

SCHOOL LAUNCH • EXPLORE TRACKS

EXPLORE TRAVEL AND FARAWAY PLACES • EXPERT

Track 8 of the Explore Tracks, Expert level: four trails for students who want to read the world well. Map projections and coordinates, real trip planning with real numbers, great journeys read from the travelers' own words, and an armchair tour of famous places.

First edition

*If I take the wings of the morning, and dwell in the uttermost parts of the sea;
even there shall thy hand lead me, and thy right hand shall hold me.
Psalm 139:9-10 (KJV)*

COURSE GUIDE

Explore Tracks are for students who want more of what they love. Each track is a set of short stops. At every stop the student meets a true story, studies a great picture, does something with his or her hands, plays a game and adds a page to a Field Notebook. At the Expert level each stop also brings primary sources, numbers to work, and a “go deeper” list of books, museum pages and a second video.

The Travel track has four trails of eight stops. Trail A reads the world: why every flat map must stretch, how latitude, longitude and time zones work, and how mapmakers from Ptolemy to the Hereford Mappa Mundi to Mercator (1569) drew what they knew. Trail B plans a real trip, with a costed budget, a day-by-day itinerary, a one-bag packing list, passports and currency, courtesy abroad and safety. Trail C follows great journeys, from Abraham leaving Ur and Paul’s missionary voyages to Marco Polo, Columbus, Lewis and Clark, Isabella Bird, Nellie Bly and Amelia Earhart, read where possible in their own journals and letters. Trail D tours faraway places, from Jerusalem and Rome to Mount Fuji and the Grand Canyon.

Each stop ends with “Goes deeper in.”, a link to the matching School Launch lesson, most often Geography (Grade 4, Grade 8, or Technology Overcoming Geography), with History, Arithmetic, Art and Literature where they fit. A travel journal is kept through the whole track.

WHO IT IS FOR

Written for students about ages 14 and up who read on their own and can work with percentages, ratios and simple formulas. Younger siblings working at the Scout or Ranger level can share the same stops, maps and pictures and talk them over together. No travel is needed, and nothing earlier is required.

HOW TO USE THIS COURSE

1. **One stop at a time.** An Expert stop takes 25–40 minutes: read the story and the primary source, study the picture, work the numbers, do the hands-on part and play the game. Two or three stops a week works well.
2. **Any order.** The four trails are independent, though Trail A’s map skills help everywhere else.
3. **Primary sources and numbers.** Expert stops quote travelers’ own words where they are in the public domain (the Lewis and Clark journals, Isabella Bird’s letters, Nellie Bly’s book) and ask the student to check claims against a map: distances, speeds, dates and costs.
4. **Field Notebook and travel journal.** Every stop adds a page. Each trail builds something: a map portfolio, a complete trip plan with budget and itinerary, a hand-drawn map of Paul’s journeys and a journey timeline, or a set of postcards written from each faraway place. A parent signs each trail certificate.

5. **Badge quizzes.** Each trail has a short, optional quiz, written or oral. They are for review, not grades.

SCOPE AND SEQUENCE

Trail 1: Travel and Faraway Places 🗺️ **Trail A: Reading the World** (Self-paced)

Trail 2: Travel and Faraway Places 🗺️ **Trail B: Planning a Trip** (Self-paced)

Trail 3: Travel and Faraway Places 🗺️ **Trail C: Great Journeys** (Self-paced)

Trail 4: Travel and Faraway Places 🗺️ **Trail D: Armchair Tour of Faraway Places** (Self-paced)

MATERIALS

- **Field Notebook (a sketchbook or composition book)** One for the whole track; it doubles as the travel journal.
- **A world atlas and, if you have one, a globe** Any recent atlas will do. A library atlas is fine.
- **A ruler, protractor, string, colored pencils, tracing paper and a calculator** For scale, projections, great-circle routes and budgets.
- **A local road map or transit map (printed or online)** For Trail A and the trip plan.
- **A Bible (KJV)** For the verse at each stop and for Paul's journeys in Acts.

GRADING

Explore Tracks are not graded. A stop is done when the student has read the story and source, done the hands-on part and made a notebook page.

Badges and trail certificates are earned by finishing the stops.

- Families who want to count the track toward a Geography credit can use the trip plan, the map portfolio and the badge quizzes as evidence of work.

A NOTE TO PARENTS

You do not need to be a traveler. Read alongside, look at the picture together and ask, "What do you notice, and how do you know?" Each stop has a short *For families* note with sources and any facts that are uncertain or disputed, such as how much of Marco Polo's account he saw himself, or the exact route of Abraham's journey.

Safety: the trip-planning stops are paper exercises. If you turn one into a real outing, an adult plans it and goes along, the family agrees on a meeting place, and no one shares personal details or travel plans online. Prices in the budget stops are examples; check current figures before spending money.

Journeys are told plainly and judged by the standards of their own day. Hard things (the hardships of the Corps of Discovery, the harm done in the years after Columbus, shipwreck and imprisonment in Paul's voyages, Amelia Earhart's loss in 1937) are named honestly without graphic detail.

Books: the Lewis and Clark journals, Isabella Bird's *A Lady's Life in the Rocky Mountains* (1879) and Nellie Bly's *Around the World in Seventy-Two Days* (1890) are public domain and are quoted. Modern translations and newer biographies are summarized; borrow them from the library.

Pictures are public-domain paintings, maps and historic photographs, including Claude Lorrain, Canaletto, Thomas Moran, Albert Bierstadt, Hokusai and the Hereford Mappa Mundi.

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Trails may be done in any order.

TRAVEL AND FARAWAY PLACES TRAIL A: READING THE WORLD

The first trail of the Travel track teaches the tools of every traveler and mapmaker: why flat maps must stretch the round earth, the compass rose and the cardinal directions, latitude and longitude, scale and distance, time zones, road maps and subway diagrams, three great old maps (Ptolemy's *Geography*, the Hereford Mappa Mundi and Mercator's map of 1569), and finally a map of your own town.

This is the  **Expert** level, for ages 14 and up. Each stop takes 35 to 50 minutes and stands by itself. Students read the stop on their own, study the picture, work the numbers, read a primary source where one is given, write a one-paragraph narration for the parent to keep, and add a page to their **travel journal**. The practice problems include “challenge” questions with worked answers, and the trail ends with a finished, field-checked town map.

Five stops earn the **Map Reader badge, part 1**; eight stops earn part 2 and the **Trail A certificate**. The optional badge quizzes below can be used as a review.

BEFORE YOU BEGIN

- Multiply and divide with decimals and work with simple ratios and fractions (a calculator is fine).
- Use a protractor to measure angles and find places on a globe or atlas.

MASTERY CHECKLIST

- ☐ I can explain why every flat map distorts the earth and say what Mercator's projection keeps and gives up.
- ☐ I can give and correct compass bearings, including for magnetic declination.
- ☐ I can read and use latitude and longitude, and find longitude from time at 15° per hour.
- ☐ I can convert map scales, read road and transit maps, and work out time differences across zones and the date line.
- ☐ I have drawn a map of my town with a legend, north arrow, scale bar, sources and an honest closing error.

OPTIONAL BOOKS AND RESOURCES

- **Library of Congress, Geography and Map Division** (<https://www.loc.gov/research-centers/geography-and-map/>): Free digitized old maps, Sanborn fire insurance maps and panoramic town views. Useful for Stops A1, A7 and A8.
- **USGS topoView** (<https://ngmdb.usgs.gov/topoview/>): Free current and historical topographic maps of the United States at 1:24,000 and other scales, for Stops A4 and A8.

- **NOAA Magnetic Field Calculators**
(<https://www.ngdc.noaa.gov/geomag/calculators/magcalc.shtml>): Find the magnetic declination for your location, for Stop A2.
- **Royal Museums Greenwich** (<https://www.rmg.co.uk>): The prime meridian, Harrison's timekeepers and Greenwich Mean Time, for Stops A3 and A5.
- **The Mappa Mundi and Chained Library, Hereford Cathedral**
(<https://www.themappamundi.co.uk>): Zoomable images and explanations of the Hereford Mappa Mundi, for Stop A7.

1.1 GLOBE AND MAP: WHY MAPS STRETCH

OBJECTIVES

- Explain why no flat map can show a round earth without stretching something, and name the mathematician who proved it.
- Compare a conformal map (Mercator), an equal-area map and a compromise map by what each keeps and what each gives up.
- Calculate Mercator's stretch at a given latitude and use it to explain why Greenland looks as large as Africa.

Warm-up. Peel an orange and try to keep the peel in one piece. Now press it flat on the table without tearing it. What happens? Write one sentence: what would you have to do to make the peel lie perfectly flat?

Video slot. Video coming. Map projections explained: why every flat map distorts the globe; Mercator versus equal-area maps; Tissot's circles. Search approved channels (National Geographic Education, Library of Congress, Royal Museums Greenwich, Smithsonian); preview first.

KEY TERMS

globe

A model of the earth on a sphere. It is the only kind of map that can keep shape, size, distance and direction all true at once.

map projection

A mathematical rule for moving the lines of latitude and longitude from a round earth onto a flat surface.

distortion

The stretching, squeezing or bending of shapes, sizes, distances or directions that happens when a round surface is drawn flat.

conformal projection

A projection that keeps angles and small shapes true but changes sizes. The Mercator projection is conformal.

equal-area projection

A projection that keeps every region at its true size compared with others, but bends and squashes shapes.

great circle

Any circle on a globe whose center is the center of the earth, such as the equator. The shortest path between two places always runs along a great circle.

CORE IDEAS

The earth is very nearly a ball. It bulges slightly at the equator, where its diameter is about 7,926 miles, compared with about 7,900 miles from pole to pole, a difference of only about a third of one percent. Because of that, a **globe** is the truest map there is. On a good globe, Greenland, Africa and Australia all have their real shapes and their real sizes, the shortest routes are shown correctly and every direction is true. But a globe has three faults: you can never see more than half of it at once, it will not fold into a glove box, and it is tiny. A 12-inch school globe is drawn at about 1 to 42 million, so one inch on it stands for roughly 660 miles of real ground. For a town, a state or even a country, we need flat maps.

Here is the trouble, and it is not the mapmaker's fault. A sheet of paper can be rolled into a cylinder or a cone and unrolled again without stretching, because paper is curved in only one direction at a time. A sphere is curved in every direction at once. In 1827 the German mathematician Carl Friedrich Gauss proved what is now called his *Theorema Egregium* (the "remarkable theorem"): this kind of curvature cannot be changed by bending. In plain words, there is no way to lay a sphere flat without stretching, squeezing or tearing it. The orange peel in the warm-up is the proof in your hands. Every flat map of the world is a set of trade-offs.

A **map projection** is the rule a mapmaker uses to make those trade-offs. Picture a light inside a glass globe throwing the grid of latitude and longitude onto a paper cylinder wrapped around it, a cone set on top of it, or a flat sheet touching it at one point. These give the three great families of projections: cylindrical, conic and azimuthal (flat-plane). Real projections are worked out with formulas, not lamps, but the picture shows the idea. Each one can keep some things true, but never all of them. A map can be **conformal** (true angles and small shapes), **equal-area** (true sizes), or equidistant (true distances from one or two points), and no flat map is all three.

The most famous projection is the one Gerard Mercator published in 1569. Mercator built it for sailors. On his map, a line of constant compass bearing is a straight line, so a navigator could lay a ruler from port to port, read the angle and steer it. To do that, the map had to be conformal, and so it stretches everything more and more as you move away from the equator. The stretch in length is 1 divided by the cosine of the latitude. At 60° north, near Anchorage, Alaska, or Oslo, Norway, lengths are doubled, so areas are four times too big. At 80° north, areas are blown up more than thirty times. The poles themselves would be infinitely far away, which is why Mercator maps simply cut off before them. That is why Greenland looks about as big as Africa on a Mercator map, though Africa is really about fourteen times larger.

Other mapmakers chose differently. Equal-area maps, such as the Mollweide (1805) or the Gall-Peters, show every country at its true size compared with others, but their shapes look pulled and squashed, especially near the edges. Many atlases use compromise projections that let everything be a little wrong so that nothing is badly wrong. Arthur Robinson designed one in 1963, and the National Geographic Society used it for its world maps from

1988. In 1998 the Society switched to the Winkel Tripel, a compromise first drawn by the German mapmaker Oswald Winkel in 1921.

Distortion also fools us about routes. The shortest path between two places follows a **great circle**. On a globe, stretch a string tightly from Chicago to Tokyo and it runs far north, past Alaska. On a Mercator map that same route looks like a long, strange curve, while the straight line drawn on the map is really the longer way. Airline pilots fly great circles. Sailors in Mercator's day usually steered by steady compass bearings instead, because these are simpler to follow, and on most voyages the extra distance was small.

So which map is right? Each one is right for its job and wrong for some other job. The honest question to ask of any map is: what did the mapmaker choose to keep true, and what was given up? Asking that question is the first step in reading the world well. It is also a good habit of mind for more than maps: every picture of something large, whether a map, a chart or a summary, leaves things out, and a careful reader asks what.

PICTURE STUDY



The Geographer, Johannes Vermeer, 1669 · Oil on canvas · Städel Museum, Frankfurt am Main, Germany
Wikimedia Commons · Public domain

Johannes Vermeer of Delft painted this scholar at work in 1669, when Dutch mapmakers led the world. The man holds a pair of dividers, the tool used to step off distances on a map. Behind him, a terrestrial globe sits on the cupboard and a sea chart hangs on the wall. Historians think the globe is a real one, made by the Hondius family of Amsterdam. Vermeer seems to have painted a man between two kinds of map, the round one and the flat one.

Look closely

- Find the globe. Which part of the world faces us, and why might Vermeer have turned it that way?
- Find the dividers in his hand. What is he about to measure?
- Follow the light from the window. What does it light up most brightly?

Talk about it

1. The scholar is looking up from his flat map toward the window. What do you think he has just realized?
2. Why would a geographer in 1669 need both a globe and flat charts?

HANDS-ON: MEASURE THE STRETCH

Test Mercator's stretch for yourself by measuring Greenland and Africa on a globe and on a Mercator map, then work out the stretch factor at several latitudes.

You will need

- A globe
- A Mercator world map (many wall maps and online maps use it; check the label)
- A flexible tape measure or a piece of string, and a ruler
- Graph paper or tracing paper
- A calculator with a cosine key

Steps

1. On the globe, use the string to measure Greenland from north to south, and Africa from north to south. Write both lengths and the ratio $\text{Africa} \div \text{Greenland}$.
2. Do the same on the Mercator map. Compare the two ratios. Which map is lying, and in which direction?
3. Trace Greenland and Africa from the Mercator map onto graph paper. Count squares to estimate each area. Then look up the true areas (Greenland about 836,000 square miles; Africa about 11.7 million square miles) and compare.
4. Make a table for latitudes 0° , 30° , 45° , 60° , 75° and 80° . For each, work out the length stretch ($1 \div \cos \text{latitude}$) and the area stretch (the length stretch squared).
5. Find the latitude of your own town. How much does a Mercator map enlarge it?

Check your work

- I measured on both the globe and the flat map.
- My table shows length and area stretch for six latitudes.
- I can explain in one sentence why Greenland looks too big.

FIELD NOTEBOOK

1. **Journal page: Globe and Map.** Sketch the orange peel flattened, and beside it a small Mercator world outline with Greenland and Africa shaded. Copy your stretch

table underneath.

2. **Narration (parent keeps).** Write one paragraph explaining to a younger student why every flat map of the world is wrong somewhere, using the word *projection* and one real number from this stop.

Did you know? The emblem of the United Nations uses an azimuthal equidistant projection centered on the North Pole. On that kind of map, every distance measured straight out from the center is true, but the farther edges are stretched badly, so Antarctica becomes a thin ring around the outside.

Go deeper. Mark Monmonier, *How to Lie with Maps* (University of Chicago Press; the third edition is 2018), a short, lively book on how maps simplify and mislead. Mark Monmonier, *Rhumb Lines and Map Wars: A Social History of the Mercator Projection* (2004). The Library of Congress Geography and Map Division (loc.gov) has many old world maps to compare. Second video topic: “Tissot’s indicatrix,” the circles mapmakers draw to show how a projection stretches.

Goes deeper in. Geography, Grade 8, “Maps and Projections,” and Arithmetic, “Ratios and Scale” (coming soon).

For families. Sources: Encyclopaedia Britannica on map projections and Gauss; National Geographic Society on its adoption of the Robinson (1988) and Winkel Tripel (1998) projections. Areas: Greenland about 2.17 million km² (836,000 sq mi), Africa about 30.4 million km² (11.7 million sq mi). The stretch figures use the simple spherical formula; the real earth’s slight flattening changes them very little. There is no primary-source excerpt for this stop.

PRACTICE

1. **EASY** Why can a sheet of paper be rolled into a tube without stretching, while it cannot be wrapped smoothly around a ball?
2. **EASY** What does the Mercator projection keep true, and what does it give up?
3. **MEDIUM** On a Mercator map, Greenland and Africa look about the same size. About how many times larger is Africa really?
4. **MEDIUM** Name three families of projections and the shape of the paper each one imagines.
5. **CHALLENGE** Mercator stretches lengths by $1 \div \cos(\text{latitude})$. Find the length stretch and the area stretch at 45° and at 60°. ($\cos 45^\circ \approx 0.707$; $\cos 60^\circ = 0.5$.)
6. **CHALLENGE** A 12-inch globe is drawn at about 1:42,000,000. About how many miles does one inch on it stand for? (One mile = 63,360 inches.)

Make it a game · Pick the Projection. One player names a job: “steer a ship,” “compare the sizes of countries,” “fly the shortest way from Chicago to Tokyo,” “hang a pretty map on the wall.” The others race to call out the best choice: Mercator, equal-area,

globe or compromise. Each correct answer earns a point if the player can say what that map gives up.

Scripture. “It is he that sitteth upon the circle of the earth, and the inhabitants thereof are as grasshoppers; that stretcheth out the heavens as a curtain, and spreadeth them out as a tent to dwell in:” (Isaiah 40:22, KJV)

We struggle to draw the round earth on flat paper, and every map we make gives something up. God sees the whole earth at once, perfectly and without distortion. Our maps are small copies of a world He made and holds.

Practice: answers

1. A tube is curved in only one direction, but a ball is curved in every direction at once. Gauss proved that this kind of curvature cannot be flattened or matched without stretching or tearing.
2. It keeps angles and small shapes true, so a constant compass bearing is a straight line. It gives up true size: areas grow larger and larger toward the poles.
3. About 14 times (about 11.7 million square miles against about 836,000).
4. Cylindrical (a cylinder wrapped around the globe), conic (a cone set over it) and azimuthal (a flat plane touching it at one point).
5. At 45°: length about 1.41 times, area about 2 times. At 60°: length 2 times, area 4 times.
6. $42,000,000 \div 63,360 \approx 663$, so about 660 miles to the inch.

1.2 THE COMPASS ROSE AND CARDINAL DIRECTIONS

OBJECTIVES

- Name the 8 main points of the compass and give the bearing in degrees for each, and explain how the 32-point rose divides the circle.
- Explain the difference between true north and magnetic north, and correct a compass bearing for magnetic declination.
- Trace the history of the compass rose from Mediterranean wind roses and Chinese and European magnetic needles to the charts of the 1300s.

Warm-up. Without a phone or compass, point to north from where you are sitting. How did you decide? Write down your guess and your reason, and check it with a compass at the end of the stop.

Video slot. Video coming. History of the magnetic compass and the compass rose; true north versus magnetic north (magnetic declination). Search approved channels (Royal Museums Greenwich, NOAA, National Geographic Education, Smithsonian); preview first.

KEY TERMS

cardinal directions

The four main directions: north, east, south and west. “Cardinal” comes from the Latin *cardo*, a hinge: the directions the rest turn on.

intercardinal directions

The directions halfway between the cardinal ones: northeast, southeast, southwest and northwest.

compass rose

The star-shaped figure on a map or compass card that shows the directions. Older roses were called wind roses because their points were named for winds.

bearing

A direction given in degrees, measured clockwise from north: east is 90°, south 180°, west 270°.

magnetic declination

The angle between true north (toward the North Pole) and magnetic north (where a compass needle points) at a given place and time.

lodestone

A naturally magnetic piece of the iron mineral magnetite, used to magnetize the first compass needles.

CORE IDEAS

North and south are not chosen by people. They are set by the turning of the earth. The earth spins on an axis, and the two ends of that axis are the North and South Poles. Due north means toward the North Pole along the earth's surface. East is the direction the earth turns, which is why the sun, moon and stars all seem to rise in the east. The sun rises exactly due east only at the spring and autumn equinoxes; in June it rises well north of east, and in December well south of it. Because the cardinal directions come from the earth's spin, they are the same for everyone, everywhere.

Long before the magnetic compass, Mediterranean sailors steered by the winds and by the sun and stars. They named eight winds and the directions they came from. In the Italian names found on later charts these are *Tramontana* (north), *Greco* (northeast), *Levante* (east), *Scirocco* (southeast), *Ostro* (south), *Libeccio* (southwest), *Ponente* (west) and *Maestro* (northwest). A circle with these winds marked was called a wind rose, and many old charts still put the first letter of each wind at its point. Sailors split the eight winds into half-winds and quarter-winds to make 32 points, each $11\frac{1}{4}^\circ$ apart. Learning to recite all 32 in order, "north, north by east, north-northeast..." was called **boxing the compass**, and every young sailor had to do it.

The magnetic compass came later, and the earliest clear written records come from China. Around 1088 the scholar Shen Kuo described a needle rubbed on a lodestone that pointed south, and he noticed it pointed slightly east of true south. The first clear European description comes from the English monk Alexander Neckam, writing around 1190, who mentions sailors using a magnetized needle when the sun was hidden. By the 1300s, Mediterranean sailors had joined needle and wind rose into one instrument, with the rose drawn on a card that turned with the needle. The Catalan Atlas of 1375 is often named as the first surviving map to show a full compass rose. In 1600 the English physician William Gilbert published *De Magnete*, arguing that the whole earth is a great magnet, which is why the needle points north at all.

But the needle does not point to the North Pole. It points toward the **magnetic** north pole, a place where the earth's magnetic field points straight down. That pole is not fixed. In the last century it has wandered from northern Canada across the Arctic Ocean toward Siberia, at times moving tens of kilometers a year. The angle between true north and magnetic north at your location is the **magnetic declination**. Across the lower 48 states it ranges from roughly 15° west in Maine to roughly 15° east in Washington State, and somewhere between them runs a line where it is zero. Declination matters: an error of only 1° means you will be about one mile off course after sixty miles of travel. Hikers and pilots look up the current declination, and topographic maps print it in the margin with the year it was measured.

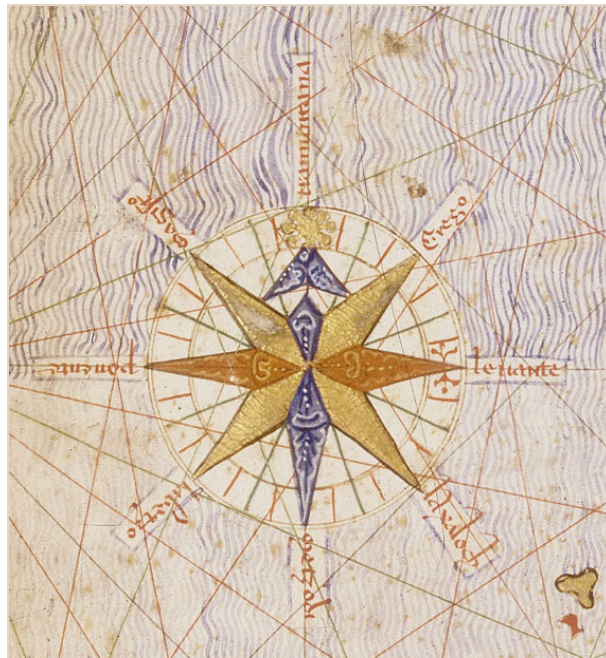
Directions can be named by points or by **bearings**. A bearing is measured in degrees clockwise from north: north 0° (or 360°), northeast 45° , east 90° , southeast 135° , south 180° , southwest 225° , west 270° , northwest 315° . To turn around and go back the way you came, add or subtract 180° ; this is called the back bearing. To turn a magnetic bearing into a

true one, add an east declination or subtract a west one. Many navigators remember this with the phrase “east is least, west is best” when going the other way, from true to magnetic.

Putting north at the top of a map is a habit, not a law. Many medieval Christian world maps put east at the top, toward the earthly paradise and the rising sun; that is where we get the word *orient*, to set a map by the east. The famous world map made for King Roger II of Sicily by the scholar al-Idrisi in 1154 put south at the top. North-up became standard with the printed maps and sea charts of the 1500s and later. That is why a good map always has a north arrow or a compass rose: never assume.

You can find true north without a compass. On a clear night in the Northern Hemisphere, follow the two pointer stars at the end of the Big Dipper’s bowl to Polaris, the North Star, which sits less than a degree from true north. By day, the sun is due south at local solar noon for anyone north of the tropics, and a stick’s shadow is then at its shortest and points due north. The project uses this shadow-stick method.

PICTURE STUDY



The Catalan Atlas (detail with the compass rose), Attributed to Abraham Cresques, of Majorca, 1375 · Ink, colors and gold on vellum, mounted on wooden panels · Bibliothèque nationale de France, Paris
Wikimedia Commons · Public domain

The Catalan Atlas was made on the island of Majorca, a center of Mediterranean chartmaking, and was sent as a royal gift to the King of France. It is usually credited to the Jewish chartmaker Abraham Cresques. Its western panels are a working sea chart covered with lines that radiate from compass roses, so that a navigator could find a line running in the direction he needed and follow it. It is often called the earliest surviving map with a full compass rose.

Look closely

- Find the compass rose. How many points can you count? Which point is marked differently from the others?
- Follow one straight line out from a rose to a coast. Why would sailors want so many lines on their chart?
- Find the place names along the coasts. Why are almost all of them on the shore, and so few inland?

Talk about it

1. This chart was useful to sailors and also beautiful enough for a king. Which do you think mattered more to its maker?
2. What would a sailor in 1375 still have needed that the chart could not give him?

HANDS-ON: SHADOW STICK AND A 32-POINT ROSE

Find true north with the sun, compare it with your compass, and measure your own magnetic declination. Then draw a full 32-point compass rose for your travel journal.

You will need

- A straight stick about 3 feet long, and 2 or 3 small stones or pegs
- A magnetic compass
- A protractor, compass for drawing (or a plate to trace), ruler and colored pencils
- Internet access for the NOAA Magnetic Field Calculator (a parent may help)

Steps

1. On a sunny day, set the stick upright in level ground about an hour before local solar noon (around 11 a.m. standard time, or noon during daylight saving time; a sunrise-sunset table will give the exact time). Mark the tip of its shadow with a stone every 15 minutes for about two hours.
2. Find the shortest shadow. A line from the base of the stick to that mark points to true north.
3. Stand over the line with your magnetic compass held level, away from metal. How many degrees east or west of your true-north line does the needle point? That is your measured declination.
4. Look up your location on the NOAA Magnetic Field Calculator. How close was your measurement?
5. In your journal, draw a circle and divide it into 32 points of $11\frac{1}{4}^\circ$ each. Label the 8 main points and their bearings. Mark north with a fleur-de-lis, the way old chartmakers often did.
6. Read the primary source from Edward Wright. Under your rose, write one sentence on what the compass made possible that “before ... was clearly impossible.”

Check your work

- I found true north with a shadow, not a magnet.

- I measured the angle between true north and my compass needle and compared it with NOAA's figure.
- My rose has 32 points with the 8 main bearings labeled.

FIELD NOTEBOOK

1. **Journal page: The Compass Rose.** Glue in or draw your 32-point rose. Beside it, write your town's declination and the year you measured it.
2. **Narration (parent keeps).** Write one paragraph telling how a sailor in 1400 could find his way across the Mediterranean on a cloudy night, naming at least two tools and the problem each solved.

Did you know? On many old compass roses, east was marked with a small cross, pointing toward the Holy Land. North was marked with a *fleur-de-lis*, a lily-shaped design that may have grown out of a decorated letter T for *Tramontana*, the north wind. Compass cards and maps still use the fleur-de-lis today.

Primary source. *From Edward Wright's preface to William Gilbert, On the Magnet (De Magnete, London, 1600), translated by Silvanus P. Thompson (1900). Project Gutenberg eBook #33810. Wright was the mathematician who, a year earlier in 1599, had published the tables behind Mercator's map.*

For by the pointing of the iron touched by a loadstone, the points of South, North, East, and West, and the other quarters of the world are made known to navigators even under an overcast sky and in the darkest night; so that thus they always very easily understand to which point of the world they ought to direct their ship's course; which before the discovery of this wonderful virtue of the magnetick ... was clearly impossible.

(The omitted word is a Greek term meaning "pointing to the north.")

Go deeper. Amir D. Aczel, *The Riddle of the Compass* (2001), a readable history of the compass. NOAA National Centers for Environmental Information, "Magnetic Field Calculators" and its maps of how declination has changed over time (ngdc.noaa.gov). Royal Museums Greenwich, collection pages on mariner's compasses (rmg.co.uk). Second video topic: "How the magnetic north pole is moving."

Goes deeper in. Geography, Grade 4, "Directions and the Compass," and Earth Science, "Earth's Magnetic Field" (coming soon).

For families. Sources: NOAA/NCEI on declination and the moving magnetic pole; Britannica on Shen Kuo, Alexander Neckam and the compass; Bibliothèque nationale de France on the Catalan Atlas. Exact dates for the first compass use are debated, so the stop gives the first clear written records. The declination range for the lower 48 states is rounded and changes year by year; use the NOAA calculator for today's figure. The

primary source is copied from Project Gutenberg; the Greek word in the original is left out and marked with an ellipsis.

PRACTICE

1. **EASY** Give the bearing in degrees for east, south, southwest and northwest.
2. **EASY** Why is a compass needle not a perfect guide to the North Pole?
3. **MEDIUM** According to Edward Wright's preface, what could navigators do with the magnetized needle that was "clearly impossible" before?
4. **MEDIUM** You walk out on a bearing of 70° . What bearing takes you straight back?
5. **CHALLENGE** The declination where you are is 10° east. Your compass reads a magnetic bearing of 50° toward a mountain. What is the true bearing? Where the declination is 10° west, what would a magnetic bearing of 50° be in true degrees?
6. **CHALLENGE** A 32-point rose divides 360° evenly. How many degrees is one point? What bearing is "northeast by east," one point east of northeast?

Make it a game • Box the Compass. Stand in a circle. The leader calls a point or a bearing ("southwest!" "270!" "north-northeast!") and everyone turns to face it. Anyone facing wrong sits down. For the final round, players take turns reciting the 32 points in order, one each, around the circle; whoever misses starts the next game as leader.

Scripture. "And they shall come from the east, and from the west, and from the north, and from the south, and shall sit down in the kingdom of God." (Luke 13:29, KJV)

Jesus names all four cardinal directions to show that people will come to God's kingdom from every part of the earth. The directions that guide a sailor home also picture how wide God's invitation is.

Practice: answers

1. East 90° , south 180° , southwest 225° , northwest 315° .
2. It points to magnetic north, which is in a different place from the geographic North Pole and moves over time. The difference is the magnetic declination.
3. Know north, south, east and west, and so which way to steer the ship, even under an overcast sky and in the darkest night, when the sun and stars could not be seen.
4. 250° ($70 + 180$).
5. With 10° east, add: true bearing 60° . With 10° west, subtract: true bearing 40° .
6. $360 \div 32 = 11.25^\circ$. Northeast is 45° , so northeast by east is $45 + 11.25 = 56.25^\circ$.

1.3 LATITUDE AND LONGITUDE

OBJECTIVES

- Read and write a location in degrees and minutes of latitude and longitude, and find a place from its coordinates.
- Explain why latitude can be found from the stars but longitude depends on knowing the time, and tell how John Harrison's clocks solved the longitude problem.
- Use the earth's turning (15° per hour) to work out longitude from the time of local solar noon.

Warm-up. Find your house on an online map and read its coordinates (often shown when you click or press on a spot). Write them down. Which number says how far north you are, and which says how far west or east?

Video slot. Video coming. Latitude and longitude explained; the longitude problem and John Harrison's marine chronometers. Search approved channels (Royal Museums Greenwich, National Geographic Education, Library of Congress, Smithsonian); preview first.

KEY TERMS

latitude

Distance north or south of the equator, measured in degrees from 0° at the equator to 90° at each pole. Lines of latitude are called parallels.

longitude

Distance east or west of the prime meridian, measured in degrees from 0° to 180° east or west. Lines of longitude are called meridians.

prime meridian

The meridian chosen as 0° longitude. Since 1884 most of the world has used the meridian through the Royal Observatory at Greenwich, England.

degree, minute, second

Units for dividing a circle: 360 degrees in a circle, 60 minutes in a degree, 60 seconds in a minute. Written $38^\circ 53' 23''$.

nautical mile

One minute of latitude, about 6,076 feet. Sea and air navigators use it because it fits the grid of the globe.

marine chronometer

A clock accurate enough to keep the time of a home port during a long sea voyage, so that a navigator can work out longitude.

CORE IDEAS

To say exactly where something is on a sphere, you need two numbers. **Latitude** tells how far north or south of the equator a place is, from 0° to 90° . **Longitude** tells how far east or west of the prime meridian it is, from 0° to 180° . The Washington Monument, for example, stands at about $38^\circ 53'$ north, $77^\circ 2'$ west. The Greek geographer Ptolemy listed places by numbers much like these in Alexandria around A.D. 150, and the grid has been the backbone of mapmaking ever since. Each degree is split into 60 minutes and each minute into 60 seconds, just as an hour is.

Latitude has always been the easier number, because the sky gives it. In the Northern Hemisphere, the height of the North Star above the horizon, measured in degrees, is very nearly your latitude: at the North Pole it is straight overhead (90°), at the equator it sits on the horizon (0°). By day, sailors measured the sun's height at noon and used printed tables. With an astrolabe, a quadrant, and later the octant (1731) and sextant, a careful navigator could find latitude within a few miles. Lines of latitude are evenly spaced: one degree is about 69 miles, and one minute is one **nautical mile**.

Longitude is different. Meridians all meet at the poles, so a degree of longitude is about 69 miles at the equator, about 53 miles at 40° north, and nothing at all at the pole (multiply 69 by the cosine of the latitude). Worse, the sky looks the same along any line of latitude, because the earth turns. The only simple way to know how far east or west you have sailed is to compare times. The earth turns 360° in 24 hours, so 15° each hour, or 1° every four minutes. If it is noon where you are (the sun at its highest) and a clock set at your home port reads 3:00 p.m., you are 45° west of home. The whole problem is keeping that home clock right for months on a rolling, damp, hot and cold ship.

For centuries no clock could do it, and ships were lost. In 1707 a British fleet under Admiral Sir Cloudesley Shovell, unsure of its position, ran onto the rocks of the Isles of Scilly; four ships sank and well over a thousand sailors drowned. In 1714 Parliament passed the Longitude Act, offering up to £20,000, a fortune, for a method accurate to half a degree. John Harrison, a self-taught carpenter and clockmaker from Lincolnshire, spent most of his life on the problem. His fourth timekeeper, H4, the size of a large pocket watch, sailed to Jamaica in 1761–1762 and lost only about five seconds in more than eighty days at sea. Astronomers meanwhile perfected a rival method, the “lunar distance,” using the moon's position against the stars and tables published from 1767 in the *Nautical Almanac*. For many years ships used both. Captain James Cook carried a copy of H4 on his second Pacific voyage and called it a trusty friend.

Latitude has a natural zero, the equator, set by the earth's spin. Longitude does not; any meridian could be zero. For a long time each nation used its own: Paris, Cadiz, Washington, Greenwich and others. In 1884, at the International Meridian Conference held in Washington, D.C., delegates voted 22 to 1, with France and Brazil abstaining, to make the Greenwich meridian the world's 0° . Most of the world's shipping already used British charts based on Greenwich, which helped decide it. France kept its own Paris meridian for its maps for some years afterward.

Here is an honest twist. The 0° longitude used by GPS today does not run exactly through the brass line visitors stand on at Greenwich. It lies about 100 meters (330 feet) to the east, because modern satellite systems measure the earth's shape and center more exactly than the 1800s astronomers could. Neither line is "wrong"; they are two careful definitions made with different tools.

Coordinates were the language of exploration. When President Thomas Jefferson sent Meriwether Lewis up the Missouri River in 1803, he ordered him to fix the latitude and longitude of every important point. Lewis studied with the astronomer Andrew Ellicott and the mathematician Robert Patterson and carried a chronometer, a sextant and an octant. His latitudes were often good; his longitudes were much less certain, because his chronometer sometimes stopped and the calculations were hard. William Clark's great map of the West, published in 1814, rested on those observations, on compass bearings and on careful estimates of distance.

PICTURE STUDY



The Ambassadors, Hans Holbein the Younger, 1533 · Oil on oak · The National Gallery, London
Wikimedia Commons · Public domain

Hans Holbein painted two French envoys in London in 1533, life-size, beside a table of the newest scientific instruments: a celestial globe, a terrestrial globe, a quadrant for measuring the height of stars, and sundials for telling time by the sun. These were the tools of latitude and time. Across the floor lies a stretched shape that becomes a skull when you view the painting from the side, a reminder that all human learning ends in death, and in the upper left corner, half hidden by the curtain, hangs a small crucifix.

Look closely

- Find the instruments on the top shelf. Which ones would help you measure the sun or stars?
- Find the terrestrial globe on the lower shelf. What lines can you see on it?
- Find the crucifix in the top left corner. Why might Holbein have put it there, nearly hidden?

Talk about it

1. Why would two diplomats want to be painted with instruments for measuring the heavens and the earth?
2. The skull and the crucifix sit at the edges of all this learning. What do you think Holbein was saying about knowledge?

HANDS-ON: FIND YOUR OWN LATITUDE AND LONGITUDE

Measure your latitude with a homemade quadrant, find your longitude from the time of solar noon, and then check both against GPS, just as Lewis was asked to do.

You will need

- A protractor, a drinking straw, tape, a 12-inch string and a small weight (a washer or nut)
- A clear night with the North Star visible, and a sunny day
- A watch or phone set to the correct time
- A sunrise-sunset table or website that gives the time of solar noon (for checking)

Steps

1. Make a quadrant: tape the straw along the flat edge of the protractor. Tie the string through the center hole and hang the weight from it.
2. At night, find Polaris by following the two pointer stars of the Big Dipper. Sight it through the straw. Read where the string crosses the scale. The star's height, and so your latitude, is the number of degrees between the string and the 90° mark (when you sight the level horizon, the string hangs on 90°). Take three readings and average them.
3. By day, use your shadow-stick or a sunrise-sunset table to find the time of solar noon. Take away one hour if you are on daylight saving time.
4. Find the meridian your time zone is based on (Eastern 75° W, Central 90° W, Mountain 105° W, Pacific 120° W). Each 4 minutes that your solar noon is later than 12:00 puts you 1° west of that meridian; each 4 minutes earlier puts you 1° east.
5. Compare both answers with your GPS coordinates. How many miles off was each? (Use 69 miles per degree of latitude.)
6. Read the Jefferson primary source. List three "remarkable points" near your home that would be worth fixing by latitude and longitude, and look up their coordinates.

Check your work

- I measured my latitude from the North Star and my longitude from solar noon.
- I compared both with GPS and worked out the error in miles.
- I listed three remarkable points with their coordinates.

FIELD NOTEBOOK

1. **Journal page: Where Am I?** Draw a small globe with the equator, the prime meridian and a dot for your home. Write your measured and your GPS coordinates side by side.
2. **Narration (parent keeps).** Write one paragraph explaining to someone in 1700 why finding longitude at sea is really a problem of keeping time, and how Harrison solved it.

Did you know? Harrison's first three clocks were large, but H4 is only about 5 inches across. It and his earlier timekeepers survive and can be seen at the Royal Observatory, Greenwich. The prize money came slowly: Harrison received large payments from the Board of Longitude and, in 1773, a further award approved by Parliament after King George III took his side.

Primary source. *Thomas Jefferson to Meriwether Lewis, instructions, June 20, 1803. Transcript from the Library of Congress exhibition "Rivers, Edens, Empires: Lewis & Clark and the Revealing of America."* Words in angle brackets are Jefferson's own corrections in the manuscript, as printed in the transcript; spelling is his.

Beginning at the mouth of the Missouri, you will take <careful> observations of latitude & longitude at all remarkable points on the river, & especially at the mouth of rivers, at rapids, at islands, & other places & objects distinguished by such <durable> natural marks & characters of a durable <nature> kind as that they may with certainty be recognized hereafter. The course of the river between these points of observation ma be supplied by the compass, the log-line & by time, corrected by the observations themselves. The variations of the compass too, in different places should be noticed.

Go deeper. Dava Sobel, *Longitude* (1995), the short, popular story of John Harrison; check with the library for the illustrated edition. Royal Museums Greenwich, pages on Harrison's timekeepers H1-H4 (rmg.co.uk). Library of Congress, "Rivers, Edens, Empires: Lewis & Clark and the Revealing of America" (loc.gov/exhibits/lewisandclark), with the full instructions and Clark's maps. Second video topic: "How a sextant works."

Goes deeper in. Geography, Grade 8, "The Global Grid," and Technology Overcoming Geography, "Clocks, Ships and the Longitude Problem" (coming soon).

For families. Sources: Royal Museums Greenwich on Harrison, the Longitude Act and the Shovell disaster; the protocol of the International Meridian Conference (1884); Library of Congress on Lewis's training and instruments. Figures for the Scilly losses vary between sources (roughly 1,400 to 2,000), so the stop says "well over a thousand." Accounts of H4's 1761-1762 trial give its error as about five seconds. A homemade

quadrant held by hand is usually good to within a degree or two (70 to 140 miles), which is itself a useful lesson in accuracy. Night observation should be done with an adult.

PRACTICE

1. **EASY** Which runs north-south on a globe, a line of latitude or a line of longitude? Which is measured from the equator?
2. **EASY** How many degrees does the earth turn in one hour? In four minutes?
3. **MEDIUM** In Jefferson's instructions, which places should Lewis fix by latitude and longitude, and why should they be places with "durable" natural marks?
4. **MEDIUM** The North Star stands 35° above your horizon. About what is your latitude? About how far are you from the equator in miles?
5. **CHALLENGE** A navigator sees the sun at its highest (local noon) when the chronometer, set to Greenwich time, reads 4:20 p.m. What is the ship's longitude?
6. **CHALLENGE** A degree of longitude is about $69 \times \cos(\text{latitude})$ miles. How long is it at 60° north? If a clock gains 1 minute, how many miles of error does that make at 60° north?

Make it a game • Coordinates Hunt. One player secretly picks a city on a globe or atlas and reads out only its latitude and longitude, rounded to whole degrees. The others race to find it. The first to put a finger on the right place chooses the next city. For a harder round, give only the latitude and the local time when it is noon at Greenwich.

Scripture. "If I take the wings of the morning, and dwell in the uttermost parts of the sea; Even there shall thy hand lead me, and thy right hand shall hold me." (Psalm 139:9-10, KJV)

Sailors once dreaded being lost at sea, not knowing where on the grid they were. David says that no place, not even the farthest sea, is beyond God's knowing. Our coordinates are measured by clocks and stars; God never loses track of His people.

Practice: answers

1. Lines of longitude (meridians) run north-south. Latitude is measured from the equator.
2. 15° in one hour; 1° in four minutes.
3. Remarkable points on the river: river mouths, rapids, islands and other places with lasting natural features. They must be marks that will last, so that later travelers can recognize the same spots "with certainty" and use the numbers.
4. About 35° north; $35 \times 69 \approx 2,400$ miles.
5. 4 hours 20 minutes = $4 \times 15^\circ + 20 \div 4 = 60^\circ + 5^\circ = 65^\circ$. Local noon is later than Greenwich, so the ship is 65° west.
6. $69 \times 0.5 = 34.5$ miles per degree. One minute of time = $\frac{1}{4}$ degree, so about 8.6 miles of error.

1.4 SCALE AND DISTANCE

OBJECTIVES

- Read and convert the three ways of showing scale: a verbal scale, a representative fraction and a scale bar.
- Explain the difference between a large-scale and a small-scale map, and why doubling the scale multiplies area by four.
- Measure real distances by pacing and on a map, and explain why some distances, such as coastlines, depend on how you measure.

Warm-up. Walk 100 feet (measure it with a tape, or use the distance between two known marks) and count your steps. Do it twice. Divide 100 by your average to get the length of your step. Keep the number; you will use it in the project.

Video slot. Video coming. How map scale works: representative fractions, scale bars, large-scale versus small-scale maps; how Eratosthenes measured the earth. Search approved channels (USGS, National Geographic Education, Library of Congress, Smithsonian); preview first.

KEY TERMS

map scale

The relationship between a distance on a map and the real distance on the ground.

representative fraction

A scale written as a ratio, such as 1:24,000, meaning one unit on the map equals 24,000 of the same units on the ground. It works in any unit.

scale bar

A ruled line on a map marked with real distances. It stays correct even if the map is enlarged or shrunk.

large-scale map

A map that shows a small area in great detail, such as 1:24,000. The fraction 1/24,000 is larger than 1/1,000,000.

small-scale map

A map that shows a large area with little detail, such as a world map at 1:50,000,000.

pace

A measure of distance by steps. The Romans counted a pace as two steps (left and right), and a thousand paces made their mile.

CORE IDEAS

Every map is smaller than the ground it shows, and the **scale** tells by how much. Mapmakers show it three ways. A verbal scale uses words: “one inch to one mile.” A **representative**

fraction uses a ratio: 1:63,360, because there are 63,360 inches in a mile. A **scale bar** is a ruled line marked in miles or kilometers. Each has its use. The fraction works in any unit at all: on a 1:63,360 map, one centimeter is 63,360 centimeters too. The scale bar has a special strength. If you photocopy a map at 150 percent, the words “one inch to one mile” become false, but the bar grows with the map and stays true.

The words “large” and “small” scale confuse almost everyone at first. A **large-scale map** has a large fraction: 1:24,000 is larger than 1:1,000,000, just as $1/24$ is larger than $1/1,000$. Large-scale maps show small areas in rich detail. The United States Geological Survey drew the whole country on more than 55,000 large-scale “quadrangle” maps at 1:24,000, where one inch equals 2,000 feet and you can see single buildings, footpaths and the bends of small creeks. A world map in an atlas might be 1:100,000,000, a very small scale, where a whole state is the size of a thumbnail and most towns disappear.

Scale works on lengths, but area grows faster. If you double the scale of a map, every length doubles, so every area becomes four times as large, and a map of the same region needs four sheets instead of one. Triple the scale and you need nine. This is why a detailed state atlas is a thick book, and why mapmakers must choose carefully what each map is for. It is also why scale matters on the world maps of Stop A1: a projection that stretches lengths by two near the poles has stretched areas by four.

Measuring the ground came before measuring maps. Roman surveyors counted *mille passus*, a thousand paces of about five Roman feet each, and set stones along their roads: the mile. In 1593 an Act of Parliament under Queen Elizabeth I fixed the English statute mile at 8 furlongs, 5,280 feet. In 1620 the English mathematician Edmund Gunter introduced a surveyor’s chain 66 feet long with 100 links. Eighty chains make a mile, and ten square chains make an acre. When the United States surveyed its western lands under the Land Ordinance of 1785, surveyors dragged Gunter’s chains across the country to mark out townships six miles square, each divided into 36 sections of one square mile, 640 acres. Look at an airplane window over the Midwest today and you still see that square grid in the fields and roads.

Some distances are too large to walk. Around 240 B.C., Eratosthenes, the librarian of Alexandria, heard that at noon on midsummer day the sun shone straight down a well at Syene, far to the south, while at Alexandria a pole cast a shadow at an angle of about 7.2° , one-fiftieth of a circle. He reasoned that the distance between the two cities, about 5,000 stadia, must be one-fiftieth of the earth’s circumference, giving about 250,000 stadia. How close was he? That depends on the length of his stadion, which historians still debate; estimates put his answer within a few percent to about 15 percent of the true figure of about 24,900 miles. Either way, it was a brilliant use of scale: a small angle and a measured base told him the size of the world.

Not all distances are as simple as they seem. On a map, a straight line between two towns is the distance “as the crow flies,” but the road may wind and climb and be half again as long. To measure a winding road, lay a string along it and then straighten the string against the scale bar. Coastlines are stranger still. The English scientist Lewis Fry Richardson (1881–

1953) noticed that the length of a coastline depends on the length of your ruler: measure Britain's coast with a 100-kilometer ruler and you skip every bay; use a 1-kilometer ruler and you follow them, and the total grows. In 1967 the mathematician Benoit Mandelbrot made the point famous in an article titled "How Long Is the Coast of Britain?" The honest answer is: it depends on the scale you measure at.

Scale is finally a matter of judgment. A good map is drawn at the scale that answers its question: a hiking map shows the path and the contour of every hill; a road atlas shows highways and leaves out footpaths; a globe shows continents and leaves out roads. Before you trust any distance taken from a map, find the scale and ask whether that map was meant to measure what you are measuring.

PICTURE STUDY



The Grand Canyon of the Yellowstone, Thomas Moran, 1872 · Oil on canvas · Smithsonian American Art Museum, Washington, D.C. (lent by the U.S. Department of the Interior Museum)
Wikimedia Commons · Public domain

Thomas Moran traveled with the Hayden survey of the Yellowstone country in 1871, the same government expedition that measured and mapped the region. The painting he made afterward is about 7 feet tall and 12 feet wide, and Congress bought it for the Capitol. Moran's problem was a problem of scale: how do you show the size of a canyon as much as a thousand feet deep on a flat canvas? Part of his answer is in the tiny figures on the rock ledge.

Look closely

- Find the tiny human figures on the rocky point. Without them, could you tell how big the canyon is?
- Find the waterfall in the distance. How does Moran make it seem far away?

- Find the steam or mist. What does it do to the colors of things far off?

Talk about it

1. A map shows scale with numbers. How does a painter show it?
2. Moran's field sketches, with William Henry Jackson's photographs, helped persuade Congress to make Yellowstone the first national park in March 1872, before this painting was finished. Why might pictures persuade people where a survey report could not?

Safety first. Pace and measure only in your own yard, a park or a quiet path, with a parent's permission. Stay off roads and private property, and watch your footing when looking at a compass or counting steps.

HANDS-ON: PACE IT AND DRAW IT TO SCALE

Measure your yard, a park or a churchyard by pacing, then draw it to scale with a scale bar and a representative fraction, and check your map against an aerial photo.

You will need

- Your step length from the warm-up
- A clipboard, graph paper, a ruler and pencil
- A compass (from Stop A2) if you have it
- An online aerial map or a USGS topographic map of the area (a parent may help)

Steps

1. Choose an area about 100 to 300 feet across. Walk each edge and the distance to each main feature (a tree, a shed, a path) and count your steps. Multiply by your step length to get feet.
2. Choose a scale that fits your paper: for example, 1 inch = 20 feet. Work out the representative fraction (1 inch : 240 inches, so 1:240).
3. Draw the area on graph paper. Add a north arrow, a scale bar marked 0, 20, 40 and 60 feet, and the fraction.
4. Measure the same distances on an aerial map using its scale bar. Make a table: feature, your paced distance, the aerial-map distance, and the percentage difference.
5. Find your neighborhood on a USGS 1:24,000 topographic map. How long would your whole yard be on that map, in inches?

Check your work

- My map has a north arrow, a scale bar and a representative fraction.
- I compared paced distances with a second source and worked out my error.
- I can explain why my map is a larger scale than the USGS map.

FIELD NOTEBOOK

1. **Journal page: To Scale.** Paste in or copy your scale drawing, with your step length written in the corner.
2. **Narration (parent keeps).** Write one paragraph explaining how Eratosthenes measured the earth, including the angle, the distance and why the size of the stadion still matters.

Did you know? Before satellites, mountains were measured from far away by triangles: measure a baseline very carefully, then measure angles to a summit from each end. The Great Trigonometrical Survey of India, begun in 1802, used this method across thousands of miles and in the 1850s announced that a remote Himalayan summit, later named Mount Everest, was the highest in the world.

Go deeper. USGS topoView (ngmdb.usgs.gov/topoview), where you can see free current and historical topographic maps of your area at 1:24,000 and other scales. Andro Linklater, *Measuring America* (2002), on Gunter's chain and the survey of the American West. Smithsonian National Museum of American History, collection pages on surveying instruments. Second video topic: "How Eratosthenes measured the earth."

Goes deeper in. Geography, Grade 4, "Using Map Scale," and Arithmetic, "Ratios and Proportions" (coming soon).

For families. Sources: USGS on the 7.5-minute 1:24,000 quadrangle series; Britannica on Eratosthenes, Gunter's chain and the statute mile; Mandelbrot, "How Long Is the Coast of Britain?", *Science* (1967). The number of 1:24,000 quadrangles is rounded. The accuracy of Eratosthenes' result is genuinely uncertain because the length of the stadion he used is not known, so the stop gives a range. Moran's painting was bought by Congress in 1872. Yellowstone was made a national park on March 1, 1872, before the large painting was shown, and historians credit Moran's survey sketches and William Henry Jackson's photographs with helping. There is no primary-source excerpt for this stop.

PRACTICE

1. **EASY** On a map at 1 inch = 5 miles, two towns are $3\frac{1}{2}$ inches apart. How far apart are they?
2. **EASY** Which is the larger scale, 1:24,000 or 1:250,000? Which shows more detail?
3. **MEDIUM** On a 1:24,000 map, how many feet does one inch represent? How many inches on the map is one mile?
4. **MEDIUM** Why is a scale bar more trustworthy than a verbal scale on a map that has been photocopied larger?
5. **CHALLENGE** A county map at 1:100,000 is redrawn at 1:50,000. How many times longer is each road on the new map? How many sheets of the same size will the new map need?

6. **CHALLENGE** Eratosthenes measured an angle of 7.2° and a distance of 5,000 stadia. Show how he got the earth's circumference. If a stadion were 600 feet, what would that be in miles?

Make it a game • Guess the Distance. Outdoors, one player points to a tree, a post or a fence. Everyone writes a guess of the distance in feet. Then the pointer paces it out and uses the step length to find the answer. The closest guess earns a point and picks the next target. After five rounds, compare: are your guesses getting better?

Scripture. “Who hath measured the waters in the hollow of his hand, and meted out heaven with the span, and comprehended the dust of the earth in a measure, and weighed the mountains in scales, and the hills in a balance?” (Isaiah 40:12, KJV)

We measure with paces, chains and satellites, and still argue over the length of a coastline. Isaiah reminds us that God measures the seas with His hand. Learning to measure well is part of exploring the world He made, and it teaches us how great He is.

Practice: answers

1. $17\frac{1}{2}$ miles.
2. 1:24,000 is the larger scale, and it shows more detail of a smaller area.
3. 24,000 inches = 2,000 feet. One mile is 5,280 feet, so $5,280 \div 2,000 = 2.64$ inches.
4. The bar grows or shrinks with the map, so it stays correct. The words “1 inch = 1 mile” stay the same while the map changes, so they become wrong.
5. Lengths are twice as long. Area is four times as large, so it needs four sheets.
6. $360 \div 7.2 = 50$, so the circumference is $50 \times 5,000 = 250,000$ stadia. $250,000 \times 600 = 150,000,000$ feet $\div 5,280 \approx 28,400$ miles (about 14 percent too large; a shorter stadion gives a closer answer).

1.5 TIME ZONES

OBJECTIVES

- Explain the difference between local solar time and standard time, and work out time differences from longitude (15° per hour).
- Tell how the railroads brought standard time to North America on November 18, 1883, and how the world agreed on Greenwich in 1884.
- Explain the International Date Line and work out the date and time in another part of the world.

Warm-up. Look up the current time in London, Tokyo and Honolulu. Write each beside your own time. Which places are already in tomorrow, or still in yesterday?

Video slot. Video coming. How time zones began: railroads, standard time (1883) and the International Date Line. Search approved channels (Smithsonian, Royal Museums Greenwich, Library of Congress, National Geographic Education); preview first.

KEY TERMS

local solar time

Time set by the sun at one place, so that noon is when the sun is highest. Every town east or west of another has a slightly different solar time.

standard time

One agreed clock time used across a whole region, based on a chosen meridian, even though the sun reaches noon at slightly different moments across it.

time zone

A region that keeps the same standard time. In principle each zone is 15° of longitude wide, one hour of the earth's turning.

Coordinated Universal Time (UTC)

The world's reference time, kept by atomic clocks and matched to the old Greenwich Mean Time. Zones are written as UTC–5, UTC+9 and so on.

International Date Line

An agreed line, mostly along the 180° meridian in the Pacific Ocean, where the calendar date changes by one day.

daylight saving time

Setting clocks one hour ahead in the warm months so that more daylight falls in the evening.

CORE IDEAS

For most of history, time was simply the sun. When the sun stood highest over a town, it was noon there, and the church bell or the town clock said so. Because the earth turns 15° every

hour, every place east or west of another has its own noon. Boston lies about 3° east of New York, so Boston's solar noon came about 12 minutes before New York's. Before the 1880s, travelers in America met dozens of different local times. A railroad might run on the time of its headquarters city while the towns along the line kept their own, and a large station could have several clocks on the wall, each showing a different railroad's time.

The railroads made this chaos dangerous. On a single track, two trains running on different times could be on the same stretch of rail at the same moment. Schedules and connections were a tangle. Several men proposed a cure, among them the American schoolteacher Charles F. Dowd and the Canadian railway engineer Sandford Fleming. The plan the railroads finally adopted was drawn up by William F. Allen, secretary of the railroads' General Time Convention. On Sunday, November 18, 1883, the railroads of the United States and Canada changed to four standard time zones, based on the meridians 75°, 90°, 105° and 120° west of Greenwich, one hour apart. In cities on the eastern side of a zone, clocks were set back a few minutes at noon and so struck twelve twice; newspapers called it "the day of two noons."

The railroads did this by agreement, not by law. Most towns followed because life ran on the trains, though a few held out for years. The next year, in 1884, the International Meridian Conference in Washington chose Greenwich as the prime meridian (Stop A3) and recommended a universal day counted from Greenwich. Congress did not make the zones law until the Standard Time Act of March 19, 1918, which also began daylight saving time in the United States during the First World War. Daylight saving time has been dropped, restored and changed several times since; today the Uniform Time Act of 1966 and its amendments set the rules, and a few states and territories, such as Hawaii and most of Arizona, do not use it.

Around the world there are 24 hour-wide zones in principle, but zone borders bend to follow countries and states, and some places use half or quarter hours. India keeps one time for the whole country at UTC+5:30, and Nepal uses UTC+5:45. China stretches across about 60° of longitude, roughly four hours of the sun's path, yet uses a single time, UTC+8, so in the far west the sun may not rise until about 10 a.m. by the clock. Each nation chooses its own time for its own reasons.

If you travel west, you set your watch back an hour at each zone; travel east and you set it forward. Go all the way around and you would be a whole day off. The **International Date Line** fixes that. It follows the 180° meridian through the open Pacific, with jogs around island nations. Cross it going west and you skip ahead one calendar day; cross it going east and you repeat a day. The problem was noticed long before the line was drawn. When the survivors of Ferdinand Magellan's expedition reached the Cape Verde Islands in 1522, after sailing west around the world, they found that their carefully kept log was one day behind the date on shore. In Jules Verne's novel *Around the World in Eighty Days* (1873), Phileas Fogg nearly loses his wager because, traveling east, he had gained a day without knowing it. In 2011 the Pacific nation of Samoa moved to the west side of the line to match its trading partners Australia and New Zealand, and simply skipped Friday, December 30.

Today the world's clocks are tied to **Coordinated Universal Time**, kept by atomic clocks that lose less than a second in millions of years. This is not just tidiness. A GPS receiver finds its position by timing radio signals from satellites. Light travels about one foot in a billionth of a second, so a timing error of a millionth of a second would put you about a thousand feet off. The old longitude problem, keeping exact time, still lies underneath every map on your phone.

Time zones are a human agreement laid over a God-given pattern. The sun still rises and sets on its own schedule, and noon by the sun still moves across your zone four minutes for every degree. We draw the lines for the sake of trains, trade and travel, but the day itself, "the evening and the morning," is not ours to make.

PICTURE STUDY



The Gare Saint-Lazare, Claude Monet, 1877 · Oil on canvas · Musée d'Orsay, Paris
Wikimedia Commons · Public domain

In 1877 Claude Monet set up his easel inside the Saint-Lazare railway station in Paris and painted it again and again, a dozen times, in different light. Railroads were the newest wonder of his age, and they were changing how people lived with time: trains needed timetables, and timetables needed everyone's clocks to agree. Monet painted not a schedule but the steam, smoke and light of the moment a train comes in.

Look closely

- Find the locomotive. Is it arriving or about to leave? What makes you think so?
- Find where the sunlight comes through the roof. What time of day might it be?
- Find the people on the platform. How large are they compared with the train shed?

Talk about it

1. Monet painted quickly to catch one moment of light. Why might that suit a painting about trains and time?
2. Before standard time, what problems might a traveler in this station have had?

HANDS-ON: A FAMILY WORLD CLOCK

Build a world clock chart for places that matter to your family (missionaries you pray for, relatives, cities from this track), then work out how far your town's clock is from its own solar time.

You will need

- Poster board or a journal spread, ruler and colored pencils
- A world map or globe with time zones (an atlas or the timeanddate.com zone map; a parent may help)
- A sunrise-sunset table for your town, or the solar-noon time from your shadow-stick in Stop A2

Steps

1. Choose eight places around the world, including at least one in Asia, one in the Pacific and one with a half-hour time (such as India).
2. For each, find the UTC offset in standard time and list them from west to east. Draw a long time line, with each place where its offset falls.
3. Add two columns: the time there when it is 8:00 a.m. Sunday where you live, and the day of the week there.
4. Find your town's longitude and your zone's meridian (Eastern 75° W, Central 90° W, Mountain 105° W, Pacific 120° W). Work out how many minutes your solar noon should be from 12:00 standard time (4 minutes per degree), and check it against the sunrise-sunset table.
5. Mark on your chart where the International Date Line falls between your places. Write a sentence about which of your places reaches each new day first.

Check your work

- My chart has eight places in order of UTC offset, with times and days for one moment.
- I worked out my town's solar-noon offset and checked it.
- I marked the International Date Line correctly.

FIELD NOTEBOOK

1. **Journal page: Around the Clock.** Draw a circle as the earth seen from the North Pole, split it into 24 wedges, and label noon, midnight, your home and three of your world-clock places.
2. **Narration (parent keeps).** Write one paragraph telling what happened on "the day of two noons" and why the railroads, not the government, made it happen.

Did you know? Antarctic research stations at the South Pole, where all the meridians meet and every time zone touches, usually keep New Zealand time, because that is where their supply flights come from. And at sea, ships have long kept “nautical” time zones that follow the meridians in straight lines, with no national borders to bend them.

Go deeper. Clark Blaise, *Time Lord: Sir Sandford Fleming and the Creation of Standard Time* (2000). Jules Verne, *Around the World in Eighty Days* (1873), free at Project Gutenberg; read the last three chapters for the lost-and-found day. Smithsonian National Museum of American History, pages on railroad time and standard time. Royal Museums Greenwich, “Greenwich Mean Time” pages (rmg.co.uk). Second video topic: “How GPS uses atomic clocks.”

Goes deeper in. Technology Overcoming Geography, “Railroads and Standard Time,” and Geography, Grade 8, “The Global Grid” (coming soon).

For families. Sources: Library of Congress “Today in History, November 18” on the 1883 change; Britannica on Fleming, Dowd, Allen and the Standard Time Act (1918); the U.S. Department of Transportation, which oversees time zones today; NIST on atomic time and GPS. Counts of local times before 1883 vary widely between sources, so the stop says “dozens.” Daylight saving time is described only as law and practice. Credit for standard time is shared and argued over; the stop names three men without ranking them. There is no primary-source excerpt for this stop; Verne’s novel is suggested for reading.

PRACTICE

1. **EASY** Why did each town once have its own time?
2. **EASY** On what date did the railroads adopt standard time in North America, and how many zones did they use?
3. **MEDIUM** It is 3:00 p.m. in New York (UTC−5). What time is it in London (UTC+0) and in Tokyo (UTC+9), in standard time?
4. **MEDIUM** You fly west from Hawaii across the International Date Line on a Tuesday. What day is it when you land in Guam a few hours later (ignoring hours)?
5. **CHALLENGE** Your town is at 81° W, in the Eastern zone (75° W meridian). On standard time, about when is solar noon? On daylight saving time?
6. **CHALLENGE** Phileas Fogg traveled east around the world. When he got home, his own count of days was one day more than the London calendar showed. Explain why, using the rule of 15° per hour.

Make it a game • Human Time Zones. Players stand in a long line from west to east, each holding a card with a city and its UTC offset. The leader shines a flashlight “sun” on one player and calls “Noon!” Each player must call out their own time as fast as they can. A player who answers wrong becomes the sun for the next round. Add a Date Line player who must also say the day.

Scripture. “From the rising of the sun unto the going down of the same the LORD's name is to be praised.” (Psalm 113:3, KJV)

Somewhere on earth, at every hour, the sun is rising. Because of the turning of the earth, praise to God never stops; as one time zone goes to sleep, another wakes up and begins the day with Him.

Practice: answers

1. Each town set its clocks by the sun, with noon when the sun was highest, and the sun reaches its highest point at different moments in places east and west of one another.
2. November 18, 1883; four zones.
3. London 8:00 p.m. the same day; Tokyo 5:00 a.m. the next day.
4. Wednesday. Crossing the line going west skips forward one day.
5. $81 - 75 = 6^\circ$ west, $6 \times 4 = 24$ minutes later, so about 12:24 p.m. standard time, and about 1:24 p.m. daylight saving time (before the small seasonal correction called the equation of time).
6. Traveling east, he met each sunrise a little early, so each of his days was a little shorter than 24 hours. Across 360° those shortenings add up to 24 hours ($360 \div 15$), one whole day, so he counted one more sunrise than the people who stayed in London.

1.6 READING A ROAD MAP AND A SUBWAY MAP

OBJECTIVES

- Use a road map's legend, grid index, route numbers and distance markings to plan a route and estimate its time.
- Explain the U.S. Interstate numbering system and how exit numbers and mile markers work.
- Tell the difference between a geographic map and a topological diagram such as Harry Beck's London Underground map, and explain what each keeps true and what each leaves out.

Warm-up. Without looking, draw the route from your home to church or to a grocery store as a simple line with the turns marked. Then look at a real map. What did your drawing get right? What did it bend, shrink or leave out?

Video slot. Video coming. How the Interstate highways are numbered; the design of Harry Beck's London Underground map (1933). Search approved channels (Smithsonian, Library of Congress, London Transport Museum, National Geographic Education); preview first.

KEY TERMS

legend

The key on a map that explains its symbols, colors and line styles. Also called the key.

grid index

A system of letters along one edge of a map and numbers along the other, with an alphabetical list of places, so "Springfield, D-4" can be found quickly.

route number

The number given to a highway, shown in a shield or other shaped sign. Its number and shape tell what system the road belongs to.

mile marker

A small numbered sign along a highway counting miles from a state line or the start of the route. Most exit numbers match the nearest mile marker.

topological map

A diagram that keeps the order of stops and the connections between lines true but freely changes distances, angles and shapes.

transfer station

A station where two or more transit lines meet so riders can change from one to another.

CORE IDEAS

Maps answer different questions. “How far is it, and which way?” calls for a geographic map, drawn to scale with true positions. “Which train do I take, and where do I change?” calls for a diagram that shows connections clearly and does not care much about exact distance. A road map is the first kind; a subway map is usually the second. Reading either one well begins with asking which kind it is.

Road maps have a long history. In 1675 the Scottish-born printer John Ogilby published *Britannia*, a book of 100 strip maps showing the main roads of England and Wales as long scrolls, about 7,500 miles in all, with every hill, bridge, church and crossroads marked. Ogilby’s surveyors measured the roads with a wheel that clicked off the distance, and he drew everything at one inch to the mile, using the statute mile of 1,760 yards (Stop A4). Two hundred years later, when automobiles appeared, American travelers relied on route books and then on folded road maps, which oil companies began handing out free at service stations in the early 1900s. For much of the century a free map came with a tank of gas.

A good road map is read with its **legend** open. Line color and width show the class of road: interstates, U.S. highways, state highways and county roads. Small numbers between dots or tick marks often give the miles between junctions. The **grid index** lets you find a town by letter and number, and the scale bar lets you measure. To estimate time, divide distance by a sensible average speed, not the speed limit: stops, towns and traffic slow every trip.

The Interstate system, begun under the Federal-Aid Highway Act of 1956, numbers its roads by a pattern. Main routes with odd numbers run mostly north-south and grow larger from west to east: I-5 runs up the Pacific coast and I-95 up the Atlantic. Even numbers run mostly east-west and grow larger from south to north: I-10 crosses the southern states and I-90 the northern ones. Three-digit routes are branches of the main road: if the first digit is even, the road usually loops around a city or connects back to the main road; if it is odd, it is usually a spur into a city. The older U.S. highways number the other way round: U.S. 1 is in the east and U.S. 101 in the west. In most states, mile markers count from the southern or western state line, and exit numbers match the nearest mile marker, so Exit 120 is about 120 miles from the border and about 30 miles beyond Exit 90.

Subway maps solved a different problem. London opened the world’s first underground railway in 1863. Early Underground maps drew the lines over a street map at true scale, which crowded the central stations into a tangle and stretched the outer lines off the edge of the page. In 1931 Harry Beck, an engineering draftsman who had worked for the Underground, sketched a new kind of map in his spare time. He used only straight lines at horizontal, vertical and 45° angles, spaced the stations more evenly, and enlarged the crowded center. After some doubts, the Underground printed it in 1933, riders loved it, and nearly every subway map in the world now follows its pattern. Beck’s design is still protected by copyright, so look it up through the London Transport Museum rather than copying it.

Beck’s map is a **topological map**. It keeps true what a rider needs: the order of the stations, which lines meet where, and where to change. It lets go of what a rider does not need

underground: true distances and directions. That is a strength and a weakness. Two stations that look far apart on the diagram may be a short walk apart on the street; in central London, Leicester Square and Covent Garden are only about 250 meters apart, quicker to walk than to ride. New York tried an elegant Beck-style diagram in 1972, designed by Massimo Vignelli, but many riders found it confusing because it did not match the streets above, and in 1979 the city went back to a more geographic map. Each choice has a cost.

To read a subway map, follow the colored line, not the compass. Learn the name of each line's last station, because trains are often signed by their end of the line or by "uptown" and "downtown." Look for **transfer stations**, often shown as open circles or joined dots, and check the legend for accessible stations, fare zones and express stops. Then, as with any map, ask the honest question: what has this map kept true for me, and what has it left out?

PICTURE STUDY



Britannia: The Road from London to Aberistwith (first plate), John Ogilby, 1675 · Engraving on paper, often hand-colored · Copies in the British Library, the Library of Congress and many other collections
Wikimedia Commons · Public domain

John Ogilby was a dancing master, a theater manager, a translator of Virgil and, late in life, the King's cosmographer. His *Britannia* was the first national road atlas of Britain. Each plate shows a road as a set of strips, read from the bottom of the left-hand strip upward, like a long scroll cut into pieces. Each strip has its own little compass rose, because the strip turns as the road turns.

Look closely

- Find the starting town at the bottom of the first strip. Follow the road upward. What do you meet first?
- Find one of the small compass roses. Does north point the same way on every strip?

- Find the mile numbers along the road. How far apart are they?

Talk about it

1. Ogilby's strips show only a narrow band of land beside the road. Why is that enough for a traveler?
2. How is a strip map like a subway diagram, and how is it different?

Safety first. Ride trains, buses and subways only with a parent or trusted adult. Agree beforehand on what to do if you are separated (stay on the platform, or get off at the next stop and wait), keep behind the platform's safety line, and keep your fare card and phone secure.

HANDS-ON: PLAN A ROAD TRIP, THEN DRAW IT LIKE BECK

Plan a real or imagined road trip of 200 to 400 miles using a paper map, then redraw the trip, or a local bus or train route, as a Beck-style diagram.

You will need

- A paper road map or road atlas of your state (from a library, a welcome center or your state transportation department)
- A highlighter, string, ruler and pencil
- Graph paper and colored pencils
- A local bus, light-rail or subway route map if you have one nearby (most transit agencies post them online)

Steps

1. Choose a starting town and a destination 200 to 400 miles away. Find both with the grid index and write their grid squares.
2. Highlight a route. List each highway by number and say whether it runs mainly north-south or east-west, and whether its number fits the Interstate pattern.
3. Add up the mileage numbers between junctions, or measure with string and the scale bar. Estimate driving time at an average of 55 miles per hour, and add a stop every two hours.
4. Now draw your route as a diagram on graph paper: straight lines only, at 0°, 45° or 90°, with towns as evenly spaced dots and highway changes as transfer circles. Leave out everything a traveler does not need.
5. Compare your two maps. Make a short list: three things the diagram keeps true, and three things it leaves out.

Check your work

- I found towns by grid square and planned a route with highway numbers.
- I estimated distance and time and showed my working.

- My diagram uses only straight lines at set angles and shows transfers clearly.

FIELD NOTEBOOK

1. **Journal page: Two Kinds of Map.** Paste or sketch a small piece of a road map and a small piece of a transit diagram side by side, and label one thing each does best.
2. **Narration (parent keeps).** Write one paragraph explaining to a first-time subway rider why the map on the wall does not show true distances, and why that helps more than it hurts.

Did you know? Beck is said to have been helped by the look of electrical circuit diagrams, which show how parts are connected rather than where they sit. Mathematicians call this branch of geometry *topology*: a coffee cup and a doughnut are “the same” to a topologist, because each has exactly one hole.

Go deeper. London Transport Museum, online collection pages on Harry Beck and the Underground diagram (ltmuseum.co.uk). Library of Congress, digitized road maps and oil-company maps in its Geography and Map collections (loc.gov). Federal Highway Administration, “Interstate FAQ” on route and exit numbering (fhwa.dot.gov). Ken Garland, *Mr Beck’s Underground Map* (1994). Second video topic: “Why subway maps aren’t to scale.”

Goes deeper in. Technology Overcoming Geography, “Roads, Rails and Highways,” and Geography, Grade 4, “Reading Maps” (coming soon).

For families. Sources: Federal Highway Administration on Interstate and exit numbering (exit numbers are mileage-based in most, not all, states); British Library on Ogilby’s *Britannia*; London Transport Museum on Beck (design 1931, first printed 1933); MTA history of the 1972 Vignelli map. Accounts differ on the first free oil-company road map, so the stop says only “the early 1900s.” The Leicester Square–Covent Garden distance is rounded. Beck’s map is in copyright and is linked, not reproduced. There is no primary-source excerpt for this stop.

PRACTICE

1. **EASY** What is the legend of a map for?
2. **EASY** Does I-80 run mainly north-south or east-west? Does I-35?
3. **MEDIUM** Which would you expect to be farther north, I-10 or I-94? Which farther east, I-25 or I-75?
4. **MEDIUM** Name two things Harry Beck’s Underground map keeps true and two things it gives up.
5. **CHALLENGE** You enter an Interstate at Exit 34 and leave at Exit 187 in the same state, where exits are numbered by mileage. About how far did you drive? At an average of 60 miles per hour, about how long did it take?

6. **CHALLENGE** On a road map at 1:500,000, a winding road measures 9 inches with a string. The straight-line distance between its ends is 6 inches. How long is the road in miles, and how much longer is it than the straight line, as a percentage?

Make it a game • Find It Fast. With a road map open, one player calls out a town name. Everyone races to find it using the index and grid square, and the first to point to it calls the next. For a second round, call out a highway number and have players say which way it runs and whether it belongs east or west, north or south, before checking the map.

Scripture. “In all thy ways acknowledge him, and he shall direct thy paths.” (Proverbs 3:6, KJV)

Maps help us choose a road, but Solomon reminds us who directs the paths of our lives. A good traveler plans carefully and still trusts God for the way.

Practice: answers

1. It explains the map's symbols, colors and line styles.
2. I-80 (even) runs east-west; I-35 (odd) runs north-south.
3. I-94 is farther north (even numbers grow from south to north). I-75 is farther east (odd numbers grow from west to east).
4. It keeps the order of stations and the connections between lines (and where to change). It gives up true distances, true directions and true shapes.
5. $187 - 34 = 153$ miles. $153 \div 60 \approx 2.55$ hours, about 2 hours 33 minutes.
6. 1 inch = 500,000 inches ≈ 7.9 miles. Road: $9 \times 7.9 \approx 71$ miles; straight line: $6 \times 7.9 \approx 47$ miles. The road is 50 percent longer ($9 \div 6 = 1.5$).

1.7 OLD MAPS: PTOLEMY, THE HEREFORD MAPPA MUNDI AND MERCATOR (1569)

OBJECTIVES

- Describe three landmark maps, Ptolemy's *Geography* (c. A.D. 150), the Hereford Mappa Mundi (c. 1300) and Mercator's world map (1569), and the purpose each was made for.
- Explain why the Hereford map puts Jerusalem at the center and east at the top, reading the map in the light of its makers' own beliefs and purposes.
- Trace how errors and discoveries passed from one map to the next, including Ptolemy's too-small earth and Columbus's voyage.

Warm-up. If you had to draw the whole world on one page for someone in your family, what would you put in the middle, and why? Sketch it in two minutes before you begin.

Video slot. Video coming. The Hereford Mappa Mundi explained; Ptolemy's *Geography*; Mercator's 1569 world map. Search approved channels (Hereford Cathedral / The Mappa Mundi Trust, British Library, Library of Congress, Royal Museums Greenwich); preview first.

KEY TERMS

***Geography* (Ptolemy's)**

A Greek handbook written in Alexandria around A.D. 150 that taught how to draw maps from coordinates and listed thousands of places by latitude and longitude.

mappa mundi

Latin for "cloth (or chart) of the world": a medieval world map that showed history, Scripture and wonders as well as places.

T-O map

A simple medieval world diagram: a circle (the O) of ocean divided by a T of waters into Asia at the top, Europe at lower left and Africa at lower right.

vellum

Fine parchment made from calfskin, used for important books and maps before paper was common.

rhumb line

A line on the globe that crosses every meridian at the same angle, the path of a ship holding one compass bearing. Mercator's map draws rhumb lines straight.

atlas

A bound book of maps. The word was first used this way for a collection by Gerard Mercator, published in 1595.

CORE IDEAS

Every old map answers a question its makers cared about. If we ask only “How accurate is it?” we will misread most of them. If we ask “What was this map for?” they open up. Three famous maps, the first and second made about 1,150 years apart and the second and third about 270 years apart, show three very different answers.

Claudius Ptolemy worked in Alexandria, Egypt, around A.D. 150. His *Geography* was not mainly a picture but a method: it explained how to draw the round earth on a flat surface (he offered two projections), and it listed about 8,000 places by latitude and longitude so that anyone could plot them. His prime meridian ran through the Fortunate Isles, the Canaries, then the western edge of the known world. Ptolemy’s data were often wrong, because most of his longitudes came from travelers’ estimates of distance, not from observation. He also used a figure for the size of the earth that was too small, and he stretched Asia far to the east. For centuries the book was little known in western Europe. Around 1400 a Greek copy reached Florence, and soon after it was translated into Latin. It was printed with maps from 1477, and its grid of coordinates, the tool of Stop A3, became the foundation of modern mapmaking. Its errors traveled too: a smaller earth and a wider Asia made the sea westward to the Indies look short, and Christopher Columbus leaned on figures like these when he argued for his voyage.

The Hereford Mappa Mundi, made around 1300 and kept in Hereford Cathedral in England, is the largest medieval world map that survives: a single sheet of vellum about 5 feet 2 inches tall and 4 feet 4 inches wide. It was never meant to guide a traveler from one town to the next. It is a picture of the world as a Christian of that time understood it, in space and in history at once. East is at the top, where the Garden of Eden is drawn as a round island and where Christ sits in judgment above the whole world. Jerusalem is at the center. The map holds some five hundred drawings and more than a thousand Latin inscriptions: cities, rivers, the route of the Exodus, Noah’s Ark on the mountains of Armenia, the Tower of Babel, animals, plants and strange peoples taken from ancient writers. An inscription names its maker as “Richard of Haldingham and Lafford.” Even the mapmakers made mistakes: the labels for Europe and Africa are swapped.

It is a modern myth that medieval people thought the earth was flat. The scholar Bede taught that it was a sphere in the 700s, and the standard university textbook of the 1200s, John of Sacrobosco’s *On the Sphere*, said the same. A mappa mundi was not a failed attempt at a navigation chart; it was a different kind of map, closer to a great illuminated sermon. Its makers put Jerusalem at the center because the city stands at the center of the history of salvation, and because Scripture speaks of it as set “in the midst of the nations” (Ezekiel 5:5). To judge it only by the standard of a road atlas would be to misunderstand it.

Gerard Mercator was born in Flanders in 1512, trained in mathematics and engraving, and became the finest globe and map maker of his age. In 1544 he was arrested on suspicion of Protestant heresy and held for about seven months before being released; he later settled in Duisburg in Germany. There in 1569 he published a world map printed from 18 engraved sheets, about 2 meters wide, titled in Latin “a new and more complete description of the

earth, properly adapted for the use of navigators.” Its purpose was clear: on his projection, a **rhumb line**, the course of a ship steering one compass bearing, is a straight line. Mercator explained the idea but did not publish the mathematics; the Englishman Edward Wright worked out the tables in 1599. It took many decades for sailors to adopt the projection, but once they did, it ruled sea charts for centuries.

Late in life Mercator planned a great collection of maps, explained by a history of creation. He named it after Atlas, whom he described as a wise king and philosopher of old who first made a globe. The book was published in 1595, a year after his death, by his son, and ever since, a book of maps has been called an **atlas**.

Lay the three side by side and you see three questions. Ptolemy asked, “Where exactly is each place, by number?” The Hereford map asked, “What does the world mean, and where does it stand in God’s story?” Mercator asked, “How can a sailor steer across it?” Each made errors; each was a real achievement. Reading old maps well means taking their makers seriously on their own terms, and then measuring their work honestly against what we now know.

PICTURE STUDY



The Hereford Mappa Mundi, Attributed to Richard of Haldingham and Lafford, with other scribes and painters, c. 1300 · Ink, pigments and gold leaf on a single sheet of vellum · Hereford Cathedral, Hereford, England

Wikimedia Commons · Public domain

The Hereford Mappa Mundi has hung in or near Hereford Cathedral for about seven hundred years. In 1988, when the cathedral was short of money, it considered selling the map; gifts from many people kept it in Hereford, where it is now shown in a building beside the chained library. The map is crowded with pictures, and every one was chosen to teach something about the world and about God’s dealings with it.

Look closely

- Find Jerusalem, a round walled city in the middle. Why is it there?
- Find the Garden of Eden at the top and Christ in judgment above it. Which direction is at the top of this map?
- Find the British Isles at the bottom left edge. How large are they compared with the Holy Land? What does that tell you about the maker's purpose?

Talk about it

1. This map would not help you travel from London to Rome. What was it meant to help a person understand?
2. Ptolemy, the Hereford makers and Mercator each put something different at the center of their work. What would you put at the center of your town map in Stop A8, and why?

HANDS-ON: THREE MAPS, THREE QUESTIONS

Compare the three maps side by side, make a chart of their purposes and errors, and draw a small T-O map of your own.

You will need

- Online images of Ptolemy's world map (from a 1400s printed edition), the Hereford Mappa Mundi and Mercator's 1569 map (Library of Congress, British Library or the Mappa Mundi website; a parent may help)
- A large sheet of paper divided into a chart
- A compass for drawing (or a plate), ruler and colored pencils

Steps

1. Make a chart with three columns (Ptolemy, Hereford, Mercator) and five rows: date, maker, what is at the center, what is at the top, and what the map was for.
2. Add a sixth row: one real error in each map (for example, Ptolemy's wide Asia, the swapped Europe and Africa labels, Mercator's giant Greenland).
3. Read the primary source from Ezekiel. Write two sentences explaining how that verse helps explain the Hereford map's design.
4. Draw a T-O map: a circle with a T inside, Asia above, Europe lower left, Africa lower right, east at the top and Jerusalem at the center. Label the three seas or rivers the T stood for: the Mediterranean, and the rivers Don and Nile.
5. Under it, write one sentence on what the T-O map gets wrong as geography and one on what it got right as a way of teaching.

Check your work

- My chart compares all three maps in six rows.
- I used the Ezekiel passage to explain the Hereford design.
- My T-O map has east at the top and is labeled.

FIELD NOTEBOOK

1. **Journal page: Old Maps.** Paste in or copy your T-O map. Beside it, draw a tiny Mercator grid with straight rhumb lines and write the dates 150, 1300 and 1569 along a time line.
2. **Narration (parent keeps).** Write one paragraph answering this: “Was the Hereford Mappa Mundi a bad map?” Use at least two facts from this stop and treat its makers fairly.

Did you know? Ptolemy’s *Geography* includes a famous mistake about the Indian Ocean: he drew it as an enclosed sea, with an unknown southern land joining Africa to Asia. Bartolomeu Dias’s voyage around the Cape of Good Hope in 1488 and Vasco da Gama’s to India in 1497–1499 proved it open.

Primary source. *Ezekiel 5:5, King James Version (1611). Medieval mapmakers often pointed to this verse when they placed Jerusalem at the center of the world.*

Thus saith the Lord GOD; This is Jerusalem: I have set it in the midst of the nations and countries that are round about her.

Go deeper. The Mappa Mundi and Chained Library, Hereford Cathedral (themappamundi.co.uk), with zoomable images and explanations. Library of Congress, “Waldseemüller’s map” and other early world maps (loc.gov). Jerry Brotton, *A History of the World in Twelve Maps* (2012), which has chapters on Ptolemy, the Hereford map and Mercator; parents may want to preview it. Second video topic: “How Ptolemy’s Geography was rediscovered.”

Goes deeper in. History, “The Middle Ages” and “The Age of Exploration,” and Geography, Grade 8, “Maps and Projections” (coming soon).

For families. Sources: Hereford Cathedral / The Mappa Mundi Trust; British Library and Library of Congress on Ptolemy’s *Geography* and its printed editions; Britannica on Mercator and Edward Wright. Counts of drawings and inscriptions on the Hereford map vary by source; the stop rounds them. The maker’s name comes from an inscription on the map, and scholars still discuss who Richard was. The figure for Ptolemy’s places (about 8,000) is approximate. The primary source is quoted from the King James Version. The notion that medieval scholars believed in a flat earth is a nineteenth-century error, and the stop corrects it.

PRACTICE

1. **EASY** What is at the top of the Hereford Mappa Mundi, and what is at its center?
2. **EASY** What was Mercator’s 1569 map designed for, and what does it draw as straight lines?

3. **MEDIUM** Using Ezekiel 5:5, explain why a medieval Christian mapmaker would put Jerusalem in the middle of the world.
4. **MEDIUM** Name one thing Ptolemy's *Geography* gave later mapmakers and one error it passed on.
5. **CHALLENGE** Ptolemy's smaller earth and wider Asia both shortened the apparent sea route west from Europe to Asia. Explain how each error does that, and why it mattered in 1492.
6. **CHALLENGE** A student says, "The Hereford map is proof that people in the Middle Ages thought the world was flat." Give two reasons this is wrong.

Make it a game • Which Map Am I? One player reads a clue: "I was made for sailors." "I have Noah's Ark on me." "I list places by numbers." "My Europe and Africa are mislabeled." "I was printed on 18 sheets." The others call out Ptolemy, Hereford or Mercator. The first right answer earns a point; a player who can add another true fact about that map earns a bonus point.

Scripture. "The earth is the LORD's, and the fulness thereof; the world, and they that dwell therein." (Psalm 24:1, KJV)

Ptolemy measured the earth, the Hereford makers told its story, and Mercator charted its seas, but none of them owned it. Every map, old or new, describes a world that belongs to God, and its people with it.

Practice: answers

1. East is at the top, with the Garden of Eden and Christ in judgment above it; Jerusalem is at the center.
2. For sailors; it draws rhumb lines (courses of constant compass bearing) as straight lines.
3. The verse says God set Jerusalem "in the midst of the nations and countries that are round about her." The mapmaker was showing Jerusalem's place at the center of God's dealings with the world and of the story of salvation, not measuring distances.
4. It gave the method of plotting places by latitude and longitude (and projections). Errors: an earth too small, Asia stretched too far east, or the enclosed Indian Ocean.
5. A smaller earth makes every degree of longitude fewer miles; a wider Asia covers more of the 360°, leaving fewer degrees of open sea between Spain and Asia. Together they made the westward ocean look short enough to cross, and Columbus used such figures to argue that his voyage was possible. In fact the Americas and the much wider Pacific lay in between.
6. Medieval scholars taught that the earth is a sphere (Bede in the 700s; Sacrobosco's *On the Sphere* in the 1200s). And the Hereford map was not meant as a measured picture of the earth's shape; it was a teaching picture of the world's places and history, laid out around Jerusalem for a religious purpose.

1.8 DRAW A MAP OF YOUR TOWN

OBJECTIVES

- Plan a map by choosing its purpose, area, scale, orientation and symbols.
- Gather data in the field by a compass-and-pace traverse, and measure and correct its closing error.
- Use historic maps (Sanborn fire insurance maps, bird's-eye views, old topographic maps) to show how your town has changed.

Warm-up. From memory, list ten places in your town that a visitor ought to know about. Then circle the three you would put on a map first. Why those three?

Video slot. Video coming. How to draw a map: surveying with a compass and pacing; how cartographers choose symbols. Search approved channels (USGS, Library of Congress, National Geographic Education, Smithsonian); preview first.

KEY TERMS

survey

The careful measuring of land, its distances, directions and heights, so that it can be mapped or described.

traverse

A survey made of a chain of straight legs, each with a measured bearing and distance. A closed traverse returns to its starting point.

closing error

The gap between where a closed traverse ends on paper and where it began. It shows how accurate the survey was.

triangulation

Fixing the position of a point by measuring the angles to it from both ends of a carefully measured baseline.

generalization

A mapmaker's choice of what to simplify or leave out so that a map stays clear at its scale.

base map

An existing accurate map, such as a USGS topographic map or county plat, used as a framework for adding your own information.

CORE IDEAS

Every stop on this trail has been leading here. A map of your town uses the projection problem (small enough to ignore at this size), the compass rose, coordinates, scale, the conventions of road and transit maps, and the old mapmakers' lesson that every map serves a purpose. Now you make the choices yourself.

Start with purpose, because everything else follows from it. A map for a visiting grandparent might show your house, church, the grocery, the park and the best route between them. A history map might show the buildings that stood in 1900. A nature map might show creeks, trees and where you have seen deer. Then decide the area (a few blocks, a neighborhood or the whole town), the scale that will fit it on your paper (Stop A4), which way is up (north, unless you have a good reason), and a short **legend** of symbols. Good mapmakers practice **generalization**: they leave things out on purpose so that what matters can be seen.

Surveyors gather the facts in the field. The simplest method is a compass-and-pace **traverse**: walk a series of straight legs, and for each one record the bearing (Stop A2) and the distance in paces (Stop A4). Plotted on paper, the legs make a chain. If you walk around a block and come back to the start, your plotted chain should close up. It almost never does exactly. The gap is the **closing error**, and dividing it by the total distance walked gives your accuracy: a 30-foot gap after 1,500 feet of walking is an error of 1 in 50, about 2 percent, very good for paces. Surveyors spread the error back along the legs to correct it, and they take pride in small errors honestly reported.

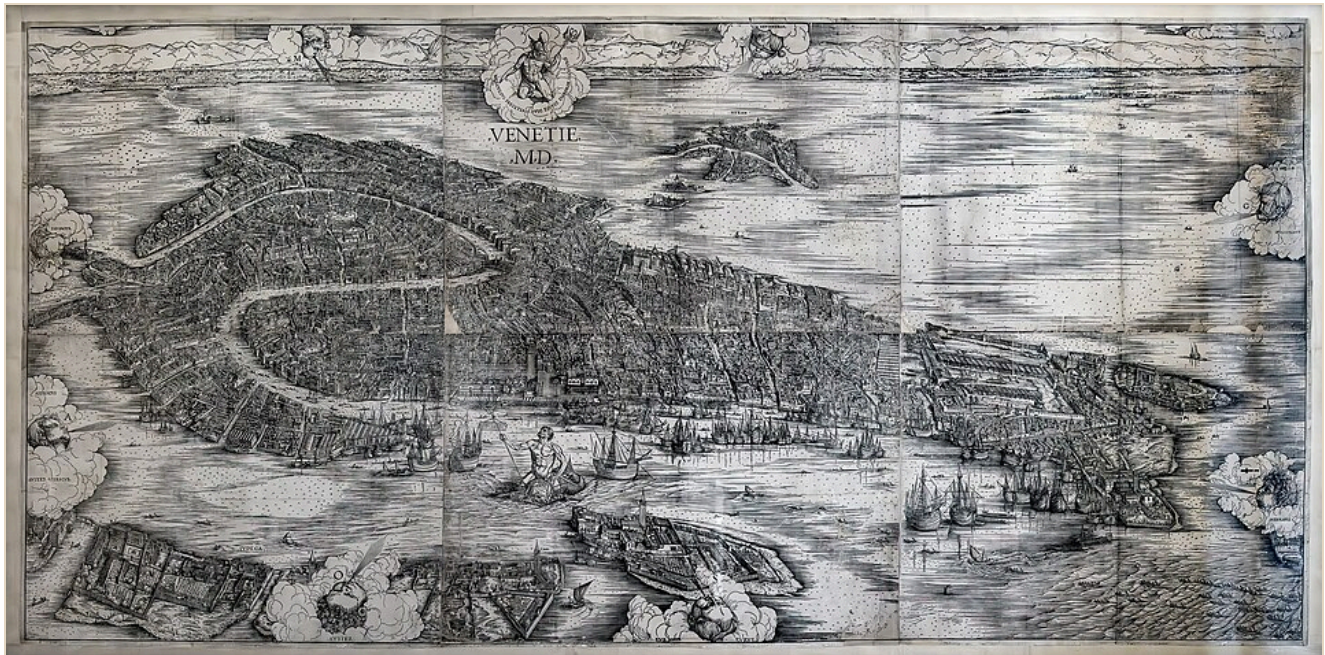
For larger areas, surveyors use **triangulation**. Measure one baseline as exactly as you can, then measure the angles from each end to a distant church spire or hilltop, and geometry fixes the point. A chain of triangles can cover a whole country. Henry David Thoreau, who earned part of his living as a land surveyor, used a compass, a chain and a weighted line in the winter of 1846 to map Walden Pond from the ice, and found that its greatest depth was 102 feet, not bottomless as local stories said. He printed his small, careful map in *Walden* (1854).

You do not have to survey everything yourself. A **base map**, such as a USGS topographic map, a county plat or an aerial photograph, gives you a true framework, and your field work adds what only you know: the shortcut, the oak that fell, the bakery that opened last year. Mapmakers have always worked this way, building on the measurements of those who came before and correcting them.

Your town also has old maps, and comparing them is like reading its diary. From the 1860s to the mid-1900s the Sanborn Map Company drew detailed fire insurance maps of thousands of American towns, showing every building, its size, whether it was brick, stone or wood, and even where the windows were. The Library of Congress has digitized hundreds of thousands of these sheets. It also holds more than a thousand panoramic “bird’s-eye views” of American towns drawn in the late 1800s and early 1900s, and USGS topoView has old topographic maps going back to the 1880s for much of the country. Put an old map beside your own and ask: what was here, what changed, and why?

Last, a map is a statement of fact, so honesty matters. Date your map, sign it, give your scale and north arrow, mark what you measured yourself and what you took from another source, and note anything you are unsure of. A map that admits its limits can be trusted. Joshua’s surveyors “described it by cities into seven parts in a book” and brought it back to Shiloh; their careful description became the basis for dividing the land among the tribes. Your map, made with care, is a gift of knowledge to the people who live in your place.

PICTURE STUDY



View of Venice, Jacopo de' Barbari, 1500 · Woodcut printed from six wooden blocks · Museo Correr, Venice (which also keeps the original woodblocks); impressions in the British Museum and other collections
Wikimedia Commons · Public domain

Jacopo de' Barbari's *View of Venice*, published in 1500 by the merchant Anton Kolb, is nearly 3 meters wide. It shows the whole city from an imaginary height, as if from a hot-air balloon three centuries before balloons existed. Historians think its makers drew it from many sketches made from bell towers around the city and then pieced them together. It is so detailed that scholars still use it to learn what individual Venetian buildings looked like in 1500. At the top, Mercury, the messenger of the old Roman gods, appears above the city; Neptune, the sea god, rides in the lagoon below, as symbols of Venice's trade and sea power.

Look closely

- Find the Grand Canal, the great S-shaped waterway. Follow it from one end to the other.
- Find St. Mark's Square and its tall bell tower. Why would a mapmaker climb towers like that one?
- Find the edges of the picture. Is the city drawn to a single scale, or does it change as you move away from the center?

Talk about it

1. Is this a map, a picture or both? What makes you say so?
2. What would you need to climb, or find, to draw your own town from above?

Safety first. Do field work only with a parent or trusted adult. Walk on sidewalks and paths, cross streets only at safe crossings, stay off private property unless you have

permission, and do not photograph people or the inside of homes. Watch traffic, not just your compass.

HANDS-ON: MY TOWN MAP

Make a finished map of part of your town, built on a base map and checked by your own traverse, with a historic comparison. This is the capstone of Trail A and the centerpiece of your travel journal.

You will need

- A base map: a printed USGS topographic map, county map or aerial photo of your area (a parent may help)
- A compass, a clipboard and your step length from Stop A4
- Large paper (11 by 17 inches or bigger), pencil, fine-tip pens, ruler and colored pencils
- A historic map of your town from the Library of Congress (Sanborn maps or panoramic maps) or USGS topoView

Steps

1. Write your map's purpose in one sentence at the top of your notes. Choose the area, a scale and the symbols for your legend.
2. Read the primary source from Joshua 18. Like Joshua's surveyors, divide your area into parts (three to seven) and describe each part in a short notebook list before you draw.
3. With a parent, walk a closed traverse around one block or park: record the bearing and paces of each leg. Plot it and measure your closing error. Write it as a ratio (1 in __).
4. Trace or lightly copy the main streets from your base map onto the large paper at your chosen scale. Add your own field details on top.
5. Finish in ink: title, legend, north arrow, scale bar, your name, the date, and a note of your sources.
6. Find a historic map of the same area. In a box in the corner, list three things that have changed and one that has stayed the same.

Check your work

- My map has a title, legend, north arrow, scale bar, date, name and sources.
- I walked and plotted a closed traverse and reported my closing error honestly.
- I compared my map with a historic map and noted changes.

FIELD NOTEBOOK

1. **Journal page: My Town.** Fold your finished map into the journal or draw a reduced copy. Paste your traverse notes and the "parts of my town" list from Joshua 18 beside it.
2. **Narration (parent keeps).** Write one paragraph explaining the three hardest choices you made in drawing your map (what to leave out, what scale, what symbols) and why

you made them.

Did you know? Sanborn maps used colors to show building materials: pink for brick, yellow for wood, and blue for stone. Insurance agents used them to judge fire risk without visiting each building. Today historians, architects and families tracing old houses use them more than anyone else.

Primary source. *Joshua 18:8-9, King James Version (1611). Before the land was divided among the remaining tribes at Shiloh, Joshua sent men to walk it and write a description of it.*

And the men arose, and went away: and Joshua charged them that went to describe the land, saying, Go and walk through the land, and describe it, and come again to me, that I may here cast lots for you before the LORD in Shiloh. And the men went and passed through the land, and described it by cities into seven parts in a book, and came again to Joshua to the host at Shiloh.

Go deeper. Library of Congress, “Sanborn Maps” and “Panoramic Maps” collections (loc.gov), searchable by state and town. USGS topoView (ngmdb.usgs.gov/topoview) for current and historic topographic maps. Henry David Thoreau, *Walden* (1854), chapter “The Pond in Winter,” free at Project Gutenberg, for his survey of the pond. Second video topic: “How land surveyors work.”

Goes deeper in. Geography, Grade 4, “Making Maps,” and History, “Local History: Reading Your Own Town” (coming soon).

For families. Sources: Library of Congress on the Sanborn and panoramic map collections; Thoreau, *Walden*, “The Pond in Winter,” for the 1846 survey and the 102-foot depth; Museo Correr and the British Museum on de’ Barbari’s view. Collection sizes are given as round figures because they grow as the Library digitizes more. Sanborn color conventions changed somewhat over the years. Some towns have no Sanborn maps; county maps, plat books and old topographic maps can take their place. The primary source is quoted from the King James Version. Please supervise all field work.

PRACTICE

1. **EASY** Name five things every finished map should have besides the map itself.
2. **EASY** In Joshua 18:8-9, what were the men told to do, and how did they record what they found?
3. **MEDIUM** What is generalization, and why can’t a town map show everything?
4. **MEDIUM** Your step is 2.5 feet. You walk a leg of 240 steps on a bearing of 90°. How long is the leg, and which way does it run? At 1 inch = 100 feet, how long is it on paper?
5. **CHALLENGE** You walk a square traverse: 400 feet north, 400 feet east, 400 feet south, 400 feet west. Plotted, your last leg ends 12 feet from the start. What is your closing error as a ratio and a percentage?

6. **CHALLENGE** From the two ends of a 300-foot baseline running east-west, a church steeple lies exactly north of the west end and at a bearing of 315° (northwest) from the east end. How far is the steeple from the west end? Explain.

Make it a game • Map Detective. A parent picks a historic map of your town (a Sanborn sheet or bird's-eye view) and a current map of the same place. Players get five minutes to find as many differences as they can: buildings gone, streets added, rivers moved. Each difference earns a point, and a player who can explain why the change happened earns a bonus point.

Scripture. “The lines are fallen unto me in pleasant places; yea, I have a goodly heritage.” (Psalm 16:6, KJV)

David speaks of the measured boundary lines of his inheritance. The place where God has set you, with its streets and fields and neighbors, is part of your heritage. Mapping it carefully is one way to give thanks for it and to learn to love and serve the people who live there.

Practice: answers

1. Any five: title, legend, north arrow, scale (bar or fraction), date, the mapmaker's name, sources.
2. To walk through the land and describe it, and come back to Joshua. They described it by cities in seven parts, in a book.
3. Generalization is choosing what to simplify or leave out. At any scale smaller than the ground itself, there is not room to show everything clearly, so a mapmaker keeps what serves the map's purpose.
4. $240 \times 2.5 = 600$ feet, due east; 6 inches on paper.
5. Total distance 1,600 feet. $12 \div 1,600 = 1$ in about 133, or 0.75 percent.
6. 300 feet. The steeple, the west end and the east end form a right triangle with a right angle at the west end. A bearing of 315° from the east end makes a 45° angle with the baseline, so the triangle is isosceles and the north side equals the 300-foot baseline.

TRAIL 1 BADGE QUIZ

The badge quizzes are optional and may be taken open-notebook. Students write their answers and show their working on the number problems. Four right out of five earns the first badge; four right out of five earns the second. Badges and the certificate are earned by completing the stops, not by scores.

Badge quiz 1 (Stops 1–5)

1. Why does Greenland look as large as Africa on a Mercator map, and about how many times larger is Africa really?
2. The declination is 8° west. Your compass shows a magnetic bearing of 100° . What is the true bearing, and what is the back bearing (true)?
3. Local noon comes when a clock set to Greenwich time reads 7:00 a.m. What is your longitude?
4. On a 1:24,000 map, two bridges are 4 inches apart. How far apart are they in feet and in miles?
5. What happened on November 18, 1883, and why?

Badge quiz 2 (Stops 6–8)

6. Which way does I-70 run, and would you expect it to be north or south of I-40?
7. What is a topological map? Give an example.
8. Name the purpose of each: Ptolemy's *Geography*, the Hereford Mappa Mundi, Mercator's 1569 map.
9. Which way is up on the Hereford Mappa Mundi, and where does the word "orient" come from?
10. A closed traverse of 2,000 feet ends 25 feet from its start. What is the closing error as a ratio and a percentage?

TRAIL CERTIFICATE: TRAVEL JOURNAL, PART A: READING THE WORLD, AND TRAIL A CERTIFICATE

Gather your eight journal pages into the first section of your travel journal, titled "Reading the World," with your name and the dates you worked.

Include your finished town map from Stop A8 as the centerpiece, folded in or in a pocket, with your traverse notes and historic comparison.

Add your eight narration paragraphs, which a parent has kept, and a short closing paragraph on which tool from this trail you would most want on a real journey, and why.

When the section is complete, a parent signs the Trail A certificate.

- **Accuracy:** Numbers are worked correctly, with units, and the town map has a correct scale, north arrow and legend.

- **Understanding:** Narrations explain causes and trade-offs (why maps stretch, why longitude depends on time, what each map was for) in the student's own words.
- **Use of sources:** Primary sources and historic maps are quoted or cited correctly and used to support a point, and the town map lists its sources.
- **Craft and honesty:** Pages are neat, labeled and dated; measured and borrowed information is distinguished; uncertainty and closing errors are reported honestly.

Answer key

1. Mercator stretches lengths by $1 \div \cos(\text{latitude})$ to keep angles true, so areas near the poles are greatly enlarged. Africa is about 14 times larger.
2. True bearing 92° (subtract a west declination). Back bearing 272° .
3. Five hours before Greenwich noon: $5 \times 15^\circ = 75^\circ$. Local noon comes before Greenwich noon, so you are 75° east.
4. $4 \times 2,000 = 8,000$ feet, about 1.5 miles.
5. The railroads of the United States and Canada changed to four standard time zones (the "day of two noons"), because dozens of local times made schedules confusing and dangerous.
6. East-west (even number), and north of I-40 (even numbers grow from south to north).
7. A diagram that keeps connections and the order of stops true but not distances or directions, such as Harry Beck's London Underground map (1933).
8. Ptolemy: to plot places by latitude and longitude. Hereford: to show the world and its history in a Christian view, centered on Jerusalem. Mercator: to help sailors steer by compass bearings (rhumb lines drawn straight).
9. East is at the top. To "orient" a map originally meant to set it by the east (Latin *oriens*, the rising sun).
10. 1 in 80, or 1.25 percent.

TRAVEL AND FARAWAY PLACES TRAIL B: PLANNING A TRIP

The second trail of the Travel track walks through the whole work of planning a journey, one decision at a time: choosing a destination and knowing why, comparing train, car, ship and plane, building a budget, writing a day-by-day itinerary, packing (and the one-bag challenge), passports, customs and currency, courtesy abroad, and safety and staying together. Each stop pairs practical skill with history and a primary source, from Francis Bacon's "Of Travel" and Jules Verne's eighty-day itinerary to Nehemiah's letters from the king and Paul's shipwreck in Acts 27.

This is the  **Expert** level, for ages 14 and up. Students read the stop on their own, work the numbers, study a primary source and a painting, and write a one-paragraph narration that a parent keeps. Each stop takes 35 to 50 minutes. Every stop stands alone, but they build on each other: by the end, the student has a **complete trip plan** in the travel journal, with a destination matrix, transport comparison, budget, itinerary, packing list, papers-and-money file, courtesy guide and safety plan.

Five stops earn the **Trip Planner badge, part 1**; all eight earn part 2 and the **Trail B certificate**. Badges are earned by doing the stops; the badge quizzes are optional checks.

BEFORE YOU BEGIN

- Work with percents, decimals and simple formulas (for budgets, exchange rates and fuel costs), using a calculator.
- Read a map and a 24-hour clock, and read older English prose (such as the King James Version) with some help.

MASTERY CHECKLIST

- ☐ I can choose a destination by its purpose and real constraints, using a weighted decision matrix.
- ☐ I can compare modes of travel by door-to-door time and cost per traveler, and build a trip budget with a contingency.
- ☐ I can write a day-by-day itinerary with anchors, clusters, buffers and a sensible pace.
- ☐ I can pack within real limits and explain passports, customs and currency exchange, including hidden fees.
- ☐ I can describe courteous customs abroad and make a family safety plan, and I have kept a narration for every stop.

OPTIONAL BOOKS AND RESOURCES

- **U.S. Department of State: travel.state.gov** (<https://travel.state.gov>): Official passport fees and steps, country information, travel advisories and the Smart Traveler Enrollment Program (Stops B6 and B8).

- **U.S. Customs and Border Protection: Know Before You Go** (<https://www.cbp.gov/travel/us-citizens/know-before-you-go>): What returning travelers may bring home, duty-free limits and forbidden items (Stop B6).
- **Transportation Security Administration: What Can I Bring?** (<https://www.tsa.gov/travel/security-screening/whatcanibring/all>): Item-by-item rules for carry-on and checked bags, including liquids and batteries (Stop B5).
- **Project Gutenberg** (<https://www.gutenberg.org>): Free texts used in this trail: Bacon's Essays (#575), Stevenson's Travels with a Donkey (#535), Franklin's Way to Wealth (#43855), Verne's Around the World in Eighty Days (#103), Thoreau's Walden (#205), Washington's Rules of Civility (#12029).
- **National Park Service: Oregon National Historic Trail** (<https://www.nps.gov/oreg>): History of the wagon companies and life on the trail (Stop B8).

2.1 CHOOSE A DESTINATION, AND KNOW WHY

OBJECTIVES

- State the purpose of a trip and explain how that purpose shapes every later choice.
- Weigh real limits (time, money, distance, season, the needs of each traveler) with a weighted decision matrix.
- Read Francis Bacon’s essay “Of Travel” (1625) as a primary source and judge whether his advice still holds.

Warm-up. Write down three places you would like to go, anywhere in the world. Next to each, write one word that says *why*: to see, to learn, to rest, to visit, to serve, to worship. Do your three reasons match, or are they all different? Keep the list; you will test it in the project.

Video slot. Video coming. How travelers choose where to go: the Grand Tour of Europe in the 1600s and 1700s, and how to weigh time, cost and season when planning a trip. Search approved channels (Rick Steves’ Europe, Smithsonian Channel, National Trust, a museum channel such as the National Gallery, London); preview first.

KEY TERMS

destination

The place a journey is meant to reach. A trip may have one destination or several stops along a route.

purpose

The reason for a journey: learning, rest, family, work, service or worship. The purpose decides what counts as a good choice.

constraint

A real limit a plan must fit inside, such as days available, money, distance, health, or school and work calendars.

Grand Tour

A long educational journey through France and Italy, often a year or more, taken by many young British gentlemen in the 1600s and 1700s.

peak, shoulder and off season

The busiest and most expensive time to visit a place (peak), the weeks just before and after it (shoulder), and the quiet, cheaper time (off).

weighted decision matrix

A table that scores each choice on several criteria, multiplies each score by how much that criterion matters, and adds the results.

CORE IDEAS

Every good trip begins with a question that is easy to skip: **why go?** People have always traveled for many reasons. Medieval pilgrims walked to Canterbury, Rome, Santiago de Compostela and Jerusalem to pray where the faith had been planted. Merchants traveled to trade, soldiers and sailors because they were sent, families to see grandparents, and missionaries to carry the Gospel. Today most trips still fall under a few headings: to learn, to rest, to visit people, to work, to serve or to worship. The **purpose** matters because it decides what a “good” destination is. A family going to rest does not want six museums a day; a student going to learn may not care whether there is a pool.

Some of the most careful thinking about the purpose of travel comes from the age of the **Grand Tour**. From the early 1600s to the early 1800s, young British gentlemen, and later some of their sisters, spent a year or more crossing France to Italy with a tutor, studying languages, art, law and the ruins of Rome. Francis Bacon (1561–1626), the English statesman and philosopher, wrote an essay “Of Travel” that appeared in the 1625 edition of his *Essays*. He opened with a famous line: travel, for the young, “is a part of education.” He then gave a long list of things worth seeing, from courts of law and churches to harbors, libraries and ruins. His point was that a traveler should go with a plan for learning, not just to wander.

Purpose is the first filter; **constraints** are the second. Five come up on almost every trip. *Time*: a three-day weekend cannot hold a trip to Japan, because a flight from the eastern United States to Tokyo takes about 14 hours each way, and the body needs a day or more to adjust to a 13-hour time difference. A useful rule is that if getting there and back takes more than about a quarter of the whole trip, look for somewhere closer. *Money*: the same week can cost ten times more in one place than another. *Distance*: longer trips add cost, fatigue and risk. *Season*: heat, snow, hurricanes and monsoons all have calendars. *People*: a toddler, a grandparent who cannot climb stairs, or a traveler with a medical need may rule some places out entirely.

Seasons deserve a closer look because they affect both cost and experience. Most popular places have a **peak season**, when weather is best and schools are out, so prices rise and lines grow. The **shoulder season** just before or after (often April–May and September–October in Europe) can bring lower prices and smaller crowds with fair weather. The off season is cheapest but may mean closed attractions or hard weather. Some famous places now charge or limit visitors because of crowds; Venice, for example, began charging day visitors an entry fee on certain busy days in 2024. A wise planner checks the calendar of the destination, not just his or her own.

When there are several good choices, a **weighted decision matrix** brings order to the argument. List the choices in rows and the criteria in columns (cost, travel time, what we will learn, fun for everyone, safety). Give each criterion a weight, say 1 to 3, by how much it matters to this trip. Score each choice 1 to 5 on each criterion, multiply each score by its weight, and add across. A family with weights cost 3, travel time 2 and learning 3 might

score a national park 4, 4, 4 (total $12 + 8 + 12 = 32$) and a distant city 2, 2, 5 ($6 + 4 + 15 = 25$). The park wins, but only because of the weights the family chose.

That last point is the honest complexity. A matrix does not make a decision; it shows the decision you have already made in your weights. If a family changes the learning weight from 3 to 5, the distant city may win. The tool is still useful, because it makes everyone say out loud what matters and why, and it catches choices that look exciting but fail a real limit. It also leaves room for things numbers cannot hold: a grandmother's eightieth birthday, a church mission that needs help, or a place a father has always wanted to show his children.

For a Christian, choosing a destination is a matter of stewardship and of trust. Time and money are gifts to be used well, and travel is one good use among many, not a right or a trophy. Scripture also teaches that our best plans sit under God's hand: "A man's heart deviseth his way: but the LORD directeth his steps" (Proverbs 16:9). So we plan carefully, as Bacon urged, and then hold the plan with an open hand. Many of the most important journeys in history began with a clear purpose and an unknown road.

PICTURE STUDY



Seaport with the Embarkation of the Queen of Sheba, Claude Lorrain, 1648 · Oil on canvas · The National Gallery, London

Wikimedia Commons · Public domain

Claude Lorrain (about 1600–1682) was a French painter who spent nearly his whole working life in Rome. He imagined the moment the Queen of Sheba sets out to visit King Solomon, the journey told in 1 Kings 10 ("she came to prove him with hard questions"). Claude painted no Arabian desert; he painted an ideal harbor full of light. Grand Tour travelers loved his pictures so much that they carried small tinted mirrors called "Claude glasses" to see real landscapes in his soft, golden tones.

Look closely

- Find the queen and her party. How small are they compared with the buildings, ships and sky?
- Find the sun. Where does its light fall on the water, the steps and the stone?
- Look at the ships. Which ones look ready to sail, and which are still being loaded?

Talk about it

1. The queen traveled a very long way “to prove him with hard questions.” What does that tell you about her purpose, and how might the purpose have shaped her journey?
2. Why do you think Claude made the people small and the light and harbor so large? What does the painting say about setting out on a journey?

Safety first. Before you choose a place abroad, a parent should read the U.S. State Department’s travel advisory for that country (levels 1 to 4) and any health notices; some destinations are not wise for families at certain times.

HANDS-ON: THREE PLACES, ONE CHOICE: A WEIGHTED DECISION MATRIX

Turn your warm-up list into a real decision. You will test three possible destinations for a family trip against Bacon’s purpose for travel and against your family’s real limits.

You will need

- Your list of three places from the warm-up
- A ruler, pencil and a page in your travel journal
- A map or atlas and a calculator
- Access to a weather or climate chart for each place (an almanac or a reliable website)

Steps

1. Write the purpose of the trip in one sentence at the top of the page (for example, “to learn American history together in one week of October”).
2. Read Bacon’s list in the “Primary source” box. Circle any items that would actually be found at each of your three places.
3. Draw a matrix with your three places as rows and five criteria as columns: cost, travel time, learning, enjoyment for everyone, and season or weather.
4. Ask a parent to help set a weight from 1 to 3 for each criterion. Write the weights above the columns.
5. Score each place from 1 to 5 on each criterion. Multiply each score by its weight and add across each row.
6. Change one weight and work the totals again. Does the winner change? Write two sentences on what this teaches you about the tool.

Check your work

- My page states the purpose of the trip in one sentence.
- Every score is multiplied by its weight and every row is added correctly.
- I tested what happens when one weight changes and explained it.
- I used Bacon's list to judge what each place could teach.

FIELD NOTEBOOK

1. **Narration (one paragraph, kept by a parent).** Explain in your own words why the purpose of a trip should be decided before the destination. Use one example from history and one from your own family.
2. **Travel journal, page 1.** Paste or copy your decision matrix. Under it, draw a small map showing your home and the winning destination, with the distance between them.

Did you know? The word *travel* comes from the same root as the French *travail*, "hard work." For most of history a journey was toil: muddy roads, slow ships and real danger. Grand Tour journeys often lasted from several months to several years, and young travelers came home with crates of paintings, books and copies of Roman statues.

Primary source. Francis Bacon, "Of Travel," from his *Essays* (1625), as given in *Project Gutenberg eBook #575*.

TRAVEL, in the younger sort, is a part of education, in the elder, a part of experience.

The things to be seen and observed are: the courts of princes, especially when they give audience to ambassadors; the courts of justice, while they sit and hear causes; and so of consistories ecclesiastic; the churches and monasteries, with the monuments which are therein extant; the walls and fortifications of cities, and towns, and so the heavens and harbors; antiquities and ruins; libraries; colleges, disputations, and lectures, where any are; shipping and navies; houses and gardens of state and pleasure, near great cities; armories; arsenals; magazines; exchanges; burses; warehouses; exercises of horsemanship, fencing, training of soldiers, and the like; comedies, such whereunto the better sort of persons do resort; treasuries of jewels and robes; cabinets and rarities; and, to conclude, whatsoever is memorable, in the places where they go.

Go deeper. Read Bacon's whole essay "Of Travel" (Project Gutenberg #575); it is about two pages. Look at the National Gallery, London, page on Claude's *Seaport with the Embarkation of the Queen of Sheba* and its companion picture. For the Grand Tour, see the Victoria and Albert Museum's online article on the Grand Tour, or a library copy of Jeremy Black, *The British and the Grand Tour* (for older readers). Second video topic: "Claude glass and the Grand Tour."

Goes deeper in. Geography, Grade 8, "Regions and Why People Travel to Them," and History, "Pilgrims and the Medieval Church" (coming soon).

For families. Sources: Bacon's text is copied from Project Gutenberg eBook #575 (spelling as given there). The Queen of Sheba's visit is in 1 Kings 10:1-13 and 2 Chronicles 9. Flight time to Tokyo and the time difference are typical figures and vary by route and daylight saving time. Venice's day-visitor access fee began as a trial on selected days in 2024; check current rules. The "quarter of the trip" guideline is a rule of thumb, not a law. Picture: Claude Lorrain, 1648, National Gallery, London (NG14).

PRACTICE

1. **EASY** Name four different purposes a person might have for a journey.
2. **EASY** What was the Grand Tour, and roughly when did it flourish?
3. **MEDIUM** In Bacon's list, find three things that a modern traveler could still visit in a city today, and one that is hard to find today.
4. **MEDIUM** A family has a 4-day trip. Travel to Place A takes 6 hours each way; to Place B, 20 hours each way. Using the "one quarter" rule (travel should take no more than about a quarter of the trip), which place fits? Show your work.
5. **CHALLENGE** Weights: cost 3, travel time 2, learning 3. Lake cabin scores 5, 4, 2. Historic city scores 2, 3, 5. Find both totals. Then change the learning weight to 5 and find both totals again. Which choice wins each time?
6. **CHALLENGE** Bacon says travel is "a part of education" for the young and "a part of experience" for the elder. Explain the difference in two or three sentences, and say whether you agree, using one example.

Make it a game · Destination Draft. Each player writes a destination on a slip and puts it in a bowl. A caller draws one slip and one "purpose card" (rest, learn, visit, serve, worship). Players have 60 seconds to argue for or against the match, naming at least one real constraint. The group votes; a convincing argument scores a point even if it argues "against."

Scripture. "A man's heart deviseth his way: but the LORD directeth his steps." (Proverbs 16:9, KJV)

Planning is good and wise; Solomon does not tell us to stop deciding. But he reminds us that the One who directs the steps is the Lord. Choose carefully, and pray over the choice.

Practice: answers

1. Any four: learning, rest, visiting family or friends, work or trade, service or mission, worship or pilgrimage.
2. A long educational journey, usually through France and Italy with a tutor, taken by young British gentlemen from about the 1600s to the early 1800s.
3. Still visitable (any three): courts of justice, churches and monuments, walls and fortifications, harbors, ruins, libraries, colleges and lectures, ships, gardens, armories, exchanges, treasuries of jewels. Hard to find (any one, with a reason): courts of princes giving audience

to ambassadors, consistories ecclesiastic, or exercises of fencing and training of soldiers open to visitors.

4. 4 days = 96 hours; a quarter is 24 hours. Place A: 12 hours round trip, which fits. Place B: 40 hours round trip, far more than 24, so it does not fit.
5. First: cabin $15 + 8 + 6 = 29$; city $6 + 6 + 15 = 27$; the cabin wins. With learning weight 5: cabin $15 + 8 + 10 = 33$; city $6 + 6 + 25 = 37$; the city wins. The weights, not the matrix, decided the outcome.
6. A strong answer explains that the young travel to learn things they do not yet know (languages, history, how other places are ordered), while older people compare what they see with long experience and use it in their work or judgment. Any reasoned agreement or disagreement with a concrete example is acceptable.

2.2 GETTING THERE: TRAIN, CAR, SHIP OR PLANE

OBJECTIVES

- Compare car, train, ship and plane by door-to-door time, cost per traveler, flexibility, comfort and safety.
- Explain how the railway, the steamship and the jet airliner each shrank the world, with dates.
- Use Robert Louis Stevenson's *Travels with a Donkey* (1879) to weigh speed against what slow travel gives.

Warm-up. Pick a city about 400 miles from your home. Guess how long it would take to get there by car, by train and by plane, counting from your front door to the door of the place you will sleep. Write the three guesses down before you read.

Video slot. Video coming. History of travel: the first passenger railways (1830), the transcontinental railroad (1869), ocean liners, and the first jet airliners (1958). Search approved channels (Smithsonian Channel, Smithsonian National Air and Space Museum, National Railway Museum (UK), Library of Congress); preview first.

KEY TERMS

mode of transport

A way of traveling: on foot, by animal, car, bus, train, ship or aircraft.

door-to-door time

The whole time from leaving where you start to arriving where you stay, including waiting, security, transfers and baggage, not just time moving.

cost per traveler

The total cost of a mode divided by the number of people sharing it. A car costs about the same for one person or five; tickets are paid per seat.

hub

A city or station where many routes meet and travelers change from one train or flight to another.

flexibility

How freely travelers can change time, route or stops after setting out.

steamship

A ship driven by a steam engine rather than by sails, able to keep a schedule regardless of wind.

CORE IDEAS

For almost all of history, the speed of travel on land was the speed of a walking man or a horse: twenty or thirty miles on a good day. The great change came with steam. The

Liverpool and Manchester Railway opened in 1830 as the first intercity line to carry passengers on a timetable with steam locomotives alone. Within twenty years, Britain was laced with track, and a journey that had taken days by coach took hours. In the United States, the first transcontinental railroad was joined at Promontory Summit, Utah, on May 10, 1869, and a trip from coast to coast fell from months by wagon or ship to about a week.

At sea, the steamship did the same. A sailing ship depended on the wind; a steamer could promise a date. By the early 1900s great liners crossed the Atlantic in about five or six days. Then in October 1958 the first jet airliners began regular passenger service across the Atlantic, and the crossing dropped to about seven or eight hours. Each new mode did not erase the older ones, but it changed what people expected. Jules Verne's novel *Around the World in Eighty Days* (1872) was only imaginable because the Suez Canal and the American transcontinental railroad had both opened in 1869.

When you plan a trip, compare modes by **door-to-door time**, not top speed. Take a 400-mile trip. A car averaging about 60 miles an hour with stops takes roughly 7 hours. A jet flies the distance in about 1 hour 15 minutes, but add the drive to the airport, arriving early for security, boarding, taxiing, collecting bags and the drive at the far end, and the total is often 4½ to 5 hours. A fast train may take 5 to 7 hours, but it runs from city center to city center, with no security line and room to read or walk about. For trips under about 300 miles, driving or rail often matches flying; for trips over about 500 miles, flying usually wins on time.

Cost works differently for each mode. A car's fuel costs nearly the same whether one person rides or five. At 28 miles per gallon and \$3.20 a gallon, an 800-mile round trip uses about 29 gallons, or roughly \$91 in fuel, plus wear, tolls and parking. A family of four flying at \$250 each round trip pays \$1,000 before bag fees; at \$120 each by train, \$480. So the car is often cheapest for a family and the plane often cheapest for one person going far. Hidden costs matter too: airport parking, rental cars at the far end, a night in a motel on a long drive, or the meals bought at a hub during a long layover.

Then there are the things no price tag shows. A car offers **flexibility**: stop at a roadside historical marker, change the route, carry a cooler and a folding stroller. A train offers time to read, sleep and see the land. A ship, whether a ferry across a strait or a slow ocean voyage, offers the sea itself and a slower adjustment to time zones. A plane offers distance: no other mode can put a family on another continent the same day. Safety also differs. Per mile traveled, U.S. airline travel and intercity rail are many times safer than driving, but most of us drive every week without fear; the wise traveler respects the real risk of a long drive by planning rest and not driving tired.

There is an honest tension here. Faster is not always better. Robert Louis Stevenson (1850–1894), the Scottish author of *Treasure Island*, chose in 1878 to cross the Cévennes mountains of southern France on foot with a small, stubborn donkey named Modestine, covering about 120 miles in twelve days. In *Travels with a Donkey* he wrote that the slowness itself was the point: it put him in touch with weather, ground and people that a railway carriage would have flashed past. Most travelers today must choose speed for the

long legs, but many find that the slow parts of a trip, a walk, a ferry, a back road, are the parts they remember.

Choosing a mode, then, is a weighing of time, money, comfort, flexibility and safety against the purpose of the trip. The psalmist imagined the fastest journey he could: to “take the wings of the morning” to the far side of the sea. His point was that no speed and no distance can carry us out of God’s keeping.

PICTURE STUDY



Rain, Steam, and Speed – The Great Western Railway, J. M. W. Turner, 1844 · Oil on canvas · The National Gallery, London
Wikimedia Commons · Public domain

Joseph Mallord William Turner (1775–1851) had grown up in a world of horses and sailing ships. Near the end of his life he painted a Great Western Railway train crossing the Maidenhead Bridge over the River Thames, west of London. Steam trains were only about fourteen years old as a passenger service, and they still astonished people. Turner did not paint a careful diagram of the engine; he painted what speed *felt* like in rain and mist.

Look closely

- Find the dark front of the engine. Where is the bright firebox glowing?
- Find the older bridge to the left and the small boat on the river. What older ways of travel do they suggest?
- Look closely in front of the train, on the track. Many viewers find a hare running ahead of it. Can you?

Talk about it

1. Why might Turner have put the old river, boat and bridge in the same painting as the new railway?
2. Does the painting celebrate speed, warn about it, or both? Give reasons from what you see.

Safety first. On a long drive, plan a stop at least every two hours and never let a tired driver keep going; on trains and platforms stay behind the safety line, and on ships keep to marked decks and know where the life jackets are.

HANDS-ON: FOUR WAYS THERE: A DOOR-TO-DOOR COMPARISON

Plan one real trip four ways and decide, with numbers, which mode is best for your family and why.

You will need

- A map or online map for distances and driving times
- Sample train, bus and airline fares (from carrier websites, with a parent)
- Your travel journal, a ruler and a calculator

Steps

1. Choose a destination 300 to 800 miles away (or use the winner from Stop B1 if it fits).
2. Make a table with four rows (car, train or bus, plane, and ship or ferry if possible; write “not available” if not) and six columns: door-to-door time, total cost, cost per traveler, flexibility (1–5), comfort (1–5) and notes.
3. For each mode, list every step from your front door to the bed at the far end, with times. Add them for the door-to-door time.
4. Work out the cost for your whole family. For the car, use $\text{miles} \div \text{miles per gallon} \times \text{price per gallon}$, and add tolls and parking.
5. Read the Stevenson passage in the “Primary source” box. Add one row: “the slow way” (a scenic road, a ferry or a train leg). What would it add to the trip that the fastest mode would not?
6. Circle your choice and write three sentences defending it to a parent.

Check your work

- Every mode lists its door-to-door steps and total time.
- Car costs use miles, miles per gallon and fuel price correctly.
- Cost per traveler is shown for each mode.
- My final choice is defended with numbers and with the purpose of the trip.

FIELD NOTEBOOK

1. **Narration (one paragraph, kept by a parent).** Tell how the railway, the steamship and the jet airliner each changed travel, with one date for each, and say which change

you think mattered most.

2. **Travel journal.** Draw a timeline from 1830 to 1958 and mark the first passenger railway, the transcontinental railroad, the Suez Canal, Verne's novel and the first transatlantic jets.

Did you know? Before railways, every town kept its own "local time" by the sun, so noon in Bristol came about ten minutes after noon in London. Railway timetables could not work that way. British railways adopted London time in the 1840s, and on November 18, 1883, American and Canadian railroads switched to standard time zones. Trains, not governments, first put the whole country on the same clocks.

Primary source. *Robert Louis Stevenson, Travels with a Donkey in the Cevennes (1879), chapter "Cheylard and Luc," Project Gutenberg eBook #535.*

Why any one should desire to visit either Luc or Cheylard is more than my much-inventing spirit can suppose. For my part, I travel not to go anywhere, but to go. I travel for travel's sake. The great affair is to move; to feel the needs and hitches of our life more nearly; to come down off this feather-bed of civilisation, and find the globe granite underfoot and strewn with cutting flints. Alas, as we get up in life, and are more preoccupied with our affairs, even a holiday is a thing that must be worked for. To hold a pack upon a pack-saddle against a gale out of the freezing north is no high industry, but it is one that serves to occupy and compose the mind. And when the present is so exacting, who can annoy himself about the future?

Go deeper. Read the opening chapters of Stevenson's *Travels with a Donkey* (Project Gutenberg #535). Explore the Smithsonian National Museum of American History's online exhibition *America on the Move*. See the National Gallery, London, page on Turner's *Rain, Steam, and Speed*. Second video topic: "The Golden Spike at Promontory Summit" (National Park Service, Golden Spike National Historical Park).

Goes deeper in. Technology Overcoming Geography, "Railroads, Steamships and the Shrinking World," and Geography, Grade 8, "Transportation Networks" (coming soon).

For families. Sources: Stevenson text from Project Gutenberg #535; the length of his route is usually given as about 120 miles (some modern walking routes measure more). Golden Spike date: National Park Service. Standard time: November 18, 1883, adopted by U.S. and Canadian railroads; Congress made it law in 1918. Jet service: BOAC's Comet 4 and Pan Am's Boeing 707 both began transatlantic jet passenger service in October 1958. Fuel, fare and travel-time figures are round illustrations; have students use current numbers. The safety comparison is per mile traveled (National Safety Council and Bureau of Transportation Statistics data). Picture: Turner, 1844, National Gallery, London (NG538).

PRACTICE

1. **EASY** What is door-to-door time, and why is it a better measure than top speed?
2. **EASY** Give the year for each: the Liverpool and Manchester Railway opens; the transcontinental railroad is joined; the first regular transatlantic jet service.
3. **MEDIUM** A round trip is 640 miles. The car gets 32 miles per gallon and fuel costs \$3.50 a gallon. What is the fuel cost? If five people ride, what is the fuel cost per person?
4. **MEDIUM** Flight: 40-minute drive to the airport, arrive 90 minutes early, 75-minute flight, 30 minutes for bags, 35-minute drive. Car: 6 hours 30 minutes including stops. Which is faster door to door, and by how much?
5. **CHALLENGE** A family of four compares: car fuel \$110 round trip plus one motel night at \$140; train tickets \$95 per person round trip; airfare \$230 per person round trip plus \$40 per checked bag each way for two bags. Find each total and rank them from cheapest.
6. **CHALLENGE** In the primary source, Stevenson says, "I travel not to go anywhere, but to go." What does he believe slow travel gives him? Do you think this is wise for every trip? Answer in three or four sentences, quoting him once.

Make it a game • Race Across the Map. Lay out a road map. Each player picks a mode card (car, train, ship, plane) and rolls a die each turn: cars move the roll in inches along roads, trains move double but only between station dots, planes jump between airport dots but must skip a turn at each airport for "security," ships move only on water. First to the destination city wins. Afterward, talk about which mode would win on a short trip and which on a long one.

Scripture. "If I take the wings of the morning, and dwell in the uttermost parts of the sea; Even there shall thy hand lead me, and thy right hand shall hold me." (Psalm 139:9–10, KJV)

David pictured the fastest travel he could imagine, as swift as the dawn racing across the sky. We can now cross an ocean in a morning, but the promise is the same: wherever we go, God's hand leads and holds His people.

Practice: answers

1. The whole time from leaving the start to arriving where you stay, including waiting, security, transfers and baggage. A fast mode with long waits at each end can be slower overall than a slower mode with none.
2. 1830; 1869 (May 10, at Promontory Summit, Utah); 1958 (October).
3. $640 \div 32 = 20$ gallons; $20 \times \$3.50 = \70 . Per person: $\$70 \div 5 = \14 .
4. Flight total: $40 + 90 + 75 + 30 + 35 = 270$ minutes = 4 hours 30 minutes. Car: 390 minutes. The flight is faster by 120 minutes, or 2 hours.
5. Car: $\$110 + \$140 = \$250$. Train: $4 \times \$95 = \380 . Plane: $4 \times \$230 = \920 , plus bags $2 \text{ bags} \times 2 \text{ ways} \times \$40 = \$160$, total \$1,080. Cheapest to dearest: car, train, plane.
6. A strong answer notes that he values "the needs and hitches of our life" felt "more nearly," leaving the "feather-bed of civilisation" to meet hardship and the real ground, and that the

work of travel “serves to occupy and compose the mind.” It should then judge fairly: slow travel suits trips for learning or rest, but not every trip (a family visit with limited days, a medical journey or a mission with a deadline may require speed).

2.3 A BUDGET: TRAVEL, ROOMS, FOOD AND EXTRAS

OBJECTIVES

- Build a trip budget in four categories (travel, rooms, food, extras) plus a contingency, with fixed and per-person costs kept separate.
- Find hidden costs (taxes, fees, tips, exchange charges) and explain how small costs add up.
- Apply Benjamin Franklin’s “The Way to Wealth” (1758) and Luke 14:28 to the work of counting the cost.

Warm-up. Guess what one family of four would spend on a five-day trip by car to a place 300 miles away: gas, four nights in a motel, all meals and a few tickets. Write your guess. You will check it against a real budget below.

Video slot. Video coming. How to make a travel budget; Benjamin Franklin and Poor Richard’s Almanack. Search approved channels (Smithsonian, The Franklin Institute, Library of Congress, a personal-finance channel for teens approved by a parent); preview first.

KEY TERMS

budget

A written plan for money: what will come in, what will go out, and for what, decided before spending.

fixed cost

A cost that stays the same however many people come, such as a motel room or the fuel for one car.

variable cost

A cost that grows with the number of people or days, such as meals or museum tickets.

contingency

Money set aside in a budget for things that go wrong or cost more than planned, often 10 to 15 percent.

opportunity cost

What you give up by choosing one use of money or time instead of the next best use.

hidden cost

A cost not shown in the first price: taxes, resort or baggage fees, parking, tips, or charges for changing money.

CORE IDEAS

A trip budget is a promise you make to yourself before you leave: this is what we will spend, and on what. Without one, most travelers spend more than they meant to, because every

decision on the road is made tired, hungry or excited. Most trip costs fall into four categories. **Travel** is getting there and getting around: fuel, tickets, tolls, parking, taxis. **Rooms** are lodging: hotel, motel, cabin, campsite or a relative's spare room. **Food** is every meal and snack. **Extras** are entrance tickets, tours, souvenirs, gifts and offerings. A wise planner adds a fifth line, a **contingency** of about 10 to 15 percent, for the flat tire, the rained-out day, or the price that rose since last year.

The next step is to sort costs into **fixed** and **variable**. A motel room for one night costs the same for two people or four, so it is fixed per night. Meals and museum tickets grow with every person and every day, so they are variable. This is why a family of six often drives while a single traveler flies, and why sharing a cabin with another family can cut the cost of rooms in half. Write each cost as a small formula: rooms = nights $\times$ rate $\times$ (1 + tax); food = people $\times$ days $\times$ daily food amount.

Here is a worked example for a family of four on a five-day, four-night car trip. Travel: 600 miles round trip at 25 miles per gallon is 24 gallons; at \$3.25, about \$78; add \$22 in tolls and parking for \$100. Rooms: 4 nights $\times$ \$130 = \$520, plus 12 percent lodging tax (\$62.40), about \$582. Food: 4 people $\times$ 5 days $\times$ \$35 a person a day (breakfast at the motel, picnic lunches, one modest supper out) = \$700. Extras: park and museum tickets \$160, small souvenirs \$40, a church offering \$20, total \$220. Subtotal: \$100 + \$582 + \$700 + \$220 = \$1,602. Contingency of 10 percent: about \$160. Total: about \$1,762, or roughly \$440 a person.

Look at where the money goes. In that example, food is the largest category (more than 40 percent of the subtotal) and travel the smallest. That is common for car trips and surprising to most people. It shows where saving is easiest: one restaurant supper for four can cost what two days of picnic food costs. Rooms are next. Driving an extra hour to stay outside a city, or choosing a room with a small kitchen, can save more than any coupon. This is the honest work of a budget: it shows you the size of each choice so you can trade a smaller pleasure for a larger one.

Then come the **hidden costs**. Hotels may add resort or parking fees by the night. Airlines often charge for checked bags. Many bank cards add a foreign transaction fee of about 3 percent on every purchase abroad, and airport money-changers often give a poor rate. In the United States, sit-down restaurants expect a tip of about 15 to 20 percent; in Japan tipping is not the custom. None of these is large alone, which is exactly the danger. Benjamin Franklin warned of this in "The Way to Wealth" (1758), the speech of "Father Abraham" that collected the sayings of *Poor Richard's Almanack*: "Beware of little expences; 'A small leak will sink a great ship.'"

There is also **opportunity cost**. The \$1,762 spent on a trip is not spent on something else: a year of music lessons, a gift to missions, savings for college, or two smaller trips. A good budget does not pretend the trip is free; it asks whether the trip is worth what it replaces. A family that decides to save for a trip can turn the total into a monthly target: \$1,762 over twelve months is about \$147 a month. Paying for a trip on a credit card at 20 percent

interest or more, and paying it off slowly, can add hundreds of dollars and turn a blessing into a burden.

Jesus used exactly this picture in the Gospel of Luke: no builder starts a tower without sitting down first and counting the cost. His point there is the cost of following Him, which is greater than any budget, but the picture works because counting the cost is plain wisdom. A trip budget is a small, practical way to practice the habits of honesty, patience and stewardship that matter in much larger things.

PICTURE STUDY



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

Wikimedia Commons · Public domain

Quentin Massys (about 1466–1530) worked in Antwerp, then one of the busiest trading cities in Europe, where coins from many lands crossed every table. A moneylender or money-changer had to weigh each coin, because worn or clipped coins held less gold or silver than they claimed. Massys set this busy work beside a quieter one: the wife holds a book of prayers. Many people read the painting as a reminder that money is to be handled honestly and kept in its place.

Look closely

- Find the little balance in the man's hand. What is he weighing, and why would weighing matter?
- Find the prayer book. Where is the wife looking, at the book or at the coins?
- Find the small round convex mirror on the table. What does it reflect, and who might be outside the window?

Talk about it

1. Why do you think Massys put a prayer book and a pile of coins in the same picture? What might he be saying about money?
2. How is weighing a coin like checking a trip budget before you spend?

Safety first. Keep trip money in two places (for example, some in a parent's wallet and a backup card in a separate bag), never count cash in public, and never share card numbers or online banking codes with anyone on a trip.

HANDS-ON: THE FAMILY TRIP BUDGET

Build a complete budget for a real trip, using the destination and mode you chose in Stops B1 and B2 (or any trip your family is considering).

You will need

- Your travel journal or a spreadsheet
- Real prices from lodging, fuel, ticket and museum websites (with a parent)
- A calculator and a highlighter

Steps

1. Make five sections: Travel, Rooms, Food, Extras, Contingency. Under each, write every item and its formula (for example, rooms = nights $\times$ rate $\times$ 1.12).
2. Look up real prices for every item. Write the source and date beside each price.
3. Mark each item F (fixed) or V (variable). Total each section, then find the subtotal and add 10 percent for contingency.
4. Find the cost per person and the percentage each category is of the subtotal. Highlight the largest category.
5. Read Franklin's words in the "Primary source" box. Find three "little expences" in your plan and write how each could be trimmed.
6. If your family would save for this trip, divide the total by the number of months until you leave to find a monthly savings goal.

Check your work

- All five sections are filled, with formulas and sources.
- My totals, per-person cost and percentages are worked correctly.
- I named three small expenses and how to trim them.
- I found a monthly savings goal.

FIELD NOTEBOOK

1. **Narration (one paragraph, kept by a parent).** Explain the difference between fixed and variable costs on a trip and why a family should add a contingency. Use numbers

from your own budget.

2. **Travel journal.** Draw a pie chart or a bar chart of your budget's four categories. Label each with its dollar amount and percentage.

Did you know? Benjamin Franklin published *Poor Richard's Almanack* every year from late 1732 to 1757 (for the years 1733 to 1758). For the last edition, the almanac for 1758, he wrote a preface in which an old man, "Father Abraham," gives a speech made of Poor Richard's sayings on work and thrift. Reprinted on its own as "The Way to Wealth," it became one of the most widely printed pieces of early American writing.

Primary source. *Benjamin Franklin, "The Way to Wealth" (1758), Project Gutenberg eBook #43855, Franklin's Way to Wealth; or, "Poor Richard Improved."*

Beware of little expences; "A small leak will sink a great ship," as Poor Richard says; and again, "Who dainties love shall beggars prove;" and moreover, "Fools make feasts, and wise men eat them."

"What maintains one vice, would bring up two children."

Go deeper. Read the whole of "The Way to Wealth" (Project Gutenberg #43855); it takes about twenty minutes. Look at the Louvre's collection page for Massys's *The Moneylender and His Wife*. The Library of Congress has digitized pages of *Poor Richard's Almanack*. Second video topic: "How a money-changer weighed coins" or "coin clipping and milled edges."

Goes deeper in. Small Business & Economics, "Budgets and Opportunity Cost," and Arithmetic, "Percents and Rates" (coming soon).

For families. Sources: Franklin text copied from Project Gutenberg #43855 (spelling "expences" as printed). Prices in the worked example are round illustrations; lodging taxes vary by state and city (often 10 to 17 percent combined). The 3 percent foreign transaction fee is typical but many cards charge none; check yours. Tipping customs vary and change; check before you go. The Luke 14:28 note keeps the passage's main meaning (the cost of discipleship) in view. Picture: Massys, 1514, Louvre, Paris.

PRACTICE

1. **EASY** Name the four main categories of a trip budget and the extra line a wise planner adds.
2. **EASY** Is a motel room for one night a fixed or a variable cost for a family? What about museum tickets?
3. **MEDIUM** Three nights at \$118 a night with 11 percent lodging tax. What is the total for rooms?
4. **MEDIUM** A traveler abroad spends the equivalent of \$640 on a card that charges a 3 percent foreign transaction fee. How much is the fee? How does Franklin's "small leak"

saying apply?

5. **CHALLENGE** A family of five plans 6 days and 5 nights. Fuel \$140; rooms $5 \times \$150$ plus 12 percent tax; food \$32 per person per day; extras \$275. Find the subtotal, a 10 percent contingency, the total and the cost per person.
6. **CHALLENGE** Using the budget in problem 5, what percent of the subtotal is food (to the nearest whole percent)? If the family replaces one restaurant supper a day (worth \$12 of each person's \$32) with a picnic costing \$4 a person, how much do they save over the trip?

Make it a game • Little Leaks. Give each player 20 paper “dollars.” A caller reads travel temptations: “Bottled water at the airport, \$4,” “A souvenir key chain, \$6,” “The fast-pass line, \$15.” Players secretly decide to buy or pass. After ten calls, everyone counts what is left. Then the caller reveals a real need at the end (“The car needs a new tire: \$12”). Who can still pay it?

Scripture. “For which of you, intending to build a tower, sitteth not down first, and counteth the cost, whether he have sufficient to finish it?” (Luke 14:28, KJV)

Jesus said this about the cost of following Him, which is the greatest cost of all. His example works because everyone knows it is foolish to start what you cannot finish. A careful trip budget is a small, everyday practice of that same wisdom.

Practice: answers

1. Travel, rooms, food, extras; plus a contingency (about 10 to 15 percent).
2. The motel room is fixed (the same for two or four people). Museum tickets are variable (they grow with each person).
3. $3 \times \$118 = \354 ; tax $\$354 \times 0.11 = \38.94 ; total \$392.94.
4. $\$640 \times 0.03 = \19.20 . Each small fee seems trivial, but together such costs drain the budget, as a small leak can sink a great ship.
5. Rooms: $5 \times \$150 = \750 ; tax \$90; \$840. Food: $5 \times 6 \times \$32 = \960 . Subtotal: $\$140 + \$840 + \$960 + \$275 = \$2,215$. Contingency: \$221.50. Total: \$2,436.50. Per person: \$487.30.
6. Food: $\$960 \div \$2,215 \approx 0.433$, or about 43 percent. Saving: $\$12 - \$4 = \$8$ per person per day; $5 \text{ people} \times 6 \text{ days} \times \$8 = \$240$.

2.4 AN ITINERARY, DAY BY DAY

OBJECTIVES

- Build a day-by-day itinerary using anchors, clusters, buffers and a sensible pace.
- Analyze the 80-day itinerary printed in Jules Verne's *Around the World in Eighty Days* (1872) and explain why it was possible only after 1869.
- Explain why good plans include margin, and connect this to James 4:13–15.

Warm-up. Think of the busiest day you have ever had away from home. What went wrong first: someone got hungry, a line was long, a drive took longer than expected? Write down the one thing that, if planned better, would have saved the day.

Video slot. Video coming. Thomas Cook and the first package tours; Bradshaw's railway guides; how to plan a travel itinerary. Search approved channels (National Railway Museum (UK), Smithsonian Channel, Rick Steves' Europe, BBC archive history clips); preview first.

KEY TERMS

itinerary

A plan of a journey, listing places, routes and times in order, day by day.

anchor

A fixed point in an itinerary that cannot easily move: a train departure, a booked tour, a church service, a check-in time.

cluster

A group of sights close together, visited on the same day to avoid crossing back and forth.

buffer

Spare time deliberately left between activities or connections to absorb delays.

leg

One section of a journey between two stops.

jet lag

Tiredness and confusion when the body's daily clock has not caught up with a new time zone; often about a day of adjustment for each zone or two crossed.

CORE IDEAS

An **itinerary** turns a destination and a budget into days. Before the 1800s, few travelers could plan by the hour; a coach might be a day late and a ship might wait a week for wind. Railways changed that. In 1839 George Bradshaw of Manchester began publishing railway timetables, and "Bradshaw" soon became the traveler's bible of departure times. On July 5, 1841, a Baptist preacher and cabinetmaker named Thomas Cook hired a train to carry about 500 people some eleven miles from Leicester to a temperance meeting in Loughborough for

a shilling each, with the travel and arrangements included. From that small beginning grew the first great travel company and the idea of the planned, ticketed tour.

Every good itinerary starts with its **anchors**: the things fixed in time. A flight at 7:10, a train that leaves at 14:32 (Europe uses the 24-hour clock), a museum booked for 10:00, a Lord's Day service at 11:00, check-out by noon. Write these first and plan everything else around them. Then group sights into **clusters** by neighborhood. In Rome, the Colosseum, the Roman Forum and the Palatine Hill sit side by side; visiting them with the Vatican on the same day means crossing the city twice. A map with each sight marked usually makes the clusters plain.

Next comes **pace**. A common rule for families is one major sight per half day, with a meal and rest between. Most people tire after two to three hours in a museum, and children sooner. Travel days are mostly lost to travel: a day with a four-hour train ride should hold little else. After a long flight across many time zones, the first day should be gentle, because the body's clock shifts slowly; travelers often count on roughly a day to adjust for every zone or two crossed, and flying east is usually harder than flying west. A plan that ignores the body ends with cranky travelers and unseen sights.

Finally comes the **buffer**. Connections need margin: an hour or more between a train and a flight, two or three hours for an international connection. Each day needs slack, perhaps a fifth of the waking hours unplanned, for rain, getting lost, a long lunch, or a surprise worth stopping for. A strong itinerary also has a "Plan B" for each day: a rainy-day museum for the hiking day, a second restaurant if the first is closed. The goal is not to fill every hour. It is to make sure the important things happen and the rest has room to breathe.

Jules Verne's novel *Around the World in Eighty Days* (1872) is built on an itinerary. Phileas Fogg wagers that he can circle the globe in eighty days, using a published estimate of eight legs by rail and steamer. That plan only became possible in 1869–1870: the Suez Canal opened in November 1869, the American transcontinental railroad was finished in May 1869, and the railway across India was linked in 1870. Yet Verne also shows why itineraries fail. In the story, the newspapers had announced the Indian railway complete, but Fogg finds fifty miles of track unfinished and must hire an elephant. He had a margin of only a few days, and he spent nearly all of it.

Fogg's plan is also honest about where the time goes. Two ocean legs (Calcutta to Hong Kong and Yokohama to San Francisco) take 35 of the 80 days, almost half. When you plan your own trip, look for the "Pacific crossing" in it: the one long leg that sets the shape of everything else. In Verne's ending, Fogg believes he has lost by a day, but he has forgotten that traveling east around the world, he gained a day by crossing what we now call the International Date Line. Planning by the calendar requires understanding the clock.

Scripture does not forbid planning; it forbids proud planning. James writes to traders who say, "To day or to tomorrow we will go into such a city," as though the future were theirs to command. He tells them to say instead, "If the Lord will." A Christian itinerary keeps anchors and buffers, but it also keeps a humble heart, ready to treat the closed road, the missed train or the unexpected meeting as part of a larger plan.

PICTURE STUDY



The Grand Canal from Palazzo Balbi toward the Rialto, Canaletto (Giovanni Antonio Canal), about 1720–1723 · Oil on canvas · Ca' Rezzonico (Museo del Settecento Veneziano), Venice
Wikimedia Commons · CC BY-SA 4.0

Canaletto (1697–1768) was the great painter of Venice. His careful views of the Grand Canal were bought above all by British travelers on the Grand Tour, who wanted to bring Venice home with them. Many were sold through Joseph Smith, an English merchant in Venice who later became British consul. This is one of Canaletto's early views, painted in the 1720s, when he was still in his twenties. A Grand Tour itinerary might give Venice a few weeks; a painting like this kept it for a lifetime.

Look closely

- Follow the canal from the front of the picture to the Rialto Bridge far away. How does Canaletto make the distance feel long?
- Count the boats. Which carry passengers, and which carry goods?
- Find the light and shadow on the palaces. What time of day do you think it is?

Talk about it

1. If you had one day in Venice, would you see the canal by boat or on foot? How would that choice change your itinerary?
2. Why would a traveler want a painting of a place instead of, or as well as, a written journal of it?

Safety first. Write every anchor (departure times, addresses, booking numbers) on a paper copy as well as a phone, and agree as a family that no one changes the plan alone; a missed connection is solved together.

HANDS-ON: A DAY-BY-DAY ITINERARY WITH MARGIN

Write the full itinerary for the trip you chose in Stops B1 to B3, at least three days, the way a professional travel planner would.

You will need

- A map of your destination (paper or printed) and colored pencils
- Opening hours, ticket times and travel times from official websites
- Your travel journal or a spreadsheet

Steps

1. Mark every sight you hope to see on the map. Circle groups that are close together; these are your clusters.
2. Make a grid with one column for each day and rows for morning, midday, afternoon and evening. Write every anchor first, in red.
3. Place one cluster in each morning or afternoon. Write travel time between places, then add a buffer to each.
4. Leave at least one block each day unplanned. Mark a Plan B for any outdoor activity.
5. Study the Verne table in the “Primary source” box. Find your trip’s longest leg and what percent of your trip it uses, as Fogg’s Pacific crossing used 22 of 80 days.
6. Show the itinerary to a parent and ask: “Which day would you be too tired on?” Revise that day.

Check your work

- Anchors are written first and clearly marked.
- Each day is built from clusters with travel times and buffers.
- Every day has open time and every outdoor plan has a Plan B.
- I worked out my longest leg as a percentage of the trip.

FIELD NOTEBOOK

1. **Narration (one paragraph, kept by a parent).** Explain why Phileas Fogg’s eighty-day plan was possible only after 1869, and what his trip teaches about margins.
2. **Travel journal.** On a world outline map, trace Fogg’s route from the Verne table in eight colors, and label each leg with its days.

Did you know? Thomas Cook led his first round-the-world tour in 1872, the same year Verne’s story was serialized in Paris. Real people soon raced Fogg’s fictional record. In 1889–1890, the American reporter Nellie Bly went around the world in 72 days (see Trail C). Today a nonstop jet could circle the earth in under two days, but a good itinerary would still need anchors, buffers and rest.

Primary source. *Jules Verne, Around the World in Eighty Days (1872), Chapter III, Project Gutenberg eBook #103 (English translation). A character reads out a newspaper's estimate of the journey.*

Here is the estimate made by the *Daily Telegraph*:—

From London to Suez *viâ* Mont Cenis and Brindisi, by rail and steamboats 7 days
From Suez to Bombay, by steamer 13 "
From Bombay to Calcutta, by rail 3 "
From Calcutta to Hong Kong, by steamer 13 "
From Hong Kong to Yokohama (Japan), by steamer 6 "
From Yokohama to San Francisco, by steamer 22 "
From San Francisco to New York, by rail 7 "
From New York to London, by steamer and rail 9 "
Total 80 days.

Go deeper. Read *Around the World in Eighty Days* (Project Gutenberg #103), especially Chapters III and XI–XII for the Indian railway gap. The Ca' Rezzonico museum page (Musei Civici di Venezia) shows its two early Canalettos. For Thomas Cook's first excursion, see the Leicester city heritage pages or the Science Museum Group collection. Second video topic: "Bradshaw's railway guide and the coming of timetables."

Goes deeper in. Technology Overcoming Geography, "The Suez Canal and the Transcontinental Railroad," and Geography, Grade 4, "Time Zones and the Date Line" (coming soon).

For families. Sources: Verne table copied from Project Gutenberg #103 (dot leaders shortened for layout; words and numbers exact). Thomas Cook's 1841 excursion: about 500 passengers, about eleven to twelve miles, a shilling a head (figures vary slightly by source). The India rail link was completed in 1870. The jet-lag rule of thumb is approximate and varies by person; it is not medical advice. Fogg's missing "day" comes from crossing the 180th meridian eastward; the International Date Line was not formally agreed in Verne's day, so the stop says "what we now call." Picture: Canaletto, Ca' Rezzonico, Venice; dated to the early 1720s.

PRACTICE

1. **EASY** What is an anchor in an itinerary? Give two examples.
2. **EASY** What did Thomas Cook organize on July 5, 1841?
3. **MEDIUM** Add the days in the Verne table and check that they make 80. Which leg is longest?
4. **MEDIUM** A train arrives at 13:45. Your connecting train leaves at 15:10. How long is the buffer? Write both times on a 12-hour clock.

5. **CHALLENGE** From the Verne table, what percent of the 80 days is spent on steamers only (count “rail and steamboats” and “steamer and rail” legs as mixed, not steamer-only)? What percent is spent on rail only? Round to the nearest whole percent.
6. **CHALLENGE** A family plans a 10-hour sightseeing day: three sights of 2 hours each, travel of 30 minutes between each pair of sights (two transfers) and a 1-hour lunch. How much buffer is left? Is it at least one fifth of the day? If not, what would you cut?

Make it a game • Fogg’s Race. Make eight cards, one for each leg of the Verne table, and a pile of “trouble” cards (storm: +2 days; missing railway: +1 day; fast ship: −1 day; missed boat: +3 days). Players start with an 80-day budget. Each turn, play the next leg and draw a trouble card. Anyone who arrives in London within 80 days wins. Then play again with a 5-day buffer added to the plan, and compare.

Scripture. “Go to now, ye that say, To day or to morrow we will go into such a city, and continue there a year, and buy and sell, and get gain: Whereas ye know not what shall be on the morrow. For what is your life? It is even a vapour, that appeareth for a little time, and then vanisheth away. For that ye ought to say, If the Lord will, we shall live, and do this, or that.” (James 4:13–15, KJV)

James is not against planning a trip; he is against boasting as if tomorrow belonged to us. A good itinerary is written in ink for the anchors and held in pencil for everything else, with the words “If the Lord will” at the top.

Practice: answers

1. A fixed point that cannot easily move. Any two: a train or flight departure, a booked tour or ticket time, a church service, a hotel check-in or check-out.
2. A railway excursion for about 500 people from Leicester to a temperance meeting in Loughborough, at a shilling each, with travel and arrangements included: the beginning of the organized tour.
3. $7 + 13 + 3 + 13 + 6 + 22 + 7 + 9 = 80$. The longest leg is Yokohama to San Francisco, by steamer, 22 days.
4. 1 hour 25 minutes. 13:45 is 1:45 p.m.; 15:10 is 3:10 p.m.
5. Steamer only: $13 + 13 + 6 + 22 = 54$ days; $54 \div 80 = 67.5$, about 68 percent. Rail only: $3 + 7 = 10$ days; $10 \div 80 = 12.5$, about 13 percent (12 or 13 accepted with correct rounding explained). Mixed: $7 + 9 = 16$ days, 20 percent.
6. Planned: $6 + 1 + 1 = 8$ hours. Buffer: 2 hours. One fifth of 10 hours is 2 hours, so it is exactly enough. (A cautious planner might still cut one sight on a first day abroad or with small children.)

2.5 PACKING LISTS AND THE ONE-BAG CHALLENGE

OBJECTIVES

- Write a packing list by category, separating essentials that must stay with you from things that can be replaced.
- Apply real limits: carry-on size, the 3-1-1 liquids rule, battery rules and checked-bag weight and fees.
- Use Thoreau's *Walden* (1854) and Luke 9:3 to think about how little a traveler truly needs.

Warm-up. Without looking, list everything you think you would need for five days away. Count the items. Now ask: which three things, if lost, would truly stop the trip? Circle them.

Video slot. Video coming. How to pack light in one carry-on bag; rolling clothes; what the TSA 3-1-1 liquids rule means. Search approved channels (Transportation Security Administration, Rick Steves' Europe, REI Co-op); preview first.

KEY TERMS

carry-on

A bag taken into the cabin of a plane or train and kept with you; most U.S. airlines allow about 22 × 14 × 9 inches plus a small personal item.

checked bag

A bag handed over at the airport to travel in the hold; usually limited to 50 pounds in economy and often charged a fee.

3-1-1 rule

The TSA rule for liquids in carry-ons: containers of 3.4 ounces (100 milliliters) or less, all in one quart-size bag, one bag per passenger.

layering

Dressing in several thin layers that can be added or removed, instead of one heavy garment, so a few clothes handle many kinds of weather.

capsule wardrobe

A small set of clothes in colors that all go together, so every top matches every bottom.

essentials

Things that would stop the trip if lost and cannot easily be replaced: travel documents, medicine, money and cards, glasses, keys and phone.

CORE IDEAS

Travelers in the 1800s did not pack light. A wealthy family going abroad might take several steamer trunks, each nearly the size of a small chest of drawers, and hire porters at every

station to carry them. William Powell Frith's painting *The Railway Station* (1862) shows the scene at Paddington in London: trunks, hatboxes, a porter straining under a load. This worked because labor was cheap and trips were long. Today most of us carry our own bags through airports, up subway stairs and over cobblestones. Every pound you pack is a pound you lift dozens of times.

A good packing list starts with **essentials**, the things that would end or ruin the trip if lost: passport or ID, tickets and booking papers, medicine, money and cards, glasses, phone and charger, house keys. These go in the bag that never leaves your body or your sight, not in a checked suitcase. Prescription medicines should travel in their original labeled containers, with a few extra days' supply. Next, sort the rest of the list by category (clothes, toiletries, gear, documents, things for the journey itself) and mark each item "need" or "nice."

Clothes are where most people overpack. Two ideas help. The first is **layering**: a T-shirt, a long-sleeved shirt, a warm sweater or fleece and a light rain shell together handle a cold morning and a warm afternoon better than one heavy coat. The second is a **capsule wardrobe**: choose clothes in a few colors that all go together. Four tops and two bottoms that all match make $4 \times 2 = 8$ different outfits. Plan to wash a few things midway, and a five-day bag can serve for two weeks. Shoes are heavy and bulky, so take two pairs at most and wear the bulkier pair while traveling.

Then come the rules. In the cabin of a U.S. flight, the TSA's **3-1-1 rule** allows liquids, gels and pastes only in containers of 3.4 ounces (100 milliliters) or less, all fitting in one clear quart-size bag, one per passenger. Spare lithium batteries and power banks must ride in carry-on bags, never in checked bags, because of the risk of fire. Most U.S. airlines limit carry-ons to about $22 \times 14 \times 9$ inches and checked bags to 50 pounds; many charge \$35 or more for a first checked bag each way, and much more for an overweight one. Rules differ by airline and country, so check before you pack, not at the gate.

The **one-bag challenge** is to travel with only a carry-on and a small personal item. Its rewards are real: no fees, no waiting at the carousel, no lost luggage, and free hands for children or train doors. It forces good questions: Will I really wear this? Can I buy it there if I need it? Yet honest planning admits that one bag is not always wise. A winter trip needs bulky coats. A baby needs a car seat and diapers. A traveler with medical equipment, a mission team carrying supplies, or a family moving abroad all have good reasons for more. The point of the challenge is not to win a contest but to learn the difference between what you need and what you only want.

Henry David Thoreau, who lived simply in a cabin at Walden Pond from 1845 to 1847, warned against "enterprises that require new clothes." He meant that a person's character matters more than his outfit, and that new things rarely make a new man. Travelers often shop for a trip as if new gear will make the journey good. The best preparation is usually a well-worn pair of shoes and a willing spirit.

When Jesus sent out the twelve apostles to preach, He told them to take "nothing for your journey." That command was for a particular mission, so that they would depend on God and on the hospitality of those they served. It is not a rule for every family vacation. But it

teaches something every traveler can learn: the less we carry, the more freely we move, and the more we notice that our real provision does not come from a suitcase.

PICTURE STUDY



The Railway Station, William Powell Frith, 1862 · Oil on canvas · Royal Holloway, University of London, Egham, Surrey
Wikimedia Commons · Public domain

William Powell Frith (1819–1909) painted huge crowd scenes full of little stories. Here, under the glass roof of Paddington Station in London, a family sends boys off to school, a wedding party departs, a porter wrestles with baggage, and two detectives arrest a man at the train door. Frith's painting drew such crowds when it was shown in London that rails were put up to hold them back.

Look closely

- Count the trunks, boxes and bags you can find. Who is carrying them?
- Find a traveler who seems to be traveling light. How can you tell?
- Find the two men stopping a passenger at the right. What story do you think is happening there?

Talk about it

1. How would these Victorian travelers manage if there were no porters? What does that tell you about why people packed so much?
2. Which person in the painting would you most like to travel with, and why?

Safety first. Keep medicines, passports and money in the bag that stays with you; never pack spare lithium batteries or power banks in a checked bag; and lift heavy bags with

bent knees, or ask for help.

HANDS-ON: THE ONE-BAG CHALLENGE

Pack for a real or imagined five-day trip in one carry-on and one personal item, weigh it, and defend every choice.

You will need

- A carry-on-size bag (about 22 × 14 × 9 inches) and a small backpack
- A bathroom scale and a tape measure
- One clear quart-size zip bag and small travel bottles
- Your travel journal

Steps

1. Write your list in categories: essentials, clothes, toiletries, gear, journey items. Mark each item “need” or “nice.”
2. Lay everything out on a bed. Remove at least one-third of the clothes, keeping a capsule of tops and bottoms that all match. Count the outfits you can make.
3. Pack liquids by the 3-1-1 rule. Put all essentials in the personal item.
4. Pack the main bag and measure it. Weigh yourself holding the bag, then without it, and subtract to find its weight.
5. Read Thoreau’s sentences in the “Primary source” box. Find one item on your list you were tempted to buy new and decide whether you truly need it.
6. Walk once around your house or block carrying both bags. Write what you would change.

Check your work

- Essentials are all in the personal item.
- Liquids meet the 3-1-1 rule.
- The bag fits the size limit and I recorded its weight.
- I can name how many outfits my capsule makes and why each item earned its place.

FIELD NOTEBOOK

1. **Narration (one paragraph, kept by a parent).** Explain the one-bag challenge: what it gains, what it costs, and one trip for which it would be unwise.
2. **Travel journal: the packed suitcase checklist.** Draw your open bag from above with each item labeled. Under it, write your final list with weights or counts.

Did you know? The 3-1-1 liquids rule began in the United States in 2006, after a plot to bring liquid explosives onto transatlantic flights was stopped in Britain. Some airports abroad now have new scanners that can relax the rule, but limits still vary by airport, so

travelers should check every leg. Rolling suitcases with wheels only became common in the 1970s and 1980s; for most of history, every bag was carried.

Primary source. *Henry David Thoreau, Walden (1854), chapter “Economy,” Project Gutenberg eBook #205.*

I say, beware of all enterprises that require new clothes, and not rather a new wearer of clothes. If there is not a new man, how can the new clothes be made to fit? If you have any enterprise before you, try it in your old clothes.

Go deeper. TSA’s official “What Can I Bring?” page answers item-by-item questions. Read the opening of Thoreau’s “Economy” chapter in *Walden* (Project Gutenberg #205). See Royal Holloway’s Picture Gallery page on Frith’s *The Railway Station*. Second video topic: “Victorian steamer trunks and the history of luggage.”

Goes deeper in. Technology Overcoming Geography, “Air Travel,” and Small Business & Economics, “Needs and Wants” (coming soon).

For families. Sources: TSA rules (3-1-1; batteries) as published at tsa.gov; airline size, weight and fee figures are typical U.S. numbers and change often. Thoreau text copied from Project Gutenberg #205. Thoreau’s main point in *Walden* is moral, not about luggage; the stop uses it that way. Luke 9:3 was a command for the apostles’ particular mission (compare Luke 22:35–36, where Jesus later tells them to take a purse and a scrip). Picture: Frith, 1862, Royal Holloway, University of London. The painting includes a small arrest scene; it is not violent.

PRACTICE

1. **EASY** Name five essentials that belong in the bag that stays with you.
2. **EASY** State the 3-1-1 rule.
3. **MEDIUM** You pack 5 tops, 3 bottoms and 2 sweaters that all go together. How many top-and-bottom outfits can you make? How many if each outfit may also have a sweater or no sweater?
4. **MEDIUM** Why must spare lithium batteries go in carry-on bags rather than checked bags?
5. **CHALLENGE** A family of four each checks one bag on a round trip. The airline charges \$40 for a first checked bag each way and \$100 for any bag over 50 pounds. One bag weighs 54 pounds both ways. What do they pay in bag fees? What would they save if all four traveled with carry-ons only?
6. **CHALLENGE** Thoreau writes, “beware of all enterprises that require new clothes, and not rather a new wearer of clothes.” Explain what he means in your own words, and apply it to preparing for a trip in two or three sentences.

Make it a game · Pack It in Sixty. Pile twenty items on the floor (some essential, some silly: passport, toothbrush, three pairs of boots, a bowling ball). Each player gets sixty seconds to fill a small backpack. A judge then draws a “trip card” (rainy London, hot

beach, mountain cabin) and scores 2 points for each essential packed, 1 for each useful item, and -1 for each useless or forbidden one.

Scripture. “And he said unto them, Take nothing for your journey, neither staves, nor scrip, neither bread, neither money; neither have two coats apiece.” (Luke 9:3, KJV)

Jesus gave this command to the twelve when He sent them out to preach, so they would rely on God and on the hospitality of others. It was for that mission, not a rule for every trip, but it still teaches that a traveler’s true provision comes from the Lord.

Practice: answers

1. Any five: passport or ID, tickets and bookings, medicine, money and cards, glasses, phone and charger, keys.
2. Liquids in containers of 3.4 ounces (100 mL) or less, all in 1 quart-size bag, 1 bag per passenger.
3. $5 \times 3 = 15$ outfits. With 3 sweater choices (sweater A, sweater B, or none): $15 \times 3 = 45$.
4. They can overheat and catch fire; in the cabin, the crew can see and put out a fire quickly, but in the hold it might go unnoticed.
5. Base: $4 \text{ bags} \times 2 \text{ ways} \times \$40 = \$320$. Overweight: $\$100 \times 2 = \200 . Total \$520. Carry-ons only would save all \$520 (assuming carry-ons are free on that fare).
6. He means that new outward things are useless without a changed inner person; the character of the man matters more than his outfit. For a trip, buying new gear will not make a good traveler; patience, curiosity, kindness and good habits do, and old, proven clothes and shoes are often better than new ones.

2.6 PASSPORTS, CUSTOMS AND CURRENCY

OBJECTIVES

- Explain what a passport, a visa and a customs declaration are for, and trace the passport from ancient letters of safe passage to the modern booklet.
- Follow the real steps, costs and timelines for getting a U.S. passport and passing through customs.
- Convert prices between currencies, including exchange fees, and read Nehemiah 2:7-9 as one of the oldest written accounts of traveling papers.

Warm-up. If you have a passport (or a parent will show you one), look at the first page. What information does it give? Why do you think each item is there? If not, list what you think a country would want to know about a stranger arriving at its border.

Video slot. Video coming. History of the passport; how U.S. Customs and Border Protection works at an airport; how currency exchange rates work. Search approved channels (U.S. Department of State, U.S. Customs and Border Protection, Smithsonian National Postal Museum or National Numismatic Collection, Federal Reserve Education); preview first.

KEY TERMS

passport

An official document issued by a person's own government that proves identity and citizenship and asks other nations to let the bearer pass safely.

visa

Permission from the country being visited to enter it for a certain purpose and time; some countries require one in advance, many do not for short visits.

customs

The government service at a border that checks goods coming in, collects any duties (taxes on imports) and stops forbidden items.

duty-free exemption

The value of goods a returning traveler may bring home without paying duty; for most U.S. residents, \$800 per person.

exchange rate

The price of one currency in terms of another, such as how many dollars it takes to buy one euro.

citizenship

Membership in a nation, with the rights and duties that come with it; a passport is evidence of it.

CORE IDEAS

Crossing into another land has always meant answering two questions: *Who are you?* and *What are you bringing?* One of the oldest written answers is in the book of Nehemiah. In about 445 B.C., in the twentieth year of King Artaxerxes of Persia, Nehemiah, the king's cupbearer, asked leave to rebuild the walls of Jerusalem. He also asked for "letters ... to the governors beyond the river," so that the officials of each province would let him pass, and a letter to the keeper of the king's forest for timber. Those letters did the work of a passport: they named the traveler, gave the king's authority, and asked officials to help him on his way.

For centuries afterward, kings issued "safe conducts," letters of protection for travelers, messengers and merchants. An English law of 1414 under Henry V is often cited as the first in that country to deal with them. The word **passport** comes from the French *passe-port*, permission to pass through a port or gate. Yet for much of the 1800s many Western travelers crossed borders with no papers at all. The First World War changed that: nations at war wanted to know who was coming in. Passports with photographs became common, and in 1920 an international conference agreed on a standard booklet. Most of the world still follows a version of it, now with a computer chip.

Getting a **U.S. passport** today is a real piece of planning. A first passport must be applied for in person at an acceptance facility, often a post office or county clerk, with proof of citizenship (such as a birth certificate), a photo and fees. For a first adult passport book, the fee is \$130 plus a \$35 acceptance fee; for a child under 16, \$100 plus \$35. A child's passport lasts five years and usually needs both parents present or a signed consent; an adult's lasts ten. Routine processing can take several weeks, so apply months before a trip. Many countries also require that a passport be valid for at least six months after you arrive, and some require a **visa**. Since 2007, Americans have needed a passport to fly even to Canada and Mexico.

On the way home comes **customs**. The United States Customs Service was created in 1789, among the first acts of the new Congress, and for more than a century import duties supplied most of the federal government's money. Today, a returning U.S. resident may usually bring home \$800 worth of goods duty-free if he or she has been abroad at least 48 hours and has not used the exemption in the previous 31 days. Some things must always be declared or are forbidden: fresh fruit, meat and soil can carry insect pests and plant and animal diseases that could ruin American farms; cash or similar instruments over \$10,000 must be reported. The rule is simple: when in doubt, declare. Honesty costs little; hiding goods can cost a heavy fine.

Then there is money. Every country (or group of countries) has its own **currency**: the British pound, the Japanese yen, the Mexican peso. The euro, first used in coins and notes on January 1, 2002, is now shared by about twenty European nations. The **exchange rate** says how much of one currency buys another, and it changes every day with trade and markets. If one euro costs \$1.15, then a €40 museum ticket costs $40 \times 1.15 = \$46$. Going the other way, \$100 buys $100 \div 1.15 \approx \text{€}86.96$.

The honest complexity is in the fees. An airport exchange booth may advertise “no commission” but pay you only €80 for that \$100, a hidden charge of about 8 percent. Many bank cards add a 3 percent foreign transaction fee; some charge none. ATMs abroad often give a fair rate but may add a fixed fee for each withdrawal, so a few larger withdrawals cost less than many small ones. When a card machine offers to charge you “in dollars” instead of local currency, it usually uses a worse rate; choosing the local currency is usually cheaper. A traveler who understands this saves real money and avoids feeling cheated.

A passport is a reminder that every traveler belongs somewhere. It says, in effect, “This person is one of ours; please let him pass and help him if needed.” Paul, a Roman citizen, used that citizenship wisely more than once (Acts 22:25-29). But he also wrote that a Christian’s deepest citizenship is elsewhere: “For our conversation is in heaven.” We carry earthly papers honestly and obey the laws of each border, as people whose final home is not on any map.

PICTURE STUDY



Portrait of the Merchant Georg Gisze, Hans Holbein the Younger, 1532 · Oil on oak panel · Gemäldegalerie, Staatliche Museen zu Berlin
Wikimedia Commons · Public domain

Hans Holbein the Younger (about 1497–1543) was a German painter who worked in London. Georg Gisze was a merchant from Danzig (today Gdańsk, Poland) who worked at the Steelyard, the London trading post of the Hanseatic League, a league of North German trading cities. Merchants like Gisze lived between countries. They read letters from many ports, weighed coins of many kinds, and paid duties on goods crossing into England. Holbein painted everything on his table with startling care.

Look closely

- Find the letters. How many can you count? What does that tell you about Gisze's work?
- Find the small balance (scales) hanging on the wall. Why would a merchant need it?
- Find the glass vase of carnations. Painters often used such details as signs of loyalty or of how short life is. What might it mean here?

Talk about it

1. Gisze worked far from his home city. What problems of money, law and language would a merchant abroad face in 1532? Which still face travelers?
2. Why would a merchant want such a detailed portrait made? Who might he have sent it to?

Safety first. A passport is the most important thing a traveler carries abroad: keep it in a zipped inside pocket or money belt, carry a photocopy separately, and if it is lost, contact the nearest U.S. embassy or consulate at once.

HANDS-ON: PAPERS, CUSTOMS AND MONEY: A BORDER-CROSSING FILE

Prepare the papers and money plan for an imagined trip abroad, as a real traveler would.

You will need

- The U.S. Department of State passport pages (travel.state.gov) and CBP's "Know Before You Go" page, read with a parent
- A current exchange rate for your chosen country (from a bank or newspaper)
- A folder or envelope page in your travel journal

Steps

1. Choose a country to visit. Find out whether it requires a visa for U.S. citizens and how long your passport must be valid.
2. Make a passport timeline: list every step and document needed for a first passport, the fees for each traveler in your family, and the latest date you should apply to be safe.
3. Write a short customs list: three things you might bring home that must be declared or are forbidden, and why.
4. Using today's exchange rate, convert five real prices from your destination (a meal, a train ticket, a museum, a night's lodging, a souvenir) into dollars.
5. Work out how much a 3 percent card fee and an 8 percent airport-booth charge would add to \$500 of spending.
6. Read Nehemiah 2:7-9 in the "Primary source" box. Write how Nehemiah's letters did the work of a passport and of a customs document.

Check your work

- My passport timeline has steps, documents, fees and a safe apply-by date.
- My customs list names items and gives reasons.

- My currency conversions are correct both ways.
- I compared Nehemiah's letters with a modern passport.

FIELD NOTEBOOK

1. **Narration (one paragraph, kept by a parent).** Tell the history of the passport from Nehemiah's letters to today's booklet, and explain what a customs officer is protecting.
2. **Travel journal.** Design a "passport page" for yourself with the fields a real passport has. Beside it, sketch a coin or note from the country you chose, with its value in dollars.

Did you know? The first page of a U.S. passport carries a request from the Secretary of State to other nations to let the bearer pass freely and to give lawful aid and protection. Customs duties were so central to the early American government that the Customs Service was created in 1789, before the Treasury Department itself had been organized. Euro coins have one "common" side and one national side, so a euro coin minted in Italy and one minted in Ireland look different but are worth the same.

Primary source. *Nehemiah 2:7-9, King James Version (1611). Nehemiah asks King Artaxerxes for letters for his journey to Jerusalem, about 445 B.C.*

Moreover I said unto the king, If it please the king, let letters be given me to the governors beyond the river, that they may convey me over till I come into Judah; And a letter unto Asaph the keeper of the king's forest, that he may give me timber to make beams for the gates of the palace which appertained to the house, and for the wall of the city, and for the house that I shall enter into. And the king granted me, according to the good hand of my God upon me. Then I came to the governors beyond the river, and gave them the king's letters. Now the king had sent captains of the army and horsemen with me.

Go deeper. The U.S. Department of State's Office of the Historian has articles on the history of the U.S. passport. U.S. Customs and Border Protection's "Know Before You Go" page explains what travelers may bring home. The Smithsonian's National Numismatic Collection has online pages on world coins and paper money. See the Gemäldegalerie, Berlin, collection page for Holbein's *Georg Gisze*. Second video topic: "The Hanseatic League and the Steelyard in London."

Goes deeper in. Small Business & Economics, "Money, Trade and Exchange Rates," and History, "Nehemiah and the Return from Exile" (coming soon).

For families. Sources: passport fees and rules from travel.state.gov (fee chart current as of 2026; check before applying, as fees and processing times change). Customs exemption and reporting rules from cbp.gov. The 1414 safe-conducts act is commonly cited by the UK Passport Office and historians; the 1920 League of Nations Paris conference set the booklet standard. The number of euro countries has grown over time;

“about twenty” avoids a figure that may change. Exchange rates in examples are illustrations only. The date of Nehemiah’s journey (20th year of Artaxerxes I) is usually placed in 445 or 444 B.C. Picture: Holbein, 1532, Gemäldegalerie Berlin.

PRACTICE

1. **EASY** What is the difference between a passport and a visa?
2. **EASY** Why does U.S. customs forbid or check fresh fruit, meat and soil brought from abroad?
3. **MEDIUM** A family of five (two parents and three children under 16) needs first passports. Using $\$130 + \35 for adults and $\$100 + \35 for children, what is the total?
4. **MEDIUM** If $\text{€}1 = \$1.15$, what does a $\text{€}24$ train ticket cost in dollars? How many euros would $\$250$ buy (to the nearest cent)?
5. **CHALLENGE** At the market rate, $\text{€}1 = \$1.15$. An airport booth gives $\text{€}80$ for $\$100$. What is the booth’s effective rate (dollars per euro), and what percent fewer euros do you get than at the market rate?
6. **CHALLENGE** In Nehemiah 2:7-9, find (a) who issued the letters, (b) to whom they were addressed, (c) what each letter asked for, and (d) what extra protection the king provided. Which parts match a modern passport?

Make it a game · Border Crossing. One player is the customs officer with a list of forbidden and declarable items. Others are travelers holding cards (an apple, a $\$900$ watch, a book, a sausage, a souvenir mug, a pressed flower). Each traveler must declare honestly. The officer “inspects” one random card per traveler. Honest declarations always pass, even for forbidden items (they are “surrendered”); a hidden forbidden item costs three points. Then switch roles.

Scripture. “For our conversation is in heaven; from whence also we look for the Saviour, the Lord Jesus Christ:” (Philippians 3:20, KJV)

In the King James Version, “conversation” here means one’s citizenship or way of life. Philippi was a Roman colony whose people were proud of their Roman citizenship. Paul reminds them, and us, that the Christian’s truest citizenship is in heaven.

Practice: answers

1. A passport is issued by your own country and proves your identity and citizenship. A visa is permission from the country you are visiting to enter it.
2. They can carry insect pests and plant or animal diseases that could harm American farms, forests and livestock.
3. Adults: $2 \times \$165 = \330 . Children: $3 \times \$135 = \405 . Total: $\$735$.
4. $\text{€}24 \times 1.15 = \27.60 . $\$250 \div 1.15 \approx \text{€}217.39$.
5. Booth rate: $\$100 \div \text{€}80 = \1.25 per euro. At the market rate, $\$100$ buys about $\text{€}86.96$. You receive $\text{€}6.96$ fewer, which is $6.96 \div 86.96 \approx 8$ percent fewer.

6. (a) King Artaxerxes. (b) The governors beyond the river, and Asaph, keeper of the king's forest. (c) The governors were to convey Nehemiah safely through their lands until he came to Judah; Asaph was to give timber for the gates, the wall and Nehemiah's house. (d) Captains of the army and horsemen. The letters to the governors match a passport: a ruler's written request that officials let the bearer pass and help him. Nehemiah adds, "according to the good hand of my God upon me."

2.7 COURTESY ABROAD: GREETINGS, MANNERS AND BEING A GOOD GUEST

OBJECTIVES

- Describe greetings and table and home customs in several countries, and explain the reasons behind them.
- Explain the principle behind “When in Rome, do as the Romans do,” where it comes from, and where conscience sets its limits.
- Analyze two of George Washington’s *Rules of Civility* as a primary source on adapting manners to local custom.

Warm-up. How do you greet a grandparent, a pastor, a new neighbor and a close friend? Write down what you do with your hands, your eyes and your words for each. Are they the same? Why not?

Video slot. Video coming. Greetings around the world: the bow in Japan, la bise in France, the wai in Thailand, the handshake; travel etiquette for visitors. Search approved channels (Smithsonian Channel, Japan National Tourism Organization, Rick Steves’ Europe, Mount Vernon (George Washington’s Rules of Civility)); preview first.

KEY TERMS

courtesy

Polite, considerate behavior that shows respect for others; from the manners expected at a king’s court.

etiquette

The accepted rules of polite behavior in a particular society or setting.

custom

A long-established practice shared by a people, such as how they greet, eat, dress for worship or give gifts.

hospitality

The welcome and care given to guests and strangers; in Scripture, a duty and a virtue.

honorific

A title or word form that shows respect, such as “Mr.,” “Madame,” or the Japanese “-san” added to a name.

conscience

The inner sense of right and wrong; a traveler follows local customs freely, but never where they would require sin.

CORE IDEAS

Courtesy is love made visible in small things. Every people has worked out ways to show respect, and they differ more than most travelers expect. Americans shake hands firmly and look a person in the eye. In Japan, people greet with a bow; a deeper and longer bow shows more respect, and a visitor who offers a polite nod-and-bow will be appreciated even if it is imperfect. In Thailand, the *wai*, palms pressed together with a slight bow, is the common greeting. In France, entering a small shop without saying “Bonjour, madame” or “Bonjour, monsieur” seems rude, and friends and family greet with light kisses on the cheeks (*la bise*), the number varying by region. None of these is better than the others; each is a language of respect.

Manners at home and at table vary as widely. In Japan, shoes come off at the entrance of a home, and often of a traditional inn or temple; slippers are provided, and a separate pair is used in the bathroom. In many parts of the Middle East, India and Africa, food and gifts are given and received with the right hand, because the left is used for washing. In much of Europe, diners keep both hands visible above the table; in Britain, it is polite to queue patiently. Tipping is expected in American restaurants (often 15 to 20 percent), included or small in much of Europe, and generally not given in Japan, where it can even cause confusion. A gift from home is welcome in many places; in Japan, bringing back small local gifts called *omiyage* for coworkers and friends is almost a duty.

Churches and holy places have their own customs. Many cathedrals in Italy, including St. Peter’s Basilica in Rome, require shoulders and knees to be covered. Mosques and Hindu temples ask visitors to remove shoes and to dress modestly. Even where no rule is posted, speaking quietly, not using flash photography during worship, and stepping aside for people who have come to pray are simple courtesies. A Christian traveler who visits a Catholic or Orthodox church abroad can show respect for fellow believers without pretending to be someone else.

The famous saying “When in Rome, do as the Romans do” has a Christian origin. Augustine of Hippo, writing around A.D. 400, recalled advice that Ambrose, bishop of Milan, had given to Augustine’s mother, Monica. Churches in Milan did not fast on Saturday; churches in Rome did. Ambrose told her that when he was in Rome he fasted on Saturday, and when in Milan he did not, and that she should follow the custom of whatever church she was in, to avoid giving offense. The principle is wise: in matters that God has left free, a guest follows the custom of his hosts.

But that principle has a boundary, and here is the honest complexity. Some customs involve no moral question at all (shoes, bows, forks). A few may ask a guest to do what conscience forbids. The prophet Daniel, carried to Babylon, was courteous and served faithfully, but he would not defile himself with the king’s food. He did not make a scene; he asked politely and proposed a fair test (Daniel 1:8–16). That is the model: adapt freely in things indifferent, decline gently in things that are not, and never mock what you do not understand. Courtesy does not mean approving of everything; it means treating every person with dignity.

George Washington learned this as a boy. As a teenager in the 1740s he copied out 110 “Rules of Civility and Decent Behaviour in Company and Conversation,” which scholars have traced to a set of maxims written by French Jesuit teachers in 1595. The first rule states the whole idea: every action in company should show “Some Sign of Respect.” The twenty-sixth, about bowing and greeting, twice tells the young gentleman to follow “the Custom” of the people around him. A traveler abroad does the same: watch, ask, imitate and thank.

Being a good guest also means learning a few words: “hello,” “please,” “thank you,” “excuse me” and “I’m sorry” in the local language open more doors than any guidebook. It means patience when things are done differently, gratitude when someone helps, and remembering that you represent your family, your country and, for a Christian, your Lord. Peter’s short command sums it up: “Honour all men.”

PICTURE STUDY



*Seki: Early Departure from the Main Inn (Seki, honjin hayadachi), from The Fifty-three Stations of the Tōkaidō, Utagawa Hiroshige, about 1833-1834 · Color woodblock print · Many museums hold impressions, including the Museum of Fine Arts, Boston, and the Metropolitan Museum of Art, New York
Wikimedia Commons · Public domain*

Utagawa Hiroshige (1797-1858) made a famous series of prints of the fifty-three post towns along the Tōkaidō, the great road between Edo (Tokyo) and Kyoto. Under Japanese law in his day, regional lords (*daimyō*) had to travel to Edo every other year with large retinues, and they stayed at official inns called *honjin*. At Seki, Hiroshige shows a lord’s party leaving before dawn. Everything is done in order: crests on the curtains, servants ready, each person in his place. It is a picture of how much ceremony a whole society attached to traveling and lodging.

Look closely

- Find the curtains with crests. What do you think the crests tell people in town?
- Find the lanterns. What time of day is it? How can you tell?
- Find the servants and baggage. Who seems to be in charge?

Talk about it

1. What would a foreign traveler need to know to behave well at an inn like this?
2. How is the order and ceremony in this picture a kind of courtesy toward the host town?

Safety first. Courtesy also protects: be polite but firm with strangers who pressure you, never accept a ride or go somewhere alone with someone you have just met, and follow a parent's lead in any uncomfortable situation.

HANDS-ON: A GOOD GUEST'S GUIDE

Write a one-page courtesy guide for your family for the country you chose earlier in this trail (or for Japan, France or Mexico).

You will need

- A library book or reliable website on the customs of your chosen country (for example, its official tourism board)
- Your travel journal
- A recorder or phone for practicing phrases (optional)

Steps

1. Research and list how people greet strangers, elders and friends in that country.
2. Find two table customs, one rule for homes or inns, one rule for churches or holy places, and the local custom on tipping.
3. Learn to say and write five phrases: hello, please, thank you, excuse me, goodbye. Practice them aloud with a parent.
4. Read Washington's Rules 1 and 26 in the "Primary source" box. Write one "Rule of Civility" of your own for travelers abroad, in Washington's style.
5. Add a short section titled "If I am unsure": what a guest should do when he or she does not know the custom.
6. Act out one greeting and one meal scene with your family, using your guide.

Check your work

- My guide covers greetings, table, home, holy places and tipping.
- I can say five phrases in the local language.
- I wrote an original rule in Washington's style.
- I acted out at least one greeting correctly.

FIELD NOTEBOOK

1. **Narration (one paragraph, kept by a parent).** Explain the saying “When in Rome, do as the Romans do,” where it came from, and where a Christian traveler must draw the line, using Daniel as an example.
2. **Travel journal.** Draw four small figures greeting in four different ways (handshake, bow, *wai*, *la bise*) and label the country for each.

Did you know? The word *courtesy* comes from *court*: it first meant the manners proper to a royal court. *Etiquette* is French for a “ticket” or label; a popular story says that at Louis XIV’s palace of Versailles, posted notices told visitors where they might walk, and “keeping to the etiquette” came to mean behaving properly. In Japan, a guest who is given a business card holds it with both hands and reads it before putting it away; shoving it in a pocket is like ignoring a handshake.

Primary source. *George Washington, Rules of Civility and Decent Behaviour in Company and Conversation (copied by Washington as a teenager, 1740s), as transcribed in Moncure D. Conway, George Washington’s Rules of Civility, Project Gutenberg eBook #12029.*

1st Every Action done in Company ought to be with Some Sign of Respect, to those that are Present.

26th In pulling off your Hat to Persons of Distinction, as Noblemen, Justices, Churchmen, &c make a Reverence, bowing more or less according to the Custom of the Better Bred, and Quality of the Persons. Amongst your equals expect not always that they Should begin with you first, but to Pull off the Hat when there is no need is Affectation, in the Manner of Saluting and resaluting in words keep to the most usual Custom.

Go deeper. Read all 110 of Washington’s rules (Project Gutenberg #12029, or George Washington’s Mount Vernon website). Read Daniel 1 for a model of courteous conscience. The Japan National Tourism Organization has visitor pages on manners. See the Museum of Fine Arts, Boston, collection pages for Hiroshige’s Tōkaidō series. Second video topic: “The Tōkaidō road and the daimyo processions.”

Goes deeper in. Geography, Grade 8, “Cultures and Customs of the World,” and History, “Early Japan” (coming soon).

For families. Sources: Washington text copied from Project Gutenberg #12029 (spelling and capitals as transcribed). The French Jesuit source (1595) was identified by Moncure Conway and later scholars. The Ambrose and Monica account is in Augustine’s letters (Letter 54 to Januarius, and Letter 36); the English proverb developed later from it. Customs vary within countries and change over time; the examples here are general and should be checked for the region you visit. The *sankin-kōtai* (alternate attendance) system

was formalized in 1635. Picture: Hiroshige, Seki, Station 48 of the Hōeidō Tōkaidō series, about 1833-1834.

PRACTICE

1. **EASY** Match each greeting with a country: the bow, the wai, la bise.
2. **EASY** Name two customs a guest in a Japanese home should know.
3. **MEDIUM** Where does the saying “When in Rome, do as the Romans do” come from, and what was the original issue?
4. **MEDIUM** A restaurant bill in the United States is \$64. What is a 15 percent tip? A 20 percent tip?
5. **CHALLENGE** In Washington’s 26th rule, find the two places where he tells the reader to follow custom. What is the principle, and how would you apply it to greeting someone in Japan or France?
6. **CHALLENGE** Using Daniel 1:8-16, explain how a traveler can refuse a custom that troubles conscience while still being courteous. List three things Daniel did.

Make it a game • Custom Charades. Write customs on slips (bow in Japan, wai in Thailand, shoes off at the door, Bonjour in a French shop, right hand for giving, queue in Britain). A player draws a slip and acts it out without words while others guess the custom and the country. Bonus point: say one reason the custom makes sense to the people who keep it.

Scripture. “Honour all men. Love the brotherhood. Fear God. Honour the king.” (1 Peter 2:17, KJV)

Peter wrote to Christians scattered as “strangers” across many lands. His first command is to honor every person, whatever his nation or custom. A traveler who honors his hosts shows the respect God commands.

Practice: answers

1. Bow: Japan. Wai: Thailand. La bise (cheek kisses): France.
2. Any two: take shoes off at the entrance; use the slippers provided (and separate bathroom slippers); bow in greeting; bring or give small gifts; receive cards or gifts with both hands; do not tip.
3. From advice Ambrose of Milan gave to Monica, Augustine’s mother, recorded by Augustine around A.D. 400. The issue was fasting on Saturday: Rome did, Milan did not, and Ambrose followed the custom of whichever church he was in.
4. 15 percent: \$9.60. 20 percent: \$12.80.
5. “bowing more or less according to the Custom of the Better Bred, and Quality of the Persons,” and “in the Manner of Saluting and resaluting in words keep to the most usual Custom.” The principle: the outward form of respect should follow the customs of the people you are among. In Japan, that means bowing (deeper to elders or officials); in France, saying “Bonjour, madame/monsieur” on entering a shop, and following the local habit of handshakes or la bise among acquaintances.

6. Daniel (1) resolved quietly in his heart not to defile himself; (2) asked permission respectfully from the official in charge, rather than defying him publicly; (3) proposed a reasonable ten-day test of vegetables and water and let the results speak. He kept his conscience and his courtesy, and God gave him favor.

2.8 SAFETY AND STAYING TOGETHER

OBJECTIVES

- Make a family plan for staying together and for what to do if someone is separated, including meeting points, headcounts and contact cards.
- Weigh the real risks of travel by evidence (roads, water, health, theft) rather than by fear, and use official tools such as travel advisories and emergency numbers.
- Study Acts 27 as a primary account of a group kept together through danger, and the wagon companies of the Oregon Trail as a historical example.

Warm-up. Imagine you turn around in a crowded train station and your family is gone. Write down, quickly, the first three things you would do. Keep your answer; you will check it against a real plan below.

Video slot. Video coming. Travel safety for families: what to do if you get lost, how to use emergency numbers abroad, and the U.S. State Department’s Smart Traveler program. Search approved channels (U.S. Department of State, National Park Service, Oregon-California Trails Association, a children’s safety channel approved by a parent); preview first.

KEY TERMS

meeting point

A fixed, easy-to-find place chosen in advance where anyone separated from the group goes and waits.

headcount

A quick count of every member of a group, done whenever the group moves, boards or leaves a place.

buddy system

Pairing travelers so that each is responsible for knowing where the other is at all times.

travel advisory

An official government rating of risk in a country; the U.S. State Department uses four levels, from “Exercise Normal Precautions” to “Do Not Travel.”

embassy and consulate

A nation’s official offices in a foreign country (the embassy in the capital, consulates in other cities) that help their citizens in trouble, such as a lost passport or an arrest.

risk assessment

Thinking through what could go wrong, how likely it is and how serious it would be, so that the biggest risks get the most care.

CORE IDEAS

Travelers have always known that the most important safety rule is the oldest: stay together. On the Oregon Trail in the 1840s to 1860s, emigrant families did not cross two thousand miles of plains and mountains alone. They formed wagon companies, often with written rules and an elected captain, and traveled together for months. When historians count the dangers they faced, the result surprises many people: by far the most deaths came from disease, especially cholera, and from accidents such as drownings at river crossings, falls under wagon wheels and careless gunfire. Attacks caused only a small share. The real dangers were the ordinary ones, and the company's greatest protection was caring for one another day after day.

The same lesson holds today, which is why a wise traveler practices **risk assessment**: asking what is most likely to go wrong and how serious it would be, and putting the most care where both are high. For Americans traveling abroad, health experts point to road crashes as a leading cause of death of otherwise healthy travelers, along with drowning. Theft is common but usually minor. Dramatic dangers make the news; everyday ones fill the hospitals. So a family abroad should wear seat belts in every taxi, choose reputable drivers, look the right way before crossing (in Britain, Japan and other countries that drive on the left, traffic comes from the right first), and swim only where it is safe and supervised.

Staying together needs a plan, not just good intentions. Before entering any crowded place, agree on a **meeting point**: not "by the entrance" (there may be ten) but "under the big clock" or "at the information desk." Do a **headcount** every time the group boards, gets off, or leaves a building; on trains and subways, agree that if anyone is left on the platform or on the train, he gets off at the next station and waits, and the rest come back for him. Use a **buddy system** for children and teens. Some families dress alike in a bright color or take a photo of each child every morning, so they can show exactly what the child was wearing.

Every child and teen should carry a contact card in a pocket: the parent's phone number with the country code, the name and address of the lodging written in the local language, and any medical needs. If you are lost, the rule is to **stop and stay**, or go straight to the agreed meeting point. Do not wander. Look for a uniformed worker (a station agent, police officer or museum guard) or a mother with children, and show your card. Never leave with a stranger who offers to take you somewhere, however kind he seems; ask him to call your parent instead.

Official tools help a family prepare. The U.S. State Department publishes a **travel advisory** for every country on a scale of 1 to 4: Exercise Normal Precautions, Exercise Increased Caution, Reconsider Travel, and Do Not Travel. Its free Smart Traveler Enrollment Program lets travelers register so the nearest **embassy** can reach them in an emergency. Learn the emergency number before you go: 911 in the United States, Canada and Mexico; 112 across the European Union; 999 in the United Kingdom (112 also works); 110 for police and 119 for fire and ambulance in Japan. Carry copies of passports separately from the originals, and check whether your health insurance pays for care abroad, because many U.S. plans pay little or nothing outside the country.

Theft is the most common trouble for tourists, and simple habits defeat most of it. Keep valuables in a front or zipped inside pocket, carry only the cash needed for the day, and be most alert in crowds, on public transport and wherever someone tries to distract you (a spilled drink, a petition, a sudden question). The honest complexity is balance. A traveler who sees danger everywhere misses the joy and kindness that most places offer; a careless one invites trouble. Preparation, not fear, is the goal.

When Paul sailed for Rome as a prisoner, about A.D. 60, the ship was caught in a great storm for fourteen days. At the worst moment, some sailors tried to slip away in the ship's boat. Paul warned the centurion: "Except these abide in the ship, ye cannot be saved." The soldiers cut the boat loose, the whole company stayed together, and all 276 people reached the shore of Malta alive. God had promised Paul their safety, and staying together was part of how that promise was kept. Psalm 121 is titled "A Song of degrees," one of the psalms sung by pilgrims on the road to Jerusalem; it ends with the traveler's blessing: "The LORD shall preserve thy going out and thy coming in."

PICTURE STUDY



Emigrants Crossing the Plains, Albert Bierstadt, 1867 · Oil on canvas · National Cowboy & Western Heritage Museum, Oklahoma City
Wikimedia Commons · Public domain

Albert Bierstadt (1830–1902) was born in Germany and grew up in Massachusetts. He traveled west with survey parties and painted the Rocky Mountains and the Sierra Nevada on enormous canvases. Here he shows an emigrant wagon train at the end of a day. The light is golden and hopeful, but look closely: the company moves together, the herd is gathered close and no one wanders off alone. That was how the trail was survived.

Look closely

- Follow the line of wagons. Where does it begin and end? Is anyone far from the group?
- Find the cattle and the riders. What job do the riders seem to be doing?
- Find the sun. Why might the painter have chosen sunset for a journey west?

Talk about it

1. What dangers do you think this company faced? Which ones would traveling together help with most?
2. Bierstadt painted the West as glorious and full of promise. Does the painting tell the whole truth about the trail? What might it leave out?

Safety first. Make the family plan before you go and practice it: every child carries a contact card, knows the meeting point and the rule to stop and stay, and never leaves with a stranger; parents check travel advisories, emergency numbers and insurance before departure.

HANDS-ON: OUR FAMILY'S STAYING-TOGETHER PLAN

Write and practice a safety plan for the trip you have built in this trail. This completes your full trip plan: destination, transport, budget, itinerary, packing, papers, courtesy and safety.

You will need

- Index cards or business-card-size paper and a pen
- The State Department's page for your destination country (travel.state.gov), read with a parent
- Your travel journal

Steps

1. Make a risk table with three columns: risk, how likely (low, medium, high), how serious (low, medium, high). List at least six risks for your trip (for example, getting separated, a road accident, sunburn or heat, theft, losing a passport, illness).
2. For each risk rated medium or high in both columns, write one specific way to prevent it and one thing to do if it happens.
3. Write a contact card for each family member: parent phone with country code, lodging name and address (in the local language if abroad), the local emergency number and medical notes.
4. Choose a meeting point for one real place you will visit, and a rule for trains (who gets off where and waits).
5. Read Acts 27:29-31, 44 in the "Primary source" box. Write two sentences on what Paul's warning teaches about staying together.
6. Practice: in a store or park (with a parent watching), rehearse "stop and stay" and showing your card to a worker.

Check your work

- My risk table lists at least six risks, each with likelihood and seriousness.
- Serious risks each have a prevention step and a response.
- Every family member has a complete contact card.
- We chose a meeting point and practiced the plan.

FIELD NOTEBOOK

1. **Narration (one paragraph, kept by a parent).** Explain why staying together is the oldest rule of travel safety, using the Oregon Trail wagon companies and Paul's shipwreck as examples.
2. **Travel journal.** Tape your contact card into the journal. Draw a map of one place you will visit with the meeting point marked with a star.

Did you know? Historians estimate that roughly 300,000 to 400,000 people traveled the overland trails to Oregon, California and Utah between the 1840s and 1860s, and that somewhere between one in ten and one in twenty died on the way, mostly of disease. The European emergency number 112 was chosen so that it would work from any phone in any member country; many phones also connect to emergency services when 112 or 911 is dialed in other parts of the world.

Primary source. *Acts 27:29–31, 44, King James Version (1611).* Luke, who sailed with Paul, describes the storm off Malta, about A.D. 60.

Then fearing lest we should have fallen upon rocks, they cast four anchors out of the stern, and wished for the day. And as the shipmen were about to flee out of the ship, when they had let down the boat into the sea, under colour as though they would have cast anchors out of the foreship, Paul said to the centurion and to the soldiers, Except these abide in the ship, ye cannot be saved.

And the rest, some on boards, and some on broken pieces of the ship. And so it came to pass, that they escaped all safe to land.

Go deeper. Read all of Acts 27 and the first verses of Acts 28. The National Park Service's Oregon National Historic Trail pages and the Oregon-California Trails Association describe life and death on the trail. The State Department's travel.state.gov pages explain advisories and the Smart Traveler Enrollment Program. For older readers: John D. Unruh Jr., *The Plains Across* (1979), the standard history of the emigrant trails (library). Second video topic: "River crossings on the Oregon Trail."

Goes deeper in. History, "Westward Expansion and the Oregon Trail," and Geography, Grade 8, "Using Maps and Landmarks to Navigate" (coming soon).

For families. Sources: Oregon Trail numbers and causes of death follow Unruh, *The Plains Across*, and National Park Service summaries; estimates vary. The CDC Yellow Book identifies motor vehicle crashes as a leading cause of preventable death among

healthy U.S. travelers abroad. Advisory levels and STEP from travel.state.gov. Emergency numbers were checked for the countries named; confirm for others. Acts 27:37 gives the number on board as 276. Insurance coverage abroad varies widely; check your own plan. Picture: Bierstadt, 1867, National Cowboy & Western Heritage Museum, Oklahoma City. Bierstadt's western scenes were idealized; question 2 invites honest discussion without overturning the painting's real beauty.

PRACTICE

1. **EASY** What should a child do first if separated from the family in a crowded place?
2. **EASY** Give the emergency number for: the United States, the European Union, the United Kingdom, and Japan (police).
3. **MEDIUM** Name the four levels of U.S. State Department travel advisories in order.
4. **MEDIUM** What caused most deaths on the Oregon Trail? Why does this matter for how we think about travel safety today?
5. **CHALLENGE** In Acts 27:29–31, why did the sailors want to leave in the boat, and why did Paul say the others could not be saved unless the sailors stayed? Use the text and reason about what sailors were needed for.
6. **CHALLENGE** Rate each risk for a family week in a big foreign city as likelihood (1 low to 3 high) × seriousness (1 to 3) and rank them: pickpocketing (likely 3, serious 1); a child separated in a crowd (2, 3); a road accident (1, 3); sunburn or heat sickness in summer (2, 2). Which risk deserves the most planning?

Make it a game • Headcount!. Play in a park or large room. A leader calls “Move!” and everyone wanders. When the leader calls “Headcount!” everyone must find his or her buddy and walk to the meeting point (a tree or a chair) within twenty seconds, where the leader counts heads. Anyone missing is “left on the platform” and must name the rule for trains to rejoin. Shrink the time each round.

Scripture. “The LORD shall preserve thy going out and thy coming in from this time forth, and even for evermore.” (Psalm 121:8, KJV)

Psalm 121 is a “song of degrees,” sung by pilgrims traveling up to Jerusalem. We plan carefully, stay together and watch over one another, and we also trust the Lord who keeps His people on every road, going out and coming home.

Practice: answers

1. Stop and stay (or go straight to the agreed meeting point), then look for a uniformed worker or a mother with children and show the contact card. Never leave with a stranger.
2. 911; 112; 999 (112 also works); 110.
3. Level 1: Exercise Normal Precautions. Level 2: Exercise Increased Caution. Level 3: Reconsider Travel. Level 4: Do Not Travel.
4. Disease, especially cholera, and accidents (drownings, wagon accidents, careless gunfire). It shows that ordinary, everyday dangers usually matter more than dramatic ones; today too,

road crashes and drowning harm more travelers than the dangers that make headlines.

5. They feared the ship would strike the rocks and wanted to save themselves, pretending to lay anchors from the bow. Paul warned that unless they stayed in the ship, the rest could not be saved: the sailors had the skill to handle the ship and bring it toward shore at daylight, and splitting the company would doom those left behind. The whole company had to stay together; verse 44 records that they “escaped all safe to land.”
6. Pickpocketing $3 \times 1 = 3$; separated child $2 \times 3 = 6$; road accident $1 \times 3 = 3$; heat $2 \times 2 = 4$. A separated child scores highest (6) and deserves the most planning (meeting points, headcounts, cards); heat is next (4), then pickpocketing and road accidents (3 each), though road accidents, being so serious, still call for seat belts and care when crossing.

TRAIL 2 BADGE QUIZ

The badge quizzes are optional and may be done open-notebook. Write answers in full sentences and show work on number problems. Four right out of five earns each badge check. Badges and the certificate are earned by doing the stops, not by scores.

Badge quiz 1 (Stops 1-5)

1. Weights: cost 3, learning 2. Place A scores cost 4, learning 3; Place B scores cost 2, learning 5. Which wins? What does this show about weighted matrices?
2. A 500-mile round trip in a car that gets 25 miles per gallon, with fuel at \$3.40. What is the fuel cost? Per person for four riders?
3. A trip subtotal is \$1,480. Add a 12 percent contingency. What is the total? What did Franklin mean by "A small leak will sink a great ship"?
4. Name four tools of a good itinerary, and explain why Phileas Fogg's plan was possible only after 1869.
5. State the 3-1-1 rule and name three items that belong in the bag that stays with you.

Badge quiz 2 (Stops 6-8)

6. What is the difference between a passport and a visa? If $\text{€}1 = \$1.10$, what does a $\text{€}35$ ticket cost in dollars?
7. Why do U.S. customs officers stop fresh fruit and meat from abroad, and what is the usual duty-free exemption for a returning resident?
8. Where does "When in Rome, do as the Romans do" come from, and where does a Christian traveler draw the line?
9. List three parts of a family plan for staying together.
10. In Acts 27, what did Paul tell the centurion when the sailors tried to escape, and what was the outcome?

TRAIL CERTIFICATE: MY COMPLETE TRIP PLAN AND TRAIL B CERTIFICATE

Gather the eight project pages from your travel journal into one trip plan, in order: destination matrix, transport comparison, budget, itinerary, packing list, papers-and-money file, courtesy guide and safety plan. Add a title page with your name, the destination and the dates.

Write a one-page cover letter to your parents presenting the plan: the purpose of the trip, its total cost and cost per person, and the three decisions you are most confident about.

Include your eight narration paragraphs. When the plan is done, a parent reviews it with you and signs the Trail B certificate.

- **Completeness:** All eight sections are present and connected: the budget fits the itinerary, the transport fits the destination, and the packing fits the weather and rules.
- **Accuracy:** Numbers (costs, conversions, times, percentages) are worked correctly, and prices and rules are drawn from named, current sources.

- **Reasoning:** Choices are defended with the purpose of the trip, real constraints and the primary sources studied, and honest trade-offs are acknowledged.
- **Writing and character:** Narrations are clear, in the student's own words, and the plan shows stewardship, courtesy toward hosts and care for every traveler.

Answer key

1. A: $12 + 6 = 18$. B: $6 + 10 = 16$. Place A wins. The result depends on the weights chosen; a matrix shows what you decided matters, it does not decide for you.
2. $500 \div 25 = 20$ gallons $\times$ $\$3.40 = \68 . Per person: $\$17$.
3. Contingency $\$177.60$; total $\$1,657.60$. Small, repeated expenses that seem harmless can together ruin a budget.
4. Anchors, clusters, buffers and a sensible pace (or Plan B). The Suez Canal and the American transcontinental railroad both opened in 1869, and the Indian railway was linked in 1870.
5. Liquids in containers of 3.4 ounces (100 mL) or less, in one quart-size bag, one per passenger. Any three: passport or ID, tickets, medicine, money and cards, glasses, phone and charger, keys.
6. A passport is issued by your own country and proves identity and citizenship; a visa is the visited country's permission to enter. $\text{€}35 \times 1.10 = \38.50 .
7. They can carry pests and diseases that harm American farms and livestock. Usually $\$800$ per person (after at least 48 hours abroad, once every 31 days).
8. From Ambrose's advice to Monica, recorded by Augustine, about fasting on Saturday in Rome but not in Milan. A guest follows local customs in things God has left free, but courteously declines anything that would require sin, as Daniel did in Babylon.
9. Any three: a specific meeting point; headcounts whenever the group moves; a buddy system; contact cards with phone, lodging address and emergency number; the "stop and stay" rule; a rule for trains and platforms; photos of what each child is wearing.
10. "Except these abide in the ship, ye cannot be saved." The soldiers cut the boat loose, the company stayed together, and all 276 aboard escaped safe to land on Malta.

TRAVEL AND FARAWAY PLACES TRAIL C: GREAT JOURNEYS

The third trail of the Travel track follows eight great journeys across four thousand years: Abraham's road from Ur to Canaan, Paul's missionary journeys and voyage to Rome, Marco Polo's travels to the court of Kublai Khan, Columbus's crossing of 1492, Lewis and Clark's expedition with Sacagawea, Isabella Bird's ride through the Rockies in 1873, Nellie Bly's race around the world in 72 days, and Amelia Earhart's solo flight over the Atlantic in 1932. Each stop asks why the traveler went, how the journey was made, what it cost, and what it changed.

This is the  **Expert** level, for ages 14 and up. Each stop takes 35 to 50 minutes. The student reads the stop alone, works from a primary source (Scripture, a traveler's own account, a log or an official letter, copied from public-domain editions), does the numbers, and writes one narration paragraph for the parent to keep. Every stop stands by itself, and each adds a page to the **travel journal** for the track, with a map of the journey.

Five stops earn the **Travel Expert badge, part 1**; eight stops earn part 2 and the **Trail C certificate**.

BEFORE YOU BEGIN

- Read a two-page historical account independently and summarize it in a paragraph.
- Use a map scale, latitude and longitude, and work with rates (distance ÷ time) and unit conversions.

MASTERY CHECKLIST

- ☐ I can trace each of the eight journeys on a map and give its dates, distance and means of travel.
- ☐ I can read a primary source closely, quote it accurately and say what it does and does not prove.
- ☐ I can explain how geography (rivers, deserts, winds, mountains, oceans) shaped each route, and how technology changed travel from caravans to airplanes.
- ☐ I can describe both the achievements and the wrongs of historical travelers plainly, judging them fairly in the light of their own times and of God's Word.
- ☐ I have written eight narration paragraphs and kept a travel journal with a page for each journey.

OPTIONAL BOOKS AND RESOURCES

- **Project Gutenberg** (<https://www.gutenberg.org>): Free public-domain texts used on this trail: the King James Bible (#10), Yule's Marco Polo (#10636, #12410), Hale's Life of Columbus (#1492), the Lewis and Clark History (#16565), Bird's A Lady's Life in the

Rocky Mountains (#755), Verne's Around the World in Eighty Days (#103) and Earhart's 20 Hrs. 40 Min. (#73448).

- **Library of Congress: Rivers, Edens, Empires (Lewis and Clark)** (<https://www.loc.gov/exhibits/lewisandclark/>): Jefferson's instructions, maps and documents of the expedition, for Stop C5; the Library also holds the 1890 Nellie Bly game board for Stop C7.
- **National Park Service: Lewis and Clark National Historic Trail and Rocky Mountain National Park** (<https://www.nps.gov/lecl/>): Maps, history and places to visit for Stops C5 and C6 (Rocky Mountain National Park is at [nps.gov/romo](https://www.nps.gov/romo/)).
- **Smithsonian National Air and Space Museum** (<https://airandspace.si.edu/>): The object page for Earhart's Lockheed Vega 5B and other early aviation history, for Stop C8.
- **A Bible atlas from the library** (<https://www.worldcat.org/>): Any good Bible atlas (for example the Moody, Zondervan or Oxford atlases) helps with the maps for Stops C1 and C2. Look for one at the library.

3.1 ABRAHAM LEAVES UR

OBJECTIVES

- Trace Abram's route from Ur to Haran to Canaan along the Fertile Crescent and estimate its length and travel time.
- Explain from Genesis 11–12, Acts 7 and Hebrews 11 why Abram went and what God promised him.
- Weigh what the excavations at Ur can and cannot tell us about the patriarch's world.

Warm-up. Suppose you were told to leave your country, your relatives and your father's house, and to set out without being told where you would end up. Write down three things you would need to believe about the One who called you before you could go. Keep the list; you will come back to it at the end of the stop.

Video slot. Video coming. Ur of the Chaldees: Sir Leonard Woolley's excavations, the ziggurat of Ur, and the Fertile Crescent route to Haran and Canaan. Search approved channels (British Museum, Penn Museum, Associates for Biblical Research, Drive Thru History); preview first.

KEY TERMS

Ur of the Chaldees

The city Abram's family left (Genesis 11:31), usually identified with Tell el-Muqayyar on the lower Euphrates in southern Iraq.

Fertile Crescent

The arc of watered land curving from the Persian Gulf up the Tigris and Euphrates, across Syria and down to Canaan and Egypt, with desert inside the curve.

Haran

A trading city on the Balikh River in what is now southeastern Turkey, where Terah's family stopped and Terah died (Genesis 11:31–32).

Canaan

The land between the Jordan River and the Mediterranean Sea that God promised to Abram's descendants.

covenant

A solemn, binding promise; in Genesis, God's promise to Abram of land, descendants and blessing for all nations (Genesis 12; 15; 17).

ziggurat

A stepped brick tower crowned with a temple; the ziggurat of Ur was built by King Ur-Nammu for the moon god Nanna.

CORE IDEAS

The first great journey in the Bible begins in a family. Genesis 11:31 says that **Terah** took his son Abram, his grandson Lot and Abram's wife Sarai, "and they went forth with them from Ur of the Chaldees, to go into the land of Canaan." But they did not reach Canaan. They stopped at **Haran** and settled there, and Terah died there. Then comes Genesis 12:1: "Now the LORD *had said* unto Abram, Get thee out of thy country." Stephen, preaching in Acts 7:2-4, explains the order: God first appeared to Abraham "when he was in Mesopotamia, before he dwelt in Charran." The call came in Ur; the obedience was completed from Haran, when Abram was seventy-five years old (Genesis 12:4).

A glance at the map shows why the family went north before going west. Ur lay near the head of the Persian Gulf; Canaan lies about 550 miles due west. But between them stretches the Syrian Desert, with little water or grass for flocks. So travelers followed the **Fertile Crescent**: roughly 600 miles northwest up the Euphrates to Haran, then roughly 400 miles southwest through Syria to Canaan. That is about 1,000 miles in all. Flocks of sheep and goats graze as they walk and cover perhaps 6 to 10 miles a day, so such a move took months, not weeks. Haran was well placed for it: it sat on the great road between Mesopotamia and the Mediterranean, and its name is often connected with an old Akkadian word for "road" or "caravan journey."

Ur itself was no village. Between 1922 and 1934 the British archaeologist **Sir Leonard Woolley** dug there for the British Museum and the University of Pennsylvania Museum. He uncovered the great **ziggurat** built by King Ur-Nammu around 2100 B.C. for Nanna, the moon god; the Royal Cemetery, with its gold helmets, harps and the "Standard of Ur" from centuries earlier; streets of brick houses with courtyards; and clay school tablets with sums and copying exercises. Ur was rich, crowded, literate and full of idols. Joshua 24:2 says plainly that Terah and his fathers "served other gods," and Haran too was a center of moon worship. God's call was a call away from a comfortable city and away from false gods.

Here honesty requires some care. The Bible gives Abram's family line but not dates in our B.C. reckoning, and scholars place him differently, most often somewhere around 2000 B.C. or a little after. No clay tablet found at Ur names Abram, which is no surprise: city scribes wrote about kings, temples and trade, not about one household that moved away. A few writers have argued for a northern "Ur" near Haran, and the name "of the Chaldees" uses the name later readers knew for that region. Most scholars still identify Ur with Woolley's site. Archaeology does not prove the story or disprove it; it shows the world Abram walked out of.

Abram did not travel light. Genesis 12:5 says he took Sarai, Lot, "all their substance that they had gathered, and the souls that they had gotten in Haran." Those souls were servants and their families; a few chapters later Abram can arm 318 trained men "born in his own house" (Genesis 14:14), which suggests a household of several hundred. They lived in tents of woven goat hair, moved with sheep, goats and donkeys, and stopped where there was pasture and water. When Abram reached Canaan he came to Shechem and the plain of Moreh and built an altar; then he pitched his tent between Bethel and Ai, built another altar,

“and called upon the name of the LORD” (Genesis 12:6–8). His route can be traced by his altars, like a pilgrim’s travel journal written in stone.

The meaning of the journey is the promise. God said, “I will make of thee a great nation ... and in thee shall all families of the earth be blessed” (Genesis 12:2–3). Hebrews 11:8 calls it faith: Abraham “obeyed; and he went out, not knowing whither he went,” for “he looked for a city which hath foundations, whose builder and maker is God.” Paul later wrote that the Scripture “preached before the gospel unto Abraham” in that promise (Galatians 3:8), because the blessing for all families would come through Abraham’s descendant, Christ. The road from Ur was the first mile of a journey that the apostles would carry to the ends of the earth.

PICTURE STUDY



Abraham's Journey from Ur to Canaan, József Molnár, 1850 · Oil on canvas · Hungarian National Gallery, Budapest

Wikimedia Commons · Public domain

József Molnár was a Hungarian painter who studied in Venice, Rome and Munich. In 1850 he painted Abram’s departure as a grand scene of a whole household on the move. He had never seen Mesopotamia; like most painters of his day, he imagined it from the Bible, travelers’ books and paintings of the Near East.

Look closely

- Find Abram. How does the painter make him the center of attention: by light, gesture, color or position?
- Find the animals and the loads. What does this household carry with it, and what does that tell you about “all their substance” in Genesis 12:5?

- Look at the sky and the land. Which direction does the caravan face, and what feeling does the light give the scene?

Talk about it

1. Molnár painted a large caravan. Does Genesis 12:5 and 14:14 support a big household or a small family? Give evidence.
2. What would a painter have to know about geography and archaeology to paint this scene more accurately than Molnár could in 1850?

HANDS-ON: MAP THE ROAD FROM UR

Draw a measured map of Abram's route through the Fertile Crescent, label it from the primary source, and work out how long the journey took.

You will need

- A Bible atlas or a printed outline map of the Middle East (free outline maps are easy to find)
- Tracing paper or a blank page in your travel journal
- Ruler, pencil, and three colored pencils (one for rivers, one for desert, one for the route)
- The Primary source aside below

Steps

1. Trace the coastline of the Mediterranean, the head of the Persian Gulf, and the Tigris and Euphrates Rivers. Shade the Syrian Desert inside the curve.
2. Mark and label Ur, Haran, Damascus, Shechem and Bethel. Write the verse beside each: Genesis 11:31 at Ur and Haran, 12:6 at Shechem, 12:8 at Bethel.
3. Draw the route in color along the Fertile Crescent. Draw a dashed straight line from Ur to Canaan across the desert for comparison.
4. Use your map's scale bar to measure both the route and the straight line. Write both distances in miles.
5. Work out the travel time at 8 miles a day, with one day of rest in every seven. Write your answer and your working in the margin.
6. Add a small altar symbol at Shechem and Bethel and a key explaining your symbols.

Check your work

- My map shows the rivers, the desert and the five places, each with its verse.
- I measured the route and the straight line with the scale bar.
- I worked out the travel time and showed my working.
- My key explains every symbol.

FIELD NOTEBOOK

1. **Travel journal, Trail C, page 1: The Road from Ur.** Paste or copy your map. Under it, write the three stages of the journey with a date range (“around 2000 B.C., by the usual reckoning”) and the distances you measured.
2. **Narration.** Write one paragraph, in your own words, telling the story of Abram’s journey from Ur to Bethel as if you were a servant in his household. Include at least two facts about the route and one about Ur. A parent keeps this paragraph in the portfolio.
3. Return to your warm-up list. Which of your three things does Hebrews 11:8–10 say Abraham believed?

Did you know? Ur was once a busy river port, but the Euphrates has since shifted its course, and the ruins now stand in dry land some miles from the river. Woolley’s finds are divided among the British Museum in London, the Penn Museum in Philadelphia and the Iraq Museum in Baghdad. The famous “Standard of Ur,” a wooden box covered with shell and lapis lazuli scenes of war and peace, is in the British Museum.

Primary source. *The Holy Bible, King James Version (1611), Genesis 11:31 and 12:4–5, from Project Gutenberg eBook #10*

And Terah took Abram his son, and Lot the son of Haran his son's son, and Sarai his daughter in law, his son Abram's wife; and they went forth with them from Ur of the Chaldees, to go into the land of Canaan; and they came unto Haran, and dwelt there.

So Abram departed, as the LORD had spoken unto him; and Lot went with him: and Abram was seventy and five years old when he departed out of Haran. And Abram took Sarai his wife, and Lot his brother's son, and all their substance that they had gathered, and the souls that they had gotten in Haran; and they went forth to go into the land of Canaan; and into the land of Canaan they came.

Go deeper.

- The British Museum’s online collection page for the *Standard of Ur* and the Royal Cemetery finds.
- Ur Online (the joint British Museum and Penn Museum Ur project), with Woolley’s field records and photographs.
- Sir Leonard Woolley, *Ur of the Chaldees* (1929), the excavator’s own short account for general readers; look for it at the library.
- A second video topic: the ziggurat of Ur and how it was restored in the 1980s.

Goes deeper in. Geography, Grade 8, “Southwest Asia: The Fertile Crescent,” and History, “The Ancient Near East” (coming soon).

For families. Sources: Genesis 11-12, Acts 7:2-4, Joshua 24:2, Hebrews 11:8-10 (KJV); British Museum and Penn Museum materials on Woolley's excavations (1922-1934). Distances are rounded estimates along the usual river route; the Bible does not give Abram's exact road. Dates for Abraham vary among careful scholars, so the stop says "around 2000 B.C." and explains why. The meaning of the name Haran is a common scholarly suggestion, not a certainty. The picture's exact holding and title should be checked against the museum's catalogue before printing.

PRACTICE

1. **EASY** How old was Abram when he departed out of Haran?
2. **EASY** Name the three stages of the journey in order, with the first two places Abram stopped in Canaan.
3. **MEDIUM** Why did the family travel northwest to Haran instead of straight west to Canaan?
4. **MEDIUM** Use the Primary source. Genesis 11:31 says the family set out "to go into the land of Canaan." What happened instead, and how do Genesis 12:4-5 finish the story?
5. **CHALLENGE** Take the route as 600 miles from Ur to Haran and 400 miles from Haran to Shechem. If the household moves 8 miles a day and rests one day after every six days of travel, about how many days does the whole journey take? About how many months?
6. **CHALLENGE** Genesis 12:1 tells of the call after Terah's death in Haran, but Stephen in Acts 7:2-4 says God appeared to Abraham in Mesopotamia "before he dwelt in Charran." Do these contradict? Explain using the wording of Genesis 12:1.

Make it a game • Caravan Across the Crescent. Mark a large crescent on the floor or the lawn with string: Ur at one tip, Haran at the top, Shechem and Bethel at the other tip. Players move along it one step for each right answer to a question drawn from a hat (verses, distances, key terms). A wrong answer means "the flocks need water" and the player waits one turn. Anyone who tries to cut straight across the middle (the desert) goes back to Ur. First to build an "altar" of three stones at Bethel wins.

Scripture. "Now the LORD had said unto Abram, Get thee out of thy country, and from thy kindred, and from thy father's house, unto a land that I will shew thee:" (Genesis 12:1, KJV)

God gave Abram a command before He gave him a map. The verse ends with a colon, because the promises of verses 2 and 3 follow at once: the call to leave was always joined to a promise of blessing for all the families of the earth.

Practice: answers

1. Seventy-five (Genesis 12:4).
2. Ur to Haran; Haran to Canaan; in Canaan, Shechem (the plain of Moreh) and then between Bethel and Ai.

3. The straight line crosses the Syrian Desert, with too little water and grass for people and flocks. The Fertile Crescent route followed rivers and pasture, and Haran lay on the main trade road.
4. They stopped at Haran and “dwelt there,” and Terah died there. Abram later left Haran with Sarai, Lot, their goods and servants, “and into the land of Canaan they came,” finishing the journey his father began.
5. $1,000 \div 8 = 125$ travel days. One rest day for every six travel days adds about $125 \div 6 \approx 20$ rest days, so about 145 days in all, close to five months (not counting the years spent living in Haran).
6. No. The King James text says the LORD “had said” unto Abram, which looks back to a call given earlier. God called Abram in Ur; the family moved to Haran; after Terah died, Abram finished obeying the call by going on to Canaan. Stephen gives the start of the call, and Genesis 12 tells when it was fully carried out.

3.2 PAUL'S MISSIONARY JOURNEYS

OBJECTIVES

- Map Paul's three missionary journeys and his voyage to Rome, with the main cities of each, from Acts 13–28.
- Explain how Roman roads, sea lanes, the Greek language and the synagogues of the Jewish dispersion shaped where and how Paul traveled.
- Compare Acts with Paul's own words in 2 Corinthians 11 and draw careful conclusions about what each source tells us.

Warm-up. Look at a map of the eastern Mediterranean. Find Antioch in Syria, Ephesus, Corinth, Athens and Rome. If you had to reach all five on foot and by sailing ship, with no motor of any kind, which would you visit first, and why? Write your route in one line.

Video slot. Video coming. The missionary journeys of the apostle Paul on a map: Antioch, Cyprus, Galatia, Philippi, Athens, Corinth, Ephesus, Malta and Rome. Search approved channels (Drive Thru History, Associates for Biblical Research, Logos Bible maps); preview first.

KEY TERMS

apostle

“One who is sent”: a messenger commissioned by Christ; Paul called himself the apostle of the Gentiles (Romans 11:13).

Gentiles

People who are not Jews; the nations to whom Paul was especially sent.

Via Egnatia

The Roman road across northern Greece from the Adriatic to the Aegean; Paul walked it from Philippi to Thessalonica (Acts 17:1).

Areopagus

“Mars’ hill” in Athens, the hill and council where Paul spoke of “the Unknown God” (Acts 17:22–23).

“we” passages

Sections of Acts written in the first person plural (beginning at Acts 16:10), showing that the author, Luke, traveled with Paul.

Gallio inscription

A letter of Emperor Claudius carved in stone at Delphi that dates Gallio's time as governor of Achaia to about A.D. 51–52, fixing Paul's stay in Corinth (Acts 18:12).

CORE IDEAS

Saul of Tarsus was a Jew of the tribe of Benjamin, a trained Pharisee, a tentmaker by trade and a Roman citizen by birth (Acts 22:28). After Christ met him on the Damascus road (Acts 9), he became the most traveled preacher of the early church. His base was **Antioch in Syria**, the third city of the Roman Empire, where the disciples were first called Christians (Acts 11:26). There, as the church fasted and prayed, “the Holy Ghost said, Separate me Barnabas and Saul for the work whereunto I have called them” (Acts 13:2). From that sending, about A.D. 46, Acts follows Paul for some fifteen years.

The **first journey** (Acts 13–14, about A.D. 46–48) took Paul, Barnabas and young John Mark by ship to Cyprus, Barnabas’s home island, where the proconsul Sergius Paulus believed. Then they sailed to Perga on the south coast of Asia Minor, where Mark turned back, and climbed into the highlands of Galatia: Pisidian Antioch, Iconium, Lystra and Derbe. At Lystra the crowd first tried to worship them as Jupiter and Mercurius, then stoned Paul and left him for dead. Instead of taking the short road home, the two went back through the same towns to strengthen the believers and appoint elders. Afterward the church met in Jerusalem (Acts 15, about A.D. 49) and agreed that Gentile believers need not become Jews to be saved.

The **second journey** (Acts 15:36–18:22, about A.D. 49–52) began with a sharp disagreement: Barnabas took Mark to Cyprus, and Paul took Silas overland. Timothy joined them at Lystra. Twice the Spirit stopped them from turning aside, until at Troas Paul saw a man of Macedonia praying, “Come over into Macedonia, and help us.” The next verse says “we” for the first time: Luke had joined the party. They crossed into Europe, founded a church at Philippi, where they were beaten and jailed, and walked the **Via Egnatia** to Thessalonica. They went on to Berea, Athens and Corinth, where Paul stayed eighteen months. A stone inscription found at Delphi dates the governor Gallio to about A.D. 51–52; since Paul stood before Gallio (Acts 18:12), it is one of the firmest dates in his life.

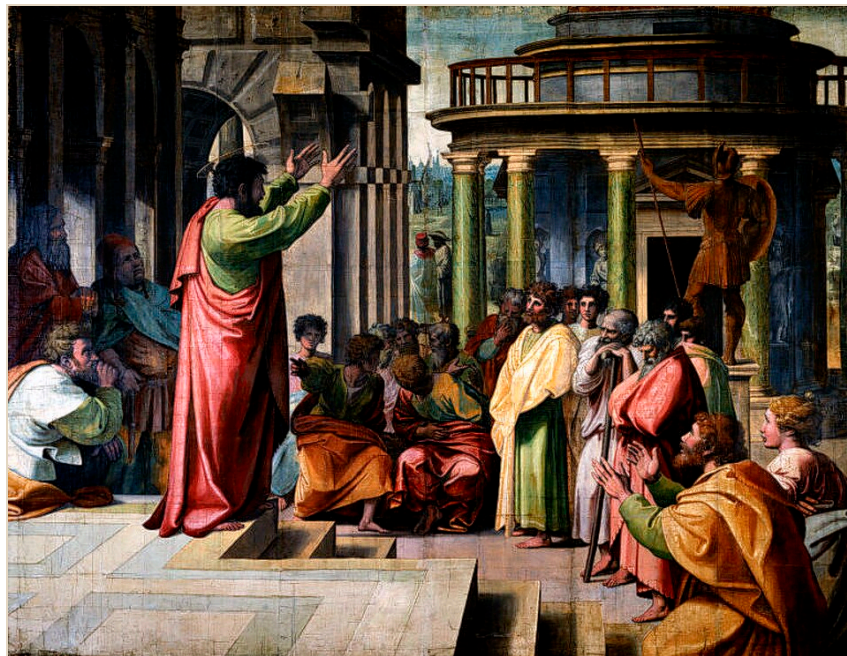
The **third journey** (Acts 18:23–21:17, about A.D. 53–57) centered on Ephesus, where Paul taught for about three years (Acts 20:31). So many turned from idols that the silversmiths who made shrines of Diana stirred up a riot in the great theater, which held perhaps 25,000 people. From Ephesus and Corinth Paul wrote some of his letters, including 1 Corinthians and Romans. He then gathered an offering for the poor in Jerusalem and said farewell to the Ephesian elders at Miletus, knowing that “bonds and afflictions” awaited him (Acts 20:23).

How did he travel? On foot along Roman roads, at perhaps 15 to 20 miles a day, and on merchant ships, since there were no passenger lines. Sailing was reasonably safe from late spring to about mid-September and dangerous in winter; Acts 27:9 notes the danger because “the fast was now already past,” meaning the autumn Day of Atonement. The empire helped him in ways it never intended: Roman peace kept the roads open, Greek was understood from Syria to Rome, and nearly every city had a synagogue where Paul began by preaching to his own people. Paul himself saw the hand of God in such timing (Galatians 4:4). Exact dates for each journey are reconstructed from Acts, the letters and a few outside anchors like Gallio, so careful scholars differ by a year or two.

The last journey was not one Paul planned. Arrested in the temple at Jerusalem (Acts 21), he was held two years at Caesarea and then, as a Roman citizen, appealed to Caesar. He sailed for Rome under guard in the autumn, was caught in a storm for fourteen days, and was shipwrecked on Malta with 276 people aboard, every one of whom reached land alive (Acts 27:37, 44). In Rome he lived two years “in his own hired house,” under guard, preaching “no man forbidding him” (Acts 28:30-31). Acts ends there. Early Christian writers report that Paul was later put to death in Rome under Nero, probably in the mid-60s A.D. Taken together, his recorded journeys are often estimated at more than 10,000 miles.

The shape of Acts is the shape of Christ’s command in Acts 1:8: witnesses “in Jerusalem, and in all Judaea, and in Samaria, and unto the uttermost part of the earth.” The book begins in Jerusalem and ends in the capital of the world. Paul was carrying the promise made to Abraham, that in him all the families of the earth would be blessed, to the families of Cyprus, Galatia, Macedonia, Greece and Rome.

PICTURE STUDY



St Paul Preaching in Athens, Raphael (Raffaello Sanzio), 1515 · Bodycolour (glue-based paint) on paper, mounted on canvas; a full-size design (cartoon) for a tapestry · Royal Collection, on loan to the Victoria and Albert Museum, London

Wikimedia Commons · Public domain

Pope Leo X asked Raphael to design ten tapestries showing the acts of Peter and Paul for the lower walls of the Sistine Chapel. Raphael painted full-size designs, called cartoons, for weavers in Brussels to copy. Because the weavers worked from the back, the cartoons are mirror images of the finished tapestries. Seven of the cartoons survive. This one shows Acts 17:16-34.

Look closely

- Find Paul. How do his pose and his place in the picture show that he is the speaker?
- Look at the listeners. Find one who seems convinced, one who doubts and one who is arguing. Acts 17:32–34 says some mocked, some wanted to hear more, and some believed.
- Find the statue in the background. Whose statue might it be in a city “wholly given to idolatry” (Acts 17:16)?

Talk about it

1. Near the front, a man and a woman stand a little apart from the crowd. Acts 17:34 names two believers. Who are they, and why might Raphael have painted them this way?
2. Raphael shows Athens as a Renaissance city with a round temple. What would a historian change to make the setting match first-century Athens?

HANDS-ON: A HAND-DRAWN MAP OF PAUL’S JOURNEYS

Make the track’s map of Paul’s journeys, measure them, and pin Paul’s own list of dangers to the places where Acts records them.

You will need

- A Bible atlas or an outline map of the Mediterranean
- A large sheet of paper (11 by 17 inches if you have it)
- Four colored pencils, one for each journey and one for the voyage to Rome
- Ruler, string for measuring curved routes
- The Primary source aside below

Steps

1. Trace the coasts from Rome to Jerusalem, including Cyprus, Crete and Malta. Label Antioch in Syria, Jerusalem and Rome in capitals.
2. Draw the first journey (Acts 13–14), the second (Acts 15:36–18:22), the third (Acts 18:23–21:17) and the voyage to Rome (Acts 27–28) in four colors. Use solid lines for land and dashed lines for sea.
3. Lay string along each route, then measure the string against the scale bar. Write each journey’s length in its color in a corner table.
4. Read the Primary source. Put a small star with a verse reference wherever Acts records one of those dangers: beaten with rods (Philippi, Acts 16:22–23), stoned (Lystra, Acts 14:19), perils by his own countrymen (Thessalonica, Acts 17:5), perils in the city (Ephesus, Acts 19:23–41). Mark the mountain road from Perga into Galatia with a question mark as a likely place for “perils of robbers” and “perils of waters.”
5. In the margin, list the dangers in 2 Corinthians 11 that you could not place on the map. Then do Practice question 5.

Check your work

- My map shows four routes in four colors, with land and sea marked differently.
- I measured each journey and wrote the lengths in a table.
- I placed at least three of Paul's dangers with verse references.
- I listed the dangers Acts does not record.

FIELD NOTEBOOK

1. **Travel journal, Trail C, page 2: Paul's Road.** Fold your map into the journal or copy a smaller version. Add a timeline from A.D. 46 to about A.D. 62 with the three journeys and the voyage to Rome.
2. **Narration.** Write one paragraph telling the second journey from Troas to Corinth as Luke might have told it to a friend, using "we." Include the vision at Troas, one event in Philippi and one fact about how they traveled. A parent keeps this paragraph in the portfolio.

Did you know? Paul usually dictated his letters to a helper and then wrote the last lines himself to prove they were his (Galatians 6:11; 2 Thessalonians 3:17). Tertius, who wrote down Romans, sends his own greeting in Romans 16:22. The theater at Ephesus where the silversmiths rioted still stands, and visitors can sit in its stone seats.

Primary source. *The Holy Bible, King James Version (1611), 2 Corinthians 11:25-27. Paul wrote this about A.D. 55-57, during or just after his third journey.*

Thrice was I beaten with rods, once was I stoned, thrice I suffered shipwreck, a night and a day I have been in the deep; In journeyings often, in perils of waters, in perils of robbers, in perils by mine own countrymen, in perils by the heathen, in perils in the city, in perils in the wilderness, in perils in the sea, in perils among false brethren; In weariness and painfulness, in watchings often, in hunger and thirst, in fastings often, in cold and nakedness.

Go deeper.

- W. J. Conybeare and J. S. Howson, *The Life and Epistles of St. Paul* (1852), a classic with maps and descriptions of the roads and ships; free on Project Gutenberg.
- William M. Ramsay, *St. Paul the Traveller and the Roman Citizen* (1895), by an archaeologist who walked the roads of Asia Minor; free online.
- The Victoria and Albert Museum's pages on the Raphael Cartoons.
- A second video topic: Paul's voyage and shipwreck in Acts 27, with a map of the route past Crete to Malta.

Goes deeper in. Geography, Grade 8, "The Mediterranean World," and History, "Rome and the Early Church" (coming soon).

For families. Sources: Acts 9-28, Galatians, 2 Corinthians 11 and Romans 16 (KJV); the Gallio (Delphi) inscription; Ramsay and Conybeare and Howson. The dates given are the

usual reconstructions and may differ by a year or two in other books. Paul's death in Rome under Nero rests on early Christian tradition (Clement of Rome, Eusebius) rather than on Acts, and the stop says so. Mileage totals are estimates. The theater's seating figure is approximate.

PRACTICE

1. **EASY** Which church sent Paul and Barnabas on the first journey, and who said they should go?
2. **EASY** In what city did Paul found the first church in Europe, and what called him there?
3. **MEDIUM** What is a "we" passage in Acts, and what does it tell us about the author?
4. **MEDIUM** Why is the Gallio inscription at Delphi important for dating Paul's journeys?
5. **CHALLENGE** In the Primary source, written about A.D. 55-57, Paul says "thrice I suffered shipwreck." The shipwreck on Malta (Acts 27) happened about A.D. 59-60. What can you conclude about Paul's life and about the book of Acts?
6. **CHALLENGE** The sea crossing from Troas to Neapolis is roughly 150 miles. On the way out it took two days with a straight course (Acts 16:11); coming back it took five days (Acts 20:6). Find the average distance per day each way, and explain the difference.

Make it a game • Pack the Ship. Write Paul's cities on cards (Antioch, Salamis, Paphos, Perga, Lystra, Troas, Philippi, Thessalonica, Berea, Athens, Corinth, Ephesus, Miletus, Caesarea, Malta, Rome). Shuffle and deal. Players take turns laying a card on a timeline, naming the journey and one event there. A correct placement earns a point; a challenge that proves a card is out of order steals the point. The player with the most points chooses the next Scripture memory verse.

Scripture. "But ye shall receive power, after that the Holy Ghost is come upon you: and ye shall be witnesses unto me both in Jerusalem, and in all Judæa, and in Samaria, and unto the uttermost part of the earth." (Acts 1:8, KJV)

This verse is the outline of the book of Acts. The church's greatest journeys were not for trade or fame but for witness, and they were made in the power of the Holy Ghost, not human strength.

Practice: answers

1. The church at Antioch in Syria; the Holy Ghost said, "Separate me Barnabas and Saul" (Acts 13:2).
2. Philippi in Macedonia; a vision at Troas of a man of Macedonia saying, "Come over into Macedonia, and help us" (Acts 16:9).
3. A section written in the first person plural, beginning at Acts 16:10. It shows that the author, Luke, was with Paul for those parts of the journey and wrote as an eyewitness.
4. It dates Gallio's term as governor of Achaia to about A.D. 51-52. Acts 18:12 says Paul stood before Gallio in Corinth, so Paul's stay in Corinth, and with it the second journey, can be fixed by an outside source.

5. Paul had already been shipwrecked three times before Malta, so Malta was at least his fourth. None of those three is described in Acts, which shows that Acts is a selective account, not a complete diary. The letter and Acts agree in kind of hardship but each records things the other leaves out.
6. Outbound: $150 \div 2 = 75$ miles a day. Return: $150 \div 5 = 30$ miles a day. Sailing ships depended on the wind; Acts 16:11 says they ran a straight course with a following wind, while on the return they likely beat against northerly winds of the Aegean.

3.3 MARCO POLO TO CHINA

OBJECTIVES

- Trace the Polos' route from Venice to Kublai Khan's court (1271–1275) and their return by sea (1292–1295).
- Explain how the Mongol Empire made such a journey possible and name things Polo described that Europe did not yet have.
- Test Polo's description of a real bridge against the bridge that stands today, and weigh the debate over whether he went to China at all.

Warm-up. Think of something you have seen that your friends never have. If you had to describe it from memory, years later, to someone who had never heard of it, what might you get right and what might you get wrong? Write two sentences.

Video slot. Video coming. Marco Polo and the Silk Road: Venice, the Mongol Empire, Kublai Khan's court, paper money and the Lugou (Marco Polo) Bridge. Search approved channels (Smithsonian, National Geographic, Khan Academy, British Library); preview first.

KEY TERMS

Silk Road

The network of caravan routes linking China with Persia, the Near East and the Mediterranean; silk went west, and silver, glass and horses went east.

Kublai Khan

Grandson of Genghis Khan, Great Khan of the Mongols from 1260 and founder of the Yuan dynasty in China (1271); he died in 1294.

Pax Mongolica

"The Mongol peace": the roughly hundred years in which Mongol rule over most of Asia made the long roads unusually safe for merchants.

paiza

A metal tablet given by the Khan as a passport; the bearer had a right to horses, food and lodging along the way.

Cathay

The medieval European name for northern China; southern China Polo called Manzi.

Rustichello of Pisa

A writer of romances who shared a Genoese prison with Polo and wrote down his story, about 1298–1299.

CORE IDEAS

In the thirteenth century Venice was a city of merchants whose ships reached every port of the eastern Mediterranean. Two Venetian brothers, **Niccolò and Maffeo Polo**, went farther than most. Trading in the lands of the Golden Horde in the 1260s, they were cut off by a war and drifted east until they reached the court of **Kublai Khan** himself. Kublai sent them home in 1269 with a letter asking the pope for a hundred learned Christian teachers and for oil from the lamp that burned at Christ's tomb in Jerusalem. In 1271 they set out again, taking Niccolò's son **Marco**, then seventeen. The pope could spare only two Dominican friars, and they turned back in fear when they ran into war in Armenia.

The road east took about three and a half years. From Acre, where they collected the holy oil, the Polos crossed Armenia and Persia to Hormuz on the Persian Gulf, meaning to sail for China; but Marco judged the local ships, "stitched" together with coconut twine, too flimsy, and they went overland instead. They crossed what is now Afghanistan, where Marco fell ill for about a year, climbed the high Pamir plateau, and came down to the oasis cities of Kashgar and Khotan. Polo says it took a month to cross the Lop desert, where travelers heard "spirits" calling them away from the caravan at night. At last they came through the Gobi to the Khan's summer palace at Shangdu, the "Xanadu" of later poetry, around 1275. The journey covered well over 5,000 miles.

Only a vast empire made this possible. The Mongols ruled from Korea to the edge of Hungary, the largest land empire the world had seen, and for about a century the **Pax Mongolica** kept the long roads open. A Khan's messenger carried a **paiza**, and Polo describes the post system that served it: relay stations about every 25 to 30 miles with fresh horses, which he numbered in the hundreds of thousands. Kublai, a Mongol ruling Chinese subjects, trusted foreigners as officials, and Polo says he served the Khan for seventeen years, traveling on his errands to the southwest and the south.

What Polo saw astonished Europe. He describes **paper money** made from mulberry bark and stamped with the Khan's seal, which every subject had to accept; "black stones" dug from mountains that burn like logs (coal); the Grand Canal; salt works; porcelain; and Kinsay, now Hangzhou, which he calls the finest and noblest city in the world, with twelve thousand bridges by his count. In 1292 the Polos at last got leave to go home by sea, escorting a Mongol princess named Kököchin to her bridegroom, the ruler of Persia. Polo says many of the travelers died on the voyage. The Polos reached Venice in 1295, twenty-four years after they had left.

Polo's book was born in a prison. In about 1298, during a war between Venice and Genoa, he was captured and held in Genoa, where he told his story to **Rustichello of Pisa**, a writer of knightly romances. Their book, written in a mix of French and Italian, spread in copies and translations; about 150 manuscripts survive, and no two agree in every detail. In Venice it was nicknamed *Il Milione*, perhaps because Polo spoke of millions. Two centuries later Christopher Columbus owned a printed Latin copy and wrote notes in its margins; it is still kept in Seville.

Did Polo go to China? In 1995 the historian Frances Wood argued that he may have gathered his stories from Persian and Arab traders, since the book never mentions the Great Wall, tea drinking, chopsticks, the binding of women's feet or Chinese writing, and no Chinese record names him. Others answer that the Great Wall we picture was mostly built later, under the Ming; that Polo lived among Mongols and foreigners, not Chinese scholars; and that his details are often right. A Chinese official record studied in 1941 names the three envoys who escorted the princess to Persia, exactly as Polo does, and in 2013 the historian Hans Ulrich Vogel showed that Polo's accounts of paper money and salt match Chinese sources more closely than any other Western writer's. Most historians conclude that he went, while his book exaggerates and sometimes borrows.

Polo died in Venice in 1324. A friar later reported that, when friends urged him on his deathbed to take back the tall tales, he answered that he had not told half of what he saw. Whether or not those were his words, they set the task for a careful reader: neither swallow a traveler's tale whole nor throw it away, but test it.

PICTURE STUDY

Marco Polo Departing from Venice, English illuminator, often named as Johannes and his workshop, About 1400 · Tempera and gold on parchment (manuscript illumination) · Bodleian Library, Oxford, MS. Bodl. 264

MS. Bodley 264 is one of the most beautiful books of the Middle Ages: an earlier romance of Alexander the Great to which an English workshop added Marco Polo's book about 1400. This full-page painting opens Polo's text. The painter had probably never been to Venice, but he knew it was a city of water, churches and ships.

Look closely

- Find the four bronze horses. They still stand at St Mark's Basilica today. What does including them tell you about the painter's sources?
- Follow the travelers from the shore to the ship. How many times do you think the painter shows the same people?
- Find the fish, swans or other creatures in the water. Are they true to life or decoration?

Talk about it

1. The painting shows departure by sea, but the Polos left Venice for Acre by ship and then went overland. What does the picture get right, and what does it leave out?
2. Why might an English workshop around 1400 want to bind Polo's travels together with a romance of Alexander the Great?

HANDS-ON: TEST A TRAVELER'S TALE

Act as a historian. Compare Polo's description of a bridge near Beijing with the bridge that stands there today, and write a short verdict.

You will need

- The Primary source aside below
- A photograph and basic facts about the Lugou Bridge (Marco Polo Bridge) from an encyclopedia or a museum page
- Your travel journal, a ruler and a pencil
- A calculator

Steps

1. Read the Primary source twice. Make a two-column table: “Polo says” and “The bridge today.”
2. Fill in the Polo column: material, length in paces, width, number of riders abreast, columns and lions. Polo’s text also gives the bridge 24 arches.
3. Fill in the other column from your reference: the Lugou Bridge was built 1189–1192, is about 266 meters (874 feet) long, has 11 arches, and has several hundred carved stone lions on its posts. It was rebuilt after a flood in 1698.
4. Mark each row ✓ (agrees), ✗ (disagrees) or ? (cannot tell).
5. Write a verdict of four or five sentences: Did Polo see this bridge? Which details are strong evidence, and how might the errors be explained?

Check your work

- My table has at least six rows, each marked ✓, ✗ or ?.
- I used the exact words of the source in the “Polo says” column.
- My verdict weighs evidence on both sides and gives at least one explanation for an error.

FIELD NOTEBOOK

1. **Travel journal, Trail C, page 3: To the Court of the Khan.** Draw a route map from Venice to Shangdu and back by sea to Hormuz and home. Mark five places Polo describes, each with one fact.
2. **Narration.** Write one paragraph, as Rustichello in the Genoese prison, describing what Marco told you about one wonder of Cathay (paper money, coal, the post system or Kinsay). End with a sentence on whether you believed him and why. A parent keeps this paragraph in the portfolio.

Did you know? Westerners call the Lugou Bridge “the Marco Polo Bridge” because of the passage quoted below. Its stone lions are famous for being hard to count: many large lions have smaller lions hidden on their backs and under their paws, and counts have ranged from about 485 to 501. Kublai’s paper money was not the first in China; paper notes had been used under the Song dynasty for two centuries.

Primary source. *Marco Polo, “The Book of Ser Marco Polo,” translated by Henry Yule, revised by Henri Cordier (1903), Book II, Chapter XXXV, “Here begins the Description of*

Over this River there is a very fine stone bridge, so fine indeed, that it has very few equals. The fashion of it is this: it is 300 paces in length, and it must have a good eight paces of width, for ten mounted men can ride across it abreast. ... At the beginning of the bridge there is a marble column, and under it a marble lion, so that the column stands upon the lion's loins, whilst on the top of the column there is a second marble lion, both being of great size and beautifully executed sculpture.

Go deeper.

- Henry Yule's full translation with notes, *The Book of Ser Marco Polo*, free on Project Gutenberg (eBooks #10636 and #12410); the notes are a course in themselves.
- Frances Wood, *Did Marco Polo Go to China?* (1995), and Hans Ulrich Vogel, *Marco Polo Was in China* (2013), read side by side for the two sides of the debate (library or interlibrary loan).
- The Bodleian Library's online pages on MS. Bodley 264.
- A second video topic: the Mongol yam (post-horse) system and paiza passports.

Goes deeper in. Geography, Grade 8, “East Asia: China and the Silk Road,” and History, “The Middle Ages” (coming soon).

For families. Sources: Yule-Cordier translation; Britannica; Wood (1995); Vogel (2013). Many details of Polo's life (his exact route, his year of capture, the battle in which he was taken) are uncertain and differ between manuscripts; the stop gives the usual account with “about.” The deathbed words come from the friar Jacopo d'Acqui, writing years later, and are reported as tradition. In the Gutenberg text a footnote number runs into the sentence about the arches, so that sentence is described rather than quoted. The picture's attribution to “Johannes” follows the Bodleian's description; the Commons file name was not confirmed, so use the search phrase.

PRACTICE

1. **EASY** In what year did Marco Polo set out from Venice, and in what year did he come home?
2. **EASY** Who wrote down Polo's story, and where?
3. **MEDIUM** Name three things Polo described in Cathay that were new to most Europeans.
4. **MEDIUM** Explain how the Mongol Empire made the Polos' journey possible.
5. **CHALLENGE** Polo's text gives the bridge 24 arches; the Lugou Bridge today has 11. Give two different explanations for the difference and say what evidence would help decide between them.

6. **CHALLENGE** Polo says the bridge is 300 paces long. A Roman or Venetian “pace” (double step) was about 5 feet; a single walking step is about 2.5 feet. Work out the length both ways and compare with the real bridge, about 874 feet. Which reading fits better, and what does that suggest?

Make it a game · Rustichello’s Prison. One player is Marco, the rest are Rustichello’s fellow prisoners. Marco tells three short “wonders of Cathay”: two true facts from this stop and one invented detail. The listeners vote on which one is invented and must give a reason (“that doesn’t fit the Mongol post system because...”). Anyone who spots the invention with a good reason becomes the next Marco.

Scripture. “Trust in the LORD with all thine heart; and lean not unto thine own understanding. In all thy ways acknowledge him, and he shall direct thy paths.” (Proverbs 3:5-6, KJV)

The Polos trusted Venetian skill and the Khan’s paiza to keep them on the road. Scripture points to a surer guide. Notice too that Kublai asked for a hundred Christian teachers, and the two friars sent turned back; a few Franciscans reached the Khan’s capital years later, but most of that open door was missed.

Practice: answers

1. He set out in 1271 and returned in 1295.
2. Rustichello of Pisa, in a prison in Genoa, about 1298–1299.
3. Any three: paper money, coal (“black stones” that burn), the post-horse relay system, the Grand Canal, porcelain, the great city of Kinsay (Hangzhou).
4. One power ruled most of the road from the Black Sea to China, kept it fairly safe (the Pax Mongolica), ran relay stations with horses and supplies, and gave travelers paiza passports. Kublai also welcomed foreigners into his service.
5. Possible explanations: the bridge was rebuilt after the 1698 flood and may have changed; Polo, describing it from memory decades later in prison, misremembered; a copyist changed the number as the book was copied; or Polo counted something else, such as piers and openings together. Evidence: Chinese records or drawings of the bridge before 1698, and the readings of the number in other manuscripts. (Yule’s own notes discuss the arches and print a Chinese engraving of the bridge that shows thirteen, so even the old pictures disagree.)
6. $300 \times 5 = 1,500$ feet; $300 \times 2.5 = 750$ feet. The real bridge (874 feet) is much closer to 750 feet, so Polo was probably counting ordinary steps or giving a rough estimate. Either way his figure is the right size for the bridge, which supports the view that he saw it.

3.4 COLUMBUS, 1492

OBJECTIVES

- Explain what Columbus believed about the size of the earth, why the experts doubted him, and why he still found land.
- Trace the first voyage from Palos to the Canaries to the Bahamas and home, using the trade winds and westerlies.
- Read the log of October 11–12 as a historian, and describe plainly both Columbus's achievement and the wrongs done under his rule.

Warm-up. Many people say that Columbus proved the earth was round. Before you read, write one sentence saying whether you think that is true, and why. You will check your answer in Practice question 3.

Video slot. Video coming. Columbus's first voyage of 1492: the Niña, Pinta and Santa María, the trade winds, dead reckoning and the landfall at San Salvador. Search approved channels (Smithsonian, Library of Congress, Mariners' Museum, Hillsdale College); preview first.

KEY TERMS

caravel

A small, nimble Portuguese and Spanish sailing ship of the 1400s; the Niña and Pinta were caravels, while the larger Santa María was a nao (carrack).

trade winds

Steady winds that blow from the northeast across the Atlantic between about 10° and 30° north latitude; Columbus rode them west.

westerlies

Winds blowing from the west in the middle latitudes, farther north; Columbus used them to sail home.

dead reckoning

Finding a ship's position from its compass heading, its estimated speed and the time sailed.

Taíno

The Arawak-speaking people of the Bahamas (the Lucayans) and the Greater Antilles whom Columbus met in 1492.

Columbian Exchange

The transfer of plants, animals, people and diseases between the Eastern and Western Hemispheres after 1492.

CORE IDEAS

Christopher Columbus was born in Genoa about 1451, the son of a wool weaver, and went to sea young. By the 1480s he lived in Portugal, the leading seafaring nation, and had sailed the Atlantic from the Gulf of Guinea to the British Isles. He proposed to reach “the Indies,” meaning China, Japan and the spice islands, by sailing west. The common story that people then thought the earth was flat is a myth made popular in the 1800s. Educated Europeans had known it was round since the Greeks. The real argument was about its **size**.

Here Columbus was wrong. Eratosthenes, about 240 B.C., had measured the earth at close to its true circumference of about 25,000 miles. Columbus chose the smallest figures he could find. He took the Arab astronomer al-Farghani’s length of a degree, 56⅔ miles, and read it in shorter Italian miles; he accepted estimates that stretched Asia far to the east; and he added Marco Polo’s report that Japan lay some 1,500 miles off the coast of China. He concluded that Japan was about 2,400 nautical miles west of the Canary Islands. The true distance is about 10,600. The experts in Portugal and Spain who turned him down were right: no ship of the day could carry food and water that far. Columbus found land because two continents no one in Europe knew of lay in the way.

Portugal refused him in 1485. Spain listened at last in 1492, after Ferdinand and Isabella finished the conquest of Granada in January. In April they promised him the title **Admiral of the Ocean Sea**, the governorship of any lands he found and a tenth of their wealth. The voyage was modest: the Santa María and two caravels, the Pinta and the Niña, with about ninety men. They left Palos on August 3, 1492, refitted in the Canary Islands, where the Pinta’s rudder was repaired and the Niña given square sails, and sailed from Gomera on September 6. The choice of the Canaries was shrewd. At about 28° north the northeast **trade winds** blow steadily west, and coming home Columbus sailed north into the **westerlies**, finding the wind pattern that sailing ships would use for three hundred years.

The crossing was the longest anyone had made out of sight of land. Columbus navigated by **dead reckoning**. According to the log, he kept two counts of distance and showed the crew the smaller one, so they would not take fright at how far they were from home; ironically, the “false” figure was nearer the truth. He also noticed that the compass needle no longer pointed quite to the North Star, one of the earliest recorded observations of this variation in the open Atlantic. By October 10 the men were on the edge of mutiny. On October 11 they saw floating branches, a carved stick and a reed, and at about two in the morning of October 12 Rodrigo de Triana, the lookout on the Pinta, cried land.

The island was called Guanahani by its people; Columbus named it San Salvador, “Holy Saviour.” Exactly which Bahamian island it was is still debated, though Watling Island, renamed San Salvador in 1925, is the usual choice. He met the Lucayan **Taíno**, called them “Indians” because he believed he was in the Indies, and went on to Cuba, which he took for the mainland of Asia, and Hispaniola. On Christmas Eve the Santa María ran aground, and he left thirty-nine men in a fort called La Navidad. Battling storms on the way home, he reached Lisbon on March 4 and Palos on March 15, 1493. His printed letter announcing the

discovery spread across Europe within weeks. To the end of his life, after four voyages, he insisted he had reached Asia. He died in Valladolid in 1506.

The rest of the story must be told plainly. As governor of Hispaniola Columbus was harsh and often unjust. Taíno were forced to bring in fixed amounts of gold, and some were shipped to Spain as slaves; Spanish settlers too suffered his punishments. In 1500 the Crown sent an investigator, Francisco de Bobadilla, who sent Columbus home in chains, and Queen Isabella ordered that enslaved Taíno be returned and freed. Within a generation the Taíno of Hispaniola had almost disappeared, chiefly from European diseases such as smallpox, to which they had no resistance, together with forced labor and war. These were real wrongs, and men of Columbus's own time said so: the friar Antonio de Montesinos preached against them in 1511, and Bartolomé de las Casas, who copied out the log that survives today, spent his life defending the native peoples.

Columbus saw himself as a man with a mission from God. He signed his name with the Greek and Latin form *Xpo Ferens*, "Christ-bearer," and late in life collected prophecies about the gospel reaching the islands of the sea. His voyages joined the two halves of the world for good, unlike the Norse settlement in Vinland around A.D. 1000, which did not last. Horses, cattle, wheat and the gospel crossed west; maize, potatoes, tomatoes and cacao crossed east and changed the diet of the whole world. Both the courage of the voyage and the cruelty that followed belong to the record.

PICTURE STUDY



Landing of Columbus, John Vanderlyn, Commissioned 1836; installed 1847 · Oil on canvas, 12 by 18 feet · Rotunda, United States Capitol, Washington, D.C.
Wikimedia Commons · Public domain

Congress commissioned John Vanderlyn, a New York painter trained in Paris, to paint this scene for the Capitol Rotunda. He worked on it in Paris for about ten years. Columbus is

shown claiming the island for Spain with the royal standard. The picture is a history painting, imagined three and a half centuries after the event, not a record made by a witness.

Look closely

- Find Columbus. What is he holding, and where is he looking? What does his pose say about how the painter saw the event?
- Find the sailors. Some kneel, one seems to search the sand, another gestures. Which feelings can you name?
- Find the Taíno at the edge of the picture. How large are they, where are they placed, and what does the painter suggest about them?

Talk about it

1. Compare the painting with the Primary source. Which details in the log could Vanderlyn have used, and which details did he invent?
2. This painting hangs in the heart of the United States Capitol. What does its placement say about how Americans of the 1840s understood Columbus?

HANDS-ON: PLOT THE CROSSING

Plot the first voyage on a map of the Atlantic, using the wind belts and the log's figures, and compare Columbus's planned distance with the real one.

You will need

- An outline map of the Atlantic showing latitude lines (or trace one from an atlas)
- Colored pencils: blue for winds, red for the outbound route, green for the return
- Ruler and calculator
- The Primary source aside below

Steps

1. Mark Palos, the Canary Islands, San Salvador (Watling Island), Cuba, Hispaniola, the Azores and Lisbon.
2. Draw arrows for the northeast trade winds between about 10° and 30° north, and for the westerlies between about 35° and 50° north.
3. Draw the outbound route in red along about 28° north, and the return in green curving north to the Azores and east to Lisbon. Explain in the margin why the two routes are different.
4. Using the log, write the speed and distance for the night of October 11–12 beside the last part of the red line. Do Practice question 5.
5. Draw a small bar showing where Columbus believed Japan lay (about 2,400 nautical miles west of the Canaries), and another bar showing where Japan really lies (about 10,600). Label the gap “two unknown continents and the Pacific.”

Check your work

- My map shows both wind belts with arrows.
- The outbound and return routes follow the winds, and I explained why.
- I used the log's figures and showed the difference between Columbus's Asia and the real Asia.

FIELD NOTEBOOK

1. **Travel journal, Trail C, page 4: The Ocean Sea.** Paste your map. Add a short table of the voyage's dates from August 3, 1492, to March 15, 1493.
2. **Narration.** Write one paragraph telling the night of October 11-12 as a sailor on the Pinta might have, using details from the log. Then add two sentences on what came after the landing, told honestly. A parent keeps this paragraph in the portfolio.

Did you know? The Crown had promised a yearly reward of 10,000 maravedís to the first man to sight land. Columbus claimed it himself, saying he had seen a light some hours before Rodrigo de Triana's cry. Columbus's original log is lost; what survives is a summary made by Bartolomé de las Casas decades later, partly in Columbus's own words and partly in Las Casas's. That is why the log below speaks of "the Admiral" in the third person.

Primary source. *Christopher Columbus's log of the first voyage, entry for October 11, 1492, as abridged by Bartolomé de las Casas, translated in Edward Everett Hale, "The Life of Columbus" (1891), Chapter III; Project Gutenberg eBook #1492*

Oct. 11, course to west and southwest. Heavier sea than they had known, pardelas and a green branch near the caravel of the Admiral. From the Pinta they see a branch of a tree, a stake and a smaller stake, which they draw in, and which appears to have been cut with iron, and a piece of cane. Besides these, there is a land shrub and a little bit of board. The crew of the Nina saw other signs of land and a branch covered with thorns and flowers. With these tokens every-one breathes again and is delighted. They sail twenty-seven leagues on this course. The Admiral orders that they shall resume a westerly course at sunset. They make twelve miles each hour; up till two hours after midnight they made ninety miles. ... At two hours after midnight land appeared, from which they were about two leagues off.

Go deeper.

- Samuel Eliot Morison, *Admiral of the Ocean Sea* (1942) or his shorter *Christopher Columbus, Mariner* (1955), by a historian and sailor who retraced the voyages under sail (library).
- Edward Everett Hale, *The Life of Columbus*, free on Project Gutenberg (#1492).

- The Library of Congress's pages on the 1493 printed letter of Columbus and its Jay I. Kislak Collection.
- A second video topic: the trade winds and westerlies and how sailing ships used them.

Goes deeper in. Geography, Grade 8, "The Atlantic World," and Technology Overcoming Geography, "Ships, Winds and Navigation" (coming soon).

For families. Sources: the Las Casas abstract of the log (Hale's translation); Morison; Library of Congress; Britannica. The stop names the wrongs of Columbus's governorship and the collapse of the Taíno plainly and without modern slogans, and it notes that his own contemporaries condemned them. Figures for Columbus's planned distance follow Morison. The landfall island is debated, so the stop says so. Hale's translation spells the ship "Nina" without the tilde, and the quotation keeps it; "pardelas" are shearwaters, a sea bird. A "league" in the log was about four Roman miles.

PRACTICE

1. **EASY** Name the three ships of the first voyage and the date of the landfall.
2. **EASY** What did the island's people call it, and what did Columbus name it?
3. **MEDIUM** Did Columbus prove that the earth is round? Explain what the real disagreement was.
4. **MEDIUM** From the Primary source, list four signs of land the crews saw on October 11, and say which one would have convinced you most, and why.
5. **CHALLENGE** The log says the fleet made twelve miles each hour after sunset and ninety miles by two hours after midnight. How many hours does 90 miles at 12 miles an hour take, and about what time did they turn west at sunset? The "miles" were Roman miles of about 0.92 statute mile: about how many of our miles is 90? How far off was the land, in our miles, if a league is four Roman miles?
6. **CHALLENGE** In his letter announcing the discovery, Columbus said he crossed from the Canaries to the Indies in thirty-three days. He left Gomera on September 6, and land was sighted on October 12. Count the days. How can both figures be honest?

Make it a game • Dead Reckoning. In a yard or a large room, one player is the navigator, blindfolded. A partner calls a heading ("northwest") and a number of steps. The navigator walks, while the others keep silent, then marks the spot where they think they are with a coin. Compare the coin with the real spot. Take turns. Talk afterward: why do small errors in heading grow over a long distance, and how did Columbus correct his position when he saw land?

Scripture. "If I take the wings of the morning, and dwell in the uttermost parts of the sea; Even there shall thy hand lead me, and thy right hand shall hold me." (Psalm 139:9-10, KJV)

There is no ocean so wide that it lies outside God's reach. Columbus believed God led him across the sea; the same Lord sees the men who sailed and the people who met them on the shore, and He judges rightly what each did.

Practice: answers

1. The Santa María, the Pinta and the Niña; land was sighted about 2 a.m. on October 12, 1492.
2. Guanahani; Columbus named it San Salvador, "Holy Saviour."
3. No. Educated Europeans already knew the earth was round. The disagreement was about its size and the width of the ocean; Columbus thought Asia was much closer than it is, and the experts who doubted him were right about the distance.
4. A green branch, a branch of a tree, a stake that seemed cut with iron, a piece of cane, a land shrub, a bit of board, a branch with thorns and flowers. The stake cut with iron is strong evidence of people nearby; the flowering branch shows land was near, because it was still fresh.
5. $90 \div 12 = 7.5$ hours; counting back from 2 a.m. gives about 6:30 p.m., which fits a mid-October sunset. $90 \times 0.92 \approx 83$ statute miles. Two leagues = 8 Roman miles ≈ 7.4 statute miles from shore.
6. From September 6 to October 12 is 36 days. The log records that the last of the Canaries dropped out of sight on September 9; from September 9 to October 12 is 33 days. Columbus counted from the moment land was lost to the moment land was seen again.

3.5 LEWIS AND CLARK, WITH SACAGAWEA

OBJECTIVES

- Explain from Jefferson's own instructions what the Corps of Discovery was sent to do, and judge how far it succeeded.
- Trace the route from Camp Dubois up the Missouri, over the Rockies and down the Columbia to the Pacific and back (1804–1806).
- Describe accurately what Sacagawea and York contributed, without legend and without leaving them out.

Warm-up. Imagine the President hands you a letter: map a river no one in your country has mapped, record every new plant and animal, make friends with every nation you meet, and come home. Write down the first five things you would pack.

Video slot. Video coming. The Lewis and Clark Expedition 1804–1806: the Missouri River, Fort Mandan, Sacagawea and the Shoshone, the Lolo Trail and Fort Clatsop. Search approved channels (National Park Service, Library of Congress, Smithsonian, Monticello); preview first.

KEY TERMS

Louisiana Purchase

The 1803 purchase from France of about 828,000 square miles west of the Mississippi for \$15 million.

Corps of Discovery

The army unit, led by Captains Meriwether Lewis and William Clark, that crossed the continent and returned, 1804–1806.

portage

Carrying boats and supplies overland around falls or between rivers; the portage around the Great Falls of the Missouri was about 18 miles.

Continental Divide

The line of high ground in the Rockies that separates rivers flowing to the Atlantic and Gulf from rivers flowing to the Pacific.

Lemhi Shoshone

Sacagawea's people, who lived in the mountain valleys of present-day Idaho and Montana and owned the horses the Corps needed.

celestial navigation

Finding latitude and longitude by measuring the sun, moon and stars with instruments such as the sextant and octant.

CORE IDEAS

In 1803 the United States bought Louisiana from Napoleon's France: about 828,000 square miles for \$15 million, roughly three cents an acre. The young nation doubled in size overnight, yet no American knew what most of it held. President Thomas Jefferson had already asked Congress, in a confidential message of January 1803, for \$2,500 to send an expedition up the Missouri. His written instructions of June 20, 1803, quoted below, set its goals: find a water route to the Pacific "for the purposes of commerce," map the rivers by latitude and longitude, record soil, plants, animals and climate, and meet the Indian nations in peace.

To lead it Jefferson chose his secretary, **Meriwether Lewis**, an army captain who was sent to Philadelphia for crash courses in celestial navigation, medicine, botany and fossils. Lewis invited **William Clark**, a former army officer and a gifted mapmaker, to share the command. With them went soldiers, boatmen, the hunter and interpreter George Drouillard, Lewis's Newfoundland dog Seaman, and **York**, Clark's enslaved servant, who did a full share of the work and the danger. The Corps left Camp Dubois, across the Mississippi from St. Louis, on May 14, 1804, with a 55-foot keelboat and two pirogues.

Going up the Missouri meant fighting the current by rowing, poling and towing, often 10 to 15 miles a day. In August Sergeant Charles Floyd died, probably of a burst appendix; he was the only man lost on the whole journey. The captains held councils with the Oto, Missouri and Yankton Sioux, and a tense standoff with the Teton Sioux nearly came to blows. They wintered at Fort Mandan, near the earth-lodge villages of the Mandan and Hidatsa in present North Dakota, in temperatures far below zero. There they hired the French-Canadian trader Toussaint Charbonneau and his young wife **Sacagawea**, a Lemhi Shoshone who had been captured by Hidatsa raiders as a girl of about twelve. Her son, Jean Baptiste, was born at the fort on February 11, 1805, and she carried him all the way to the Pacific.

In 1805 the Corps found the Great Falls of the Missouri and spent about a month carrying its boats and baggage some 18 miles around them. Near the Three Forks Sacagawea recognized the place where she had been taken captive, and later she pointed out Beaverhead Rock, a landmark of her people. In August they reached the Shoshone. At the council Sacagawea recognized the chief, **Cameahwait**, as her brother. That meeting won the Corps the horses it needed to cross the mountains. Her interpreting worked through a chain of languages: Shoshone to Hidatsa with Sacagawea, Hidatsa to French with Charbonneau, French to English with a soldier. Clark also noted that a woman traveling with a party of men was taken by the tribes as a token of peace.

The crossing of the Bitterroot Mountains on the Lolo Trail in September 1805 was the worst of the journey: early snow, steep slopes and hunger, until the men ate candles and some of their colts. The Nez Perce received them, fed them and kept their horses for the winter, and the Corps made dugout canoes and ran the Clearwater, Snake and Columbia Rivers. On November 7, 1805, Clark wrote that the ocean was in view, though they were still in the wide estuary of the Columbia. On November 24 the whole party, York and Sacagawea included,

gave their opinions on where to spend the winter. They built Fort Clatsop near present Astoria, Oregon, and endured a winter of rain with very few dry days.

Coming home in 1806, the captains split up to explore more country. Lewis's small party clashed with young Blackfeet warriors who tried to take their guns and horses, and two of the Blackfeet were killed. The reunited Corps raced down the Missouri with the current and reached St. Louis on September 23, 1806, after about twenty-eight months and some 8,000 miles. They brought back maps, journals and descriptions of about 178 plants and 122 animals new to science, such as the grizzly bear, the pronghorn and the prairie dog.

Jefferson's main hope failed: there was no easy water route, because the Rockies were far wider than anyone had guessed. Other stories ended sadly too. York asked for his freedom and was refused for years; Clark freed him only about ten years later. Lewis died in 1809. Sacagawea most likely died in 1812 at a trading post on the Missouri, though a Shoshone tradition holds that she lived to old age in Wyoming; Clark became guardian of her children and paid for Jean Baptiste's schooling. The expedition's real gifts were knowledge and courage, gained by careful work under God's sky.

PICTURE STUDY



Lewis and Clark on the Lower Columbia, Charles Marion Russell, 1905 · Opaque and transparent watercolor over graphite on paper · Amon Carter Museum of American Art, Fort Worth, Texas
Wikimedia Commons · Public domain

Charles M. Russell was a Montana cowboy who became the best-known painter of the old West. He painted this watercolor a century after the expedition, for the centennial of 1905. He shows Sacagawea, not the captains, as the center of the meeting with the Chinook peoples of the lower Columbia.

Look closely

- Find Sacagawea. What is she doing with her hands? What does Russell want you to understand about her part in the meeting?
- Compare the two kinds of canoe. Which one looks built for this river, and why?
- Find Lewis and Clark. Where has Russell placed them, and what does that choice say?

Talk about it

1. Sacagawea did not speak the Chinookan languages of the lower Columbia. Is Russell's scene a fair picture of her role? What did she actually do that the picture captures?
2. Russell painted from his own knowledge of rivers, canoes and western peoples, a hundred years later. How would you test which details are accurate?

Safety first. If you do the field project by a creek or river, go with an adult, stay off steep or crumbling banks, and do not wade in moving water.

HANDS-ON: JEFFERSON'S ORDERS IN YOUR OWN COUNTRY

Carry out a small piece of Jefferson's instructions in your own neighborhood, then report on it the way the captains did.

You will need

- The Primary source aside below
- A compass and, if you have one, a phone or map that shows latitude and longitude
- A notebook, pencil, ruler and colored pencils
- A creek, pond, field edge or park (with an adult)

Steps

1. Read the Primary source. Underline every task Jefferson gives in those sentences: what to explore, what to measure, how to treat people.
2. At your site, record the date, the weather and the latitude and longitude to the nearest hundredth of a degree.
3. Map the site from above: draw the water or path, mark north with an arrow, and pace out one distance to make a scale.
4. Choose one plant and one animal (a bird or insect is fine). Describe each in five or six sentences the way Lewis did: size, color, shape, where found, behavior. Sketch each.
5. Write a one-page "Report to the President": what you found, what you measured, and one thing you could not find out.

Check your work

- I listed Jefferson's tasks from the source.
- My map has a north arrow, a scale and the latitude and longitude.
- I described and sketched one plant and one animal in detail.
- My report says honestly what I could not learn.

FIELD NOTEBOOK

1. **Travel journal, Trail C, page 5: Up the Missouri.** Draw the route from Camp Dubois to Fort Clatsop with the main stops: Fort Mandan, Great Falls, Three Forks, Camp Fortunate (the Shoshone meeting), Lolo Trail, Fort Clatsop. Label each with its month and year.
2. **Narration.** Write one paragraph telling the meeting with the Shoshone in August 1805 from Sacagawea's point of view, using only facts from the stop. A parent keeps this paragraph in the portfolio.

Did you know? The captains could not spell consistently, and neither could anyone else in 1805: Clark is said to have spelled "Sioux" more than twenty different ways. In North Dakota her name is often written *Sakakawea*, from a Hidatsa meaning "bird woman"; the spelling *Sacagawea* follows the journals. Seaman the dog went all the way to the Pacific and back.

Primary source. *Thomas Jefferson's instructions to Meriwether Lewis, June 20, 1803, as printed in "History of the Expedition under the Command of Captains Lewis and Clark," vol. 1 (first published 1814); Project Gutenberg eBook #16565*

The object of your mission is to explore the Missouri river, and such principal streams of it, as, by its course and communication with the waters of the Pacific ocean, whether the Columbia, Oregon, Colorado, or any other river, may offer the most direct and practicable water-communication across the continent, for the purposes of commerce. Beginning at the mouth of the Missouri, you will take observations of latitude and longitude, at all remarkable points on the river, and especially at the mouths of rivers, at rapids, at islands, and other places and objects distinguished by such natural marks and characters, of a durable kind, as that they may with certainty be recognised hereafter.

...In all your intercourse with the natives, treat them in the most friendly and conciliatory manner which their own conduct will admit; allay all jealousies as to the object of your journey; satisfy them of its innocence; make them acquainted with the position, extent, character, peaceable and commercial dispositions of the United States; of our wish to be neighbourly, friendly, and useful to them, and of our dispositions to a commercial intercourse with them.

Go deeper.

- The Journals of the Lewis and Clark Expedition online (University of Nebraska-Lincoln), the full scholarly edition, searchable by date.
- The Library of Congress exhibition "Rivers, Edens, Empires: Lewis and Clark and the Revealing of America," with Jefferson's instructions in his own hand.
- National Park Service, Lewis and Clark National Historic Trail (nps.gov/lecl), with maps and sites to visit.

- A second video topic: how Lewis took latitude with an octant and an artificial horizon.

Goes deeper in. Geography, Grade 4, “Rivers and Mountains of the West,” and History, “The Early Republic” (coming soon).

For families. Sources: Jefferson’s instructions; the Moulton edition of the journals (University of Nebraska); Library of Congress; National Park Service. Counts of new plants and animals vary between books; the figures here are the ones most often cited. Sacagawea’s birth year, the meaning of her name and the date of her death are uncertain, and the stop says so. York’s freedom date is not known exactly; most historians put it about 1815–1816. The Blackfeet clash is told plainly and briefly.

PRACTICE

1. **EASY** When did the Corps leave Camp Dubois, and when did it return to St. Louis?
2. **EASY** Who was Cameahwait, and why did meeting him matter so much?
3. **MEDIUM** According to the Primary source, what was “the object” of the mission? Did the expedition achieve it?
4. **MEDIUM** Describe the chain of languages used to speak with the Shoshone, and explain why it shows Sacagawea’s value.
5. **CHALLENGE** Louisiana measured about 828,000 square miles and cost \$15,000,000. One square mile is 640 acres. Find the price per acre to the nearest tenth of a cent.
6. **CHALLENGE** Going up the Missouri, the Corps covered about 1,600 miles from Camp Dubois to the Mandan villages between May 14 and about October 26, 1804. Coming home, it covered roughly the same 1,600 miles from the Mandan villages (August 17, 1806) to St. Louis (September 23, 1806). Find the average miles per day each way and explain the difference.

Make it a game · Captain’s Council. Recreate the vote of November 24, 1805.

Describe three possible winter camps: stay on the north shore of the Columbia, cross to the south shore where elk are plentiful, or go back upriver to the drier country by the falls. Every player, whatever their age, gets one vote and must give one reason drawn from the stop (food, salt, weather, trade, a ship that might come). Count the votes, then reveal what the Corps chose (the south shore, where they built Fort Clatsop) and why.

Scripture. “The heavens declare the glory of God; and the firmament sheweth his handywork.” (Psalm 19:1, KJV)

Every night he could, Lewis measured the stars to fix where the Corps stood on the map. The order of the heavens that made his sums work is the handiwork this psalm praises.

Practice: answers

1. It left on May 14, 1804, and returned on September 23, 1806.

2. A Shoshone chief and Sacagawea's brother. Because of that meeting the Shoshone traded the horses the Corps needed to cross the Rockies.
3. To find the most direct and practicable water route across the continent to the Pacific, for commerce. No: there was no easy water route, because the Rockies required a long, hard crossing by land between the Missouri and the Columbia.
4. Shoshone to Hidatsa (Sacagawea), Hidatsa to French (Charbonneau), French to English (a soldier who spoke French). Without Sacagawea the chain broke at its first link; she was the only one who spoke Shoshone.
5. $828,000 \times 640 = 529,920,000$ acres. $\$15,000,000 \div 529,920,000 \approx \0.0283 , or about 2.8 cents an acre.
6. Upstream: May 14 to October 26 is 165 days; $1,600 \div 165 \approx 9.7$ miles a day. Downstream: August 17 to September 23 is 37 days; $1,600 \div 37 \approx 43$ miles a day. The difference is the current: going up, they fought it with oars, poles and towlines; coming home, it carried them, and they no longer stopped for long councils or to map new country.

3.6 ISABELLA BIRD IN THE ROCKIES, 1873

OBJECTIVES

- Tell the story of Isabella Bird’s ride through Colorado Territory in the autumn of 1873 and her ascent of Long’s Peak.
- Analyze how Bird builds a description in her letters, and use her methods in your own writing.
- Explain what altitude does to air, water and travelers, with numbers.

Warm-up. Look out of a window for one full minute. Then write one sentence describing the most important thing you see, using at least four adjectives before the noun. Read it aloud. Does piling up words make the thing clearer, or does it bury it?

Video slot. Video coming. Isabella Bird, “A Lady’s Life in the Rocky Mountains,” Estes Park in the 1870s and the climb of Longs Peak. Search approved channels (National Park Service / Rocky Mountain National Park, Royal Geographical Society, History Colorado); preview first.

KEY TERMS

Colorado Territory

Colorado before statehood (1861–1876); Bird traveled there three years before it became a state.

park

In the Rockies, a high, grassy mountain valley ringed by forest and peaks, such as Estes Park.

timberline

The elevation above which trees cannot grow, about 11,000 to 11,500 feet in northern Colorado.

fourteener

A mountain over 14,000 feet; Long’s Peak (14,259 feet) is the highest in Rocky Mountain National Park.

travel writing

A true account of a journey, written to let readers see and feel a place; Bird’s books were written first as letters to her sister.

CORE IDEAS

Isabella Lucy Bird was born in 1831 at Boroughbridge in Yorkshire, England, the daughter of an Anglican clergyman. As a young woman she suffered from a painful spine, sleeplessness and low spirits, and her doctors recommended a sea voyage. She went to America and Canada in 1854 and wrote a book about it, and found that travel did for her what medicine

could not. In 1872 she set out again, to Australia, New Zealand and the Sandwich Islands (Hawaii), where she rode across lava fields and climbed the volcano Mauna Loa. In the late summer of 1873 she landed at San Francisco and turned east toward the Rocky Mountains.

She arrived in Colorado Territory in September 1873, traveling alone and carrying very little. That very month a financial panic closed banks across the country, and for weeks she could hardly cash her notes. She rode instead of taking coaches: on a small, sure-footed pony she called Birdie she covered about 800 miles in three months, through the foothill towns, the high parks and the mining camps, in weather that turned from golden autumn to blizzard. She rode astride in what she called her "Hawaiian riding dress," a jacket, an ankle-length skirt and full trousers gathered at the boots, safer on mountain trails than the sidesaddle. When a London newspaper later suggested she had dressed as a man, she added a note to her book to set the record straight.

Her goal was **Estes Park**, a high valley under Long's Peak where a Welsh rancher, Griffith Evans, kept cabins for hunters and invalids. Her first attempt to find it, in late September, failed: she and a settler couple who offered to guide her lost the trail in the canyons and turned back. It is on that disappointed ride, in Letter V, that she first sees Long's Peak, and her description is the Primary source for this stop. A few days later she reached the park and stayed, helping with the ranch work and riding out across the hills.

In October 1873 Bird climbed **Long's Peak**, at 14,259 feet the highest mountain in what is now Rocky Mountain National Park. She went with two young men and a guide, the trapper James Nugent, called "Mountain Jim," a well-read, hard-drinking man who had lost an eye to a grizzly bear. They camped at **timberline**, and the next day climbed the steep ledges, gullies and narrow shelves of the upper mountain, where a fall would have been fatal. Bird was no mountaineer and admitted that at the hardest places she was hauled and pushed up by Jim. She was not the first woman to reach the summit, but she was among the first, and her account made the climb famous in Britain.

Bird wrote all this as letters to her younger sister, Henrietta, at home in Scotland. They appeared in the magazine *The Leisure Hour* in 1878 and as the book *A Lady's Life in the Rocky Mountains* in 1879. The letters are vivid because they were written soon after the events, by lamplight in a cabin or at a ranch table. They are also honest about hardship: frozen water, ice on her clothes, an exhausted pony, cattle drives in the snow. The West she saw was rough and young. The Ute and Arapaho had used the Estes valley for summer hunting before settlers arrived, and miners, ranchers and speculators were remaking the land. Bird wrote about them all with keen eyes and the opinions of a Victorian Englishwoman. Mountain Jim's end was sad: the next year he was shot in a quarrel and died of the wound.

Bird went on traveling for thirty more years: to Japan, Malaya, India, Persia, Kurdistan, Tibet, Korea and China. In 1881 she married Dr. John Bishop, who died five years later. In memory of her husband and her sister she founded mission hospitals in India, at Srinagar and Amritsar, and she came to support the missionary work she had once doubted. In 1892

she was among the first women elected Fellows of the Royal Geographical Society. She died in Edinburgh in 1904, with her trunks packed for another trip.

The numbers of the high country explain why such trips were hard. At the top of Long's Peak the air pressure is only about 60 percent of that at sea level, so each breath brings in less oxygen. Water boils at a lower temperature, about 186 °F instead of 212 °F, so food cooks slowly. Temperatures fall roughly 3 to 5 °F for every thousand feet of climbing. Bird crossed the high passes in snowstorms without a map, a tent or a weather forecast, trusting her pony, her own judgment and the providence of God.

PICTURE STUDY



The Rocky Mountains, Lander's Peak, Albert Bierstadt, 1863 · Oil on canvas · The Metropolitan Museum of Art, New York

Wikimedia Commons · Public domain

Albert Bierstadt traveled west in 1859 with a government surveying party and made sketches in the Wind River Range of present-day Wyoming. Back in his New York studio he combined them into this enormous painting, about 6 by 10 feet. Crowds paid to see it. Ten years later Isabella Bird rode through mountains like these, and her words do with sentences what Bierstadt did with paint.

Look closely

- Follow the picture from front to back: camp, plain, lake, waterfall, peak. How does Bierstadt lead your eye upward?
- Find the people and horses in the foreground. How large are they compared with the mountain? What does that say?
- Find where the light falls brightest. Is it on the people or on the peak?

Talk about it

1. Bierstadt combined several sketches into one scene, so the painting is not a single real view. Is it still truthful? In what sense?
2. Compare the painting with Bird's description of Long's Peak in the Primary source. Which of her words could be labels for parts of this painting?

Safety first. Mountain hikes need an adult, water, warm layers and a turn-back time. Above about 8,000 feet, go slowly and come down at once if anyone has a pounding headache, dizziness or nausea; these are signs of altitude sickness.

HANDS-ON: A LETTER HOME FROM THE HIGH COUNTRY

Study how Bird builds her description, then write a letter of your own in the same way about a real place you can see or have seen.

You will need

- The Primary source aside below
- Your travel journal or good paper, and a pen
- Colored pencils for a small sketch
- A real view: a hill, a skyline, a field, a river, or the Bierstadt painting if nothing else is near

Steps

1. Read the Primary source aloud. In your journal, list the things Bird names in order (valley, glades, streams, pines, rock, canyons, ranges, peak). Notice that she moves from near to far and from low to high.
2. Copy out her last sentence. Circle every adjective before "summit." Notice how she makes you wait for the mountain's name.
3. Stand before your view and list ten things you see from nearest to farthest. Then list eight exact adjectives for the most important one.
4. Write a letter of 150 to 200 words to a real relative, beginning with a place-and-month heading like Bird's. Move from near to far, and end with one long sentence that saves the most important thing for last.
5. Add a small sketch of the view at the top or bottom of the letter.

Check your work

- I listed the order of Bird's description and her adjectives.
- My letter has a heading, moves from near to far, and ends with a sentence that saves the key thing for last.
- My letter describes a real place truthfully.
- I added a sketch.

FIELD NOTEBOOK

1. **Travel journal, Trail C, page 6: Estes Park, 1873.** Paste your letter and sketch. Add a small elevation profile: Denver (about 5,280 feet), Estes Park (about 7,500 feet), timberline (about 11,000 feet) and the summit of Long's Peak (14,259 feet).
2. **Narration.** Write one paragraph telling, in your own words, Bird's three months in Colorado: how she arrived, how she traveled, what she climbed and how her letters became a book. A parent keeps this paragraph in the portfolio.

Did you know? Long's Peak is named for Major Stephen H. Long, who saw it from the plains in 1820 but never climbed it. The first recorded ascent was in 1868, by a party led by John Wesley Powell, who later ran the Grand Canyon. Today the mountain is usually written "Longs Peak," without the apostrophe, following the rules for American place names. Thousands try the climb each summer, and many turn back.

Primary source. *Isabella L. Bird, "A Lady's Life in the Rocky Mountains" (1879), Letter V, from a canyon above the Big Thompson on her first, failed attempt to reach Estes Park, September 1873; Project Gutenberg eBook #755*

This is an upland valley of grass and flowers, of glades and sloping lawns, and cherry-fringed beds of dry streams, and clumps of pines artistically placed, and mountain sides densely pine clad, the pines breaking into fringes as they come down upon the 'park,' and the mountains breaking into pinnacles of bold grey rock as they pierce the blue of the sky. A single dell of bright green grass, on which dwarf clumps of the scarlet poison oak look like beds of geraniums, slopes towards the west, as if it must lead to the river which we seek. Deep, vast canyons, all trending westwards, lie in purple gloom. Pine-clad ranges, rising into the blasted top of Storm Peak, all run westwards too, and all the beauty and glory are but the frame out of which rises—heaven-piercing, pure in its pearly luster, as glorious a mountain as the sun tinges red in either hemisphere—the splintered, pinnacled, lonely, ghastly, imposing, double-peaked summit of Long's Peak, the Mont Blanc of Northern Colorado.

Go deeper.

- Isabella L. Bird, *A Lady's Life in the Rocky Mountains* (1879), free on Project Gutenberg (#755); read Letter VII for the climb of Long's Peak.
- National Park Service, Rocky Mountain National Park: "Longs Peak" and the history pages on early Estes Park.
- Pat Barr, *A Curious Life for a Lady: The Story of Isabella Bird* (1970), a biography (library).
- A second video topic: what happens to the body at high altitude, and how climbers acclimatize.

Goes deeper in. Geography, Grade 4, “Mountains and Elevation,” and Literature, “Letters and Travel Writing” (coming soon).

For families. Sources: Bird’s book (Gutenberg #755); National Park Service; Royal Geographical Society; Britannica. The excerpt is from Letter V, on the failed first ride toward Estes Park; Gutenberg’s text prints the American spelling “luster.” Bird’s friendship with Mountain Jim has been much romanticized by later writers; the stop sticks to her own account of him as a guide. His death is mentioned in one plain sentence. Altitude figures are rounded approximations.

PRACTICE

1. **EASY** In what year did Bird ride in the Rockies, and was Colorado a state yet?
2. **EASY** To whom did Bird write the letters that became her book?
3. **MEDIUM** Long’s Peak is 14,259 feet high. Convert to meters (1 meter $\approx$ 3.281 feet), and find how many feet higher it is than Estes Park at about 7,500 feet.
4. **MEDIUM** In the Primary source, Bird calls Long’s Peak “the Mont Blanc of Northern Colorado.” What is Mont Blanc, and why would that comparison help her readers?
5. **CHALLENGE** Look at Bird’s last sentence in the Primary source. How many adjectives come right before “summit”? Why does she put the subject (the summit of Long’s Peak) at the very end of such a long sentence, after a long interruption set off by dashes?
6. **CHALLENGE** A common rule of thumb says water’s boiling point drops about 1 °F for every 500 feet of elevation. Use it to estimate the boiling point at the summit of Long’s Peak. The measured value is about 186 °F. How close is the rule, and why would a cook in Estes Park care?

Make it a game • Near to Far. One player describes a picture (the Bierstadt painting or any landscape) one item at a time, from nearest to farthest, without naming the main subject. After each item the others may guess the subject; a correct guess after one clue earns 5 points, after two clues 4 points, and so on. Then switch. The best describers, like Bird, make the listeners see the whole frame before the mountain appears.

Scripture. “In his hand are the deep places of the earth: the strength of the hills is his also. The sea is his, and he made it: and his hands formed the dry land.” (Psalm 95:4–5, KJV)

Bird’s “deep, vast canyons” and the “heaven-piercing” peak are both in God’s hand. A traveler who sees the strength of the hills is seeing the work of the One who formed them.

Practice: answers

1. 1873; no, it was still Colorado Territory (statehood came in 1876).
2. Her younger sister, Henrietta.
3. $14,259 \div 3.281 \approx 4,346$ meters. $14,259 - 7,500 = 6,759$ feet higher.

4. Mont Blanc is the highest mountain in the Alps, on the border of France and Italy, and was famous to British travelers. Her readers in Britain had never seen the Rockies, so comparing Long's Peak with a mountain they knew gave them a sense of its size and grandeur.
5. Six: splintered, pinnacled, lonely, ghastly, imposing, double-peaked. She delays the subject so the reader's eye travels, as hers did, up through the frame of valleys, canyons and ranges before the peak appears; the delay builds suspense and makes the mountain the climax. The words between the dashes add praise ("heaven-piercing ... as glorious a mountain") while still holding back the name. This kind of sentence, with the main point saved for last, is called a periodic sentence.
6. $14,259 \div 500 \approx 28.5$, and $212 - 28.5 \approx 183.5$ °F. The rule is off by about 2.5 °F, close but rough. In Estes Park (about 7,500 feet) water boils near 198 °F, so beans, potatoes and eggs take longer to cook, and baking recipes must be adjusted.

3.7 NELLIE BLY AROUND THE WORLD IN 72 DAYS

OBJECTIVES

- Trace Nellie Bly's route around the world (November 1889 to January 1890) and compare it with the route in Jules Verne's novel.
- Explain how steamships, railways, the Suez Canal and the telegraph made a 72-day circuit possible.
- Calculate with days, hours and time zones, including what happens to the calendar when a traveler circles the globe eastward.

Warm-up. Could you travel for two and a half months with one small bag and the dress you are wearing? Write a list of what you would put in the bag. You will compare it with Bly's list later.

Video slot. Video coming. Nellie Bly's race around the world, 1889–1890: the New York World, Jules Verne at Amiens, the Suez Canal, Elizabeth Bisland and the special train home. Search approved channels (Smithsonian, Library of Congress, PBS American Experience, National Women's History Museum); preview first.

KEY TERMS

Nellie Bly

The pen name of Elizabeth Cochrane (1864–1922), reporter for Joseph Pulitzer's New York World.

stunt journalism

Reporting in which the writer undertakes a daring task to get the story, popular in American newspapers of the 1880s and 1890s.

Suez Canal

The canal across Egypt, opened in 1869, linking the Mediterranean and the Red Sea and cutting thousands of miles from the sea route to Asia.

transcontinental railroad

The railroad across the United States, completed in 1869, which made it possible to cross the country in about a week.

International Date Line

The line, roughly along 180° longitude, where the calendar date changes by one day.

Prime Meridian

The line of 0° longitude through Greenwich, England, agreed as the world's starting point for longitude and time at a conference in 1884.

CORE IDEAS

Elizabeth Jane Cochran was born in 1864 at Cochran's Mills, Pennsylvania. Her father, a mill owner and judge, died when she was six, and the family fell on hard times. In 1885 she read a column in the *Pittsburgh Dispatch* called "What Girls Are Good For" and wrote the editor such a spirited reply that he hired her. He gave her a pen name from a popular Stephen Foster song: **Nellie Bly**. In 1887 she moved to New York and talked her way onto Joseph Pulitzer's *New York World*. Her first big story came from pretending to be insane and spending ten days in the women's asylum on Blackwell's Island; her report of cold, filth and cruelty led the city to spend more on the care of patients.

Jules Verne's novel *Around the World in Eighty Days* (1873) tells of an Englishman, Phileas Fogg, who wagers he can circle the globe in eighty days. Bly proposed to beat him. Her editor said that only a man could do it, since a woman would need a protector and too much luggage. She answered that if a man went for the *World*, she would go the same day for another paper and beat him. On November 14, 1889, at 9:40:30 in the morning, she sailed from Hoboken on the steamship *Augusta Victoria*. She took one dress, which she wore, a heavy coat, and a single small handbag, a gripsack, packed with underclothes, toilet articles, writing materials and a jar of cold cream. She carried her money, English gold and banknotes, in a bag around her neck.

Her route went east. From Southampton she hurried through London and France to Amiens, where Jules Verne and his wife received her and wished her success. A mail train took her to Brindisi in Italy, and the steamer *Victoria* carried her through the Suez Canal and the Red Sea to Aden and across the Indian Ocean to Colombo in Ceylon, where she lost five days waiting for a ship. Then came Penang, Singapore, where she bought a monkey, and Hong Kong. There she learned that a rival magazine, *Cosmopolitan*, had sent its own writer, Elizabeth Bisland, around the world the opposite way on the very day Bly left. From Yokohama she crossed the Pacific on the *Oceanic* to San Francisco, arriving on January 21, 1890.

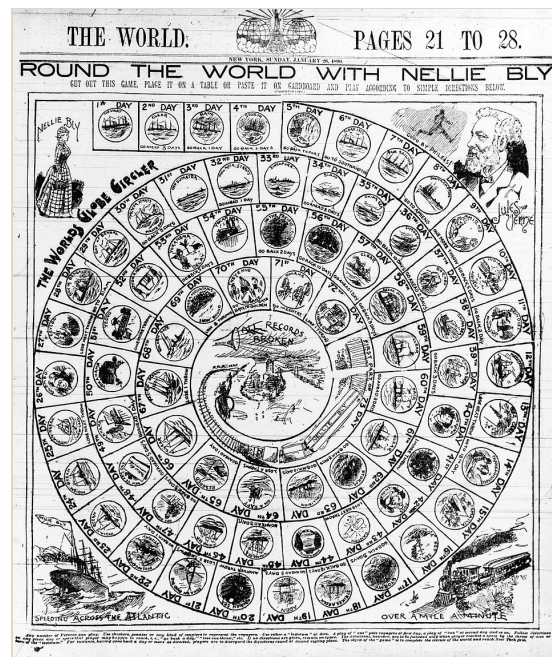
The *World* hired a special train to rush her across America, and crowds met her at stations with bands and cheers. She reached Jersey City at 3:51 p.m. on January 25, 1890, in **72 days, 6 hours, 11 minutes and 14 seconds**, then the fastest trip around the world on record. Bisland, delayed on the Atlantic, arrived four and a half days later. Bly's record did not stand long: later in 1890 the promoter George Francis Train went around in about 67 days, and by 1913 a traveler did it in about 35.

The trip was possible only because of new machines. The Suez Canal and the American transcontinental railroad had both opened in 1869. Steamships kept fixed schedules across every ocean, so a traveler could plan connections days ahead, and when one connection failed, as at Colombo, the whole plan slipped. Undersea telegraph cables let the *World* report her progress to readers almost daily, though she herself often had no news at all. In 1884 an international conference at Washington had chosen Greenwich as the **Prime Meridian**, and American railroads had adopted standard time zones the year before. Geography had not changed; technology had shrunk the time it took to cross it.

Going east meant chasing the sunrise. Every 15° of longitude moved her local clock ahead one hour, and over the whole journey she saw one more sunrise than the people at home. Without a correction she would have counted one day more than had really passed. That is the trick at the end of Verne's novel: Fogg, traveling east, thinks he has arrived a day late, but he has gained a day and is just in time. A traveler fixes the count at the **International Date Line**, roughly along 180° longitude, by repeating a date when crossing it eastward.

Bly's book about the trip, *Nellie Bly's Book: Around the World in Seventy-Two Days*, appeared in 1890, and a board game was printed in her honor. Later she married the manufacturer Robert Seaman and, after his death, ran his Iron Clad Manufacturing Company, which made steel containers, before returning to reporting; during the First World War she wrote from the Eastern Front. She died in New York in 1922. Her journey shows what careful planning, nerve and the machines of a new age could do.

PICTURE STUDY



Round the World with Nellie Bly (game board), Published by the New York World, January 26, 1890 · Color print (lithograph) on paper · Library of Congress, Prints and Photographs Division
Wikimedia Commons · Public domain

The day after Bly came home, the *World* printed this game for its readers. Players moved around the spiral, one square for each day of her trip, from New York to New York. Squares marked her stops, delays and lucky breaks. It is a primary source in pictures: it shows what Americans of 1890 found exciting about her journey.

Look closely

- Find the start and the finish. Where are they on the spiral, and why?
- Find three squares that name places. Are they in the same order as her route in the stop?

- Find the picture of Bly. How is she dressed, and what is she carrying?

Talk about it

1. Why would a newspaper print a game about its own reporter? What did the World gain?
2. If you made a game of a journey from this trail, which journey would you choose, and what would the delay squares say?

HANDS-ON: FOGG'S PLAN AND BLY'S TRIP

Compare the itinerary printed in Verne's novel with Bly's real journey, leg by leg, on a world map and a table.

You will need

- The Primary source aside below
- A world map (outline or atlas) and colored pencils
- A ruler and a calculator
- Your travel journal

Steps

1. Copy the eight legs of the Primary source table into your journal, with a column for days. Add up the column to check the total.
2. On the map, draw Fogg's planned route in one color. Draw Bly's route in another: New York, Southampton, London, Amiens, Brindisi, Port Said, Suez, Aden, Colombo, Penang, Singapore, Hong Kong, Yokohama, San Francisco, New York.
3. Mark where the two routes differ. Bly went by Ceylon instead of Bombay and Calcutta; explain in the margin why a sea route might beat a rail crossing of India for her.
4. Mark the International Date Line on the map, and write beside it what a traveler going east must do with the calendar.
5. Do Practice questions 5 and 6, and write your answers beside the map.

Check your work

- My table matches the source, and the total is 80 days.
- Both routes are on the map in different colors, with the differences marked.
- I marked the Date Line and explained the calendar change.

FIELD NOTEBOOK

1. **Travel journal, Trail C, page 7: Seventy-Two Days.** Paste your map. Draw Bly's one bag and list what she packed beside your own list from the warm-up.
2. **Narration.** Write one paragraph as a New York World reporter on January 25, 1890, telling readers how Bly made it home and which new inventions made the trip possible. A parent keeps this paragraph in the portfolio.

Did you know? Bly had only a few days' notice before she sailed; Elizabeth Bisland, her rival, was given only a few hours. Jules Verne is reported to have told Bly that if she made the trip in seventy-nine days he would applaud with both hands. The monkey she bought in Singapore came all the way home to New York with her.

Primary source. *Jules Verne, "Around the World in Eighty Days," translated by George M. Towle (1873), Chapter III: the newspaper estimate that sets Phileas Fogg's wager. Bly's trip was planned to beat it. Project Gutenberg eBook #103*

Here is the estimate made by the *Daily Telegraph*:—
From London to Suez *viâ* Mont Cenis and Brindisi, by rail and steamboats
..... 7 days
From Suez to Bombay, by steamer 13 "
From Bombay to Calcutta, by rail 3 "
From Calcutta to Hong Kong, by steamer 13 "
From Hong Kong to Yokohama (Japan), by steamer 6 "
From Yokohama to San Francisco, by steamer 22 "
From San Francisco to New York, by rail 7 "
From New York to London, by steamer and rail 9 "

Total 80 days.

Go deeper.

- Nellie Bly, *Nellie Bly's Book: Around the World in Seventy-Two Days* (1890). Project Gutenberg has it as a free audiobook (#20975); the text is free on Wikisource and in many library editions.
- Jules Verne, *Around the World in Eighty Days*, free on Project Gutenberg (#103).
- The Library of Congress's pages on Nellie Bly and the 1890 game board.
- Matthew Goodman, *Eighty Days: Nellie Bly and Elizabeth Bisland's History-Making Race Around the World* (2013) (library).

Goes deeper in. Technology Overcoming Geography, "Steam, Rails and the Shrinking World," and Geography, Grade 8, "Longitude and Time Zones" (coming soon).

For families. Sources: Bly's book; the Verne novel (Towle translation); Library of Congress; Goodman (2013). In the Towle translation the estimate is credited to the *Daily Telegraph*; the dotted leaders and ditto marks (") are printed as in the Gutenberg text and mean "days." Reports of what Bly packed and carried come from her own book; the stop leaves out small details that sources tell differently. Train's 1890 time is usually given as 67 days. Verne's plot turns on a wager, and the stop mentions it only as part of the story.

PRACTICE

1. **EASY** When and where did Bly start and finish, and what was her exact time?
2. **EASY** Whose novel did Bly set out to beat, and who raced her the other way?
3. **MEDIUM** In the Primary source, which leg is the longest, and what fraction of the 80 days does it take? Which two legs are by rail alone?
4. **MEDIUM** Name two things built or agreed in the 1860s–1880s that made Bly’s trip possible, and explain each in a sentence.
5. **CHALLENGE** By how much did Bly beat Phileas Fogg’s 80 days? Give the answer in days, hours, minutes and seconds, and also in total hours to the nearest hour.
6. **CHALLENGE** Bly traveled east all the way around the world. Each 15° of longitude moves local time one hour. How many hours did she set her local watch forward in all, and what does that mean for the number of sunrises she saw compared with people who stayed in New York? What must an eastbound traveler do at the Date Line?

Make it a game · Make Your Own Race-Around-the-World Board. Draw a spiral of 73 squares (day 0 to day 72) on poster board. Label squares with Bly’s real stops, and add delay squares from the stop (“Five days lost at Colombo: go back 5”) and lucky squares (“Special train across America: forward 3”). Use one die and buttons as tokens. Before each move, a player must answer a question about any Trail C journey; a wrong answer loses the turn. First to New York wins.

Scripture. “The LORD shall preserve thy going out and thy coming in from this time forth, and even for evermore.” (Psalm 121:8, KJV)

Bly’s going out from Hoboken and her coming in at Jersey City were watched by thousands of readers. The psalm promises a better watching: the Lord keeps every traveler’s going and coming, the long legs and the delays alike.

Practice: answers

1. She left Hoboken on November 14, 1889, at 9:40:30 a.m., and reached Jersey City on January 25, 1890, at 3:51 p.m.: 72 days, 6 hours, 11 minutes, 14 seconds.
2. Jules Verne’s *Around the World in Eighty Days*; Elizabeth Bisland of *Cosmopolitan* raced westward.
3. Yokohama to San Francisco by steamer, 22 days, which is $22/80 = 11/40$, a little over a quarter. The rail-only legs are Bombay to Calcutta (3 days) and San Francisco to New York (7 days).
4. Any two: the Suez Canal (1869) shortened the sea route to Asia; the transcontinental railroad (1869) let her cross America in days; undersea telegraph cables let the World report her progress; standard time zones (1883) and the Prime Meridian (1884) made schedules and clocks agree; regular steamship lines let her plan connections.
5. $80 \text{ days} - 72 \text{ days } 6 \text{ h } 11 \text{ min } 14 \text{ s} = 7 \text{ days } 17 \text{ h } 48 \text{ min } 46 \text{ s}$. In hours: $7 \times 24 + 17 = 185$ hours 48 minutes, about 186 hours.
6. $360^\circ \div 15^\circ = 24$ hours, one full day. Because she kept moving toward the sunrise, she saw one more sunrise than people at home; if she simply counted sunrises she would think 73

days had passed. At the International Date Line an eastbound traveler repeats a date (sets the calendar back one day) to keep the count correct.

3.8 AMELIA EARHART OVER THE ATLANTIC, 1932

OBJECTIVES

- Tell the story of Amelia Earhart's path from her first flight (1920) through the Friendship flight (1928) to her solo Atlantic crossing (May 20–21, 1932).
- Explain the dangers of the 1932 flight and the navigation and engineering behind it, using numbers.
- Compare Earhart's own words about the 1928 flight with her 1932 achievement, and show how the Atlantic crossing shrank from weeks to hours.

Warm-up. In 1620 the Mayflower took 66 days to cross the Atlantic. In 1932 Amelia Earhart crossed it alone in about 15 hours. Before you read, write down three things that had to be invented between 1620 and 1932 for that to happen.

Video slot. Video coming. Amelia Earhart's 1932 solo transatlantic flight in the Lockheed Vega 5B, from Harbour Grace, Newfoundland, to Culmore, Northern Ireland. Search approved channels (Smithsonian National Air and Space Museum, Purdue University Libraries, Library of Congress, Amelia Earhart Birthplace Museum); preview first.

KEY TERMS

solo nonstop

Flown by one pilot alone, without landing on the way.

Lockheed Vega 5B

The single-engine, high-wing monoplane with a wooden body in which Earhart crossed the Atlantic; it is now in the Smithsonian's National Air and Space Museum.

altimeter

The instrument that tells a pilot the aircraft's height; Earhart's failed during the 1932 flight.

exhaust manifold

The pipes that carry hot gases away from an engine's cylinders; a cracked weld in Earhart's showed flames during the night.

icing

Ice forming on wings and controls in cold cloud, adding weight and spoiling the wing's lift.

Ninety-Nines

The organization of licensed women pilots founded in 1929 by 99 charter members; Earhart was its first president.

CORE IDEAS

Amelia Mary Earhart was born on July 24, 1897, in Atchison, Kansas. When she first saw an airplane at the Iowa State Fair in 1908 she was not impressed; she remembered it as a thing of rusty wire and wood. During the First World War she worked as a nurse's aide in a military hospital in Toronto and watched pilots of the Royal Flying Corps practice. On December 28, 1920, at Long Beach, California, the pilot Frank Hawks took her up for a ten-minute ride, and by the time they landed she knew she had to fly. She took lessons from Neta Snook, saved for her first airplane, a yellow Kinner Airster she called *The Canary*, and in 1922 set a women's altitude record of 14,000 feet. In 1923 she became only the sixteenth woman to receive a pilot's license from the international aviation federation.

Her fame came first from a flight in which she did not fly. In 1928 a wealthy American, Amy Guest, wanted the first woman to cross the Atlantic by air to be an American, and the organizers chose Earhart, then a social worker in Boston. On June 17, 1928, the trimotor seaplane *Friendship*, flown by Wilmer Stultz with Lou Gordon as mechanic, left Trepassey, Newfoundland, and landed at Burry Port, Wales, 20 hours and 40 minutes later. Earhart kept the log. The world cheered her, but she told reporters she had been carried like baggage, "like a sack of potatoes," and she meant to do it herself one day. Her book about the flight, *20 Hrs. 40 Min.*, came out that year; its words are the Primary source for this stop.

Four years later she was ready. Her airplane was a red **Lockheed Vega 5B** with a single Pratt & Whitney Wasp radial engine, its cabin filled with extra fuel tanks. The polar flier Bernt Balchen helped prepare it, and she trained on instrument flying, steering by gauges alone when cloud hid the horizon. She chose to leave from Harbour Grace, Newfoundland, the North American airfield closest to Europe, and to aim for Paris, as Charles Lindbergh had done. She took off on the evening of May 20, 1932, exactly five years after Lindbergh began his flight.

The night went wrong almost at once. Her **altimeter** failed, so in cloud she could not know her height above the sea. Through a crack in a weld on the **exhaust manifold** she could see flames, and they grew worse through the night. She flew into a storm, and when she climbed to escape it, **icing** loaded the wings until the Vega fell into a spin; she recovered so low that she could see the whitecaps. Fuel began leaking from a reserve tank into the cabin. Her only meal was a can of tomato juice sipped through a straw. When daylight came she decided not to risk going on to Paris and turned for the first land she could find.

That land was Ireland. After about 14 hours and 56 minutes and some 2,026 miles, she landed in a pasture at Culmore, just north of Londonderry, in Northern Ireland, scattering the cows. A farmhand who ran up is said to have asked whether she had come far. "From America," she answered. She was the first woman and the second person, after Lindbergh, to fly the Atlantic alone without stopping, and her time was the fastest crossing yet. Congress awarded her the Distinguished Flying Cross, and President Herbert Hoover presented her with the gold medal of the National Geographic Society.

Her achievement makes sense only alongside the slow conquest of the Atlantic. The *Mayflower* took 66 days in 1620. Steam liners of the 1900s crossed in under a week; the fastest of the early 1930s took about four or five days. Lindbergh's 3,600-mile flight from New York to Paris in 1927 took 33½ hours. Earhart crossed a shorter but stormier route in under 15 hours, alone, with no radio contact worth the name. She navigated by compass, airspeed and the clock, the same **dead reckoning** Columbus used, now at about 135 miles an hour instead of 5.

Earhart used her fame to encourage others into aviation. She had helped found the Ninety-Nines and served as its first president, and she wrote and lectured widely; her second book, *The Fun of It*, appeared in 1932. In 1937, attempting to fly around the world near the equator, she and her navigator Fred Noonan disappeared over the Pacific near Howland Island. A great search by the U.S. Navy and Coast Guard found nothing, and what happened is still unknown. Her solo flight of 1932 remains what it was: a feat of courage resting on careful preparation.

PICTURE STUDY



A Portrait of Amelia Earhart, Unknown photographer, 1928 · Photograph, printed in Earhart's book *20 Hrs. 40 Min.* (1928) · From the 1928 book; digital copy on Wikimedia Commons
Wikimedia Commons · Public domain

This photograph appeared in Earhart's first book, published a few months after the Friendship flight, when she was thirty and suddenly famous. Photographs like this one went around the world in newspapers and magazines. Earhart understood that a picture could do as much as a speech to make flying seem possible for ordinary people.

Look closely

- Look at her face and expression. What three words would you use to describe the person you see?
- Look at her clothes and hair. Are they suited to flying, to a lecture hall, or to both?
- Look at the light and background. Is this a candid snapshot or a posed portrait? How can you tell?

Talk about it

1. In 1928 Earhart was famous for a flight she did not pilot. How might she have felt about portraits like this one, given what she told reporters?
2. Why would a publisher put the author's portrait in a book about a flight? What does the picture add that the words cannot?

HANDS-ON: FLIGHT PLAN: HARBOUR GRACE TO LONDONDERRY

Work out Earhart's 1932 flight as a navigator would, and compare it with the 1928 flight she described in her own words.

You will need

- A map or globe of the North Atlantic (a string on a globe shows a great-circle route)
- Ruler, protractor and calculator
- The Primary source aside below
- Your travel journal

Steps

1. Mark Harbour Grace (Newfoundland), Culmore near Londonderry (Northern Ireland), Paris, Trepassey and Burry Port (Wales).
2. Draw the 1932 route in red and the 1928 Friendship route in blue. Stretch string on a globe between Harbour Grace and Londonderry and notice that the shortest path curves north on a flat map.
3. Compute the 1932 average speed: 2,026 miles in 14 hours 56 minutes. Then compute how far she would drift in one hour with a 20 mph crosswind she did not correct for. Write both in your journal.
4. Read the Primary source. Write three sentences: what Earhart's role was in 1928, how she felt about being asked, and what changed by 1932.
5. Make a timeline bar of Atlantic crossing times: Mayflower (66 days), a 1930s liner (about 5 days), Lindbergh (33½ hours), Earhart (about 15 hours). Draw it to scale in hours and comment on what the scale shows.

Check your work

- My map shows both flights with their start and end points.
- I computed the average speed and the drift correctly and showed my work.
- My three sentences use the Primary source.

- My timeline bar is drawn to scale.

FIELD NOTEBOOK

1. **Travel journal, Trail C, page 8: Over the Atlantic.** Paste your map and timeline.
Draw the Vega 5B in side view and label the engine, the wing, the cockpit and the extra fuel tanks.
2. **Narration.** Write one paragraph telling the night of May 20-21, 1932, from Earhart's point of view, using at least three facts about the dangers she met. A parent keeps this paragraph in the portfolio.
3. **Trail C reflection.** On the last page, list the eight travelers of this trail and write one line for each: what they were looking for, and what they found.

Did you know? Earhart's red Vega 5B hangs in the Smithsonian's National Air and Space Museum in Washington. In August 1932 she flew the same airplane nonstop across the United States, from Los Angeles to Newark, the first woman to do so. In January 1935 she also became the first person to fly solo from Hawaii to California.

Primary source. *Amelia Earhart, "20 Hrs. 40 Min.: Our Flight in the Friendship" (1928), Chapter V, "Preparations," and a line from the notes she kept on the flight, as printed in the book; Project Gutenberg eBook #73448*

A few days later I was told the flight actually would be made and that I could go—if I wished. Under the circumstances there was only one answer. I couldn't say no. For here was fate holding out the best in the way of flying ability in the person of Wilmer Stultz, pilot, aided by Lou Gordon as flight mechanic; and a beautiful ship admirably equipped for the test before it.

The sea looks like the back of an elephant, the same kind of wrinkles.

Go deeper.

- Smithsonian National Air and Space Museum: the online object page for Earhart's Lockheed Vega 5B.
- Purdue University Libraries, George Palmer Putnam Collection of Amelia Earhart Papers, with digitized flight logs, maps and photographs.
- Amelia Earhart, *20 Hrs. 40 Min.* (1928), free on Project Gutenberg (#73448).
- A second video topic: how a 1930s pilot navigated by dead reckoning and the magnetic compass.

Goes deeper in. Technology Overcoming Geography, "The Age of Flight," and Geography, Grade 8, "The North Atlantic" (coming soon).

For families. Sources: Smithsonian National Air and Space Museum; Purdue University Libraries; Earhart's 1928 book. The flight time is usually given as 14 hours 56 minutes

and the distance as about 2,026 miles; some books round to 15 hours and 2,000 miles. The “sack of potatoes” remark comes from newspaper interviews in 1928, and the farmhand’s question is the traditional account. The 1937 disappearance is told without speculation; many theories exist, and none is proven. The photograph was printed in a 1928 book and is public domain in the United States; the photographer is not named.

PRACTICE

1. **EASY** From where to where did Earhart fly alone in 1932, and on what dates?
2. **EASY** What was Earhart’s role on the 1928 Friendship flight, and who flew the airplane?
3. **MEDIUM** Name three things that went wrong during the 1932 flight and explain why each was dangerous.
4. **MEDIUM** In the Primary source, why does Earhart say she “couldn’t say no”? What does her phrase “fate holding out the best” tell you about how she saw the chance?
5. **CHALLENGE** Earhart flew about 2,026 miles in 14 hours 56 minutes. Find her average speed. Lindbergh flew 3,600 miles in 33½ hours; find his. Who was faster on average, and give one reason the comparison is not quite fair.
6. **CHALLENGE** Over a flight of about 15 hours, suppose a 20 mph crosswind blows from the south and the pilot never corrects for it. How far off course would the plane drift by the end? If the coast of Ireland runs roughly north and south and is about 300 miles long, why did Earhart’s choice to land on the first land she could find make sense?

Make it a game • Instrument Flight. Set up a simple course of chairs. The “pilot” wears a blindfold (cloud) and holds a paper plate as a control wheel. The “instrument panel” is a partner who may only say “left,” “right,” “straight” or “climb” (step over a rope). If the pilot touches a chair, the flight is lost to “icing.” Switch roles and time each flight. Afterward talk about why Earhart trained to trust instruments rather than her own sense of balance in cloud.

Scripture. “But they that wait upon the LORD shall renew their strength; they shall mount up with wings as eagles; they shall run, and not be weary; and they shall walk, and not faint.” (Isaiah 40:31, KJV)

Earhart mounted up with wings of wood and steel and was exhausted by morning. The prophet speaks of a strength no engine supplies: the Lord renews those who wait on Him, whether they fly, run or simply keep walking.

Practice: answers

1. From Harbour Grace, Newfoundland, to a pasture at Culmore near Londonderry, Northern Ireland, on May 20–21, 1932.
2. She was a passenger who kept the log; Wilmer Stultz was the pilot and Lou Gordon the flight mechanic.
3. Any three: the altimeter failed (she could not tell her height above the sea in cloud); flames from a cracked exhaust manifold (risk of fire or structural failure); icing (added weight and

loss of lift, which put the plane into a spin); a fuel leak into the cabin (fire risk and fumes, and lost fuel).

4. Because the flight had the best pilot and mechanic she could hope for and a well-equipped airplane. She saw it as a rare opportunity that might never come again, one she would regret refusing.
5. $14\text{ h }56\text{ min} \approx 14.93\text{ h}$; $2,026 \div 14.93 \approx 136\text{ mph}$. Lindbergh: $3,600 \div 33.5 \approx 107\text{ mph}$. Earhart was faster on average. The comparison is not quite fair because they flew different airplanes five years apart, different distances and routes, and in different weather and winds.
6. $20 \times 15 = 300$ miles of drift to the north. That is enough to miss a small target like Paris or an airfield, but Ireland is a long, wide target across her path; aiming at a coast rather than a point allows for errors in dead reckoning, especially with a broken altimeter and a leaking fuel tank.

TRAIL 3 BADGE QUIZ

The badge quiz is optional and may be done orally or in writing. Answers should be complete sentences; for the starred questions, show your work or reasoning. Four right out of five earns the first badge; four right out of six earns the second. Badges and the certificate are earned by doing the stops, not by scores.

Badge quiz 1 (Stops 1-5)

1. Why did Abram's family travel by way of Haran rather than straight west from Ur to Canaan?
2. What is the Gallio inscription, and why does it matter for Paul's journeys?
3. Give one argument that Marco Polo never reached China and one answer to it.
4. *Columbus believed Japan lay about 2,400 nautical miles west of the Canaries; the real distance is about 10,600. By about what factor did he underestimate the distance, and why did he still find land?
5. What did Jefferson name as "the object" of the Lewis and Clark mission, and how did Sacagawea help the expedition reach its goal?

Badge quiz 2 (Stops 6-8)

6. How did Isabella Bird's letters become a book, and to whom were they written?
7. *Long's Peak is 14,259 feet high. About how many meters is that, and why does food take longer to cook at high altitude?
8. Name two inventions or agreements of 1869-1884 that made Nellie Bly's 72-day trip possible.
9. *A traveler goes all the way around the world eastward. How many hours in all does local time move forward, and what must the traveler do at the International Date Line?
10. *Earhart flew about 2,026 miles in about 15 hours. Find her average speed, and name two dangers she met on the flight.
11. Put these Atlantic crossings in order from slowest to fastest and give the time of each: Earhart (1932), the Mayflower (1620), Lindbergh (1927), Columbus's outbound crossing from the Canaries (1492).

TRAIL CERTIFICATE: MY TRAIL C TRAVEL JOURNAL AND CERTIFICATE

Gather the eight Trail C pages of your travel journal, each with a map of the journey, the dates and distances, your project work, and your narration paragraph.

Add a title page, "Great Journeys," with your name and the dates you worked, and a final page comparing two of the journeys: which was harder, which changed the world more, and why. Support your answer with at least one quotation from a primary source.

When the journal is complete, a parent reads the narrations, signs the Trail C certificate, and keeps the narration paragraphs in the student's portfolio.

- **Maps:** Each journey is mapped with a scale, labeled places and a route; distances are measured, not guessed.
- **Sources:** Primary sources are quoted exactly and named; the student explains what each source shows and what it cannot prove.
- **Reasoning and numbers:** Calculations of distance, speed, time and cost are correct and shown; conclusions follow from evidence.
- **Narration and judgment:** Eight clear narration paragraphs in the student's own words; travelers' achievements and wrongs are described honestly and fairly.

Answer key

1. The straight route crosses the Syrian Desert, with too little water and pasture for flocks; the Fertile Crescent route followed the Euphrates and the trade road through Haran.
2. A stone inscription found at Delphi that dates Gallio's term as governor of Achaia to about A.D. 51–52; since Paul stood before Gallio at Corinth (Acts 18:12), it fixes the date of the second journey.
3. Argument: he never mentions the Great Wall, tea, chopsticks or Chinese writing (any one). Answer: the familiar Great Wall was mostly built later under the Ming; he lived among Mongols and foreigners; and his details of paper money, salt and the princess's envoys match Chinese records (any one).
4. $10,600 \div 2,400 \approx 4.4$, so he underestimated by a factor of about four and a half. He found land because the Americas, unknown to Europe, lay in the way, at about the distance he expected to find Asia.
5. To find the most direct and practicable water route across the continent for commerce. Sacagawea interpreted with the Shoshone, recognized landmarks, and her brother Cameahwait's people supplied the horses needed to cross the Rockies; her presence also signaled peace to the tribes.
6. She wrote them to her sister Henrietta; they were printed in the magazine *The Leisure Hour* in 1878 and as *A Lady's Life in the Rocky Mountains* in 1879.
7. About 4,346 meters ($14,259 \div 3.281$). Lower air pressure makes water boil at a lower temperature (about 186 °F at the summit), so food in boiling water cooks more slowly.
8. Any two: the Suez Canal (1869), the transcontinental railroad (1869), regular steamship lines, undersea telegraph cables, standard time zones (1883), the Prime Meridian at Greenwich (1884).
9. 24 hours ($360^\circ \div 15^\circ$ per hour). Crossing the Date Line eastward, the traveler repeats a date, setting the calendar back one day.
10. About 135 mph ($2,026 \div 15$). Any two: failed altimeter, flames from a cracked exhaust manifold, icing and a spin, a fuel leak, storms.
11. The Mayflower (66 days); Columbus (about 33–36 days from the Canaries); Lindbergh ($33\frac{1}{2}$ hours); Earhart (about 15 hours).

TRAVEL AND FARAWAY PLACES TRAIL D: ARMCHAIR TOUR OF FARAWAY PLACES

The fourth trail of the Travel track is a tour of eight famous places without leaving home: the Holy Land of Jerusalem, Bethlehem and Galilee; Rome and its Colosseum; London and its Tower; Paris and the Eiffel Tower; the Swiss Alps; the pyramids of Egypt; Japan and Mount Fuji; and two of America's great national parks, Yellowstone and the Grand Canyon. At each stop the student studies the land itself (its rivers, mountains, volcanoes and canyons), the people who built or explored there, and the faith and history that give the place its meaning.

This is the  **Expert** level, for ages 14 and up, at a high-school standard. Each stop takes 35 to 50 minutes and stands by itself. The student reads a real primary source: a traveler, an ancient historian, a diarist, a climber or an act of Congress. The student checks its claims with numbers, maps and other evidence, works six practice problems (two of them challenges), and writes a narration paragraph for the parent to keep. Each stop adds a **postcard** to a set of eight and a page to the **travel journal** in the Field Notebook.

Five stops earn the **Armchair Traveler badge, part 1**; eight stops earn part 2 and the **Trail D certificate**. The badge quizzes at the end are optional.

BEFORE YOU BEGIN

- Read a page of nineteenth-century prose and summarize it in your own words.
- Use a map scale bar, work with percentages and ratios, and do multi-step arithmetic with a calculator.

MASTERY CHECKLIST

- ☐ I can locate all eight places on a world map and explain how the land (rivers, mountains, rifts, volcanoes, canyons) shaped what happened there.
- ☐ I can read a primary source closely, tell fact from opinion in it, and check its claims against other evidence.
- ☐ I can use real measurements to estimate sizes, speeds, temperatures and distances, and explain my reasoning.
- ☐ I can tell honestly what is known and what is tradition or estimate, and explain how Scripture and Christian history connect to these places.
- ☐ I have made eight postcards, eight travel-journal pages and eight narration paragraphs.

OPTIONAL BOOKS AND RESOURCES

- **Project Gutenberg** (<https://www.gutenberg.org>): Free full texts of the trail's primary sources: Twain's *Innocents Abroad*, Suetonius, Pepys, Vogel on the Eiffel Tower,

Whympers' *Scrambles Amongst the Alps*, Amelia Edwards and Lafcadio Hearn, plus Powell's *Canyons of the Colorado*.

- **National Archives: Milestone Documents** (<https://www.archives.gov/milestone-documents/act-establishing-yellowstone-national-park>): The Yellowstone Act of 1872, with a scan of the original and a full transcript, for Stop D8.
- **Historic Royal Palaces: Tower of London** (<https://www.hrp.org.uk/tower-of-london/>): History of the White Tower, the Crown Jewels and the Tower's prisoners, for Stop D3.
- **National Park Service** (<https://www.nps.gov>): Free maps, park histories, the Old Faithful webcam and geyser predictions, and Junior Ranger materials for Stop D8.
- **The Metropolitan Museum of Art: Heilbrunn Timeline of Art History** (<https://www.metmuseum.org/toah/>): Free essays on the pyramids of Giza and on Hokusai and Japanese woodblock prints, for Stops D6 and D7.
- **H. V. Morton, *In the Steps of the Master* (1934) and *A Traveller in Rome* (1957)** (<https://www.worldcat.org>): Classic travel books by a British writer who walked the Gospel lands and the streets of Rome. Look for them at the library for Stops D1 and D2.

4.1 THE HOLY LAND: JERUSALEM, BETHLEHEM, GALILEE

OBJECTIVES

- Explain how the land between the Mediterranean and the Jordan Rift Valley rises and falls, and why Jerusalem, Bethlehem and Galilee each sit where they do.
- Read Mark Twain's 1867 eyewitness description of Jerusalem as a primary source and use its numbers to estimate the size of the old walled city.
- Trace the life of Christ from Bethlehem to Galilee to Jerusalem on a map and write a narration of the journey.

Warm-up. On a map of the eastern Mediterranean, find Jerusalem, Bethlehem, Nazareth and the Sea of Galilee. Guess the straight-line distance from Nazareth to Jerusalem before you measure it with the map's scale bar. Then write one sentence: why might a whole history of the world have happened in so small a country?

Video slot. Video coming. Geography of the Holy Land: the Judean hills, the Jordan Rift Valley, the Sea of Galilee and the Old City of Jerusalem; the Church of the Nativity in Bethlehem. Search approved channels (Answers in Genesis, Bible Land Passages, the Israel Museum, Smithsonian Channel); preview first.

KEY TERMS

Jordan Rift Valley

The long, deep trough that runs north to south along the eastern side of the land, holding the Sea of Galilee, the Jordan River and the Dead Sea; its floor is the lowest dry land on earth.

Judean hills

The limestone ridge, about 2,000 to 3,300 feet high, that forms the spine of southern Israel; Jerusalem and Bethlehem both sit on it.

Old City

The part of Jerusalem inside the stone walls built by the Ottoman sultan Suleiman the Magnificent between 1537 and 1541, about 2½ miles around.

Church of the Nativity

The church in Bethlehem built over the cave long honored as Christ's birthplace; begun under Constantine in the 320s and rebuilt under Justinian in the 500s, it is one of the oldest churches still in daily use.

Sea of Galilee

A freshwater lake about 13 miles long and 8 miles wide, nearly 700 feet below sea level, where Jesus called fishermen to follow Him and did much of His preaching.

pilgrim

A traveler who journeys to a holy place for worship, prayer or remembrance; Christians have made pilgrimages to the Holy Land since at least the 300s.

CORE IDEAS

A small land at a crossroads. The land of the Bible is tiny. The old phrase “from Dan even to Beersheba” (Judges 20:1) covers only about 150 miles from north to south, about the drive from Philadelphia to New York and a little more. Yet it sits on the land bridge between Africa and Asia, with the sea on one side and desert on the other, so every army and trader moving between Egypt and Mesopotamia had to pass through it. That is one reason so much history was made here, and one reason it has been fought over so often.

Ridge and rift. Cross the land from west to east and you climb and then fall. From the flat coastal plain you rise into the **Judean hills**, a limestone ridge where Jerusalem stands about 2,500 feet above the sea. Then, in less than 20 miles, the ground drops through dry wilderness into the **Jordan Rift Valley**, where the surface of the Dead Sea lies more than 1,400 feet below sea level. Rain comes from the west in winter and falls on the hills; the eastern slopes lie in a “rain shadow” and are desert. That is why Jesus could tell of a man going “down from Jerusalem to Jericho” (Luke 10:30): it is downhill nearly the whole way, more than 3,300 feet in some 15 miles.

Bethlehem. About six miles south of Jerusalem on the same ridge lies Bethlehem, the town of Ruth and of David, named by the prophet Micah some seven hundred years before Christ as the birthplace of Israel’s ruler. Early Christians remembered a cave there as the place of His birth. In the 320s the emperor Constantine and his mother Helena built a church over it, and after it was damaged the emperor Justinian rebuilt it in the 500s. The **Church of the Nativity** still stands; its main door was made so low, probably to keep out carts and horsemen, that visitors must stoop to enter.

Galilee. Some 65 miles north of Jerusalem the hills open into greener country around the **Sea of Galilee**. Here the Lord grew up in Nazareth, called the fishermen Peter, Andrew, James and John, made Capernaum His home base, and did much of His teaching and many of His miracles. The lake sits in the rift nearly 700 feet below sea level, ringed by hills; cool air pouring down from them can stir up sudden storms like the one the disciples met in Mark 4. In 1986, when drought lowered the lake, two brothers from a nearby kibbutz found the hull of a fishing boat about 27 feet long, dated to around the first century; it is now shown in a museum on the shore.

Jerusalem. The city stands on hills cut by two valleys, the Kidron on the east and the Hinnom on the south and west. David made it his capital about 1000 B.C., and Solomon built the Temple there. Herod the Great rebuilt the Temple on a vast platform in the time of Christ, and the Romans destroyed it in A.D. 70, as Jesus had foretold (Luke 21:6). The great stones of the platform’s western retaining wall still stand. The walls around today’s **Old City**, though, are much later: the Ottoman sultan Suleiman built them in the 1530s, and they run only about 2½ miles around.

A traveler's eye. In 1867 Mark Twain sailed to the Holy Land on the steamship *Quaker City* with a party of American tourists and pilgrims, and in 1869 he published their trip as *The Innocents Abroad*. Twain was a humorist and often a skeptic, and he poked fun at guides and at his fellow travelers. But his description of Jerusalem is careful and exact. He found a small, crowded, domed city of perhaps 14,000 people. The greater Jerusalem of today is home to about a million. A good historian reads an old travel book for both kinds of facts: what the writer saw, and what has changed since.

Why it matters. Christianity is a faith about events that happened in real places: a birth in Bethlehem, a ministry in Galilee, a cross and an empty tomb outside a city wall in Jerusalem. The geography does not prove the Gospel, but it fits it. Luke wrote that he had “perfect understanding of all things from the very first” (Luke 1:3), and his roads, distances and climbs are the roads, distances and climbs that travelers still walk.

PICTURE STUDY



Jerusalem, from the Mount of Olives, April 8th 1839, David Roberts (lithograph by Louis Haghe), Drawn 1839; published in the 1840s · Hand-colored lithograph, from Roberts's *The Holy Land* · Library of Congress, Prints and Photographs Division (this copy)
Wikimedia Commons · Public domain

David Roberts was a Scottish painter who began life as a house painter and stage-scenery artist. In 1838–1839 he traveled through Egypt and the Holy Land, sketching on the spot, and the master printmaker Louis Haghe turned his drawings into lithographs. Published as *The Holy Land*, they gave Victorian families their first accurate pictures of places they knew only from the Bible. Roberts drew this view from the Mount of Olives, east of the city, across the Kidron Valley, almost thirty years before Twain arrived.

Look closely

- Find the city wall. Trace it with your finger. Does the city look large or small next to the hills around it?
- Find the largest dome inside the walls. Twain called it the “Mosque of Omar”; today it is known as the Dome of the Rock, built about A.D. 691 on the old Temple platform.
- Find the travelers in the foreground. What are they doing, and how does Roberts use them to show the size of the land?

Talk about it

1. Twain wrote that the city looked as if it were roofed “with inverted saucers.” Can you see what he meant in this picture?
2. Roberts drew this scene in 1839 and Twain wrote in 1867. Why are two independent witnesses who agree more convincing than one?

Safety first. Travel safety: before any trip to the Holy Land, a parent should read the current U.S. State Department travel advisory for each place on the route, carry passports at all times (checkpoints are common), dress modestly for holy sites, and stay with the group in the crowded lanes of the Old City.

HANDS-ON: MEASURE A CITY WITH A TRAVELER’S WORDS

Use Twain’s description (the primary source in this stop) and a modern map to estimate the size of old Jerusalem, then write the first postcard of the trail and a travel-journal page.

You will need

- The primary source in this stop
- A printed or online map of Jerusalem’s Old City with a scale bar
- A piece of string or a strip of paper, a ruler and a calculator
- An index card or blank postcard and colored pencils

Steps

1. Read the primary source aloud. Underline every fact you could check on a map today (a gate, a building, a distance or a time).
2. Lay the string around the Old City wall on your map. Measure it against the scale bar. Write the length in miles. (You should find roughly 2½ miles.)
3. Twain says a fast walker could go all the way around in an hour. Divide your distance by 1 hour. Is that a believable walking speed? (Most adults walk about 3 miles an hour.)
4. Find the Damascus Gate on your map and mark it. Find the building Twain called the Mosque of Omar and write its modern name beside it.
5. Make Postcard 1: on the front draw the domed skyline from the picture study; on the back write four sentences to a friend as if you were Twain’s fellow traveler in 1867, using two facts from the source.
6. In your travel journal, add a page titled “The Holy Land” with a sketch map showing Bethlehem, Jerusalem, Nazareth, the Sea of Galilee and the Dead Sea, with their

elevations.

Check your work

- I measured the wall with a scale bar and tested Twain's one-hour claim with arithmetic.
- I matched Twain's 1867 names to modern names.
- My postcard uses two facts from the primary source, and my journal map shows five places with elevations.

FIELD NOTEBOOK

1. **Journal page D1: The Holy Land.** Draw a west-to-east cross-section from the Mediterranean through Jerusalem to the Dead Sea. Label sea level, Jerusalem (about +2,500 feet) and the Dead Sea (about -1,400 feet).
2. **Narration (parent keeps).** Without looking at your notes, write one well-built paragraph of eight to ten sentences tracing the life of Christ through the land: Bethlehem, Nazareth, the Sea of Galilee and Jerusalem. Include at least two distances or elevations and explain how the land's shape shows up in the Gospels. Date it and give it to a parent for the portfolio.

Did you know? The Sea of Galilee is called by four names in Scripture and history: Chinnereth (Numbers 34:11), the lake of Gennesaret (Luke 5:1), the Sea of Tiberias (John 21:1) and the Sea of Galilee. The fishing boat found in its mud in 1986 was so fragile that it was packed in polyurethane foam and floated across the lake to be preserved; it took years of soaking in wax solution before it could be dried and displayed.

Primary source. *Mark Twain, The Innocents Abroad (1869), Chapter LIII, from the Project Gutenberg text (eBook #5693)*

A fast walker could go outside the walls of Jerusalem and walk entirely around the city in an hour. I do not know how else to make one understand how small it is. The appearance of the city is peculiar. It is as knobby with countless little domes as a prison door is with bolt-heads. Every house has from one to half a dozen of these white plastered domes of stone, broad and low, sitting in the centre of, or in a cluster upon, the flat roof. Wherefore, when one looks down from an eminence, upon the compact mass of houses (so closely crowded together, in fact, that there is no appearance of streets at all, and so the city looks solid,) he sees the knobbiest town in the world, except Constantinople. It looks as if it might be roofed, from centre to circumference, with inverted saucers. The monotony of the view is interrupted only by the great Mosque of Omar, the Tower of Hippicus, and one or two other buildings that rise into commanding prominence.

Go deeper. H. V. Morton, *In the Steps of the Master* (1934), a British journalist's walk through the Gospel places. Mark Twain, *The Innocents Abroad*, Chapters LIII-LVI (Jerusalem and Bethlehem; parents may wish to preview, as Twain's humor is sometimes

irreverent). The Library of Congress online collection of David Roberts's *Holy Land* lithographs. Second video topic: the Galilee boat ("Jesus boat") and how it was preserved.

Goes deeper in. Geography, Grade 8, "Southwest Asia and the Holy Land," and History, "The Life of Christ" (coming soon).

For families. Sources: Project Gutenberg eBook #5693 (Twain); Library of Congress (Roberts lithograph); Israel Antiquities Authority and the Yigal Allon Centre on the Galilee boat. Elevations and distances are rounded. The population of Jerusalem in 1867 is Twain's own estimate; other counts of the 1860s run somewhat higher. Twain's "Mosque of Omar" is the Dome of the Rock; the tower he calls Hippicus is part of the citadel by the Jaffa Gate, now usually called the Tower of David. The stop keeps to geography and history and does not take up present-day political disputes; Bethlehem today lies in the West Bank, and travel there requires checking current advisories.

PRACTICE

1. **EASY** Name the three places of this stop and one event in the life of Christ that happened in each.
2. **EASY** In the primary source, what does Twain compare the domes of Jerusalem to? Give both comparisons.
3. **MEDIUM** Jerusalem stands about 2,500 feet above sea level and Jericho about 850 feet below. How far does a traveler descend "from Jerusalem to Jericho"?
4. **MEDIUM** Why is the land east of Jerusalem a desert when the hills west of it get winter rain?
5. **CHALLENGE** Twain says a fast walker could circle the walls in an hour. The Old City wall is about 2½ miles long, but a walker outside it must go around towers, valleys and steps, so the path is perhaps 20 percent longer. What speed would the walker need? Was Twain's claim reasonable?
6. **CHALLENGE** Twain was a skeptic who often mocked what he saw on the trip, yet historians still use his description of Jerusalem. Write three or four sentences explaining when a writer's opinions should make us doubt his facts, and when they need not.

Make it a game • Up to Jerusalem. Tape a line on the floor for sea level. Players start on a chair for the Judean hills (Jerusalem). A caller names a place and its height: "Dead Sea, minus 1,400!", "Mount of Olives, plus 2,600!", "Sea of Galilee, minus 700!", "Mediterranean coast, zero!". Players crouch low, stand tall, kneel or stand on the line to match. The slowest or wrongest becomes the next caller. Finish by reciting Micah 5:2 together.

Scripture. "But thou, Beth-lehem Ephratah, though thou be little among the thousands of Judah, yet out of thee shall he come forth unto me that is to be ruler in Israel; whose goings forth have been from of old, from everlasting." (Micah 5:2, KJV)

Micah named the little town some seven centuries before the birth, and in Matthew 2:5–6 the chief priests and scribes quoted this very verse to Herod when the wise men came asking for the newborn King. Notice the two halves: the Ruler comes forth from a small place on a map, yet His goings forth are “from everlasting.” The land is small; the King is not.

Practice: answers

1. Bethlehem: His birth. Galilee: calling the fishermen, teaching and miracles (for example, calming the storm). Jerusalem: the cross and the resurrection (or the cleansing of the Temple, the Last Supper).
2. The bolt-heads on a prison door, and inverted (upside-down) saucers.
3. $2,500 + 850 =$ about 3,350 feet, roughly two-thirds of a mile straight down.
4. Rain clouds come from the Mediterranean in the west and drop their rain as they rise over the Judean hills. The air sinking down the eastern side is dry, so the eastern slopes lie in a rain shadow.
5. $2.5 \times 1.2 = 3$ miles in one hour, so 3 miles per hour. That is an ordinary brisk adult pace, so Twain’s claim is reasonable; a “fast walker” would finish with a little time to spare.
6. Sample: A writer’s opinions color his judgments, so we should weigh his praise and scorn with care. But plain facts he could see and measure, such as the size of the city, the domes and the buildings, are less likely to be bent by opinion, especially when they agree with other witnesses like Roberts’s 1839 drawing. A skeptic who describes a place exactly may even be a stronger witness on those points, because he had no reason to make the Holy Land look better than it was.

4.2 ROME AND THE COLOSSEUM

OBJECTIVES

- Explain who built the Colosseum, when, with what materials and money, and how its design moved tens of thousands of people.
- Read Suetonius on Vespasian and Titus as a primary source, and compare an ancient writer's claims with the evidence of the building itself.
- Weigh the Christian traditions about the Colosseum honestly, separating what is recorded from what is remembered.

Warm-up. Find Rome on a map of Italy: about halfway down the west side of the “boot,” on the Tiber River, some 15 miles from the sea. Then make a quick list: what does a stadium need besides seats? (Think about getting 50,000 people in and out, shade, water and safety.) Keep the list and check it against the Romans at the end of the stop.

Video slot. Video coming. How the Colosseum was built: travertine, concrete, arches, the 80 entrances, the velarium awning and the underground hypogeum. Search approved channels (Smithsonian Channel, the Parco archeologico del Colosseo, PBS Secrets of the Dead (preview first), Khan Academy art history); preview first.

KEY TERMS

Flavian Amphitheatre

The Colosseum's ancient name, from the Flavian family of emperors (Vespasian, Titus and Domitian) who built it between about A.D. 70 and 90.

amphitheatre

From Greek words meaning “theatre on both sides”: an oval or round arena with seats rising all the way around it.

travertine

A hard, cream-colored limestone quarried near Tivoli, about 20 miles from Rome; the Colosseum's outer wall is made of it.

vomitorium

A passage that let crowds “spew out” of the seating quickly into the corridors and stairs (plural vomitoria). It has nothing to do with being sick.

hypogeum

The underground maze of tunnels, cages and lifts beneath the arena floor, added under Domitian, from which animals and scenery were raised by hand-turned lifts.

Suetonius

A Roman writer (about A.D. 70 to after 122) who served as a secretary to the emperor Hadrian and wrote *The Lives of the Twelve Caesars*.

CORE IDEAS

An emperor's gift on a tyrant's lake. In A.D. 64 a great fire burned much of Rome. The emperor Nero blamed the Christians and put many to death, then took over the ruined center of the city for a vast pleasure palace, the Golden House, with an artificial lake. After Nero's death and a year of civil war, the general Vespasian became emperor in 69. He drained Nero's lake and began building on that spot a huge amphitheatre for the people, as Suetonius tells it, an idea Augustus had once had. It was a shrewd move: land one tyrant had taken for himself was handed back to the public.

Paid for by war. In A.D. 70 Vespasian's son Titus captured Jerusalem and destroyed the Temple, the event Jesus foretold. The treasure carried back to Rome, along with thousands of Jewish captives, helped pay for and build the new arena. A dedication inscription, pieced together by scholars from the holes left by its long-lost bronze letters, appears to say that the emperor built it "from the spoils." The Arch of Titus, a short walk away, still shows Roman soldiers carrying the Temple's golden lampstand in triumph.

Built fast, built to last. Titus dedicated the building in A.D. 80 with 100 days of games, and his brother Domitian finished it. It is an ellipse about 620 by 513 feet, and its outer wall rose about 157 feet in four stories. The Romans used each material for its strength: some 100,000 cubic meters of **travertine** for the main piers and outer wall, tuff and brick for inner walls, and Roman concrete for the vaults. The stones were held with iron clamps; in the Middle Ages people chiseled the metal out, which is why the walls are pocked with holes today.

A machine for crowds. Estimates of the crowd run from 50,000 to more than 70,000. Eighty arches ringed the ground floor; seventy-six were numbered in Roman numerals, and a spectator's token showed his gate, level and section, much like a modern ticket. Stairs and **vomitoria** let the building empty quickly. Sailors from the fleet worked a huge canvas awning, the velarium, to shade the seats. Seating followed rank: senators near the arena, ordinary citizens higher up, women and the poor at the very top.

What happened there. The games were cruel. Gladiators, most of them slaves or prisoners, fought before the crowd; wild animals from Africa and Asia were hunted in the arena; condemned criminals were executed there. Romans of the day thought this a fitting public entertainment and a display of the empire's power. Christians in the empire came to see it differently. Around 404, according to the church historian Theodoret, a monk named Telemachus ran into an arena in Rome to stop a fight and was killed by the angry crowd; the emperor Honorius then banned gladiator combats. Animal hunts went on until about 523.

Ruin and remembrance. An earthquake in 1349 brought down much of the south side, and for centuries the fallen stone was carted off to build palaces and churches. Many Christians believed that martyrs had died on its sand. Honest history must say that no ancient record names the Colosseum as the place of a particular martyrdom, though Christians certainly died in Roman arenas, and tradition places Ignatius of Antioch's death there about 108. In 1749 Pope Benedict XIV dedicated the building to the memory of the Passion of Christ and

the martyrs, set up the Stations of the Cross and stopped its use as a quarry. Thomas Cole painted the great cross standing in the arena in 1832.

Why it matters. The Colosseum shows Rome at its most skillful and its most brutal at once. It also shows how history turned. Paul wrote to the Christians of Rome years before the first stone was laid, and lived there under guard “two whole years” (Acts 28:30). The empire that built the arena is gone; the church to which Paul wrote still meets in Rome.

PICTURE STUDY



Interior of the Colosseum, Rome, Thomas Cole, 1832 · Oil on canvas · Albany Institute of History & Art, Albany, New York (1964.71)
Wikimedia Commons · Public domain

Thomas Cole was the founder of the Hudson River School, America’s first great group of landscape painters. From 1829 to 1832 he studied in Europe, and of all the ruins of Rome, he said, the Colosseum moved him most. He painted the arena as it was in his day: grassy and quiet, with the cross and the small chapels of the Stations of the Cross set up in 1749. The ruin set Cole thinking about how empires rise and fall, and he soon painted a five-part series on that theme, *The Course of Empire*.

Look closely

- Find the large cross. Where has Cole placed it in the picture, and why might he have put it there?
- Find the small chapels around the edge of the arena. How many can you count?
- Look at the broken tiers. Which side is more ruined? Where is the light coming from?

Talk about it

1. The arena where crowds once cheered violence is shown silent, with a cross in the middle. What story about Rome is Cole telling without words?
2. Cole was an American who had never seen a ruin this old at home. How might seeing it have changed the way he thought about his own young country?

Safety first. Travel safety: in Rome and other crowded tourist sites, keep wallets and passports in a front pocket or a zipped bag worn in front, stay together in the crowds, carry water in summer, and agree on a meeting place in case anyone is separated.

HANDS-ON: TEST THE ANCIENT WRITER AGAINST THE STONES

A historian checks a writer's claims against other evidence. Read Suetonius (the primary source in this stop), then test what he says against the building and against a second ancient writer. Finish with Postcard 2.

You will need

- The primary source in this stop
- A photo or plan of the Colosseum (from a book or museum website)
- A Field Notebook page divided into three columns
- An index card or blank postcard

Steps

1. Head three columns: "Suetonius says," "Other evidence," and "Agree or not?"
2. From the primary source, write down three claims: who began the amphitheatre and where; what Titus did at the dedication; how many animals were brought in one day.
3. For each claim, find other evidence in this stop or a book: the site of Nero's lake, the 100 days of games, the reconstructed inscription. Add this second ancient writer: the historian Cassius Dio, writing about a century after Suetonius, says that 9,000 animals were killed during the whole of Titus's opening games.
4. Decide whether Suetonius's "five thousand wild beasts ... in one day" and Dio's 9,000 in all can both be true. Write your reasoning in the third column.
5. Write one sentence: which of Suetonius's claims can be checked by the stones themselves, and which can be checked only by other writers?
6. Make Postcard 2: draw one bay of the outer wall (an arch with its column and a Roman numeral above it). On the back, write four sentences from Rome, including the year it was dedicated and one fact you checked.

Check your work

- My chart has three claims from Suetonius, each tested against other evidence.
- I explained whether Suetonius and Dio contradict each other.
- My postcard has a correct drawing of an arch and a checked fact.

FIELD NOTEBOOK

1. **Journal page D2: Rome.** Draw a cross-section of the Colosseum's seating, from the arena floor to the top level, and label who sat where. Add the hypogeum beneath the arena and the velarium above.
2. **Narration (parent keeps).** Write one well-built paragraph of eight to ten sentences telling the story of the Colosseum from Nero's rule to the cross of 1749. Include at least two numbers, the name of one emperor, and one place where you had to say "tradition holds" rather than "we know." Date it and give it to a parent for the portfolio.

Did you know? The name "Colosseum" was probably not the Romans' own. It seems to come from the *Colossus*, a bronze statue of Nero about 100 feet tall that stood nearby and was later turned into a statue of the sun god. The name was in use by the Middle Ages. Some ancient spectators scratched graffiti of gladiators into the plaster of the corridors, and a few of these drawings survive.

Primary source. *Suetonius, The Lives of the Twelve Caesars (about A.D. 121), translated by Alexander Thomson, revised by T. Forester; "Vespasian," section IX, and "Titus," section VII; from the Project Gutenberg texts (eBooks #6395 and #6396)*

He likewise erected several new public buildings, namely, the temple of Peace near the Forum, that of Claudius on the Coelian mount, which had been begun by Agrippina, but almost entirely demolished by Nero; and an amphitheatre in the middle of the city, upon finding that Augustus had projected such a work.

Having dedicated his amphitheatre, and built some warm baths close by it with great expedition, he entertained the people with most magnificent spectacles. He likewise exhibited a naval fight in the old Naumachia, besides a combat of gladiators; and in one day brought into the theatre five thousand wild beasts of all kinds.

Go deeper. H. V. Morton, *A Traveller in Rome* (1957). Keith Hopkins and Mary Beard, *The Colosseum* (2005), a short history by two scholars (parents may preview; the authors are not writing from a Christian view). The Parco archeologico del Colosseo website, with plans of the hypogeum and the upper levels. Second video topic: Roman concrete and why some Roman structures have lasted two thousand years.

Goes deeper in. Geography, Grade 8, "Southern Europe," and History, "Ancient Rome and the Early Church" (coming soon).

For families. Sources: Project Gutenberg eBooks #6395 and #6396 (Suetonius); Cassius Dio, *Roman History* 66.25; Theodoret, *Ecclesiastical History* 5.26 (Telemachus); Albany Institute of History & Art (Cole). Crowd estimates for the Colosseum vary widely; the stop gives a range. The "from the spoils" inscription is a modern reconstruction from nail holes in a reused block and is widely but not universally accepted. Theodoret does not

name the Colosseum as the place of Telemachus's death, and the tradition of martyrs dying in the Colosseum itself is stated here as tradition. The games are described plainly, without detail.

PRACTICE

1. **EASY** Name the three Flavian emperors and say what each did for the Colosseum.
2. **EASY** In the primary source, where did Vespasian put his amphitheatre, and whose idea did Suetonius say it was first?
3. **MEDIUM** Why are the Colosseum's walls full of holes?
4. **MEDIUM** Why was building the amphitheatre on the site of Nero's lake a clever political choice?
5. **CHALLENGE** Suppose 50,000 spectators leave through 76 public gates, and each gate lets out 40 people a minute. About how long does it take to empty the building? What if only half the gates were open?
6. **CHALLENGE** Many books say Christians were martyred in the Colosseum, but no ancient record names a particular martyrdom there. Write three or four sentences explaining how a careful Christian should speak about this.

Make it a game • Find Your Gate. Number 12 sheets of paper in Roman numerals (for example IV, IX, XIV, XIX, XXIV, XL, XLIX, LII, LXIV, LXX, LXXIV, LXXVI) and tape them around a room or yard like the Colosseum's arches. Hand each player a "token" card with an Arabic number on it. At "Go!" players must find and stand under the matching gate. Swap tokens and play again. Talk afterward: why might numbered gates have helped 50,000 people find their seats?

Scripture. "So, as much as in me is, I am ready to preach the gospel to you that are at Rome also. For I am not ashamed of the gospel of Christ: for it is the power of God unto salvation to every one that believeth; to the Jew first, and also to the Greek." (Romans 1:15-16, KJV)

Paul wrote these words about A.D. 57, before Nero's fire and before the Colosseum was begun. Rome boasted of its power in stone; Paul named a different power, the gospel, that works in hearts. The arena is a ruin now, and the gospel is still preached in Rome.

Practice: answers

1. Vespasian began it; Titus dedicated it in A.D. 80 with 100 days of games; Domitian finished it (and added the hypogeum).
2. "In the middle of the city"; Augustus had first "projected such a work."
3. In the Middle Ages people chiseled out the iron clamps that held the stones together, to reuse the metal.
4. Nero had seized the center of Rome for his private palace and lake. Vespasian gave that land back to the people as a place of public entertainment, showing that the new emperor served Rome rather than himself.

5. $76 \times 40 = 3,040$ people a minute; $50,000 \div 3,040 \approx 16.4$, so about 16 or 17 minutes. With half the gates ($38 \times 40 = 1,520$ a minute), $50,000 \div 1,520 \approx 33$ minutes, about twice as long.
6. Sample: We should say plainly what is known: Christians were put to death in Roman arenas, Nero persecuted the church in Rome, and the games in the Colosseum were cruel. We should call the belief that particular martyrs died in the Colosseum itself a tradition, not a proven fact. Truthfulness is a Christian duty, and the faith does not need exaggeration; the real suffering of the early church is witness enough.

4.3 LONDON AND THE TOWER

OBJECTIVES

- Explain why William the Conqueror built the Tower of London where he did, and list the many jobs it has done in more than nine hundred years.
- Read Samuel Pepys's diary entry for 2 September 1666 as a primary source and reconstruct the first morning of the Great Fire of London on a map.
- Explain why the Tower survived the fire, and how the fire changed the shape and building of London.

Warm-up. Find London on a map of Britain: on the River Thames, about 50 miles up from where the river meets the North Sea. Then think like a conqueror in 1066. You have just won a kingdom and its largest city does not trust you. Where in the city would you build your castle, and why? Write two reasons before you read.

Video slot. Video coming. The Tower of London: the Norman White Tower, the Chapel of St John, the Crown Jewels, the Yeoman Warders and the ravens; Samuel Pepys and the Great Fire of London (1666). Search approved channels (Historic Royal Palaces, Museum of London (London Museum), English Heritage, the BBC); preview first.

KEY TERMS

White Tower

The great square stone keep at the center of the Tower of London, begun by William the Conqueror about 1075–1079 and finished about 1100; about 90 feet tall, with walls up to 15 feet thick at the base.

keep

The strongest, central tower of a castle, used as a last refuge and often as the lord's residence.

concentric castle

A castle with one ring of walls inside another, so that attackers who break the outer wall face a higher inner wall; Henry III and Edward I made the Tower one in the 1200s.

Yeoman Warders

The Tower's ceremonial guards, nicknamed "Beefeaters," whose order goes back to the bodyguard formed by Henry VII in 1485. Today they are retired senior soldiers who live inside the walls and guide visitors.

firebreak

A gap cleared of anything that can burn, so a fire cannot cross it. In 1666 houses were pulled down or blown up with gunpowder to make firebreaks.

Samuel Pepys

(Say “peeps.”) An official of the Navy Board (1633–1703) who lived beside the Tower and kept a private diary in shorthand from 1660 to 1669; it was first deciphered and published in the 1820s.

CORE IDEAS

A castle to watch a city. William, Duke of Normandy, won the Battle of Hastings in October 1066 and was crowned king in Westminster Abbey on Christmas Day. London was the richest city in England, and it was not friendly. So William built a fortress in the southeast corner of the old Roman city wall, right on the Thames. From there he could control the river traffic that fed the city, keep watch on its people and get help by water. A Norman monk, Gundulf, later bishop of Rochester, oversaw the building of the **White Tower**, begun about 1075–1079. Some of its pale stone was shipped from Caen in Normandy, a reminder to the English of who now ruled.

A fortress that grew. The White Tower rises about 90 feet, and its walls are up to 15 feet thick at the base. Inside is the Chapel of St John the Evangelist, with plain round Norman arches, one of the oldest church interiors in London. In the 1200s Henry III and Edward I wrapped the keep in two rings of walls and towers and a wide moat, making the Tower a **concentric castle** that covers about 12 acres. It was never taken by storm.

A castle with many jobs. In the 1500s the historian John Stow listed the Tower’s uses: fortress, royal palace, prison of state, the only mint for coins, an armory, the treasury for the crown jewels and a store for royal records. Kings also kept a menagerie there, with lions and even a polar bear that fished in the Thames, until the animals went to the new London Zoo in the 1830s. The Mint stayed until 1810. The Crown Jewels are still kept there, though most date from 1661, because the regalia of earlier kings had been sold or melted down after the execution of Charles I.

A prison. Many famous prisoners passed through its gates. Sir Thomas More, who would not swear that Henry VIII was head of the Church in England, was held there before his execution on Tower Hill in 1535. The young princess Elizabeth was held there in 1554 by her sister Mary, fearing for her life, four years before she became queen. Sir Walter Raleigh spent years there and wrote a *History of the World* in his rooms. Prisoners of conscience, both Protestant and Catholic, were held and some were put to death, as men and women of that age fought bitterly over religion. Most executions took place on Tower Hill outside the walls; only a handful happened on Tower Green inside.

The fire. Early on Sunday, 2 September 1666, a fire broke out in the bakery of Thomas Farriner in Pudding Lane, a few hundred yards west of the Tower. A hot, dry summer and a strong east wind drove it through streets of timber houses packed close together. Samuel Pepys, who lived near the Tower, climbed one of its high places that morning to watch. The fire burned for four days. It destroyed about 13,200 houses, 87 parish churches and the old St Paul’s Cathedral, and left most of the city’s people homeless. Only a few deaths were recorded, though historians think there were more that went uncounted.

Why the Tower survived. The wind and the fire moved mostly westward, away from the Tower. But by the third and fourth days flames were creeping east toward it, and the Tower held great stores of gunpowder. Had it exploded, it could have wrecked the whole neighborhood. Soldiers and workmen blew up houses nearby to make **firebreaks**, and the wind dropped. The fire stopped short of the Tower's walls.

A new London. After the fire Parliament ordered that new houses be built of brick or stone, with wider streets. Sir Christopher Wren designed 51 new city churches and the new St Paul's Cathedral, finished in 1710, and with Robert Hooke the Monument to the fire, a column 202 feet high that stands 202 feet from the site of the bakery. The Tower still stands beside the Thames, guarded each night, as it has been for centuries, by the Ceremony of the Keys.

PICTURE STUDY



The Great Fire of London, Unknown Dutch painter, About 1675 · Oil on panel · London Museum (formerly the Museum of London), 000793

Wikimedia Commons · Public domain

No one knows who painted this picture, but it was made by an artist trained in the Dutch style about nine years after the fire. The painter imagines the burning city at night, as seen from a boat near Tower Wharf, looking upriver. Old St Paul's is outlined against the flames, and the crowded houses of Old London Bridge stand on the right. On the left is the Tower, the very place where Pepys climbed to watch the fire's first morning.

Look closely

- Find the Tower of London on the left. How does the painter show that it is still safe?
- Find London Bridge, with houses built on top of it. Which end is burning?

- Find the boats on the river. What are the people in them doing, and what are they carrying?

Talk about it

1. Pepys wrote that he “got a boat” and went “through bridge.” Find where his boat might have passed in this picture.
2. This picture was painted years after the fire by someone who probably did not see it. Is it a primary source? What is it good evidence for, and what is it not?

Safety first. Travel safety: in London, traffic drives on the left. Look right first before crossing, and use the “Look right” and “Look left” signs painted at crossings. At the Tower and on the Underground, stay together in crowds and mind the gap between train and platform.

HANDS-ON: MAP THE FIRST MORNING OF THE FIRE

Pepys’s diary lets us follow one man hour by hour on the first day of the fire. Use the primary source and a map of old London to reconstruct his morning, then write Postcard 3.

You will need

- The primary source in this stop
- A map of the City of London showing the Tower, London Bridge, Pudding Lane and Fish Street Hill (a modern street map works; the Museum of London and the British Library have historic maps online)
- Two colored pencils, an index card or blank postcard

Steps

1. Read the primary source aloud. List every place named in it, in order.
2. Mark each place on your map: Fish Street, London Bridge, the Tower, Pudding Lane, St Magnus’s Church and the water-side. Draw Pepys’s route in one color.
3. Draw an arrow showing the direction of the east wind. In the second color, shade the area you think would burn next. Which way does it go, toward the Tower or away from it?
4. Find two phrases that show Pepys’s feelings, and two that show he was gathering facts. Copy them in your notebook under “Feelings” and “Facts.”
5. Notice that Pepys first heard about 300 houses had burned. Compare that with the final total of about 13,200. Work out how many times larger the final figure was.
6. Make Postcard 3: on the front draw the White Tower with its four corner turrets; on the back write four sentences as Pepys might have written to a friend on 3 September 1666.

Check your work

- My map shows Pepys’s route and the direction of the wind and fire.

- I sorted phrases from the source into feelings and facts.
- I compared the early report with the final count, and my postcard is written in Pepys's voice.

FIELD NOTEBOOK

1. **Journal page D3: London.** Draw a bird's-eye plan of the Tower: the White Tower in the middle, two rings of walls, the moat and the Thames. Label the Chapel of St John, Tower Green and the river gate.
2. **Narration (parent keeps).** Write one well-built paragraph of eight to ten sentences telling the Tower's story from William the Conqueror to the Great Fire. Include at least two dates, two of the Tower's jobs, and one sentence quoting Pepys. Date it and give it to a parent for the portfolio.

Did you know? On 4 September 1666, as the fire came closer, Pepys and a neighbor dug a pit in his garden and buried their wine and, as he wrote, his "Parmazan cheese." Pepys's diary was written in a form of shorthand and lay unread in the library he left to Magdalene College, Cambridge, for more than a century. A student named John Smith spent about three years deciphering it, and an edited version was first published in 1825.

Primary source. *Samuel Pepys, Diary, entry for 2 September 1666 (Lord's day), from the Project Gutenberg text (eBook #4167, edited by Henry B. Wheatley)*

By and by Jane comes and tells me that she hears that above 300 houses have been burned down to-night by the fire we saw, and that it is now burning down all Fish-street, by London Bridge. So I made myself ready presently, and walked to the Tower, and there got up upon one of the high places, Sir J. Robinson's little son going up with me; and there I did see the houses at that end of the bridge all on fire, and an infinite great fire on this and the other side the end of the bridge; which, among other people, did trouble me for poor little Michell and our Sarah on the bridge. So down, with my heart full of trouble, to the Lieutenant of the Tower, who tells me that it begun this morning in the King's baker's' house in Pudding-lane, and that it hath burned St. Magnus's Church and most part of Fish-street already. So I down to the water-side, and there got a boat and through bridge, and there saw a lamentable fire.

Go deeper. Historic Royal Palaces, "Tower of London" pages, with the history of the White Tower and the Crown Jewels. The full Pepys diary entries for 2-7 September 1666 (Project Gutenberg #4167). The London Museum's online pages on the Great Fire. Second video topic: Christopher Wren and the building of St Paul's Cathedral.

Goes deeper in. Geography, Grade 8, "The British Isles," and History, "Castles and Kings of the Middle Ages" (coming soon).

For families. Sources: Project Gutenberg eBook #4167 (Pepys, Wheatley edition); Historic Royal Palaces; London Museum. In the excerpt, “Sir J. Robinson” was Sir John Robinson, Lieutenant of the Tower; “Michell” and “Sarah” were people Pepys knew who lived on the bridge (Sarah had been a servant in his house). The odd punctuation “baker’s’” is as printed in the Gutenberg text. Figures for the fire (13,200 houses, 87 churches) are the standard ones from the 1667 survey; recorded deaths were few, but many historians think the true number was higher. Executions and imprisonments are mentioned without detail; Henry VIII’s wives are not discussed.

PRACTICE

1. **EASY** Who began the White Tower, and about when?
2. **EASY** In the primary source, where did the fire begin, according to the Lieutenant of the Tower, and what had it already burned?
3. **MEDIUM** Name four different jobs the Tower of London has done.
4. **MEDIUM** Give three reasons the fire spread so quickly in 1666.
5. **CHALLENGE** On the first morning Pepys heard that about 300 houses had burned. The final count was about 13,200. How many times larger was the final figure? If a quarter of the 13,200 burned on each of the four days, how many houses burned each day, and how many per hour?
6. **CHALLENGE** Pepys wrote his diary in shorthand, for himself alone, and did not expect it to be read. Does that make it a better or a worse source for the fire? Give one strength and one weakness, and explain.

Make it a game · Who Comes There?. Every night at the Tower, a Yeoman Warder carrying the keys is challenged by a sentry before he may pass, in a ceremony centuries old. Choose one player to be the sentry, standing with eyes closed at the far side of the room. Before the round, a parent whispers a password to all the other players, who are “the keys” and must creep toward the sentry. Whenever the sentry opens eyes and calls “Halt! Who comes there?” everyone must freeze, and the player the sentry points to must answer “The keys!” and whisper the password. Anyone caught moving, or who forgets the password, goes back to the start. The first to touch the sentry’s post becomes the next sentry, and a new password is chosen.

Scripture. “The name of the LORD is a strong tower: the righteous runneth into it, and is safe.” (Proverbs 18:10, KJV)

Solomon knew what a tower was for: in war, people ran into it for safety. The Tower of London was strong, yet it was a prison to some and nearly a powder keg in 1666. The proverb points to the one refuge that never fails. Read the next verse, Proverbs 18:11, to see what the rich man trusts instead.

Practice: answers

1. William the Conqueror, about 1075–1079, soon after he won England in 1066.

2. In the King's baker's house in Pudding Lane; it had already burned St. Magnus's Church and most of Fish Street.
3. Any four: fortress, royal palace, prison, mint for coins, armory, treasury for the Crown Jewels, store for records, royal menagerie (zoo).
4. A hot, dry summer had dried the wooden buildings; a strong east wind drove the flames; the houses were made of timber and packed close together on narrow streets (and warehouses near the river held things that burned easily).
5. $13,200 \div 300 = 44$ times larger. $13,200 \div 4 = 3,300$ houses a day; $3,300 \div 24 \approx 137.5$, so about 140 houses every hour.
6. Sample: Strength: he had no reason to impress readers or to defend himself, so he wrote honestly, including his fears and even burying his cheese; and he wrote within hours of the events. Weakness: he saw only what one man could see from his own neighborhood, and some of what he wrote was hearsay (for example, the 300 houses Jane heard about). So the diary is excellent evidence for what Londoners saw and felt, but it must be checked against official surveys for the total damage.

4.4 PARIS AND THE EIFFEL TOWER

OBJECTIVES

- Place the Eiffel Tower in the history of Paris, from the island of Notre-Dame to the great boulevards of the 1860s and the World's Fair of 1889.
- Explain how the tower was designed and built, using real numbers for its height, parts, rivets and building time.
- Read the 1887 artists' protest as a primary source, judge how its writers argued, and decide whether history proved them right or wrong.

Warm-up. Find Paris on a map of France, on the Seine River in the north of the country. Look at a photo of the Eiffel Tower and write down three words that describe it. Now imagine that it does not exist yet and someone shows you a drawing of an iron tower nearly 1,000 feet tall planned for the middle of your city. Write three words you might say then. Keep both lists.

Video slot. Video coming. How the Eiffel Tower was built for the 1889 World's Fair: prefabricated iron pieces, rivets, the curved legs and the elevators. Search approved channels (the official Eiffel Tower channel, Smithsonian Channel, Practical Engineering, PBS); preview first.

KEY TERMS

Exposition Universelle (1889)

The World's Fair held in Paris in 1889, marking the hundredth anniversary of the French Revolution; the Eiffel Tower was its entrance arch and centerpiece.

wrought iron

Iron worked to make it tough and slightly flexible, used for bridges and frames before steel became cheap. The Eiffel Tower is made of a kind called puddled iron, not steel.

rivet

A metal pin heated red-hot, pushed through holes in two plates and hammered flat on the end; as it cools it shrinks and clamps the plates together.

lattice girder

A beam built of crisscrossed strips with open spaces between, strong but light, and letting the wind blow through.

prefabrication

Making the parts of a structure in a factory, ready to fit, and then assembling them on the site.

Haussmann's Paris

The wide boulevards, parks, sewers and cream-stone apartment blocks built under Baron Haussmann for Emperor Napoleon III between 1853 and 1870, which give central Paris

much of its look today.

CORE IDEAS

An island city. Paris began on the Île de la Cité, an island in the Seine, where a Celtic tribe called the Parisii lived when the Romans came. The island is still the city's heart. There the bishop of Paris began the cathedral of Notre-Dame in 1163, and King Louis IX built the Sainte-Chapelle, finished in 1248, its walls almost all stained glass. In the 1850s and 1860s Baron Haussmann cut broad, straight boulevards through the crowded medieval streets and lined them with matching stone buildings about six stories high. Paris became a low, even, cream-colored city of domes and spires. That is why a tall iron tower startled it.

A tower for a fair. France planned a great World's Fair for 1889. Two engineers in Gustave Eiffel's company, Maurice Koechlin and Émile Nouguier, sketched a 300-meter iron tower in 1884, and the architect Stephen Sauvestre gave it its great arches and decoration. Eiffel bought the rights, promoted the plan and won the competition. The tower would be nearly twice the height of the Washington Monument, the tallest structure in the world at the time.

Built from drawings. Eiffel had built railway bridges and viaducts and had designed the iron skeleton inside the Statue of Liberty, so his firm knew iron. Every one of the tower's 18,038 pieces was drawn to the tenth of a millimeter and made at the company's workshop outside Paris, with its rivet holes already punched. Teams of four riveters set about 2.5 million **rivets**; at the busiest time only a few hundred workers were on the site. Work began on 28 January 1887 and the tower was finished on 31 March 1889, in two years, two months and five days, when Eiffel climbed to the top and raised the French flag.

Shaped by the wind. At 300 meters (about 984 feet) the tower was the tallest man-made structure on earth until the Chrysler Building in New York passed it in 1930. Its open **lattice girders** let the wind pass through. Eiffel said that the curve of the four legs followed the forces of the wind, so that the shape was both strong and beautiful. The iron frame weighs about 7,300 metric tons, yet it presses on the ground about as hard as a man sitting in a chair. In summer sun the iron expands and the top can grow several inches and lean slightly away from the sun.

The protest. Not everyone was pleased. In February 1887, as the foundations were being dug, a group of well-known artists and writers, including the composer Charles Gounod, the writer Guy de Maupassant and Charles Garnier, architect of the Paris Opera, published a protest in the newspaper *Le Temps*. They called the tower useless and monstrous and said it would shame the city's great monuments. Eiffel answered in the same paper that an engineer's work could have its own beauty, and that he would not let the tower be ugly.

Saved by usefulness. The tower was a huge success at the fair: nearly two million people went up in 1889, many in elevators supplied partly by the American Otis company. But the permit was only for twenty years. Eiffel set out to make it useful for science, with a weather station, experiments on air resistance, and above all radio. From the early 1900s the army used it as a giant antenna, and in the First World War it intercepted enemy messages. That

saved it. Eiffel's career had shadows too: he was caught up in the financial scandal of the failed French Panama Canal and was convicted in 1893, though the verdict was overturned.

Why it matters. Today the tower draws millions of visitors a year and is the symbol of Paris and of France. Around the first level Eiffel had the names of 72 French scientists and engineers painted in large gold letters, so that the tower honored others' work. The artists of 1887 were right that it would change the skyline. They were wrong that Paris would be ashamed of it.

PICTURE STUDY



The Eiffel Tower, Georges Seurat, About 1889 · Oil on wood panel · Fine Arts Museums of San Francisco, Legion of Honor

Wikimedia Commons · Public domain

Georges Seurat was a young French painter who studied the science of color. Instead of mixing paints on a palette, he placed small dots of pure color side by side and let the viewer's eye blend them, a method called pointillism. This little panel is only about 9½ by 6 inches, smaller than a sheet of notebook paper. Seurat painted it around the year the tower opened, when many artists were still protesting against it, and he chose to paint it as something shimmering and new.

Look closely

- Come close and find the separate dots. What colors has Seurat used for the iron? Step back. What color does the tower seem to be now?
- Look at the top of the tower. Is it painted sharply or does it fade? Why might Seurat have painted it that way?
- Find the lower buildings and trees. How does Seurat make the tower seem tall in so small a picture?

Talk about it

1. Some of Paris's most famous artists called the tower monstrous. Why might a young painter like Seurat have looked at it differently?
2. The real tower was painted a red-brown color in 1889. Seurat used reds, oranges and blues. Is his painting true to life? In what sense?

Safety first. Travel safety: at the Eiffel Tower and other crowded Paris sites, watch for pickpockets, keep bags zipped and in front, buy tickets only from official sellers, and choose a meeting point at the base in case anyone is separated in the lines or elevators.

HANDS-ON: ANSWER THE PROTEST

Read the 1887 protest (the primary source in this stop) the way a debater would: find its claims, its loaded words and its predictions. Then write Eiffel's side and make Postcard 4.

You will need

- The primary source in this stop
- Two colored pencils or highlighters
- Notebook paper, an index card or blank postcard

Steps

1. Read the protest aloud with feeling, as its writers meant it.
2. In one color, highlight every word or phrase meant to make the reader feel disgust or fear (for example, "staggering," "barbarous"). Count them.
3. In the other color, highlight every famous Paris monument named. Look each one up on a map of Paris and mark it. How many are within two miles of the tower?
4. Write the protest's main argument in one plain sentence without any loaded words.
5. Write a reply of five or six sentences in Eiffel's voice. Use at least two facts from this stop (the wind-shaped legs, the 72 names, the height, its use for science) and do not insult the artists.
6. Make Postcard 4: draw the tower in dots, Seurat's way, on the front. On the back, write four sentences from the top of the tower in 1889, as a visitor who had read the protest.

Check your work

- I found the loaded words and the monuments in the protest.
- I restated the argument fairly and answered it with facts, not insults.
- My postcard is in dots and written as an 1889 visitor.

FIELD NOTEBOOK

1. **Journal page D4: Paris.** Draw the Eiffel Tower to scale beside the Washington Monument (555 feet), the Great Pyramid as built (481 feet) and Notre-Dame's towers (about 226 feet). Use 1 square on graph paper for every 50 feet.

2. **Narration (parent keeps).** Write one well-built paragraph of eight to ten sentences telling how the Eiffel Tower was planned, built, attacked and saved. Include at least three numbers and one phrase from the protest. Date it and give it to a parent for the portfolio.

Did you know? The Eiffel Tower is repainted by hand about every seven years, using about 60 metric tons of paint, to keep the iron from rusting. In 1889 it was a red-brown; since 1968 it has been painted a special color called “Eiffel Tower brown,” slightly darker at the bottom than at the top so that it looks even against the sky. A story is told that Maupassant, one of the protesters, liked to eat in the tower’s restaurant because it was the one place in Paris from which he could not see the tower.

Primary source. *The “Protest Against the Tower of Monsieur Eiffel” (February 1887), in the English translation quoted by Robert M. Vogel, “Elevator Systems of the Eiffel Tower, 1889,” Contributions from the Museum of History and Technology, Paper 19 (Smithsonian Institution, 1961), from the Project Gutenberg text (eBook #32282). Vogel introduces it: “The eloquence of one article, which appeared in several Paris papers in February 1887, was typical:”*

We protest in the name of French taste and the national art culture against the erection of a staggering Tower, like a gigantic kitchen chimney dominating Paris, eclipsing by its barbarous mass Notre Dame, the Sainte-Chapelle, the tower of St. Jacques, the Dôme des Invalides, the Arc de Triomphe, humiliating these monuments by an act of madness.

Go deeper. Robert M. Vogel, *Elevator Systems of the Eiffel Tower, 1889* (Smithsonian, 1961; free on Project Gutenberg), with drawings of the lifts and the story of the Otis company’s quarrel with Eiffel. The official Eiffel Tower website’s history pages, with figures and early photographs. Miroslav Šašek, *This Is Paris* (1959), for younger siblings. Second video topic: the building and 2024 reopening of Notre-Dame Cathedral.

Goes deeper in. Geography, Grade 8, “Western Europe,” Art, “Seurat and the Painters of Light,” and Arithmetic, “Scale and Ratio” (coming soon).

For families. Sources: Project Gutenberg eBook #32282 (Vogel); the official site of the Société d’Exploitation de la Tour Eiffel (figures for pieces, rivets, weight and dates); Fine Arts Museums of San Francisco (Seurat). The protest is quoted in Vogel’s English translation; it is a shortened version of a longer French letter, and translations differ. The height is given as the original 300 meters; with modern antennas the tower is now about 330 meters. The Maupassant story is told as a story, not as a proven fact. The Panama Canal affair is mentioned only briefly; Eiffel’s conviction was overturned on appeal.

PRACTICE

1. **EASY** For what event was the Eiffel Tower built, and in what year did it open?

2. **EASY** In the primary source, what household object do the protesters compare the tower to, and which five monuments do they say it will humiliate?
3. **MEDIUM** The tower is 984 feet tall and the Washington Monument is 555 feet. How many times taller is the tower? Round to one decimal place.
4. **MEDIUM** What saved the tower when its twenty-year permit ran out?
5. **CHALLENGE** Iron expands about 0.000012 of its length for every 1 °C it warms. If the 300-meter tower warms by 35 °C from a winter night to a summer afternoon, about how much taller does it get, in centimeters and inches? (1 inch = 2.54 cm.)
6. **CHALLENGE** The protesters were some of the most gifted artists in France. Were they right or wrong? Write a short argument (three or four sentences) that gives them credit for one thing and disagrees with them about another.

Make it a game • The Twenty-Card Tower. Give each player or team 20 index cards and 30 centimeters of tape. In ten minutes, build the tallest tower that can stand by itself for ten seconds while someone fans it with a book (the wind test). Measure each tower. Talk afterward: did the winners use wide bases, triangles or open frames like Eiffel's lattice? Then read Genesis 11:4 and ask: what made Babel's tower wrong, and was it the height?

Scripture. "And they said, Go to, let us build us a city and a tower, whose top may reach unto heaven; and let us make us a name, lest we be scattered abroad upon the face of the whole earth." (Genesis 11:4, KJV)

The sin of Babel was not height or skill. It was pride ("let us make us a name") and refusing God's command to fill the earth (Genesis 9:1). Skill in building is a gift of God, as Bezaleel's was (Exodus 31:1-5). Notice that Eiffel put the names of 72 other men on his tower. Whose name are we building for?

Practice: answers

1. The Paris World's Fair (Exposition Universelle) of 1889, marking the hundredth anniversary of the French Revolution.
2. A gigantic kitchen chimney. Notre Dame, the Sainte-Chapelle, the tower of St. Jacques, the Dôme des Invalides and the Arc de Triomphe.
3. $984 \div 555 \approx 1.8$ times as tall (nearly twice).
4. It had become useful for science, and especially as a radio antenna for the army; in the First World War it intercepted enemy messages.
5. $300 \text{ m} \times 0.000012 \times 35 = 0.126 \text{ m}$, or about 12.6 cm. $12.6 \div 2.54 \approx 5$ inches. (In practice the sunny side warms more than the shady side, so the top also leans slightly away from the sun.)
6. Sample: They were right that the tower would dominate the skyline and change how Paris looked, and right to care about the beauty of their city and its old monuments. But they were wrong that it would shame those monuments; Notre-Dame and the Sainte-Chapelle are still loved, and the tower became a symbol of Paris itself. Their mistake was to judge a new kind of beauty, the beauty of engineering shaped by the forces of nature, by the rules of an older kind. Strong words like "barbarous" and "madness" could not change the facts of the design.

4.5 THE SWISS ALPS

OBJECTIVES

- Describe the Alps and Switzerland with real numbers, and explain how glaciers, passes and tunnels have shaped travel and life there.
- Read Edward Whymper's account of the Matterhorn's reputation as a primary source and tell the story of its first ascent in 1865, including its cost.
- Use the rule that air cools as it rises to estimate temperatures on a mountain, and explain why mountain travelers must plan for it.

Warm-up. On a map of Europe, trace the Alps: a curved chain from near Nice on the Mediterranean through Switzerland and Austria into Slovenia. Then find the Matterhorn on the border of Switzerland and Italy, above the village of Zermatt. If it is a warm 68 °F in Zermatt, guess the temperature on the summit, almost 9,500 feet higher. Write your guess down; you will check it later.

Video slot. Video coming. The Swiss Alps: glaciers and U-shaped valleys, the Matterhorn and Zermatt, the Great St Bernard Pass and its hospice, mountain railways and the Gotthard Base Tunnel. Search approved channels (Switzerland Tourism, Swiss National Museum, Smithsonian Channel, Practical Engineering); preview first.

KEY TERMS

glacier

A great mass of ice, built up from snow over many years, that flows slowly downhill under its own weight. The Aletsch Glacier, about 13 miles long, is the largest in the Alps.

U-shaped valley

A valley with steep sides and a broad, flat floor, carved by a glacier; rivers alone tend to cut narrower V-shaped valleys.

pass

A low point in a mountain range where a road or path can cross; the Great St Bernard, Simplon and Gotthard passes have carried travelers across the Alps for centuries.

lapse rate

How fast air cools as you climb: on average about 3.5 °F for every 1,000 feet (about 6.5 °C for every 1,000 meters).

rack railway

A mountain railway with a toothed rail between the tracks that a cogwheel under the engine grips, so the train can climb slopes too steep for ordinary wheels.

canton

One of the 26 states that make up the Swiss Confederation. Switzerland traces its founding to a league of three cantons, Uri, Schwyz and Unterwalden, in 1291.

CORE IDEAS

The roof of Europe. The Alps arc about 750 miles across eight countries. Their highest peak, Mont Blanc on the French-Italian border, rises about 15,770 feet. Switzerland, about a third the size of Pennsylvania, lies near the middle of the chain, and the mountains cover roughly 60 percent of it. More than forty Swiss peaks rise above 4,000 meters (13,123 feet); the highest is the Dufourspitze at 15,203 feet. Rivers born in Swiss ice flow to four seas: the Rhine to the North Sea, the Rhone to the Mediterranean, the Ticino by way of the Po to the Adriatic, and the Inn by way of the Danube to the Black Sea.

Carved by ice. The valleys of the Alps show the work of **glaciers**. A glacier grinds the valley it flows through into a broad **U shape** and leaves side valleys hanging high above, so that streams pour off cliffs in waterfalls; in the Lauterbrunnen valley there are dozens. Ice also left lakes such as Lake Lucerne and Lake Geneva behind its old dams of rock. Alpine glaciers have grown and shrunk over the centuries; most have been shrinking since about the 1850s, and scientists measure them closely.

A people of the mountains. The Swiss have long lived by the seasons. In summer cattle are driven up to high pastures, and the milk is made into cheeses such as Gruyère and Emmental. In 1291 three mountain **cantons** swore to help one another, and from that league grew the Swiss Confederation, today 26 cantons with four national languages: German, French, Italian and Romansh. Switzerland played a great part in the Reformation, through Ulrich Zwingli in Zurich from 1519 and John Calvin in Geneva. It has stayed out of Europe's wars for more than two hundred years.

Crossing the wall. For travelers the Alps were a wall to be crossed by **passes**. On the Great St Bernard Pass, nearly 8,100 feet high, a hospice founded about 1050 by Bernard of Menthon has sheltered travelers for nearly a thousand years; its canons and their big dogs once searched the snow for lost travelers. Napoleon marched an army over the same pass in 1800. Engineers then went through the mountains. The first Gotthard rail tunnel, 9 miles long, opened in 1882 at the cost of about two hundred workers' lives. The Gotthard Base Tunnel, opened in 2016, runs about 35 miles and is the longest railway tunnel in the world.

The mountain no one climbed. By 1865 nearly every great Alpine peak had been climbed except the Matterhorn, a steep pyramid of rock 14,692 feet high. Edward Whymper, a young London wood-engraver who first came to the Alps in 1860 to make sketches for a publisher, tried it again and again from 1861. On 14 July 1865 his party of seven, led by the Chamonix guide Michel Croz, reached the summit from the Swiss side. Three days later the Italian guide Jean-Antoine Carrel, Whymper's old rival, reached it from Italy.

Triumph and loss. On the way down, the youngest climber, Douglas Hadow, slipped and knocked Croz from his steps. Hadow, Croz, the Reverend Charles Hudson and Lord Francis Douglas fell, and the rope between them and the others broke. Whymper and the two Peter Taugwalders, father and son, survived. The accident shocked Europe, and Queen Victoria is said to have asked whether climbing should be banned. Whymper wrote his book *Scrambles*

Amongst the Alps (1871) partly to tell what happened, and he ended it with advice to climbers: courage and strength are nothing without prudence.

Why it matters. The same mountains that killed climbers draw millions of visitors who travel up them in comfort. The Rigi railway above Lake Lucerne, opened in 1871, was the first mountain **rack railway** in Europe, and since 1912 trains have climbed through the Eiger itself to the Jungfrauoch, at 11,332 feet the highest railway station in Europe. Mountains teach both wonder and humility. Air cools by about 3.5 °F for every 1,000 feet, the weather turns in minutes, and the safest traveler is the one who respects them.

PICTURE STUDY



The Blue Rigi, Sunrise, Joseph Mallord William Turner, 1842 · Watercolor on paper · Tate Britain, London
Wikimedia Commons · Public domain

J. M. W. Turner was the great English painter of light, weather and the sea. In his sixties he returned again and again to Lake Lucerne, where the Rigi mountain rises above the water, and he painted it at different hours: the “Blue Rigi” at sunrise, the “Red Rigi” at sunset, the “Dark Rigi” before dawn. This sheet is a watercolor, painted with thin washes of color one over another. When it came up for sale in 2006, people across Britain gave money so that it could stay in the national collection.

Look closely

- Find the mountain. Where are its edges? How has Turner painted it, with sharp lines or with soft washes?
- Find the line where the mountain meets its reflection in the lake. Is it easy to see?
- Find the small living things in the foreground. What do they add to the size of the scene?

Talk about it

1. Whymper climbed mountains and measured them; Turner sat and watched one in different light. What can each way of knowing a mountain teach that the other cannot?
2. Why might a painter choose to paint the same mountain many times?

Safety first. Travel and mountain safety: weather in the Alps changes fast, so carry warm layers, rain gear, water and sun protection even in summer; stay on marked trails; never walk on a glacier without a qualified guide; above about 8,000 feet watch for headache or dizziness from altitude and go down if it gets worse; check the forecast and the last train or lift time before setting out.

HANDS-ON: FROM HAUNTED PEAK TO CONQUERED SUMMIT

Whymper describes how people in the valleys thought about the Matterhorn before anyone had climbed it. Read the primary source, sort fear from fact, and make a mountain profile and Postcard 5.

You will need

- The primary source in this stop
- Graph paper, a ruler, colored pencils
- An index card or blank postcard

Steps

1. Read the primary source aloud. Make two columns, “What people believed” and “What was true.” Fill the first from the source (an invisible cordon, a ruined city on top, spirits, the highest mountain in the world).
2. Fill the second column from this stop: the real height, the year it was first climbed, and the real highest peaks of the Alps and of the world.
3. Notice Whymper’s last sentence: even “stronger minds” were carried away. Write one sentence on what made the mountain so frightening, even to educated men.
4. On graph paper, draw a profile from Zermatt (5,276 feet) to the summit (14,692 feet), using 1 square for every 1,000 feet. Mark the temperature at each 1,000 feet, starting from 68 °F in Zermatt and subtracting 3.5 °F per 1,000 feet.
5. Make Postcard 5: on the front, draw the Matterhorn’s pyramid shape; on the back, write four sentences from Zermatt in July 1865, as a traveler who has just heard the news of the first ascent and the accident.

Check your work

- My two columns separate what people believed from what was true.
- My profile is to scale, with temperatures that fall correctly with height.
- My postcard tells both the triumph and the cost, plainly and respectfully.

FIELD NOTEBOOK

1. **Journal page D5: The Alps.** Draw two valleys side by side: a V-shaped river valley and a U-shaped glacier valley with a hanging valley and waterfall. Label each part.
2. **Narration (parent keeps).** Write one well-built paragraph of eight to ten sentences on the first ascent of the Matterhorn: who Whymper was, what people believed about the mountain, what happened on 14 July 1865, and what Whymper learned. Include at least two numbers. Date it and give it to a parent for the portfolio.

Did you know? The most famous rescue dog of the Great St Bernard Hospice was named Barry. He worked there in the early 1800s and is said to have saved more than forty people lost in the snow. His preserved body is shown in the Natural History Museum in Bern. The barrel of brandy around a St Bernard's neck is a legend made popular by painters; the real dogs carried nothing but their noses and their warm coats.

Primary source. *Edward Whymper, Scrambles Amongst the Alps in the Years 1860-69 (1871), Chapter IV, from the Project Gutenberg text (eBook #41234)*

There seemed to be a *cordon* drawn around it, up to which one might go, but no farther. Within that invisible line jins and affreets were supposed to exist—the Wandering Jew and the spirits of the damned. The superstitious natives in the surrounding valleys (many of whom still firmly believe it to be not only the highest mountain in the Alps, but in the world) spoke of a ruined city on its summit wherein the spirits dwelt; and if you laughed they gravely shook their heads, told you to look yourself to see the castles and the walls, and warned one against a rash approach, lest the infuriate demons from their impregnable heights might hurl down vengeance for one's derision. Stronger minds felt the influence of the wonderful form, and men who ordinarily spoke or wrote like rational beings, when they came under its power seemed to quit their senses and ranted and rhapsodized, losing for a time all common forms of speech.

Go deeper. Edward Whymper, *Scrambles Amongst the Alps* (1871; free on Project Gutenberg), with his own engravings; the chapters on the Matterhorn are the heart of the book. James Ramsey Ullman, *Banner in the Sky* (1954), a Newbery Honor novel inspired by the Matterhorn story (summarize, do not copy). Johanna Spyri, *Heidi* (1880-1881). Second video topic: how the Gotthard Base Tunnel was bored through the mountains.

Goes deeper in. Geography, Grade 8, "Central Europe and the Alps," and Earth Science, "Mountains and Glaciers" (coming soon).

For families. Sources: Project Gutenberg eBook #41234 (Whymper); Swiss Federal Office of Topography (heights); Tate (Turner). In the excerpt, "jins and affreets" are spirits from Arabian tales and the Wandering Jew is a figure of medieval legend; Whymper uses them to show how dread of the mountain had grown, not because anyone had seen them. His word "superstitious" reflects the confident tone of a Victorian

Englishman; the valley people had real reason to respect a mountain that had beaten every climber. The accident of 1865 is told plainly without detail. The story of Queen Victoria's question is commonly told but hard to document, and it is given as "is said." Glacier change is stated as measured fact, without forecasts.

PRACTICE

1. **EASY** How high is the Matterhorn, and on what date was it first climbed?
2. **EASY** In the primary source, what did people in the valleys say was on the summit, and what did many of them believe about its height?
3. **MEDIUM** How can you tell whether a valley was carved by a river or by a glacier?
4. **MEDIUM** Name the four national languages of Switzerland and explain how the country began.
5. **CHALLENGE** Zermatt is at 5,276 feet and the Matterhorn's summit is at 14,692 feet. If it is 68 °F in Zermatt and the air cools 3.5 °F for every 1,000 feet, about what is the temperature on the summit? Above freezing or below? (Check the guess you made in the warm-up.)
6. **CHALLENGE** Whymper called the valley people "superstitious," yet the mountain did kill four of his party on the very day it was first climbed. Write three or four sentences judging fairly between Whymper and the valley people.

Make it a game • Rope Team. Tie a loose loop of yarn around each player's waist and join three or four players together with a length of yarn between each, like a rope team. Set an "ascent" course of cushions, chairs to step around and a table to crawl under. The team must reach the "summit" and come back down without snapping the yarn. If it breaks, the whole team starts again. Talk afterward: why did the leader have to watch the slowest climber, and what did Whymper learn about the descent?

Scripture. "I will lift up mine eyes unto the hills, from whence cometh my help. My help cometh from the LORD, which made heaven and earth." (Psalm 121:1-2, KJV)

This is a "song of degrees," sung by pilgrims climbing up to Jerusalem. The hills were beautiful, and they were also dangerous, the haunt of robbers and storms. The psalmist looks up at the hills but looks past them to their Maker. Whymper's valley neighbors feared the mountain; the Christian honors it as God's handiwork and trusts the One who made it.

Practice: answers

1. 14,692 feet (4,478 meters); 14 July 1865.
2. A ruined city where spirits dwelt, with castles and walls. Many believed it was the highest mountain not only in the Alps but in the world.
3. A river usually cuts a narrow V-shaped valley; a glacier grinds a broad U-shaped valley with steep sides and a flat floor, often with hanging side valleys and waterfalls.
4. German, French, Italian and Romansh. It began in 1291 when three cantons, Uri, Schwyz and Unterwalden, swore to help each other; other cantons joined over the centuries until there

were 26.

5. $14,692 - 5,276 = 9,416$ feet, about 9.4 thousand feet. $9.4 \times 3.5 \approx 33$ °F colder. $68 - 33 =$ about 35 °F, just above freezing, before counting wind, which makes it feel much colder. On many days the summit is well below freezing.
6. Sample: Whymper was right that there was no ruined city or demons on the summit; those were legends, and he proved the mountain could be climbed. But the valley people were right that the Matterhorn was deadly and should be approached with great respect. Their explanation was wrong, but their caution was wise. Whymper himself learned this and ended his book by warning climbers that courage and strength are nothing without prudence.

4.6 EGYPT AND THE PYRAMIDS

OBJECTIVES

- Explain how the Nile made Egyptian civilization possible, and place the pyramids of Giza in time against the Bible's story of Egypt.
- Use real measurements of the Great Pyramid to work out its size, slope and the pace of its building, and weigh what Herodotus, archaeologists and the newly found papyri of Merer tell us about its builders.
- Read Amelia Edwards's 1877 description as a primary source and explain why the pyramid looks small from far away and overwhelming up close.

Warm-up. On a map of Africa, follow the Nile north from Lake Victoria to the Mediterranean, more than 4,000 miles. Now look at a satellite photo of Egypt. Describe in one sentence where the green is and where it is not. Then guess: about what share of Egypt's people live on that green strip?

Video slot. Video coming. How the Great Pyramid of Giza was built: quarries, ramps, sledges, the workers' town and the Wadi al-Jarf papyri (Diary of Merer). Search approved channels (Smithsonian Channel, the Harvard Giza Project, Ancient Egypt Research Associates (AERA), the British Museum); preview first.

KEY TERMS

inundation

The yearly flooding of the Nile from about July to October, which spread water and fresh black silt over the fields. It ended when the Aswan High Dam was finished in 1970.

pharaoh

The king of Egypt; the word comes from Egyptian words meaning "great house," first used of the palace and later of the king himself.

Old Kingdom

The age of the great pyramid builders, roughly 2700 to 2200 B.C.; Khufu, who built the Great Pyramid, ruled in its Fourth Dynasty.

casing stones

The smooth, fine white limestone blocks that once covered the pyramids, making them shine; most were later stripped away for building in medieval Cairo.

Diary of Merer

Papyrus logbooks found in 2013 at Wadi al-Jarf on the Red Sea, kept by an official named Merer whose team ferried limestone to Giza for Khufu's pyramid; they are among the oldest written papyri ever found.

Egyptology

The study of ancient Egypt's history, language and remains. It grew quickly after Napoleon's expedition of 1798 and the decoding of hieroglyphs in 1822.

CORE IDEAS

The gift of the river. Egypt is a desert country cut by one great river. The Nile flows north more than 4,000 miles, the longest river in Africa, and in Egypt it makes a green ribbon only a few miles wide that opens into a fan-shaped delta near the sea. Almost all of Egypt's more than 100 million people live on the river's banks and delta, about 5 percent of the land. For thousands of years the yearly **inundation** laid down fresh soil, so that farmers could grow grain where rain almost never falls. The Greek traveler Herodotus, who visited about 450 B.C., called Egypt the gift of the river.

The pyramids in time. The three great pyramids stand on a limestone plateau at Giza, at the desert's edge just west of modern Cairo. The largest was built for the **pharaoh** Khufu (in Greek, Cheops) around 2560 B.C.; the next for his son Khafre, and the smallest for Menkaure. The Great Sphinx, carved from the bedrock, was probably made for Khafre. These pyramids were already very old when the Bible's story of Egypt begins. They had stood for many centuries before Joseph was sold into Egypt, and for more than a thousand years before Moses. The Israelites in Exodus built "treasure cities" of brick (Exodus 1:11), not the pyramids of Giza.

A mountain made by hand. The Great Pyramid was about 481 feet tall when finished, and it remained the tallest man-made structure on earth for some 3,800 years, until a cathedral spire in England passed it in the 1300s. Each side of its square base is about 756 feet, and the base covers 13 acres. It holds roughly 2.3 million blocks, averaging about 2½ tons, though granite beams over the king's burial chamber, floated some 500 miles down the Nile from Aswan, weigh far more. Its sides face the four directions almost exactly. Today it stands about 455 feet, because its top and its white **casing stones** were carried away long ago.

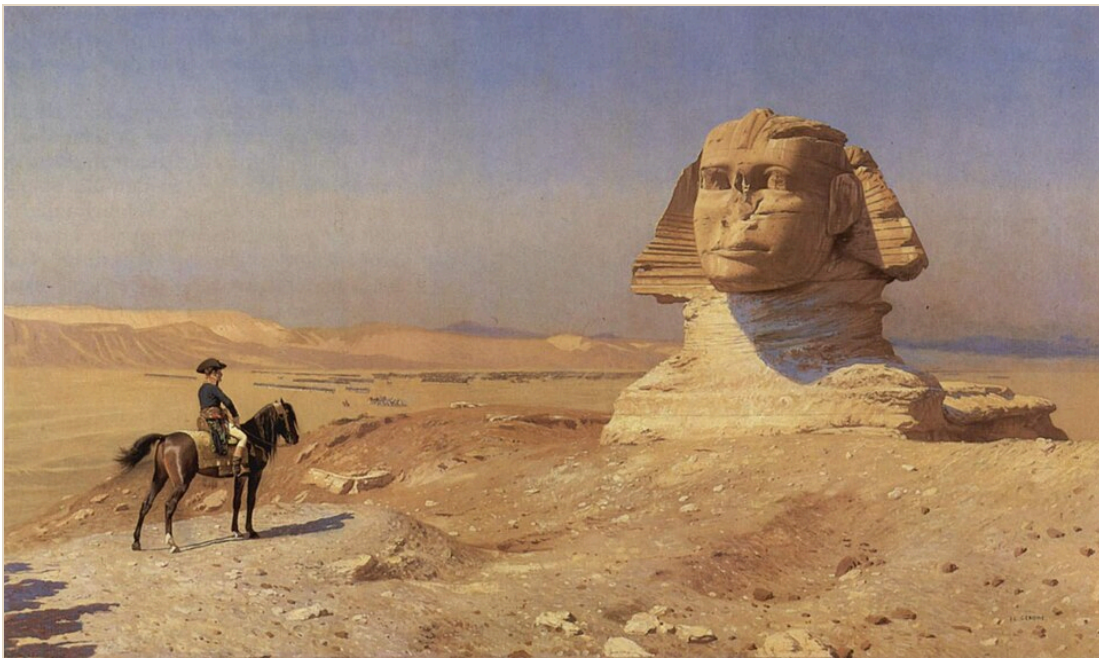
Who built it? Herodotus heard from Egyptian priests that 100,000 men worked in three-month shifts for twenty years. But he wrote two thousand years after the building, and some of what he was told cannot be true. Modern digging gives a different and better-supported picture. South of the Sphinx, archaeologists since the late 1980s have uncovered a workers' town with bakeries, breweries, barracks and the bones of many cattle, and nearby the tombs of workers buried with honor. The builders were not slaves of a later age; most were Egyptian laborers and skilled craftsmen, perhaps 20,000 to 30,000 at a time, fed and housed by the state, with farmers likely serving in rotation.

A sailor's logbook. In 2013 a French team found papyrus scrolls in caves at Wadi al-Jarf on the Red Sea coast. They are the logbook of an official named Merer, who led a crew of about 40 men in Khufu's late reign. For months they sailed fine limestone from the quarries of Tura, across the Nile from Giza, down canals to the building site, a round trip every few days. The **Diary of Merer** is the only eyewitness record we have of the building of the Great Pyramid, and it sounds like ordinary hard, organized work.

Rediscovered. In 1798 Napoleon invaded Egypt and defeated its Mamluk rulers near the pyramids. He brought along more than 150 scholars, who measured and drew everything, and in 1799 his soldiers found the Rosetta Stone. In 1822 the Frenchman Jean-François Champollion used it to read hieroglyphs, and **Egyptology** was born. Travelers followed. In the winter of 1873-1874 the English novelist Amelia Edwards sailed up the Nile; her book, *A Thousand Miles up the Nile* (1877), became a classic, and in 1882 she helped found the Egypt Exploration Fund to dig and protect ancient sites.

Why it matters. The pyramids show what a well-ordered kingdom could do with simple tools, careful mathematics and many hands over many years. They also show the limits of human glory. They were built to protect a king's body and secure his life after death, yet every one was robbed in ancient times. The kings who built them could not take their treasure with them; Scripture tells of a Child who came to Egypt with almost nothing and left it for the work of salvation.

PICTURE STUDY



Bonaparte Before the Sphinx, Jean-Léon Gérôme, 1867-1868 · Oil on canvas · Hearst Castle, San Simeon, California

Wikimedia Commons · Public domain

Jean-Léon Gérôme was a French painter who traveled in Egypt several times and painted its people and monuments with great care for detail. Here he imagines Napoleon Bonaparte in 1798, alone on his horse, face to face with the Great Sphinx. The scene is not a record of a real moment; it is a painted idea about an ambitious general meeting something far older and greater than himself.

Look closely

- Find Napoleon. How large is he compared with the Sphinx? Where are his soldiers?

- Find the Sphinx’s face. How much of its body can you see, and what covers the rest?
- Look at the light and the empty sand. What feeling does the empty space give the picture?

Talk about it

1. Amelia Edwards wrote that the pyramid “shuts out everything but the sense of awe and wonder.” How does Gérôme try to give the viewer the same feeling?
2. Napoleon came to Egypt to conquer, but his expedition is best remembered for its scholars and the Rosetta Stone. What does that suggest about what lasts?

Safety first. Travel safety: in Egypt, carry plenty of water and sun protection, visit the pyramids early in the day, do not climb the monuments (it is forbidden and dangerous), agree on prices for camel or horse rides before mounting, and stay with the group and a licensed guide.

HANDS-ON: SCALE THE GREAT PYRAMID

Amelia Edwards noticed that from far away the pyramids look small, but up close the Great Pyramid “shuts out the sky.” Test her observation with measurements, then make Postcard 6.

You will need

- The primary source in this stop
- A tape measure, chalk or string, a yardstick
- A calculator, graph paper, an index card or blank postcard

Steps

1. Read the primary source aloud. Underline the reason Edwards gives for why distant views are not startling (“too distant to afford the means of scaling them against other objects”). Put it in your own words.
2. Outdoors, mark a square 75 feet 7 inches on each side with chalk or string, a scale of 1 to 10 for the base of the Great Pyramid. Walk around it and time yourself. Multiply your time by 10 to estimate how long it would take to walk around the real base.
3. Stand at one corner and look at the opposite corner. Imagine a point 48 feet high above the center (one-tenth of the pyramid’s height). Is the pyramid wider than it is tall? By how much?
4. On graph paper, draw a side view of the pyramid to scale (1 square = 50 feet): base 756 feet, height 481 feet. Next to it draw a 6-foot person to the same scale. Can you even see the person?
5. Make Postcard 6: on the front draw the three Giza pyramids with the Sphinx; on the back write four sentences from Giza in 1874, as a traveler with Amelia Edwards, using one of her phrases and one measurement.

Check your work

- I explained Edwards's reason for why distant pyramids look small.
- I laid out a 1-to-10 base and estimated the walk around the real pyramid.
- My scale drawing and postcard use correct measurements.

FIELD NOTEBOOK

1. **Journal page D6: Egypt.** Draw a map of Egypt with the Nile, the delta, Cairo, Giza, Aswan and the Red Sea coast at Wadi al-Jarf. Shade the green strip along the river and label the desert on both sides.
2. **Narration (parent keeps).** Write one well-built paragraph of eight to ten sentences explaining who built the Great Pyramid, when and how, and how we know. Name at least two kinds of evidence (Herodotus, the workers' town, the Diary of Merer) and say which you trust more and why. Date it and give it to a parent for the portfolio.

Did you know? A painting from an Egyptian tomb of about 1900 B.C. shows a huge statue on a sledge being pulled by rows of men while one man pours water on the sand in front of it. In 2014 physicists in the Netherlands tested this in the laboratory and found that sand dampened just enough takes about half the force to pull a sledge across as dry sand does. The Egyptians knew it four thousand years earlier.

Primary source. *Amelia B. Edwards, A Thousand Miles up the Nile (1877), Chapter I, "Cairo and the Great Pyramid," from the Project Gutenberg text (eBook #70565)*

The well-known triangular forms look small and shadowy, and are too familiar to be in any way startling. And the same, I think, is true of every distant view of them—that is, of every view which is too distant to afford the means of scaling them against other objects. But when at last the edge of the desert is reached, and the long sand-slope climbed, and the rocky platform gained, and the great pyramid in all its unexpected bulk and majesty towers close above one's head, the effect is as sudden as it is overwhelming. It shuts out the sky and the horizon. It shuts out all the other pyramids. It shuts out everything but the sense of awe and wonder.

Go deeper. Amelia B. Edwards, *A Thousand Miles up the Nile* (free on Project Gutenberg). David Macaulay, *Pyramid* (1975), a drawn account of how a pyramid was built. The Harvard Giza Project and the Ancient Egypt Research Associates (AERA) websites on the workers' town. The British Museum's Rosetta Stone pages. Second video topic: the Diary of Merer and the port of Wadi al-Jarf.

Goes deeper in. Geography, Grade 8, "North Africa and the Nile," History, "Ancient Egypt," and Arithmetic, "Geometry of Solids" (coming soon).

For families. Sources: Project Gutenberg eBook #70565 (Edwards; the Gutenberg text prints the dash as a double hyphen); Mark Lehner and Zahi Hawass, *Giza and the Pyramids* (2017); Pierre Tallet's publications on Wadi al-Jarf; Hearst Castle (Gérôme; most

catalogs date the painting 1867–1868, though some give 1886). Dates for Khufu vary by a few decades among scholars. Herodotus is paraphrased, not quoted. Workforce figures are estimates. The stop does not take up questions of the pyramids' date in relation to the date of the Flood; Christian scholars hold different views on Old Kingdom chronology.

PRACTICE

1. **EASY** For which pharaoh was the Great Pyramid built, and about when?
2. **EASY** In the primary source, name the three things Edwards says the Great Pyramid “shuts out,” and what it leaves.
3. **MEDIUM** Did the Israelites build the pyramids of Giza? Give a reason from Scripture and a reason from dates.
4. **MEDIUM** Name two kinds of evidence that the pyramid builders were organized, paid or fed workers rather than slaves driven by whips.
5. **CHALLENGE** If 2.3 million blocks were set in 20 years, working 300 days a year and 10 hours a day, how many blocks were set each day, and how many minutes apart, on average?
6. **CHALLENGE** The pyramid's height was about 481 feet and half its base about 378 feet. For every 1 foot you move inward from the edge, how many feet does the face rise? Then explain, using Edwards's idea of “scaling them against other objects,” why a photograph of the pyramid alone cannot show its size.

Make it a game • Haul the Block. Load a sturdy box with books and set it on a towel or a small rug (the sledge). Mark a course across the yard or floor. Teams take turns pulling the “block” to the “pyramid” with a rope while one member is the overseer who calls the pulling rhythm (“Heave! ... Heave!”), as Egyptian crews did with songs and chants. Time each team. Talk afterward: what made the fastest team fast, strength or teamwork and rhythm?

Scripture. “When he arose, he took the young child and his mother by night, and departed into Egypt: And was there until the death of Herod: that it might be fulfilled which was spoken of the Lord by the prophet, saying, Out of Egypt have I called my son.” (Matthew 2:14–15, KJV)

When Joseph fled with Mary and the young Child, the pyramids were already about 2,500 years old. Egypt had sheltered Abraham, Joseph and Israel before; now it sheltered the Son of God. Matthew quotes Hosea 11:1, which first spoke of Israel coming out of Egypt, and shows that Christ retraced His people's journey.

Practice: answers

1. Khufu (Cheops), around 2560 B.C., in the Fourth Dynasty of the Old Kingdom.
2. It shuts out the sky and the horizon, all the other pyramids, and everything but “the sense of awe and wonder.”

3. No. Exodus 1:11 says they built treasure cities (Pithom and Raamses) and worked in brick, not the stone pyramids of Giza. The Giza pyramids were built around 2560 B.C., many centuries before Joseph or Moses.
4. Any two: the workers' town south of the Sphinx with bakeries, breweries and cattle bones; workers' tombs built near the pyramids with their titles; the Diary of Merer recording an organized crew ferrying stone.
5. Days: $20 \times 300 = 6,000$. Blocks per day: $2,300,000 \div 6,000 \approx 383$. Minutes per day: 600. $600 \div 383 \approx 1.6$, so about one block every minute and a half, all day, for twenty years. (This is why historians believe many teams worked at once on different faces.)
6. $481 \div 378 \approx 1.27$, so the face rises about 1.27 feet for every foot inward (an angle of about 52 degrees). A photo of the pyramid with nothing beside it gives the eye nothing to compare it with; a small model would look the same. Only when there is a known object, such as a person, a camel or a car, can the viewer "scale" the pyramid and understand how huge it is.

4.7 JAPAN AND MOUNT FUJI

OBJECTIVES

- Describe Japan's islands, mountains and volcanoes, and explain why Mount Fuji has the shape it has and why it is watched closely.
- Read Lafcadio Hearn's 1898 essay "Fuji-no-Yama" as a primary source, check his numbers against modern ones, and compare his view from afar with his view from the summit.
- Tell the story of Christianity in Japan, from Francis Xavier to the Hidden Christians of 1865, plainly and accurately.

Warm-up. Find Japan on a globe, off the east coast of Asia, and trace its four main islands from north to south: Hokkaido, Honshu, Shikoku and Kyushu. Find Tokyo and then Mount Fuji, about 60 miles to the west-southwest. Japan's own name, Nihon, means "origin of the sun." Look at the globe and write one sentence explaining why people to its west might have called it the land of the rising sun.

Video slot. Video coming. Mount Fuji: how a stratovolcano forms, the 1707 Hōei eruption, climbing seasons and trails; Hokusai's Thirty-Six Views of Mount Fuji. Search approved channels (Smithsonian Channel, the Metropolitan Museum of Art, the British Museum, Japan National Tourism Organization, USGS Volcanoes); preview first.

KEY TERMS

stratovolcano

A tall, steep, cone-shaped volcano built up of many layers of lava, ash and cinders from repeated eruptions. Mount Fuji, Mount St. Helens and Mount Rainier are stratovolcanoes.

Ring of Fire

The long horseshoe of volcanoes and earthquake zones around the edges of the Pacific Ocean. Japan lies where several plates of the earth's crust meet, and it has more than 100 active volcanoes.

ukiyo-e

(Say "oo-kee-yoh-eh.") "Pictures of the floating world": Japanese woodblock prints of the 1600s to 1800s, cut on cherry-wood blocks and printed one color at a time, cheap enough for ordinary people to buy.

sakoku

"Closed country": the policy of Japan's rulers from the 1630s to 1853, which banned most foreign trade and travel and forbade Christianity.

Hidden Christians

(In Japanese, *Kakure Kirishitan*.) Japanese believers who kept the Christian faith secretly for about 250 years after it was banned, without priests or churches, passing prayers down by memory.

goraikō

“The honorable coming of the light”: the sunrise seen from the summit of Fuji, which climbers time their night ascent to watch.

CORE IDEAS

A nation of mountains on the sea. Japan is a long chain of islands, nearly 1,900 miles from end to end, a little smaller than California in area but home to about 124 million people. About three-quarters of the land is mountains or hills, so most people crowd onto the narrow coastal plains; greater Tokyo, with well over 30 million people, is one of the largest city regions in the world. Japan sits where several plates of the earth’s crust meet, on the Pacific **Ring of Fire**. It feels hundreds of earthquakes a year, has more than 100 active volcanoes, and builds its towers, bridges and railways to sway rather than break.

A nearly perfect cone. Mount Fuji, 12,388 feet (3,776 meters), is Japan’s highest mountain. It is a **stratovolcano**, and its smooth, gently curving sides were built by layer after layer of ash and lava. The present cone is young as volcanoes go, built over older ones beneath it. Fuji last erupted in 1707, during the Hōei era, when for about two weeks it threw out ash that fell even on Edo, the city now called Tokyo, about 60 miles away. It has been quiet for three centuries, but Japanese scientists watch it with instruments day and night.

A mountain of pilgrims and painters. For centuries Japanese pilgrims climbed Fuji as an act of their native religion, wearing white and ringing bells, and many still climb it today, though most go as hikers. The official climbing season is only about two months, from early July to early September, when the snow is gone. Most climbers start at a station about halfway up, climb through the night and watch the sunrise, **goraikō**, from the crater rim. In 2013 Fuji was named a World Heritage site as a “sacred place and source of artistic inspiration.” Its most famous portraits are the color woodblock prints of Katsushika Hokusai, made around 1830–1832.

Christianity comes to Japan. In 1549 the Jesuit missionary Francis Xavier landed in Kagoshima, and within about fifty years there were perhaps 300,000 Japanese Christians. Then Japan’s rulers came to fear that the faith would bring foreign power with it. In 1597, twenty-six Christians, Japanese and European, were crucified at Nagasaki; in 1614 the faith was banned throughout the country. Believers were searched out and made to tread on images of Christ or the Virgin Mary to prove they had given up the faith. Under **sakoku**, from the 1630s, Japan closed its doors to most of the outside world.

Found faithful. In 1853 and 1854 the American commodore Matthew Perry sailed warships into Tokyo Bay and pressed Japan to open its ports; the treaty was signed at Kanagawa, the same coast Hokusai drew under the great wave. French priests soon built a church in Nagasaki. On 17 March 1865 a group of villagers from nearby Urakami came quietly to the priest, Father Bernard Petitjean, and told him that they shared his faith. They were **Hidden Christians**, whose families had kept the faith in secret for some 250 years, baptizing their children and praying in whispers without a single priest. Persecution did not end at once, but by 1873 the ban was lifted.

A writer on the summit. In 1890 the writer Lafcadio Hearn came to Japan, born on a Greek island to an Irish father and a Greek mother and trained as a newspaperman in America. He married a Japanese wife, took Japanese citizenship and the name Koizumi Yakumo, and wrote a dozen books explaining Japan to English readers. In August 1897 he climbed Fuji and described it in his essay “Fuji-no-Yama” (1898). He begins with a Japanese saying that Fuji up close disappoints, describes the long, hard climb through cinders, and ends with sunrise from the summit as one of the great moments of his life.

Why it matters. Japan shows how a people can make a rich life on crowded islands among earthquakes and volcanoes, with careful building, orderly cities and fast trains: the first Shinkansen “bullet train” line opened in 1964. Its Christian history shows something else. A faith driven underground for two and a half centuries did not die. Psalm 139 was true at the uttermost parts of the sea.

PICTURE STUDY



Under the Wave off Kanagawa (The Great Wave), from Thirty-Six Views of Mount Fuji, Katsushika Hokusai, About 1830–1832 · Color woodblock print (ukiyo-e) · Impressions are in many collections; this one is in the Library of Congress

Wikimedia Commons · Public domain

Katsushika Hokusai was about seventy when he made his series *Thirty-Six Views of Mount Fuji*; it was so popular that he added ten more prints. He drew the design, a carver cut it into blocks of cherry wood, and a printer pressed each color from a separate block, so thousands of copies could be sold cheaply. The deep blue is Prussian blue, a new pigment then being imported from Europe. The boats are fast cargo boats carrying fish to market in Edo.

Look closely

- Find Mount Fuji. How big is it in the picture? What shape near the bottom of the wave echoes it?
- Find the rowers. Count the boats. What are the men doing to survive?
- Look at the foam at the top of the wave. What does it look like?

Talk about it

1. The wave is huge and wild for a moment; the mountain is small, still and lasting. What do you think Hokusai wanted us to feel?
2. Hearn wrote that Fuji is most beautiful from far away. How does Hokusai's choice to put Fuji far off and small agree with him?

Safety first. Travel and mountain safety: climb Fuji only in the official season and only with a parent or guide; carry warm clothes, rain gear, a headlamp and water, because the summit is near freezing even in August; climb slowly and go down at once if you feel the headache or sickness of altitude. In Japan, learn the earthquake drill: drop, cover and hold on, and follow posted evacuation signs.

HANDS-ON: CHECK THE TRAVELER'S NUMBERS AND WORDS

Hearn was a careful writer, but writers make mistakes and use poetic words. Read the primary source, check his facts against modern measurements, and compare his two views of the mountain. Finish with Postcard 7.

You will need

- The primary source in this stop
- A map of Japan with Tokyo and Fuji marked, and a calculator
- An index card or blank postcard and colored pencils (blue especially)

Steps

1. Read the primary source aloud. Copy the Japanese proverb and its English meaning. Does Hearn agree with the proverb?
2. Hearn gives Fuji's height as "nearly 12,500 feet." The modern measurement is 12,388 feet. Work out the difference and the percent error. Was Hearn close?
3. Hearn says Fuji is visible from thirteen provinces. Measure on your map how far Fuji is from Tokyo. Then work out (Practice 6) how far one can see from the summit.
4. Make two columns: "From afar" and "From the summit." Copy Hearn's best phrase for each. What changed his feelings: the mountain, or where he stood?
5. Make Postcard 7: on the front draw Fuji from far away in Hokusai's style, with a strong blue; on the back write four sentences from the summit at sunrise, using one phrase of Hearn's.

Check your work

- I compared Hearn's height with the modern figure and found the percent error.

- My two columns show Hearn's view from afar and from the summit, in his words.
- My postcard uses one of Hearn's phrases and draws Fuji in Hokusai's style.

FIELD NOTEBOOK

1. **Journal page D7: Japan.** Draw a cross-section of a stratovolcano with its layers of ash and lava, the central vent and the crater. Beside it, a small map of Japan with the four main islands, Tokyo, Fuji and Nagasaki.
2. **Narration (parent keeps).** Write one well-built paragraph of eight to ten sentences on Mount Fuji: how it was formed, when it last erupted, how people climb it, and how Hokusai and Hearn each saw it. Include at least three numbers. Date it and give it to a parent for the portfolio.

Did you know? The Hidden Christians had no Bibles and no priests, so they hid their prayers in plain sight. Some kept small statues of the Buddhist figure Kannon, holding a child, that they secretly honored as the Virgin Mary with the Christ Child; these came to be called "Maria Kannon." They kept a calendar of Christian feasts by memory and chose elders in each village to baptize the babies. Over 250 years, some of their Latin and Portuguese prayers were worn by memory into words they no longer understood.

Primary source. Lafcadio Hearn, "Fuji-no-Yama," in *Exotics and Retrospectives* (1898), from the Project Gutenberg text (eBook #42735). Hearn opens with a Japanese proverb and his translation:

Kité miréba,
Sahodo madé nashi,
Fuji no Yama!

Seen on close approach, the mountain of Fuji does not come up to expectation.—
Japanese proverbial philosophy.

The most beautiful sight in Japan, and certainly one of the most beautiful in the world, is the distant apparition of Fuji on cloudless days,—more especially days of spring and autumn, when the greater part of the peak is covered with late or with early snows. You can seldom distinguish the snowless base, which remains the same color as the sky: you perceive only the white cone seeming to hang in heaven; and the Japanese comparison of its shape to an inverted half-open fan is made wonderfully exact by the fine streaks that spread downward from the notched top, like shadows of fan-ribs.

Rising to a height of nearly 12,500 feet, Fuji is visible from thirteen provinces of the Empire.

At sunrise on the summit:

The immense poetry of the moment enters into me with a thrill. I know that the colossal vision before me has already become a memory ineffaceable,—a memory of which no luminous detail can fade till the hour when thought itself must fade, and the dust of these eyes be mingled with the dust of the myriad million eyes that also have looked, in ages forgotten before my birth, from the summit supreme of Fuji to the Rising of the Sun.

Go deeper. Lafcadio Hearn, *Exotics and Retrospectives* (free on Project Gutenberg); read the whole “Fuji-no-Yama” essay. The Metropolitan Museum of Art’s pages on Hokusai’s *Thirty-Six Views of Mount Fuji*. Rhoda Blumberg, *Commodore Perry in the Land of the Shogun* (1985), a Newbery Honor history. Second video topic: the Oura Church in Nagasaki and the “discovery” of the Hidden Christians in 1865.

Goes deeper in. Geography, Grade 8, “East Asia,” Earth Science, “Volcanoes,” and Art, “Printmaking” (coming soon).

For families. Sources: Project Gutenberg eBook #42735 (Hearn; the three passages are separate excerpts from the essay, and the dashes are printed as in the Gutenberg text); Geospatial Information Authority of Japan (height); Library of Congress and the Metropolitan Museum of Art (Hokusai). Hearn admired Japan’s native religions and was often critical of missionaries; the excerpts chosen are descriptive. The martyrdoms of 1597 and the persecutions are stated plainly without detail. Numbers of early Japanese Christians are estimates. Japan’s length, earthquake frequency and the population of greater Tokyo are rounded and vary by source.

PRACTICE

1. **EASY** How high is Mount Fuji, and when did it last erupt?
2. **EASY** In the primary source, what does the Japanese proverb say about Fuji, and what Japanese comparison does Hearn give for its shape?
3. **MEDIUM** Why is Fuji shaped like a smooth, steep cone?
4. **MEDIUM** Who were the Hidden Christians, and what happened on 17 March 1865?
5. **CHALLENGE** Hearn wrote “nearly 12,500 feet.” The true height is 12,388 feet. What is the difference, and what is the percent error, to one decimal place? Was Hearn’s figure a fair one for 1898?
6. **CHALLENGE** The distance in miles to the horizon from a height of h feet is about $1.22 \times \sqrt{h}$. How far can a climber see from Fuji’s summit on a perfectly clear day? Can Tokyo (about 60 miles away) be seen?

Make it a game • Thirty-Six Views. Each player draws a scene (a kitchen, a street, a farm, a sea) and hides a small Mount Fuji somewhere in it, the way Hokusai did, maybe in a cup of tea, a roof line or a wave. Swap drawings and race to find the hidden mountain. The finder gets a point; the artist gets a point if no one finds it in one minute. Look at a few of Hokusai’s real views afterward and try to find Fuji in each.

Scripture. “If I take the wings of the morning, and dwell in the uttermost parts of the sea; Even there shall thy hand lead me, and thy right hand shall hold me.” (Psalm 139:9–10, KJV)

To the people of the Bible, the “wings of the morning” flew from the east, and the uttermost parts of the sea were the farthest places imaginable. Japan, the land of the rising sun on the far side of the sea, was such a place. The Hidden Christians of Nagasaki found this psalm true for 250 years: no one could reach them with a priest, but God’s hand held them.

Practice: answers

1. 12,388 feet (3,776 meters); it last erupted in 1707 (the Hōei eruption).
2. Seen up close, Fuji does not come up to expectation. Its shape is compared to an inverted (upside-down) half-open fan, with streaks like the shadows of fan-ribs.
3. It is a stratovolcano, built up by many eruptions that laid down layer after layer of ash, cinders and lava around a central vent.
4. Japanese believers who kept the Christian faith in secret for about 250 years after it was banned in 1614, without priests. On 17 March 1865 villagers from Urakami came to Father Petitjean at the new church in Nagasaki and told him they shared his faith.
5. $12,500 - 12,388 = 112$ feet. $112 \div 12,388 \approx 0.009$, so about 0.9 percent. Yes; within one percent, and he said “nearly,” so he was rounding, not claiming an exact figure.
6. $\sqrt{12,388} \approx 111.3$; $1.22 \times 111.3 \approx 136$ miles. Tokyo, at about 60 miles, is well within that distance, which is why Fuji and Tokyo can see each other on clear winter days. (Haze, clouds and the curve of the land usually shorten the real view.)

4.8 AMERICA'S NATIONAL PARKS: YELLOWSTONE AND THE GRAND CANYON

OBJECTIVES

- Explain what makes Yellowstone and the Grand Canyon unique, using real numbers for their geysers, falls, depth and size.
- Read the Yellowstone Act of 1872 as a primary source and explain the two goals it set for the first national park, and how they can pull against each other.
- Tell how explorers, artists and a president helped make these places national parks, including John Wesley Powell's 1869 voyage through the Grand Canyon.

Warm-up. On a map of the United States, find Yellowstone in the northwest corner of Wyoming and the Grand Canyon in northern Arizona. Measure the straight-line distance between them with the scale bar. Then answer in one sentence: if a place is so beautiful that everyone wants to see it, how can it stay beautiful?

Video slot. Video coming. Yellowstone's geysers and hot springs and the Grand Canyon's rock layers; how Yellowstone became the first national park in 1872; John Wesley Powell's 1869 expedition. Search approved channels (National Park Service, Yellowstone and Grand Canyon park channels, Smithsonian American Art Museum, USGS); preview first.

KEY TERMS

national park

Land set aside by Congress and kept by the nation for its natural wonders and for people to enjoy. Yellowstone, created on 1 March 1872, is generally counted the first in the world; the United States now has 63.

geyser

A hot spring that erupts from time to time, when water deep underground is heated past boiling, flashes to steam and blasts the water above it into the air.

hydrothermal

Having to do with hot water underground. Yellowstone has more than 10,000 hydrothermal features: geysers, hot springs, mud pots and steam vents.

caldera

A huge bowl-shaped hollow formed when the ground collapses after a volcano empties the magma beneath it. Much of central Yellowstone lies in a caldera about 30 by 45 miles.

strata

Layers of rock laid one on another. The walls of the Grand Canyon show strata from the dark Vishnu Schist at the bottom to the pale Kaibab Limestone at the rim.

National Park Service

The federal agency created on 25 August 1916 to care for the national parks; its rangers protect the parks and teach visitors.

CORE IDEAS

A land of fire and water. Yellowstone covers about 3,500 square miles, larger than the state of Delaware, mostly in Wyoming, with edges in Montana and Idaho. It sits on a high plateau above a volcanic hot spot, and much of it lies within a great **caldera**. Heat from below powers more than 10,000 **hydrothermal** features, including about 500 **geysers**, roughly half of all the geysers in the world. Old Faithful, named by explorers in 1870, erupts about every 60 to 110 minutes, sending water 100 to 180 feet high. Rangers predict each eruption from the length of the one before.

A canyon of yellow stone. The Yellowstone River has cut its own Grand Canyon, about 20 miles long, through rock colored yellow, orange and pink by heat and minerals. At its head the Lower Falls drops 308 feet, nearly twice as far as Niagara's Horseshoe Falls. Many native peoples knew the region. The Crow, Shoshone, Bannock and Blackfeet hunted and traveled through it, and one band of Shoshone, the Sheep Eaters, lived there year-round until, a few years after the park was made, they were moved to reservations.

How a park was made. Trappers had told stories of boiling springs that few believed. In 1870 an expedition of Montana men explored the region and named Old Faithful. In 1871 the government geologist Ferdinand Hayden led a survey with the painter Thomas Moran and the photographer William Henry Jackson. Their reports, sketches and photographs, shown to members of Congress, made the wonders real. On 1 March 1872 President Ulysses S. Grant signed the act creating Yellowstone, and that summer Congress bought Moran's great painting of the canyon. Protecting it was harder. The Army guarded the park from 1886 to 1918 against poachers and vandals, until the new **National Park Service**, created in 1916, took over.

The Great Unknown. Six hundred miles to the south the Colorado River runs through the Grand Canyon in Arizona: 277 river miles long, up to 18 miles wide and about a mile deep. In 1869 no one had ever followed the river through it and lived to describe it. John Wesley Powell, a geology professor who had lost his right arm at the Battle of Shiloh, set out on 24 May 1869 from Green River, Wyoming, with nine men in four wooden boats. They lost a boat and much of their food in the rapids. Near the end three men, sure that the rapids ahead were deadly, climbed out of the canyon and were killed. Powell and five others came out at the mouth of the Virgin River on 30 August.

Reading the walls. The canyon walls are a book of **strata**: limestone, sandstone and shale stacked in flat layers about a mile thick above dark, twisted older rock. Some of the limestone layers hold the shells of sea creatures, high in the desert. Christians who study the canyon agree that it displays the power of water on a scale hard to imagine; they differ on how long the canyon took to form and how its layers relate to the Flood. Both kinds of Christian scholars study the same rocks with care.

“Leave it as it is.” In May 1903 President Theodore Roosevelt stood on the South Rim and told the crowd to “leave it as it is,” because they could not improve on it. In 1908 he made the canyon a national monument, and in 1919 Congress made it a national park. People still live in it: the Havasupai, whose village of Supai lies deep in a side canyon, still receive their mail by mule train. Today each park welcomes more than four million visitors a year.

Why it matters. The Yellowstone Act of 1872 gave the nation a new idea: that some land should belong to all the people, not to be sold or settled, but kept for their benefit and enjoyment and held in its natural condition. Those two goals, enjoying a place and keeping it unspoiled, pull against each other, and every road, lodge and trail is a choice between them. The Christian sees the parks first as God’s handiwork, entrusted to people to keep with gratitude and care.

PICTURE STUDY



The Grand Canyon of the Yellowstone, Thomas Moran, 1872 · Oil on canvas mounted on aluminum · Smithsonian American Art Museum, Washington, D.C. (lent by the U.S. Department of the Interior Museum)
Wikimedia Commons · Public domain

Thomas Moran was born in England and grew up near Philadelphia. In the summer of 1871 he joined the Hayden survey of Yellowstone and sketched the canyon in watercolor. Back home he painted this canvas, about 7 feet tall. He said that he wanted to give the feeling of the whole place rather than copy every rock. In 1872 Congress bought it for \$10,000, and it hung for many years in the Capitol.

Look closely

- Find the Lower Falls. How large is it in the picture? How far away does it seem?
- Find the tiny people on the rock in the foreground. Two of them are said to be Hayden and his guide. How do they help you sense the canyon’s size?

- Find the colors of the canyon walls. Which colors did Moran use most?

Talk about it

1. The paintings and photographs from the Hayden survey helped persuade Congress to create the park. Why might a picture persuade people where a written report could not?
2. Moran said he wanted to paint the feeling of the place, not a map of it. Is that honest? What makes a picture true?

Safety first. Park safety: in Yellowstone’s thermal areas stay on boardwalks and marked trails, because the crust can be thin over boiling water; stay at least 25 yards from bison and elk and at least 100 yards from bears and wolves, as the National Park Service requires. At the Grand Canyon, stay back from the rim, carry plenty of water, and never try to hike to the river and back in one day.

HANDS-ON: READ THE LAW THAT MADE A PARK

The Yellowstone Act (the primary source in this stop) is short and full of careful legal words. Read it like a lawyer and a citizen, find its two goals, and test them on a real park decision. Finish with Postcard 8, the last of your set.

You will need

- The primary source in this stop
- A dictionary, two colored pencils or highlighters
- A Yellowstone or Grand Canyon map from the National Park Service website
- An index card or blank postcard

Steps

1. Read the act aloud slowly. Look up any word you do not know (for example, “occupancy,” “trespassers,” “spoliation,” “retention”).
2. In one color, highlight every phrase about people using the park (for example, “for the benefit and enjoyment of the people”). In the other, every phrase about protecting it (for example, “preservation, from injury or spoliation”).
3. Write each of the two goals in one plain sentence of your own.
4. Choose one real question a park ranger faces: Should a new road be built to a beautiful spot? Should the number of cars be limited? Should a lodge be built near the canyon rim? Write a paragraph deciding it, using both goals of the act.
5. On your park map, find where the roads and lodges are. What share of the park can be reached by car? What does that tell you about how the Park Service balances the two goals?
6. Make Postcard 8: on the front, draw Old Faithful erupting or the Lower Falls; on the back, write four sentences from the park, quoting one phrase from the 1872 act.

Check your work

- I found and highlighted both goals of the act and restated them plainly.
- My paragraph decides a real question using both goals, fairly.
- My postcard quotes the act correctly.

FIELD NOTEBOOK

1. **Journal page D8: The national parks.** Draw a cross-section of a geyser: the plumbing of cracks underground, the heat source below, water filling from above, and the eruption. On the same page, draw a strip of the Grand Canyon wall with five layers labeled from the river to the rim.
2. **Narration (parent keeps).** Write one well-built paragraph of eight to ten sentences explaining how Yellowstone became the first national park and what the 1872 act required. Include Hayden, Moran, the date the act was signed, and one phrase quoted from it. Date it and give it to a parent for the portfolio.

Did you know? John Wesley Powell named many places on his voyage. Bright Angel Creek, near today's Phantom Ranch, is said to take its name from a line in a hymn; the party had named a muddy stream upriver the Dirty Devil, so Powell named this clear one for an angel. Powell later became the second director of the U.S. Geological Survey and urged that the West be settled carefully, according to its water.

Primary source. *An Act to set apart a certain Tract of Land lying near the Head-waters of the Yellowstone River as a public Park, approved 1 March 1872 (17 Stat. 32), from the National Archives transcription of the enrolled act (Record Group 11). From Section 1 (the description of the boundaries is left out where marked):*

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the tract of land in the Territories of Montana and Wyoming, lying near the headwaters of the Yellowstone River, and described as follows, to wit, [boundaries] ... is hereby reserved and withdrawn from settlement, occupancy, or sale under the laws of the United States, and dedicated and set apart as a public park or pleasuring-ground for the benefit and enjoyment of the people; and all persons who shall locate or settle upon or occupy the same, or any part thereof, except as hereinafter provided, shall be considered trespassers and removed therefrom.

From Section 2:

Such regulations shall provide for the preservation, from injury or spoliation, of all timber, mineral deposits, natural curiosities, or wonders within said park, and their retention in their natural condition.

Go deeper. John Wesley Powell, *Canyons of the Colorado* (1895; free on Project Gutenberg), his own account of 1869. The National Park Service websites for Yellowstone

(with live Old Faithful webcam and geyser predictions) and Grand Canyon (with free Junior Ranger books). The Smithsonian American Art Museum's pages on Thomas Moran. Second video topic: how geysers work, and why Old Faithful can be predicted.

Goes deeper in. Geography, Grade 8, "The American West," Earth Science, "Rocks, Rivers and Canyons," and Art, "Painters of the American West" (coming soon).

For families. Sources: National Archives, Milestone Documents (the act; the National Archives is used here because the enrolled act is a federal record; an older NPS printing spells one word "pleasureing-ground"); National Park Service (park figures and wildlife distances); Smithsonian American Art Museum (Moran, L.1968.84.1). Roosevelt's words at the Grand Canyon are known mainly from a local newspaper report; the stop quotes only the short, widely recorded phrase. Christians hold different views on the age of the Grand Canyon; the stop states both briefly and does not decide between them. The removal of native peoples from the park is stated plainly. Visitor numbers and the count of national parks are recent and may change.

PRACTICE

1. **EASY** On what date was Yellowstone made a national park, and which president signed the act?
2. **EASY** In the primary source, for whose "benefit and enjoyment" was the park set apart, and what would happen to people who settled on it?
3. **MEDIUM** Explain in two or three sentences what makes a geyser erupt.
4. **MEDIUM** Name two kinds of evidence (people or things) that persuaded Congress to create Yellowstone.
5. **CHALLENGE** Old Faithful erupts on average about every 90 minutes. About how many eruptions are there in a day and in a year? The Lower Falls drops 308 feet and Niagara's Horseshoe Falls about 167 feet; how many times higher is the Lower Falls?
6. **CHALLENGE** The 1872 act set two goals: the "benefit and enjoyment of the people" and the "retention" of the park's wonders "in their natural condition." Give one example where the goals agree and one where they conflict, and say how you would decide the conflict.

Make it a game • Predict Old Faithful. One player is the geyser. A parent whispers a secret number of seconds between 30 and 90. The geyser crouches, silently counts, then leaps up with arms spread and a whoosh. Before it starts, every other player writes a prediction of when it will "erupt." The closest predictor becomes the next geyser. After a few rounds, give the geyser a rule (short count after a short eruption, long count after a long one) and see whether the rangers can learn to predict it, as real rangers do.

Scripture. "In his hand are the deep places of the earth: the strength of the hills is his also. The sea is his, and he made it: and his hands formed the dry land." (Psalm 95:4-5, KJV)

The deep places of the earth, a canyon a mile deep, and the strength of the hills, a plateau over a volcanic hot spot, are in God's hand. The parks belong to the people only as stewards. The psalm goes on, "O come, let us worship and bow down: let us kneel before the LORD our maker" (Psalm 95:6). Wonder that does not lead to worship stops short.

Practice: answers

1. 1 March 1872; President Ulysses S. Grant.
2. For the benefit and enjoyment of the people. Anyone who settled on or occupied it would be "considered trespassers and removed therefrom."
3. Water seeps down into cracks deep underground, where it is heated by hot rock above magma. Under pressure it gets hotter than its normal boiling point; when some of it flashes to steam, the steam pushes the water above it out of the vent in an eruption. Then the plumbing refills and the cycle begins again.
4. Any two: the reports of the 1870 Washburn expedition; Ferdinand Hayden's 1871 survey report; Thomas Moran's sketches and paintings; William Henry Jackson's photographs.
5. $24 \times 60 = 1,440$ minutes; $1,440 \div 90 = 16$ eruptions a day; $16 \times 365 = 5,840$ a year. $308 \div 167 \approx 1.8$, so the Lower Falls is nearly twice as high.
6. Sample: They agree when the park stops someone from cutting the forest or carrying off geyser deposits, which both protects the wonders and keeps them for all to enjoy. They conflict when more roads or lodges would let more people see the park but damage the land, wildlife or quiet. I would decide by asking whether the change could be undone and whether it harms the very thing people come to enjoy; if it would permanently spoil a wonder, protection should win, because a spoiled wonder benefits no one.

TRAIL 4 BADGE QUIZ

The badge quizzes are optional and may be done orally or in writing, without notes. Four right out of five earns the first badge; four right out of five earns the second. For questions that ask for reasons, accept any answer that is accurate and well explained. Badges and the certificate are earned by doing the stops, not by scores.

Badge quiz 1 (Stops 1-5)

1. Why is the land east of Jerusalem a desert, and why does the Bible speak of going “down” from Jerusalem to Jericho?
2. Who began and who dedicated the Colosseum, and what helped pay for it? Suetonius says 5,000 wild beasts were brought in on one day; Cassius Dio says 9,000 animals died in all. Do they contradict each other?
3. Name three jobs the Tower of London has done, and explain why it survived the Great Fire of 1666.
4. Give the Eiffel Tower’s original height and opening year. What did the 1887 protesters say it would do to Paris, and what saved it when its permit ran out?
5. Zermatt is about 9,400 feet below the Matterhorn’s summit. If air cools about 3.5 °F for every 1,000 feet and it is 68 °F in Zermatt, about how cold is the summit? What happened there on 14 July 1865?

Badge quiz 2 (Stops 6-8)

6. For whom was the Great Pyramid built, and about when? Name two pieces of modern evidence about who built it.
7. Amelia Edwards wrote that distant views of the pyramids are not startling. What reason did she give?
8. What kind of volcano is Mount Fuji, when did it last erupt, and who were the Hidden Christians?
9. What two goals did the Yellowstone Act of 1872 set for the park, and why can they conflict?
10. Old Faithful erupts about every 90 minutes. About how many times does it erupt in a day? Who led the first known voyage through the Grand Canyon, and in what year?

TRAIL CERTIFICATE: MY ARMCHAIR TOUR: POSTCARDS, JOURNAL AND NARRATIONS

Gather the eight postcards into a set or a sleeve page titled “Postcards from Eight Faraway Places,” with your name and dates.

Bind the eight travel-journal pages (maps, cross-sections, drawings) with the eight narration paragraphs your parent kept, in stop order.

Choose one primary source from the trail and write a one-page essay: what it says, how you checked it, and what it taught you that a modern summary could not.

When the set is complete, a parent signs the Trail D certificate.

- **Sources:** Primary sources are quoted exactly, named correctly, and checked against other evidence; tradition and estimate are labeled honestly.
- **Numbers and maps:** Measurements, scale drawings and calculations are correct, with the work shown and units given.
- **Narration:** Each paragraph is well built, accurate and in the student's own words, with the facts and quotations each stop asked for.
- **Craft:** Postcards and journal pages are neat, labeled and complete, and the Scripture for each stop is connected thoughtfully to the place.

Answer key

1. Rain comes from the Mediterranean in the west and falls on the Judean hills; the eastern slopes lie in a rain shadow. Jerusalem is about 2,500 feet above sea level and Jericho about 850 feet below, in the Jordan Rift Valley, so the road drops more than 3,300 feet.
2. Vespasian began it on the site of Nero's lake; Titus dedicated it in A.D. 80. It was paid for largely from the spoils of the Jewish War, after Jerusalem fell in A.D. 70. The writers need not contradict: one figure is for a single day and the other for all 100 days of games.
3. Any three: fortress, palace, prison, mint, armory, treasury of the Crown Jewels, records office, menagerie. The east wind drove the fire mostly westward, away from it, and houses nearby were blown up to make firebreaks before the fire could reach its gunpowder stores.
4. 300 meters (about 984 feet); 1889. They said it would dominate Paris and humiliate its great monuments. It was saved because it had become useful for science, especially as a military radio antenna.
5. $9.4 \times 3.5 \approx 33$ °F colder, so about 35 °F. On 14 July 1865 Whymper's party of seven made the first ascent; on the descent four fell to their deaths when the rope broke.
6. For the pharaoh Khufu (Cheops), around 2560 B.C. Evidence: the workers' town south of the Sphinx (bakeries, barracks, workers' tombs) and the Diary of Merer, the papyrus logbook of a crew ferrying limestone to Giza.
7. From far away there is nothing beside them to compare them with; such views are "too distant to afford the means of scaling them against other objects."
8. A stratovolcano; it last erupted in 1707. The Hidden Christians were Japanese believers who kept the faith in secret for about 250 years after it was banned in 1614, and made themselves known in Nagasaki in 1865.
9. The park was set apart "for the benefit and enjoyment of the people," and its wonders were to be kept "in their natural condition." More roads and buildings let more people enjoy the park but can damage what they come to see.
10. $1,440 \div 90 = 16$ times a day. John Wesley Powell, in 1869.