAT BOARD GAMES

Five board games have outlasted empires: chess, Go, mancala, the tafl and morris games of the north, and the tables family that became backgammon. This unit follows each across centuries and continents, from chaturanga in India and weiqi in China to oware in Ghana, tablut in Lapland and Alfonso X's great Book of Games of 1283.

You will play every game you study: shatranj and modern chess, Go on a 9×9 board, oware on an egg carton, tablut and nine men's morris, and backgammon. You will count squares and liberties, predict where seeds will land, compute the size of a game's search space with powers of ten, and measure luck and skill with dice. Throughout, you will ask why some games last a thousand years.

PREREQUISITES

- Counting outcomes for two dice (Lesson 1.1)
- Fractions, decimals and percents
- Powers and simple use of a calculator's log key (helpful for Lesson 2.2)

MASTERY CHECKLIST

- ☐ I can trace chess from chaturanga to the modern queen of about 1475 and compare old and new pieces by counting squares.
- ☐ I can explain the rules and history of Go and estimate the number of board positions with powers of ten.
- ☐ I can play oware and predict the landing pit of a move with arithmetic.
- ☐ I can describe tafl and nine men's morris and explain what makes a game asymmetric.

☐ I can describe the
Li and calculate dice chances in
br backgammon.

o
de
los
jue
gos

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **lichess.org**: Free, with no advertising. Play chess against the computer or family, study openings, and record games for Lesson 2.1. A parent should set up an account and turn off chat. Ages 10+.
- **Chess Fundamentals, by José Raúl Capablanca (Project Gutenberg)**: Free. The great Cuban world champion's classic 1921 introduction to endings, middlegames and openings; a fine next step after Lesson 2.1. Ages 12+.
- **Online Go Server (OGS)**: Free. Play 9×9 Go against computer opponents and work through beginner puzzles for Lesson 2.2. A parent should supervise any games against strangers. Ages 12+.

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	Chess: From Chaturanga to the Modern Queen	3 sessions of 50 minutes
2.2	Go and the 19×19 Board	3 sessions of 50 minutes
2.3	Mancala Across Africa	3 sessions of 50 minutes
2.4	Tafl in the Viking North and Nine Men's Morris	3 sessions of 50 minutes
2.5	Backgammon, Tables and the Book of Games	3 sessions of 50 minutes

UNIT 2 TEST

Calculators are allowed. Show your work for every calculation: write what you are counting, the numbers you used, and the answer with a sentence explaining it. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **7 pts**

Trace chess from its origin to Europe in four steps, with approximate dates.

2. (7 pts)

How many squares can a modern queen reach from e4 on an empty board? How many could a ferz reach? Show your work.

3. (6 pts)

What changed about the queen and the bishop around 1475, and what evidence dates the change?

4. (7 pts)

How many points are on a 19×19 Go board, and how many liberties does a lone stone have in the centre, on an edge and in a corner?

5. (7 pts)

Estimate 3^{361} as a power of ten. Show the logarithm step.

6. (7 pts)

Who was Hon'inbō Sansa, and why does 1612 matter in the history of Go?

7. (6 pts)

In oware you sow 8 seeds from pit 6. Where does the last seed land, and can it capture? Explain.

8. (6 pts)

In oware you sow 4 seeds from pit 5 and the last lands in pit 9, which had 2 seeds. Pits 8 and 7 had 1 and 4 seeds before your move. What do you capture?

9. (7 pts)

What did Romein and Bal prove about oware in 2002?

10. (7 pts)

Describe Linnaeus's tablut: board size, the pieces on each side, how pieces move, and how each side wins.

11. (7 pts)

How many points and how many possible mills are on a nine men's morris board? Explain the count.

12. (6 pts)

Verify the starting backgammon pip count of 167.

13. (7 pts)

A blot is 4 points away with a clear path. Count the rolls that hit it (rolls containing a 4; 3-1; 2-2; 1-1).

14. (6 pts)

What is the *Libro de los juegos*, who commissioned it, and what does its introduction teach about the three kinds of games?

15. (7 pts)

Short essay. In about 150 words, explain why some board games have lasted for a thousand years or more. Use at least three games from this unit as examples.

ANSWER KEY

1. Chaturanga in India (about 6th century); chatrang/shatranj in Persia (6th–7th century); shatranj across the Islamic world after the 7th-century conquest, with masters in Baghdad (9th–10th century); Christian Europe by about 1000.
2. Queen: rook part 14 + bishop part 13 = 27. Ferz: 4 diagonal neighbours.
3. The queen gained the combined moves of rook and bishop, and the bishop could slide any distance diagonally. A Valencian poem of about 1475 (*Scachs d'amor*) and Lucena's book of 1497 show the new rules.
4. 361; 4, 3 and 2.
5. $361 \times \log_{10} 3 \approx 361 \times 0.4771 \approx 172.2$; about 10^{172} (1.7×10^{172}).
6. Sansa was the head of the first official Go house; in 1612 the Tokugawa shogunate began paying stipends to Go players, making Go a profession in Japan.
7. $6 + 8 = 14$; $14 - 12 = 2$, so it lands in pit 2, in your own row. No capture is possible, because captures are made only in the opponent's row.
8. Seeds go to 6, 7, 8, 9. Pit 9 now has 3 (capture), pit 8 now has 2 (capture), pit 7 now has 5 (stop). Capture $3 + 2 = 5$ seeds.
9. That with perfect play by both sides, oware is a draw.
10. 9×9 board; a king with 8 defenders in the centre against 16 attackers on the edges; all pieces move like rooks and capture by sandwiching; the king's side wins by reaching the edge, the attackers by surrounding the king.
11. 24 points (8 on each of 3 squares); 16 mills (12 along the sides of the squares and 4 along the connecting lines).
12. $2 \times 24 + 5 \times 13 + 3 \times 8 + 5 \times 6 = 48 + 65 + 24 + 30 = 167$.
13. Rolls containing a 4: 11. 3-1 and 1-3: 2. 2-2: 1. 1-1: 1. Total $15/36 \approx 42\%$.
14. The Book of Chess, Dice and Tables, completed in 1283 for Alfonso X of Castile. Chess is pure skill, dice pure chance, and tables a mixture, in which the wise player makes the best of what chance gives.
15. Answers vary. A strong essay names qualities such as simple rules with deep strategy (Go, morris), equipment anyone can make (mancala), a balance of luck and skill (backgammon), and the ability to adapt across cultures (chess), with accurate examples and dates.

PORTFOLIO PIECE: A FAMILY GAMES NIGHT GUIDE

Write and illustrate a guide that would let a family who has never seen these games play three of them in one evening. For each game include (1) a short history with at least three dated facts; (2) a drawing of the board and starting position you made yourself; (3) the rules in no more than ten numbered sentences; (4) one strategy tip supported by a calculation from this unit (squares controlled, liberties, landing pits, mills or dice chances); and (5) the results of at least three games you actually played. Then host the games night and add a short report on how it went.

LOOK FOR	WHAT IT MEANS
History	Accurate, dated history for each game, with what is known separated from what is reconstructed.
Rules and boards	Clear, complete rules and accurate home-made board drawings that a newcomer could follow.
Mathematics	One correct calculation per game that supports a real strategy tip.
Play and report	Results of real games, and an honest report of the games night.

2.1 CHESS: FROM CHATURANGA TO THE MODERN QUEEN

OBJECTIVES

- Trace chess from chaturanga in India to shatranj in Persia and the Islamic world, and into medieval Europe.
- Explain how the old counsellor (ferz) and elephant (alfil) became the modern queen and bishop in Spain around 1475, and why that change transformed the game.
- Count the squares a piece can reach and use the counts to compare the old and new pieces.
- Read Sofonisba Anguissola's *The Chess Game* as evidence of who played chess in Renaissance Italy.

Warm-up. Put a single queen on a central square of an empty chessboard (or a drawn 8×8 grid) and count every square it could move to. Then count for a king on the same square. Write both numbers down before reading on.

WATCH

A brief history of chess - Alex Gendler

TED-Ed • 5:40

<https://www.youtube.com/watch?v=YeB-1F-UK00>

WHEN TO WATCH

After the story paragraph. An animated tour from India and Persia to Europe and the computer age.

KEY TERMS

chaturanga

The Indian game of about the sixth century AD from which chess descends; its name refers to the four divisions of an army: infantry, cavalry, elephants and chariots.

shatranj

The Persian and Arabic form of the game, played from about the seventh century; its rules governed chess in Europe until the late fifteenth century.

ferz

The king's counsellor in shatranj, which moved only one square diagonally; it became the queen.

alfil

The elephant in shatranj, which jumped exactly two squares diagonally; it became the bishop.

checkmate

From the Persian *shāh māt*, “the king is helpless”: the king is attacked and cannot escape.

CORE IDEAS

The story. Chess began in India, probably by the sixth century AD, as chaturanga: a war game with a king, a counsellor, elephants, horses, chariots and foot soldiers. Persian writers of the sixth and seventh centuries tell how it reached the Persian court, where it became chatrang. After the Arab conquest of Persia in the seventh century the game, now called shatranj, spread across the Islamic world. Baghdad produced the first great masters, among them al-Adli and as-Suli in the ninth and tenth centuries, who wrote books of openings and problems. Through Muslim Spain and Sicily, and by trade, shatranj reached Christian Europe around the year 1000.

How it changed. In shatranj the counsellor (ferz) moved just one square diagonally and the elephant (alfil) jumped exactly two squares diagonally, so the game was slow and battles took a long time to develop. Medieval Europeans kept the rules but changed the pieces' meaning: the counsellor became a queen and the elephant a bishop (or, in some countries, a fool or an archer). Then, around 1475, players in Spain, probably in Valencia, gave the queen the combined powers of the rook and bishop and let the bishop slide any distance diagonally. A Valencian poem of about 1475, *Scachs d'amor*, describes a game with the new queen, and Luis Lucena's printed book of 1497 taught the new rules. Within a few decades the faster game had swept Europe. Castling and the pawn's first double step settled into their modern forms over the next century or two.

How it is played. The board, the six kinds of pieces and the goal of checkmate are the same as in the fifteenth century. The new queen changed everything: openings became sharp, attacks could arrive in a few moves, and the value of quick development was born. Every piece's worth can be compared by counting how many

squares it controls from a central square, which is one reason modern players value a queen at about nine pawns.

Why it matters. Chess crossed more borders than almost any other game, from India to Persia, Baghdad, Spain, Italy and the whole world, and each people left its mark on it. In 1555 the Italian painter Sofonisba Anguissola showed her own sisters at a chessboard, a sign that the game had become a respected pastime for educated families. A game that rewards patience, planning and humility in defeat has been loved by kings, monks, schoolchildren and grandmothers alike.

PICTURE STUDY



The Chess Game, Sofonisba Anguissola, 1555 · Oil on canvas · National Museum in Poznań, Poland

Image: [Wikimedia Commons](#), public domain

Sofonisba Anguissola, from Cremona in northern Italy, was one of the first women of the Renaissance to win fame as a painter. Here she painted three of her younger sisters, Lucia, Minerva and Europa, playing chess while their servant watches.

The painting is a portrait of a family as much as of a game, and it tells us that by 1555 chess was a cultured pastime in an educated Italian household.

Look closely

- Look at the board. Which sister seems to have just moved, and which is about to respond?
- Look at the faces. Who looks confident, who looks surprised, and who is simply enjoying the moment?
- Find the youngest sister. Why might the painter have included a child watching the game?
- Look at the landscape behind them. Why paint a quiet game against such a wide view?

Talk about it

1. What does this painting suggest about who played chess in sixteenth-century Italy?

2. Chess had the new, powerful queen for about eighty years when this was painted. How might faster games change what happens around the table?
3. If you painted your family at a game, which game would it be, and what would each face show?

PROJECT

Play Shatranj, Then Play Chess

You will play the old game of shatranj with medieval rules and compare it with modern chess, keeping careful records of game length and the moment the first piece is captured.

You will need

- A chess set (or a drawn board and paper pieces)
- A family member or friend to play
- A free online board such as lichess.org (optional, for recording games)
- Your scorebook

Steps

1. Write the shatranj rules in your scorebook: the queen (ferz) moves one square diagonally; the bishop (alfil) jumps exactly two squares diagonally, leaping over any piece between; pawns move one square only and promote only to a ferz; there is no castling. All other pieces move as in modern chess.
2. Play three games of shatranj. Record for each: the move number of the first capture, the total number of moves, and the result.
3. Play three games of modern chess with the same partner and record the same things.
4. Compute the average move of first capture and the average game length for each kind of game.
5. Choose one game of each kind and write the first ten moves in algebraic notation.
6. Write a paragraph: how did the new queen and bishop change the feel of the game? Which do you prefer, and why might fifteenth-century players have adopted the new rules so quickly?

Tips

- In shatranj, a bare king (one with no other pieces left) usually lost the game: record whether this happens.
- If games run long, set a limit of 60 moves and count the material left.

Check your work

- ☐ I played at least three games of each kind and recorded first-capture moves and game lengths.
- ☐ I calculated averages for both versions.
- ☐ My paragraph compares the two using my data.

SCOREBOOK

1. Draw an 8×8 grid and shade every square a ferz, an alfil, a modern bishop and a modern queen can reach from d4, each in a different colour.
2. Make a timeline from 500 to 1600 with chaturanga, shatranj, the masters of Baghdad, chess in Europe, the new queen and Lucena's book.
3. Record your three shatranj and three chess games in a table: first capture, total moves, result.

From history. Some of the best-known medieval chess pieces are the Lewis chessmen, carved from walrus ivory in the twelfth century, probably in Norway, and found on the Isle of Lewis in Scotland in 1831. Their bishops wear mitres, a sign of how thoroughly Europe had made the game its own.

WORKED EXAMPLES

Example 1. Count the squares a modern queen can reach from d4 on an empty board, and compare with a shatranj ferz on the same square.

Show solution

1. As a rook from d4: 7 squares along the rank and 7 along the file = 14.
2. As a bishop from d4: diagonals give $3 + 3 + 3 + 4 = 13$.
3. Queen = $14 + 13 = 27$.
4. The ferz moves one square diagonally: c3, c5, e3, e5 = 4.

Answer: 27 squares against 4: the new queen controls almost seven times as many squares from the centre.

Example 2. The shatranj alfil jumps exactly two squares diagonally. Starting on c1, which squares can an alfil ever reach? How many is that out of 64?

Show solution

1. From c1 it jumps to a3 or e3. From a3: c1, c5. From e3: c1, c5, g1, g5. Continue the pattern.
2. The reachable squares are those two-apart diagonal steps can visit: a3, a7, c1, c5, e3, e7, g1, g5.
3. Count: 8 squares.

Answer: Only 8 of the 64 squares (12.5%). A modern bishop on the same colour can reach all 32 light or dark squares, four times as many.

Example 3. An old legend says the inventor of chess asked for one grain of wheat on the first square, two on the second, four on the third, doubling each time. How many grains on the 64th square, and in all?

Show solution

1. Square n holds 2^{n-1} grains, so square 64 holds $2^{63} \approx 9.22 \times 10^{18}$.
2. The total is $1 + 2 + 4 + \dots + 2^{63} = 2^{64} - 1$.
3. $2^{64} - 1 = 18,446,744,073,709,551,615$.

Answer: About 1.8×10^{19} grains in all, far more wheat than the whole world grows in many centuries. The story is a legend, but the arithmetic is real.

PRACTICE

1. **Easy** In which country did chess begin, and by about what century?

Show answer

India, by about the sixth century AD.

2. **Easy** What did the ferz and the alfil become in modern chess?

Show answer

The ferz became the queen; the alfil became the bishop.

3. Easy What does “checkmate” come from?

Show answer

The Persian *shāh māt*, “the king is helpless.”

4. Medium How many squares can a rook reach from any square on an empty board? Why is it always the same number?

Show answer

14: 7 along its rank and 7 along its file, wherever it stands.

5. Medium How many squares can a knight reach from d4, and from a1?

Show answer

From d4: 8 (b3, b5, c2, c6, e2, e6, f3, f5). From a1: 2 (b3, c2).

6. Medium Put in order: Lucena’s printed book; as-Suli in Baghdad; chaturanga in India; chess reaches Christian Europe.

Show answer

Chaturanga in India (about 6th century), as-Suli in Baghdad (about 900), chess reaches Christian Europe (about 1000), Lucena’s book (1497).

7. Medium Why did the new queen make games shorter and sharper?

Show answer

A piece reaching up to 27 squares can attack from far away and combine with others quickly, so attacks on the king came early and games were decided sooner.

8. Medium How many squares can a king reach from d4? From a corner?

Show answer

8 from d4; 3 from a corner.

9. Hard Find the average number of squares a bishop can reach, over all 64 squares of an empty board. (Hint: the 4 central squares give 13, the next ring of 12 gives 11, the next ring of 20 gives 9, and the 28 edge squares give 7.)

Show answer

$(4 \times 13 + 12 \times 11 + 20 \times 9 + 28 \times 7) \div 64 = (52 + 132 + 180 + 196) \div 64 = 560 \div 64 = 8.75.$

10. **Hard** Historians date the new queen to “about 1475” from a Valencian poem rather than from a rule book. Why is a poem good evidence, and what are its limits?

Show answer

The poem describes a real game played with the new moves, so it shows the rules existed by then. But it does not tell us who invented them, exactly where, or how widely they were used; it gives a latest date, not the first.

11. **Challenge** Show that a queen placed on any of the four central squares of an empty board attacks 27 squares, and find how many squares a queen attacks from a corner.

Show answer

From a central square: rook part 14 and bishop part 13 ($3 + 3 + 3 + 4$), total 27 (by symmetry the same for d4, d5, e4, e5). From a1: rook 14, bishop 7 along the long diagonal, total 21.

COMMON MISTAKES

- Saying chess was invented in Persia. It came to Persia from India.
- Thinking the queen has always been the strongest piece. Until about 1475 she was one of the weakest.
- Forgetting that the alfil jumps over pieces, like a knight, rather than sliding.

Make it a game · Name Change Match. Make eight cards: chaturanga, shatranj, ferz, alfil, checkmate, and the modern names queen, bishop and king. Place them face down and flip two at a time. When you match an old name with its modern heir, explain the journey from India through Persia and the Islamic world to Europe. Most pairs wins, and a correct story earns a bonus.

Scripture. “A wise man is strong; yea, a man of knowledge increaseth strength. For by wise counsel thou shalt make thy war: and in multitude of counsellors there is safety.” (Proverbs 24:5-6, KJV)

Chess began as a picture of an army and its counsellor. Scripture agrees that planning and good counsel are a kind of strength, on the board and in life.

2.2 GO AND THE 19 × 19 BOARD

OBJECTIVES

- Tell the history of Go (weiqi, baduk) from ancient China to Japan's great Go houses and AlphaGo's match of 2016.
- Explain the rules of Go: placing stones, liberties, capture and territory.
- Calculate the size of the board and estimate the number of possible positions with powers of ten.
- Explain why a game with very simple rules can be extraordinarily deep.

Warm-up. Draw a 5 × 5 grid of lines (25 points). Place one stone in the centre, one on an edge and one in a corner, and count how many empty neighbouring points (liberties) each has. Predict: where is a stone easiest to surround?

WATCH

Go History — Is It a Chinese or a Japanese Game?

Go Magic · 7:03

<https://www.youtube.com/watch?v=EN10EHNdJjQ>

WHEN TO WATCH

After the story paragraph. A strong player explains how Go travelled from China to Japan and why Japanese names are used around the world.

BACKUP VIDEO

How to Play Go: Rules Explained | Beginner Tutorial on Go Game, Baduk, Weiqi

Go Magic · 7:59

<https://www.youtube.com/watch?v=oZTdT8MQexk>

Before session 2. A clear explanation of liberties, capture and territory, which you will need for the project.

KEY TERMS

Go (weiqi, baduk)

The board game of surrounding territory, called weiqi in China, igo in Japan and baduk in Korea.

liberty

An empty point directly next to a stone or a connected group of stones along a line; a group with no liberties is captured.

territory

Empty points completely surrounded by one player's stones; at the end the player who controls more territory (plus captures, in Japanese scoring) wins.

Go house

One of the four schools (Honinbo, Yasui, Inoue and Hayashi) supported by the Tokugawa shoguns from the early 1600s to train and rank professional players.

komi

Extra points given to White to make up for Black's advantage of moving first.

CORE IDEAS

The story. Go is the oldest board game still played in nearly its original form. Chinese writings mention it by the fourth century BC: the *Zuo Zhuan* chronicle uses weiqi as a figure of speech for an event of 548 BC, and Confucius and Mencius refer to it. Early boards were 17×17 ; a pottery board of that size was found in a tomb of the Han period. By the Tang dynasty (618–907) the board had settled at 19×19 . The game crossed to Korea and then to Japan, where by the eighth century it was played at the imperial court.

How it changed. In 1612 Tokugawa Ieyasu, the shogun who had unified Japan, began paying stipends to the best Go players. Hon'inbō Sansa (1559–1623) became the head of the first of four official Go houses, which trained players from childhood, ranked them, and staged annual games before the shogun. Under this system Go became a profession, and players such as Hon'inbō Shūsaku in the 1840s brought the game to a level of skill admired to this day. Japan's names for the game and its terms spread worldwide in the twentieth century. In March 2016 the computer program AlphaGo, built by the company DeepMind, defeated the Korean professional Lee Sedol four games to one in Seoul, a moment many experts had thought was decades away.

How it is played. Two players take turns placing black and white stones on the points where the lines of a 19×19 grid cross, 361 points in all. Stones never move once placed. A stone or a connected group is captured when the opponent fills all its liberties. The aim is to surround more empty territory than your opponent. A handful of rules creates a game in which a single stone placed early can matter two hundred moves later.

Why it matters. Go shows that simple rules can produce astonishing depth: the number of legal positions on a 19×19 board is about 2×10^{170} , far more than the number of atoms in the observable universe. It rewards balance: greed for territory leaves weaknesses, and too much caution gives the opponent the board. Its long history in China, Korea and Japan also shows how a game can carry the habits of patience and courtesy from one generation to the next; players still bow and say “please” before a game.

PICTURE STUDY



Outfit for the Go Game, Kubo Shunman, early nineteenth century · Woodblock print (surimono), ink and colour on paper · The Metropolitan Museum of Art, New York

Image: [Wikimedia Commons](#), public domain

A surimono was a privately printed Japanese woodblock print, often made for friends and poetry circles. Kubo Shunman shows a Go board, the two bowls of stones, and a game in progress, with poems written above.

The heavy board on legs is the kind still used today: players sit on the floor, and the board's thickness lets the stones land with a satisfying click.

Look closely

- Look at the stones on the board. Can you find any groups that are close to being surrounded?
- Look at the bowls. Why would each player keep his stones in a covered bowl?
- Look at the legs and thickness of the board. What does that tell you about how Go was valued?
- Look at the poems above the board. Why might a poetry circle choose Go as a subject?

Talk about it

1. Why might a game with no dice and no hidden information appeal to poets and scholars?

2. This print shows the equipment but no players. What does the artist want you to imagine?
3. How is a Go board like a blank page?

PROJECT

Learn Go on a 9×9 Board

You will make a 9×9 Go board, learn to capture with the first-capture game, then play full 9×9 games and record territory and captures.

You will need

- Card or paper for a 9×9 grid of lines (about 2 cm apart)
- About 40 black and 40 white counters (beans, buttons or coins)
- A family member or friend to play
- online-go.com (optional)
- Your scorebook

Steps

1. Draw a 9×9 grid of lines; stones go on the points where lines cross.
2. Play five games of “first capture”: the first player to capture any stone wins. Record who won and in how many moves.
3. Now play three full games of 9×9 Go. Give White 5.5 points of komi.
4. At the end of each game, count each player’s territory and captured stones and record the score.
5. For one game, record every move with coordinates (a–j, skipping i; 1–9) so you can replay it.
6. Calculate the average number of moves per game and the average margin of victory.
7. Write a paragraph: what surprised you about how much depth comes from so few rules?

Tips

- Start near the corners: territory there is easiest to surround.
- When a group has only one liberty, it is in “atari”: rescue it or let it go.

Check your work

- ☐ I played five first-capture games and three full 9×9 games.
- ☐ I scored each full game with territory, captures and komi.

- ☐ I recorded one complete game and wrote my reflection.

SCOREBOOK

1. Draw a group of stones and mark every liberty with a small x. Then draw the same group on an edge and in a corner.
2. Make a table of your full games: moves, Black's territory and captures, White's territory, captures and komi, winner.
3. Write the rules of Go in five sentences or fewer.

From history. Go was so honoured in China that it was counted among the four arts of the cultivated gentleman, along with music, calligraphy and painting.

WORKED EXAMPLES

Example 1. How many points are on a 19×19 board, and how many more than on the older 17×17 board?

Show solution

1. $19 \times 19 = 361$.
2. $17 \times 17 = 289$.
3. $361 - 289 = 72$.

Answer: 361 points, 72 more than the old board: an increase of about 25%.

Example 2. Each point can be empty, black or white. Use logarithms to estimate 3^{361} as a power of ten.

Show solution

1. $\log_{10} 3 \approx 0.4771$.
2. $361 \times 0.4771 \approx 172.2$.
3. So $3^{361} \approx 10^{172.2} \approx 1.7 \times 10^{172}$.

Answer: About 1.7×10^{172} ways to colour the board. Only about 1.2% of them are legal positions (about 2.08×10^{170} , as John Tromp computed in 2016), because many colourings contain groups with no liberties.

Example 3. A black group of three stones in a straight line stands in the middle of an empty board. How many liberties does it have? How many if the line lies along an edge?

Show solution

1. In the middle: each end has 1 liberty along the line; each of the 3 stones has 2 liberties on either side. Total = $2 + 6 = 8$.
2. Along an edge: the ends still give 2, but each stone has only 1 side liberty (the other side is off the board): $2 + 3 = 5$.

Answer: 8 liberties in the middle, 5 on the edge. Groups near the edge are easier to capture, but territory near the edge is cheaper to surround; that trade-off shapes every opening.

PRACTICE

1. Easy What are the Chinese, Japanese and Korean names for Go?

Show answer

Weiqi (China), igo or go (Japan), baduk (Korea).

2. Easy How many liberties does a single stone have in the centre, on an edge and in a corner?

Show answer

4, 3 and 2.

3. Easy Who began supporting Go players with stipends in 1612, and who led the first Go house?

Show answer

Tokugawa Ieyasu; Hon'inbō Sansa.

4. Medium A 9×9 board is used by beginners. How many points does it have, and what fraction of a 19×19 board is that?

Show answer

81 points; $81/361 \approx 0.224$, about 22%.

5. Medium Estimate 3^{81} as a power of ten.

Show answer

$81 \times 0.4771 \approx 38.6$, so about $10^{38.6} \approx 4 \times 10^{38}$.

6. Medium Why does Go give White extra points (komi)?

Show answer

Black moves first, which is an advantage; komi compensates so the game is fair.

7. Medium In what year and where did AlphaGo defeat Lee Sedol, and by what score?

Show answer

March 2016, in Seoul, four games to one.

8. Medium A 2×2 square block of four stones sits in the centre of the board. How many liberties does it have?

Show answer

8 (two on each of the four sides).

9. Hard Explain why Go is said to be harder for computers than chess, using the board size and the number of legal moves.

Show answer

A Go position offers about 200–250 legal moves on average, against about 35 in chess, and games last longer, so the tree of possible continuations grows far faster; brute-force searching that worked in chess did not work in Go until new learning methods were used.

10. Hard The Tokugawa Go houses trained boys from childhood and ranked them by results. What were the strengths and weaknesses of such a system for the game?

Show answer

Strengths: full-time study raised the standard of play, preserved knowledge and produced great masters. Weaknesses: the houses competed for position, and a closed system could favour tradition and rank over new ideas.

11. **Challenge** If the number of legal 19×19 positions is about 2.08×10^{170} , what percentage is that of $3^{361} \approx 1.74 \times 10^{172}$?

Show answer

$$2.08 \times 10^{170} \div 1.74 \times 10^{172} \approx 0.012, \text{ about } 1.2\%.$$

COMMON MISTAKES

- Counting diagonal points as liberties. Only points directly along the lines count.
- Placing stones inside squares instead of on the points where lines cross.
- Forgetting komi when scoring.

Make it a game • Liberty Count Sprint. On a sheet of paper, draw a 9 by 9 grid and place black and white stones using beans or buttons. Your parent calls a stone and you count its liberties in five seconds. Capture one group on the board by surrounding it. For the history round, name the great Go houses and AlphaGo's 2016 match from memory.

2.3 MANCALA ACROSS AFRICA

OBJECTIVES

- Describe the mancala family of sowing games, their wide spread across Africa and beyond, and the evidence for their age.
- Play oware (abapa rules) and explain how sowing and capturing work.
- Use counting and remainders to predict where the last seed of a move will land.
- Explain what it means that oware was “solved” in 2002 and why people still enjoy playing it.

Warm-up. Put 4 beans in each of 12 cups (or circles drawn on paper) in two rows of six. Take all 4 beans from one cup and drop them one by one into the next cups going counter-clockwise. Where did the last bean land? Predict where 7 beans from the same cup would end before you try it.

WATCH

How to Play Oware (Abapa).

TA Kofi · 8:02

<https://www.youtube.com/watch?v=M3LjiN7BSRs>

WHEN TO WATCH

After the how-it-is-played paragraph. A Ghanaian player demonstrates the abapa rules on a traditional board, with captions explaining each rule.

BACKUP VIDEO

Basic Oware Rules for Beginners

First Step Tours · 5:00

<https://www.youtube.com/watch?v=HunzMxlbghQ>

Before the project, as a second explanation from a Ghanaian guide.

KEY TERMS

mancala

The family name for hundreds of “count-and-capture” or sowing games played with seeds or stones in rows of pits; from the Arabic *naqala*, “to move.”

sowing

Picking up all the seeds in one pit and dropping them one at a time into the following pits.

oware

The two-row mancala game of the Akan people of Ghana, played with 48 seeds in 12 pits; also called awale, wari and warri.

bao

A four-row mancala game of East Africa, especially popular in Tanzania and Zanzibar.

solved game

A game whose result with perfect play by both sides has been computed exactly.

CORE IDEAS

The story. Walk through a market in Ghana, a street in Zanzibar or a village in Uganda and you may see two people bent over a wooden board of pits, sowing seeds and counting under their breath. Mancala games are played across almost all of Africa, and also in the Middle East, South and Southeast Asia, and the Caribbean. The oldest firm evidence comes from northeast Africa: rows of pits cut into stone at sites of the Aksumite kingdom in Ethiopia and Eritrea, from roughly the sixth or seventh century AD. Claims of much older Egyptian boards are still debated.

How it changed. Mancala is not one game but a family of hundreds. West Africa favours two-row games like oware, with 4 seeds in each of 12 pits; East and southern Africa favour four-row games like bao and omweso, which are often harder still. Rules changed from village to village, and the boards themselves became works of art, some carved with figures or set on pedestals for chiefs. Because a board can be scooped into the ground with a hand and played with pebbles, the game travelled wherever people went.

How it is played. In oware a player picks up all the seeds from one of his six pits and sows them counter-clockwise, one per pit. If the last seed lands in the opponent's row and makes a total of 2 or 3 there, the player captures those seeds, and also any unbroken run of 2s and 3s just before it in the opponent's row. A pit with 12 or more seeds goes all the way around, skipping the pit it came from. Players must leave the opponent seeds to play if they can. The first to capture 25 of the 48 seeds wins.

Why it matters. Mancala is pure counting: no dice, no hidden cards, just arithmetic and foresight. Good players count seeds in every pit and calculate several moves

ahead, so the game has long been a way for children to learn numbers. In 2002 two computer scientists at the Vrije Universiteit in Amsterdam, John Romein and Henri Bal, solved oware: with perfect play from both sides the game is a draw. Yet people play on, because no human plays perfectly, and the joy of the game is in thinking well, not in knowing the answer key.

PICTURE STUDY



Bao Players in Stone Town, Zanzibar, Photograph by Moongateclimber (released into the public domain), August 2010 · Colour photograph · Stone Town, Zanzibar, Tanzania

Image: [Wikimedia Commons](#), public domain

Bao, the four-row mancala game of East Africa, is a street game in Zanzibar: men gather on the stone benches called *barazas* along the narrow lanes of Stone Town to play and to watch. Expert players move so fast that onlookers struggle to follow.

This photograph was taken in 2010 and released by the photographer into the public domain.

Look closely

- Count the rows of pits. How is this board different from an oware board?
- Look at the player's hand. Is he in the middle of sowing, or about to choose a pit?
- Look at the two watchers. What are they doing with their eyes?
- Look at the setting. Why might a game be played in the street rather than at home?

Talk about it

1. Bao has more pits and more seeds than oware. How might that change the kind of thinking it requires?

2. Why do you think games played in public places often draw a crowd of advisers?
3. What does this photograph suggest about how a game passes from one generation to the next?

PROJECT

An Oware Tournament with Move Analysis

You will make an oware board from an egg carton, play a short family tournament, and analyse your captures with the landing-pit rule.

You will need

- An egg carton for 12 eggs (two rows of six cups) and two small bowls for captured seeds
- 48 dried beans or pebbles
- Family members to play
- Your scorebook

Steps

1. Set up 4 seeds in each cup. Number the cups 1–12 counter-clockwise on a strip of tape.
2. Write the abapa rules in your scorebook from the video and the lesson.
3. Play at least four games against two different people.
4. In each game, record every capture: the pit sown, the number of seeds, the landing pit and the seeds captured.
5. After each game, check two of your captures with the landing-pit rule: (start + seeds), reduced by 12.
6. Find your average seeds captured per capturing move and your largest single capture.
7. Write a paragraph: what pattern of seeds in your opponent's row was most dangerous for him? How did counting help you?

Tips

- Before every move, count the seeds in the pit you are thinking of using and calculate where the last seed will fall.
- Watch your own row for pits of 1 or 2 seeds that your opponent could reach.

Check your work

- ☐ I made a working board and played at least four games.

- ☐ I recorded every capture and checked at least eight with the landing-pit rule.
- ☐ My paragraph uses my capture data.

SCOREBOOK

1. Draw an oware board with pits numbered 1–12 and arrows showing the direction of sowing.
2. Make a capture log: game, pit sown, seeds, landing pit, seeds captured.
3. Draw a map of Africa and mark Ghana (oware), Tanzania and Zanzibar (bao), Uganda (omweso) and Ethiopia (early stone boards).

From history. Mancala boards were sometimes carved for chiefs and kings with elaborate pedestals, while ordinary players scooped twelve pits in the dirt. The same game could be a royal treasure and a child's pastime at once.

WORKED EXAMPLES

Example 1. Number the pits 1–12 counter-clockwise, with your pits 1–6 and your opponent's 7–12. You take 9 seeds from pit 4. Where does the last seed land?

Show solution

1. Seeds go into pits 5, 6, 7, ... one each.
2. The 9th seed lands in pit $4 + 9 = 13$. There is no pit 13; after 12 comes 1 again, so subtract 12: $13 - 12 = 1$.

Answer: Pit 1, back in your own row. In general the last seed lands in pit (start + seeds), reduced by 12 until it is between 1 and 12, as long as the seeds number fewer than 12.

Example 2. Your opponent's pits 8, 9, 10 and 11 hold 3, 1, 2 and 1 seeds. You sow 7 seeds from pit 4. What do you capture?

Show solution

1. Seeds go into pits 5, 6, 7, 8, 9, 10, 11; the last lands in pit 11.
2. After sowing: pit 8 has 4, pit 9 has 2, pit 10 has 3, pit 11 has 2.
3. Pit 11 has 2, so capture it. Look back: pit 10 has 3 (capture), pit 9 has 2 (capture), pit 8 has 4, so the run stops.

Answer: $2 + 3 + 2 = 7$ seeds captured in one move.

Example 3. A pit holds 15 seeds. Sowing skips the starting pit. Where does the last seed land if it starts in pit 2?

Show solution

1. The first 11 seeds fill pits 3–12 and then 1 (11 pits, skipping pit 2).
2. The remaining 4 seeds go into pits 3, 4, 5, 6 (pit 2 is skipped again on the way round).
3. The last seed lands in pit 6.

Answer: Pit 6. Large pits that go all the way round are powerful because they add a seed to every opponent pit, setting up captures.

PRACTICE

1. **Easy** How many pits and seeds are used in oware?

Show answer

12 pits (two rows of six) and 48 seeds, 4 per pit at the start.

2. **Easy** What does the word *mancala* come from?

Show answer

The Arabic *naqala*, “to move.”

3. **Easy** How many seeds must a player capture to win oware?

Show answer

25 (more than half of 48).

4. **Medium** You sow 5 seeds from pit 3. Where does the last seed land?

Show answer

Pit 8 (in the opponent’s row).

5. **Medium** You sow 10 seeds from pit 6. Where does the last seed land?

Show answer

$6 + 10 = 16$; $16 - 12 = 4$. Pit 4.

6. **Medium** Why is a pit holding exactly 1 or 2 seeds in your opponent's row a target?

Show answer

If your last seed lands there it becomes 2 or 3, which you capture.

7. **Medium** Name a two-row and a four-row mancala game and where each is played.

Show answer

Two-row: oware (Ghana and West Africa). Four-row: bao (Tanzania, Zanzibar) or omweso (Uganda).

8. **Medium** What did Romein and Bal show in 2002?

Show answer

That oware (awari) is a draw if both sides play perfectly.

9. **Hard** A pit has 23 seeds and starts at pit 1. Where does the last seed land? (Skip pit 1 each time round.)

Show answer

Each lap fills 11 pits. $23 = 11 + 11 + 1$: two full laps end at pit 12, then the 23rd seed goes to pit 2.

10. **Hard** The rules require a player to give his opponent seeds when the opponent's row is empty, if he can. Why is this rule good for the game?

Show answer

It keeps both players in the game and prevents a player from simply starving his opponent; it also makes play more generous and the endgame more interesting.

11. **Challenge** Pit 1 holds exactly 12 seeds, and the starting pit is skipped. Where does the last seed land, and why can a 12-seed pit never end in the opponent's row?

Show answer

Eleven seeds fill pits 2–12; the 12th skips pit 1 and lands in pit 2. Any pit of 12 seeds visits all 11 other pits once and then lands on the pit just after its start; starting from your own pits 1–5 that is your own row (from pit 6 it reaches pit 7, the opponent's first pit). So only pit 6 can turn 12 seeds into a capture.

COMMON MISTAKES

- Dropping a seed back into the starting pit on a large move. In oware it is skipped.
- Capturing from your own row. Captures are made only in the opponent's row.
- Forgetting to look back for a run of 2s and 3s before the landing pit.

Make it a game · Sow and Predict. Set up egg-carton or bowl pits with four beans in each. Before sowing, predict which pit the last bean will land in. Check by sowing. One point for a right prediction. Then trade places. Finish by telling your parent two pieces of evidence for the age of mancala games and where they spread across Africa.

2.4 TAFL IN THE VIKING NORTH AND NINE MEN'S MORRIS

OBJECTIVES

- Describe the tafl games of northern Europe, including hnefatafl, Linnaeus's record of tablut in 1732 and the Irish Ballinderry board.
- Explain what makes tafl an asymmetric game and how the two sides need different strategies.
- Describe nine men's morris, its board and its long history from the Viking Age to Shakespeare and the Libro de los juegos.
- Count the points, lines and mills of a morris board and the pieces on each side of a tafl board.

Warm-up. Draw three squares one inside another and join the midpoints of their sides with four short lines. Count the points where lines meet or end. Then count how many straight rows of three points you can find. Write both numbers.

WATCH

Hnefatafl - Board Game of the Vikings

Bjorn Andreas Bull-Hansen • 8:10

https://www.youtube.com/watch?v=rwO3AN__kAw

WHEN TO WATCH

After the story paragraph. A Norwegian author explains one modern rule set and plays it on a large board. He says plainly that the exact Viking rules are not known.

BACKUP VIDEO

Nine Men's Morris: Learn the Game Rules, Part 1 with Jason

NovaScotiaMuseum • 5:02

<https://www.youtube.com/watch?v=TUgmSYU8i3c>

Before the second half of the project. A museum educator teaches nine men's morris on a large paper board.

KEY TERMS

tafl

A family of Norse and Celtic board games in which a king and his defenders, in the centre, face twice as many attackers around the edges.

asymmetric game

A game in which the two sides have different numbers of pieces, different goals or different rules.

mill

Three of one player's pieces in a straight line on a morris board.

hnefatafl

The Viking-Age tafl game; *hnefi* means “fist” and probably named the king piece.

nine men's morris

A game for two players with nine pieces each on a board of three nested squares; three in a row, a “mill,” removes an enemy piece.

CORE IDEAS

The story. In the long winters of Scandinavia, Iceland, Ireland and Britain, people played games of tafl, “table.” Gaming boards and pieces of glass, bone and amber turn up in Viking-Age graves and settlements. The best-preserved board, found in a crannog at Ballinderry in Ireland, is a wooden square of 7×7 holes for pegs from the tenth century. The sagas mention hnefatafl, and pieces were buried with warriors so that they could play in the next life, as the Norse believed. But nobody wrote the rules down. The fullest description came much later, in 1732, when the young Swedish naturalist Carl Linnaeus travelled through Lapland and recorded in his journal how the Sámi played a game called tablut on a 9×9 board.

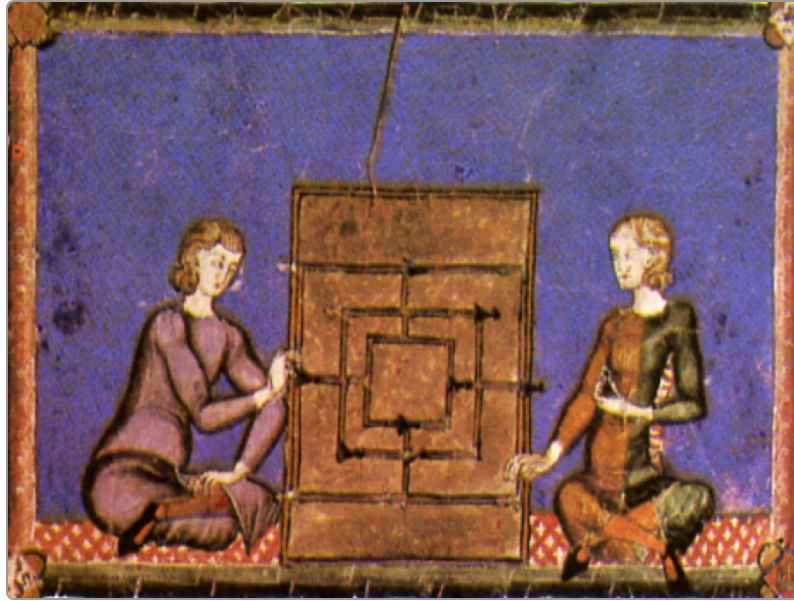
How it changed. Tafl spread wherever the Norse sailed and traded, and each region had its own board size, from 7×7 to 19×19 . An English manuscript of the twelfth century, now at Corpus Christi College, Oxford, even shows a tafl board called *alea evangelii*, “the game of the gospels,” whose pieces and spaces were matched to the harmony of the four Gospels. When chess arrived in the north in the eleventh and twelfth centuries, it slowly replaced tafl, and by the seventeenth century the old game survived only in remote places like Lapland. Nine men's morris had a longer life. A morris board was found with the Gokstad ship burial in Norway (about AD

900); Alfonso X's *Libro de los juegos* of 1283 shows it; English village greens had morris boards cut in the turf, as Shakespeare remembered in *A Midsummer Night's Dream*; and it is still sold today as "mill."

How it is played. In Linnaeus's *tablut* the king starts in the centre with 8 defenders, surrounded by 16 attackers in groups on the four edges. All pieces move like a chess rook. A piece is captured by being trapped between two enemies. The king's side wins if the king escapes to the edge (in many modern versions, to a corner); the attackers win by surrounding the king on all four sides. In nine men's morris, each player places nine pieces in turn on the 24 points, then moves them along the lines; every mill removes an opponent's piece, and a player reduced to two pieces loses.

Why it matters. *Tafl* is one of the oldest asymmetric games: the two sides want different things and need different strategies, outnumbered defenders using speed and the attackers using a slow, patient ring. It is a lesson in how historians work with fragments: a board here, a saga line there, and a traveller's notebook from Lapland. Morris shows the opposite: a game so simple and so satisfying that it was played almost unchanged for over a thousand years.

PICTURE STUDY



Nine Men's Morris in the Libro de los juegos, Workshop of Alfonso X of Castile, 1283 · Illumination on parchment · Real Biblioteca del Monasterio de El Escorial, Spain

Image: [Wikimedia Commons](#), public domain

Alfonso X's great Book of Games (the next lesson tells its story) includes a section on games of the "mill" family. Here two players sit on the floor on either side of a nine men's morris board, which looks exactly like the boards sold in toy shops today.

The painters usually showed the players mid-game, with a hand raised to make a move.

Look closely

- Trace the three nested squares and the four connecting lines with your finger. Count the points.
- Look at the players' hands. Who is about to move?
- Look at how the players sit. What does it tell you about how games were played in a medieval household?
- Compare this board with the one in your project. What has changed in seven hundred years?

Talk about it

1. Why would a king commission paintings of ordinary games in a book?

2. Why might a game with no dice, like morris, appeal to someone who wants a contest of pure skill?
3. What makes a game last unchanged for a thousand years?

PROJECT

Two Northern Games: Tablut and Morris

You will make a tablut board using Linnaeus's setup and a nine men's morris board, play both, and test whether tablut is balanced between the two sides.

You will need

- Card, ruler and pencil
- 25 counters for tablut (16 of one colour, 8 of another and a distinctive king)
- 18 counters for morris (9 of each colour)
- A family member to play
- Your scorebook

Steps

1. Draw a 9×9 grid. Place the king on the centre square with 8 defenders in a cross around him (two in each direction). Place 16 attackers in four T-shaped groups of four at the middle of each edge.
2. Write the rules: all pieces move like rooks; a piece is captured by being sandwiched between two enemies along a line; the king wins on reaching any edge square; the attackers win by surrounding the king on all four sides.
3. Play six games of tablut, switching sides each game. Record which side won and in how many moves.
4. Calculate the win rate for each side. If one side wins much more often, try the common variant in which the king must reach a corner, and play four more games.
5. Draw a morris board and play five games. Record the number of mills each player made and the winner.
6. Write a paragraph: which game demands more planning? Is tablut fair, according to your results?

Tips

- Defenders: move the king early before the ring closes.
- Attackers: block the edges and corners before chasing pieces.

Check your work

- ☐ I played at least six games of tablut, switching sides, and five of morris.
- ☐ I calculated each side's win rate in tablut.
- ☐ My conclusion about fairness uses my data.

SCOREBOOK

1. Draw Linnaeus's starting position for tablut and a morris board, both labelled.
2. Make a results table for tablut: game, my side, winner, number of moves.
3. Write three sentences on the difference between a symmetric and an asymmetric game, with one example of each from outside this lesson.

From history. Linnaeus, who later became famous for naming plants and animals, wrote his tablut notes in Latin and Swedish in his travel diary. Because he recorded what he saw so carefully, the diary of a botanist became the most important source for a lost Viking game.

WORKED EXAMPLES

Example 1. On a morris board of three nested squares joined at the midpoints, how many points are there and how many possible mills?

Show solution

1. Each square has 8 points (4 corners and 4 midpoints): $3 \times 8 = 24$ points.
2. Each side of each square is a line of three points: $4 \text{ sides} \times 3 \text{ squares} = 12$ mills.
3. The four connecting lines across the middle each join three midpoints: 4 more mills.
4. Total: $12 + 4 = 16$.

Answer: 24 points and 16 possible mills.

Example 2. In Linnaeus's tablut on a 9×9 board, what is the ratio of attackers to defenders (counting the king), and what fraction of the board's squares are occupied at the start?

Show solution

1. Attackers: 16. Defenders: 8 + king = 9.
 2. Ratio $16 : 9 \approx 1.78 : 1$.
 3. Squares: $9 \times 9 = 81$. Occupied: $16 + 9 = 25$.
 4. $25 \div 81 \approx 0.31$.
-

Answer: About 1.8 attackers for every defender, with about 31% of the board filled. The outnumbered side must rely on mobility.

Example 3. Linnaeus recorded tablut in 1732. The Ballinderry board dates from the tenth century (say about 950). How many years separate them? How many years separate Linnaeus from today?

Show solution

1. $1732 - 950 = 782$ years.
 2. From 1732 to 2025 is 293 years.
-

Answer: About 780 years passed between the Irish board and the first full written rules, more than twice the time between Linnaeus and us. That gap is why every tafl rule set is a reconstruction.

PRACTICE

1. Easy Who recorded the rules of tablut, where, and in what year?

Show answer

Carl Linnaeus, in Lapland, in 1732.

2. Easy How many pieces does each player have in nine men's morris?

Show answer

Nine.

3. Easy How does the king's side win in tafl?

Show answer

By getting the king to the edge of the board (or to a corner, in many versions).

4. Medium Why is tafl called an asymmetric game?

Show answer

The two sides have different numbers of pieces and different goals: the defenders try to get the king out, and the attackers try to surround him.

5. Medium A tafl board is 11×11 with 24 attackers and 12 defenders plus a king. What fraction of the squares are occupied at the start?

Show answer

121 squares; 37 occupied; $37/121 \approx 31\%$.

6. Medium In morris, a player forms a mill on every turn for three turns. How many enemy pieces has he removed?

Show answer

Three, one for each mill.

7. Medium Name three pieces of evidence for the history of nine men's morris.

Show answer

Any three: the Gokstad ship board (about 900); the Libro de los juegos (1283); boards cut in English turf and stone; Shakespeare's mention in *A Midsummer Night's Dream*; boards scratched into church benches and cloisters.

8. Medium What was *alea evangelii*?

Show answer

A tafl board in a twelfth-century English manuscript, "the game of the gospels," with its pieces and spaces linked to the harmony of the four Gospels.

9. **Hard** Explain why the rules of hnefatafl must be reconstructed, and what kinds of evidence a reconstruction uses.

Show answer

No Viking-Age rule book survives. Reconstructions use boards and pieces from graves, saga references, later records such as Linnaeus's tablut, the Welsh tawlbwrdd and alea evangelii, and play-testing to see which rules give a balanced game.

10. **Hard** Nine men's morris was shown by Ralph Gasser in 1996 to be a draw with perfect play. Why does that not spoil the game for ordinary players?

Show answer

Perfect play requires remembering or calculating an enormous number of positions. Human players make mistakes, so real games are still won and lost by skill.

11. **Challenge** In tablut, attackers capture by sandwiching. A defender stands on a square with all four neighbours empty. In how many different ways (pairs of neighbouring squares) could two attackers sandwich it?

Show answer

Two: left and right, or above and below. Diagonal pairs do not capture.

COMMON MISTAKES

- Moving tafl pieces diagonally. They move only along rows and columns.
- Counting a diagonal line on a morris board as a mill. Standard nine men's morris has no diagonals.
- Calling any tafl rule set "the Viking rules." All are reconstructions.

Make it a game • Tafl Story Chain. Take turns adding one sentence to a tale of a tafl board discovered long ago in the north, with a king in the middle and an unequal number of attackers and defenders. Each sentence must include a true fact: hnefatafl, Linnaeus in 1732, tablut, or the Ballinderry board. If one fact is wrong, the other player says stop. Play three rounds.

2.5 BACKGAMMON, TABLES AND THE BOOK OF GAMES

OBJECTIVES

- Trace the family of “tables” games from the Roman *tabula* to medieval tables and modern backgammon.
- Describe Alfonso X’s *Libro de los juegos* (1283) and its lesson about chess, dice and tables.
- Calculate dice chances for two dice, the starting pip count and the chance of hitting a single checker.
- Explain how backgammon combines luck and skill, and why a wise player judges a move by its chances, not by one result.

Warm-up. Roll two dice 36 times and tally how often you roll a double. Predict first: about how many doubles should you get?

WATCH

Backgammon for Beginners

Augusta-Richmond County Public Library System • 11:17

<https://www.youtube.com/watch?v=G9ddSiTVH1M>

WHEN TO WATCH

After the how-it-is-played paragraph. A public library’s clear, quiet tutorial on setting up, moving, hitting, entering from the bar and bearing off.

KEY TERMS

tables

The medieval name for the family of games played on a board of 24 points with dice and 15 pieces a side, of which backgammon is the best-known survivor.

pip count

The total number of points a player’s checkers must still travel to bear off; at the start of backgammon it is 167.

tabula

The Roman game of the tables family, played with three dice in early times; a position from a game of the emperor Zeno in AD 480 was recorded in verse.

blot

A single checker alone on a point, which an opponent can hit and send back to the start.

Libro de los juegos

The Book of Games, more fully the Book of Chess, Dice and Tables, made for King Alfonso X of Castile and completed in 1283.

CORE IDEAS

The story. In 1283, in Seville, the workshop of King Alfonso X of Castile, called “the Wise,” finished a book unlike any before it: the *Libro de acedrex, dados e tablas*, the Book of Chess, Dice and Tables. Its 97 parchment leaves hold some 150 paintings of people playing: Christians, Muslims and Jews; kings, monks, women and children. Its introduction explains why there are three kinds of games. Chess is a game of the mind alone; dice are pure chance; tables join the two, so that a skilled player can make the best of whatever the dice give him. Alfonso thought that was the wisest picture of life.

How it changed. The Romans played *tabula* on a board of 24 points; the Greek poet Agathias recorded a disastrous throw by the emperor Zeno in AD 480, the oldest game position in the family that we can set up exactly. In Persia a related game called nard spread east and west. Medieval Europe played dozens of tables games; the *Libro de los juegos* describes fifteen. In England the name “backgammon” appears in the 1640s, and in 1743 Edmond Hoyle published a short treatise on its rules and chances. Kings and churchmen sometimes discouraged dice games because they so often led to quarrels and losses of money, but tables as a game of skill was played everywhere, from monasteries to palaces.

How it is played. Each player has 15 checkers that race around the 24 points in opposite directions toward his home board. Two dice give two moves; a double gives four. A single checker, a blot, can be hit and sent to the bar, from which it must re-enter. Two or more checkers on a point make it safe and block the opponent. When all 15 checkers reach home, a player bears them off, and the first to bear off all 15 wins.

Why it matters. Backgammon is the clearest example of Alfonso’s point: luck decides each roll, but over many games the better player wins. A good player knows the chances, avoids leaving a blot where it is likely to be hit, and makes the move that is best on average, accepting that sometimes the dice will go against him. That is

a habit worth having in life too, where we do the wise thing and trust God with the outcome.

PICTURE STUDY



Herr Goeli at the Tables Board (Codex Manesse, folio 262v), Master of the Codex Manesse, about 1305–1315 · Illumination on parchment · Heidelberg University Library, Germany (Cod. Pal. germ. 848)

Image: [Wikimedia Commons](#), public domain

The Codex Manesse is a great songbook made in Zurich in the early fourteenth century, with a painted portrait for each of its poets. The page for the poet Herr Goeli shows two noblemen, one of them crowned, at a game of tables, the ancestor of backgammon.

Notice that the board looks very like a modern backgammon board, with its two halves and rows of pointed triangles.

Look closely

- The crowned player holds up something small between finger and thumb. What might it be, and what is he about to do?
- Count the points (triangles) you can see on each half of the board. How many should a full tables board have?
- Look at the players' hands and faces. Who seems to be explaining, and who is listening?
- Look at the crown and the coat of arms. Why might a book of noble poets show its men at a board game?

Talk about it

1. Why would a book of songs show a poet at a game of tables?

2. This picture is about seven hundred years old. What has stayed the same in backgammon since then?
3. Alfonso X said tables join skill and chance. Which do you see more of in this picture?

PROJECT

Measure Luck and Skill in Backgammon

You will play backgammon, record every roll and every hit, and compare the hits you see with the chances you calculated.

You will need

- A backgammon board (or a drawn board of 24 triangles)
- 15 checkers of each colour (coins or buttons)
- Two dice
- A family member to play
- Your scorebook

Steps

1. Set up the board as in the video and write the rules in your scorebook. Play for points only, as the lesson does: a win scores 1.
2. Play five games. On a tally sheet, record every roll (which numbers came up) and whether it was a double.
3. Every time a blot is left within 1–12 points of an enemy checker, record its distance and whether it was hit on the next roll.
4. At the end, compare your number of doubles with the expected $\frac{1}{6}$ of all rolls.
5. Group your blots by distance (1–6 and 7–12) and compute what fraction were hit. Compare with the chances in the worked examples.
6. Compute the pip count for both players at one moment in each game.
7. Write a paragraph: how often did the better decision lose because of the dice? Over five games, did skill show through?

Tips

- Count the pips before deciding whether to race or to hold back.
- Keep the tally sheet beside the board so recording takes only a second.

Check your work

- ☐ I played five games and recorded every roll and every blot.

- ☐ I compared my observed doubles and hit rates with the calculated chances.
- ☐ My paragraph discusses luck and skill using my numbers.

SCOREBOOK

1. Draw a 6×6 table of all 36 rolls of two dice and shade the doubles and the rolls that hit a blot 6 away.
2. Make a blot log: distance, hit or not, and the calculated chance of a hit.
3. Copy Alfonso X's idea in your own words: "Chess is..., dice are..., tables are..."

From history. Alfonso X also sponsored law codes, astronomical tables and collections of songs in honour of the Virgin Mary. His Book of Games was part of a lifelong effort to gather and organise knowledge, which is why he is called *el Sabio*, "the Wise."

WORKED EXAMPLES

Example 1. How many different rolls of two dice are there (counting a 3 then 5 as different from a 5 then 3), and what is the chance of a double?

Show solution

1. Each die has 6 faces: $6 \times 6 = 36$ ordered rolls.
2. Doubles: 1-1, 2-2, 3-3, 4-4, 5-5, 6-6 = 6 rolls.

Answer: 36 rolls; the chance of a double is $6/36 = 1/6 \approx 16.7\%$.

Example 2. Check the starting pip count of 167. At the start a player has 2 checkers on his 24-point, 5 on his 13-point, 3 on his 8-point and 5 on his 6-point.

Show solution

1. $2 \times 24 = 48$.
2. $5 \times 13 = 65$.
3. $3 \times 8 = 24$.
4. $5 \times 6 = 30$.
5. $48 + 65 + 24 + 30 = 167$.

Answer: 167 pips. Players compare pip counts to see who is ahead in the race.

Example 3. Your opponent has a blot exactly 6 points in front of your checker, with nothing blocking the way. In how many of the 36 rolls can you hit it?

Show solution

1. Any roll containing a 6: 6-1, 6-2, 6-3, 6-4, 6-5 (each two ways = 10) plus 6-6 (1) = 11.
2. Combinations that add to 6: 5-1 and 4-2 (each two ways) = 4.
3. Doubles that reach 6 in steps: 3-3 (two steps) and 2-2 (three steps) = 2.
4. Total: $11 + 4 + 2 = 17$.

Answer: 17 of 36 rolls, about 47%. A blot 6 away is hit nearly half the time, which is why good players avoid leaving one there.

Example 4. The average roll in backgammon, counting doubles as four moves, is $294/36 \approx 8.17$ pips. About how many rolls does a player need to bear off from 167 pips with no hits?

Show solution

1. $167 \div 8.17 \approx 20.4$.

Answer: About 20 to 21 rolls, a little more in practice because some pips are wasted when bearing off.

PRACTICE

1. **Easy** What three kinds of games does the *Libro de los juegos* describe, and in what year was it completed?

Show answer

Chess, dice and tables; 1283.

2. **Easy** How many checkers does each player have in backgammon, and how many points are on the board?

Show answer

15 checkers each; 24 points.

3. Easy What is a blot?

Show answer

A single checker alone on a point, which can be hit.

4. Medium What is the chance of rolling double sixes?

Show answer

$1/36 \approx 2.8\%$.

5. Medium In how many of the 36 rolls does at least one die show a 4?

Show answer

11 (6 + 6 – 1 for 4-4 counted twice).

6. Medium A blot is 2 points away. In how many rolls can you hit it? (Count rolls containing a 2, and 1-1.)

Show answer

11 rolls contain a 2, plus 1-1 = 12 rolls, $12/36 = 1/3$.

7. Medium Explain Alfonso X's reason for dividing games into chess, dice and tables.

Show answer

Chess depends wholly on skill, dice wholly on chance, and tables on both, so a wise player makes the best use of whatever chance gives him.

8. Medium Your pip count is 98 and your opponent's is 112, and it is your turn. Who is ahead in the race, and by how much?

Show answer

You are, by 14 pips, and you also have the next roll (worth about 8 pips more).

9. Hard Show that the average backgammon roll is $294/36 \approx 8.17$ pips. (Non-doubles count the sum; doubles count four times the number.)

Show answer

Sum over all 36 ordered rolls of the two dice = 252; doubles add an extra $2 \times (1+2+3+4+5+6) = 42$ because each double counts four times instead of twice. $252 + 42 = 294$; $294 \div 36 \approx 8.17$.

10. **Hard** You can either leave a blot 6 points from an enemy checker or one 11 points away. Which is safer? (A blot 11 away can be hit by 6-5 or 5-6 only, plus no doubles.)

Show answer

11 away: $2/36 \approx 5.6\%$. 6 away: $17/36 \approx 47\%$. The blot 11 away is far safer.

11. **Challenge** A blot is 8 points away and the path is clear. Count the rolls that hit it: 6-2, 5-3 (two ways each), 4-4 and 2-2.

Show answer

6-2: 2, 5-3: 2, 4-4: 1, 2-2: 1. Total 6 of 36, $1/6 \approx 16.7\%$.

COMMON MISTAKES

- Treating 3-5 and 5-3 as one roll. They are two of the 36.
- Forgetting that a double is played four times.
- Judging a move by one result. A move that leaves a 1-in-18 shot was still good even if the shot is hit.

Make it a game • Family Tree Draw. Race your parent to draw a family tree of the games called tables. Start with the Roman tabula, add medieval tables, then modern backgammon, and note the Libro de los juegos. Add the terms pip count and blot beside the right branch. Compare drawings, and award yourself a point for each branch your parent missed.

Scripture. “The lot is cast into the lap; but the whole disposing thereof is of the LORD.” (Proverbs 16:33, KJV)

Dice seem to fall by chance, but Scripture teaches that nothing is outside God’s rule. A wise player does his best with each roll and does not fret over what he cannot control.

UNIT 2

THE GREAT BOARD GAMES

Five board games have outlasted empires: chess, Go, mancala, the tafl and morris games of the north, and the tables family that became backgammon. This unit follows each across centuries and continents, from chaturanga in India and weiqi in China to oware in Ghana, tablut in Lapland and Alfonso X’s great Book of Games of 1283.

You will play every game you study: shatranj and modern chess, Go on a 9 × 9 board, oware on an egg carton, tablut and nine men’s morris, and backgammon. You will count squares and liberties, predict where seeds will land, compute the size of a game’s search space with powers of ten, and measure luck and skill with dice. Throughout, you will ask why some games last a thousand years.

PREREQUISITES

- Counting outcomes for two dice (Lesson 1.1)
- Fractions, decimals and percents
- Powers and simple use of a calculator’s log key (helpful for Lesson 2.2)

MASTERY CHECKLIST

- ☐ I can trace chess from chaturanga to the modern queen of about 1475 and compare old and new pieces by counting squares.
- ☐ I can explain the rules and history of Go and estimate the number of board positions with powers of ten.
- ☐ I can play oware and predict the landing pit of a move with arithmetic.
- ☐ I can describe tafl and nine men’s morris and explain what makes a game asymmetric.

☐ I can describe the
Li and calculate dice chances in
br backgammon.
o
de
los
jue
gos

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **lichess.org**: Free, with no advertising. Play chess against the computer or family, study openings, and record games for Lesson 2.1. A parent should set up an account and turn off chat. Ages 10+.
- **Chess Fundamentals, by José Raúl Capablanca (Project Gutenberg)**: Free. The great Cuban world champion's classic 1921 introduction to endings, middlegames and openings; a fine next step after Lesson 2.1. Ages 12+.
- **Online Go Server (OGS)**: Free. Play 9×9 Go against computer opponents and work through beginner puzzles for Lesson 2.2. A parent should supervise any games against strangers. Ages 12+.

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	Chess: From Chaturanga to the Modern Queen	3 sessions of 50 minutes
2.2	Go and the 19×19 Board	3 sessions of 50 minutes
2.3	Mancala Across Africa	3 sessions of 50 minutes
2.4	Tafl in the Viking North and Nine Men's Morris	3 sessions of 50 minutes
2.5	Backgammon, Tables and the Book of Games	3 sessions of 50 minutes

UNIT 2 TEST

Calculators are allowed. Show your work for every calculation: write what you are counting, the numbers you used, and the answer with a sentence explaining it. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **7 pts**

Trace chess from its origin to Europe in four steps, with approximate dates.

2. (7 pts)

How many squares can a modern queen reach from e4 on an empty board? How many could a ferz reach? Show your work.

3. (6 pts)

What changed about the queen and the bishop around 1475, and what evidence dates the change?

4. (7 pts)

How many points are on a 19×19 Go board, and how many liberties does a lone stone have in the centre, on an edge and in a corner?

5. (7 pts)

Estimate 3^{361} as a power of ten. Show the logarithm step.

6. (7 pts)

Who was Hon'inbō Sansa, and why does 1612 matter in the history of Go?

7. (6 pts)

In oware you sow 8 seeds from pit 6. Where does the last seed land, and can it capture? Explain.

8. (6 pts)

In oware you sow 4 seeds from pit 5 and the last lands in pit 9, which had 2 seeds. Pits 8 and 7 had 1 and 4 seeds before your move. What do you capture?

9. (7 pts)

What did Romein and Bal prove about oware in 2002?

10. (7 pts)

Describe Linnaeus's tablut: board size, the pieces on each side, how pieces move, and how each side wins.

11. (7 pts)

How many points and how many possible mills are on a nine men's morris board? Explain the count.

12. (6 pts)

Verify the starting backgammon pip count of 167.

13. (7 pts)

A blot is 4 points away with a clear path. Count the rolls that hit it (rolls containing a 4; 3-1; 2-2; 1-1).

14. (6 pts)

What is the *Libro de los juegos*, who commissioned it, and what does its introduction teach about the three kinds of games?

15. (7 pts)

Short essay. In about 150 words, explain why some board games have lasted for a thousand years or more. Use at least three games from this unit as examples.

ANSWER KEY

1. Chaturanga in India (about 6th century); chatrang/shatranj in Persia (6th–7th century); shatranj across the Islamic world after the 7th-century conquest, with masters in Baghdad (9th–10th century); Christian Europe by about 1000.
2. Queen: rook part 14 + bishop part 13 = 27. Ferz: 4 diagonal neighbours.
3. The queen gained the combined moves of rook and bishop, and the bishop could slide any distance diagonally. A Valencian poem of about 1475 (*Scachs d'amor*) and Lucena's book of 1497 show the new rules.
4. 361; 4, 3 and 2.
5. $361 \times \log_{10} 3 \approx 361 \times 0.4771 \approx 172.2$; about 10^{172} (1.7×10^{172}).
6. Sansa was the head of the first official Go house; in 1612 the Tokugawa shogunate began paying stipends to Go players, making Go a profession in Japan.
7. $6 + 8 = 14$; $14 - 12 = 2$, so it lands in pit 2, in your own row. No capture is possible, because captures are made only in the opponent's row.
8. Seeds go to 6, 7, 8, 9. Pit 9 now has 3 (capture), pit 8 now has 2 (capture), pit 7 now has 5 (stop). Capture $3 + 2 = 5$ seeds.
9. That with perfect play by both sides, oware is a draw.
10. 9×9 board; a king with 8 defenders in the centre against 16 attackers on the edges; all pieces move like rooks and capture by sandwiching; the king's side wins by reaching the edge, the attackers by surrounding the king.
11. 24 points (8 on each of 3 squares); 16 mills (12 along the sides of the squares and 4 along the connecting lines).
12. $2 \times 24 + 5 \times 13 + 3 \times 8 + 5 \times 6 = 48 + 65 + 24 + 30 = 167$.
13. Rolls containing a 4: 11. 3-1 and 1-3: 2. 2-2: 1. 1-1: 1. Total $15/36 \approx 42\%$.
14. The Book of Chess, Dice and Tables, completed in 1283 for Alfonso X of Castile. Chess is pure skill, dice pure chance, and tables a mixture, in which the wise player makes the best of what chance gives.
15. Answers vary. A strong essay names qualities such as simple rules with deep strategy (Go, morris), equipment anyone can make (mancala), a balance of luck and skill (backgammon), and the ability to adapt across cultures (chess), with accurate examples and dates.

PORTFOLIO PIECE: A FAMILY GAMES NIGHT GUIDE

Write and illustrate a guide that would let a family who has never seen these games play three of them in one evening. For each game include (1) a short history with at least three dated facts; (2) a drawing of the board and starting position you made yourself; (3) the rules in no more than ten numbered sentences; (4) one strategy tip supported by a calculation from this unit (squares controlled, liberties, landing pits, mills or dice chances); and (5) the results of at least three games you actually played. Then host the games night and add a short report on how it went.

LOOK FOR	WHAT IT MEANS
History	Accurate, dated history for each game, with what is known separated from what is reconstructed.
Rules and boards	Clear, complete rules and accurate home-made board drawings that a newcomer could follow.
Mathematics	One correct calculation per game that supports a real strategy tip.
Play and report	Results of real games, and an honest report of the games night.

UNIT 3

MEDIEVAL AND EARLY MODERN SPORT

Between the fall of Rome and the age of railways, sport lived in villages, palaces and parishes. This unit follows five threads: the mob football and golf that Scottish and English kings tried to ban; the jeu de paume that became royal tennis; archery at the butts, which the law required; cricket, whose first written Laws of 1744 marked the start of organised sport; and the winter games of Scotland and the fens: curling, the Highland games and bandy.

You will compare a rule-less folk game with a game you write rules for, test the palm against the paddle and work out the odds of winning from deuce, measure how practice improves accuracy, play cricket by the Laws of 1744, and run a kitchen-floor curling championship. The question running through the unit is simple: why did people begin to write down the rules of their games?

PREREQUISITES

- Fractions, decimals and percents
- Multiplying probabilities of independent events (Unit 1)
- Converting units with a conversion factor

MASTERY CHECKLIST

- ☐ I can explain why kings banned football and golf and why the bans failed.
- ☐ I can describe real tennis and calculate the chance of winning a game from deuce.
- ☐ I can explain the archery laws of medieval and Tudor England and convert old units of distance and force.
- ☐ I can describe the 1744 Laws of Cricket and calculate run rates and reaction times.
- ☐ I can trace the history of curling and the Highland games and keep a curling score.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **The Complete Golfer, by Harry Vardon (Project Gutenberg):** Free. The great champion's 1905 book on how golf is played, with a chapter of reminiscences, for students who want to go further after Lesson 3.1. Ages 12+.
- **The Laws of Cricket (MCC):** Free. The current Laws as kept by the Marylebone Cricket Club, including the Preamble on the Spirit of Cricket, to compare with the 1744 Laws in Lesson 3.4. Ages 12+.
- **The Mary Rose Museum:** Free website of the museum in Portsmouth that holds the Mary Rose and her longbows, with articles on the ship and her crew, for Lesson 3.3. A visit is optional. Ages 10+.
- **World Curling:** Free. The governing body's site, with the rules of curling and its history, for Lesson 3.5. Ages 10+.

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	The Kings Who Banned Football and Golf	3 sessions of 50 minutes
3.2	Real Tennis and the Jeu de Paume	3 sessions of 50 minutes
3.3	Archery and the Longbow Butts	3 sessions of 50 minutes
3.4	Cricket's First Laws, 1744	3 sessions of 50 minutes
3.5	Curling, Bandy and the Highland Games	3 sessions of 50 minutes

UNIT 3 TEST

Calculators are allowed. Show your work for every calculation: write the formula or conversion you used, substitute the numbers, and give the answer with units and a sentence. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **6 pts**

What did London's proclamation of 1314 forbid, and why?

2. (7 pts)

Explain why the Scottish Parliament banned football and golf in 1457 and why golf survived anyway.

3. (6 pts)

The Ashbourne goals are about 3 miles apart. Convert to kilometres (1 mile $\approx$ 1.609 km).

4. (6 pts)

Describe two features of a real tennis court and the origin of the word tennis.

5. (8 pts)

A player wins 65% of points. Find his chance of winning a game from deuce. Show the formula.

6. (6 pts)

Where is the oldest real tennis court still in use, and who built the first court at Hampton Court?

7. (7 pts)

List three requirements of Henry VIII's Unlawful Games Act of 1541.

8. (6 pts)

Convert 220 yards to metres and 160 lbf to newtons.

9. (7 pts)

Using $R = v^2 \sin 2\theta / g$, find the range of an arrow launched at 45 m/s at 45° , ignoring air resistance.

10. (6 pts)

What did the Mary Rose teach historians about Tudor archery?

11. (7 pts)

List four things the 1744 Laws of Cricket fixed.

12. (6 pts)

A team scores 156 runs in 20 overs. Find its run rate per over and per ball.

13. (6 pts)

In curling, Team A's stones are 0.2 m and 1.4 m from the button; Team B's are 0.6 m, 0.9 m and 1.7 m. Who scores, and how many?

14. (6 pts)

Give the dates and significance of 1511, 1541, 1838 and 1998 in curling history.

15. (10 pts)

Short essay. In about 200 words, explain why people began writing down the rules of games between the 1500s and the 1700s. Use at least three examples from this unit and say what was gained and what, if anything, was lost.

ANSWER KEY

1. Football in the city, because of the great noise and disturbance it caused and the evils that might arise from it.
2. The crown wanted men to practise archery for defence. Golf survived because it was loved, the bans were unenforceable, and after the 1502 peace with England the king himself took up the game.
3. $3 \times 1.609 \approx 4.83$ km.
4. Any two features: walls in play, sloping penthouse, dedans, grille, tambour, chases. The word probably comes from the server's call *tenez*, "take this."
5. $p^2/(p^2 + q^2) = 0.4225/(0.4225 + 0.1225) = 0.4225/0.545 \approx 0.775$, about 78%.
6. Falkland Palace, Scotland (1539); Cardinal Wolsey built the first Hampton Court court (1526–1529).
7. Any three: men under sixty to own bows and practise; fathers to provide bows for sons from seven; towns to keep butts; men over twenty-four not to shoot at marks under 220 yards; restrictions on other games.
8. $220 \times 0.9144 \approx 201$ m; $160 \times 4.448 \approx 712$ N.
9. $R = 45^2/9.8 = 2025/9.8 \approx 207$ m.
10. Her raising in 1982 recovered over 170 yew longbows (137 complete) and about 3,500 arrows, showing the size and very heavy draw weights of Tudor bows; bones of the crew showed the physical strain of archery.
11. Any four: 22-yard pitch; two-stump wicket 22 inches high and 6 inches wide; one bail; ball of 5 to 6 ounces; four-ball overs; rules for umpires and ways of being out.
12. $156 \div 20 = 7.8$ per over; $156 \div 120 = 1.3$ per ball.
13. Team A's nearest is 0.2 m, closer than all of B's stones; A's next stone (1.4 m) is farther than B's 0.6 m. Team A scores 1.
14. 1511: oldest dated stone (Stirling). 1541: Paisley Abbey challenge, first written record. 1838: Grand Caledonian Curling Club formed (Royal from 1843). 1998: curling a full Olympic medal sport.
15. Answers vary. A strong essay uses examples such as the Leith golf rules (1744), the Laws of Cricket (1744), Hulpeau's tennis book (1632) and the Caledonian curling rules (1838); explains gains (fair matches between clubs, fewer disputes, spread of the game) and possible losses (local variety, informality); and notes that written rules still depend on honour and the spirit of the game.

PORTFOLIO PIECE: A MEDIEVAL AND EARLY MODERN SPORTS ALMANAC

Make a twelve-month almanac of sport and play in the style of the Golf Book: for each month, choose a game or sport from this unit (or a closely related one) that was played in that season. For each month include (1) a drawing or a copy of a historical picture; (2) a 100-word description with at least two dated facts; (3) one rule written as it might have appeared in a club's laws; and (4) for at least four months, a calculation from this unit (a unit conversion, a deuce probability, a range, a run rate or a curling score). Finish with a one-page essay on the theme "From bans to rule books."

LOOK FOR	WHAT IT MEANS
Historical accuracy	Dates, people and places are correct, and each month's activity fits its season.
Pictures and design	Twelve neat, captioned pictures with sources named for copies of historical images.
Mathematics	At least four correct calculations with units and clear working.
Essay	A clear argument about why rules were written, using at least three examples.

3.1 THE KINGS WHO BANNED FOOTBALL AND GOLF

OBJECTIVES

- Describe medieval mob football and explain why Edward II's London proclamation of 1314 and later royal orders tried to stop it.
- Explain why James II of Scotland's Parliament ordered in 1457 that football and golf be "utterly cried down," and how golf survived.
- Compare medieval folk games with modern codified sports using numbers: distances, team sizes and dates.
- Weigh the reasons a ruler might restrict a sport, and judge whether those reasons were wise.

Warm-up. Imagine a football game between two villages with no limit on players, no referee and goals three miles apart. Write down three problems that game would cause. Then read on to see whether medieval kings saw the same problems.

WATCH

The REAL History of Golf – And why it was BANNED...

Scotland Unplugged • 11:52

https://www.youtube.com/watch?v=O77VD_uTFW0

WHEN TO WATCH

After the how-it-changed paragraph. A walk around St Andrews and Edinburgh's Leith Links tells the story of golf's early history and the royal bans.

KEY TERMS

mob football

Medieval and early modern football between towns, villages or parishes, played with few rules, unlimited players and goals that could be miles apart.

proclamation

A public order announced in the name of the king.

Act of Parliament

A law passed by a national parliament; the Scottish Parliament passed acts against football and golf in 1424, 1457, 1471 and 1491.

links

Sandy, grassy land along the Scottish coast between the beach and the farmland, where golf was first played.

Shrovetide football

Mob football played on Shrove Tuesday and Ash Wednesday, a tradition that still survives in a few English towns such as Ashbourne in Derbyshire.

CORE IDEAS

The story. On April 13, 1314, the Mayor of London issued a proclamation in the name of King Edward II. Because of the “great noise in the city” caused by scuffling over large footballs in the public fields, from which “many evils” might arise, the game was forbidden in the city on pain of imprisonment. It was not the last such order. In 1363 Edward III commanded that able-bodied men spend their holidays practising archery instead of playing at football, handball and other pastimes. In Scotland, King James I’s Parliament ordered in 1424 that no man play at football, and on March 6, 1457, James II’s Parliament decreed that football and golf be “utterly cried down and not used,” and that every parish set up butts for archery.

How it changed. The bans did not work. Football was too popular, and golf, played on the free, rolling links of the east coast of Scotland, kept its devoted players. The Scottish bans were repeated in 1471 and 1491, and then, after the Treaty of Perpetual Peace with England in 1502, the need for archers faded. That same year the royal accounts record King James IV buying golf clubs and balls from a bow-maker in Perth: the king had taken up the game his grandfather had banned. In 1552 the Archbishop of St Andrews confirmed the townspeople’s right to play golf on the links, and in 1744 the Gentlemen Golfers of Leith wrote the first known rules of golf, thirteen in all.

How it was played. Mob football had almost no rules. Hundreds of men from two parishes might struggle for a ball across fields, streams and streets, trying to carry it to the other side’s goal, which might be a church door, a mill or a bridge miles away. Games could last all day. In Ashbourne, Derbyshire, the Royal Shrovetide game is

still played this way, with goals about three miles apart. Early golf was played with wooden clubs and hard balls of wood or, later, the leather “feathery,” over courses of no fixed number of holes. St Andrews settled on eighteen in 1764 when it combined several short holes.

Why it matters. Medieval rulers judged sport by what it did to the common good. Mob football broke property and bones and disturbed the peace; golf and football kept men from the archery practice the kingdom needed for defence. Their reasons were serious, but their method failed, because a pastime people love cannot simply be forbidden. The lasting answer, as later units show, was not banning games but giving them rules. Scripture reminds us that preparation matters, “the horse is prepared against the day of battle,” but it adds that the outcome is the Lord’s.

PICTURE STUDY



September: Four Men Playing a Game That Resembles Golf (from the Golf Book), Workshop of Simon Bening, about 1520–1530 · Illumination on parchment, in a book of hours · The British Library, London (Add MS 24098, folio 27r)

Image: [Wikimedia Commons](#), public domain

This page comes from a Flemish book of hours, a prayer book with a calendar of saints' days. Each month has a small scene of country life along the bottom. The book is nicknamed the "Golf Book" because this September scene shows four men with clubs playing a ball toward a hole.

It was painted in Bruges in the workshop of Simon Bening around the same years that James IV and his grandson were playing golf in Scotland.

Look closely

- Find the four players. What are they holding, and how are they standing?
- Look for the target. Is it a hole, a post or a door?
- Notice that this little scene sits beneath a calendar of saints' days. Why might a prayer book include pictures of games?
- Compare the clubs with modern golf clubs. What is the same and what is different?

Talk about it

1. This game was played in Flanders, not Scotland. What does that suggest about the claim that golf was "invented" in one place?

2. Why would a king ban a game that appeared in an expensive prayer book in other lands?
3. How does the calendar setting suggest that play had its proper season and place in a well-ordered life?

Safety first. If you try a putting game outdoors, use a soft or plastic ball and swing only in a clear space with no one nearby, with a parent present.

PROJECT

Folk Game versus Rule Game

You will play a backyard game twice, first with almost no rules and then with written rules, and record what changes. Then you will write the first laws of your own game.

You will need

- A soft ball
- Markers for goals (cones, buckets or shirts)
- At least four players from your family
- A stopwatch
- Your scorebook

Steps

1. With a parent, mark a play area in a yard or park. Use a soft ball only.
2. Round 1, the “folk game”: two teams try to carry or kick the ball to the other side’s goal. Agree only on the goals. Play for 10 minutes and record goals, stoppages, arguments and any near-collisions.
3. Discuss what went wrong. Write five rules that would fix the problems (for example: no holding, the ball must be kicked, a time limit, a boundary, a referee).
4. Round 2: play another 10 minutes under your five rules, with one person as referee. Record the same things.
5. Compare the two rounds in a table.
6. Write your five rules as “Laws of the Game,” in numbered sentences, and sign and date them like a club secretary of 1744.
7. Write a paragraph: what did written rules gain, and did anything fun get lost?

Tips

- Keep play gentle: no tackling or grabbing.
- A short, clear rule is better than a long, clever one.

Check your work

- ☐ I played both rounds and recorded stoppages, goals and disputes.
- ☐ I wrote five numbered laws for the game.
- ☐ My paragraph compares the two rounds with my data.

SCOREBOOK

1. Make a timeline from 1314 to 1764 with every ban and every rule-making date from this lesson.
2. Draw a map of a pretend mob-football course between two villages, with goals 3 miles apart and the obstacles in between.
3. Copy the table comparing your folk game and rule game.

From history. Mary, Queen of Scots was accused by her enemies of playing golf at Seton a few days after the death of her husband Lord Darnley in 1567. True or not, the charge shows that golf was by then a well-known pastime of the Scottish court.

WORKED EXAMPLES

Example 1. The Ashbourne Shrovetide goals are about 3 miles apart. A modern soccer pitch is about 105 m long. How many soccer pitches would fit between the Ashbourne goals? (1 mile $\approx$ 1,609 m.)

Show solution

1. 3 miles $\approx 3 \times 1,609 = 4,827$ m.
2. $4,827 \div 105 \approx 46$.

Answer: About 46 soccer pitches end to end. Mob football was a game of distance and endurance, not of a measured field.

Example 2. How many years passed between James II's ban (1457) and James IV's purchase of golf clubs (1502)? Between the ban and the first written rules of golf (1744)?

Show solution

1. $1502 - 1457 = 45$ years.
2. $1744 - 1457 = 287$ years.

Answer: 45 years from ban to royal golfer, and 287 years from ban to the first written rules.

Example 3. A modern round of golf has 18 holes. Before 1764 the Old Course at St Andrews had 22 holes (11 out and 11 back). When four short holes were combined into two on each side, how many holes were left?

Show solution

1. Going out: 11 holes; combining four short holes into two removes 2, leaving 9.
2. Coming back: the same, 9.
3. $9 + 9 = 18$.

Answer: 18 holes, the number St Andrews made standard and the world later adopted.

PRACTICE

1. **Easy** In what year did London forbid football in the name of Edward II, and what reason did it give?

Show answer

1314; the great noise and disturbance in the city from scuffling over large balls, from which many evils might arise.

2. **Easy** What did the Scottish Parliament decree in 1457?

Show answer

That football and golf be utterly cried down and not played, and that archery be practised instead.

3. **Easy** Which Scottish king bought golf clubs in 1502?

Show answer

James IV.

4. **Medium** Why did kings want men to practise archery instead of playing football and golf?

Show answer

Their armies depended on skilled archers, and archery needed years of regular practice; time spent at other games was time lost from training.

5. **Medium** List the years of the Scottish acts against football or golf, and find the average gap between them.

Show answer

1424, 1457, 1471, 1491. Gaps: 33, 14, 20; average $(33 + 14 + 20) \div 3 = 67 \div 3 \approx 22$ years.

6. **Medium** What changed in 1502 that made golf acceptable to the Scottish crown?

Show answer

The Treaty of Perpetual Peace with England lessened the need for archers, and the king himself took up golf.

7. **Medium** What was the significance of 1744 for golf?

Show answer

The Gentlemen Golfers of Leith wrote the first known rules of golf, thirteen articles.

8. **Medium** Describe two differences between mob football and modern soccer.

Show answer

Any two: unlimited players versus eleven a side; goals miles apart versus a measured pitch; few or no rules versus written laws; no referee versus officials; games lasting all day versus 90 minutes.

9. **Hard** Were the royal bans wise? Give one argument for them and one against.

Show answer

For: the kingdom needed trained archers, and mob football caused injuries and damage. Against: the bans were unenforceable, made criminals of ordinary people at play, and failed to achieve their aim; regulating the games would have done more good.

10. **Hard** If 400 men from each parish joined a mob football game and the goals were 3 miles apart, how many players were there per mile of the course? Compare with 22 players on a 105 m pitch, per 100 m.

Show answer

$800 \div 3 \approx 267$ players per mile, about 16.6 per 100 m (1 mile ≈ 16.09 hundred metres). Soccer: $22 \div 1.05 \approx 21$ per 100 m. Surprisingly similar density, but spread over a far larger area and in a crowd rather than a team.

11. **Challenge** Golf's 1744 rules and cricket's 1744 laws (Lesson 3.4) were written in the same year. Suggest two reasons why gentlemen's clubs began writing rules in the mid-1700s.

Show answer

Any two well-argued reasons: clubs played matches against other clubs and needed common rules; competitions for prizes demanded clear rules; growing literacy and printing made written codes easy to share; organised clubs of educated men liked order and records.

COMMON MISTAKES

- Thinking medieval football was the same game as modern soccer. It was a mass contest with almost no rules.
- Assuming the bans stopped people from playing. They were repeated because they did not.
- Confusing James II (the 1457 ban) with James IV (the 1502 golf clubs).

Make it a game · Proclamation Reading. Write a short royal proclamation from memory as if you were in London in 1314, forbidding mob football and giving a reason. Read it aloud in a dramatic voice while your parent plays the crowd. Then your parent writes one wrong fact into the proclamation and reads it back, and you must catch it. Swap the roles.

Scripture. "The horse is prepared against the day of battle: but safety is of the LORD." (Proverbs 21:31, KJV)

Kings banned games so that men would train for war. Preparation is wise, Scripture agrees, but it is not where our security ultimately rests.

3.2 REAL TENNIS AND THE JEU DE PAUME

OBJECTIVES

- Trace real tennis from the jeu de paume of French cloisters to the royal courts of Henry VIII and the Stuart kings.
- Describe the features of a real tennis court and the game's odd scoring of 15, 30, 40.
- Use probability to find the chance of winning a game from deuce when you win each point with a given chance.
- Explain how a game of the palm became a game of the racquet, and how the old game gave birth to lawn tennis.

Warm-up. With a soft ball, hit it against a wall ten times with your open palm and ten times with a book used as a paddle. Which gave you more control? More power? Record your guesses before you try.

WATCH

Henry VIII's Tennis Court at Hampton Court Palace

Historic Royal Palaces • 4:50

<https://www.youtube.com/watch?v=x-YwtNyy5mo>

WHEN TO WATCH

After the story paragraph. A palace historian and the court's professional explain the court and its strange features.

BACKUP VIDEO

We Played King Henry VIII's Favourite Sport at Hampton Court Palace

History Hit • 16:03

<https://www.youtube.com/watch?v=2udq8dyuNYA>

In session 2. Two presenters learn the rules from the head professional and try to play; watch for chases and how the walls are used.

KEY TERMS

jeu de paume

“Game of the palm”: the French name for the ball game played first with the hand and later with a racquet, from which real tennis comes.

penthouse

The sloping roof along three sides of a real tennis court, onto which the ball is served.

chase

A real tennis rule by which a ball that bounces twice in certain parts of the court does not end the point at once but marks a position that must later be bettered.

real tennis

The original indoor game of tennis, played in a walled court with sloping roofs; called court tennis in the United States and royal tennis in Australia.

dedans

The large opening at the server’s end of the court, behind which spectators sit; hitting the ball into it wins a point.

CORE IDEAS

The story. Tennis began in France in the Middle Ages as the jeu de paume, a game in which players struck a ball with the palm of the hand, probably first in monastery cloisters, where sloping roofs and open galleries gave the walls of the court their peculiar shape. By the sixteenth century players used gloves and then strung racquets, and the game had become the passion of kings. Courts were built in palaces and towns all over France; contemporaries claimed that Paris had more than two hundred. The word “tennis” itself probably comes from the server’s call *tenez*, “take this!”

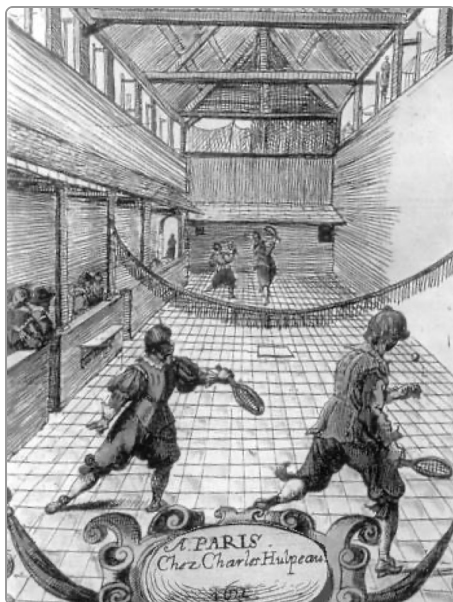
How it changed. The game crossed the Channel. Cardinal Wolsey built a court at Hampton Court between 1526 and 1529, and when King Henry VIII took over the palace he built a new court and played there often. In Scotland, James V built a court at Falkland Palace in 1539, now the oldest court in the world still in use. Charles II restored the Hampton Court court in the 1660s, and it remains in play today. After the 1600s the game declined, as courts were costly and the upheavals in France after 1789 swept many of them away. But when Victorian inventors in the 1870s looked for

a game for the lawn, they took tennis's scoring and its name: lawn tennis was the child of the old royal game.

How it is played. A real tennis court is an enclosed hall about 110 by 39 feet, with a net across the middle, a sloping roof (the penthouse) along three sides, and openings such as the *dedans* and the *grille* that win a point if the ball enters them. The server always serves from the same end, and the ball must touch the penthouse. Balls are hand-made of cork and cloth, heavier and less bouncy than lawn tennis balls, and the walls are part of the game. Scoring is the familiar 15, 30, 40, game, a system already in use in the fifteenth century; one popular explanation is that scores were once kept on a clock face, with 45 later shortened to 40, but nobody knows for sure.

Why it matters. Real tennis shows how buildings shape games. Its rules grew out of the shape of a cloister, and its odd features make it a game of angles, patience and craft rather than raw speed. It also shows how an old game can parent a new one. Every time a tennis umpire calls “forty-fifteen” or “deuce” (from the French *à deux*, “at two,” meaning two points still needed), he is speaking the language of the *jeu de paume*.

PICTURE STUDY



A Tennis Court in Paris, Unknown engraver, published by Charles Hulpeau, 1632 · Engraving · From Charles Hulpeau's *Le jeu royal de la paume*, Paris, 1632

Image: [Wikimedia Commons](#), public domain

In 1632 a Parisian tennis master, Charles Hulpeau, published one of the first books of rules for the jeu de paume, and this engraving of a Paris court appeared in it. The players hold strung racquets and the long net sags across the middle of the hall.

The court was already very like the courts at Hampton Court and Falkland: an enclosed hall with a gallery along one side.

Look closely

- Find the net. How does it differ from a modern tennis net?
- Look at the gallery on the left. Who is sitting there, and why would a sloping roof over it matter to the players?
- Look at the racquets. How are they shaped compared with modern ones?
- Look at the players' clothes. What do they suggest about who played in Paris in 1632?

Talk about it

1. Why would a tennis master publish rules and a picture of a court in a book?
2. How would playing indoors, with walls and a roof, change the way the game is played?

3. What features of this court can you still see in the video of Hampton Court?

Safety first. Use only a soft ball and play against a solid outside wall or garage door with no windows nearby. Keep a clear space behind you and wear proper shoes.

PROJECT

The Palm, the Paddle and the Odds of Deuce

You will test the jeu de paume against a racquet game at a wall, and then simulate deuce games with dice to check the formula from the worked examples.

You will need

- A soft ball and a safe outside wall
- Your palm, a homemade paddle (a sturdy book or a piece of plywood wrapped in tape) or a cheap racquet
- Chalk or tape to mark a target square on the wall
- A die
- Your scorebook

Steps

1. Mark a target square about 60 cm wide on the wall at shoulder height, and a line 3 m from the wall.
2. From behind the line, hit the ball at the target 20 times with your palm. Record hits.
3. Repeat 20 times with a paddle or racquet. Record hits.
4. Compute your hit rate with each and write which gave more control and which more power.
5. Now simulate deuce: roll a die for each point. Rolls 1–4 ($4/6 \approx 67\%$) mean you win the point; 5–6 mean you lose it. Play out 30 deuce games, recording who wins each.
6. Compare your result with the formula: $p^2/(p^2 + q^2)$ with $p = 2/3$.
7. Write a paragraph about what you learned about the game of the palm and about the odds of deuce.

Tips

- Keep score of a deuce game with tally marks: A for advantage you, D for deuce, B for advantage opponent.
- With $p = 2/3$, the formula gives $(4/9) \div (4/9 + 1/9) = 0.8$.

Check your work

- ☐ I recorded 20 palm hits and 20 paddle hits at the target.
- ☐ I simulated 30 deuce games with a die.
- ☐ I compared my simulation with the formula and explained any difference.

SCOREBOOK

1. Draw a plan of a real tennis court and label the net, penthouse, dedans, grille and tambour.
2. Draw a tree diagram for two points from deuce: win-win, win-lose, lose-win, lose-lose, with probabilities.
3. Record your target hits and your 30 simulated deuce games.

From history. When Henry VIII died, his palace inventories listed his tennis clothes, racquets and balls. The balls of his time were hand-sewn and stuffed, and some old balls have been found hidden in the roof timbers of English halls.

WORKED EXAMPLES

Example 1. At deuce, a player must win two points in a row to win the game. If he wins each point with probability p and the points are independent, show that his chance of winning the game from deuce is $\frac{p^2}{p^2 + q^2}$, where $q = 1 - p$.

Show solution

1. From deuce, after two points there are three outcomes: he wins both (p^2), loses both (q^2), or they split, returning to deuce ($2pq$).
2. Returning to deuce simply starts the same situation over, so only the first decisive pair matters.
3. His share of the decisive pairs is $\frac{p^2}{p^2 + q^2}$.

Answer: Chance of winning from deuce = $p^2 / (p^2 + q^2)$.

Example 2. Use the formula for a player who wins 60% of points.

Show solution

1. $p^2 = 0.36$, $q^2 = 0.16$.
2. $0.36 \div (0.36 + 0.16) = 0.36 \div 0.52 \approx 0.692$.

Answer: About 69%. A modest edge on each point (60%) becomes a larger edge in the game, which is why tennis scoring rewards the better player.

Example 3. A real tennis court is about 110 feet long and 39 feet wide. A lawn tennis doubles court is 78 feet by 36 feet. Compare their areas.

Show solution

1. Real tennis: $110 \times 39 = 4,290$ sq ft.
2. Lawn tennis: $78 \times 36 = 2,808$ sq ft.
3. $4,290 \div 2,808 \approx 1.53$.

Answer: The real tennis floor is about one and a half times the area of a lawn tennis doubles court, and it has walls and roofs too.

PRACTICE

1. Easy What does jeu de paume mean?

Show answer

“Game of the palm.”

2. Easy Who built the first tennis court at Hampton Court, and when?

Show answer

Cardinal Wolsey, between 1526 and 1529.

3. Easy Where is the oldest real tennis court still in use, and when was it built?

Show answer

Falkland Palace in Scotland, built in 1539 for James V.

4. **Medium** Give the most common explanation of tennis scoring by 15s, and say why historians are cautious about it.

Show answer

Scores may once have been kept on a clock face in quarters (15, 30, 45), with 45 shortened to 40. No early source proves it, so it remains a guess.

5. **Medium** What is the probability of winning a game from deuce for a player who wins 70% of points?

Show answer

$$0.49 \div (0.49 + 0.09) = 0.49 \div 0.58 \approx 0.845.$$

6. **Medium** What is the probability of winning from deuce when each player wins 50% of points? Explain why.

Show answer

$$0.25 \div (0.25 + 0.25) = 0.5. \text{ Evenly matched players have an even chance.}$$

7. **Medium** Name two features of a real tennis court that a lawn tennis court does not have.

Show answer

Any two: walls in play, the sloping penthouse roof, the dedans, the grille, the tambour, chases marked on the floor.

8. **Medium** How did real tennis contribute to lawn tennis?

Show answer

Lawn tennis took its name, its scoring (15, 30, 40, deuce) and many of its ideas from real tennis.

9. **Hard** Explain why tennis scoring makes a small advantage per point grow into a larger advantage per game.

Show answer

A game requires winning at least four points and two more than the opponent; the more points a game needs, the more the stronger player's edge accumulates and the less chance there is for a lucky run by the weaker player.

10. **Hard** A player wins a set 6–4. Every game he wins, he wins 4–0; every game he loses, he loses 2–4. How many points did each player win? Who won more points, and what does that show?

Show answer

Winner: $6 \times 4 + 4 \times 2 = 32$ points. Loser: $4 \times 4 = 16$ points. Here the set winner also won more points, but because games are scored separately, a player can win a set while winning fewer points overall if he wins the close games.

11. **Challenge** Find the chance that a player who wins 60% of points wins a game from love-all. (Add his chances of winning 4–0, 4–1, 4–2, and reaching deuce and winning.)

Show answer

4–0: $0.6^4 = 0.1296$. 4–1: $4 \times 0.6^4 \times 0.4 = 0.2074$. 4–2: $10 \times 0.6^4 \times 0.4^2 = 0.2074$.
Deuce: $20 \times 0.6^3 \times 0.4^3 = 0.2765$, times $0.692 = 0.1913$. Total ≈ 0.736 , about 74%.

COMMON MISTAKES

- Calling real tennis “royal tennis” only because kings played it. “Real” probably meant “royal,” but the game was played in many towns as well as palaces.
- Adding probabilities of independent points instead of multiplying them.
- Forgetting that from deuce a split pair of points returns the game to deuce.

Make it a game • Court Label Run. Tape paper labels around the room: dedans, penthouse, chase, and the net line. Your parent calls a term, and you walk to the right label as fast as you can. Add the trail from French cloisters to Henry VIII's courts by calling out the next stop on your parent's timeline. Beat your own time in a second round.

3.3 ARCHERY AND THE LONGBOW BUTTS

OBJECTIVES

- Explain why English kings required men to practise archery, from the Statute of Winchester (1285) to Henry VIII's Unlawful Games Act (1541).
- Describe practice at the butts and what the Mary Rose (sank 1545, raised 1982) has taught us about Tudor longbows.
- Convert old measures (yards, pounds of draw weight) into metric units and use a simple range formula.
- Describe Roger Ascham's *Toxophilus* (1545) and its argument that archery was an honest and healthful pastime.

Warm-up. Toss a soft ball or beanbag at a bucket from 2 m, 4 m and 6 m, five tosses each. Predict your hit rate at each distance before you start, then record what happens.

WATCH

The Longbow | Seven fun facts from history

[thehistorysquad](#) · 5:01

<https://www.youtube.com/watch?v=eCdWlxGOZio>

WHEN TO WATCH

After the how-it-was-practised paragraph. A historical interpreter in Tudor-style clothing shoots a reproduction longbow in an open field and shares facts about its history.

KEY TERMS

longbow

A tall bow, usually of yew, about as long as the archer was tall, used in England from the Middle Ages to the sixteenth century.

butts

Earthen mounds with targets set against them, where men practised archery; many English towns still have a street called Butts.

draw weight

The force needed to pull a bowstring back to full draw, measured in pounds of force (lbf) or newtons.

Toxophilus

Roger Ascham's book of 1545, the first book on archery written in English, in the form of a dialogue praising archery as a manly and honest pastime.

Unlawful Games Act

Henry VIII's law of 1541 that required men to own bows and practise, set minimum shooting distances, and restricted games such as bowls and tennis.

CORE IDEAS

The story. On July 19, 1545, Henry VIII's warship the Mary Rose heeled over and sank in the Solent, off Portsmouth, while the king watched from the shore. Four hundred and thirty-seven years later, in 1982, archaeologists raised what remained of her hull. Inside were the bows and arrows of the men who sailed in her: more than 170 yew longbows, 137 of them complete, and some 3,500 arrows. For the first time, historians could hold the real bows and arrows of the archers who had trained at English butts for generations.

How it changed. English kings depended on archers, and archery took years of practice. The Statute of Winchester of 1285 required men to keep arms, including bows. In 1363 Edward III ordered that able-bodied men practise archery on holidays instead of playing other games. In 1541 Henry VIII's Unlawful Games Act required every man under sixty to own a bow and arrows and to practise, required fathers to provide bows for sons from the age of seven, ordered towns to keep butts, and forbade men over twenty-four to practise at any mark nearer than 220 yards. In 1545, the year the Mary Rose sank, the Cambridge scholar Roger Ascham published *Toxophilus*, a dialogue defending archery as an honest pastime that built strength and character. Henry VIII rewarded him with a pension. But by then guns were replacing the bow, and the longbow passed from the army to the sporting field.

How it was practised. On Sundays and holidays, men and boys of a parish went to the butts, earthen mounds with a target pinned to them, and shot in turn at marks set at different distances. The Mary Rose bows have draw weights estimated at

roughly 100 to 180 pounds of force, far more than most modern sporting bows, and the bones of some of her crew show the strain such bows put on shoulder and spine. That strength came only from practice begun in boyhood, which is exactly why the law demanded it.

Why it matters. Archery shows sport and national duty tied tightly together. The kings who banned football in Lesson 3.1 wanted men at the butts instead, and for centuries the archery practice of ordinary villagers was a pillar of England's defence. Today archery survives as a precise and peaceful sport of concentration and self-control. Scripture records that David ordered the men of Judah to be taught "the use of the bow," a reminder that training the young in a useful skill is an old and honourable duty.

PICTURE STUDY



Archers at the Butts (from the Luttrell Psalter), Unknown English illuminator, for Sir Geoffrey Luttrell, about 1325–1340 · Illumination on parchment, in a psalter · The British Library, London (Add MS 42130)

Image: [Wikimedia Commons](#), public domain

The Luttrell Psalter, a book of psalms made for a Lincolnshire knight, Sir Geoffrey Luttrell, is famous for its lively pictures of everyday English life in the margins. In this one, men practise at the butts: earthen mounds studded with arrows, each with a round target.

A man in front seems to be directing the others, perhaps calling the shots or teaching the younger archers.

Look closely

- Find the two butts. How can you tell they have been used often?
- Look at the bows. How tall are they compared with the men?
- Find the man who is not shooting. What is he doing with his hand?
- Look at how each archer stands and holds his bow. What do they have in common?

Talk about it

1. Why would a knight want pictures of archery practice in his book of psalms?
2. What does this picture suggest about how villagers learned archery: alone, or together?
3. How is practice at the butts like practice for a team sport today?

Safety first. Do not use a real bow or arrows for this project. Use only soft balls or beanbags, throw toward a target with no one beyond it, and wait until all throws are finished before anyone collects them.

PROJECT

The Parish Butts: Accuracy and Distance

You will set up “butts” with beanbags or soft balls, test how accuracy falls as distance grows, and see how practice changes the results, as the old laws intended.

You will need

- Beanbags or soft balls (at least 5)
- A target: a bucket, laundry basket or a circle drawn on cardboard
- A tape measure
- Your scorebook

Steps

1. Set the target against a fence, wall or hedge outdoors. Mark throwing lines at 3, 5, 7 and 9 m.
2. Throw 10 times from each line and record hits. This is your “before” score.
3. Practise for 10 minutes a day on four more days, at any distance you choose.
4. On the last day, throw 10 times from each line again. This is your “after” score.
5. Make a table and a line graph of hit rate against distance, with two lines: before and after.
6. Compute how much your hit rate improved at each distance.
7. Write a paragraph: what did a week of practice do? Why did Henry VIII require boys to start practising at seven?

Tips

- Keep the same throwing style throughout so that changes come from practice, not from changing technique.
- Ask a family member to do the before-and-after test too, and compare.

Check your work

- ☐ I recorded 40 throws before and 40 after practice.
- ☐ My graph shows hit rate against distance before and after.

- My paragraph uses my numbers to explain the effect of practice.

SCOREBOOK

1. Draw a set of butts as in the Luttrell Psalter, labelled with the mound, the target and the shooting line.
2. Make a timeline of English archery laws: 1285, 1363, 1541, and the Mary Rose (1545, 1982).
3. Record your before-and-after accuracy table.

From history. Many English towns still have streets called Butts, Butts Lane or Butt Street, marking where the parish archery ground once lay. A town map can be a historical document.

WORKED EXAMPLES

Example 1. Henry VIII's 1541 Act forbade men over 24 to shoot at any mark nearer than 220 yards. Convert 220 yards to metres (1 yard = 0.9144 m).

Show solution

$$1. 220 \times 0.9144 = 201.2 \text{ m.}$$

Answer: About 201 metres, roughly two soccer pitches end to end.

Example 2. A Mary Rose bow has an estimated draw weight of 150 lbf. Convert to newtons (1 lbf $\approx$ 4.448 N). How does that compare with lifting a mass of 68 kg? (Weight = mass $\times$ 9.8 N/kg.)

Show solution

$$1. 150 \times 4.448 \approx 667 \text{ N.}$$

$$2. 68 \text{ kg} \times 9.8 \text{ N/kg} \approx 666 \text{ N.}$$

Answer: About 667 N, the same force as holding up a 68 kg weight, at full draw, with one arm. No wonder the law made boys start at seven.

Example 3. Ignoring air resistance, the range of an arrow launched at speed v and angle θ is $R = \frac{v^2 \sin 2\theta}{g}$. Find the range for $v = 50$ m/s at 45° . Why is the real range shorter?

Show solution

1. At 45° , $\sin 90^\circ = 1$.
2. $R = 50^2 \div 9.8 = 2500 \div 9.8 \approx 255$ m.

Answer: About 255 m in a vacuum. Air resistance slows a real arrow, so its range is shorter, typically well under that figure for a heavy war arrow. (The launch speed is illustrative.)

PRACTICE

1. **Easy** When did the Mary Rose sink and when was she raised?

Show answer

She sank on July 19, 1545, and was raised in 1982.

2. **Easy** What were the butts?

Show answer

Earthen mounds with targets where men practised archery.

3. **Easy** Who wrote *Toxophilus*, and in what year?

Show answer

Roger Ascham, in 1545.

4. **Medium** List three requirements of Henry VIII's Unlawful Games Act of 1541.

Show answer

Any three: men under sixty to own a bow and arrows and practise; fathers to provide bows for sons from age seven; towns to maintain butts; men over twenty-four not to shoot at marks nearer than 220 yards; restrictions on games such as bowls, tennis and dice.

5. **Medium** Convert 100 lbf and 180 lbf to newtons.

Show answer

$100 \times 4.448 \approx 445$ N; $180 \times 4.448 \approx 801$ N.

6. **Medium** How many years passed between the Statute of Winchester (1285) and the Unlawful Games Act (1541)?

Show answer

256 years.

7. **Medium** Of about 172 bows recovered from the Mary Rose, 137 were complete. What percentage is that?

Show answer

$137 \div 172 \approx 0.797$, about 80%.

8. **Medium** Why did kings need laws to make men practise archery, when they did not need laws to make men practise football?

Show answer

Archery was hard work that took years to master and was needed for the kingdom's defence, while football was popular for its own sake; people needed no encouragement to play it.

9. **Hard** Use $R = v^2 \sin 2\theta / g$ to find the launch speed needed for a range of 220 yards (201 m) at 45° , ignoring air resistance.

Show answer

$v^2 = Rg = 201 \times 9.8 \approx 1970$, so $v \approx 44$ m/s.

10. **Hard** Explain why the end of the longbow in war did not mean the end of archery.

Show answer

Firearms replaced the bow in war, but archery remained enjoyable and good for strength and concentration, so it continued as a sport in societies and clubs and today is an Olympic event.

11. **Challenge** At what other angle does the range formula give the same range as 30° ? Explain why using $\sin 2\theta$.

Show answer

60° , because $\sin 60^\circ = \sin 120^\circ$: angles that add to 90° give the same $\sin 2\theta$ and so the same range (ignoring air resistance).

COMMON MISTAKES

- Confusing draw weight (a force) with the weight of the bow (a mass).

- Forgetting to convert yards to metres before using the range formula in SI units.
- Thinking the range formula gives real ranges. It ignores air resistance, which is large for arrows.

Make it a game · King's Archery Debate. Play a debate. You are an English king explaining to your parent, a skeptical villager, why every man must practise at the butts. Use the Statute of Winchester, the longbow, and Toxophilus. Your parent raises one objection per turn and you must answer it with a fact. Switch roles, and see who lasts longer without repeating a point.

Scripture. “Also he bade them teach the children of Judah the use of the bow: behold, it is written in the book of Jasher.” (2 Samuel 1:18, KJV)

After Saul and Jonathan fell in battle, David ordered that the young men of Judah be trained in archery. Teaching the next generation a useful skill is an old and honourable duty.

3.4 CRICKET'S FIRST LAWS, 1744

OBJECTIVES

- Trace cricket from the first written mention (1597) through the Laws of 1744 to the founding of the MCC and Lord's in 1787.
- Describe what the 1744 Laws fixed: the 22-yard pitch, the wicket, the ball and the four-ball over.
- Calculate distances, times and run rates in cricket.
- Explain why written laws turned a country pastime into a sport that could be played between distant clubs.

Warm-up. Pace out 22 yards (about 20 m) in a yard or hallway. Stand at one end while someone rolls a soft ball to you from the other. How long does it take to arrive? Guess first, then time it.

WATCH

The Rules of Cricket - EXPLAINED!

Ninh Ly • 4:09

<https://www.youtube.com/watch?v=AqtpNkMvj5Y>

WHEN TO WATCH

Before the how-it-is-played paragraph. A quick, clear guide to batting, bowling, runs and the ways a batsman can be out, using modern match footage.

Note: The footage shows advertising boards and team sponsors from a professional league.

KEY TERMS

pitch

The strip of ground 22 yards long between the two wickets.

wicket

The set of stumps with bails on top that the bowler aims at and the batsman defends; in 1744 it had two stumps and one bail.

over

A set of balls bowled in succession from one end; four in 1744, six today.

leg before wicket (LBW)

A way of being out when the ball would have hit the wicket but strikes the batsman's body instead; added to the laws in 1774.

MCC

The Marylebone Cricket Club, founded in 1787 at Thomas Lord's ground in London, which has been the guardian of the Laws of Cricket ever since.

CORE IDEAS

The story. The first written mention of cricket comes from a court case in Guildford, Surrey, in 1597, when a man named John Derrick testified that as a schoolboy, about fifty years earlier, he and his friends had played “creckett” on a certain plot of land. For the next century and a half cricket was a game of villages in the south of England, especially in Kent, Surrey, Sussex and Hampshire. By the early 1700s gentlemen were organising matches between counties and clubs, and the players needed to agree on rules.

How it changed. In 1744 a group of noblemen and gentlemen, meeting under the name of the London Club, drew up the oldest surviving Laws of Cricket. They fixed the distance between the wickets at 22 yards, which was one chain, a surveyor's measure. The wicket was to be two stumps 22 inches high and 6 inches apart with a bail across the top; the ball was to weigh between five and six ounces; and an over had four balls. Later revisions added more: a limit on the width of the bat (after a batsman appeared with a bat as wide as the wicket in 1771), the leg-before-wicket rule in 1774, and a third stump in the late 1770s. The village of Hambledon in Hampshire was the strongest club of the 1770s and 1780s. Then, in 1787, Thomas Lord opened a ground in Marylebone, and the Marylebone Cricket Club was founded there. The MCC has kept the Laws ever since.

How it is played. Two teams of eleven take turns to bat and to field. A bowler delivers the ball from one wicket to a batsman defending the other; the batsman tries to hit it and run between the wickets to score. He is out if the ball hits his wicket (bowled), if a fielder catches his hit before it bounces (caught), if he is run out, or in several other

ways. In early cricket the ball was bowled underarm along the ground, and the bat was curved like a hockey stick to sweep it away; as bowlers learned to make the ball bounce, the bat straightened.

Why it matters. Written laws allowed teams from different places to play each other without arguing over the rules, and they let the game travel. From the English counties cricket went to the whole British Empire and beyond, as Unit 6 shows. The Laws also contain a principle that cricket is played within “the spirit of the game,” and players to this day speak of something that is “not cricket” to mean something unfair. A rule book cannot cover everything; honour must fill the gaps.

PICTURE STUDY



Cricket, Antoine Benoist, after a painting by Francis Hayman, 1743 · Etching and engraving · The British Museum, London (1862,1011.615)

Image: [Wikimedia Commons](#), public domain

This print was published in 1743, just one year before the first written Laws. It copies a painting by Francis Hayman that decorated the supper boxes of Vauxhall Gardens in London. The batsman holds a curved bat, the wicket has two short stumps, and a scorer lying on the grass keeps count by cutting notches in a stick.

Verses printed below the picture praise cricket as a healthy English pastime.

Look closely

- Find the wicket. How many stumps does it have, and how tall is it compared with the batsman?
- Look at the shape of the bat. Why would a curved bat suit a ball bowled along the ground?
- Find the scorer. How is he keeping count?
- Look at the players' clothes. What do they suggest about who played this match?

Talk about it

1. This print appeared a year before the Laws were written. What rules can you already see being followed?

2. Why might a match like this need an agreed distance between the wickets?
3. If you could add one law to make this game fairer, what would it be?

Safety first. Use a soft ball or tennis ball and a plastic or light bat, play outdoors with plenty of space, and keep spectators well away from the batsman's swing.

PROJECT

Play by the Laws of 1744

You will play a backyard game of cricket by the 1744 Laws and again by modern rules, keeping a proper scorebook, and compare the two.

You will need

- A soft ball and a bat (a plastic bat or a flat board)
- Two sets of “stumps” (two sticks 56 cm high and 15 cm apart for 1744; three sticks for modern)
- A tape measure
- At least three players
- Your scorebook

Steps

1. Measure a pitch of 22 yards (20.1 m) or, for younger players, half that. Set up two-stump wickets as in 1744.
2. Play an innings for each player under 1744 rules: underarm bowling along the ground, overs of 4 balls, out if bowled or caught. Record every ball in a scorebook: runs, dots (no run) and wickets.
3. Now set up three-stump wickets and play the same number of overs under modern rules: overs of 6 balls, bowling allowed to bounce.
4. Total each innings and compute run rates per over and per ball.
5. Record how many batsmen were bowled under each set of rules. Did the third stump make a difference?
6. Write a paragraph comparing the two games.

Tips

- A simple scorebook uses a dot for no run, a number for runs and W for a wicket.
- Keep the ball low and soft; nobody should bowl overarm hard at a young batsman.

Check your work

- ☐ I played under both sets of rules and kept a ball-by-ball scorebook.
- ☐ I calculated run rates and counted dismissals.
- ☐ My paragraph compares the two games with my numbers.

SCOREBOOK

1. Draw a 1744 wicket and a modern wicket side by side to scale, with measurements.
2. Copy one page of your ball-by-ball scorebook.
3. Make a cricket timeline: 1597, 1744, 1771, 1774, 1787.

From history. Thomas Lord moved his ground twice. The present Lord's Cricket Ground in St John's Wood opened in 1814, and Lord brought the turf from his old ground with him.

WORKED EXAMPLES

Example 1. Convert the 22-yard pitch into feet and metres (1 yard = 3 feet = 0.9144 m). A surveyor's chain is 66 feet. How many chains is the pitch?

Show solution

1. $22 \times 3 = 66$ feet.
2. $22 \times 0.9144 = 20.12$ m.
3. $66 \div 66 = 1$ chain.

Answer: 66 feet, about 20.1 m: exactly one chain, which is probably why 22 yards was chosen.

Example 2. A fast bowler releases the ball at about 2 m in front of the far wicket, and the ball travels about 18 m at an average speed of 36 m/s (about 130 km/h). How long does the batsman have?

Show solution

1. Time = distance $\div$ speed = $18 \div 36 = 0.5$ s.

Answer: Half a second, less time than it takes to blink twice. The batsman must read the bowler's action before the ball is released.

Example 3. In 1744 an over had 4 balls. In a 20-over game today an over has 6 balls. How many balls is that? How many overs of 4 balls would give the same number?

Show solution

1. $20 \times 6 = 120$ balls.

2. $120 \div 4 = 30$ overs.

Answer: 120 balls, the same as 30 of the old four-ball overs.

Example 4. A team scores 168 runs in 20 overs. What is its run rate per over and per ball?

Show solution

1. $168 \div 20 = 8.4$ runs per over.

2. $168 \div 120 = 1.4$ runs per ball.

Answer: 8.4 runs per over, 1.4 per ball.

PRACTICE

1. Easy What is the earliest written mention of cricket, and where?

Show answer

A court case in Guildford, Surrey, in 1597, in which John Derrick said he had played “creckett” as a boy.

2. Easy How long is a cricket pitch, and what old unit equals that length?

Show answer

22 yards, one chain.

3. Easy When was the MCC founded, and where?

Show answer

1787, at Thomas Lord’s ground in Marylebone, London.

4. Medium Describe the wicket set by the 1744 Laws.

Show answer

Two stumps 22 inches high and 6 inches apart, with one bail across the top.

5. **Medium** Convert the 1744 wicket dimensions to centimetres (1 inch = 2.54 cm).

Show answer

$22 \times 2.54 \approx 55.9$ cm high; $6 \times 2.54 \approx 15.2$ cm wide.

6. **Medium** Put in order: LBW rule; MCC founded; first written laws; Derrick's testimony.

Show answer

Derrick (1597), first laws (1744), LBW (1774), MCC (1787).

7. **Medium** Why did the bat change from a curved shape to a straight one?

Show answer

Early bowling was underarm along the ground, which a curved bat could sweep; when bowlers began making the ball bounce (pitch), a straight bat was needed to meet it.

8. **Medium** A batsman scores 54 runs from 40 balls. What is his scoring rate in runs per 100 balls?

Show answer

$54 \div 40 \times 100 = 135$.

9. **Hard** A ball bowled at 140 km/h covers 18 m before reaching the bat. Find the time in seconds.

Show answer

$140 \text{ km/h} \approx 38.9 \text{ m/s}$; $18 \div 38.9 \approx 0.46 \text{ s}$.

10. **Hard** What does it mean to say something is “not cricket,” and why do the Laws mention the spirit of the game?

Show answer

It means something is unfair or dishonourable even if no written rule forbids it. Written laws cannot cover every situation, so players are expected to act honourably where the rules are silent.

11. **Challenge** Why might a bowler's and batsman's strategy change if overs had 4 balls instead of 6? Give two effects.

Show answer

Any two: bowlers change ends more often, so fielders move more and a bowler's turn is broken up; a bowler has fewer balls to set a batsman up; batsmen face changes of bowling more often; the game slows slightly because of more changeovers.

COMMON MISTAKES

- Saying cricket was invented in 1744. The game was much older; 1744 is the date of the oldest surviving written laws.
- Forgetting that early bowling was underarm and along the ground.
- Confusing run rate per over with runs per ball.

Make it a game • Timeline Tag. Write four dates on slips and place them on the floor in different corners: 1597, 1744, 1787, and a question mark. Your parent calls out an event, such as the first written mention, the first laws, or the founding of the MCC and Lord's. Hop to the right slip. Then define pitch, wicket, over and LBW, scoring a point for each.

3.5 CURLING, BANDY AND THE HIGHLAND GAMES

OBJECTIVES

- Trace curling from the Stirling stone of 1511 and the Paisley Abbey record of 1541 to the Royal Caledonian Curling Club and the Olympic Games.
- Describe the Highland games, including the caber toss, and Queen Victoria's part in their popularity.
- Describe bandy, the fen-country ice game, and how Charles Tebbutt spread its rules.
- Measure and score a home version of curling and use averages to compare techniques.

Warm-up. Slide a coin or a plastic lid along a smooth floor or table toward a target circle drawn on paper, five times. Predict how many will finish in the circle. Then try it.

WATCH

Throwing Stones - History of Curling

World Curling · 3:58

<https://www.youtube.com/watch?v=wyObtpOpPkw>

WHEN TO WATCH

After the story paragraph. The governing body of curling visits Paisley Abbey and Kinross and shows historic stones and photographs.

BACKUP VIDEO

The "Roaring" Game: A History of Curling

The History Guy: History Deserves to Be Remembered · 18:02

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

In session 2, for the fuller story, including Bruegel's paintings, the Grand Match and the Royal Caledonian Curling Club.

KEY TERMS

curling

A game in which players slide heavy granite stones across ice toward a target called the house, while teammates sweep the ice to guide them.

house

The target of concentric circles at each end of a curling sheet; the centre is the button.

bonspiel

A curling tournament or match; the Grand Match was a great outdoor bonspiel between the north and south of Scotland.

caber

A long, heavy wooden pole tossed end over end in the Highland games; a perfect toss lands straight away from the thrower, at “twelve o’clock.”

bandy

A game played on ice with sticks and a small ball, eleven a side, on a field about the size of a soccer pitch; its rules were set down in England in 1882.

CORE IDEAS

The story. In the Smith Art Gallery and Museum in Stirling sits a rough, handleless stone carved with the date 1511, the oldest known curling stone. Thirty years later, in February 1541, a notary in Paisley recorded a challenge between a monk of Paisley Abbey, John Sclater, and Gavin Hamilton, a relative of the abbot: a contest of stones thrown along the ice. In 1565 the Flemish painter Pieter Bruegel painted villagers on frozen ponds sliding stones toward a mark. Scotland’s cold winters, frozen lochs and smooth river stones made curling the national winter game.

How it changed. Early curlers used whatever stones the river gave them, some with handles cut into them. Clubs formed in the 1600s and 1700s; Kinross claims a club from 1668. In 1838 curlers met in Edinburgh to form the Grand Caledonian Curling Club and write common rules. In 1842 Queen Victoria and Prince Albert watched curling on the polished ballroom floor of Scone Palace, and the next year the club became the Royal Caledonian Curling Club. Stones became round and polished,

many of them cut from granite from the island of Ailsa Craig. Scottish emigrants carried the game to Canada, which now has more curlers than any other country. Curling appeared at the 1924 Winter Olympics and became a full medal sport in 1998. The Highland games followed a similar path: gatherings of clan strength and skill became organised festivals, and Queen Victoria's attendance at the Braemar Gathering from 1848 made them famous. In the English fens, meanwhile, villagers played bandy on frozen flooded fields, and in 1882 Charles Goodman Tebbutt of Bluntisham wrote down its rules and helped carry the game to the Netherlands, Scandinavia and Russia.

How it is played. In curling, two teams of four take turns sliding eight stones each down a sheet of ice about 45 metres long toward the house. Sweepers brush the ice in front of a moving stone to make it travel farther and straighter. After all sixteen stones, only one team scores: one point for each of its stones closer to the button than the opponent's nearest. In the caber toss, an athlete runs with a pole that may be 5 or 6 metres long and heavier than a man, then flips it end over end; judges score not distance but how straight it lands. In bandy, eleven skaters a side use curved sticks to drive a small ball into a goal on a field of ice.

Why it matters. Curling is called "the roaring game" for the rumble of the stone on the ice, and it is famous for its courtesy: players shake hands before and after, call their own fouls, and traditionally share a meal with their opponents after a match. These northern games grew from the land and weather of Scotland and the fens, and they show how a people's pastimes can carry their character: patience, strength and good fellowship in hard winters.

PICTURE STUDY



The Hunters in the Snow, Pieter Bruegel the Elder, 1565 · Oil on panel · Kunsthistorisches Museum, Vienna

Image: [Wikimedia Commons](#), public domain

Pieter Bruegel painted this scene in 1565 as one of a series of pictures of the months. Tired hunters return through the snow, but the eye is soon drawn down to the frozen ponds, where villagers skate, play a stick-and-ball game, and slide objects across the ice toward a mark.

It is one of the earliest pictures of winter sport in Europe, painted just a generation after the Paisley Abbey challenge.

Look closely

- Find the frozen ponds. How many different games or activities can you count on the ice?
- Look for a figure sliding or throwing something along the ice. What modern game does it remind you of?
- Look at the hunters. How does their mood differ from that of the people on the ice?
- Follow the line of the hill down to the ponds. How does Bruegel lead your eye?

Talk about it

1. Why might winter games have mattered so much to people in a cold country with short days?
2. Bruegel painted the Low Countries, not Scotland. What does that tell you about where ice games were played?
3. What does this painting suggest about the place of play in an ordinary community's year?

Safety first. Play your home curling game indoors on a smooth floor with soft or light “stones” (plastic lids, beanbags or water bottles), or outdoors on a safe surface. Never go onto frozen ponds, rivers or lakes.

PROJECT

Kitchen-Floor Curling

You will build a small curling sheet on a smooth floor, play several ends with family, keep a proper curling score, and test whether “sweeping” (polishing the floor ahead) changes how far a stone slides.

You will need

- A smooth floor (kitchen tiles or a hallway)
- Masking tape for the house and hog lines
- Eight “stones”: plastic lids, beanbags or half-filled water bottles, four of each colour
- A soft cloth or dust mop for sweeping
- A tape measure
- Your scorebook

Steps

1. Tape a house at one end: rings of about 20, 40 and 60 cm radius. Mark a throwing line about 4 m away.
2. Play four ends with two teams of one or two players. Each team slides four stones per end, alternating.
3. After each end, measure the distance of each stone from the button and score by curling rules.
4. Keep a score card by ends, as curlers do.
5. Experiment: slide one stone ten times with no sweeping and ten times while a partner sweeps the floor ahead of it. Measure each distance.
6. Find the average distance with and without sweeping.
7. Write a paragraph: did sweeping help? How does your result connect with what real curlers do?

Tips

- Push the stones with the same gentle force each time in the experiment.
- Shake hands before and after, as curlers do.

Check your work

- ☐ I played four ends and kept a correct score card.
- ☐ I measured 20 slides for the sweeping experiment and computed averages.
- ☐ My paragraph uses my numbers.

SCOREBOOK

1. Draw a curling sheet with the house, button, hog line and tee line.
2. Copy your end-by-end score card.
3. Make a three-column table, “Curling / Highland games / Bandy,” with country of origin, key date and one rule for each.

From history. In the Grand Matches of the nineteenth century, thousands of curlers from the north and south of Scotland met on a frozen loch. One such match on the Lake of Menteith in 1979 was the last outdoor Grand Match to date, because the ice must be very thick for so many people.

WORKED EXAMPLES

Example 1. A team has stones at 0.4 m, 1.1 m and 1.9 m from the button. The other team’s closest stone is at 1.5 m. How many points does the first team score?

Show solution

1. Count the first team’s stones closer than 1.5 m: 0.4 m and 1.1 m.
2. The 1.9 m stone is farther than the opponent’s best, so it does not count.

Answer: 2 points. Only one team can score in an end.

Example 2. A curling stone may weigh at most 44 pounds. Convert to kilograms (1 lb $\approx$ 0.4536 kg). How many curling stones weigh as much as a 60 kg student?

Show solution

1. $44 \times 0.4536 \approx 19.96$ kg.
2. $60 \div 19.96 \approx 3.0$.

Answer: About 20 kg; three stones weigh about as much as a 60 kg student.

Example 3. A stone slides 28 m in 20 s, slowing steadily to a stop. What was its average speed, and what was its starting speed? (For steady slowing to rest, the average speed is half the starting speed.)

Show solution

1. Average speed = $28 \div 20 = 1.4$ m/s.
2. Starting speed = $2 \times 1.4 = 2.8$ m/s.

Answer: Average 1.4 m/s; it left the thrower's hand at about 2.8 m/s.

Example 4. How many years separate the Stirling stone (1511) from curling's first Olympic medal event as a full sport (1998)?

Show solution

1. $1998 - 1511 = 487$.

Answer: 487 years.

PRACTICE

1. Easy What date is carved on the oldest known curling stone, and where is it kept?

Show answer

1511; in the Smith Art Gallery and Museum, Stirling.

2. Easy What happened at Paisley Abbey in February 1541?

Show answer

A notary recorded a challenge between the monk John Sclater and Gavin Hamilton to a contest of stones thrown on the ice.

3. Easy How is a caber toss judged?

Show answer

By how straight the caber lands, end over end; the perfect toss lands at "twelve o'clock," straight away from the thrower.

4. **Medium** Team A's stones are 0.3 m, 0.9 m, 1.6 m and 2.2 m from the button. Team B's are 1.0 m and 1.8 m. Who scores, and how many?

Show answer

Team B's nearest is 1.0 m. Team A has 0.3 and 0.9 closer: 2 points to Team A.

5. **Medium** Why did the Grand Caledonian Curling Club become "Royal" in 1843?

Show answer

Queen Victoria and Prince Albert watched curlers play at Scone Palace in 1842, and the club received royal patronage.

6. **Medium** Why do curlers sweep the ice?

Show answer

Sweeping warms and polishes the ice just ahead of the stone, reducing friction so the stone travels farther and curls less.

7. **Medium** Who wrote down the rules of bandy in 1882, and where did he help spread the game?

Show answer

Charles Goodman Tebbutt of Bluntisham; to the Netherlands, Scandinavia and Russia.

8. **Medium** A curling sheet is about 45 m long. Convert to feet ($1 \text{ m} \approx 3.281 \text{ ft}$).

Show answer

$45 \times 3.281 \approx 148 \text{ ft}$ (the official length is about 150 ft).

9. **Hard** A stone leaves the hand at 2.4 m/s and slows steadily to rest in 22 s. How far does it travel?

Show answer

Average speed 1.2 m/s; $1.2 \times 22 = 26.4 \text{ m}$.

10. **Hard** Explain why curling, born in Scotland, became most popular in Canada.

Show answer

Scottish emigrants brought the game to Canada, where long, cold winters and many frozen lakes made it easy to play; clubs and indoor rinks then spread it nationwide.

11. **Challenge** If a stone slows steadily from speed v to rest over distance d , show that the time taken is $t = 2d/v$. Then find t for $d = 30$ m and $v = 2.5$ m/s.

Show answer

Average speed is $v/2$, so $d = (v/2)t$ and $t = 2d/v$. $t = 60/2.5 = 24$ s.

COMMON MISTAKES

- Giving both teams points in the same end. Only one team scores per end.
- Thinking the caber toss is judged by distance. It is judged by how straight it lands.
- Confusing bandy with ice hockey. Bandy uses a ball, eleven a side and a much larger field.

Make it a game • Curling Charades. Act out a term without speaking: sweeping a stone, the house, a bonspiel, tossing the caber, or a bandy stick. Your parent guesses. Keep a score. Then place the 1511 Stirling stone and the 1541 Paisley Abbey record in order on a timeline and say which game on this list became part of the Olympic Games.

UNIT 3

MEDIEVAL AND EARLY MODERN SPORT

Between the fall of Rome and the age of railways, sport lived in villages, palaces and parishes. This unit follows five threads: the mob football and golf that Scottish and English kings tried to ban; the jeu de paume that became royal tennis; archery at the butts, which the law required; cricket, whose first written Laws of 1744 marked the start of organised sport; and the winter games of Scotland and the fens: curling, the Highland games and bandy.

You will compare a rule-less folk game with a game you write rules for, test the palm against the paddle and work out the odds of winning from deuce, measure how practice improves accuracy, play cricket by the Laws of 1744, and run a kitchen-floor curling championship. The question running through the unit is simple: why did people begin to write down the rules of their games?

PREREQUISITES

- Fractions, decimals and percents
- Multiplying probabilities of independent events (Unit 1)
- Converting units with a conversion factor

MASTERY CHECKLIST

- ☐ I can explain why kings banned football and golf and why the bans failed.
- ☐ I can describe real tennis and calculate the chance of winning a game from deuce.
- ☐ I can explain the archery laws of medieval and Tudor England and convert old units of distance and force.
- ☐ I can describe the 1744 Laws of Cricket and calculate run rates and reaction times.
- ☐ I can trace the history of curling and the Highland games and keep a curling score.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **The Complete Golfer, by Harry Vardon (Project Gutenberg):** Free. The great champion's 1905 book on how golf is played, with a chapter of reminiscences, for students who want to go further after Lesson 3.1. Ages 12+.
- **The Laws of Cricket (MCC):** Free. The current Laws as kept by the Marylebone Cricket Club, including the Preamble on the Spirit of Cricket, to compare with the 1744 Laws in Lesson 3.4. Ages 12+.
- **The Mary Rose Museum:** Free website of the museum in Portsmouth that holds the Mary Rose and her longbows, with articles on the ship and her crew, for Lesson 3.3. A visit is optional. Ages 10+.
- **World Curling:** Free. The governing body's site, with the rules of curling and its history, for Lesson 3.5. Ages 10+.

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 The Kings Who Banned Football and Golf	3 sessions of 50 minutes
3.2 Real Tennis and the Jeu de Paume	3 sessions of 50 minutes
3.3 Archery and the Longbow Butts	3 sessions of 50 minutes
3.4 Cricket's First Laws, 1744	3 sessions of 50 minutes
3.5 Curling, Bandy and the Highland Games	3 sessions of 50 minutes

UNIT 3 TEST

Calculators are allowed. Show your work for every calculation: write the formula or conversion you used, substitute the numbers, and give the answer with units and a sentence. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **6 pts**

What did London's proclamation of 1314 forbid, and why?

2. (7 pts)

Explain why the Scottish Parliament banned football and golf in 1457 and why golf survived anyway.

3. (6 pts)

The Ashbourne goals are about 3 miles apart. Convert to kilometres (1 mile $\approx$ 1.609 km).

4. (6 pts)

Describe two features of a real tennis court and the origin of the word tennis.

5. (8 pts)

A player wins 65% of points. Find his chance of winning a game from deuce. Show the formula.

6. (6 pts)

Where is the oldest real tennis court still in use, and who built the first court at Hampton Court?

7. (7 pts)

List three requirements of Henry VIII's Unlawful Games Act of 1541.

8. (6 pts)

Convert 220 yards to metres and 160 lbf to newtons.

9. (7 pts)

Using $R = v^2 \sin 2\theta / g$, find the range of an arrow launched at 45 m/s at 45° , ignoring air resistance.

10. (6 pts)

What did the Mary Rose teach historians about Tudor archery?

11. (7 pts)

List four things the 1744 Laws of Cricket fixed.

12. (6 pts)

A team scores 156 runs in 20 overs. Find its run rate per over and per ball.

13. (6 pts)

In curling, Team A's stones are 0.2 m and 1.4 m from the button; Team B's are 0.6 m, 0.9 m and 1.7 m. Who scores, and how many?

14. (6 pts)

Give the dates and significance of 1511, 1541, 1838 and 1998 in curling history.

15. (10 pts)

Short essay. In about 200 words, explain why people began writing down the rules of games between the 1500s and the 1700s. Use at least three examples from this unit and say what was gained and what, if anything, was lost.

ANSWER KEY

1. Football in the city, because of the great noise and disturbance it caused and the evils that might arise from it.
2. The crown wanted men to practise archery for defence. Golf survived because it was loved, the bans were unenforceable, and after the 1502 peace with England the king himself took up the game.
3. $3 \times 1.609 \approx 4.83$ km.
4. Any two features: walls in play, sloping penthouse, dedans, grille, tambour, chases. The word probably comes from the server's call *tenez*, "take this."
5. $p^2/(p^2 + q^2) = 0.4225/(0.4225 + 0.1225) = 0.4225/0.545 \approx 0.775$, about 78%.
6. Falkland Palace, Scotland (1539); Cardinal Wolsey built the first Hampton Court court (1526–1529).
7. Any three: men under sixty to own bows and practise; fathers to provide bows for sons from seven; towns to keep butts; men over twenty-four not to shoot at marks under 220 yards; restrictions on other games.
8. $220 \times 0.9144 \approx 201$ m; $160 \times 4.448 \approx 712$ N.
9. $R = 45^2/9.8 = 2025/9.8 \approx 207$ m.
10. Her raising in 1982 recovered over 170 yew longbows (137 complete) and about 3,500 arrows, showing the size and very heavy draw weights of Tudor bows; bones of the crew showed the physical strain of archery.
11. Any four: 22-yard pitch; two-stump wicket 22 inches high and 6 inches wide; one bail; ball of 5 to 6 ounces; four-ball overs; rules for umpires and ways of being out.
12. $156 \div 20 = 7.8$ per over; $156 \div 120 = 1.3$ per ball.
13. Team A's nearest is 0.2 m, closer than all of B's stones; A's next stone (1.4 m) is farther than B's 0.6 m. Team A scores 1.
14. 1511: oldest dated stone (Stirling). 1541: Paisley Abbey challenge, first written record. 1838: Grand Caledonian Curling Club formed (Royal from 1843). 1998: curling a full Olympic medal sport.
15. Answers vary. A strong essay uses examples such as the Leith golf rules (1744), the Laws of Cricket (1744), Hulpeau's tennis book (1632) and the Caledonian curling rules (1838); explains gains (fair matches between clubs, fewer disputes, spread of the game) and possible losses (local variety, informality); and notes that written rules still depend on honour and the spirit of the game.

PORTFOLIO PIECE: A MEDIEVAL AND EARLY MODERN SPORTS ALMANAC

Make a twelve-month almanac of sport and play in the style of the Golf Book: for each month, choose a game or sport from this unit (or a closely related one) that was played in that season. For each month include (1) a drawing or a copy of a historical picture; (2) a 100-word description with at least two dated facts; (3) one rule written as it might have appeared in a club's laws; and (4) for at least four months, a calculation from this unit (a unit conversion, a deuce probability, a range, a run rate or a curling score). Finish with a one-page essay on the theme "From bans to rule books."

LOOK FOR	WHAT IT MEANS
Historical accuracy	Dates, people and places are correct, and each month's activity fits its season.
Pictures and design	Twelve neat, captioned pictures with sources named for copies of historical images.
Mathematics	At least four correct calculations with units and clear working.
Essay	A clear argument about why rules were written, using at least three examples.

UNIT 4

THE RULE-MAKERS

In the nineteenth century, sport was transformed. Folk games and school games became national sports with written laws, governing bodies, championships and newspapers to report them. This unit asks why it happened then and there: railways and the Saturday half-holiday, public schools and universities, clubs and committees. It follows the Football Association of 1863 and the Rugby Football Union of 1871, the first Wimbledon Championship of 1877, the Knickerbocker rules of baseball and the myth of Abner Doubleday, and the Christian movement that saw sport as a school of character.

You will play a game with two codes and hold a rules meeting, play the FA's laws of 1863, test the high net of 1877, lay out a Knickerbocker diamond with your own paces and the Pythagorean theorem, and keep a character scorebook. Throughout, you will practise a historian's most important skill: weighing evidence, so that a good story is not mistaken for the truth.

PREREQUISITES

- The history of real tennis (Lesson 3.2) and cricket's Laws (Lesson 3.4)
- Unit conversions with feet, inches, yards and metres
- The Pythagorean theorem (taught in Lesson 4.4 if new)

MASTERY CHECKLIST

- ☐ I can explain how railways, schools, clubs, newspapers and free time led to the codification of sport.
- ☐ I can tell the story of the FA (1863) and the RFU (1871) and explain the quarrel over handling and hacking.
- ☐ I can describe the first Wimbledon Championship and calculate court areas and net heights.
- ☐ I can explain the true origins of baseball, refute the Doubleday myth, and compute diamond distances with the Pythagorean theorem.
- ☐ I can describe muscular Christianity and evaluate it in the light of 1 Timothy 4:8.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Tom Brown's School Days, by Thomas Hughes (Project Gutenberg)**: Free. The 1857 novel at the heart of Lesson 4.5, with its famous football match. It includes a schoolboy fight and scenes of bullying; parents may wish to read it first. Ages 13+.
- **National Baseball Hall of Fame and Museum**: Free website of the museum in Cooperstown, with articles on baseball's early history and the Doubleday story, for Lesson 4.4. A visit is optional. Ages 10+.
- **Wimbledon Lawn Tennis Museum**: Free website of the museum at the All England Club, with the history of the Championships, for Lesson 4.3. Ages 10+.
- **The Football Association**: Free. The governing body founded in 1863; its site includes the current Laws of the Game for comparison with the 1863 laws in Lesson 4.2. Ages 12+.

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	Why Sports Were Codified in the 1800s	3 sessions of 50 minutes
4.2	The Football Association and the Rugby Split	3 sessions of 50 minutes
4.3	Wimbledon and the Lawn-Tennis Rules	3 sessions of 50 minutes
4.4	Baseball's Real Origins	3 sessions of 50 minutes
4.5	Muscular Christianity and Tom Brown's School Days	3 sessions of 50 minutes

UNIT 4 TEST

Calculators are allowed. Show your work for every calculation: write the formula or conversion you used, substitute the numbers and give the answer with units and a sentence. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **7 pts**

Explain how four forces of the 1800s led to the codification of sport.

2. (6 pts)

When and by whom was Sheffield FC founded, and why is it important?

3. (6 pts)

With 10 clubs that each play every other club once, how many matches are needed? Show the formula.

4. (7 pts)

Describe the founding of the FA in 1863 and the role of Ebenezer Cobb Morley.

5. (6 pts)

Why did Blackheath and the rugby-playing clubs leave the FA, and when did they form the RFU?

6. (6 pts)

A field of 7,700 sq yd holds 40 rugby players or 22 football players. Find the area per player in each case.

7. (7 pts)

Describe the first Wimbledon Championship: date, number of entrants, winner and reason for holding it.

8. (6 pts)

Find the area of a singles court of 78×27 ft in square feet and square metres (1 ft = 0.3048 m).

9. (6 pts)

Convert the 1877 net height at the posts (5 ft) and today's centre height (3 ft) to centimetres.

10. (7 pts)

List four of the Knickerbocker rules of 1845.

11. (7 pts)

Find the distance from home plate to second base on a 90-ft diamond, showing the Pythagorean theorem.

12. (7 pts)

Give three pieces of evidence against the claim that Abner Doubleday invented baseball in 1839.

13. (6 pts)

What was muscular Christianity, and name two people or institutions connected with it.

14. (6 pts)

Quote or paraphrase 1 Timothy 4:8 and explain how it keeps sport in its proper place.

15. (10 pts)

Short essay. In about 200 words, choose two of the sports codified in this unit and compare how and why their rules were written. Then explain what the Doubleday myth teaches about how history should be done.

ANSWER KEY

1. Railways let teams travel and play in a day; schools and universities brought players of different codes together; clubs organised regular matches; newspapers and the telegraph spread results and rules; the Saturday half-holiday gave workers time to play and watch.
2. October 24, 1857, by Nathaniel Creswick and William Prest; it is the world's oldest football club and wrote its own influential rules in 1858.
3. $10 \times 9 \div 2 = 45$ matches.
4. Clubs met at the Freemasons' Tavern, London, on October 26, 1863; Morley, of Barnes, proposed the meeting, became secretary and wrote the laws, thirteen of which were adopted in December 1863.
5. They wanted to keep carrying the ball and hacking; they formed the Rugby Football Union on January 26, 1871.
6. 192.5 sq yd for rugby; 350 sq yd for football.
7. July 1877 (final July 19); 22 entrants; Spencer Gore won; it was held to raise money to repair the club's pony roller.
8. 2,106 sq ft; $23.77 \text{ m} \times 8.23 \text{ m} \approx 195.6 \text{ m}^2$.
9. 152.4 cm and 91.4 cm.
10. Any four: 42 paces home to second and first to third; underhand pitching; no soaking; foul lines; three outs; 21 aces to win; a ball caught on the first bounce is out.
11. $\sqrt{90^2 + 90^2} = 90\sqrt{2} \approx 127.3 \text{ ft}$.
12. Doubleday was at West Point in 1839; he never claimed it; the only witness was about five years old and wrote 66 years later; and the game is mentioned in 1744 and 1791.
13. A movement linking physical strength and sport with Christian character and service; any two: Thomas Arnold, Thomas Hughes, Charles Kingsley, George Williams and the YMCA, C. T. Studd, the Springfield training school.
14. Bodily exercise profits a little, but godliness profits in everything, now and forever. Exercise is good but secondary; character and faith come first.
15. Answers vary. A strong essay compares two codification stories accurately (for example the FA's 1863 meetings and Wimbledon's 1877 committee), names the forces behind each, and explains that the Doubleday myth shows the danger of accepting one late, convenient testimony instead of weighing all the evidence.

PORTFOLIO PIECE: THE FOUNDING DOCUMENTS OF A SPORT

Choose one sport from this unit. Prepare a short “founding documents” file of four to six pages: (1) a timeline of its codification with at least eight dated events; (2) a side-by-side table comparing at least six of its earliest written rules with the rules today, with the reason for each change; (3) a scale drawing of its field or court then and now, with one calculation (area, distance or a Pythagorean diagonal); (4) a one-page analysis of one legend or disputed claim about its origin, weighing the evidence; and (5) a record of a game you played under the earliest rules.

LOOK FOR	WHAT IT MEANS
Timeline and sources	At least eight correct, dated events, with the sources of key claims noted.
Rules comparison	Six or more rules compared accurately with clear reasons for change.
Mathematics	A correct scale drawing and at least one correct calculation with units.
Historical judgement	The legend or disputed claim is weighed fairly, using the reliability of each source.
Play	A real game under the old rules is recorded honestly, with observations.

4.1 WHY SPORTS WERE CODIFIED IN THE 1800S

OBJECTIVES

- Explain how railways, schools, clubs, newspapers and the Saturday half-holiday turned local pastimes into national sports with written rules.
- Describe the different football codes of the English public schools, the Cambridge Rules (1848 and 1856) and the Sheffield Rules (1858).
- Use travel times and simple rates to show how railways changed who could play whom.
- Explain why a game with one agreed set of rules can grow in ways that a local game cannot.

Warm-up. Ask two people in your family to write down, separately, the rules of a simple game you all know (tag, hide-and-seek or a card game). Compare their lists. How many rules differ? What would happen if their two versions played a match against each other?

WATCH

Sheffield FC: The Oldest Football Team

Tifo Football by The Athletic · 4:39

<https://www.youtube.com/watch?v=RF2DYldllmc>

WHEN TO WATCH

After the story paragraph. An illustrated history of Sheffield FC, founded in 1857, and its own rules of football.

KEY TERMS

codify

To gather the rules of a game into one written, agreed set, or code.

public school

In England, an old, fee-paying boarding school such as Eton, Harrow, Rugby or Winchester; each had its own form of football.

Cambridge Rules

Rules drawn up at Cambridge University in 1848 (and revised in 1856) so that former pupils of different schools could play football together.

Sheffield Rules

The rules of Sheffield FC, the world's oldest football club (1857), first printed in 1858; they spread through the north of England.

Saturday half-holiday

Time off from about two o'clock on Saturday afternoon, made law for many factory workers by the Factory Act of 1850, which gave working men time to play and watch sport.

CORE IDEAS

The story. On October 24, 1857, two young men of Sheffield, Nathaniel Creswick and William Prest, both keen cricketers, founded a club to keep fit through the winter by playing football. Sheffield FC is today recognised as the oldest football club in the world. Creswick and Prest soon faced a problem everyone faced: there was no single game called football. There were dozens, and the rules depended on where you had learned to play. So in 1858 they wrote and printed their own.

How it changed. In the early 1800s each English public school had its own game, shaped by its grounds: Eton's field game, Harrow's game with its heavy ball, Winchester's narrow pitch, and Rugby's game in which a player might catch the ball and run with it. Rugby School wrote its rules down in 1845. When boys from these schools met at Cambridge University they could not play together, so in 1848 they agreed the Cambridge Rules, revised in 1856. Then the railways changed everything. By 1850 trains linked most English cities, so a team could travel to another town, play and return in a day, and the Factory Act of 1850 gave many workers Saturday afternoons free. Newspapers such as *Bell's Life* printed results, and the telegraph carried them overnight. Teams from different places now met often, and every match began with an argument unless the rules were agreed in advance.

How it is played. The early codes differed on the very questions that later split football and rugby: Could you handle the ball? Could you run with it? Could you trip or kick an opponent's shins (hacking)? How high was the goal, and was there a crossbar? Sheffield's rules allowed a player to catch the ball but not to run with it,

and Sheffield clubs experimented with ideas such as the corner kick and the free kick that later entered the national game. Clubs met to settle the differences, usually by a show of hands.

Why it matters. Codification is why sport became a national and then a world activity. A local game can only be played by those who know its customs; a codified game can be played by strangers, reported in newspapers, refereed fairly and taught anywhere. The same forces, trains, schools, clubs, print and free time, codified cricket, rugby, tennis, baseball and many other sports within a few decades. In Lesson 3.1 kings tried to ban unruly games; the Victorians tamed them with rules instead.

PICTURE STUDY



Rain, Steam and Speed – The Great Western Railway, J. M. W. Turner, 1844 · Oil on canvas · The National Gallery, London

Image: [Wikimedia Commons](#), public domain

In 1844 the English painter J. M. W. Turner showed a train of the Great Western Railway crossing the Maidenhead Railway Bridge over the Thames in a storm. Turner was fascinated by speed and by the new power of steam.

Within a few years railways like this one would carry football and cricket teams, and thousands of spectators, from town to town every Saturday.

Look closely

- Find the locomotive. How does Turner make it seem to rush toward you?
- Look at the river to the left. What older way of travelling can you see there?
- Look closely along the track ahead of the train. Some viewers see a small hare running. Why might Turner include an animal running from the train?
- Notice how little of the scene is sharp. What feeling does the blur create?

Talk about it

1. How might a painting about speed help explain why sport changed so quickly in the 1800s?
2. What did railways make possible for a football club that a stagecoach did not?

3. Turner painted the new railway as something thrilling and a little frightening. How do people today react to new technology in sport?

Safety first. Play your rules experiment outdoors with a soft ball, warm up first, and keep the game gentle: no tackling or tripping.

PROJECT

Two Codes, One Match

You will see codification at work by having two groups write rules for the same ball game separately, try to play a match, and then hold a meeting to agree on one code.

You will need

- A soft ball and markers for goals
- At least four players (two “schools” of two)
- Paper and pencils
- Your scorebook

Steps

1. Divide into two “schools.” Each school, separately, writes eight rules for a backyard football game: handling, running with the ball, goals, out of bounds, starting and restarting play, fouls, scoring and length of game.
2. Without comparing rules, play a 10-minute match in which each side follows its own rules. Record every dispute.
3. Hold a “Cambridge meeting”: compare the two codes rule by rule, decide each difference by majority, and write one combined code of no more than ten rules.
4. Play a second 10-minute match under the combined code. Record disputes again.
5. Count the disputes in each match and list which rules caused them.
6. Write a paragraph comparing the two matches, and explain which compromise was hardest to agree on and why.

Tips

- Write each rule as one short sentence.
- Let the person who is not playing act as secretary and record each decision.

Check your work

- ☐ Both schools wrote eight rules before the first match.

- ☐ I recorded disputes in both matches and wrote the combined code.
- ☐ My paragraph explains the hardest compromise using the records.

SCOREBOOK

1. Make a timeline from 1830 to 1871 with the railway, school, club and rule-making dates from this lesson and the next.
2. Copy your two schools' codes and the combined code side by side.
3. Draw a simple map of England marking Rugby, Eton, Harrow, Cambridge, Sheffield and London.

From history. Sheffield FC and its neighbour Hallam FC first met on December 26, 1860, at Sandygate Road, Hallam's ground, which is still in use. It is often called the oldest football ground in the world.

WORKED EXAMPLES

Example 1. Illustrative numbers: a stagecoach covered about 8 miles per hour including stops, and an 1850s express train about 30 miles per hour. How long would each take to cover the 60 miles between two towns? Could a team travel, play a 90-minute match and return in one day by each method?

Show solution

1. Coach: $60 \div 8 = 7.5$ hours each way, 15 hours of travel.
2. Train: $60 \div 30 = 2$ hours each way, 4 hours of travel.
3. Add 90 minutes of play and an hour to get to and from the ground: coach ≈ 17.5 hours; train ≈ 6.5 hours.

Answer: By coach the trip took two days; by train it fit easily into a Saturday afternoon and evening. Railways made regular matches between towns possible.

Example 2. In 1856 six public-school games were represented at Cambridge. If every school's team played every other once, how many different pairings would need agreed rules?

Show solution

1. Each pair is chosen from 6 schools: $\binom{6}{2} = \frac{6 \times 5}{2} = 15$.

Answer: 15 different pairings, each needing a compromise. One common code replaces 15 negotiations with one.

Example 3. Sheffield FC was founded in 1857, the Football Association in 1863 and the Rugby Football Union in 1871. How many years after Rugby School wrote its rules (1845) was each founded?

Show solution

1. $1857 - 1845 = 12$.

2. $1863 - 1845 = 18$.

3. $1871 - 1845 = 26$.

Answer: 12, 18 and 26 years: within a single generation, schoolboy codes became national ones.

PRACTICE

1. Easy Who founded Sheffield FC, and when?

Show answer

Nathaniel Creswick and William Prest, on October 24, 1857.

2. Easy Name four English public schools that had their own forms of football.

Show answer

Any four: Eton, Harrow, Rugby, Winchester, Charterhouse, Westminster, Shrewsbury.

3. Easy Why were the Cambridge Rules written?

Show answer

So that students from different schools, who had learned different games, could play football together at the university.

4. **Medium** List four forces that helped sports become codified in the 1800s.

Show answer

Railways, schools and universities, clubs, newspapers and the telegraph, and the Saturday half-holiday (any four).

5. **Medium** With 8 clubs that each play every other once, how many matches are there?

Show answer

$$8 \times 7 \div 2 = 28.$$

6. **Medium** What is hacking, and why did it matter in the 1860s?

Show answer

Deliberately kicking an opponent's shins; some clubs thought it essential to a manly game, others thought it barbaric, and the quarrel helped split football from rugby.

7. **Medium** A train averages 35 mph. How long does a 105-mile journey take, and how many such return trips could a team make in a 12-hour day with a 3-hour match stop?

Show answer

3 hours each way; one return trip takes 6 hours of travel plus 3 hours at the ground, 9 hours, so one trip fits in 12 hours (two would need 18).

8. **Medium** Why did newspapers matter to the growth of organised sport?

Show answer

They published fixtures, results and rules, so clubs could follow one another, arrange matches and build a national following.

9. **Hard** Explain how the shape of a school's grounds might shape its game. Give an example.

Show answer

Narrow grounds encourage a narrow, crowded game; walls invite games played against walls (Eton's wall game); a large open field allows running and long kicks. Rugby School's open Close suited a running game.

10. **Hard** Why do agreed rules matter more when strangers play each other than when friends do?

Show answer

Friends can settle disputes by custom and goodwill; strangers have no shared customs, so without written rules every match risks argument, and no fair comparison of results is possible.

11. **Challenge** In a league of n clubs where every club plays every other club home and away, how many matches are there? Find the number for 22 clubs.

Show answer

$n(n - 1)$ matches. For 22 clubs: $22 \times 21 = 462$.

COMMON MISTAKES

- Thinking there was one game called football before 1863. There were many local codes.
- Forgetting that codification was gradual: school rules (1845), Cambridge (1848, 1856), Sheffield (1858), then national bodies.
- Counting pairings as $n \times (n - 1)$ when each pair plays once; divide by 2.

Make it a game • Five Forces in Thirty. In thirty seconds, name every force that turned local pastimes into national sports with written rules: railways, schools, clubs, newspapers and the Saturday half-holiday. Your parent counts. Then choose a pastime, such as mob football, and explain how each force changed it. Add a point for every Cambridge Rules fact you can include.

4.2 THE FOOTBALL ASSOCIATION AND THE RUGBY SPLIT

OBJECTIVES

- Tell the story of the meetings at the Freemasons' Tavern in 1863 that founded the Football Association, and of Ebenezer Cobb Morley's part in them.
- Explain why the quarrel over handling and hacking led the rugby clubs to form the Rugby Football Union in 1871.
- Compare the early laws of association football and rugby with today's, using numbers such as team sizes and field dimensions.
- Separate the legend of William Webb Ellis from the evidence.

Warm-up. List three differences you know between soccer and rugby. For each, guess whether the difference existed in 1863 or came later.

WATCH

An Animated History of Rugby Union

InfobytesTV · 3:34

<https://www.youtube.com/watch?v=aBmNNdd2mXU>

WHEN TO WATCH

After the how-it-changed paragraph. A short cartoon history from the school games to the Football Association meeting and the founding of rugby clubs.

Note: The video repeats the William Webb Ellis story; this lesson explains why historians doubt it.

BACKUP VIDEO

The original football rule book from 1863 unveiled @ the British Library

England · 1:54

<https://www.youtube.com/watch?v=X5kIZ73JE58>

After the story paragraph. The real FA minute book in Morley's handwriting, shown when it went on display in 2013.

KEY TERMS

Football Association (FA)

The governing body of football in England, founded on October 26, 1863, at the Freemasons' Tavern in London.

association football

Football played under the FA's laws; the word "soccer" comes from a shortening of "association."

hacking

Kicking an opponent's shins; the dispute over it helped split the rugby clubs from the FA.

Rugby Football Union (RFU)

The governing body of rugby in England, founded on January 26, 1871, by 21 clubs.

international

A match between national teams; the first rugby international was in 1871, the first football international in 1872.

CORE IDEAS

The story. On the evening of October 26, 1863, representatives of a dozen London clubs and schools met at the Freemasons' Tavern in Great Queen Street, London, to form an association and agree on one code of football. The driving spirit was Ebenezer Cobb Morley, a solicitor and captain of the Barnes club, who had written to a newspaper proposing such a body. He became the FA's first secretary and wrote its first laws by hand in the minute book. Over six meetings in the autumn the delegates argued, and on December 8 they adopted thirteen laws. On December 19, 1863, Barnes and Richmond played the first match under the new laws; it ended 0–0.

How it changed. Two questions divided the delegates: carrying the ball in the hands, and hacking. Francis Campbell of the Blackheath club insisted that hacking was essential to a manly game and that banning it would make football fit only for "Frenchmen." The majority disagreed, and Blackheath withdrew from the FA. The clubs that preferred the Rugby School style went their own way, and on January 26, 1871, twenty-one of them met at the Pall Mall Restaurant in London and founded the Rugby Football Union. Ironically, the RFU soon banned hacking too. Two months later, on March 27, 1871, Scotland beat England at Raeburn Place in Edinburgh in the first rugby international, twenty a side. The first association football international

followed on November 30, 1872, when Scotland and England drew 0–0 at Hamilton Crescent in Glasgow, and the first FA Cup final was played that same year.

How it is played. The 1863 laws still allowed a fair catch, but by 1870 handling was forbidden to everyone except the goalkeeper, a position that developed in the early 1870s. Team sizes settled at eleven in football; rugby kept twenty a side until 1877 and adopted fifteen afterwards. Tape between the goalposts gave way to a crossbar (football made it compulsory in 1882), the referee moved from the touchline onto the field in 1891, and the penalty kick arrived the same year. Rugby developed the try, the scrum and the lineout, and in 1895 its clubs in the north of England split again over payment for lost work time, forming what became rugby league.

Why it matters. The FA and the RFU show both the power and the cost of codification: one agreed code made a national game possible, but the same process drew a firm line between two sports that had once been one. Both games began with gentlemen who expected players to “strive lawfully,” as Paul wrote, and both depended on the honour of players as much as on written laws. As for William Webb Ellis, who is said to have first picked up the ball and run with it at Rugby School in 1823: the only source is a letter written more than fifty years later by a man who had left the school before the event, and historians treat the story as a legend.

PICTURE STUDY



Touch Standing Up (Football at Rugby School), Charles Harcourt Chambers, 1845 · Pen-and-ink drawing
· Rugby School, Warwickshire

Image: [Wikimedia Commons](#), public domain

Charles Harcourt Chambers was a pupil at Rugby School in 1845, the year the school first wrote down its rules of football. He sketched the game as he saw it on the school's playing field, the Close. Here the boys form two lines for the throw-in from touch, a moment that survives in rugby's lineout.

Drawings like this are precious evidence because they show the game as it was actually played, before any national rules existed.

Look closely

- Count the players you can see. How does the number compare with a modern team?
- Find the boy with the ball. What is he about to do?
- Look at the two lines of players. Which modern rugby set piece does this resemble?
- Look at the boys' caps and clothes. Are they dressed for sport as we would be?

Talk about it

1. This sketch was made the same year Rugby School wrote down its rules. Why might people start writing rules when they start drawing and describing a

game?

2. What does a pupil's sketch tell a historian that a rule book cannot?
3. Why might a game with so many players on the field develop set pieces like this one?

Safety first. Play your comparison games outdoors with a soft ball. No tackling, hacking, tripping or pushing: use two-hand touch instead of tackles.

PROJECT

Play the Laws of 1863

You will play a short game under a simplified version of the FA's 1863 laws and another under a modern-style rugby touch game, record what happens, and compare the two codes that grew from one root.

You will need

- A soft ball (round for football, oval or round for touch rugby)
- Four markers for goals; tape or string for an imaginary “tape” between posts
- At least four players
- A stopwatch
- Your scorebook

Steps

1. Set up a small pitch. Use two posts for each goal with no crossbar, as in 1863: a goal counts if the ball passes between the posts at any height (or below a tape you stretch at about 2 m).
2. Game 1, “1863”: ball kicked only; a player may catch the ball and claim a free kick by marking the ground with his heel; no handling otherwise; no hacking or tripping; change ends after every goal. Play 10 minutes and record goals, fair catches and disputes.
3. Game 2, “touch rugby”: the ball may be carried and passed backward by hand; a two-hand touch stops the carrier, who must place the ball down and restart; a try is scored by placing the ball over the line. Play 10 minutes and record tries, touches and forward-pass errors.
4. Make a table comparing scoring, stoppages and disputes in the two games.
5. Write a paragraph: which rule difference changed the game most? Why could the two codes not easily be combined in 1863?

Tips

- Changing ends after every goal was an 1863 rule; notice what it does to wind and slope.

- Keep a tally sheet with a column for each event.

Check your work

- ☐ I played both games under clearly written rules.
- ☐ I recorded scores, stoppages and disputes in a table.
- ☐ My paragraph explains the key rule difference with evidence from play.

SCOREBOOK

1. Copy three of the thirteen 1863 FA laws (from a library book or the FA website) and put them beside today's rule on the same subject.
2. Draw a timeline of football and rugby from 1845 to 1895.
3. Record your two games in a comparison table.

From history. The FA's minute book of 1863, with Morley's handwritten laws, is one of the most valuable documents in sport. It was displayed at the British Library in 2013 for the FA's 150th anniversary.

WORKED EXAMPLES

Example 1. The 1863 FA laws allowed a pitch up to 200 yards long and 100 yards wide. Today's laws allow at most 130 yards by 100 yards. Compare the largest areas.

Show solution

1. 1863: $200 \times 100 = 20,000$ sq yd.
2. Today: $130 \times 100 = 13,000$ sq yd.
3. $20,000 \div 13,000 \approx 1.54$.

Answer: An 1863 pitch could be about one and a half times the largest pitch allowed today.

Example 2. In 1871 rugby teams had 20 players a side; football teams 11. How many square yards of a 110×70 yard field did each player have in each game?

Show solution

1. Field area: $110 \times 70 = 7,700$ sq yd.
2. Rugby, 40 players: $7,700 \div 40 = 192.5$ sq yd each.
3. Football, 22 players: $7,700 \div 22 = 350$ sq yd each.

Answer: About 193 sq yd per rugby player and 350 per football player. The crowded rugby game encouraged scrummaging; the open football game encouraged dribbling and later passing.

Example 3. Put these in order and find the gaps in months: FA founded (October 1863); RFU founded (January 1871); first rugby international (March 1871); first football international (November 1872).

Show solution

1. October 1863 $\rightarrow$ January 1871: 7 years 3 months = 87 months.
2. January 1871 $\rightarrow$ March 1871: 2 months.
3. March 1871 $\rightarrow$ November 1872: 1 year 8 months = 20 months.

Answer: FA, RFU, rugby international, football international; gaps of 87, 2 and 20 months.

PRACTICE

1. **Easy** Where and when was the Football Association founded?

Show answer

At the Freemasons' Tavern, Great Queen Street, London, on October 26, 1863.

2. **Easy** Who was the FA's first secretary and wrote its first laws?

Show answer

Ebenezer Cobb Morley.

3. **Easy** When and where was the first football international, and what was the score?

Show answer

November 30, 1872, at Hamilton Crescent, Glasgow: Scotland 0, England 0.

4. **Medium** What two issues divided the clubs in 1863?

Show answer

Running with the ball in the hands and hacking (kicking opponents' shins).

5. **Medium** Where does the word "soccer" come from?

Show answer

From "association" football, shortened in university slang to "assoc" and then "soccer."

6. **Medium** Rugby teams went from 20 to 15 a side. By what percentage did the number of players on the field fall?

Show answer

From 40 to 30 players: a fall of $10/40 = 25\%$.

7. **Medium** Why do historians doubt the William Webb Ellis story?

Show answer

The only source is a letter written over fifty years after 1823 by Matthew Bloxam, who had left Rugby School before the supposed event; no contemporary evidence supports it.

8. **Medium** List three changes to association football's laws between 1863 and 1891.

Show answer

Any three: handling forbidden to all but the goalkeeper; the goalkeeper position; eleven a side; a compulsory crossbar (1882); the referee on the field and the penalty kick (1891).

9. **Hard** Explain the irony in the RFU's decision to ban hacking soon after its founding.

Show answer

Blackheath had left the FA partly because it insisted hacking was essential; yet the rugby clubs themselves banned it within a short time, showing that the split rested on more than that single issue and that both codes were moving toward safer play.

10. **Hard** Why did the 1895 split in rugby happen, and what does it show about the pressures on amateur sport?

Show answer

Northern clubs, whose players were mostly working men, wanted to pay them for wages lost when they played ("broken time"); the RFU refused, so the northern clubs formed their own union. It shows that a strictly amateur rule suited men of means better than working men.

11. **Challenge** In 1871 a rugby field might measure about 110×75 yards. If the area per player had stayed the same when teams went from 20 to 15 a side, how large would the field have needed to be? Give the area and one possible pair of dimensions in the same proportion.

Show answer

Area per player: $8,250 \div 40 = 206.25$ sq yd. For 30 players: 6,187.5 sq yd. Scaling both sides by $\sqrt{30/40} \approx 0.866$: about 95×65 yards.

COMMON MISTAKES

- Saying the FA banned handling completely in 1863. The fair catch remained for a few years, and the goalkeeper later kept the right to handle.
- Treating the William Webb Ellis story as established fact.
- Confusing the founding of the RFU (1871) with the later split that created rugby league (1895).

Make it a game • Tavern Meeting. Role-play the 1863 meeting at the Freemasons' Tavern. Your parent and you each propose one rule, argue it for thirty seconds, and then vote using beans as ballots. Retell Ebenezer Cobb Morley's part and why the rugby side walked away. Count correct facts. A wrong fact in your retelling loses a bean.

Scripture. “And if a man also strive for masteries, yet is he not crowned, except he strive lawfully.” (2 Timothy 2:5, KJV)

Paul knew that in the games of his day a victory won by breaking the rules was no victory. The men who wrote football’s laws in 1863 hoped players would keep the spirit of the laws, not just the letter.

4.3 WIMBLEDON AND THE LAWN-TENNIS RULES

OBJECTIVES

- Describe how Major Walter Clopton Wingfield's patented game of 1874 and the All England Croquet Club produced the first Wimbledon Championship in 1877.
- Explain how the 1877 rules committee settled the rectangular court, the net and real-tennis scoring.
- Calculate court areas, net heights in metric units and the games and points in a match.
- Explain why a new sport borrowed so much from an old one, and why tournaments need fixed rules.

Warm-up. Draw a rectangle 78 squares long and 27 squares wide on graph paper at one square per foot (or a scaled version). Then draw an hourglass shape the same length that is wide at the ends and narrow in the middle. Which looks easier to play on? Why?

WATCH

Pat Cash Explores the Wimbledon Lawn Tennis Museum's Treasure Trove

Wimbledon • 4:41

<https://www.youtube.com/watch?v=nHBrTUfPqTY>

WHEN TO WATCH

After the how-it-changed paragraph. A former champion tours the museum's storerooms: old racquets, programmes, posters and clothing from more than a century of the Championships.

BACKUP VIDEO

9th July 1877: First Wimbledon Championship begins in London

HistoryPod • 2:37

<https://www.youtube.com/watch?v=uqwP7n1X-H0>

After the story paragraph. A short narrated account of the first Championship, shown over a contemporary engraving.

KEY TERMS

lawn tennis

Tennis played outdoors on grass (and later other surfaces), invented in the 1870s from real tennis and older garden games.

All England Club

The All England Croquet Club, founded in 1868, which added lawn tennis in 1875 and staged the first Wimbledon Championship in 1877.

amateur

A player who competes for love of the game rather than for pay; Wimbledon was for amateurs only until 1968.

Sphairistikè

Greek for “the art of playing ball”: the name Major Wingfield gave to his patented lawn-tennis set of 1874, played on an hourglass-shaped court.

Challenge Round

An old tournament system in which the previous year’s champion played only the final, against the winner of all the other matches.

CORE IDEAS

The story. In July 1877 the All England Croquet and Lawn Tennis Club, at its grounds in Worple Road, Wimbledon, needed money to repair its pony-drawn roller. The committee announced a lawn-tennis tournament open to all amateurs, with an entry fee of one guinea. Twenty-two men entered. Play began on July 9, rain delayed the final, and on July 19, before about two hundred spectators who paid a shilling each, Spencer Gore, an old Harrovian, beat William Marshall 6–1, 6–2, 6–4. The tournament made a small profit, the roller was mended, and the world’s oldest tennis championship had begun.

How it changed. Lawn tennis was barely three years old. In February 1874 Major Walter Clopton Wingfield, a retired army officer, patented a boxed set for a game he called *Sphairistikè*, played on an hourglass-shaped court that was narrower at the net than at the baselines. Rival versions appeared at once, and players argued about court shapes, net heights and scoring. For the 1877 Championship a committee of three, Julian Marshall, Henry Jones (who wrote on games as “Cavendish”) and C. G. Heathcote, settled the matter: a rectangular court 78 feet long and 27 feet wide, with real tennis’s scoring of 15, 30, 40 and game. Their rules, with small changes such as a

lower net, have lasted ever since. The Ladies' Championship followed in 1884, won by Maud Watson, and in 1922 the club moved to its present grounds in Church Road.

How it is played. Players serve diagonally into the service box and rally across the net, trying to make the ball bounce in the opponent's court so that it cannot be returned. Games are won with four points and a margin of two; sets with six games and a margin of two. In 1877 the net was five feet high at the posts and about three feet three inches in the middle, so most play was from the baseline; within a few years the net was lowered to three feet in the middle, and players learned to rush forward and volley.

Why it matters. Lawn tennis shows how fast a new game could become a world sport once it had agreed rules and a famous championship. It borrowed its scoring and much of its language from the old royal game of Lesson 3.2, and its new rules were made by a committee in a few weeks. Wimbledon's traditions, white clothing, courtesy and restraint, grew from the amateur ideal that one should play for the love of the game and accept victory or defeat with grace.

PICTURE STUDY



Lawn Tennis at Wimbledon: Match for the Championship, Signed H.W.P., for the Illustrated Sporting and Dramatic News, July 14, 1877 · Wood engraving · Published in London

Image: [Wikimedia Commons](#), public domain

This engraving appeared in a London sporting newspaper during the very first Wimbledon Championship. It shows a match on the club's grass at Worple Road, with spectators in top hats and bonnets standing along the side of the court.

Look closely at the net: it is much higher at the posts than a modern net, as the rules of 1877 required.

Look closely

- Find the net. How high is it at the posts compared with the players?
- Look at the players' clothing. How would long trousers and caps affect play?
- Find the umpire. Where does he sit, and what can he see?
- Look at the spectators. How many are there, and how close do they stand?

Talk about it

1. A newspaper sent an artist to draw a brand-new tournament in its first week. What does that suggest about how quickly lawn tennis became popular?
2. Compare this scene with a photograph of Wimbledon today. What has stayed the same?

3. Why did a high net make sense to people who had grown up with real tennis?

Safety first. Use a soft ball and a light racquet or paddle, play outdoors or against a wall with no windows nearby, keep clear space around swinging racquets, and wear proper shoes.

PROJECT

Mark Out a Court and Test the Net

You will mark a scaled tennis court, play mini-tennis with a high “1877” net and a low modern net, and record how the net height changes the way points are won.

You will need

- Chalk, string or rope and a tape measure
- Two chairs and a long string or rope for a net
- Two racquets or paddles and a soft ball
- A partner
- Your scorebook

Steps

1. On a driveway, lawn or park, mark a half-scale singles court: 39 ft by 13.5 ft (about 11.9 m by 4.1 m), with a net line across the middle and service lines 10.5 ft from the net.
2. Tie the string between chairs at a scaled “1877” height: 2.5 ft (76 cm) at the posts.
3. Play 20 points. For each, record whether it was won from the baseline, at the net (a volley) or by an error.
4. Lower the string to a scaled modern height of 1.5 ft (46 cm) and play 20 more points, recording the same things.
5. Make a table and bar chart comparing the two net heights.
6. Write a paragraph explaining how the net height changed the game, and connect your result to the history of lawn tennis.

Tips

- Serve underarm if overarm is hard to control in a small space.
- Decide before you start how you will tell a volley from a ground stroke.

Check your work

- ☐ I marked a scaled court with measured lines.

- ☐ I played and recorded 20 points at each net height.
- ☐ My chart and paragraph explain the effect of the net with evidence.

SCOREBOOK

1. Draw an 1877 singles court to scale (1 cm = 2 ft), labelling all lines and the net heights.
2. Sketch Wingfield's hourglass court beside it and write two reasons the rectangle won.
3. Record your net-height experiment in a table.

From history. Spencer Gore lost his title in 1878 to Frank Hadow, who lobbed over Gore's head whenever he came to the net. Gore later wrote that he doubted lawn tennis would ever rank among the great games, a reminder that even champions cannot predict the future.

WORKED EXAMPLES

Example 1. Find the area of an 1877 singles court (78 ft $\times$ 27 ft) in square feet and square metres (1 ft = 0.3048 m).

Show solution

1. $78 \times 27 = 2,106$ sq ft.
2. 78 ft = 23.77 m; 27 ft = 8.23 m.
3. $23.77 \times 8.23 \approx 195.6$ m².

Answer: 2,106 sq ft, about 196 m²: the same singles court used today.

Example 2. In the 1877 final Gore won 6–1, 6–2, 6–4. How many games were played, and what fraction did Gore win?

Show solution

1. Gore: $6 + 6 + 6 = 18$ games. Marshall: $1 + 2 + 4 = 7$ games.
2. Total: 25 games.
3. $18 \div 25 = 0.72$.

Answer: 25 games; Gore won 72% of them.

Example 3. The net was 5 ft at the posts in 1877; today it is 3 ft 6 in at the posts and 3 ft at the centre. Convert each to centimetres (1 in = 2.54 cm; 1 ft = 12 in).

Show solution

1. 5 ft = 60 in = 152.4 cm.

2. 3 ft 6 in = 42 in = 106.7 cm.

3. 3 ft = 36 in = 91.4 cm.

Answer: 152.4 cm at the posts in 1877, against 106.7 cm today at the posts and 91.4 cm in the centre: the net at the posts has come down by about 46 cm.

PRACTICE

1. **Easy** Who won the first Wimbledon Championship, against whom, and when?

Show answer

Spencer Gore beat William Marshall on July 19, 1877.

2. **Easy** What did Major Wingfield call his game, and when did he patent it?

Show answer

Sphairistikè; February 1874.

3. **Easy** Why did the All England Club stage the 1877 tournament?

Show answer

To raise money to repair its pony-drawn roller.

4. **Medium** Name the three men on the 1877 rules committee and two decisions they made.

Show answer

Julian Marshall, Henry Jones (“Cavendish”) and C. G. Heathcote; they chose a rectangular court of 78×27 ft and real tennis’s scoring.

5. **Medium** A doubles court is 78 ft by 36 ft. How much larger is it than a singles court, in square feet and as a percentage?

Show answer

$78 \times 36 = 2,808$ sq ft; $2,808 - 2,106 = 702$ sq ft larger, about 33% more.

6. **Medium** Twenty-two players entered in 1877, each paying one guinea (21 shillings). How many shillings did the entry fees raise? If 200 spectators paid a shilling each at the final, what was that day's gate?

Show answer

$22 \times 21 = 462$ shillings; 200 shillings at the final.

7. **Medium** Why did a high net encourage baseline play?

Show answer

A high net made it hard to hit hard, low shots or volleys near the net, so players stayed back and rallied with safe, high strokes.

8. **Medium** When did the Ladies' Championship begin, and who won it first?

Show answer

1884; Maud Watson.

9. **Hard** In a set that goes 6–4, what is the smallest number of points the winner could have won, and the largest number the loser could have won if every game was won 4–0? Explain why scoring by games can reward the player who wins fewer points.

Show answer

Winner $6 \times 4 = 24$ points; loser $4 \times 4 = 16$. If the loser won his own games 4–0 but lost the winner's games after deuces, he might win more points overall; game-based scoring rewards winning the crucial points rather than the most points.

10. **Hard** Why might a committee of experienced players have chosen real tennis scoring rather than Wingfield's scoring of 15 points to a game?

Show answer

It was familiar to the gentlemen who already played real tennis and rackets; it made games short and sets dramatic; and it gave the new game the dignity of an old tradition.

11. **Challenge** A service box is 21 ft deep and 13.5 ft wide. What fraction of one half of a singles court (39 ft × 27 ft) is the service box? Why does serving into a target this small make the serve a skill?

Show answer

$21 \times 13.5 = 283.5$ sq ft; half court $39 \times 27 = 1,053$ sq ft; $283.5 \div 1,053 \approx 0.27$, about 27%. The server must hit over the net into barely a quarter of the opponent's half, which demands accuracy as well as power.

COMMON MISTAKES

- Thinking Wingfield's game was played on the modern court. His court was hourglass-shaped.
- Confusing lawn tennis with real tennis. Lawn tennis was a new outdoor game that borrowed real tennis's scoring.
- Forgetting to convert feet and inches to inches (or centimetres) before calculating.

Make it a game • Clue Ladder: Wingfield. Write five clues about Major Walter Clopton Wingfield and his 1874 game, each more revealing than the last. Read them one at a time while your parent guesses the person or game. Guess correctly on clue one for five points, clue five for one. Then swap. Include Sphairistikè, the All England Club, and the 1877 Wimbledon.

4.4 BASEBALL'S REAL ORIGINS

OBJECTIVES

- Trace baseball's roots in English bat-and-ball games, from the "Base-Ball" of a 1744 children's book to the 1791 Pittsfield bylaw.
- Describe the Knickerbocker rules of September 23, 1845, and the first recorded match under them at the Elysian Fields in 1846.
- Explain how the Mills Commission of 1907 created the Abner Doubleday myth and why historians reject it.
- Use the Pythagorean theorem to compare the Knickerbocker "paces" with the modern 90-foot diamond.

Warm-up. Write down who you have heard invented baseball, and where. Then write one question you would ask to check whether that story is true.

WATCH

Why Do People Think Abner Doubleday Invented Baseball?

Today I Found Out • 11:42

<https://www.youtube.com/watch?v=cL28mgEZ2Ts>

WHEN TO WATCH

After the how-it-changed paragraph. A careful account of the Mills Commission, Abner Graves's letter and why the story does not hold up.

Note: The description links to the channel's Patreon page; the video itself is a straightforward history.

KEY TERMS

rounders

An English bat-and-ball game with bases, played by children for centuries, which shares many features with early baseball.

Knickerbocker Base Ball Club

A New York club of young professional men that wrote a set of twenty rules on September 23, 1845.

soaking

Putting a runner out by hitting him with a thrown ball, a common rule in older bat-and-ball games that the Knickerbocker rules forbade.

Mills Commission

A committee appointed in 1905 to settle baseball's origins; in 1907 it credited Abner Doubleday and Cooperstown, New York, with inventing the game in 1839.

myth

A widely believed story that is not supported by the evidence.

CORE IDEAS

The story. In 1905 the sporting-goods businessman Albert Spalding, eager to prove that baseball was a purely American invention, persuaded the leaders of the game to appoint a commission under Abraham Mills, a former president of the National League. The commission asked the public for evidence. An elderly mining engineer, Abner Graves, wrote that as a boy in Cooperstown, New York, he had seen Abner Doubleday lay out a diamond and invent the game in 1839. In December 1907 the commission declared Doubleday the inventor. Cooperstown later opened the National Baseball Hall of Fame there in 1939, the game's supposed centenary.

How it changed. The story collapses on inspection. In 1839 Doubleday was a cadet at West Point, not in Cooperstown; he never claimed to have invented anything of the kind, and his many letters and obituaries never mention baseball. Graves was a boy of about five at the time. Much older evidence points elsewhere. In 1744 the London publisher John Newbery printed *A Little Pretty Pocket-Book* for children, with a woodcut and verse titled "Base-Ball." In 1791 the town of Pittsfield, Massachusetts, passed a bylaw forbidding "baseball" within eighty yards of its new meeting house, to protect the windows. The game grew, like rounders, from English bat-and-ball games. Henry Chadwick, the journalist who invented the box score, argued for the rounders origin, and historians agree with him.

How it is played. The decisive step came in New York. On September 23, 1845, the Knickerbocker Base Ball Club adopted twenty rules. They set the distance from home to second base and from first to third at 42 paces; required the ball to be pitched underhand, not thrown hard; forbade soaking, so that a runner had to be tagged or forced instead; made a ball hit outside the lines from first or third "foul";

set three outs for a side; and declared the first team to score 21 runs (“aces”) the winner. On June 19, 1846, at the Elysian Fields in Hoboken, New Jersey, the Knickerbockers lost the first recorded game under these rules to the “New York Nine,” 23 to 1, in four innings. In 1857 a convention of clubs fixed nine innings and 90 feet between the bases.

Why it matters. The Doubleday myth is a lesson in how history should be done. A commission with a conclusion in mind accepted one old man’s memory and ignored the documents. Real history weighs every source: who wrote it, when, how they knew, and whether other evidence agrees. The truth, a gradual development from English children’s games through New York clubs, is less romantic but more interesting, and it shows how a game becomes great by being shared and improved by many hands.

PICTURE STUDY



The American National Game of Base Ball: Grand Match for the Championship at the Elysian Fields, Hoboken, N.J., Currier and Ives, 1866 · Hand-coloured lithograph · The Metropolitan Museum of Art, New York

Image: [Wikimedia Commons](#), public domain

Currier and Ives, the most popular printmakers in nineteenth-century America, sold this view of a championship match at the Elysian Fields in Hoboken, the same park where the Knickerbockers had played in 1846. By 1866 baseball was already called “the national game.”

Look for the diamond, the umpire and the spectators, and compare them with a game today.

Look closely

- Find the diamond. Are the base paths the same length on every side?
- Find the pitcher. How far is he from the batter, and how is he throwing?
- Look at the crowd. What kind of people came to watch?
- Find the umpire. Where does he stand?

Talk about it

1. This print calls baseball “the American national game” in 1866. How had the game become so popular only twenty years after the Knickerbocker rules?
2. What details in the print would help a historian check how the game was played at that time?

3. Why might a printmaker choose the Elysian Fields for this scene?

Safety first. Use a soft ball and a plastic or foam bat, swing only with a clear circle around you, and keep everyone else well behind the batter.

PROJECT

Lay Out a Knickerbocker Diamond and Play by the 1845 Rules

You will measure your own pace, lay out a diamond the Knickerbocker way, measure its sides and diagonals, and play a short game under a few of the 1845 rules.

You will need

- A tape measure
- Four bases (paper plates or cardboard)
- A soft ball and a plastic bat
- At least three players
- Your scorebook

Steps

1. Measure your pace: walk 20 normal steps, measure the distance and divide by 20. Record it.
2. Pace out a diagonal of 42 paces (or 21 paces for a half-size field) from home to second, then lay out first and third at right angles so the four bases form a square.
3. Measure the four base paths and both diagonals with the tape. Check the Pythagorean theorem: does $\text{diagonal} \approx \text{side} \times 1.414$?
4. Play a short game with these Knickerbocker rules: underhand pitching, three outs a side, runners must be tagged or forced (no throwing the ball at runners), a ball caught on the first bounce is out, and the first side to 21 runs (or the leader after 4 innings) wins.
5. Record every inning's runs in a line score.
6. Write a paragraph: how close was your pace-based diamond to a square? How did the old rules feel compared with modern baseball?

Tips

- Use a large right-angle triangle made from cardboard, or the 3-4-5 rule with a tape, to check your corners.

- The catch-on-the-bounce rule makes fielding easier for beginners; notice why the Knickerbockers liked it.

Check your work

- ☐ I measured my pace and laid out a diamond from it.
- ☐ I measured all sides and diagonals and checked them with the Pythagorean theorem.
- ☐ I kept a line score of a game under 1845 rules and wrote my comparison.

SCOREBOOK

1. Draw your diamond to scale with your measured sides and diagonals.
2. Make a two-column chart, “Myth / Evidence,” for the origin of baseball.
3. Copy your line score.

From history. Cooperstown kept the Hall of Fame even after historians rejected the Doubleday story, and the museum itself now explains the myth honestly to its visitors. A place can honour a game’s history without pretending a legend is true.

WORKED EXAMPLES

Example 1. The Knickerbocker rules set 42 paces from home to second base. If a pace was about 2.5 feet, how long were the base paths? (The distance home to second is the diagonal of the square.)

Show solution

1. Diagonal = $42 \times 2.5 = 105$ ft.
2. For a square, side = diagonal $\div \sqrt{2}$.
3. $105 \div 1.414 \approx 74$ ft.

Answer: About 74 feet between bases, if a pace was 2.5 feet. Historians disagree about the length of a pace; at 3 feet the paths would be about 89 feet, very close to today’s 90.

Example 2. Find the distance from home plate to second base on a modern diamond with 90-foot base paths.

Show solution

1. By the Pythagorean theorem, $d = \sqrt{90^2 + 90^2} = 90\sqrt{2}$.
2. $90 \times 1.414 \approx 127.3$ ft.

Answer: About 127 feet 3 inches, the throw a catcher must make to second base.

Example 3. How old was Abner Graves in 1839 if he was born in 1834, and how many years later did he write his letter (1905)? Why do these numbers matter to a historian?

Show solution

1. $1839 - 1834 = 5$ years old.
2. $1905 - 1839 = 66$ years later.

Answer: He was about five, and wrote sixty-six years after the event. A small child's memory recalled after two generations, with no other support, is weak evidence.

Example 4. In the 1846 Elysian Fields game the New York Nine scored 23 runs in 4 innings. What was their average per inning? How many innings would it take, at that rate, to reach the Knickerbockers' target of 21 runs?

Show solution

1. $23 \div 4 = 5.75$ runs per inning.
2. $21 \div 5.75 \approx 3.65$, so 4 innings.

Answer: 5.75 runs per inning; they would pass 21 runs during the fourth inning, which is why the game ended after four innings.

PRACTICE

1. Easy On what date did the Knickerbocker Base Ball Club adopt its rules?

Show answer

September 23, 1845.

2. **Easy** Where and when was the first recorded game under the Knickerbocker rules?

Show answer

At the Elysian Fields, Hoboken, New Jersey, on June 19, 1846.

3. **Easy** What did the Mills Commission conclude, and when?

Show answer

In 1907 it declared that Abner Doubleday invented baseball at Cooperstown, New York, in 1839.

4. **Medium** Give three reasons historians reject the Doubleday story.

Show answer

Doubleday was at West Point in 1839; he never claimed it and his papers never mention it; the only witness was a five-year-old recalling events 66 years later; and older evidence (1744, 1791) shows the game existed earlier.

5. **Medium** What did the 1791 Pittsfield bylaw forbid, and why?

Show answer

Playing baseball (and other ball games) within 80 yards of the new meeting house, to protect its windows.

6. **Medium** List four Knickerbocker rules.

Show answer

Any four: 42 paces home to second; underhand pitching; no soaking (runners tagged or forced); foul lines; three outs; 21 aces to win; a ball caught on the first bounce is an out.

7. **Medium** If a pace was 2.75 feet, how long were the Knickerbocker base paths?

Show answer

Diagonal $42 \times 2.75 = 115.5$ ft; side $\approx 115.5 \div 1.414 \approx 81.7$ ft.

8. **Medium** Why might Albert Spalding have wanted baseball to be a purely American invention?

Show answer

He was a promoter and businessman who wanted baseball to be seen as the national game of the United States, not a descendant of an English children's game.

9. **Hard** A diamond's base path is 60 feet in youth baseball. Find the distance from home to second.

Show answer

$$60\sqrt{2} \approx 84.9 \text{ ft.}$$

10. **Hard** Explain why forbidding soaking changed the kind of ball the game could use.

Show answer

Once runners could no longer be hit with the ball, there was no need for a soft ball; a harder, livelier ball could be used, which travelled farther and made hitting and fielding more skilful.

11. **Challenge** A first baseman stands on first base and throws to third base on a 90-foot diamond. How far is the throw? Compare it with the throw from home to second, and explain.

Show answer

First to third is also a diagonal of the square: $90\sqrt{2} \approx 127.3$ ft, the same as home to second, because the two diagonals of a square are equal.

COMMON MISTAKES

- Saying Doubleday invented baseball. The evidence does not support it.
- Using the side of the diamond where the diagonal is needed, or the reverse.
- Treating the length of a "pace" as exact. It varied, which is why later rules used feet.

Make it a game • The Doubleday Trial. Your parent plays the Mills Commission and states that Abner Doubleday invented baseball in a field in 1839. You are the historian cross-examining with evidence: rounders, the 1744 children's book, the 1791 Pittsfield bylaw, and the Knickerbockers. Your parent pushes back. Score a point for each fact that proves the myth wrong.

4.5 MUSCULAR CHRISTIANITY AND TOM BROWN'S SCHOOL DAYS

OBJECTIVES

- Describe Thomas Arnold's Rugby School and Thomas Hughes's novel *Tom Brown's School Days* (1857).
- Explain the idea of "muscular Christianity" and its influence through the YMCA (founded 1844), the Cambridge Seven and the coming of new sports.
- Weigh the movement's strengths and limits in the light of 1 Timothy 4:8.
- Analyse a historical text for its argument and its evidence.

Warm-up. Write one sentence answering this question: does playing a sport make a person better, or does it only make him fitter? Keep your sentence; you will return to it at the end of the lesson.

WATCH

George Williams: The Man Behind the YMCA | Cody Crouch on TBN

Cody Crouch TV • 10:11

<https://www.youtube.com/watch?v=oSVPnKPRcx0>

WHEN TO WATCH

After the how-it-changed paragraph. The story of the young draper's assistant who founded the Young Men's Christian Association in London in 1844.

Note: The video's description mentions a 1970s pop song about the YMCA; the video itself is a short Christian history.

BACKUP VIDEO

The Incredible Story of C.T. Studd

Mike McDonald (Christianity Commons) • 8:53

<https://www.youtube.com/watch?v=fILi86yrdCU>

In session 2, for the story of the England cricketer who became a missionary with the Cambridge Seven.

KEY TERMS

muscular Christianity

A Victorian movement that held that physical strength, manliness and sport could serve Christian character and service; the phrase was first used in 1857.

YMCA

The Young Men's Christian Association, founded in London on June 6, 1844, by George Williams and eleven friends; it later built gymnasiums and helped invent new sports.

amateur ideal

The belief that sport should be played for its own sake and for character, not for money.

Thomas Arnold

Headmaster of Rugby School from 1828 to 1841, who sought to form "Christian gentlemen" and whose school inspired *Tom Brown's School Days*.

Cambridge Seven

Seven Cambridge graduates, among them the England cricketer C. T. Studd, who sailed in 1885 as missionaries to China.

CORE IDEAS

The story. In 1857 Thomas Hughes, a lawyer who had been a pupil at Rugby School under Thomas Arnold, published a novel about a boy named Tom Brown. Tom arrives at Rugby, plays in a great football match on his first day, faces a cruel bully named Flashman, and learns, through friendship, sport and the example of the headmaster, to become a brave, honest and kind young man. *Tom Brown's School Days* became one of the most popular books of its century and shaped how millions thought about schools, sport and character.

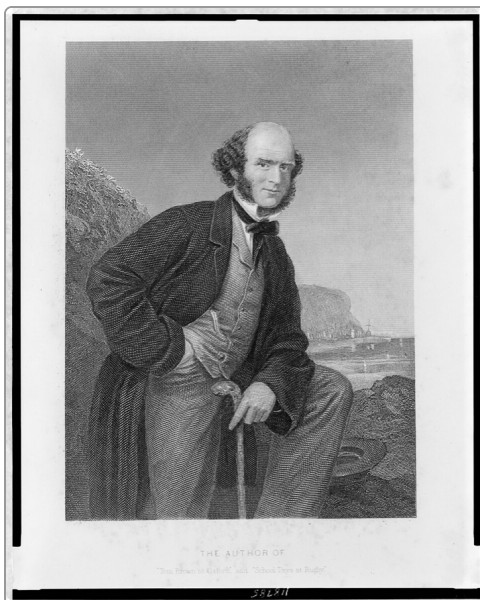
How it changed. The same year a reviewer coined the phrase "muscular Christianity" to describe the books of Hughes and his friend Charles Kingsley, a clergyman and novelist. The movement taught that the body was a gift of God to be strengthened and used in service, and that games could teach courage, fairness, teamwork and self-control. It spread through the public schools, where games became central to education, and through the Young Men's Christian Association, founded in London in 1844 by George Williams, a young draper's assistant who

gathered fellow workers for prayer and Bible study. The YMCA spread to the United States in 1851 and soon added gymnasiums. In 1885 the Cambridge Seven, including the famous England cricketer C. T. Studd, gave up promising careers to serve as missionaries in China. And in the 1880s and 1890s the YMCA's training school in Springfield, Massachusetts, became the place where, as Unit 5 shows, basketball and volleyball were invented.

How it was lived. At its best, muscular Christianity meant playing hard and fairly, refusing to cheat, protecting the weak, and putting one's strength at the service of God and neighbour. Hughes himself worked for working men's education and even founded a colony named Rugby in Tennessee in 1880. Pierre de Coubertin, who revived the Olympic Games (Lesson 5.5), admired Arnold's Rugby and was deeply influenced by this ideal of sport as moral education.

Why it matters. The movement also had limits, and an honest history names them. At times it treated games almost as a religion, praising athletic success more than faith, and it could make manliness sound like the whole of Christian virtue. Scripture keeps sport in its place: "bodily exercise profiteth little: but godliness is profitable unto all things." Exercise does profit, a little; godliness profits in everything. The best muscular Christians, like Studd and later Eric Liddell, understood that order: they valued the body and enjoyed the game, but they put Christ first.

PICTURE STUDY



The Author of “Tom Brown at Oxford” and “School Days at Rugby”, Unknown engraver (portrait of Thomas Hughes), nineteenth century · Engraved portrait · Library of Congress, Washington, D.C.

Image: [Wikimedia Commons](#), public domain

Thomas Hughes (1822–1896) was a lawyer, a member of Parliament and a tireless worker for the education of working men. He is remembered for one book above all: the story of *Tom Brown at Rugby*, drawn from his own schooldays under Thomas Arnold.

This portrait, kept by the Library of Congress, was published for American readers, who loved the book as much as the British did.

Look closely

- Read the caption. How is Hughes identified: by his name or by his books? Why?
- Look at his expression and bearing. What kind of man does he seem to be?
- Look at the setting: a rocky coast with ships in the distance. Why might the engraver show him outdoors with a walking stick rather than at a desk?

Talk about it

1. Why might an American publisher sell a portrait of an English author?
2. Hughes wrote about a boy learning courage and kindness through school and sport. What would you want to ask him about that?

3. Can a novel change how a nation thinks about sport? Give a reason.

PROJECT

A Character Scorebook

Muscular Christians believed games could train character. You will test that claim honestly by keeping a “character scorebook” across several games and practices, recording not only the score but also moments of fair play, self-control and encouragement.

You will need

- Any game or sport you play over a week (a team sport, a backyard game, or board games from Unit 2)
- Your scorebook

Steps

1. Choose four virtues to watch: honesty (calling your own fouls), self-control (temper), courage (trying when behind) and kindness (encouraging others).
2. Make a tally sheet with a column for each virtue and a column for the opposite failing.
3. Over at least four games or practices, record the score and tally every moment you notice in yourself (and, kindly, in others) for each virtue or failing.
4. After each session, write two sentences: one thing done well and one to improve.
5. At the end, total the tallies and look for patterns: did failings come more when losing, tired or behind?
6. Write a paragraph answering the lesson’s question: did the games make you better, or only show what was already there? Use your data and 1 Timothy 4:8.

Tips

- Be honest rather than flattering: the point is to learn.
- Ask a parent or teammate to keep a second tally and compare.

Check your work

- ☐ I recorded at least four sessions with scores and character tallies.

- ☐ I found at least one pattern in my data.
- ☐ My paragraph uses my tallies and Scripture thoughtfully.

SCOREBOOK

1. Make a timeline of muscular Christianity: 1828, 1844, 1851, 1857, 1880, 1885, 1891, 1895.
2. Copy one sentence from *Tom Brown's School Days* that you think states its message, and explain it in your own words.
3. Record your character tallies in a table.

From history. Hughes's settlement of Rugby, Tennessee, founded in 1880 for the younger sons of English families, struggled and largely failed, but its library and some buildings survive and can be visited today.

WORKED EXAMPLES

Example 1. Reasoning with dates. Put in order and find the gaps: YMCA founded (1844); Tom Brown published (1857); YMCA reaches Boston (1851); Cambridge Seven sail (1885); Hughes founds Rugby, Tennessee (1880).

Show solution

1. Order: 1844, 1851, 1857, 1880, 1885.
2. Gaps: 7, 6, 23 and 5 years.

Answer: Within about forty years the movement went from a prayer meeting in a London shop to schools, colonies and missions across the world.

Example 2. Reasoning with a text. Hughes has Tom’s father say, as Tom leaves for school, that he wants his son to turn out “a brave, helpful, truth-telling Englishman, and a gentleman, and a Christian.” What does this sentence suggest about the purpose of a Victorian school?

Show solution

1. List the qualities: brave, helpful, truth-telling, a gentleman, a Christian.
2. Note what is missing: there is no mention of learning Greek or Latin, the main school subjects of the day.
3. Conclude what Hughes valued most.

Answer: For Hughes, character mattered more than learning; a school existed to form good men, and games were one of its tools.

Example 3. Reasoning about a claim. A writer says, “Sport builds character.” Using 1 Timothy 4:8 and one example from this lesson, write a careful two-sentence response.

Show solution

1. Grant what is true: sport can train courage, self-control and fairness, as Tom Brown learns.
2. Add the limit: Scripture says bodily exercise profits only a little compared with godliness, and sport can also feed vanity.

Answer: Sample: “Sport can help build character when it is played fairly and under good leaders, as Tom Brown found at Rugby. But Paul reminds us that bodily exercise profits only a little compared with godliness, so sport is a servant of character, not its source.”

PRACTICE

1. Easy Who wrote *Tom Brown’s School Days*, and when?

Show answer

Thomas Hughes, in 1857.

2. Easy Who was headmaster of Rugby School from 1828 to 1841?

Show answer

Thomas Arnold.

3. Easy Who founded the YMCA, where and when?

Show answer

George Williams, in London, on June 6, 1844.

4. Medium What is muscular Christianity? Give a definition in your own words.

Show answer

A Victorian movement that saw physical strength and sport as ways of building Christian character and serving God and others.

5. Medium Who were the Cambridge Seven, and why were they famous?

Show answer

Seven Cambridge graduates, including the England cricketer C. T. Studd, who left promising careers in 1885 to serve as missionaries in China.

6. Medium How did the YMCA connect muscular Christianity with the invention of new sports?

Show answer

Its training school at Springfield, Massachusetts, trained physical directors; there James Naismith invented basketball (1891), and a YMCA director, William Morgan, invented volleyball (1895).

7. Medium How many years after the YMCA was founded was *Tom Brown's School Days* published? How many years after that did the Cambridge Seven sail?

Show answer

13 years (1857 – 1844); 28 years (1885 – 1857).

8. Medium Which later sports leader was influenced by Arnold's Rugby, and what did he revive?

Show answer

Pierre de Coubertin; the Olympic Games.

9. **Hard** Explain 1 Timothy 4:8 in your own words and say how it both supports and limits muscular Christianity.

Show answer

Exercise has some value, but godliness has value in every part of life, now and eternally. It supports caring for the body, but it limits any idea that sport is the main way to holiness.

10. **Hard** Name one weakness of muscular Christianity that a fair historian should mention.

Show answer

It could make sport almost an object of worship, value athletic success too highly, or reduce Christian virtue to manliness and physical courage.

11. **Challenge** Return to your warm-up sentence. Rewrite it in three sentences using evidence from this lesson and from Scripture.

Show answer

Answers vary. A strong answer grants that fair play, discipline and teamwork can train virtue, uses an example (Tom Brown, Studd or the YMCA), and uses 1 Timothy 4:8 to keep sport in its proper place.

COMMON MISTAKES

- Thinking Thomas Arnold invented rugby. He was headmaster of the school where it developed, but he was more interested in chapel and character than in games.
- Confusing Thomas Arnold (headmaster) with Thomas Hughes (author).
- Treating 1 Timothy 4:8 as a dismissal of exercise. It says exercise profits “little,” not “nothing.”

Make it a game • Match the Muscle. Make cards for muscular Christianity, Thomas Arnold, Rugby School, Thomas Hughes, Tom Brown's School Days, YMCA, and Cambridge Rules, plus one-line descriptions. Shuffle, lay them face down, and flip two. If they match, read the pair aloud and explain why games were valued for building character. Most matches wins.

Scripture. “For bodily exercise profiteth little: but godliness is profitable unto all things, having promise of the life that now is, and of that which is to come.” (1 Timothy 4:8, KJV)

Paul does not despise exercise; he ranks it. Muscular Christianity was at its best when it kept this order.

UNIT 4

THE RULE-MAKERS

In the nineteenth century, sport was transformed. Folk games and school games became national sports with written laws, governing bodies, championships and newspapers to report them. This unit asks why it happened then and there: railways and the Saturday half-holiday, public schools and universities, clubs and committees. It follows the Football Association of 1863 and the Rugby Football Union of 1871, the first Wimbledon Championship of 1877, the Knickerbocker rules of baseball and the myth of Abner Doubleday, and the Christian movement that saw sport as a school of character.

You will play a game with two codes and hold a rules meeting, play the FA's laws of 1863, test the high net of 1877, lay out a Knickerbocker diamond with your own paces and the Pythagorean theorem, and keep a character scorebook. Throughout, you will practise a historian's most important skill: weighing evidence, so that a good story is not mistaken for the truth.

PREREQUISITES

- The history of real tennis (Lesson 3.2) and cricket's Laws (Lesson 3.4)
- Unit conversions with feet, inches, yards and metres
- The Pythagorean theorem (taught in Lesson 4.4 if new)

MASTERY CHECKLIST

- ☐ I can explain how railways, schools, clubs, newspapers and free time led to the codification of sport.
- ☐ I can tell the story of the FA (1863) and the RFU (1871) and explain the quarrel over handling and hacking.
- ☐ I can describe the first Wimbledon Championship and calculate court areas and net heights.
- ☐ I can explain the true origins of baseball, refute the Doubleday myth, and compute diamond distances with the Pythagorean theorem.
- ☐ I can describe muscular Christianity and evaluate it in the light of 1 Timothy 4:8.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Tom Brown's School Days, by Thomas Hughes (Project Gutenberg)**: Free. The 1857 novel at the heart of Lesson 4.5, with its famous football match. It includes a schoolboy fight and scenes of bullying; parents may wish to read it first. Ages 13+.
- **National Baseball Hall of Fame and Museum**: Free website of the museum in Cooperstown, with articles on baseball's early history and the Doubleday story, for Lesson 4.4. A visit is optional. Ages 10+.
- **Wimbledon Lawn Tennis Museum**: Free website of the museum at the All England Club, with the history of the Championships, for Lesson 4.3. Ages 10+.
- **The Football Association**: Free. The governing body founded in 1863; its site includes the current Laws of the Game for comparison with the 1863 laws in Lesson 4.2. Ages 12+.

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	Why Sports Were Codified in the 1800s	3 sessions of 50 minutes
4.2	The Football Association and the Rugby Split	3 sessions of 50 minutes
4.3	Wimbledon and the Lawn-Tennis Rules	3 sessions of 50 minutes
4.4	Baseball's Real Origins	3 sessions of 50 minutes
4.5	Muscular Christianity and Tom Brown's School Days	3 sessions of 50 minutes

UNIT 4 TEST

Calculators are allowed. Show your work for every calculation: write the formula or conversion you used, substitute the numbers and give the answer with units and a sentence. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **7 pts**

Explain how four forces of the 1800s led to the codification of sport.

2. (6 pts)

When and by whom was Sheffield FC founded, and why is it important?

3. (6 pts)

With 10 clubs that each play every other club once, how many matches are needed? Show the formula.

4. (7 pts)

Describe the founding of the FA in 1863 and the role of Ebenezer Cobb Morley.

5. (6 pts)

Why did Blackheath and the rugby-playing clubs leave the FA, and when did they form the RFU?

6. (6 pts)

A field of 7,700 sq yd holds 40 rugby players or 22 football players. Find the area per player in each case.

7. (7 pts)

Describe the first Wimbledon Championship: date, number of entrants, winner and reason for holding it.

8. (6 pts)

Find the area of a singles court of 78×27 ft in square feet and square metres (1 ft = 0.3048 m).

9. (6 pts)

Convert the 1877 net height at the posts (5 ft) and today's centre height (3 ft) to centimetres.

10. (7 pts)

List four of the Knickerbocker rules of 1845.

11. (7 pts)

Find the distance from home plate to second base on a 90-ft diamond, showing the Pythagorean theorem.

12. (7 pts)

Give three pieces of evidence against the claim that Abner Doubleday invented baseball in 1839.

13. (6 pts)

What was muscular Christianity, and name two people or institutions connected with it.

14. (6 pts)

Quote or paraphrase 1 Timothy 4:8 and explain how it keeps sport in its proper place.

15. (10 pts)

Short essay. In about 200 words, choose two of the sports codified in this unit and compare how and why their rules were written. Then explain what the Doubleday myth teaches about how history should be done.

ANSWER KEY

1. Railways let teams travel and play in a day; schools and universities brought players of different codes together; clubs organised regular matches; newspapers and the telegraph spread results and rules; the Saturday half-holiday gave workers time to play and watch.
2. October 24, 1857, by Nathaniel Creswick and William Prest; it is the world's oldest football club and wrote its own influential rules in 1858.
3. $10 \times 9 \div 2 = 45$ matches.
4. Clubs met at the Freemasons' Tavern, London, on October 26, 1863; Morley, of Barnes, proposed the meeting, became secretary and wrote the laws, thirteen of which were adopted in December 1863.
5. They wanted to keep carrying the ball and hacking; they formed the Rugby Football Union on January 26, 1871.
6. 192.5 sq yd for rugby; 350 sq yd for football.
7. July 1877 (final July 19); 22 entrants; Spencer Gore won; it was held to raise money to repair the club's pony roller.
8. 2,106 sq ft; $23.77 \text{ m} \times 8.23 \text{ m} \approx 195.6 \text{ m}^2$.
9. 152.4 cm and 91.4 cm.
10. Any four: 42 paces home to second and first to third; underhand pitching; no soaking; foul lines; three outs; 21 aces to win; a ball caught on the first bounce is out.
11. $\sqrt{90^2 + 90^2} = 90\sqrt{2} \approx 127.3 \text{ ft}$.
12. Doubleday was at West Point in 1839; he never claimed it; the only witness was about five years old and wrote 66 years later; and the game is mentioned in 1744 and 1791.
13. A movement linking physical strength and sport with Christian character and service; any two: Thomas Arnold, Thomas Hughes, Charles Kingsley, George Williams and the YMCA, C. T. Studd, the Springfield training school.
14. Bodily exercise profits a little, but godliness profits in everything, now and forever. Exercise is good but secondary; character and faith come first.
15. Answers vary. A strong essay compares two codification stories accurately (for example the FA's 1863 meetings and Wimbledon's 1877 committee), names the forces behind each, and explains that the Doubleday myth shows the danger of accepting one late, convenient testimony instead of weighing all the evidence.

PORTFOLIO PIECE: THE FOUNDING DOCUMENTS OF A SPORT

Choose one sport from this unit. Prepare a short “founding documents” file of four to six pages: (1) a timeline of its codification with at least eight dated events; (2) a side-by-side table comparing at least six of its earliest written rules with the rules today, with the reason for each change; (3) a scale drawing of its field or court then and now, with one calculation (area, distance or a Pythagorean diagonal); (4) a one-page analysis of one legend or disputed claim about its origin, weighing the evidence; and (5) a record of a game you played under the earliest rules.

LOOK FOR	WHAT IT MEANS
Timeline and sources	At least eight correct, dated events, with the sources of key claims noted.
Rules comparison	Six or more rules compared accurately with clear reasons for change.
Mathematics	A correct scale drawing and at least one correct calculation with units.
Historical judgement	The legend or disputed claim is weighed fairly, using the reliability of each source.
Play	A real game under the old rules is recorded honestly, with observations.

AMERICAN INVENTIONS

Some of the world's most popular games were invented on purpose, by people we can name, in a single place and year. This unit tells their stories: James Naismith's basketball (1891) and William Morgan's volleyball (1895), both born in YMCA gymnasiums in Massachusetts; Walter Camp's American football and the reforms of 1905–06 that saved it; George Hancock's softball (1887) and the travels of baseball to Japan, Cuba and Korea; and Pierre de Coubertin's revival of the Olympic Games in Athens in 1896.

You will play basketball by Naismith's original thirteen rules, play mintonette and modern volleyball, test three eras of football rules with two-hand touch, measure balls and check π , and hold a family pentathlon. You will see how inventors design rules to solve problems, how rule-makers change behaviour by changing incentives, and how a good game can travel the world.

PREREQUISITES

- The rule-making of Unit 4, especially muscular Christianity and the YMCA (Lesson 4.5)
- Unit conversions and the Pythagorean theorem
- Circumference $C = \pi d$ and speed = distance $\div$ time

MASTERY CHECKLIST

- ☐ I can tell the story of Naismith's invention of basketball and explain how his rules solved specific problems.
- ☐ I can explain how Morgan designed volleyball and compare his court and net with today's.
- ☐ I can explain Walter Camp's scrimmage and downs and the 1906 reforms, and calculate yards per down.
- ☐ I can trace softball's invention and baseball's spread to Japan, Cuba and Korea, and compute ball sizes from circumferences.
- ☐ I can describe Coubertin's revival of the Olympics and the Athens Games, and calculate paces and Olympic counts.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Naismith Memorial Basketball Hall of Fame**: Free website of the Hall of Fame in Springfield, Massachusetts, with the history of the game and Naismith's rules, for Lesson 5.1. A visit is optional. Ages 10+.
- **International Volleyball Hall of Fame**: Free website of the Hall of Fame in Holyoke, the birthplace of volleyball, with Morgan's story, for Lesson 5.2. Ages 10+.

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 Naismith's Thirteen Rules	3 sessions of 50 minutes
5.2 Morgan's Mintonette Becomes Volleyball	3 sessions of 50 minutes
5.3 Walter Camp and the Football Reforms of 1905–06	3 sessions of 50 minutes
5.4 Softball and Baseball Around the World	3 sessions of 50 minutes
5.5 Coubertin and the Modern Olympics, Athens 1896	3 sessions of 50 minutes

UNIT 5 TEST

Calculators are allowed. Show your work for every calculation: write the formula or conversion, substitute the numbers and give the answer with units and a sentence. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **7 pts**

Tell the story of the invention of basketball in four sentences: who, where, when and why.

2. **7 pts**

Explain how two of Naismith's rules solved specific problems.

3. (6 pts)

Convert 10 ft to metres and 6 ft 6 in to metres.

4. (6 pts)

Who invented volleyball, for whom, and how did it get its name?

5. (6 pts)

A volleyball set ends 25–21. How many rallies were played under rally scoring?

6. (7 pts)

What did Walter Camp introduce in 1880 and 1882, and why was each needed?

7. (7 pts)

Describe the crisis of 1905 and four reforms of 1906.

8. (6 pts)

Find yards needed per down under the 1906 rule and the 1912 rule.

9. (6 pts)

Where, when and how did softball begin?

10. (7 pts)

Name the person who brought baseball to Japan and to Korea, with dates, and the place of Cuba's first recorded organised game.

11. (6 pts)

Find the diameter of a ball with circumference 12 in, and the volume ratio of a 12-inch ball to a 9-inch ball.

12. (6 pts)

When and where was the IOC founded, and who was its founder and its first president?

13. (7 pts)

Spyridon Louis ran about 40 km in 2:58:50. Find his average speed in km/h.

14. (6 pts)

Explain the Christian origins of the Olympic motto and creed.

15. **10 pts**

Short essay. In about 200 words, compare how basketball and volleyball were invented. What problem did each inventor solve, how did the YMCA shape both games, and what does their story teach about designing good rules?

ANSWER KEY

1. James Naismith, an instructor at the International YMCA Training School in Springfield, Massachusetts, invented basketball in December 1891, when Luther Gulick asked him to devise an indoor winter game for a restless class. He nailed peach baskets ten feet high and wrote thirteen rules. The first game, nine a side, ended 1–0.
2. Any two: no running with the ball removed the reason to tackle; a raised goal prevented crowding the goal and required a skilful arcing shot; banning striking, holding and pushing kept play clean; three consecutive fouls giving a goal discouraged fouling.
3. 3.048 m; $78 \text{ in} \times 2.54 = 198.1 \text{ cm} \approx 1.98 \text{ m}$.
4. William G. Morgan at the Holyoke YMCA in 1895, for businessmen who found basketball too strenuous; Alfred Halstead suggested “volley ball” at Springfield in 1896 because the game consisted of volleying.
5. 46 rallies.
6. The line of scrimmage (1880), to give one team clear possession instead of a scrum; downs (1882), to stop teams holding the ball indefinitely by requiring a gain of five yards in three downs.
7. At least eighteen players died in 1905, mostly in mass plays; colleges met and formed the IAAUS (later NCAA). Reforms: legal forward pass, ten yards in three downs, neutral zone, six men on the line, sixty-minute game.
8. $10 \div 3 \approx 3.33 \text{ yd}$; $10 \div 4 = 2.5 \text{ yd}$.
9. At the Farragut Boat Club, Chicago, on Thanksgiving Day 1887, when George Hancock tied a boxing glove into a ball and used a broom handle as a bat, inventing “indoor baseball.”
10. Horace Wilson, Tokyo, about 1872; Philip Gillett, Korea, 1905; Palmar de Junco, Matanzas, December 1874.
11. $12 \div \pi \approx 3.82 \text{ in}$; $(12/9)^3 = 64/27 \approx 2.37$.
12. June 23, 1894, at the Sorbonne in Paris; founded at Coubertin’s initiative, with Demetrios Vikelas as first president.
13. $2:58:50 \approx 2.981 \text{ h}$; $40 \div 2.981 \approx 13.4 \text{ km/h}$.
14. The motto *Citius, Altius, Fortius* was coined by the Dominican priest Henri Didon for his school’s sports; the creed came from Bishop Ethelbert Talbot’s 1908 sermon at St Paul’s, London.

15. Answers vary. A strong essay explains that Naismith needed a vigorous, clean indoor game for restless young men and Morgan a gentler game for businessmen; that both were YMCA men trained at Springfield with a Christian vision of physical education; that the YMCA spread both worldwide; and that both designed rules by starting from a clear problem and choosing rules that changed players' incentives.

PORTFOLIO PIECE: INVENT A GAME

Follow Naismith's and Morgan's method to invent a new game for a real group of people you know (your family, a youth group or a co-op class) and a real space you have. Your portfolio must include (1) a one-page statement of the problem: who will play, where, with what equipment, and what the game must achieve (exercise, fairness, safety, fun for different ages); (2) no more than thirteen numbered rules, each with a note on the problem it solves; (3) a scale drawing of the playing area with measurements; (4) records of at least three trial games, with scores and any problems that arose; and (5) a revised rule set with an explanation of every change, as Naismith's game was revised after its first seasons.

LOOK FOR	WHAT IT MEANS
Problem statement	A clear description of the players, space and goals of the game.
Rules	Thirteen or fewer clear rules, each tied to a stated problem.
Measurement	An accurate scale drawing with dimensions and any calculations.
Testing and revision	Records of three real trials and thoughtful revisions supported by those records.

5.1 NAISMITH'S THIRTEEN RULES

OBJECTIVES

- Tell the story of James Naismith's invention of basketball at the YMCA training school in Springfield, Massachusetts, in December 1891.
- Explain how Naismith designed the game by reasoning from problems to rules, and read his original thirteen rules.
- Compare the first game with the modern game using numbers: players, time, scoring and dimensions.
- Explain how Naismith's Christian purpose shaped the game he invented.

Warm-up. You have a room 15 m by 10 m, a ball, two baskets and eighteen restless young men in winter. Write down three dangers of an indoor ball game and one rule that would prevent each. Then compare your rules with Naismith's.

WATCH

The History of Basketball

Basketball U • 12:55

<https://www.youtube.com/watch?v=JRSYmQr73g0>

WHEN TO WATCH

After the story paragraph. An illustrated history of the game from Naismith's peach baskets to the modern professional game.

BACKUP VIDEO

Heritage Minutes: Basketball

Historica Canada • 1:01

<https://www.youtube.com/watch?v=xiJJlacf-E>

After the story paragraph, as a one-minute dramatisation of the first game in Springfield in 1891.

KEY TERMS

International YMCA Training School

The college in Springfield, Massachusetts (now Springfield College), that trained YMCA secretaries and physical directors; basketball was invented there.

Duck on a Rock

A Canadian children's game of throwing stones at a target on a rock; Naismith said its lobbed throw gave him the idea of an arcing shot at a raised goal.

The Triangle

The Springfield school's magazine, which first printed Naismith's thirteen rules on January 15, 1892, under the title "A New Game."

Luther Gulick

Head of physical education at the Springfield school, who asked Naismith in 1891 to invent an indoor game for the winter.

foul

In Naismith's rules, holding, pushing, tripping or striking an opponent, or hitting the ball with the fist; three consecutive fouls by one side gave the other side a goal.

CORE IDEAS

The story. In December 1891 the young instructor James Naismith faced a problem. A class of eighteen men at the International YMCA Training School in Springfield, Massachusetts, was bored with marching, calisthenics and apparatus work through the New England winter, and two instructors had already given up on them. Luther Gulick, head of the department, gave Naismith two weeks to invent an indoor game. Naismith, born in 1861 near Almonte, Ontario, had studied theology at Presbyterian College in Montreal and believed that sport could build Christian character. After several failed attempts to adapt football, soccer and lacrosse for indoors, he sat down to reason the problem out. He asked the janitor for two boxes; he was given two peach baskets instead. He nailed them to the railing of the gymnasium's running track, ten feet above the floor, pinned his thirteen rules to the notice board, divided the class into two teams of nine, and tossed up a soccer ball. The final score was 1-0; William R. Chase made the only goal.

How it changed. Naismith reasoned from problems to rules. Tackling was dangerous on a wooden floor, so no one could run with the ball; it had to be passed. Players crowding a goal would be rough, so the goal was placed above their heads and a soft, lobbed shot was needed to score. The rules were printed in *The Triangle* on January 15, 1892, and YMCA graduates carried them across the country and the world within months. Spectators in the running-track gallery reached over to deflect shots, so backboards appeared in the 1890s; the baskets lost their bottoms around 1912, ending the need to fetch the ball with a ladder or pole; dribbling developed as a way to move with the ball. Senda Berenson adapted the game for women at Smith College in 1892. Basketball became an Olympic sport in 1936, and Naismith, then seventy-four, was there to see it.

How it is played. Naismith's thirteen rules still describe the heart of the game: the ball may be thrown or batted in any direction with one or both hands, but not with the fist; a player may not run with it; there is no shouldering, holding, pushing, tripping or striking; a goal is made when the ball is thrown or batted into the basket and stays there; and the side with the most goals wins. The original game had two fifteen-minute halves and an umpire and a referee. Modern basketball adds the dribble, five players a side, a shot clock and three-point shots, but a player from 1891 would recognise it at once.

Why it matters. Basketball is one of the few major sports invented by a known person on a known date, and it was invented by a man of faith for a purpose. Naismith wanted a game that was vigorous but clean, that rewarded skill over brute force and that could be played by anyone indoors. He later became a doctor, a professor at the University of Kansas and a lifelong teacher of physical education. His method, define the problem, then design the rules to solve it, is a model for anyone who makes things, and the game he made is now played in almost every country on earth.

PICTURE STUDY



James Naismith at Springfield College, Springfield College (photographer unknown), about 1920 · Photograph · Springfield College Archives, Springfield, Massachusetts
Image: [Wikimedia Commons](#), public domain

By the time this portrait was taken, about 1920, James Naismith was a doctor of medicine and a professor at the University of Kansas, and the game he had invented in a winter fortnight was played across the world.

He never sought to make money from basketball. He spent his life teaching physical education and caring for the young men in his charge.

Look closely

- Look at his expression. What words would you use to describe the man?
- Look at his spectacles and dress. Does he look like an athlete, a teacher or a minister? Why might he be all three?
- Imagine him at thirty, nailing up the peach baskets. What would have been different about him?

Talk about it

1. Naismith invented the game to solve a problem in a gym class. What does that tell you about where good inventions come from?
2. Why might a man trained in theology care so much about how young men played games?

3. If you could ask Naismith one question about today's game, what would it be?

Safety first. Play your Naismith game with a soft ball and a basket or laundry hamper fixed securely at a safe height. Clear the space of furniture, keep away from windows and play without pushing or holding, as Naismith's rules require.

PROJECT

Play the Thirteen Rules

You will set up a peach-basket game at home, play strictly by Naismith's original thirteen rules, and compare it with a version using modern rules.

You will need

- A soft ball (a soccer ball or foam ball)
- Two baskets, buckets or hampers fixed securely at a safe height (a fence, a garage wall or a shelf)
- At least four players
- A stopwatch and your scorebook

Steps

1. Copy Naismith's thirteen rules into your scorebook from *The Triangle* text (found in many library books and on the Springfield College and Naismith Hall of Fame websites), or use the summary in this lesson.
2. Set the baskets at opposite ends of your space. Appoint a referee (fouls) and an umpire (goals and time).
3. Play two 5-minute halves under the 1891 rules: no running with the ball, no dribbling, no contact; three consecutive fouls give the opponents a goal; after each goal, jump ball in the centre.
4. Record goals, fouls, and how many passes led to each goal.
5. Play two more 5-minute halves allowing the modern dribble. Record the same things.
6. Compare the two games in a table and write a paragraph: what did the dribble change? Did Naismith's rules achieve his goal of a clean, skilful game?

Tips

- Count passes aloud so the umpire can record them.
- The ball has to be fetched from a basket with a bottom: notice how that slows the game.

Check your work

- ☐ I played two halves under the 1891 rules and two with the dribble.
- ☐ I recorded goals, fouls and passes for both games.
- ☐ My paragraph uses my data to judge Naismith's rules.

SCOREBOOK

1. Draw the Springfield gymnasium as you imagine it, with the baskets on the gallery railing, labelled with heights.
2. List Naismith's rules beside the problem each solves.
3. Record your two games in a comparison table.

From history. Naismith refused to have the game named after him. When one of his students, Frank Mahan, suggested "Naismith ball," Naismith laughed the idea away; Mahan then suggested "basket ball," and the name stuck.

WORKED EXAMPLES

Example 1. Convert the 10-foot basket height to metres ($1 \text{ ft} = 0.3048 \text{ m}$). If a player's reach (standing, arm raised) is 2.35 m, how far above his fingertips is the rim?

Show solution

$$1. 10 \times 0.3048 = 3.048 \text{ m.}$$

$$2. 3.048 - 2.35 = 0.698 \text{ m.}$$

Answer: The rim is 3.05 m high, about 70 cm above this player's reach: high enough that the ball must be shot, not placed, as Naismith intended.

Example 2. The first game had 18 players on a floor about 15 m by 10 m. A modern court is 28 m by 15 m with 10 players. Compare the floor area per player.

Show solution

1. First game: $15 \times 10 = 150 \text{ m}^2$; $150 \div 18 \approx 8.3 \text{ m}^2$ per player.
2. Modern: $28 \times 15 \div 10 = 42 \text{ m}^2$ per player.
3. $42 \div 8.3 \approx 5.1$.

Answer: A modern player has about five times as much floor as a player in 1891 (the 1891 floor size is approximate). No wonder early games were crowded and low scoring.

Example 3. The first game was 1–0 in two 15-minute halves. A modern game might end 110–104 in 48 minutes, with field goals worth 2 points. Ignoring free throws and three-pointers, roughly how many baskets per minute were scored in each game?

Show solution

1. 1891: 1 goal in 30 minutes ≈ 0.033 goals per minute.
2. Modern: $(110 + 104) \div 2 = 107$ baskets (counting each as 2 points), $107 \div 48 \approx 2.2$ baskets per minute.
3. $2.2 \div 0.033 \approx 67$.

Answer: Roughly 67 times as many baskets per minute today. Backboards, open nets, the dribble, fewer players and better shooting all raised the scoring.

PRACTICE

1. Easy Where and in what month and year did Naismith invent basketball?

Show answer

At the International YMCA Training School in Springfield, Massachusetts, in December 1891.

2. Easy How many players were in the first game, and what was the score?

Show answer

Eighteen (nine a side); 1–0.

3. Easy What did Naismith use for goals?

Show answer

Two peach baskets nailed to the gallery railing, ten feet above the floor.

4. Medium Why did Naismith forbid running with the ball?

Show answer

To prevent tackling, which was dangerous on a hard wooden floor; without running, players had to pass, and defenders had no reason to tackle.

5. Medium Why did Naismith put the goal above the players' heads?

Show answer

A raised goal could not be defended by crowding in front of it, and it required a soft, arcing shot rather than a hard throw, which made the game more skilful and less rough.

6. Medium In Naismith's rules, what happened if one side made three consecutive fouls?

Show answer

The other side was credited with a goal.

7. Medium List three changes to basketball after 1891, with the problem each solved.

Show answer

Any three: backboards (spectators deflecting shots); open-bottomed nets (fetching the ball after each goal); the dribble (moving with the ball); five a side (crowding); the shot clock (stalling).

8. Medium How many years passed between the first game and basketball's first Olympic tournament?

Show answer

$1936 - 1891 = 45$ years.

9. **Hard** A team scores 96 points with 30 two-point baskets, some three-point baskets and 18 free throws (1 point each). How many three-pointers did it make?

Show answer

$30 \times 2 + 18 = 78$; $96 - 78 = 18$; $18 \div 3 = 6$ three-pointers.

10. **Hard** Naismith designed the game by reasoning from problems to rules. Choose one problem in a game you play and design one rule to solve it, explaining your reasoning.

Show answer

Answers vary. A strong answer states the problem precisely, proposes a clear rule, and explains how the rule changes players' incentives (as Naismith's no-running rule removed the reason to tackle).

11. **Challenge** A ball is released 2.1 m above the floor and must drop into a rim 3.05 m high. If the ball's path reaches a maximum height of 4.0 m, how far does it rise and how far does it fall? Why does a higher arc make a basket easier, as Naismith hoped?

Show answer

It rises $4.0 - 2.1 = 1.9$ m and falls $4.0 - 3.05 = 0.95$ m to the rim. A higher arc brings the ball down more steeply, so the rim presents a larger opening to it and small errors are less costly.

COMMON MISTAKES

- Saying basketball began with dribbling. The dribble developed later; at first the ball moved only by passing.
- Thinking Naismith was American-born. He was born in Ontario, Canada, and later became an American citizen.
- Confusing the date of the first game (December 1891) with the date the rules were printed (January 15, 1892).

Make it a game • Peach Basket Rules. Set a basket or wastebasket across the room. Before each paper-ball shot, recall one fact about Naismith's invention: the Springfield YMCA, December 1891, Luther Gulick, Duck on a Rock, or one of the thirteen rules. A fact is required to earn the shot. Score one point for each basket. Race to ten, with no dribbling and no running.

Scripture. "And whatsoever ye do, do it heartily, as to the Lord, and not unto men;" (Colossians 3:23, KJV)

Naismith invented a game in a gym class and spent his life teaching physical education. Paul's words remind us that even ordinary work and play can be done for the Lord.

5.2 MORGAN'S MINTONETTE BECOMES VOLLEYBALL

OBJECTIVES

- Tell how William G. Morgan invented mintonette at the Holyoke YMCA in 1895 and how it was renamed volleyball in 1896.
- Explain how Morgan designed a gentler game for older businessmen, borrowing from tennis, basketball and handball.
- Compare Morgan's court, net and scoring with today's using unit conversions.
- Explain why the YMCA spread volleyball around the world so quickly.

Warm-up. Keep a balloon in the air as long as you can with a partner, using only your hands, without catching it. Count your touches. What made the rally end?

WATCH

International Volleyball Hall of Fame - Virtual Museum Tour

International Volleyball Hall of Fame · 9:33

<https://www.youtube.com/watch?v=b-VAVs9V8fk>

WHEN TO WATCH

After the how-it-changed paragraph. The director of the International Volleyball Hall of Fame in Holyoke shows Morgan's story and early equipment.

BACKUP VIDEO

9th February 1895: Volleyball invented by William G. Morgan

HistoryPod · 2:32

<https://www.youtube.com/watch?v=EclLnVJ1rlw>

Before session 2, as a short narrated summary of Morgan's invention.

KEY TERMS

mintonette

The name William G. Morgan first gave his game in 1895, perhaps from badminton, which it resembled.

volley

To hit the ball back before it touches the ground; volleyball is named for this.

Holyoke YMCA

The Young Men's Christian Association in Holyoke, Massachusetts, where Morgan was physical director when he invented the game.

rally scoring

Modern scoring in which a point is won on every rally, no matter which side served; adopted internationally in 1999.

rotation

The rule that players move one position clockwise each time their side wins back the serve, so everyone serves and plays every position.

CORE IDEAS

The story. William G. Morgan, born in 1870 in Lockport, New York, studied at the YMCA training school in Springfield, where he met James Naismith. In 1895, as physical director of the YMCA in Holyoke, Massachusetts, he had a class of businessmen who found basketball too rough and too tiring. Morgan wanted a game with less running and no collisions. He raised a tennis net to 6 feet 6 inches above the floor, a little above an average man's head, and had players bat a ball back and forth over it. The leather case of a basketball was too heavy and the inner bladder too light, so he asked the A. G. Spalding company to make a ball, light and soft enough to be hit with the hands. He called his game mintonette.

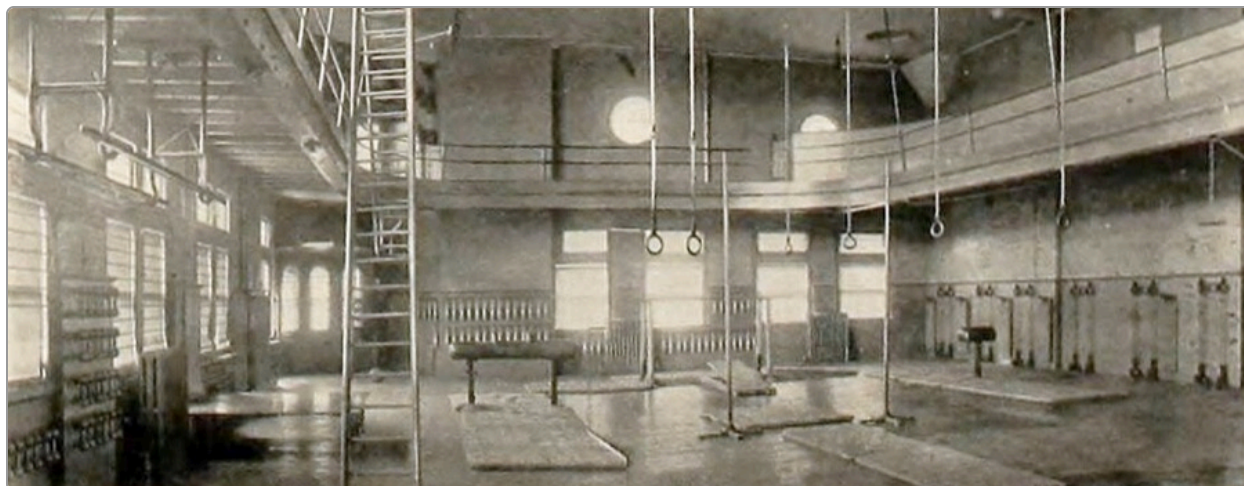
How it changed. In 1896 Morgan's teams played the game before a conference of YMCA physical directors in Springfield. A professor there, Alfred T. Halstead, noticed that the whole game consisted of volleying the ball over the net and suggested the name "volley ball." The YMCA printed its rules, and its secretaries carried the game across America and overseas: to Canada, then to the Philippines, Japan, China and South America in the early 1900s. In the Philippines around 1916 players developed the set and the spike, turning a gentle pastime into a fast, attacking sport. Volleyball entered the Olympic Games in Tokyo in 1964.

How it is played. Morgan's game allowed any number of players and was played in nine "innings," with each side serving in turn; a server had a second chance if his first serve failed. Today six players a side rotate through the positions; each side may touch the ball up to three times before sending it back; a player may not touch it twice in a row; and the first side to 25 points, winning by two, wins a set. The men's

net is now 2.43 metres high and the women's 2.24 metres, and the court is 18 metres by 9.

Why it matters. Morgan's game shows the same Christian purpose as Naismith's: physical education for the whole person, open to all ages, played with courtesy. Because it needs little equipment and no physical contact, volleyball became one of the most widely played sports in the world, in churches, schools, villages and on factory grounds. It also shows that a good game can be designed for people who are not young athletes; Morgan's first players were middle-aged businessmen.

PICTURE STUDY



Interior of the Old Holyoke YMCA Gymnasium, Holyoke YMCA, published in the Holyoke Transcript, 1897

· Photograph · Holyoke, Massachusetts

Image: [Wikimedia Commons](#), public domain

This is the gymnasium where William G. Morgan worked and where volleyball was born. It was photographed in 1897, two years after he invented the game.

Notice the apparatus: ropes, rings, ladders and bars. This was the equipment of the gymnastics that bored so many young and middle-aged men, and that Naismith and Morgan wanted to replace with games.

Look closely

- Look at the height of the ceiling and the gallery. Where might Morgan have strung his net?
- Find the ropes, rings and ladders. What kind of exercise were they for?
- Look at the floor space. How many players could fit on a court here?
- Look for windows and lights. Why would an indoor game need good light?

Talk about it

1. Why might a game played over a net suit this room better than basketball did?
2. What does this room suggest about how the YMCA thought exercise should be done before games like volleyball arrived?
3. Morgan designed his game for the room and the people he had. What would you design for the room and people you have?

Safety first. Use a balloon or a very light soft volleyball, play in a clear space away from furniture and windows, and keep play gentle: no jumping into the net or diving onto hard floors.

PROJECT

Mintonette and Modern Volleyball

You will set up a home net at Morgan's original height (scaled if needed), play by his 1895-style rules and by modern rules, and record rallies.

You will need

- A string or rope tied between two chairs, posts or trees for a net
- A balloon or a light soft ball
- A tape measure
- At least two players (more is better)
- Your scorebook

Steps

1. Mark a court about 4 m by 8 m (or whatever fits) with a net across the middle. Set the net at a height that is a little above the tallest player's head, as Morgan did.
2. Game 1, mintonette: any number of players; each side serves in turn for an "inning"; a server gets a second try if the first fails; the ball may be hit any number of times on a side. Play three innings and record the length of every rally (number of hits).
3. Game 2, modern: up to three touches per side; no player may touch the ball twice in a row; rally scoring to 15. Record rally lengths and points.
4. Compute the average rally length in each game.
5. Raise the net by 20 cm and play five more modern rallies. What changes?
6. Write a paragraph comparing the two games and explaining why the three-touch rule changed volleyball.

Tips

- A balloon is ideal indoors: it moves slowly enough for beginners to rally.
- Have one person count hits aloud.

Check your work

- ☐ I played both versions and recorded rally lengths.

- ☐ I calculated average rally lengths.
- ☐ My paragraph explains the effect of the three-touch rule with my data.

SCOREBOOK

1. Draw Morgan's 1895 court and today's court side by side to scale, with dimensions in feet and metres.
2. Record your rallies in a table and draw a bar chart of rally lengths.
3. Make a timeline of volleyball from 1895 to 1964.

From history. Holyoke is now home to the International Volleyball Hall of Fame, and the city celebrates its place as the birthplace of the game.

WORKED EXAMPLES

Example 1. Morgan's net was 6 ft 6 in high. Convert to metres and compare it with today's men's net (2.43 m) and women's net (2.24 m). (1 in = 2.54 cm.)

Show solution

1. 6 ft 6 in = 78 in.
2. $78 \times 2.54 = 198.1 \text{ cm} \approx 1.98 \text{ m}$.
3. Men's: $2.43 - 1.98 = 0.45 \text{ m}$ higher. Women's: $2.24 - 1.98 = 0.26 \text{ m}$ higher.

Answer: 1.98 m. Today's nets are 26 to 45 cm higher, because the spike made a higher net necessary.

Example 2. Morgan's court was 25 ft wide and 50 ft long. Today's court is 9 m by 18 m. Compare the areas in square metres.

Show solution

1. 25 ft = 7.62 m; 50 ft = 15.24 m.
2. Morgan: $7.62 \times 15.24 \approx 116.1 \text{ m}^2$.
3. Today: $9 \times 18 = 162 \text{ m}^2$.
4. $162 \div 116.1 \approx 1.40$.

Answer: Today's court is about 40% larger in area than Morgan's.

Example 3. Under rally scoring a set is won at 25 points with a margin of two. In a set that ends 25–23, how many rallies were played? If the average rally lasts 8 seconds with 20 seconds between rallies, about how long did the set take?

Show solution

1. Every rally gives one point: $25 + 23 = 48$ rallies.
2. Each rally plus the break takes $8 + 20 = 28$ s.
3. $48 \times 28 = 1,344$ s ≈ 22.4 minutes.

Answer: 48 rallies, about 22 minutes (illustrative timings).

PRACTICE

1. Easy Who invented volleyball, where and when?

Show answer

William G. Morgan, at the YMCA in Holyoke, Massachusetts, in 1895.

2. Easy What did Morgan first call his game, and who renamed it?

Show answer

Mintonette; Alfred T. Halstead suggested “volley ball” in 1896.

3. Easy Why did Morgan invent a new game rather than use basketball?

Show answer

His class of businessmen found basketball too rough and tiring; he wanted a game with less running and no physical contact.

4. Medium Name two sports Morgan borrowed from and one idea he took from each.

Show answer

Any two: tennis (the net), basketball (the ball), handball or badminton (hitting the ball with the hand or volleying).

5. Medium Where and roughly when were the set and spike developed?

Show answer

In the Philippines, around 1916.

6. **Medium** Convert the women's net height of 2.24 m to feet and inches.

Show answer

$$2.24 \div 0.3048 \approx 7.35 \text{ ft} \approx 7 \text{ ft } 4 \text{ in.}$$

7. **Medium** How many years separate the invention of volleyball and its first Olympic tournament?

Show answer

$$1964 - 1895 = 69 \text{ years.}$$

8. **Medium** Explain how the rotation rule makes volleyball fair to every player.

Show answer

Each player rotates through every position and takes a turn serving, so no one can stay only at the net or only at the back; every player must learn every skill.

9. **Hard** Under the old side-out scoring, only the serving side could score. Why did that make matches longer and harder to schedule?

Show answer

Many rallies produced no point (a side-out only changed the serve), so the number of rallies in a set varied widely and long matches were common; rally scoring makes every rally count and match length more predictable.

10. **Hard** Why did the YMCA spread volleyball so quickly?

Show answer

It had trained physical directors in many cities and countries, printed rules, gymnasiums, and a mission to promote healthy recreation; the game needed little equipment and suited all ages.

11. **Challenge** A spike is hit from 3.2 m high and travels in a straight line to land 6 m beyond the point directly below the hit. Does it clear a 2.43 m net that is 1.0 m in front of the hitter (horizontally)? Show your reasoning with similar triangles.

Show answer

The ball drops 3.2 m over 6 m of horizontal distance, so after 1.0 m it has dropped $3.2 \times (1.0/6) \approx 0.53$ m, and its height is $3.2 - 0.53 \approx 2.67$ m. That is above 2.43 m, so it clears the net by about 24 cm.

COMMON MISTAKES

- Saying volleyball was invented in Springfield. It was invented in Holyoke; it was shown to YMCA directors and renamed at Springfield.
- Forgetting to convert feet and inches fully before converting to metres.
- Thinking the spike was part of Morgan's game. It developed about twenty years later.

Make it a game • Balloon Mintonette. Tie a string across a room as a net and keep a balloon airborne in a volleying rally with your parent. Before each hit, call out a fact about William G. Morgan, the Holyoke YMCA, 1895, mintonette becoming volleyball in 1896, or rotation. No repeats. Count your rally. Beat your record on the next try.

5.3 WALTER CAMP AND THE FOOTBALL REFORMS OF 1905–06

OBJECTIVES

- Explain how Walter Camp turned rugby into American football by introducing the line of scrimmage (1880) and the system of downs (1882).
- Describe the crisis of 1905 and the reforms of 1906, including the legal forward pass, that made football safer and more open.
- Calculate yards per down needed under different rules and compare field dimensions.
- Explain how rule changes, not bans, saved a dangerous sport.

Warm-up. Two teams line up nose to nose and may only push forward with the ball; there is no passing. Predict what kind of game results and what injuries would be common. Then read on.

WATCH

Does Walter Camp Deserve To Be Called "The Father Of American Football"?

Hardcore College Football History · 12:59

<https://www.youtube.com/watch?v=2Nd0gjPF2nQ>

WHEN TO WATCH

After the how-it-changed paragraph. A college-football historian weighs Walter Camp's scrimmage, downs and scoring rules, quoting Camp's own writing on the 1906 forward pass.

KEY TERMS

line of scrimmage

The imaginary line across the field where each play begins, with each team on its own side; introduced by Walter Camp in 1880 in place of rugby's scrum.

snap

Passing the ball back from the line of scrimmage to start a play, giving one team clear possession.

down

One play from the line of scrimmage; a team must gain a set distance in a set number of downs or give up the ball.

mass play

Formations such as the flying wedge, in which many players locked together to push the ball carrier forward; they caused many injuries before 1906.

forward pass

Throwing the ball forward to a teammate; made legal in 1906 to open up the game.

CORE IDEAS

The story. In the autumn of 1905 American college football was in crisis. Newspapers counted at least eighteen players dead from injuries that season, most of them in mass plays in which whole teams crashed together around the ball. Some colleges dropped the game. President Theodore Roosevelt, who admired football but feared for its future, called the coaches and leaders of Harvard, Yale and Princeton to the White House in October 1905 and urged them to reform it. After another player died in a game in November, the chancellor of New York University, Henry MacCracken, called a meeting of colleges in December. On December 28, 1905, sixty-two schools formed the Intercollegiate Athletic Association of the United States, renamed the National Collegiate Athletic Association (NCAA) in 1910, and set about rewriting the rules.

How it changed. American football had already been transformed once. In the 1870s colleges played a version of rugby, with the ball fought for in a scrum. Walter Camp, a Yale player and later Yale's unofficial coach, sat on the rules convention for decades. In 1880 he replaced the scrum with the line of scrimmage, giving one team clear possession; teams of eleven were adopted the same year. Teams then simply held the ball all game, so in 1882 Camp introduced downs: a team had three downs to gain five yards or lose the ball. He also worked out the values of different scores. His changes made a new game, but they also encouraged mass plays, because pushing a wedge forward was the surest way to gain yards. The 1906 reforms answered that: the forward pass was made legal, the distance for a first down was raised to ten yards in three downs, a neutral zone separated the teams, at least six men had to stand on the line, and the game was shortened to sixty minutes. On

September 5, 1906, Bradbury Robinson of Saint Louis University threw the first recorded legal forward pass, against Carroll College in Wisconsin.

How it is played. Each play starts at the line of scrimmage with a snap. The offence has four downs (adopted in 1912) to gain ten yards; if it succeeds it gets a new set of downs, and if it fails the ball goes to the other team. Teams may run or pass.

A touchdown has been worth six points since 1912; a field goal three; an extra point one or two. The field is 100 yards between the goal lines, plus two ten-yard end zones.

Why it matters. Football was saved not by abolition but by better rules, and the reforms show how rule-makers can change behaviour by changing incentives. The forward pass spread the play across the field and made speed and skill matter as much as weight. Safety reform has never ended: helmets, padding and rules against dangerous hits followed over the years. Camp himself, who also selected the first All-America teams, is remembered as the father of American football because he saw that the rules of a game shape its character.

PICTURE STUDY



The Yale Football Team of 1879, Unknown photographer, 1879 · Albumen photograph · Yale University, New Haven, Connecticut

Image: [Wikimedia Commons](#), public domain

This is the Yale team of 1879, the year before Walter Camp, then a Yale player, persuaded the rules convention to replace the scrum with the line of scrimmage. Notice how many players there are: in 1879 college football was still played with fifteen a side.

The ball is round-ended, like a rugby ball. Within a few years these same young men would be playing a new American game.

Look closely

- Count the players. How does the number compare with a modern team?
- Look at the clothing. What protection did players have?
- Find the ball. How is its shape different from a modern football?
- Look at the faces and postures. What do they suggest about how these players saw themselves?

Talk about it

1. Without helmets or pads, why would mass plays have been so dangerous for these players?
2. Why might a player on this team have been the one to change the rules of the whole game?

3. Compare this team photograph with a modern one. What has changed most?

Safety first. Play flag or two-hand-touch football only, with a soft ball, on grass, with no tackling, blocking or diving. Warm up first and stop if anything hurts.

PROJECT

Downs, Distance and the Forward Pass

You will play a simple two-hand-touch football game under three sets of rules (1882, 1906 and 1912) and record how often teams earn first downs and how often they pass.

You will need

- A soft football or foam ball
- Markers for a field about 40 m long, with a marker every 5 m
- At least four players (two a side)
- Your scorebook

Steps

1. Mark a field and decide a scale: 1 m = 1 yard.
2. Rule set A (1882): no forward passes; 3 downs to gain 5 yards. Each team gets four possessions. Record every play: run or lateral, yards gained, first down or not.
3. Rule set B (1906): forward passes allowed (one per play, from behind the line); 3 downs to gain 10 yards. Four possessions each. Record the same.
4. Rule set C (1912): forward passes allowed; 4 downs to gain 10 yards. Four possessions each.
5. For each rule set, compute the percentage of series that earned a first down and the percentage of plays that were passes.
6. Write a paragraph: how did each rule change the way you played? Which rule set produced the most open, least crowded game?

Tips

- Use two-hand touch to end a play, never tackling.
- One person can be the “chain crew” with a 10-step string.

Check your work

- ☐ I played all three rule sets with four possessions each.
- ☐ I recorded every play and calculated first-down and passing percentages.

- My paragraph uses my data to explain the effect of the rules.

SCOREBOOK

1. Draw a football field to scale with end zones and yard lines, labelled in yards and metres.
2. Make a timeline of American football rules from 1876 to 1912.
3. Record your three rule-set experiments in a table.

From history. Walter Camp also helped choose the first All-America team in 1889 and wrote dozens of books on football and fitness. During the First World War he led a fitness programme of daily exercises for American servicemen and government workers.

WORKED EXAMPLES

Example 1. Compare the average yards per down a team needed under three rules: 5 yards in 3 downs (1882), 10 yards in 3 downs (1906) and 10 yards in 4 downs (1912).

Show solution

1. 1882: $5 \div 3 \approx 1.67$ yd per down.
2. 1906: $10 \div 3 \approx 3.33$ yd per down.
3. 1912: $10 \div 4 = 2.5$ yd per down.

Answer: 1.67, 3.33 and 2.5 yards. Doubling the distance in 1906 made short pushing plays less useful and encouraged passing and end runs; the fourth down in 1912 balanced the game.

Example 2. A field is 100 yd between goal lines plus two 10-yd end zones, and $53\frac{1}{3}$ yd wide. Find its area in square yards and square metres ($1 \text{ yd} = 0.9144 \text{ m}$).

Show solution

1. Length: 120 yd. Area: $120 \times 53\frac{1}{3} = 6,400$ sq yd.
2. $120 \text{ yd} = 109.73 \text{ m}$; $53\frac{1}{3} \text{ yd} = 48.77 \text{ m}$.
3. $109.73 \times 48.77 \approx 5,351 \text{ m}^2$.

Answer: 6,400 sq yd, about 5,350 m^2 .

Example 3. If 18 players died from football injuries in the 1905 season, and roughly 7,000 college players took part (an illustrative number), what was the rate per 1,000 players?

Show solution

1. $18 \div 7,000 \approx 0.0026$.

2. $\times 1,000 \approx 2.6$ per 1,000.

Answer: About 2.6 deaths per 1,000 players in a single season, a rate no school could accept, which is why reform was urgent. (The number of players is illustrative.)

PRACTICE

1. **Easy** What did Walter Camp introduce in 1880 and in 1882?

Show answer

The line of scrimmage (1880) and the system of downs (1882).

2. **Easy** What organisation was founded on December 28, 1905, and what is it called today?

Show answer

The Intercollegiate Athletic Association of the United States; the NCAA (renamed in 1910).

3. **Easy** Who threw the first recorded legal forward pass, and when?

Show answer

Bradbury Robinson of Saint Louis University, on September 5, 1906.

4. **Medium** List four rule changes of 1906.

Show answer

Legal forward pass; ten yards in three downs; a neutral zone between the lines; six men on the line; a sixty-minute game.

5. **Medium** Why did Camp's 1882 downs rule unintentionally encourage mass plays?

Show answer

Teams needed only short gains, and locking many players together to push the ball forward was the surest way to get them.

6. **Medium** How did the forward pass make the game safer?

Show answer

It spread players across the field and gave teams a way to gain ground without massing together, so fewer plays ended in pile-ups.

7. **Medium** A team gains 3, 4 and 2 yards on three downs. Did it earn a first down under the 1882 rule? Under the 1906 rule?

Show answer

Total 9 yards. Yes under 1882 (5 yards needed); no under 1906 (10 yards needed).

8. **Medium** Why did the rugby scrum have to be replaced for American football to develop its own style?

Show answer

In a scrum neither side clearly possessed the ball; Camp's scrimmage gave one team possession and allowed planned plays.

9. **Hard** A team must gain 10 yards in 4 downs. If its average gain per down is 3.1 yards, how many yards would it gain in 4 downs on average? Will it usually make a first down? Why is average gain not the whole story?

Show answer

$3.1 \times 4 = 12.4$ yards on average, so usually yes. But gains vary from play to play; a loss or a stopped run on one down can make the remaining downs fall short.

10. **Hard** Compare how kings in Lesson 3.1 dealt with a dangerous game and how football's leaders dealt with it in 1905–06.

Show answer

Medieval kings tried to ban football, and failed; football's leaders kept the game and changed its rules to remove the most dangerous play, which succeeded.

11. **Challenge** Explain how the 1906 change from 5 to 10 yards for a first down changed the expected value of a running play that gains 2 yards with near certainty compared with a pass that gains 15 yards one-third of the time and nothing otherwise.

Show answer

The run averages 2 yards, the pass $15 \times 1/3 = 5$ yards. Under the 5-yard rule, three sure 2-yard runs (6 yards) always earned a first down, so the run was enough. Under the 10-yard rule three runs (6 yards) fall short, while the pass has a real chance of gaining 10 or more, so the pass becomes the better choice.

COMMON MISTAKES

- Saying Walter Camp invented the forward pass. He created the scrimmage and downs; the forward pass came in the 1906 reforms.
- Forgetting that four downs were not adopted until 1912.
- Treating a single play's gain as typical. Gains vary; averages and chances both matter.

Make it a game • Downs Drill. Draw a ten-segment field on paper and place a bean as the ball. Your parent plays a defender. You have three downs to advance five yards by moving the bean along the strip. When you fail, call the scrimmage line, the snap, and the down number. Then tell your parent what rugby did differently before Walter Camp.

5.4 SOFTBALL AND BASEBALL AROUND THE WORLD

OBJECTIVES

- Tell how softball began at the Farragut Boat Club in Chicago on Thanksgiving Day, 1887, and how it got its name.
- Trace baseball's spread to Japan (1872), Cuba (1860s–1870s) and Korea (1905), and the people who carried it.
- Compare the sizes of balls, bases and pitching distances in baseball and softball using circumference, diameter and ratios.
- Explain how a game takes root in a new country and becomes part of that nation's own culture.

Warm-up. Find a ball of any size and measure its circumference with a string. Predict its diameter, then measure across it with a ruler between two books. How close was your prediction?

WATCH

The Mainer who brought baseball to Japan

NEWS CENTER Maine · 7:22

<https://www.youtube.com/watch?v=HaDif5ElwgQ>

WHEN TO WATCH

After the how-it-changed paragraph. A Maine news report on Horace Wilson, the teacher who brought baseball to Japan in the 1870s.

BACKUP VIDEO

Looking into softball's history, beginnings in Chicago

NBC Chicago · 2:40

<https://www.youtube.com/watch?v=kfcCLVY0qVA>

After the story paragraph. A short Chicago news report on softball's beginnings in 1887.

KEY TERMS

indoor baseball

The first name of the game George Hancock invented in Chicago in 1887, played inside a gymnasium with a large soft ball.

Kaisei Gakko

A government school in Tokyo, a forerunner of the University of Tokyo, where the American teacher Horace Wilson introduced baseball around 1872.

national pastime

A sport so widely loved that it is seen as part of a nation's character, as baseball is in the United States, Japan, Cuba and Korea.

softball

The name adopted in the 1920s for baseball played with a larger, softer ball, a shorter pitching distance and underhand pitching.

circumference

The distance around a circle or a ball; it equals π times the diameter.

CORE IDEAS

The story. On Thanksgiving Day, November 24, 1887, a group of young men waited at the Farragut Boat Club in Chicago for the result of the Harvard–Yale football game. When it came in, a Yale supporter threw a boxing glove at a Harvard man, who swung at it with a broom handle. A reporter named George Hancock had an idea: he tied the glove into a ball, chalked a small diamond on the gymnasium floor and invented “indoor baseball” on the spot. Within a week he had written rules. The game moved outdoors, was played in Minneapolis by firemen as “kitten ball,” and went by many names until a YMCA official in Denver, Walter Hakanson, suggested “softball” in 1926. A great tournament at the Chicago World's Fair in 1933 made it a national game.

How it changed. Baseball itself travelled the world with teachers, students, sailors and missionaries. In Japan, an American teacher named Horace Wilson taught it to his students at the Kaisei Gakko in Tokyo around 1872, and a railway engineer, Hiroshi Hiraoka, who had learned the game in the United States, founded the first

Japanese team in 1878. By 1905 Waseda University's team was touring the American West Coast. In Cuba, students returning from the United States brought bats and balls in the 1860s, and the first recorded organised game was played at Palmar de Junco in Matanzas in December 1874. In Korea the YMCA missionary Philip Gillett introduced the game in 1905. In each country baseball became a national passion with its own style and customs.

How it is played. Softball keeps baseball's structure, nine players (ten in some forms), three outs and a diamond, but shrinks the field: bases 60 feet apart instead of 90, and a pitching distance of 43 feet in women's fastpitch instead of 60 feet 6 inches. The ball is 12 inches around (Chicago's famous variant uses a 16-inch ball and no gloves) compared with baseball's 9 inches, and it is pitched underhand. Because it needs less space and less equipment, softball became a game for schools, churches, factories and families.

Why it matters. A game spreads when people who love it teach it to others, and it takes root when the new players make it their own. Japanese high-school baseball, Cuban baseball and Korean baseball are each distinct, yet they share Hancock's and the Knickerbockers' game. Sport can be a bridge between peoples: a teacher in Tokyo, a missionary in Seoul and a boat club in Chicago each passed on something good, and generations have enjoyed it since.

PICTURE STUDY



The Waseda University Baseball Club, Unknown photographer, 1905 · Photograph · Taken during the team's tour of the United States

Image: [Wikimedia Commons](#), public domain

In 1905 the baseball team of Waseda University in Tokyo crossed the Pacific to play college teams on the American West Coast, the first Japanese team to tour the United States. This photograph shows the players in uniform with their supporters behind them.

Barely thirty years after Horace Wilson taught his students the game, Japanese players were good enough to come and compete in America.

Look closely

- Find the players in uniform and the men in suits. Who might the men in suits be?
- Look at the bats, gloves and caps. How do they compare with baseball equipment of the time in America?
- Look at the players' expressions. How do they seem to feel about representing their university abroad?
- Find the flag. What does it suggest about the importance of the trip?

Talk about it

1. Why might a university send its team across an ocean to play a foreign game?
2. What would the American players have learned from playing this team?

3. How does a sport become part of a new nation's own culture?

Safety first. Use a soft, oversized ball and a plastic or foam bat, swing only with a clear circle around the batter, and keep everyone else well back.

PROJECT

Measure the Balls and Play Hancock's Game

You will measure several balls, check the circumference formula, and play an indoor-baseball game in the spirit of Hancock's first game.

You will need

- Several balls of different sizes
- String and a ruler or tape measure
- A large soft ball (a soft playground ball or rolled-up towel tied with string) and a foam bat or broom handle wrapped in foam
- Four bases (paper plates)
- Your scorebook

Steps

1. For each ball, measure the circumference with a string and the diameter between two books. Compute $\text{circumference} \div \text{diameter}$ for each and compare with $\pi \approx 3.14$.
2. Make a table of your measurements and the ratio for each ball.
3. Set up a small diamond with bases about 9 m apart (or smaller indoors) and a pitching mark about 6 m from home.
4. Play an "indoor baseball" game with underhand pitching and the large soft ball, three outs a side, for four innings. Keep a line score.
5. Play two more innings with a smaller ball (a tennis ball). Compare hits and runs.
6. Write a paragraph: how did the ball size change the game? Why would a large soft ball suit an indoor game in 1887?

Tips

- Wrap the string around the ball's widest part and mark where it overlaps.
- Average three measurements for each ball.

Check your work

- ☐ I measured at least four balls and computed $C \div d$ for each.

- ☐ I played at least four innings with the large ball and two with the small ball.
- ☐ My paragraph compares the two with my line scores.

SCOREBOOK

1. Draw a softball diamond and a baseball diamond to the same scale, labelling base paths and pitching distances.
2. Draw a world map marking Chicago (1887), Tokyo (1872), Matanzas (1874) and Seoul (1905).
3. Record your ball measurements and line scores.

From history. Chicago still loves its 16-inch softball, played bare-handed with a ball so big and soft that fielders catch it without gloves, much as Hancock's first players did.

WORKED EXAMPLES

Example 1. A baseball has a circumference of 9 inches and a softball 12 inches. Find each diameter. ($d = C/\pi$.)

Show solution

1. Baseball: $9 \div 3.1416 \approx 2.86$ in.
2. Softball: $12 \div 3.1416 \approx 3.82$ in.
3. Chicago 16-inch ball: $16 \div 3.1416 \approx 5.09$ in.

Answer: About 2.9, 3.8 and 5.1 inches across.

Example 2. Because volume grows with the cube of the diameter, how many times larger in volume is a 12-inch softball than a 9-inch baseball?

Show solution

1. Ratio of diameters (same as ratio of circumferences): $12 \div 9 = 4/3$.
2. Volume ratio: $(4/3)^3 = 64/27 \approx 2.37$.

Answer: About 2.37 times the volume, though a softball is not 2.37 times heavier because it is less dense.

Example 3. A softball pitch travels 43 ft at 60 mph; a baseball pitch travels 60.5 ft at 90 mph. Which gives the batter more time? (1 mph $\approx$ 1.467 ft/s; ignore the release point.)

Show solution

1. Softball: 60 mph $\approx$ 88 ft/s; $43 \div 88 \approx 0.49$ s.
2. Baseball: 90 mph $\approx$ 132 ft/s; $60.5 \div 132 \approx 0.46$ s.

Answer: Almost the same, about half a second each. A fast softball pitch is as hard to hit as a fast baseball pitch because the shorter distance makes up for the lower speed.

PRACTICE

1. **Easy** Where and when was softball invented, and by whom?

Show answer

At the Farragut Boat Club, Chicago, on Thanksgiving Day, November 24, 1887, by George Hancock.

2. **Easy** Who introduced baseball in Japan, and about when?

Show answer

The American teacher Horace Wilson, at the Kaisei Gakko in Tokyo, around 1872.

3. **Easy** Who introduced baseball to Korea, and in what year?

Show answer

The YMCA missionary Philip Gillett, in 1905.

4. **Medium** Where and when was the first recorded organised baseball game in Cuba?

Show answer

At Palmar de Junco, Matanzas, in December 1874.

5. **Medium** Find the distance from home to second base on a 60-foot softball diamond.

Show answer

$60\sqrt{2} \approx 84.9$ ft.

6. **Medium** What is the ratio of softball base paths to baseball base paths? Of the areas of the two diamonds?

Show answer

$60 : 90 = 2 : 3$; areas $3,600 : 8,100 = 4 : 9$.

7. **Medium** Why did softball spread so quickly in American schools, churches and factories?

Show answer

It needed less space and equipment than baseball, was easier for beginners and all ages, and could be played after work or on small fields.

8. **Medium** How many years after the Knickerbocker rules (1845) did baseball reach Japan (about 1872)? Korea (1905)?

Show answer

About 27 years; 60 years.

9. **Hard** A ball has circumference 30 cm. Find its diameter and its volume ($V = \frac{4}{3}\pi r^3$).

Show answer

$d = 30/\pi \approx 9.55$ cm, $r \approx 4.77$ cm; $V \approx (4/3)(3.1416)(4.77)^3 \approx 455$ cm³.

10. **Hard** Name two ways a sport might change when it takes root in a new country.

Show answer

Any two: new customs (such as Japanese high-school tournaments), a different style of play, new vocabulary, different seasons or schedules, local heroes and traditions.

11. **Challenge** A batter needs about 0.15 s to swing. If his decision must be made by the time a pitch is halfway to the plate, how much time does he have to decide on a 43-ft softball pitch at 88 ft/s? Is that enough to swing after deciding?

Show answer

Halfway is 21.5 ft; $21.5 \div 88 \approx 0.24$ s to decide. The remaining half takes another 0.24 s, enough for a 0.15 s swing, but only just.

COMMON MISTAKES

- Using the circumference as the diameter. Divide by π .

- Assuming a ball with a larger circumference is proportionally heavier. Volume grows with the cube; weight also depends on material.
- Saying softball was always called softball. It had many names until the 1920s.

Make it a game • Circumference Guess. Gather three round household objects. Each of you guesses the circumference of each one, then wraps a string around it and measures. The closest guess wins a point. Between rounds, tell the story of the Farragut Boat Club in Chicago on Thanksgiving Day 1887 and the thrown glove that started softball.

5.5 COUBERTIN AND THE MODERN OLYMPICS, ATHENS 1896

OBJECTIVES

- Tell how Pierre de Coubertin revived the Olympic Games, from the Sorbonne congress of 1894 to the Athens Games of April 1896.
- Describe the Athens Games: the Panathenaic Stadium, James Connolly's first victory and Spyridon Louis's marathon.
- Calculate speeds and paces and count Olympic Games across the twentieth century.
- Explain the Christian roots of the Olympic motto and creed and the ideals Coubertin hoped sport would serve.

Warm-up. Time yourself walking or jogging 400 m (once around a running track, or a measured route). Then estimate how long it would take you to cover 40 km at that pace. Write your estimate down.

WATCH

6th April 1896: The first modern Olympic Games open in Athens

HistoryPod · 2:35

<https://www.youtube.com/watch?v=BkewPyyp-jU>

WHEN TO WATCH

After the story paragraph. A short narrated account of Coubertin's congress and the opening of the Athens Games, with photographs from 1896.

KEY TERMS

International Olympic Committee (IOC)

The body founded at the Sorbonne in Paris on June 23, 1894, to organise the modern Olympic Games.

Panathenaic Stadium

The ancient stadium in Athens, rebuilt in white marble for 1896 with funds from the businessman George Averoff; it held about 50,000 people at the opening.

marathon

A long-distance footrace, about 40 km in 1896, created for the first modern Games in memory of the legend of a messenger running from Marathon to Athens.

Citius, Altius, Fortius

“Faster, higher, stronger”: the Olympic motto, coined by the Dominican priest and schoolmaster Henri Didon and adopted by Coubertin.

Olympic creed

The saying that the most important thing is not to win but to take part, inspired by a sermon preached by Bishop Ethelbert Talbot in London in 1908.

CORE IDEAS

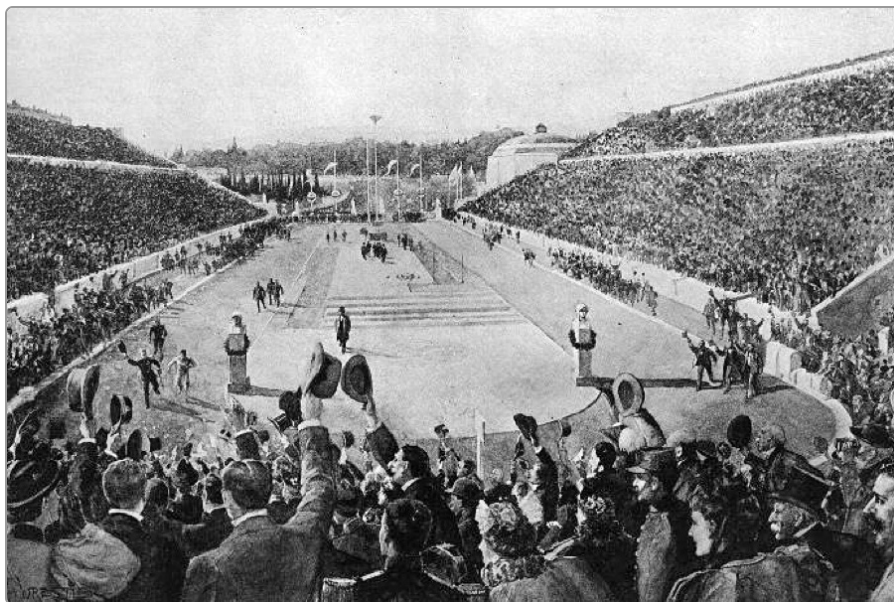
The story. On April 10, 1896, a twenty-three-year-old water carrier named Spyridon Louis ran into the Panathenaic Stadium in Athens to the roar of tens of thousands of his countrymen. He had won the first Olympic marathon, about 40 kilometres from the town of Marathon, in 2 hours 58 minutes 50 seconds. Greek princes ran alongside him down the final stretch. Four days earlier the American student James Connolly had won the triple jump, becoming the first Olympic champion crowned in about fifteen hundred years. About 240 athletes, nearly all men from fourteen nations, competed in 43 events, from athletics and gymnastics to cycling, fencing, shooting, swimming in the open sea, tennis and wrestling.

How it changed. The man behind the Games was a French nobleman, Pierre de Coubertin, born in 1863. As a young man he visited English schools, including Rugby, and came to admire the role of games in forming character that Thomas Arnold and *Tom Brown's School Days* had made famous (Lesson 4.5). He was also inspired by the German excavations of the ancient Games' sanctuary (Lesson 1.3). At an international congress at the Sorbonne in June 1894 he proposed reviving the Games, and the International Olympic Committee was founded, with the Greek writer Demetrios Vikelas as its first president. Greece agreed to host the first Games, and the benefactor George Averoff paid to rebuild the ancient stadium in marble. Winners received a silver medal and an olive branch; gold medals came later.

How it is played. The modern Games kept the four-year cycle of the ancient ones but opened them to the world. Coubertin wanted amateurs, men who played for honour and not money, to compete in the spirit of fair play. The motto *Citius, Altius, Fortius* came from Father Henri Didon, a Dominican priest who used it at his school's sports day in 1891 and whom Coubertin admired. In 1908 the Olympic creed was born when Bishop Ethelbert Talbot of Pennsylvania, preaching at St Paul's Cathedral in London during the Games, said that the important thing was not so much winning as taking part; Coubertin took up the words and made them famous.

Why it matters. The modern Olympics joined many of the threads of this course: an ancient festival, the rule-making clubs of the nineteenth century, and the conviction that sport can train character. They have had their troubles since, but their best ideals, honest effort, respect for opponents and the joy of taking part, echo Paul's words: "I have fought a good fight, I have finished my course, I have kept the faith." Unit 6 begins with the World Cup and ends with Eric Liddell, whose Olympic story shows those ideals at their finest.

PICTURE STUDY



Spyridon Louis Entering the Panathenaic Stadium, Unknown illustrator, April 10, 1896 (published 1897) · Engraving, printed in the official report of the Games · Athens, Greece

Image: [Wikimedia Commons](#), public domain

This illustration, printed in the official report of the Games in 1897, shows the moment the marathon runners reached the stadium in Athens. Spyridon Louis was the first to enter, and the crowd, tens of thousands strong, rose to its feet. Men in the foreground wave their hats.

The stadium stood on the site of the ancient Panathenaic Stadium and had been rebuilt in white marble for the Games.

Look closely

- Find the runner on the track. How can you tell which way he is going?
- Look at the spectators in the foreground. What are they doing?
- Look at the shape of the stadium. How is it like the ancient stadium at Olympia, and how is it different?
- Estimate how many people you can see. How does the crowd compare with the 200 spectators at the first Wimbledon final?

Talk about it

1. Why would a marathon win by a Greek runner mean so much to the crowd in Athens in 1896?

2. What does this picture suggest about the power of a sporting event to unite a nation?
3. How does this scene connect the ancient Games of Lesson 1.3 with the modern Games?

Safety first. Walk or jog your timed 400 m on a safe, flat route with a parent, warm up first, carry water and stop if anything hurts. Do not attempt a long run without training.

PROJECT

A Family Olympic Pentathlon

You will organise a small, safe five-event home Olympics in the spirit of 1896, keep official results, and score them fairly with a points table.

You will need

- A stopwatch and a tape measure
- A soft ball or beanbag for throwing
- Chalk or markers
- Paper medals or ribbons
- Your scorebook

Steps

1. Choose five safe events, for example a 50 m dash, a standing long jump, a soft-ball throw for distance, a 400 m walk-or-jog, and a balance or skill event (such as keeping a balloon in the air).
2. Write the rules for each event and appoint a judge.
3. Hold the events with at least three competitors. Record every time and distance precisely.
4. Design a fair points system: in each event, award 5 points to first place, 4 to second, and so on, or devise a formula based on each result as a percentage of the best result.
5. Total the points and award medals. Compare the winner under the two scoring systems.
6. Write a paragraph: did the scoring system change the result? How does your Olympics reflect the ideals of Coubertin and the Olympic creed?

Tips

- Warm up together before the first event.
- Include an event in which a younger child can compete fairly, perhaps with a head start or a handicap.

Check your work

- ☐ I held five events and recorded every result.
- ☐ I scored the results two ways and compared them.
- ☐ My paragraph connects my Games with the Olympic ideals.

SCOREBOOK

1. Make a timeline from 1863 (Coubertin's birth) to 1908 (the creed).
2. Draw the Panathenaic Stadium in plan, horseshoe-shaped, and label the track and the curved end.
3. Record your family pentathlon results and both points tables.

From history. Coubertin's heart is buried at Olympia in a monument near the ancient site, a sign of how closely he linked the modern Games with the ancient ones.

WORKED EXAMPLES

Example 1. Spyridon Louis ran about 40 km in 2:58:50. Find his average speed in km/h and his average pace in minutes per kilometre.

Show solution

1. Time: $2 \text{ h } 58 \text{ min } 50 \text{ s} = 2 + 58/60 + 50/3600 \approx 2.981 \text{ h}$.
2. Speed: $40 \div 2.981 \approx 13.4 \text{ km/h}$.
3. Pace: $178.83 \text{ min} \div 40 \approx 4.47 \text{ min/km} \approx 4 \text{ min } 28 \text{ s per km}$.

Answer: About 13.4 km/h, or 4 minutes 28 seconds per kilometre, over rough roads and in heat.

Example 2. The Summer Games have been scheduled every four years from 1896 to 2024. How many were scheduled, and how many were held, if those of 1916, 1940 and 1944 were cancelled because of world wars?

Show solution

1. Scheduled: $(2024 - 1896) \div 4 + 1 = 128 \div 4 + 1 = 33$.
2. Held: $33 - 3 = 30$.

Answer: 33 scheduled and 30 held (the Games scheduled for 2020 were held in 2021, and are counted).

Example 3. The 1896 Games had about 240 athletes from 14 nations in 43 events. Find the average number of athletes per nation and per event.

Show solution

1. $240 \div 14 \approx 17$ athletes per nation.

2. $240 \div 43 \approx 5.6$ athletes per event.

Answer: About 17 per nation and fewer than 6 per event: small fields by modern standards, when more than 10,000 athletes compete.

PRACTICE

1. **Easy** Who revived the Olympic Games, and where was the IOC founded?

Show answer

Pierre de Coubertin; at the Sorbonne in Paris, on June 23, 1894.

2. **Easy** Who won the first Olympic event of the modern Games, and in what event?

Show answer

James Connolly of the United States, in the triple jump.

3. **Easy** Who won the 1896 marathon, and why was his victory so celebrated?

Show answer

Spyridon Louis, a Greek water carrier; he won the new marathon for the host nation in its ancient stadium.

4. **Medium** Who coined the motto “Citius, Altius, Fortius,” and what does it mean?

Show answer

Father Henri Didon, a Dominican priest and headmaster; “faster, higher, stronger.”

5. **Medium** What English school and book influenced Coubertin, and how?

Show answer

Rugby School and *Tom Brown’s School Days*; they convinced him that games could form character and should be part of education.

6. **Medium** A runner covers 42.195 km (the modern marathon) in 3 hours. What is his pace in minutes per kilometre?

Show answer

$180 \div 42.195 \approx 4.27 \text{ min/km} \approx 4 \text{ min } 16 \text{ s per km.}$

7. **Medium** What did first-place winners receive in 1896?

Show answer

A silver medal, an olive branch and a diploma.

8. **Medium** How many years separate the traditional first ancient Games (776 BC) from the first modern Games (1896)? (No year 0.)

Show answer

$776 + 1896 - 1 = 2,671 \text{ years.}$

9. **Hard** Using your warm-up pace, compute your predicted marathon time and compare it with Louis's. What makes the prediction unreliable?

Show answer

Answers vary. The prediction assumes you could keep your 400 m pace for 40 km, which is impossible without training: fatigue, heat and terrain slow runners greatly over long distances.

10. **Hard** Explain the origin of the Olympic creed and why it fits Coubertin's ideals.

Show answer

Bishop Ethelbert Talbot preached at St Paul's in 1908 that the important thing was not winning but taking part; Coubertin adopted it because he wanted the Games to promote character, effort and fair play rather than victory alone.

11. **Challenge** If the number of athletes grew from 240 in 1896 to about 10,500 in 2024, find the average growth factor per Games over the 29 intervals between the 30 Games held. (Use $(10500/240)^{1/29}$.)

Show answer

$10,500 \div 240 = 43.75$; $43.75^{1/29} \approx e^{\ln 43.75/29} = e^{3.778/29} \approx e^{0.130} \approx 1.14$, about 14% growth per Games on average.

COMMON MISTAKES

- Saying the modern marathon has always been 42.195 km. In 1896 it was about 40 km; the present distance was fixed later.

- Forgetting that gold medals were not given in 1896.
- Counting Olympic Games without allowing for the cancelled Games of 1916, 1940 and 1944.

Make it a game · Opening Ceremony Announcer. Play the announcer at the opening of the Athens Games in April 1896. Give a dramatic speech covering Pierre de Coubertin, the 1894 Sorbonne congress, the International Olympic Committee, the Panathenaic Stadium and the first marathon. Your parent holds up a finger for each correct fact. Aim for seven, then reverse the roles.

Scripture. “I have fought a good fight, I have finished my course, I have kept the faith: Henceforth there is laid up for me a crown of righteousness” (2 Timothy 4:7-8, KJV)

Paul looked back on his life as a race finished faithfully. The best Olympic ideals, honest effort and perseverance to the end, point beyond themselves to the race of faith.

AMERICAN INVENTIONS

Some of the world's most popular games were invented on purpose, by people we can name, in a single place and year. This unit tells their stories: James Naismith's basketball (1891) and William Morgan's volleyball (1895), both born in YMCA gymnasiums in Massachusetts; Walter Camp's American football and the reforms of 1905–06 that saved it; George Hancock's softball (1887) and the travels of baseball to Japan, Cuba and Korea; and Pierre de Coubertin's revival of the Olympic Games in Athens in 1896.

You will play basketball by Naismith's original thirteen rules, play mintonette and modern volleyball, test three eras of football rules with two-hand touch, measure balls and check π , and hold a family pentathlon. You will see how inventors design rules to solve problems, how rule-makers change behaviour by changing incentives, and how a good game can travel the world.

PREREQUISITES

- The rule-making of Unit 4, especially muscular Christianity and the YMCA (Lesson 4.5)
- Unit conversions and the Pythagorean theorem
- Circumference $C = \pi d$ and speed = distance $\div$ time

MASTERY CHECKLIST

- ☐ I can tell the story of Naismith's invention of basketball and explain how his rules solved specific problems.
- ☐ I can explain how Morgan designed volleyball and compare his court and net with today's.
- ☐ I can explain Walter Camp's scrimmage and downs and the 1906 reforms, and calculate yards per down.
- ☐ I can trace softball's invention and baseball's spread to Japan, Cuba and Korea, and compute ball sizes from circumferences.
- ☐ I can describe Coubertin's revival of the Olympics and the Athens Games, and calculate paces and Olympic counts.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Naismith Memorial Basketball Hall of Fame**: Free website of the Hall of Fame in Springfield, Massachusetts, with the history of the game and Naismith's rules, for Lesson 5.1. A visit is optional. Ages 10+.
- **International Volleyball Hall of Fame**: Free website of the Hall of Fame in Holyoke, the birthplace of volleyball, with Morgan's story, for Lesson 5.2. Ages 10+.

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	Naismith's Thirteen Rules	3 sessions of 50 minutes
5.2	Morgan's Mintonette Becomes Volleyball	3 sessions of 50 minutes
5.3	Walter Camp and the Football Reforms of 1905–06	3 sessions of 50 minutes
5.4	Softball and Baseball Around the World	3 sessions of 50 minutes
5.5	Coubertin and the Modern Olympics, Athens 1896	3 sessions of 50 minutes

UNIT 5 TEST

Calculators are allowed. Show your work for every calculation: write the formula or conversion, substitute the numbers and give the answer with units and a sentence. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **7 pts**

Tell the story of the invention of basketball in four sentences: who, where, when and why.

2. **7 pts**

Explain how two of Naismith's rules solved specific problems.

3. (6 pts)

Convert 10 ft to metres and 6 ft 6 in to metres.

4. (6 pts)

Who invented volleyball, for whom, and how did it get its name?

5. (6 pts)

A volleyball set ends 25–21. How many rallies were played under rally scoring?

6. (7 pts)

What did Walter Camp introduce in 1880 and 1882, and why was each needed?

7. (7 pts)

Describe the crisis of 1905 and four reforms of 1906.

8. (6 pts)

Find yards needed per down under the 1906 rule and the 1912 rule.

9. (6 pts)

Where, when and how did softball begin?

10. (7 pts)

Name the person who brought baseball to Japan and to Korea, with dates, and the place of Cuba's first recorded organised game.

11. (6 pts)

Find the diameter of a ball with circumference 12 in, and the volume ratio of a 12-inch ball to a 9-inch ball.

12. (6 pts)

When and where was the IOC founded, and who was its founder and its first president?

13. (7 pts)

Spyridon Louis ran about 40 km in 2:58:50. Find his average speed in km/h.

14. (6 pts)

Explain the Christian origins of the Olympic motto and creed.

15. **10 pts**

Short essay. In about 200 words, compare how basketball and volleyball were invented. What problem did each inventor solve, how did the YMCA shape both games, and what does their story teach about designing good rules?

ANSWER KEY

1. James Naismith, an instructor at the International YMCA Training School in Springfield, Massachusetts, invented basketball in December 1891, when Luther Gulick asked him to devise an indoor winter game for a restless class. He nailed peach baskets ten feet high and wrote thirteen rules. The first game, nine a side, ended 1–0.
2. Any two: no running with the ball removed the reason to tackle; a raised goal prevented crowding the goal and required a skilful arcing shot; banning striking, holding and pushing kept play clean; three consecutive fouls giving a goal discouraged fouling.
3. 3.048 m; $78 \text{ in} \times 2.54 = 198.1 \text{ cm} \approx 1.98 \text{ m}$.
4. William G. Morgan at the Holyoke YMCA in 1895, for businessmen who found basketball too strenuous; Alfred Halstead suggested “volley ball” at Springfield in 1896 because the game consisted of volleying.
5. 46 rallies.
6. The line of scrimmage (1880), to give one team clear possession instead of a scrum; downs (1882), to stop teams holding the ball indefinitely by requiring a gain of five yards in three downs.
7. At least eighteen players died in 1905, mostly in mass plays; colleges met and formed the IAAUS (later NCAA). Reforms: legal forward pass, ten yards in three downs, neutral zone, six men on the line, sixty-minute game.
8. $10 \div 3 \approx 3.33 \text{ yd}$; $10 \div 4 = 2.5 \text{ yd}$.
9. At the Farragut Boat Club, Chicago, on Thanksgiving Day 1887, when George Hancock tied a boxing glove into a ball and used a broom handle as a bat, inventing “indoor baseball.”
10. Horace Wilson, Tokyo, about 1872; Philip Gillett, Korea, 1905; Palmar de Junco, Matanzas, December 1874.
11. $12 \div \pi \approx 3.82 \text{ in}$; $(12/9)^3 = 64/27 \approx 2.37$.
12. June 23, 1894, at the Sorbonne in Paris; founded at Coubertin’s initiative, with Demetrios Vikelas as first president.
13. $2:58:50 \approx 2.981 \text{ h}$; $40 \div 2.981 \approx 13.4 \text{ km/h}$.
14. The motto *Citius, Altius, Fortius* was coined by the Dominican priest Henri Didon for his school’s sports; the creed came from Bishop Ethelbert Talbot’s 1908 sermon at St Paul’s, London.

15. Answers vary. A strong essay explains that Naismith needed a vigorous, clean indoor game for restless young men and Morgan a gentler game for businessmen; that both were YMCA men trained at Springfield with a Christian vision of physical education; that the YMCA spread both worldwide; and that both designed rules by starting from a clear problem and choosing rules that changed players' incentives.

PORTFOLIO PIECE: INVENT A GAME

Follow Naismith's and Morgan's method to invent a new game for a real group of people you know (your family, a youth group or a co-op class) and a real space you have. Your portfolio must include (1) a one-page statement of the problem: who will play, where, with what equipment, and what the game must achieve (exercise, fairness, safety, fun for different ages); (2) no more than thirteen numbered rules, each with a note on the problem it solves; (3) a scale drawing of the playing area with measurements; (4) records of at least three trial games, with scores and any problems that arose; and (5) a revised rule set with an explanation of every change, as Naismith's game was revised after its first seasons.

LOOK FOR	WHAT IT MEANS
Problem statement	A clear description of the players, space and goals of the game.
Rules	Thirteen or fewer clear rules, each tied to a stated problem.
Measurement	An accurate scale drawing with dimensions and any calculations.
Testing and revision	Records of three real trials and thoughtful revisions supported by those records.

UNIT 6

SPORT AROUND THE WORLD TODAY

By the twentieth century the games of England, America and Canada had spread across the world, and the world had made them its own. This unit follows the first World Cup in Uruguay in 1930, cricket in Australia, India and the Caribbean, ice hockey in Canada from the Victoria Rink to the Stanley Cup, and Eric Liddell, whose refusal to run on a Sunday at the 1924 Olympics and whose life of service show sport at its best.

You will run a mini World Cup and count its matches, keep batting averages as a cricket statistician and explain Bradman's 99.94, test a puck against a ball, time your own 400 metres against Liddell's, and then complete the course with a capstone: a research paper on the history of one game and a playable presentation of an earlier form of it.

PREREQUISITES

- The codification of football and cricket (Units 3 and 4)
- Muscular Christianity and the modern Olympics (Lessons 4.5 and 5.5)
- Averages, rates, unit conversions and the area of a circle

MASTERY CHECKLIST

- ☐ I can tell the story of the first World Cup and count matches in round-robin and elimination tournaments.
- ☐ I can trace cricket in Australia, India and the West Indies and compute batting averages, including Bradman's.
- ☐ I can tell the story of hockey in Canada and calculate rink areas and puck volume.
- ☐ I can tell the true story of Eric Liddell and explain what it shows about the virtue of sport.
- ☐ I can research, write and present the history of a game using primary and secondary sources.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Hockey Hall of Fame:** Free website of the Hall of Fame in Toronto, home of the Stanley Cup, with the history of the game, for Lesson 6.3. Ages 10+.
- **The Eric Liddell Community (Edinburgh):** Free website of the Edinburgh charity named after Liddell, with a reliable account of his life, for Lesson 6.4. Ages 10+.
- **Project Gutenberg (search: games history):** Free. Old rule books and histories of games in the public domain, useful as primary sources for the capstone in Lesson 6.5. A parent should help choose suitable titles. Ages 13+.

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	The World Cup and Football's Global Reach	3 sessions of 50 minutes
6.2	Cricket in India, Australia and the Caribbean	3 sessions of 50 minutes
6.3	Hockey and Canada	3 sessions of 50 minutes
6.4	Eric Liddell and the Virtue of Sport	3 sessions of 50 minutes
6.5	Capstone: The History of a Game	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 the answer with units and a sentence. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **6 pts**

When and where was the first World Cup final played, who won, and what was the score?

2. (7 pts)

How many matches are needed for a round robin of 8 teams? For a pure elimination of 8 teams? Show the formulas.

3. (6 pts)

Give two reasons the World Cup became possible by 1930.

4. (6 pts)

When and where was the first Test match, and how did the Ashes get their name?

5. (7 pts)

Bradman scored 6,996 runs in 80 Test innings, 10 not out. Compute his average and explain what would have happened if he had scored 4 in his last innings and been out.

6. (6 pts)

A batsman scores 30, 0, 72*, 15 and 48 (* = not out). Find his average.

7. (6 pts)

Who was Ranjitsinhji, and when did India and the West Indies play their first Tests?

8. (7 pts)

Describe the first recorded indoor hockey game: date, place, organiser and one innovation.

9. (6 pts)

Find the volume of a puck 3 in across and 1 in thick.

10. (6 pts)

Who donated the Stanley Cup, when was it first awarded, and to whom?

11. (7 pts)

Tell the true story of Eric Liddell's choice at the 1924 Olympics and its result.

12. (6 pts)

Find Liddell's average speed in the 400 m in m/s and km/h.

13. (6 pts)

What did Liddell do after 1924, and how did he die?

14. (6 pts)

Define primary and secondary sources and give one example of each from this course.

15. (12 pts)

Short essay. In about 250 words, explain how one sport in this unit became a world game and what virtue its history best displays. Support your answer with at least four dated facts and connect it to one passage of Scripture from the course.

ANSWER KEY

1. July 30, 1930, at the Estadio Centenario, Montevideo; Uruguay beat Argentina 4–2.
2. Round robin: $8 \times 7 \div 2 = 28$. Elimination round: $8 - 1 = 7$.
3. Any two: football had spread worldwide under one set of laws; FIFA (1904) gave the game an international body; Olympic football had shown the demand; Rimet championed it; Uruguay offered to host and pay travel.
4. March 1877 at the Melbourne Cricket Ground; after Australia won at the Oval in 1882, a mock obituary said English cricket's body would be cremated and the ashes taken to Australia.
5. $6,996 \div 70 \approx 99.94$. With 4 more runs: $7,000 \div 70 = 100.00$.
6. Runs 165; dismissals 4; $165 \div 4 = 41.25$.
7. An Indian prince who batted brilliantly for England from 1896 and gave his name to India's Ranji Trophy; the West Indies in 1928, India in 1932.
8. March 3, 1875, Victoria Skating Rink, Montreal, organised by James Creighton; a flat wooden puck instead of a ball.
9. $\pi \times 1.5^2 \times 1 \approx 7.07 \text{ in}^3$.
10. Lord Stanley of Preston; 1893; the Montreal Hockey Club.
11. He declined to run the 100 m because the heats were on a Sunday, which he knew months in advance; he trained for the 200 and 400 m, won bronze in the 200 m and gold in the 400 m in a record 47.6 s.
12. $400 \div 47.6 \approx 8.40 \text{ m/s} \approx 30.3 \text{ km/h}$.
13. He became a missionary teacher in China, married, served in hard places, and died of a brain tumour in the Weixian internment camp in February 1945.
14. Primary: evidence from the time (Finkel's tablet, the 1744 Laws, the FA minute book). Secondary: a later account based on such evidence (a history book or museum article).
15. Answers vary. A strong essay traces the sport's spread accurately (for example football from 1863 to FIFA in 1904 and the World Cup in 1930), names a virtue with a clear example (Liddell's conviction, curling's courtesy, the spirit of cricket), and uses a passage such as 1 Corinthians 9:24-25, 2 Timothy 2:5, Proverbs 16:32 or 1 Samuel 2:30 appropriately.

PORTFOLIO PIECE: CAPSTONE: THE HISTORY OF A GAME

The capstone of Lesson 6.5 is this unit's portfolio. Submit (1) a research paper of about 2,000 words on the history of one game or sport, with a clear thesis, at least five cited sources (two of them primary), and the four-part structure of the course; (2) one page of rules for an earlier form of the game, with photographs or drawings of the equipment you made; (3) a record of the presentation you led: who played, what happened and what they said; and (4) a half-page reflection on what you learned from researching, writing and teaching.

LOOK FOR	WHAT IT MEANS
Research	At least five reliable sources, including two primary sources, used and cited accurately; legend separated from evidence.
Writing	A clear thesis, logical organisation in four parts, accurate dates and careful prose.
Presentation	An earlier form of the game, with clear one-page rules and working equipment, led well for real participants.
Reflection	An honest, thoughtful reflection on the work and on the place of play in a well-ordered life.

6.1 THE WORLD CUP AND FOOTBALL'S GLOBAL REACH

OBJECTIVES

- Tell the story of the first FIFA World Cup, held in Uruguay in July 1930, and of Jules Rimet, who made it happen.
- Explain how association football spread from England to become the world's most widely played sport.
- Count matches in tournament formats and compute goals per game.
- Explain why one set of laws and one great tournament helped football unite people across the world.

Warm-up. Thirteen teams enter a tournament. Before reading on, design a format: how many groups, how many matches, and how many rounds of elimination rounds? Count the matches in your design.

WATCH

1930 WORLD CUP FINAL: Uruguay 4-2 Argentina

FIFA • 2:41

<https://www.youtube.com/watch?v=3gELBavbzWQ>

WHEN TO WATCH

After the story paragraph. FIFA's own short film of the 1930 final, with original footage.

BACKUP VIDEO

Uruguay 1930 | How The First World Cup Was Won

TheSportsFiles • 14:23

<https://www.youtube.com/watch?v=0PWeAuViU0o>

In session 2, for the fuller story of how the first World Cup was organised and won.

KEY TERMS

FIFA

The Fédération Internationale de Football Association, founded in Paris on May 21, 1904, which governs world football and organises the World Cup.

Jules Rimet

French lawyer and president of FIFA from 1921 to 1954, who championed the World Cup; the first trophy was later named after him.

Estadio Centenario

The stadium in Montevideo built for the 1930 World Cup and named for the centenary of Uruguay's first constitution (1830).

group stage

The first part of a tournament, in which teams in small groups each play the others and the best advance.

elimination

A round in which the loser of each match is eliminated.

CORE IDEAS

The story. On July 30, 1930, about 68,000 people filled the new Estadio Centenario in Montevideo for the first World Cup final. Uruguay, the host and twice Olympic champion, met its great neighbour Argentina. The two sides could not agree on which ball to use, so each team's ball was used for one half. Argentina led 2–1 at half-time; Uruguay scored three goals in the second half and won 4–2. The captain, José Nasazzi, received the trophy, a gold statuette of Victory, from FIFA's president, Jules Rimet.

How it changed. Football had spread from England in the late nineteenth century with sailors, engineers, merchants, teachers and students. British workers founded clubs in Buenos Aires, Montevideo, Genoa and Bilbao; schools and churches taught the game across Europe and South America. FIFA was founded in Paris in 1904 by seven European associations. Football was played at the Olympic Games, and after Uruguay won the Olympic tournaments of 1924 and 1928, Rimet persuaded FIFA in 1928 to create a world championship open to professionals. Uruguay offered to host it in 1930, the centenary of its constitution, and to pay the visitors' travel. Only four European teams made the two-week sea voyage (France, Belgium, Romania and Yugoslavia); Rimet sailed with them, carrying the trophy. Thirteen teams took part.

How it is played. The 1930 tournament began with four groups, one of four teams and three of three; the four group winners played semi-finals and a final. Lucien Laurent of France scored the first World Cup goal, against Mexico, on July 13, 1930. The tournament has grown with the game: sixteen teams for many decades, twenty-four from 1982, thirty-two from 1998, and forty-eight in 2026, when it was hosted by the United States, Canada and Mexico. Today FIFA has more than two hundred member associations, more than the United Nations has member states.

Why it matters. The World Cup became possible because, by 1930, people on every continent played under the same laws first written at the Freemasons' Tavern in 1863 (Lesson 4.2). A shared rule book and a great tournament let a small nation like Uruguay stand equal with the great powers. Football also shows the limits of sport: rivalries can turn bitter, and the 1930 final left hard feelings between two neighbouring nations. The game is at its best when it brings strangers together under fair rules and teaches them to win and lose with grace.

PICTURE STUDY



Uruguay's Fourth Goal in the First World Cup Final, Unknown press photographer, July 30, 1930 ·
Photograph · Estadio Centenario, Montevideo, Uruguay
Image: [Wikimedia Commons](#), public domain

This photograph is identified as the moment of Héctor Castro's goal, Uruguay's fourth, in the last minute of the first World Cup final. A player leaps, the ball bounces toward the goal mouth, and attackers rush in.

Notice the crowd filling the new stadium, which had been finished only days before the tournament began.

Look closely

- Find the ball. Where is it going, and which players are closest to it?
- Look at the players' kit: shirts, shorts and boots. How do they compare with today's?
- Look at the goal net and posts. What is different from a modern goal?
- Look at the crowd. How many people do you think were in the stadium?

Talk about it

1. Why might a photograph of the winning goal have been treasured in Uruguay for generations?
2. What does this picture show about how quickly football had grown since 1863?

3. How should a team and its fans behave after winning, and after losing, a final like this?

Safety first. If you play a backyard tournament, use a soft ball, keep tackles gentle, warm up first and drink water between matches.

PROJECT

Run a Mini World Cup

You will design and run a small tournament (with a backyard game, table football or a board game), keep results like a tournament secretary, and compare a round-robin format with a elimination.

You will need

- Any simple two-player or two-team game (a backyard shoot-out, table football, or a board game from Unit 2)
- At least four players or teams
- Your scorebook

Steps

1. Choose the game and write its rules on one page.
2. With four to six entrants, run a round robin: every entrant plays every other once. Award 3 points for a win and 1 for a draw.
3. Keep a results grid and a standings table with wins, draws, losses, goals for and against, and points.
4. Then run a elimination tournament with the same entrants, seeded by the round-robin standings.
5. Compare the two champions. Count the matches each format required.
6. Write a paragraph: which format was fairer, and which was more exciting? Why does the World Cup use both?

Tips

- Draw the results grid before you start, with entrants down the side and across the top.
- Decide tie-breakers (goal difference, then head-to-head) before the first match.

Check your work

- ☐ I ran a complete round robin and a elimination with the same entrants.
- ☐ My results grid and standings table are complete and correct.

- My paragraph compares the formats with the numbers of matches and results.

SCOREBOOK

1. Copy your results grid and standings table.
2. Make a timeline of world football: 1863, 1872, 1904, 1924, 1928, 1930.
3. Draw a world map marking where the four European teams of 1930 sailed from and the route to Montevideo.

From history. The trophy of 1930 was renamed the Jules Rimet Trophy in 1946. Brazil won it outright after its third title in 1970, and a new trophy was made for 1974.

WORKED EXAMPLES

Example 1. In 1930 there was one group of four and three groups of three, each team playing every other once; then two semi-finals and a final. How many matches were played?

Show solution

1. Group of four: $\binom{4}{2} = 6$ matches.
2. Each group of three: $\binom{3}{2} = 3$; three groups give 9.
3. Elimination round: 2 semi-finals + 1 final = 3.
4. Total: $6 + 9 + 3 = 18$.

Answer: 18 matches.

Example 2. The 1930 tournament produced 70 goals in its 18 matches. What was the average per match? If a modern World Cup of 64 matches produced 172 goals, compare the averages.

Show solution

1. 1930: $70 \div 18 \approx 3.89$ goals per match.
2. Modern: $172 \div 64 \approx 2.69$ goals per match.
3. Difference ≈ 1.2 goals per match.

Answer: About 3.9 goals per match in 1930 against about 2.7 in a modern tournament (the modern total is illustrative of recent World Cups): defending has become more organised.

Example 3. In a elimination tournament, every match eliminates exactly one team. How many matches are needed to find a champion among 32 teams in a pure elimination? Among 13?

Show solution

1. Every team but the champion must be eliminated once.
2. 32 teams: 31 matches. 13 teams: 12 matches.

Answer: 31 and 12. In a pure elimination of n teams there are always $n - 1$ matches, however the byes are arranged.

PRACTICE

1. **Easy** When and where was the first World Cup final, and what was the score?

Show answer

July 30, 1930, at the Estadio Centenario in Montevideo; Uruguay 4, Argentina 2.

2. **Easy** When and where was FIFA founded?

Show answer

In Paris, on May 21, 1904.

3. **Easy** Why did Uruguay host the first World Cup?

Show answer

It was the two-time Olympic champion (1924, 1928), it offered to pay visiting teams' travel, and 1930 was the centenary of its first constitution.

4. **Medium** How many matches are played in a group of 6 teams if each plays every other once?

Show answer

$$6 \times 5 \div 2 = 15.$$

5. **Medium** Why did so few European teams travel to Uruguay in 1930?

Show answer

The sea voyage took about two weeks each way, so players would be away from their jobs and clubs for two months or more.

6. **Medium** Who scored the first World Cup goal, and against whom?

Show answer

Lucien Laurent of France, against Mexico, on July 13, 1930.

7. **Medium** The 2026 World Cup had 48 teams and 104 matches. How many times as many matches is that as in 1930?

Show answer

$104 \div 18 \approx 5.8$ times.

8. **Medium** Give two ways football spread around the world before 1930.

Show answer

Any two: British sailors, engineers and merchants abroad; schools and teachers; churches and missions; local clubs founded by expatriates; the Olympic Games.

9. **Hard** Twelve groups of four each play a round robin. How many group matches is that? If the top two in each group plus the eight best third-placed teams advance to a elimination, how many teams advance and how many elimination matches follow?

Show answer

$12 \times 6 = 72$ group matches. $24 + 8 = 32$ teams advance; a elimination of 32 needs 31 matches, plus a third-place match makes 32. $72 + 32 = 104$ in all.

10. **Hard** Explain why one shared set of laws was a precondition for a World Cup.

Show answer

Teams from different continents could only meet fairly if they played the same game; without the common laws developed after 1863 and kept by the International Football Association Board, every match would have required negotiation over rules.

11. **Challenge** Prove that a round robin of n teams has $n(n - 1)/2$ matches, and find the smallest n for which a round robin needs more matches than a 64-team elimination.

Show answer

Each of n teams plays $n - 1$ others, and each match is counted twice, so $n(n - 1)/2$. A 64-team elimination has 63 matches. $n = 12$ gives $66 > 63$, and $n = 11$ gives 55, so the answer is 12.

COMMON MISTAKES

- Counting each round-robin match twice. Divide $n(n - 1)$ by 2 when each pair meets once.
- Saying the World Cup began with the Olympics. Football was played at the Olympics first; the World Cup was a separate championship from 1930.
- Forgetting that a pure elimination of n teams always needs $n - 1$ matches.

Make it a game • Radio Final 1930. You are a radio commentator in Montevideo in July 1930. Describe the first FIFA World Cup to your parent as it happens, naming Jules Rimet, the Estadio Centenario, the group stage and the knockout rounds. Your parent counts the facts. After ninety seconds, your parent interrupts with one wrong detail and you must catch it.

6.2 CRICKET IN INDIA, AUSTRALIA AND THE CARIBBEAN

OBJECTIVES

- Trace cricket's spread to Australia, India and the West Indies and the beginnings of Test cricket in 1877.
- Tell the stories of Ranjitsinhji, the Ashes and Sir Donald Bradman.
- Calculate batting averages correctly, including the effect of not-out innings, and explain Bradman's 99.94.
- Explain how a game carried abroad became a source of national joy and excellence for new nations.

Warm-up. A batsman scores 40, 12, 0, 55 not out and 23. Compute his average two ways: total runs $\div$ innings, and total runs $\div$ times out. Which do you think cricket uses, and why?

WATCH

Don Bradman's Duck - Numberphile

Numberphile • 6:03

<https://www.youtube.com/watch?v=A8Tiba3h9Fw>

WHEN TO WATCH

After the how-it-is-played paragraph. A mathematician explains Bradman's 99.94 and the duck that cost him an average of 100.

BACKUP VIDEO

Prince Ranjitsinhji Practising Batting at the Nets (1897) - Oldest surviving cricket film

BFI • 2:20

<https://www.youtube.com/watch?v=loiE0luWCHo>

After the how-it-changed paragraph. The oldest surviving cricket film, showing Ranjitsinhji batting in the nets in 1897.

KEY TERMS

Test match

The longest form of international cricket, played over up to five days between national teams; the first was played in Melbourne in March 1877.

batting average

Runs scored divided by the number of times the batsman was out; not-out innings add runs but not dismissals.

duck

A score of nought by a batsman.

the Ashes

The series between England and Australia, named after a mock obituary of English cricket printed in 1882 after Australia won at the Oval.

Ranji Trophy

India's national first-class championship, begun in 1934 and named after Ranjitsinhji.

CORE IDEAS

The story. On August 14, 1948, Donald Bradman walked out at the Oval in London for what everyone knew would be his last Test innings. He needed just four runs to finish with a career batting average of exactly 100. The English players gave him three cheers. The leg-spinner Eric Hollies bowled; the second ball, a googly, beat Bradman's bat and bowled him for nought. He walked back to the pavilion with a Test average of 99.94, still the most famous number in cricket and by far the highest of any batsman who has played many Tests.

How it changed. Cricket went wherever the British Empire went, carried by soldiers, sailors, officials, teachers and missionaries, and it took root most deeply where local people made it their own. In Australia, settlers played from the early 1800s; on March 15–19, 1877, at the Melbourne Cricket Ground, Australia beat England by 45 runs in what is now counted as the first Test match, and Charles Bannerman scored the first Test century. When Australia won at the Oval in 1882, a London newspaper printed a mock obituary of English cricket, whose body would be cremated and “the ashes taken to Australia,” and the Ashes were born. In India, the Calcutta Cricket Club was formed in 1792, and the Parsi community of Mumbai formed clubs in the 1840s and toured England in 1886. Prince Kumar Shri Ranjitsinhji, later the ruler of Nawanagar, scored a century on his Test debut for England in 1896 and was celebrated for his wristy, graceful batting. India played its first Test at Lord's in 1932,

and the West Indies, a team drawn from several Caribbean islands, played theirs in 1928.

How it is played. Test cricket is played over up to five days, each side batting twice. Since the 1970s shorter forms have been added: one-day matches of fifty overs a side, and since 2003 Twenty20 matches of twenty overs. Batting averages measure consistency: runs divided by dismissals. Bradman played 52 Tests, batted in 80 innings, was not out in 10 of them and scored 6,996 runs: $6,996 \div 70 = 99.94$. No one else with a long career has averaged even 70.

Why it matters. Cricket shows how a game introduced from outside can become a people's own and a source of excellence. India, Australia, the West Indies, Pakistan, Sri Lanka and others developed their own styles and champions, and by the late twentieth century India had become the centre of the cricket world. Bradman, Ranjitsinhji and many others were remembered as much for their sportsmanship as for their runs. The game's long tradition of the "spirit of cricket" (Lesson 3.4) travelled with the rules.

PICTURE STUDY



“Ranji” (K. S. Ranjitsinhji), Leslie Ward (“Spy”), for *Vanity Fair*, August 26, 1897 · Chromolithograph caricature · Published in London

Image: [Wikimedia Commons](#), public domain

The London magazine *Vanity Fair* printed portraits of the famous, drawn by the caricaturist Leslie Ward, who signed himself “Spy.” In August 1897, a year after his brilliant Test debut, Ranjitsinhji was given the honour.

Ranji’s graceful leg-glance, turning the ball fine off his pads with a flick of the wrists, changed how batsmen thought about the game.

Look closely

- Look at his posture. How does Spy show that Ranji is relaxed and confident?
- Look at his clothing. How does it compare with the 1743 cricketers of Lesson 3.4?
- Look at the bat and pads. What equipment had cricket added since the 1700s?
- Read the caption, “Ranji.” What does it suggest that a single nickname was enough?

Talk about it

1. Why would a London magazine celebrate an Indian prince as one of the leading men of 1897?
2. How might Ranji’s success have encouraged cricket in India?

3. What makes a sporting hero admired across nations?

Safety first. Play your cricket project with a soft ball and a light bat outdoors, with fielders well away from the batsman's swing.

PROJECT

Keep Batting Averages Like a Statistician

You will play a short series of backyard cricket matches (or use the published Test records of three great batsmen), keep a proper scorebook and compute batting averages, including not-outs.

You will need

- A soft ball, a bat and stumps (or the two-stump wicket from Lesson 3.4)
- At least three players
- Your scorebook
- Optional: published career records of three famous batsmen from a cricket reference book or website

Steps

1. Play at least four short matches, each batsman batting once per match until out or until a limit of 6 overs.
2. Record every innings: runs and whether out or not out.
3. After all matches, compute each player's average (runs $\div$ dismissals) and his runs per innings for comparison.
4. Rank the players by average and by runs per innings. Do the rankings differ? Why?
5. Optional: find the Test records of Bradman, Ranjitsinhji and one modern batsman and compute their averages from runs, innings and not-outs.
6. Write a paragraph explaining why cricket divides by dismissals, and what Bradman's 99.94 means.

Tips

- Mark not-out innings with an asterisk, as cricket scorers do.
- Check your arithmetic by computing each total twice.

Check your work

- ☐ I recorded at least four matches with runs and dismissals.
- ☐ I computed averages correctly, including not-outs.

- My paragraph explains the average and Bradman's record.

SCOREBOOK

1. Draw a timeline of cricket abroad: 1792, 1848, 1877, 1882, 1886, 1896, 1928, 1932, 1948.
2. Copy your players' innings and averages table.
3. Mark Australia, India and the Caribbean on a world map, with the dates of each team's first Test.

From history. The original Ashes urn, given to the England captain Ivo Bligh in Australia in 1882–83, is so fragile that it rarely leaves the MCC Museum at Lord's.

WORKED EXAMPLES

Example 1. Before his last innings Bradman had 6,996 runs in 79 innings, 10 of them not out. What was his average? What would it have been if he had scored 4 and been out? Or 4 not out?

Show solution

1. Dismissals before the last innings: $79 - 10 = 69$. Average: $6,996 \div 69 \approx 101.39$.
2. Out for 0 in the last innings: $6,996 \div 70 \approx 99.94$.
3. Out for 4: $7,000 \div 70 = 100.00$.
4. 4 not out: $7,000 \div 69 \approx 101.45$.

Answer: He went into the innings averaging about 101.4; his duck brought it to 99.94; four runs would have made it exactly 100 (if out) or about 101.45 (if not out).

Example 2. In the warm-up, a batsman scored 40, 12, 0, 55* and 23 (* = not out). Find his batting average.

Show solution

1. Total runs: $40 + 12 + 0 + 55 + 23 = 130$.
2. Dismissals: 5 innings – 1 not out = 4.
3. $130 \div 4 = 32.5$.

Answer: 32.5. Dividing by innings ($130 \div 5 = 26$) would understate a batsman who was often left not out.

Example 3. Australia won the first Test by 45 runs. Australia scored 245 and 104; England scored 196 in its first innings. What did England score in its second innings?

Show solution

1. Australia's total: $245 + 104 = 349$.
2. England's total: $349 - 45 = 304$.
3. England's second innings: $304 - 196 = 108$.

Answer: 108.

PRACTICE

1. **Easy** When and where was the first Test match played, and who won?

Show answer

March 15–19, 1877, at the Melbourne Cricket Ground; Australia won by 45 runs.

2. **Easy** What was Bradman's Test batting average, and how did he score in his last innings?

Show answer

99.94; he was bowled for nought (a duck) by Eric Hollies on August 14, 1948.

3. **Easy** Who was Ranjitsinhji, and what trophy bears his name?

Show answer

An Indian prince who batted brilliantly for England from 1896; India's national championship, the Ranji Trophy.

4. **Medium** Explain how the Ashes got their name.

Show answer

After Australia beat England at the Oval in 1882, a London newspaper printed a mock obituary of English cricket, saying its body would be cremated and the ashes taken to Australia.

5. **Medium** A batsman scores 1,240 runs in 30 innings, 6 of them not out. Find his average.

Show answer

Dismissals 24; $1,240 \div 24 \approx 51.67$.

6. **Medium** In what years did the West Indies and India play their first Tests?

Show answer

The West Indies in 1928; India in 1932 (both at Lord's).

7. **Medium** How many runs short of 7,000 did Bradman finish, and how many fewer was his average than 100?

Show answer

4 runs short; $100 - 99.94 = 0.06$.

8. **Medium** Name the three main forms of cricket today and how long each lasts.

Show answer

Test cricket (up to five days, two innings each), one-day internationals (fifty overs a side) and Twenty20 (twenty overs a side).

9. **Hard** A batsman averages 45.0 after 40 dismissals. How many runs must he score in his next innings (and be out) to raise his average to 46.0?

Show answer

Current runs $45 \times 40 = 1,800$. Needed: $46 \times 41 = 1,886$. He must score 86.

10. **Hard** Why can a not-out innings raise a batting average even if the batsman scores only a few runs?

Show answer

Not-out innings add runs to the total without adding a dismissal to the divisor, so any runs scored increase the average.

11. **Challenge** Bradman's nearest rivals with long careers average about 61. By what percentage was Bradman's average higher? If batting averages among great batsmen have a spread (standard deviation) of about 7 around a mean of about 52, how many standard deviations above the mean was Bradman?

Show answer

$(99.94 - 61) \div 61 \approx 64\%$ higher. $(99.94 - 52) \div 7 \approx 6.8$ standard deviations above the mean (illustrative figures), an almost unheard-of outlier in any sport.

COMMON MISTAKES

- Dividing by innings instead of dismissals.
- Thinking Bradman averaged 99.94 because he was out in every innings. He was not out 10 times.
- Confusing the Ashes (England–Australia) with all Test cricket.

Make it a game • Batting Average Duel. Your parent calls out ten innings: scores like 12, 0, 45, 0, 33, with one not out. Write them down and compute your batting average, runs divided by dismissals. Keep a count of ducks. The next round, a new set of ten. Beat your own average, and name the Ashes and the Ranji Trophy for a bonus.

6.3 HOCKEY AND CANADA

OBJECTIVES

- Tell the story of the first recorded indoor ice-hockey game in Montreal on March 3, 1875, and of James Creighton.
- Trace hockey's growth through the McGill rules, Lord Stanley's Cup (first awarded in 1893), the NHL (1917) and the Winnipeg Falcons' Olympic gold (1920).
- Calculate rink areas, puck volume and scoring rates.
- Explain how a national game can carry a country's character, and why self-control matters in a fast, physical sport.

Warm-up. Slide a coin and a small ball across a smooth table toward a target. Which is easier to control, and which flies off the table more often? Why might hockey players have chosen a flat puck?

WATCH

Did You Know? - History of the Stanley Cup

cpac • 6:30

<https://www.youtube.com/watch?v=qw7uuULyNNs>

WHEN TO WATCH

After the how-it-changed paragraph. A short history of Lord Stanley and his Cup.

BACKUP VIDEO

The Stanley Cup Story

NHL • 2:36

<https://www.youtube.com/watch?v=U5lBkWN4xUY>

In session 2, as the NHL's own short account of the Stanley Cup.

KEY TERMS

Victoria Skating Rink

An indoor rink in Montreal where the first recorded organised game of ice hockey was played on March 3, 1875.

Stanley Cup

The trophy donated in 1892 by Lord Stanley of Preston, Governor General of Canada, first awarded in 1893; the oldest trophy competed for by professional athletes in North America.

NHL

The National Hockey League, founded in Montreal in 1917.

puck

The flat rubber disc used in ice hockey; a flat wooden block replaced the ball in 1875 so that it would stay on the ice and away from spectators.

rover

A seventh skater in early hockey who roamed between offence and defence; dropped when teams went to six a side.

CORE IDEAS

The story. On March 3, 1875, the *Montreal Gazette* announced a “game of hockey” at the Victoria Skating Rink between two teams of nine players. James Creighton, a young engineer from Halifax, Nova Scotia, had organised it. Field hockey and Nova Scotian stick games on frozen ponds lay behind it, but Creighton’s game was something new: it was played indoors, under agreed rules, before spectators. To keep the ball from flying into the crowd, the players used a flat circular block of wood, the first puck.

How it changed. Students at McGill University formed the first hockey club and wrote rules in 1877. Teams and leagues spread across Canada. In 1892 the Governor General, Lord Stanley of Preston, whose children loved the game, donated a silver bowl as a prize for Canada’s champion amateur team. It was first awarded in 1893, to the Montreal Hockey Club of the Montreal Amateur Athletic Association. Professional leagues followed, and in 1917 the National Hockey League was founded in Montreal. In 1920, at the Olympic Games in Antwerp, the Winnipeg Falcons, a

team made up almost entirely of sons of Icelandic settlers in Manitoba, won the first Olympic gold medal in ice hockey for Canada.

How it is played. Early hockey had seven a side, including the rover, and forward passing was not allowed. Teams went to six a side in the 1910s; forward passing was gradually permitted from the 1920s; the blue lines divided the rink into zones. Today an NHL rink measures 200 by 85 feet; the puck is a vulcanised rubber disc three inches across and one inch thick, weighing about six ounces; and games have three twenty-minute periods. It is among the fastest team games in the world.

Why it matters. Hockey grew out of Canada's long winters, frozen rivers and outdoor rinks, and it became part of how Canadians see themselves. Its speed and physical play demand courage and also self-control: Scripture says that "he that ruleth his spirit" is greater "than he that taketh a city." The best hockey players and coaches have always taught that discipline, not temper, wins games.

PICTURE STUDY



The Montreal Hockey Club with the First Stanley Cup, Probably the Notman studio, Montreal, 1893 ·

Photograph · Montreal, Quebec

Image: [Wikimedia Commons](#), public domain

In 1893 the Montreal Hockey Club, part of the Montreal Amateur Athletic Association, became the first winners of Lord Stanley's new trophy. The players posed with the small silver bowl that became the Stanley Cup; the larger trophy behind it was the championship trophy of their league.

Today the Stanley Cup has grown into a tall trophy with bands bearing the names of the champions, but the original bowl still sits on top.

Look closely

- Find the Stanley Cup. How big is it compared with the other trophy?
- Look at the sticks. How are they shaped compared with modern hockey sticks?
- Look at the sweaters and the emblem. What does the winged wheel suggest?
- Count the players. How many would have been on the ice at once in 1893?

Talk about it

1. Why might a Governor General give a trophy for an amateur sport?
2. What does this team photograph suggest about how the players saw their achievement?

3. How has a small silver bowl come to mean so much to a whole nation?

Safety first. Do not skate on ponds, lakes or rivers for this project. Play floor hockey indoors or on a driveway with plastic sticks and a soft ball or plastic puck, with no high sticks or body contact.

PROJECT

Puck or Ball? A Floor-Hockey Experiment

You will test Creighton's idea that a flat puck is easier to control than a ball, and then play a short floor-hockey game, keeping a proper scoresheet.

You will need

- Two plastic floor-hockey sticks, or brooms
- A plastic puck, a large flat lid or a beanbag, and a soft ball of similar size
- Two small goals (boxes or chairs)
- A tape measure and your scorebook

Steps

1. Mark a shooting line 4 m from a goal. Take 10 shots with the ball and 10 with the puck. Record goals and how many shots left the floor or went wide.
2. Pass to a partner 3 m away 10 times with each. Record completed passes.
3. Compare the results in a table and decide which object is easier to control.
4. Play a short floor-hockey game (two 5-minute periods) with the better object. Keep a scoresheet with goals, assists and penalties for high sticks or contact.
5. Write a paragraph: was Creighton right? How did the no-contact rule shape your game?

Tips

- Keep sticks below the waist at all times.
- Use the same shooting style for both objects so the test is fair.

Check your work

- ☐ I took 20 shots and 20 passes and recorded the results.
- ☐ I compared puck and ball in a table.
- ☐ I kept a scoresheet for a short game and wrote my conclusion.

SCOREBOOK

1. Draw an NHL rink to scale (1 cm = 10 ft), with blue lines, red line, creases and corner arcs.
2. Make a timeline of hockey: 1875, 1877, 1892, 1893, 1917, 1920.

3. Record your puck-and-ball experiment.

From history. The Stanley Cup is unusual among trophies: the names of the players on each champion team are engraved on it, and each player traditionally gets to spend a day with the Cup.

WORKED EXAMPLES

Example 1. An NHL rink is 200 ft long and 85 ft wide with rounded corners. Find the area of the full rectangle in square feet and square metres ($1 \text{ ft} = 0.3048 \text{ m}$).

Show solution

1. $200 \times 85 = 17,000 \text{ sq ft}$.
2. $200 \text{ ft} = 60.96 \text{ m}$; $85 \text{ ft} = 25.91 \text{ m}$.
3. $60.96 \times 25.91 \approx 1,579 \text{ m}^2$.

Answer: 17,000 sq ft (about $1,580 \text{ m}^2$) for the rectangle; the rounded corners make the real ice surface a little smaller.

Example 2. A puck is a cylinder 3 in across and 1 in thick. Find its volume, and its volume in cubic centimetres ($1 \text{ in}^3 \approx 16.39 \text{ cm}^3$).

Show solution

1. $V = \pi r^2 h = \pi \times 1.5^2 \times 1 \approx 7.07 \text{ in}^3$.
2. $7.07 \times 16.39 \approx 115.9 \text{ cm}^3$.

Answer: About 7.1 cubic inches, or 116 cm^3 .

Example 3. A shot travels 18 m to the goal at 40 m/s (about 144 km/h). How long does the goalkeeper have to react?

Show solution

1. Time = $18 \div 40 = 0.45 \text{ s}$.

Answer: Less than half a second, which is why goalkeepers must read the shooter before the puck is struck.

PRACTICE

1. **Easy** When and where was the first recorded indoor game of ice hockey, and who organised it?

Show answer

March 3, 1875, at the Victoria Skating Rink in Montreal; James Creighton.

2. **Easy** Who donated the Stanley Cup, and when was it first awarded?

Show answer

Lord Stanley of Preston, Governor General of Canada; first awarded in 1893, to the Montreal Hockey Club.

3. **Easy** Why did the first players use a flat puck instead of a ball?

Show answer

A flat puck slides along the ice and is less likely to fly up into the spectators.

4. **Medium** What was the rover, and why did teams drop the position?

Show answer

A seventh skater who roamed between attack and defence; leagues went to six a side in the 1910s to open up the ice and simplify play.

5. **Medium** Who won Canada's first Olympic ice-hockey gold medal, and where?

Show answer

The Winnipeg Falcons, at the 1920 Olympic Games in Antwerp.

6. **Medium** A team scores 246 goals in an 82-game season. What is its average per game?

Show answer

$246 \div 82 = 3.0$ goals per game.

7. **Medium** How many years after the Victoria Rink game was the NHL founded? After the first Stanley Cup?

Show answer

$1917 - 1875 = 42$ years; $1917 - 1893 = 24$ years.

8. **Medium** Convert the puck's weight of 6 oz to grams (1 oz $\approx$ 28.35 g).

Show answer

$$6 \times 28.35 \approx 170 \text{ g.}$$

9. **Hard** A puck at 45 m/s is shot from 15 m. A goalkeeper needs 0.2 s to move his glove. By what distance from the shooter must he have started to move?

Show answer

Time to goal $15 \div 45 \approx 0.333$ s. He must start at least 0.2 s before arrival, so within 0.133 s of the shot, when the puck has travelled about $45 \times 0.133 \approx 6$ m.

10. **Hard** Explain how Proverbs 16:32 applies to a fast, physical game like hockey.

Show answer

A player who controls his temper avoids penalties that hurt his team and plays with clear judgement; Scripture ranks self-control above mere strength.

11. **Challenge** A rink's four corners are quarter-circles of radius 28 ft. How much smaller is the real ice than the 200×85 rectangle? (Each corner removes a square of side 28 minus a quarter-circle.)

Show answer

Each corner removes $28^2 - \frac{1}{4}\pi \times 28^2 = 784 - 615.8 = 168.2$ sq ft; four corners remove about 673 sq ft. Ice area $\approx 17,000 - 673 \approx 16,327$ sq ft.

COMMON MISTAKES

- Saying hockey was invented in a single moment. The 1875 game is the first recorded organised indoor game; stick-and-ball games on ice are older.
- Thinking the Stanley Cup was always a professional trophy. It began as a prize for amateur champions.
- Forgetting to use the radius (not the diameter) in πr^2 .

Make it a game • Ice Pictionary. Take turns drawing a term for the other to guess: puck, rover, Stanley Cup, the Victoria Skating Rink, or a rink in Montreal. No words or letters allowed. Thirty seconds per drawing. After each guess, say one true fact about James Creighton or the March 3, 1875, game. Play until each of you has drawn five.

Scripture. “He that is slow to anger is better than the mighty; and he that ruleth his spirit than he that taketh a city.” (Proverbs 16:32, KJV)

In a fast, hard game, the strongest player is the one who keeps his temper. Self-control wins more than force.

6.4 ERIC LIDDELL AND THE VIRTUE OF SPORT

OBJECTIVES

- Tell the true story of Eric Liddell's decision not to run on a Sunday at the 1924 Paris Olympics and his victory in the 400 metres.
- Distinguish the historical facts of Liddell's life from the changes made in later retellings.
- Calculate speeds and compare Liddell's times with modern times.
- Reflect on conviction, humility and service as virtues that sport can display.

Warm-up. Write a short answer: would you give up the chance to compete in your best event for a reason of conscience? What reason would be strong enough? Keep your answer private if you wish.

WATCH

July 11th Eric Liddell – Scotland, Olympian #christianmotivation #truestory #inspirationalstory

365 Christian Men • 7:45

<https://www.youtube.com/watch?v=XVZCEov9MDY>

WHEN TO WATCH

After the story paragraph. A short narrated account of Liddell's decision, his 400 m victory and his later service in China, with archive photographs.

KEY TERMS

Sabbath

The day of rest; Liddell, like many Christians of his day, kept Sunday as the Lord's Day and would not compete on it.

conviction

A firmly held belief that a person acts on even at a cost.

heat

A preliminary race whose fastest finishers advance to the next round.

Stade de Colombes

The main stadium of the 1924 Paris Olympic Games.

internment camp

A camp where civilians of enemy nations were held during war; Liddell died in the Weixian camp in China in 1945.

CORE IDEAS

The story. Eric Liddell was born in 1902 in Tianjin, China, to Scottish missionary parents. By 1924 he was a student at the University of Edinburgh, a rugby player for Scotland and Britain's finest sprinter, a favourite for the 100 metres at the Paris Olympics. But when the timetable was published months before the Games, the heats of the 100 metres were set for a Sunday. Liddell quietly declined to run. He was criticised in the press, but he did not change his mind. Instead he trained for the 200 and 400 metres. On July 9 he won bronze in the 200 metres. On July 11, 1924, as he went to the start of the 400 metres final, a British team masseur pressed a note into his hand quoting 1 Samuel 2:30: "them that honour me I will honour." Liddell ran from the gun as if it were a sprint and won in 47.6 seconds, an Olympic and world record.

How it changed. Liddell could have enjoyed fame. Instead, in 1925 he returned to China to teach science and sport at the Anglo-Chinese College in Tianjin as a missionary. He married Florence Mackenzie in 1934 and later worked in the countryside in difficult and dangerous conditions. During the Second World War he was interned by the Japanese in the Weixian camp, where he taught children, organised games for bored teenagers and cared for the sick and elderly. Though he had refused to run on Sunday, he once agreed to referee a Sunday hockey game in the camp because the young people had begun to fight among themselves without one. He died in the camp of a brain tumour on February 21, 1945, aged forty-three. His story was told to millions in the 1981 film *Chariots of Fire*, which changed some details: in reality he knew about the Sunday heats long before he sailed for France.

How it is played. The 400 metres is one lap of a standard track, run in lanes, and it demands both a sprinter's speed and the endurance to hold it. Liddell was famous for his unorthodox style, head thrown back and arms flailing, and for running the first half nearly as fast as the second. His time of 47.6 seconds would not win a medal today, but on the slower cinder track of Colombes, without starting blocks, it was a remarkable run.

Why it matters. Liddell is remembered not mainly for a gold medal but for the kind of man he was. He showed that conviction can be held without self-righteousness: he did not condemn others who ran on Sunday, and he accepted criticism quietly. He used his fame to serve, and he finished his life caring for others in a prison camp. Sport can display virtue: courage, honesty, humility and faithfulness. The best athletes, like Liddell, put those things first and the prize second.

PICTURE STUDY



The Final of the 400 Metres, Paris 1924: Eric Liddell Wins Ahead of Horatio Fitch, Photographer for *Le Miroir des sports*, July 11, 1924 (published July 16, 1924) · Photograph, printed in a sports magazine · Stade de Colombes, Paris

Image: [Wikimedia Commons](#), public domain

This photograph appeared in the French magazine *Le Miroir des sports* five days after the race. Eric Liddell, on the left, reaches the line in first place; the American Horatio Fitch (number 216), the silver medallist, is behind him.

Liddell had run the race almost flat out from the start, a tactic many experts thought impossible over a full lap.

Look closely

- Find Liddell. How can you tell he is the winner?
- Look at the track surface and the lines. How does it differ from a modern track?
- Look at the crowd. What do you think they had come to see?
- Look at the runners' posture. Who seems to be straining more at the finish?

Talk about it

1. What would it have meant to Liddell to win this race after giving up the 100 metres?
2. Why do you think this race is remembered a century later, when so many other champions are forgotten?

3. What can a photograph of a finish tell us, and what can it not tell us, about the character of the winner?

Safety first. Time your 400 m run or walk on a safe, flat route or school track with a parent present. Warm up first, carry water, and stop if anything hurts.

PROJECT

Run Liddell's Race and Read His Life

You will time yourself over 400 m with recorded splits, compare your pacing with Liddell's, and read and summarise a short account of his life.

You will need

- A 400 m track or a measured 400 m route
- A stopwatch (or a helper with a phone)
- A biography or reliable article about Eric Liddell (from a library or a museum website)
- Your scorebook

Steps

1. Warm up for ten minutes with easy jogging and stretches.
2. Run (or briskly walk) 400 m at your best steady effort, with a helper calling out the time at 100, 200 and 300 m.
3. Record your splits and compute your speed for each 100 m segment.
4. Make a graph of speed against distance and compare it with Liddell's fast-from-the-start tactic.
5. Read a short account of Liddell's life and list five facts with dates.
6. Write a one-page reflection: what did Liddell's choice cost him, what did it gain, and what virtue in his life would you most like to imitate?

Tips

- Pace yourself: do not sprint the first 100 m flat out unless you are trained.
- If you walk, the comparison of segments still works.

Check your work

- ☐ I recorded a 400 m time with three splits and calculated segment speeds.
- ☐ I listed five dated facts about Liddell from a reliable source.
- ☐ I wrote a thoughtful one-page reflection.

SCOREBOOK

1. Draw a 400 m track and mark the 100 m splits.

2. Make a timeline of Liddell's life from 1902 to 1945.
3. Graph your 400 m segment speeds.

From history. A memorial stone now stands at the site of the Weixian camp, in Weifang, China, inscribed with Isaiah 40:31: “They shall mount up with wings as eagles; they shall run, and not be weary.”

WORKED EXAMPLES

Example 1. Liddell ran 400 m in 47.6 s. Find his average speed in m/s and km/h.

Show solution

1. $400 \div 47.6 \approx 8.40$ m/s.
2. $8.40 \times 3.6 \approx 30.3$ km/h.

Answer: About 8.4 m/s, or 30 km/h, for a whole lap.

Example 2. The world record for 400 m set in 2016 is 43.03 s. How much faster is it than Liddell's time, as a difference and as a percentage? How far behind would Liddell be when the record-holder finished?

Show solution

1. Difference: $47.6 - 43.03 = 4.57$ s.
2. Percentage: $4.57 \div 47.6 \approx 9.6\%$.
3. In 43.03 s at 8.40 m/s Liddell covers about 361 m, so he would be about 39 m behind.

Answer: 4.57 s, or about 9.6% faster; Liddell would be roughly 39 m behind, though today's athletes have synthetic tracks, starting blocks and modern training.

Example 3. Liddell was born in January 1902 and died in February 1945. How old was he at the 1924 Games, and how many years did he live after them?

Show solution

1. July 1924 – January 1902: 22 years old.
 2. February 1945 – July 1924: about 20 years and 7 months.
-

Answer: He was 22 at the Games and lived about 20 more years, most of them in service in China.

PRACTICE

1. **Easy** Why did Liddell not run the 100 metres at the 1924 Olympics?

Show answer

The heats were held on a Sunday, which he kept as the Lord's Day.

2. **Easy** What did Liddell win at the 1924 Games?

Show answer

Gold in the 400 metres (in an Olympic and world record of 47.6 s) and bronze in the 200 metres.

3. **Easy** What verse was on the note handed to Liddell before the 400 metres final?

Show answer

1 Samuel 2:30, "them that honour me I will honour."

4. **Medium** What did Liddell do after the Olympics?

Show answer

He returned to China in 1925 as a missionary teacher, married, served in difficult areas, and died in the Weixian internment camp in 1945.

5. **Medium** Name one way the film *Chariots of Fire* changed the true story.

Show answer

It showed Liddell learning of the Sunday heats on the boat to France, when in fact he knew months earlier.

6. **Medium** Find Liddell's average time per 100 m in his 400 m victory.

Show answer

$47.6 \div 4 = 11.9$ s per 100 m.

7. **Medium** Why did Liddell agree to referee a Sunday hockey game in the internment camp?

Show answer

The young people had begun fighting among themselves without a referee; he judged that serving them was more important than keeping his own rule in that situation.

8. **Medium** Explain how Liddell showed conviction without self-righteousness.

Show answer

He kept his principle at great cost but did not condemn others, accepted criticism quietly, and served others humbly afterward.

9. **Hard** If Liddell ran the first 200 m in 22.2 s, how fast was his second 200 m, and what were his average speeds in each half?

Show answer

Second half: $47.6 - 22.2 = 25.4$ s. Speeds: $200 \div 22.2 \approx 9.01$ m/s and $200 \div 25.4 \approx 7.87$ m/s (illustrative split).

10. **Hard** How does Liddell's story illustrate 1 Timothy 4:8 from Lesson 4.5?

Show answer

He trained his body and won the highest athletic prize, showing that exercise profits; but he ranked godliness higher, giving up an event for conscience and giving his life to service.

11. **Challenge** Write a short argument (four or five sentences) for or against this claim: "Liddell would have served his faith better by running on Sunday and using his fame afterward." Use facts from the lesson.

Show answer

Answers vary. A strong answer considers his conviction about the Lord's Day, the witness of his choice, his later service in China, and the danger of reasoning that good ends justify setting aside conscience, using accurate facts.

COMMON MISTAKES

- Saying Liddell learned of the Sunday heats on the boat. That is from the film; he knew months earlier.
- Thinking Liddell refused to compete at all. He ran and won the 400 m and took bronze in the 200 m.
- Calculating speed as $\text{time} \div \text{distance}$ instead of $\text{distance} \div \text{time}$.

Make it a game • Liddell's Line Walk. Lay a tape line along the hall with three stops: the choice about the Sunday heat, the race at the Stade de Colombes, and the later years of service. Walk to each stop and tell that part of the story, using the words Sabbath, conviction and 400 metres. Your parent listens for accuracy and drops one slip for each missing fact.

Scripture. “for them that honour me I will honour, and they that despise me shall be lightly esteemed.” (1 Samuel 2:30, KJV)

These are the words written on the note handed to Liddell before the 400 metres final. His honour came not from the medal but from faithfulness.

6.5 CAPSTONE: THE HISTORY OF A GAME

OBJECTIVES

- Choose one game or sport and research its history from reliable primary and secondary sources.
- Write a well-organised research paper of about 2,000 words with accurate dates, citations and a clear argument.
- Build and lead a playable presentation of the game as it was played at an earlier stage of its history.
- Evaluate sources for reliability and separate legend from evidence, as in the Doubleday and Webb Ellis lessons.

Warm-up. List three games or sports from this course you enjoyed most. For each, write one question about its history that the course did not answer. One of these questions may become your capstone.

WATCH

What's the difference between Primary and Secondary Sources in History?

The Medieval Historian • 3:43

<https://www.youtube.com/watch?v=XU0fAhss-yg>

WHEN TO WATCH

Before you begin your research. A historian explains the difference between primary and secondary sources, the skill your capstone depends on.

KEY TERMS

primary source

Evidence from the time itself: a rule book, a letter, a photograph, a newspaper report, an object.

secondary source

A later account by someone who studied the primary sources: a history book, an encyclopedia article, a museum's explanation.

thesis

The main claim of a paper, stated clearly near the beginning and supported by evidence throughout.

citation

A note telling the reader exactly where a fact or quotation came from.

presentation

A live, playable presentation of the game, with a short explanation, so that the audience experiences its history.

CORE IDEAS

The story. Every game in this course has a history that someone had to dig out: Irving Finkel reading a cracked clay tablet, Linnaeus writing in his Lapland diary, historians weighing Abner Graves's letter against the Pittsfield bylaw, archivists preserving the FA's minute book. In this capstone you join them. You will choose one game or sport, gather evidence, write its history, and teach others to play it as it was once played.

How it changed. Good historical writing has a shape. It begins with a question ("How did volleyball become a world sport?" or "Why does chess have a queen?"). It gathers evidence, weighs sources and admits uncertainty. It states a thesis and supports it with dated facts in a clear order, and it ends by explaining why the story matters. Your paper should follow the course's pattern: a story, how it changed, how it is played, and why it matters.

How it is played. The presentation is the playable heart of the capstone. Choose an earlier form of your game (the 1863 football laws, Naismith's thirteen rules, a reconstructed senet, tablut by Linnaeus's rules, 1744 cricket, Morgan's mintonette), make or gather the equipment, write the rules on one page, and lead your family or group through a game. Afterwards, ask them what surprised them and how the old game differed from the new.

Why it matters. Research teaches honesty: we say what the evidence shows and no more. Writing teaches order and clarity. Teaching a game to others teaches patience and generosity. Scripture says, "To every thing there is a season, and a time to every purpose under the heaven," and that includes a time to play. By studying the history

of play carefully and passing it on joyfully, you honour both the people who made these games and the God who made us able to delight in them.

PICTURE STUDY



Snap the Whip, Winslow Homer, 1872 · Oil on canvas · The Metropolitan Museum of Art, New York (a larger version is at the Butler Institute of American Art, Youngstown, Ohio)

Image: [Wikimedia Commons](#), public domain

Winslow Homer painted these boys at recess outside a red country schoolhouse in 1872. They are playing snap the whip: the boys hold hands in a line and run, and the leader swings suddenly so that the boys at the end are flung off.

No rule book, no equipment, no referee: just a game passed from child to child for generations. It is a fitting picture for the end of a course about the history of play.

Look closely

- Follow the line of boys from left to right. Where is the “whip” snapping?
- Look at the boy who has been flung to the ground. Does he look hurt, or ready to jump up and rejoin?
- Look at the schoolhouse. What does it tell you about when and where this game is being played?
- Look at the boys’ clothes and bare feet. What do they suggest about country life in 1872?

Talk about it

1. This game has no written rules. How do children learn games like this, and how could a historian ever study them?

2. What games in your own life are passed on without rule books?
3. Having studied the history of games, what do you now notice in this painting that you might not have noticed before?

Safety first. For your presentation, use soft balls and safe home-made equipment, clear the playing space, warm up participants for any active game, and have a parent present.

PROJECT

The Capstone: Research Paper and Playable Presentation

You will research and write the history of one game or sport and then lead a playable presentation of an earlier form of it for your family or group.

You will need

- Library books, museum websites and free primary sources (for example, rule books on Project Gutenberg)
- Your scorebook and notes from the course
- Materials to make the game's equipment
- A computer or paper for writing

Steps

1. Choose your game or sport and write a research question. Have a parent approve it.
2. Find at least five sources, including at least two primary sources. Record full citations.
3. Take notes in your scorebook, sorting facts into "Known," "Inferred" and "Disputed."
4. Write a one-sentence thesis and an outline in five parts: introduction, the story, how it changed, how it is played, why it matters.
5. Write a draft of about 2,000 words with citations for every important fact and date.
6. Revise: check every date, cut what does not support the thesis, and read the paper aloud.
7. Build the equipment for an earlier form of the game and write its rules on one page.
8. Lead a presentation: give a five-minute introduction, play the game with your audience, and ask them what surprised them.
9. Write a half-page reflection on what you learned from researching, writing and teaching.

Tips

- Start research early; the best evidence takes time to find.
- Keep every source's details as you go: it is hard to find them again later.

Check your work

- ☐ My paper has a clear thesis, accurate dates and at least five cited sources, two of them primary.
- ☐ My presentation used an earlier form of the game with written rules.
- ☐ I wrote a reflection after leading the presentation.

SCOREBOOK

1. Write your research question, thesis and outline.
2. Keep your source list with notes on each source's reliability.
3. Draw or photograph your presentation equipment and copy its one-page rules.

From history. Many of the games in this course survived because someone wrote them down: a Babylonian scribe, a Castilian king's workshop, a Swedish botanist, a London solicitor, a YMCA instructor. Your capstone continues that work.

WORKED EXAMPLES

Example 1. Plan your time. The capstone has about 15 hours across the three sessions of this lesson and your homework time: research, outlining, writing, revising, building the presentation and presenting. Divide the time sensibly and justify your plan.

Show solution

1. Research and notes: 5 hours (one third).
2. Outline and thesis: 1 hour.
3. First draft: 4 hours.
4. Revision and citations: 2 hours.
5. Building the presentation and writing its rules: 2 hours.
6. Presentation and reflection: 1 hour. Total: 15 hours.

Answer: One reasonable plan puts a third of the time into research, because a paper cannot be better than its evidence. Adjust to your topic, but never skip revision.

Example 2. Your paper should be about 2,000 words in five parts: introduction, the story, how it changed, how it is played, why it matters. If the introduction and conclusion take 15% each and the three middle sections share the rest equally, how many words is each?

Show solution

1. Introduction: $0.15 \times 2,000 = 300$.
2. Why it matters (conclusion): 300.
3. Remaining: $2,000 - 600 = 1,400; \div 3 \approx 467$ words each.

Answer: About 300, 467, 467, 467 and 300 words.

Example 3. Evaluate two sources about the invention of basketball: (A) Naismith's own book *Basketball: Its Origin and Development* (1941); (B) an anonymous website that says basketball was invented in 1895 in Boston. Which do you trust, and why?

Show solution

1. A is by the inventor, published, and consistent with the 1892 *Triangle* and other records, though written long after the event and from his own point of view.
2. B has no author, no sources and contradicts dated primary evidence (December 1891, Springfield).

Answer: Trust A, while checking it against contemporary sources; reject B. Ask of every source: who wrote it, when, how did they know, and does other evidence agree?

PRACTICE

1. Easy Give one example of a primary source and one of a secondary source for the history of cricket.

Show answer

Primary: the 1744 Laws, the 1743 Hayman print, the 1597 Guildford court record. Secondary: a modern history of cricket or a museum article.

2. Easy What is a thesis?

Show answer

The main claim of a paper, stated clearly and supported by evidence.

3. Easy Name the four parts of the course's lesson pattern that your paper should follow.

Show answer

The story; how it changed; how it is played; why it matters.

4. Medium Write a possible research question for each of these games: Go, volleyball, curling.

Show answer

Sample answers: Why did Go's board grow from 17×17 to 19×19 ? How did volleyball spread from Holyoke to the world? How did curling become an Olympic sport?

5. Medium Why is a single, late memory weak evidence? Give an example from the course.

Show answer

Memories fade and change, especially decades later, and one witness cannot be checked; Abner Graves's letter about Doubleday, written 66 years after he was five, is the classic example.

6. Medium Why should a presentation use an earlier form of the game rather than the modern one?

Show answer

It lets the audience experience the history directly and see how and why the rules changed.

7. Medium Your paper has 2,400 words. If you want each of the three middle sections to be 25% of the total, how many words is each, and how many are left for the introduction and conclusion together?

Show answer

Each 600 words; $2,400 - 1,800 = 600$ left for introduction and conclusion together.

8. **Medium** List three questions to ask about any source.

Show answer

Any three: Who wrote it? When? How did they know? Why did they write it?
Does other evidence agree?

9. **Hard** Two sources disagree on a date: one says the game began in 1891, another 1892. How would you decide, and how would you write about the disagreement?

Show answer

Look for the earliest primary evidence (dated documents or reports) and check which source relies on it; then state the best-supported date and mention the other with the reason it is less likely, or say plainly if the question cannot be settled.

10. **Hard** Explain how Ecclesiastes 3:1 applies to the study and enjoyment of games.

Show answer

Scripture gives play its proper season alongside work and worship; studying games honours God's gifts of joy and order, as long as play keeps its place.

11. **Challenge** Draft a one-sentence thesis for a capstone on any game in this course, and list three pieces of evidence you would use to support it.

Show answer

Answers vary. A strong thesis makes an arguable claim (for example, "Chess became a fast, attacking game only after Spanish players gave the queen new powers around 1475") and names specific evidence (the Valencian poem, Lucena's 1497 book, Anguissola's 1555 painting).

COMMON MISTAKES

- Choosing a topic too broad to research well ("the history of all ball games"). Narrow it.
- Copying sentences from sources instead of writing in your own words with citations.
- Repeating a popular legend as fact without checking the evidence.

Make it a game • One-Minute Thesis Pitch. Give your parent a sixty-second pitch of your game's history: your thesis, one primary source, one secondary source, and one citation. Your parent keeps time and asks two follow-up questions, such as how you know that is true, or what a skeptic would say. Score a point for each answered fact. Then improve your thesis and pitch again.

Scripture. “To every thing there is a season, and a time to every purpose under the heaven:” (Ecclesiastes 3:1, KJV)

The Preacher goes on to name “a time to laugh” and “a time to dance.” Play has its proper season in a well-ordered life, and studying it well is a way of giving thanks.

UNIT 6

SPORT AROUND THE WORLD TODAY

By the twentieth century the games of England, America and Canada had spread across the world, and the world had made them its own. This unit follows the first World Cup in Uruguay in 1930, cricket in Australia, India and the Caribbean, ice hockey in Canada from the Victoria Rink to the Stanley Cup, and Eric Liddell, whose refusal to run on a Sunday at the 1924 Olympics and whose life of service show sport at its best.

You will run a mini World Cup and count its matches, keep batting averages as a cricket statistician and explain Bradman's 99.94, test a puck against a ball, time your own 400 metres against Liddell's, and then complete the course with a capstone: a research paper on the history of one game and a playable presentation of an earlier form of it.

PREREQUISITES

- The codification of football and cricket (Units 3 and 4)
- Muscular Christianity and the modern Olympics (Lessons 4.5 and 5.5)
- Averages, rates, unit conversions and the area of a circle

MASTERY CHECKLIST

- ☐ I can tell the story of the first World Cup and count matches in round-robin and elimination tournaments.
- ☐ I can trace cricket in Australia, India and the West Indies and compute batting averages, including Bradman's.
- ☐ I can tell the story of hockey in Canada and calculate rink areas and puck volume.
- ☐ I can tell the true story of Eric Liddell and explain what it shows about the virtue of sport.
- ☐ I can research, write and present the history of a game using primary and secondary sources.

OPTIONAL BOOKS AND GAMES FOR THIS UNIT

- **Hockey Hall of Fame:** Free website of the Hall of Fame in Toronto, home of the Stanley Cup, with the history of the game, for Lesson 6.3. Ages 10+.
- **The Eric Liddell Community (Edinburgh):** Free website of the Edinburgh charity named after Liddell, with a reliable account of his life, for Lesson 6.4. Ages 10+.
- **Project Gutenberg (search: games history):** Free. Old rule books and histories of games in the public domain, useful as primary sources for the capstone in Lesson 6.5. A parent should help choose suitable titles. Ages 13+.

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	The World Cup and Football's Global Reach	3 sessions of 50 minutes
6.2	Cricket in India, Australia and the Caribbean	3 sessions of 50 minutes
6.3	Hockey and Canada	3 sessions of 50 minutes
6.4	Eric Liddell and the Virtue of Sport	3 sessions of 50 minutes
6.5	Capstone: The History of a Game	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 the answer with units and a sentence. Answer the other questions in complete sentences. The test has 15 problems worth a total of 100 points.

1. **6 pts**

When and where was the first World Cup final played, who won, and what was the score?

2. (7 pts)

How many matches are needed for a round robin of 8 teams? For a pure elimination of 8 teams? Show the formulas.

3. (6 pts)

Give two reasons the World Cup became possible by 1930.

4. (6 pts)

When and where was the first Test match, and how did the Ashes get their name?

5. (7 pts)

Bradman scored 6,996 runs in 80 Test innings, 10 not out. Compute his average and explain what would have happened if he had scored 4 in his last innings and been out.

6. (6 pts)

A batsman scores 30, 0, 72*, 15 and 48 (* = not out). Find his average.

7. (6 pts)

Who was Ranjitsinhji, and when did India and the West Indies play their first Tests?

8. (7 pts)

Describe the first recorded indoor hockey game: date, place, organiser and one innovation.

9. (6 pts)

Find the volume of a puck 3 in across and 1 in thick.

10. (6 pts)

Who donated the Stanley Cup, when was it first awarded, and to whom?

11. (7 pts)

Tell the true story of Eric Liddell's choice at the 1924 Olympics and its result.

12. (6 pts)

Find Liddell's average speed in the 400 m in m/s and km/h.

13. (6 pts)

What did Liddell do after 1924, and how did he die?

14. (6 pts)

Define primary and secondary sources and give one example of each from this course.

15. (12 pts)

Short essay. In about 250 words, explain how one sport in this unit became a world game and what virtue its history best displays. Support your answer with at least four dated facts and connect it to one passage of Scripture from the course.

ANSWER KEY

1. July 30, 1930, at the Estadio Centenario, Montevideo; Uruguay beat Argentina 4–2.
2. Round robin: $8 \times 7 \div 2 = 28$. Elimination round: $8 - 1 = 7$.
3. Any two: football had spread worldwide under one set of laws; FIFA (1904) gave the game an international body; Olympic football had shown the demand; Rimet championed it; Uruguay offered to host and pay travel.
4. March 1877 at the Melbourne Cricket Ground; after Australia won at the Oval in 1882, a mock obituary said English cricket's body would be cremated and the ashes taken to Australia.
5. $6,996 \div 70 \approx 99.94$. With 4 more runs: $7,000 \div 70 = 100.00$.
6. Runs 165; dismissals 4; $165 \div 4 = 41.25$.
7. An Indian prince who batted brilliantly for England from 1896 and gave his name to India's Ranji Trophy; the West Indies in 1928, India in 1932.
8. March 3, 1875, Victoria Skating Rink, Montreal, organised by James Creighton; a flat wooden puck instead of a ball.
9. $\pi \times 1.5^2 \times 1 \approx 7.07 \text{ in}^3$.
10. Lord Stanley of Preston; 1893; the Montreal Hockey Club.
11. He declined to run the 100 m because the heats were on a Sunday, which he knew months in advance; he trained for the 200 and 400 m, won bronze in the 200 m and gold in the 400 m in a record 47.6 s.
12. $400 \div 47.6 \approx 8.40 \text{ m/s} \approx 30.3 \text{ km/h}$.
13. He became a missionary teacher in China, married, served in hard places, and died of a brain tumour in the Weixian internment camp in February 1945.
14. Primary: evidence from the time (Finkel's tablet, the 1744 Laws, the FA minute book). Secondary: a later account based on such evidence (a history book or museum article).
15. Answers vary. A strong essay traces the sport's spread accurately (for example football from 1863 to FIFA in 1904 and the World Cup in 1930), names a virtue with a clear example (Liddell's conviction, curling's courtesy, the spirit of cricket), and uses a passage such as 1 Corinthians 9:24-25, 2 Timothy 2:5, Proverbs 16:32 or 1 Samuel 2:30 appropriately.

PORTFOLIO PIECE: CAPSTONE: THE HISTORY OF A GAME

The capstone of Lesson 6.5 is this unit's portfolio. Submit (1) a research paper of about 2,000 words on the history of one game or sport, with a clear thesis, at least five cited sources (two of them primary), and the four-part structure of the course; (2) one page of rules for an earlier form of the game, with photographs or drawings of the equipment you made; (3) a record of the presentation you led: who played, what happened and what they said; and (4) a half-page reflection on what you learned from researching, writing and teaching.

LOOK FOR	WHAT IT MEANS
Research	At least five reliable sources, including two primary sources, used and cited accurately; legend separated from evidence.
Writing	A clear thesis, logical organisation in four parts, accurate dates and careful prose.
Presentation	An earlier form of the game, with clear one-page rules and working equipment, led well for real participants.
Reflection	An honest, thoughtful reflection on the work and on the place of play in a well-ordered life.

MIDTERM EXAM

Covers Units 1–3. Time: 100 minutes.

You have 100 minutes. A calculator is allowed; no notes. Show your work for every calculation: write the formula or count you used, substitute the numbers and give the answer with units. Give names, places and dates as precisely as you can; correct reasoning earns partial credit even if a number slips. Answer the other questions in complete sentences. The exam has 24 problems worth a total of 100 points.

1. **4 pts** Lesson 1.1

Who recovered the rules of the Royal Game of Ur, from what source, and how old is that source?

2. **4 pts** Lesson 1.1

Four binary dice each score 0 or 1 with equal chance. Find the chance of throwing exactly 1, as a fraction and a percent.

3. **4 pts** Lesson 1.2

Describe the senet board and explain why all modern senet rules are called reconstructions.

4. **4 pts** Lesson 1.3

Name the oldest event of the ancient Games, its length, and the prize given to winners.

5. **4 pts** Lesson 1.3

How many festivals were held every four years from 776 BC to AD 393, counting both? Show the work.

6. **4 pts** Lesson 1.4

Gaius Appuleius Diocles started 4,257 races and won 1,462. Find his win rate.

7. **4 pts** Lesson 1.5

What did Hosler, Burkett and Tarkanian show about Mesoamerican rubber in 1999?

8. **4 pts** Lesson 1.5

A ball dropped from 1.5 m rebounds to 0.96 m. Find its rebound ratio and the height of its next bounce.

9. **4 pts** Lesson 2.1

What changed about the queen and bishop around 1475, and how many squares can a modern queen reach from d4?

10. **4 pts** Lesson 2.1

The shatranj alfil jumped exactly two squares diagonally. How many squares of the board could one alfil ever reach?

11. **4 pts** Lesson 2.2

Estimate 3^{361} as a power of ten, and explain what it counts.

12. **4 pts** Lesson 2.2

What happened in Japan in 1612, and why did it matter for Go?

13. **4 pts** Lesson 2.3

In oware you sow 9 seeds from pit 5. Where does the last seed land, and can it capture there?

14. **4 pts** Lesson 2.4

Describe Linnaeus's tablut: board size, sides and how each side wins.

15. **4 pts** Lesson 2.5

A blot stands 6 points from your checker with the path clear. How many of the 36 rolls hit it? Show the count.

16. **4 pts** Lesson 2.5

What three kinds of games does Alfonso X's Book of Games describe, and what lesson did his introduction draw from them?

17. **4 pts** Lesson 3.1

Why did Scottish and English kings ban football and golf, and why did the bans fail?

18. (4 pts) Lesson 3.2

A player wins 70% of points. Find his chance of winning a game from deuce.

19. (4 pts) Lesson 3.3

Convert 220 yards to metres and 120 lbf to newtons (1 yd = 0.9144 m; 1 lbf $\approx$ 4.448 N).

20. (4 pts) Lesson 3.3

Use $R = v^2 \sin 2\theta / g$ to find the range of an arrow launched at 40 m/s and 45° , ignoring air resistance.

21. (4 pts) Lesson 3.4

List three things fixed by the 1744 Laws of Cricket and convert the pitch length to metres.

22. (4 pts) Lesson 3.4

A team scores 144 runs in 20 overs of 6 balls. Find runs per over and per ball.

23. (5 pts) Lesson 3.5

Team A's stones lie 0.5 m and 1.3 m from the button; Team B's lie 0.8 m and 1.1 m. Who scores, and how many? Then give the dates of the Stirling stone and the Paisley Abbey challenge.

24. (7 pts) Lesson essay

Short essay. In about 200 words, compare an ancient game (Unit 1), a great board game (Unit 2) and a medieval or early modern sport (Unit 3). What does each show about the people who played it, and how do historians know? Name at least one primary source for each.

ANSWER KEY

1. Irving Finkel, from a Babylonian cuneiform tablet copied by the scribe Itti-Marduk-balātu in 177 BC.
2. $4/16 = 25\%$.
3. Thirty squares in three rows of ten. No complete ancient rule text survives, so scholars such as Kendall and Bell inferred rules from boards, pictures and fragments of text.
4. The stadion, one length of the stadium, about 192 m; a wreath of wild olive.
5. Span: $776 + 393 - 1 = 1,168$ years; $1,168 \div 4 = 292$ intervals; 293 festivals.
6. $1,462 \div 4,257 \approx 34.3\%$.
7. That Mesoamericans mixed latex from the *Castilla elastica* tree with morning-glory juice to make tough, bouncy rubber, thousands of years before modern vulcanization.
8. $0.96 \div 1.5 = 0.64$; next bounce $0.96 \times 0.64 \approx 0.61$ m.
9. The queen gained the moves of rook and bishop and the bishop could slide any distance diagonally; 27 squares from d4.
10. 8 squares.
11. $361 \times 0.4771 \approx 172.2$, about 10^{172} ; the number of ways to colour every point of a 19×19 board empty, black or white.
12. Tokugawa Ieyasu began paying stipends to top Go players and the Go houses (Hon'inbō Sansa's first) were founded, making Go a profession.
13. $5 + 9 = 14 \rightarrow 14 - 12 = 2$, pit 2 in your own row; no capture is possible in your own row.
14. 9×9 ; a king and 8 defenders against 16 attackers; the king's side wins by reaching the edge, the attackers by surrounding the king.
15. Rolls with a 6: 11; 5-1 and 4-2 (two ways each): 4; 3-3 and 2-2: 2. Total $17/36 \approx 47\%$.
16. Chess (skill), dice (chance) and tables (both); the wise player makes the best use of whatever chance gives him.
17. They wanted men to practise archery for defence and to stop disorder; the games were too popular to suppress, and kings themselves (James IV) later took up golf.
18. $0.49/(0.49 + 0.09) \approx 0.845$, about 84.5%.
19. 201.2 m; 533.8 N.

20. $1600/9.8 \approx 163$ m.
21. Any three: 22-yard pitch, two-stump wicket 22 in $\times$ 6 in, ball of 5–6 oz, four-ball overs. 22 yd $\approx$ 20.1 m.
22. 7.2 per over; $144 \div 120 = 1.2$ per ball.
23. Team A's 0.5 m stone is closest; its next stone (1.3 m) is farther than B's 0.8 m, so A scores 1. Stirling stone 1511; Paisley 1541.
24. Answers vary. A strong essay chooses three accurate examples, draws a reasonable conclusion about each people (for example Sumerian leisure, Persian and Spanish courtly learning, English village defence), and names primary sources such as Finkel's tablet, the Libro de los juegos or the 1744 Laws.

FINAL EXAM

Covers Units 1–6. Time: 120 minutes.

You have 120 minutes. A calculator is allowed; no notes. Show your work for every calculation: write the formula or count you used, substitute the numbers and give the answer with units. Give names, places and dates as precisely as you can; correct reasoning earns partial credit even if a number slips. About a third of the exam reviews Units 1–3 and the rest covers Units 4–6. The exam has 24 problems worth a total of 100 points.

1. **4 pts** Lesson 1.1

Find the average throw of four binary dice and explain why 2 is the most common total.

2. **4 pts** Lesson 1.3

Explain the sacred truce and Paul's use of the athlete in 1 Corinthians 9:24-25.

3. **4 pts** Lesson 1.5

Name the oldest known ballcourt and the oldest rubber balls, with approximate dates.

4. **4 pts** Lesson 2.1

Trace chess in four steps from India to Europe with approximate dates.

5. **4 pts** Lesson 2.3

What did Romein and Bal prove about oware in 2002, and why do people still play it?

6. **4 pts** Lesson 2.5

Verify the starting backgammon pip count of 167.

7. **4 pts** Lesson 3.2

Show that a player who wins 60% of points wins about 69% of games from deuce.

8. **4 pts** Lesson 3.4

Why did the cricket bat change from curved to straight?

9. **4 pts** Lesson 4.1

With 12 clubs each playing every other once, how many matches are needed? Explain why one code of rules mattered for such a league.

10. **4 pts** Lesson 4.2

Describe the founding of the FA in 1863 and the RFU in 1871, and the issue that divided them.

11. **4 pts** Lesson 4.3

Describe the first Wimbledon Championship and the court the rules committee adopted.

12. **4 pts** Lesson 4.4

Find the distance from home to second on a 90-ft diamond and give two reasons historians reject the Doubleday story.

13. **4 pts** Lesson 4.5

What was muscular Christianity, and how does 1 Timothy 4:8 both support and limit it?

14. **4 pts** Lesson 5.1

Explain how Naismith reasoned from problems to two of his rules.

15. **4 pts** Lesson 5.2

Convert Morgan's 6 ft 6 in net to metres and explain why today's net is higher.

16. **4 pts** Lesson 5.3

Find yards needed per down under the 1882, 1906 and 1912 rules, and explain why the 1906 change encouraged passing.

17. **4 pts** Lesson 5.4

Find the diameters of a 9-inch baseball and a 12-inch softball, and the volume ratio of the softball to the baseball.

18. **4 pts** Lesson 5.5

Spyridon Louis ran about 40 km in 2:58:50. Find his pace in minutes per kilometre.

19. **4 pts** Lesson 6.1

How many matches were played in the 1930 World Cup (one group of four, three groups of three, two semi-finals and a final)?

20. **4 pts** Lesson 6.2

A batsman scores 50, 7, 33*, 0 and 61 (* = not out). Find his average, and explain why cricket divides by dismissals.

21. **4 pts** Lesson 6.2

Explain Bradman's average of 99.94 and what four more runs would have done.

22. **4 pts** Lesson 6.3

Describe the first recorded indoor hockey game and the first award of the Stanley Cup.

23. **4 pts** Lesson 6.4

Tell the true story of Eric Liddell's decision in 1924 and find his average speed in the 400 m (47.6 s).

24. **8 pts** Lesson essay

Essay (two paragraphs). "Sport became a world activity because people learned to write fair rules and to keep them honourably." Using at least four examples from at least three different units (for example the 1744 Laws, the FA of 1863, Naismith's rules, the spirit of cricket, Liddell's conviction), explain whether you agree. Connect your answer to one passage of Scripture from the course.

ANSWER KEY

1. $(0 + 4 + 12 + 12 + 4) \div 16 = 2$; there are 6 ways to make 2, more than any other total.
2. The truce protected travel to the Games. Paul compares the Christian to an athlete who trains with self-control, but for an incorruptible crown, not a withering wreath.
3. Paso de la Amada, Chiapas, about 1650 BC; El Manatí, Veracruz, about 1600 BC.
4. Chaturanga in India (about 6th century); chatrang/shatranj in Persia; shatranj in the Islamic world and Baghdad (9th–10th century); Christian Europe by about 1000; modern queen about 1475.
5. That it is a draw with perfect play; people still enjoy it because no human plays perfectly and the pleasure is in thinking well.
6. $2 \times 24 + 5 \times 13 + 3 \times 8 + 5 \times 6 = 48 + 65 + 24 + 30 = 167$.
7. $0.36 / (0.36 + 0.16) = 0.36 / 0.52 \approx 0.692$.
8. Early bowling was underarm along the ground; when bowlers made the ball bounce, a straight bat was needed to meet it.
9. $12 \times 11 \div 2 = 66$. Every pair of clubs must play under the same rules, which is impossible without a common code.
10. The FA was founded at the Freemasons' Tavern, London, on October 26, 1863 (Morley wrote the laws); the RFU on January 26, 1871, by 21 clubs. Carrying the ball and hacking divided them.
11. July 1877, 22 entrants, Spencer Gore won; a rectangular court of 78×27 ft with real tennis scoring.
12. $90\sqrt{2} \approx 127.3$ ft. Doubleday was at West Point in 1839 and never claimed it; the only witness was a five-year-old writing 66 years later; older evidence (1744, 1791) exists.
13. A Victorian movement linking sport and physical strength with Christian character; Paul says bodily exercise profits a little but godliness profits in everything, so exercise is good but secondary.
14. Tackling was dangerous indoors, so no running with the ball; crowding the goal was rough, so the goal was raised overhead, requiring a skilful arcing shot.
15. $78 \text{ in} \times 2.54 = 198 \text{ cm} \approx 1.98 \text{ m}$; the set and spike, developed around 1916, made a higher net necessary.
16. 1.67, 3.33 and 2.5 yards. Short pushing plays could no longer earn first downs easily, so teams turned to the newly legal forward pass and wider plays.

17. 2.86 in and 3.82 in; $(12/9)^3 \approx 2.37$.
18. $178.83 \text{ min} \div 40 \approx 4.47 \text{ min/km}$, about 4 min 28 s per km.
19. $6 + 9 + 3 = 18$.
20. Runs 151; dismissals 4; $151 \div 4 = 37.75$. A not-out batsman was not defeated, so only dismissals measure how often he was got out.
21. $6,996 \text{ runs} \div 70 \text{ dismissals} = 99.94$; with 4 more runs and the same dismissals, $7,000 \div 70 = 100$.
22. March 3, 1875, Victoria Skating Rink, Montreal, organised by James Creighton, with a flat puck; the Cup, donated by Lord Stanley, first went to the Montreal Hockey Club in 1893.
23. He knew months ahead that the 100 m heats were on Sunday and declined to run; he won bronze in the 200 m and gold in the 400 m. $400 \div 47.6 \approx 8.4 \text{ m/s}$.
24. Answers vary. A strong essay uses accurate, dated examples from several units, explains how written rules allowed strangers to compete and games to spread, shows that rules depend on honour where they are silent, and uses Scripture such as 2 Timothy 2:5, 1 Corinthians 9:24-25, Proverbs 16:32 or 1 Timothy 4:8 appropriately.