Plot the Shake

1–2 Days

LATITUDE & LONGITUDE

Because “somewhere in the Atlantic” isn't much of a location report.



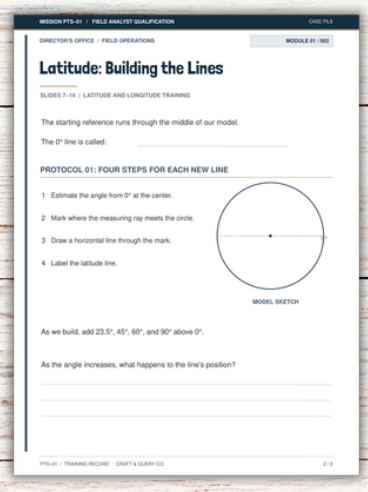
- **46-slide engaging graphing lesson**
- **Guided Student NNotes**
- **3 Latitude/Longitude Practice Sheets**
- **2 completed Frayer models**
- **Teacher guide with teaching prompts**


Plot the Shake! Mission Training Manual

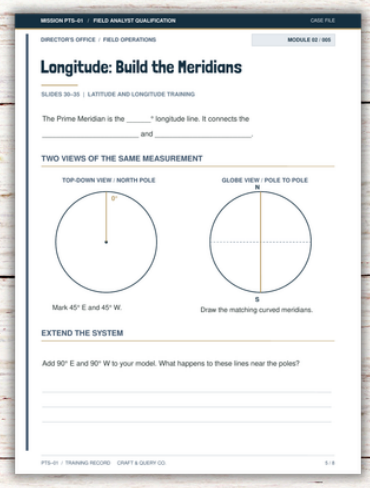
CASE INTAKE: THE LOCATION PROBLEM

DIRECTIVE 01: FIND THE SPOT

EVIDENCE LOG: INITIAL LATITUDE MODEL


Latitude: Building the Lines

PROTOCOL 01: FOUR STEPS FOR EACH NEW LINE


Longitude: Build the Meridians

TWO VIEWS OF THE SAME MEASUREMENT

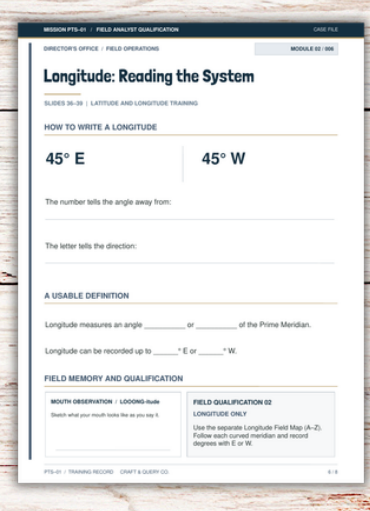
EXTEND THE SYSTEM


Latitude Debrief / New Problem

AFTER-ACTION REVIEW: NOW WITH LATITUDE

REVISIT YOUR FIRST MODEL

NEW DIRECTIVE: SAME LATITUDE


Longitude: Reading the System

HOW TO WRITE A LONGITUDE

A USABLE DEFINITION

FIELD MEMORY AND QUALIFICATION

AN INVESTIGATION BY ALYSE - Craft & Query Co.

The Overview

Latitude and longitude can be surprisingly confusing for students. We tell them that latitude lines run east and west, but the numbers appear along the sides of a map. Then we introduce memory tricks about ladders and long lines and hope everything sticks. But what if students understood why those lines exist before trying to memorize which is which. That's the thinking behind this latitude and longitude lesson!

Students begin with a mission: They've been recruited as field investigators who need to report precise locations. But there's a problem. Telling someone that something happened "somewhere in the Atlantic Ocean" isn't particularly helpful! Students quickly recognize that they need a better system for describing locations. That's where their training begins.

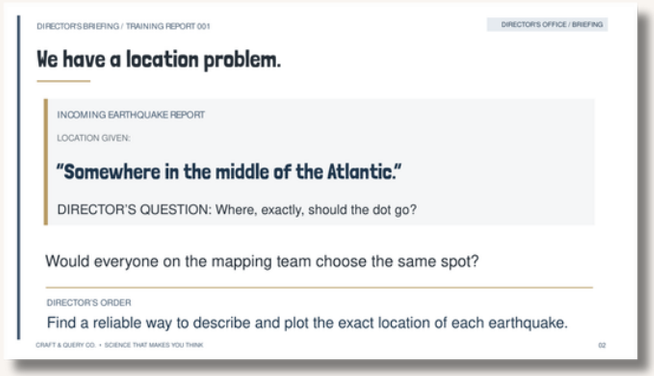
Rather than jumping straight into definitions, students investigate the logic behind latitude. They discover how latitude measurements are based on angles, construct their own understanding of the coordinate lines, and practice locating places—including positions that fall between marked lines. Once latitude makes sense, they encounter another problem: Latitude alone can't identify an exact location! Enter longitude. Students explore the same underlying logic, build their understanding of longitude measurements, and practice using them independently before combining both coordinates.

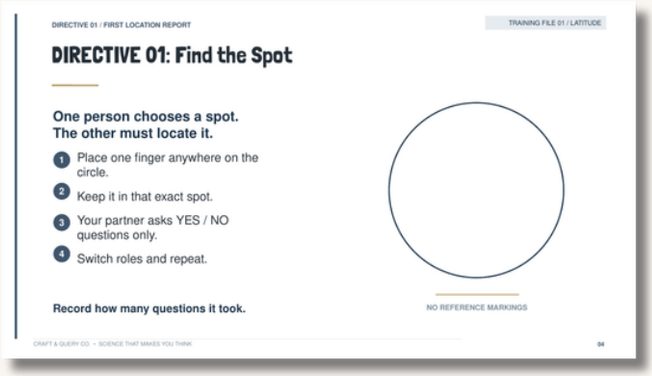
And yes, we eventually get to the silly memory tricks—including some rather ridiculous mouth movements! But those tricks come after students understand what they're remembering. Finally, students put their training to work, using latitude and longitude together to identify precise locations and complete their mission. The goal? Students who don't just memorize which lines go which way—they understand how Earth's coordinate system works and why we need it!

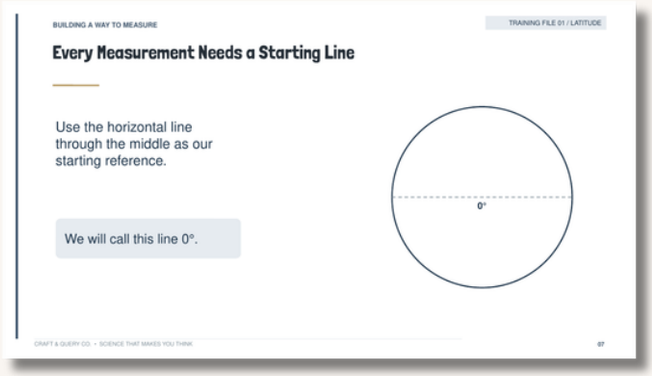


Teacher Slide Deck

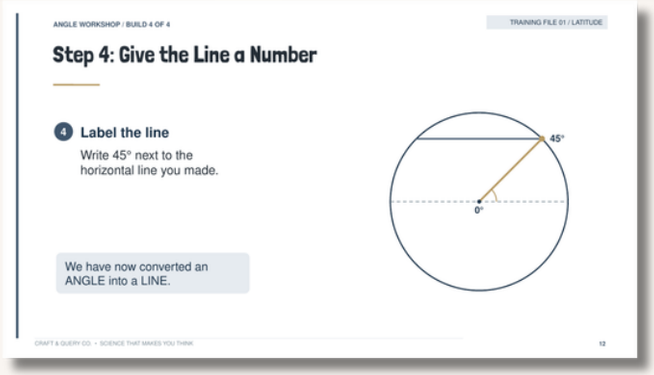


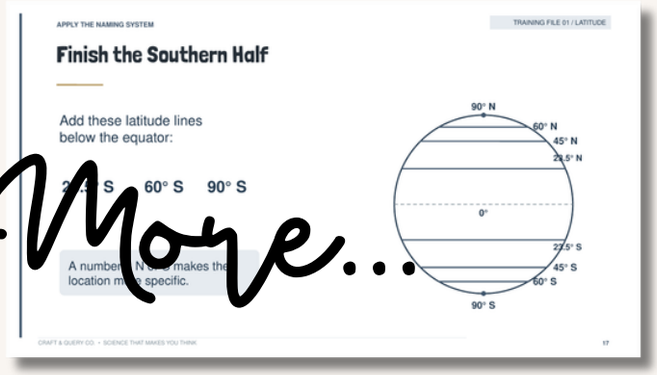


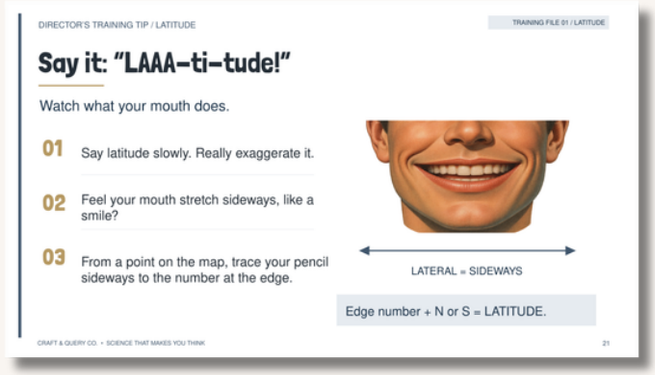












And More...

Teacher Slide Deck

DIRECTIVE 01 / LATITUDE FIELD CHECK / ALL LOCATIONS

TRAINING FILE 01 / LATITUDE

A–Z

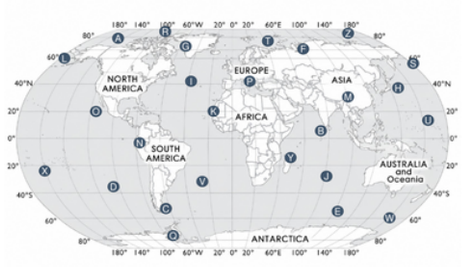
26 LOCATIONS

Latitude only.

Read the horizontal parallels on the map.

Record each degree with N or S in your training log.

ONE MAP / ALL POINTS



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CHANGE YOUR VIEWPOINT

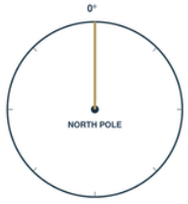
TRAINING FILE 02 / LONGITUDE

Longitude Is an Angle, Too

Look straight down at the NORTH POLE.

We measure angles around Earth from the 0° meridian.

This is a top-down view — not the side view we used for latitude.



TOP VIEW • NOT TO SCALE

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FROM AN ANGLE TO A GLOBE LINE

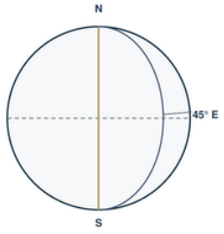
TRAINING FILE 02 / LONGITUDE

Step 2 — Draw the Meridian

The 45° E angle identifies a whole pole-to-pole line.

Follow it from the North Pole to the South Pole.

Meridians curve in this globe view.



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TRY IT ON YOUR GLOBE

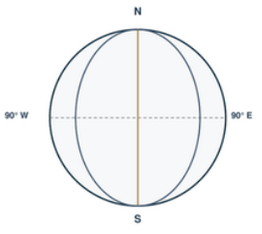
TRAINING FILE 02 / LONGITUDE

Add More Longitude Lines

Keep measuring EAST or WEST from 0°.

Add 90° E and 90° W. What happens to these lines near the poles?

Longitude can be labeled up to 180° E or W.



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DIRECTOR'S TRAINING TIP / LONGITUDE

TRAINING FILE 02 / LONGITUDE

Say it: "LOOONG–itude!"

Watch how your mouth opens.

01 Say longitude slowly. Really draw out LONG.

02 Notice how your mouth opens tall, up and down?

03 From a point on the map, trace its curved meridian toward the top or bottom edge.



Top or Bottom Edge number + E or W = LONGITUDE.

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DIRECTIVE 02 / LONGITUDE FIELD CHECK / ALL LOCATIONS

TRAINING FILE 02 / LONGITUDE

A–Z

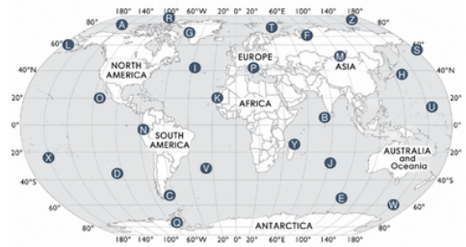
26 LOCATIONS

Longitude only.

Follow the curved meridian to the top or bottom edge.

Record each degree with E or W in your training log.

ONE MAP / ALL POINTS



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DIRECTOR'S MEMORY CHECK / BEFORE THE COMBINED COORDINATES

FIELD GUIDE / QUICK RECALL

Remember the Mouth Trick?

LATITUDE

"LAAA–ti–tude!"



↔ SIDE TO SIDE

Follow the latitude line across to its degree label.

LONGITUDE

"LOOONG–itude!"



↑ UP & DOWN ↓

Follow the longitude line up or down to its degree label.

WHEN YOU REPORT A LOCATION: LATITUDE FIRST • LONGITUDE SECOND

CRAFT & QUERY CO. • SCIENCE THAT MAKES YOU THINK RECALL 44

DIRECTOR'S OFFICE / INCOMING ASSIGNMENT

NEW CASE FILE / 02

A New Mission Arrives.

The Director has earthquake reports for your team.

Could their locations tell us something?

Your next case file is ready.

FILE 02 / EARTHQUAKE INVESTIGATION



OPEN THE NEXT MISSION BOOKLET

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And More...

Student Notes & Practice

MISSION PTS-01 / FIELD ANALYST QUALIFICATION — CASE FILE

DIRECTOR'S OFFICE / FIELD OPERATIONS — CASE INTAKE 001

Plot the Shake! Mission Training Manual

SLIDES 1–6 | LATITUDE AND LONGITUDE TRAINING

Field analyst: _____ Team / period: _____

CASE INTAKE: THE LOCATION PROBLEM

INCOMING REPORT

> *"Somewhere in the middle of the Atlantic."*

Why is this report too vague for everyone to plot the same dot?

DIRECTIVE 01: FIND THE SPOT

FIRST PARTNER TEST

Ask YES / NO questions to locate your partner's finger on the blank circle.

Questions needed: _____

What made the location difficult to describe?

EVIDENCE LOG: INITIAL LATITUDE MODEL

Rochester is about 43° N. Where might the number 43° come from?

PTS-01 / TRAINING RECORD CRAFT & QUERY CO.

MISSION PTS-01 / FIELD ANALYST QUALIFICATION — CASE FILE

DIRECTOR'S OFFICE / FIELD OPERATIONS — MODULE 01 / 002

Latitude: Building the Lines

SLIDES 7–14 | LATITUDE AND LONGITUDE TRAINING

The starting reference runs through the middle of our model.

The 0° line is called: _____

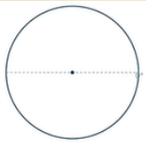
PROTOCOL 01: FOUR STEPS FOR EACH NEW LINE

1 Estimate the angle from 0° at the center.

2 Mark where the measuring ray meets the circle.

3 Draw a horizontal line through the mark.

4 Label the latitude line.



MODEL SKETCH

As we build, add 23.5°, 45°, 60°, and 90° above 0°.

As the angle increases, what happens to the line's position?

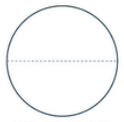
MISSION PTS-01 / FIELD ANALYST QUALIFICATION — CASE FILE

DIRECTOR'S OFFICE / FIELD OPERATIONS — MODULE 01 / 003

Latitude: Name the Direction

SLIDES 15–23 | LATITUDE AND LONGITUDE TRAINING

Both lines could be labeled 45°. What else must a location report include?



LABEL NORTH AND SOUTH

LATITUDE FIELD GUIDE

The equator is _____° latitude.

Latitude measures an angle _____ or _____ of the equator.

A full latitude report needs degrees and the letter _____ or _____.

LAAA-ti-tude

like as you say it.

FIELD QUALIFICATION 01

LATITUDE ONLY

Use the separate Latitude Field Map (A–Z). Find each point and record its latitude in degrees with N or S.

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MISSION PTS-01 / FIELD ANALYST QUALIFICATION — CASE FILE

DIRECTOR'S OFFICE / FIELD OPERATIONS — CASE REVIEW / 004

Latitude Debrief / New Problem

SLIDES 24–29 | LATITUDE AND LONGITUDE TRAINING

AFTER-ACTION REVIEW: NOW WITH LATITUDE

Questions before adding lines: _____

Questions using latitude lines: _____

What changed? Why?

REVISIT YOUR FIRST MODEL

Where does a latitude number come from? What would you revise?

NEW DIRECTIVE: SAME LATITUDE

TRAINING FILE 02

on 45° N. What can latitude tell us,

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MISSION PTS-01 / FIELD ANALYST QUALIFICATION — CASE FILE

DIRECTOR'S OFFICE / FIELD OPERATIONS — MODULE 02 / 005

Longitude: Build the Meridians

SLIDES 30–35 | LATITUDE AND LONGITUDE TRAINING

The Prime Meridian is the _____° longitude line. It connects the _____ and _____.

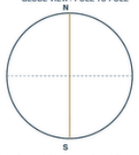
TWO VIEWS OF THE SAME MEASUREMENT

TOP-DOWN VIEW / NORTH POLE



Mark 45° E and 45° W.

GLOBE VIEW / POLE TO POLE



Draw the matching curved meridians.

EXTEND THE SYSTEM

W to your model. What happens to these lines near the poles?

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MISSION PTS-01 / FIELD ANALYST QUALIFICATION — CASE FILE

DIRECTOR'S OFFICE / FIELD OPERATIONS — MODULE 02 / 006

Longitude: Reading the System

SLIDES 36–39 | LATITUDE AND LONGITUDE TRAINING

HOW TO WRITE A LONGITUDE

45° E | **45° W**

The number tells the angle away from:

The letter tells the direction:

A USABLE DEFINITION

Longitude measures an angle _____ or _____ of the Prime Meridian.

Longitude can be recorded up to _____° E or _____° W.

FIELD MEMORY AND QUALIFICATION

MOUTH OBSERVATION / LOOONG-itude

Sketch what your mouth looks like as you say it.

FIELD QUALIFICATION 02

LONGITUDE ONLY

Use the separate Longitude Field Map (A–Z). Follow each curved meridian and record degrees with E or W.

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MISSION PTS-01 / FIELD ANALYST QUALIFICATION — CASE FILE

DIRECTOR'S OFFICE / FIELD OPERATIONS — MODULE 03 / 007

Two Lines, One Location

SLIDES 40–43 | LATITUDE AND LONGITUDE TRAINING

EXAMPLE REPORT: 45° N, 45° E

On the globe, show the two coordinate lines and mark their intersection.



WRITE THE FULL REPORT

FIRST: Latitude gives the direction _____ or _____.

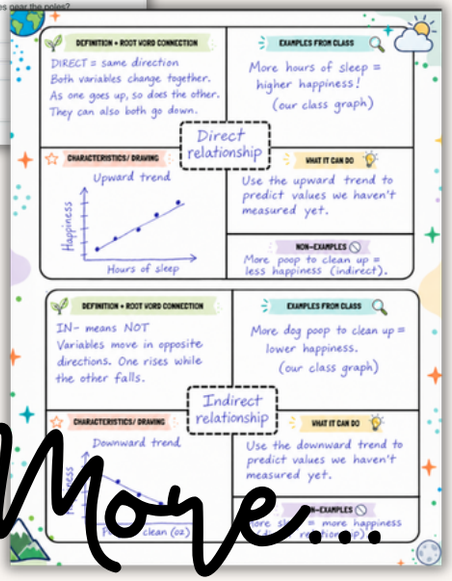
SECOND: Longitude gives the direction _____ or _____.

The complete coordinate for this example is:

RETEST WITH BOTH REFERENCE SYSTEMS

Questions needed: _____

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And More...

Logical

Scaffolded.

Engaging.

MISSION PTS–01 / FIELD ANALYST QUALIFICATION

DIRECTOR'S OFFICE / FIELD OPERATIONS

MODU

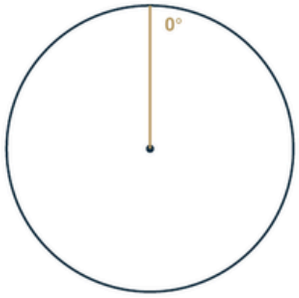
Longitude: Build the Meridians

SLIDES 30–35 | LATITUDE AND LONGITUDE TRAINING

The Prime Meridian is the _____° longitude line. It connects the _____ and _____.

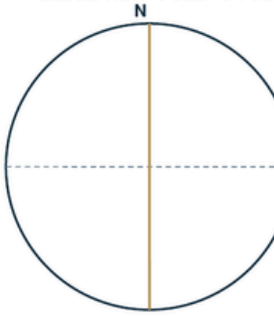
TWO VIEWS OF THE SAME MEASUREMENT

TOP-DOWN VIEW / NORTH POLE



Mark 45° E and 45° W.

GLOBE VIEW / POLE TO POL



Draw the matching curved meridia

MISSION PTS–01 / FIELD ANALYST QUALIFICATION CASE FILE

DIRECTOR'S OFFICE / FIELD OPERATIONS

MODULE 01 / 002

Latitude: Building the Lines

SLIDES 7–14 | LATITUDE AND LONGITUDE TRAINING

The starting reference runs through the middle of our model.

The 0° line is called: _____

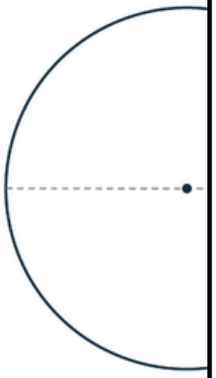
PROTOCOL 01: FOUR STEPS FOR EACH NEW LINE

1 Estimate the angle from 0° at the center.

2 Mark where the measuring ray meets the circle.

3 Draw a horizontal line through the mark.

4 Label the latitude line.



MODEL

As we build, add 23.5°, 45°, 60°, and 90° above 0°.

MISSION PTS–01 / FIELD ANALYST QUALIFICATION CASE FILE

DIRECTOR'S OFFICE / FIELD OPERATIONS

CASE INTAKE 001

Plot the Shake! Mission Training Manual

SLIDES 1–6 | LATITUDE AND LONGITUDE TRAINING

Field analyst: _____ Team / period: _____

CASE INTAKE: THE LOCATION PROBLEM

INCOMING REPORT

> *"Somewhere in the middle of the Atlantic."*

Why is this report too vague for everyone to plot the same dot?

DIRECTIVE 01: FIND THE SPOT

FIRST PARTNER TEST

Ask YES / NO questions to locate your partner's finger on the blank circle.

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Teacher Guide



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PLOT THE SHAKE! | TEACHER GUIDE

Plot the Shake!

Latitude and Longitude Mission Training

THE INSTRUCTIONAL PURPOSE

Students prepare for an earthquake mapping mission by building latitude and longitude from angle measurements, testing reference lines in partner location challenges, and practicing each coordinate separately before combining them. They use the training manual and practice maps to trace lines, identify directions, and estimate locations between grid lines.

The central question is: How can different investigators reliably locate the same place? The goal is to make coordinates meaningful before adding a memory cue. Students should understand what each number describes and how to find it on a map. Whether earthquake locations form a pattern remains unresolved until the next mission.

PLOT THE SHAKE! | LATITUDE & LONGITUDE TRAINING

2. BUILD LATITUDE BEFORE MEMORIZING IT | SLIDES 7–19

Student notes page 2. Slides 7–12: The point of this construction is to help students see that latitude numbers aren't made-up labels assigned to lines on a map. They come from measured angles—that's why we report latitude in degrees. Give students a chance to build that connection before asking them to remember how to read the lines.

Model the construction one step at a time. Begin at the circle's center, look right along the horizontal 0° reference, and estimate 45° upward. Mark where the ray meets the circle, draw a horizontal line through that mark, and label it 45°. Explain that this line gets its number from the 45° angle measured at Earth's center from the equator.

"Why does this line get to be called 45°? Show me the angle that gives it that number. Now point to the latitude line. The measuring ray helps us find the line, but it is not the latitude line."

Student notes page 2. Slides 13–14: Repeat with 23.5°, then 60° and 90°. Keep connecting each line's label to the angle students constructed: the numbers follow a system students can explain. Ask how the line's position changes as the angle increases. Students should connect larger angles with positions farther toward the pole. At 90°, the location is the pole itself, rather than another horizontal line stretching across the circle.

Student notes page 3. Slides 15–17: Add 45° below 0° and pause before supplying the direction labels: "Now we have two 45° locations. What information is missing?" Name the equator as 0°, introduce north and south, and complete 23.5° S, 60° S, and 90° S.

Slides 18–19: Pull the model together: in this spherical Earth model, latitude comes from an angle measured at Earth's center relative to the equator. The number tells the angle in degrees, and N or S tells which side of the equator. Values increase toward either pole because the measured angle increases.

"These numbers aren't just something someone wrote beside a map. We can explain where each one comes from. What does 43° N tell us now that it didn't tell us before?"

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PLOT THE SHAKE! | LATITUDE & LONGITUDE TRAINING

LATITUDE PRACTICE & THE NEXT PROBLEM | SLIDES 20–29

3. ADD THE CUE AND PRACTICE LATITUDE | SLIDES 20–25

Student notes page 3. Slides 20–21: Connect lateral with sideways movement. Say "LAAA-ti-tude" with an outrageously exaggerated sideways mouth movement, have students join in, and sketch the mouth shape in their manual. This is a perfectly respectable moment to look ridiculous. The cue now reminds students how to follow a line whose meaning they have already built.

"Follow the way your mouth stretches. Put your pencil on the location and trace sideways along its latitude line until you reach the degree label."

Address the confusing part directly: latitude labels may run up and down the side of the map, but students travel across the latitude line to read its number. Then they decide whether the location is north or south of the equator. Keep the line's direction separate from the direction the coordinate measures.

Student notes page 3. Slides 22–23: Distribute the separate Latitude Field Map (A–Z). Pause for all 26 latitude readings before moving to longitude. Students record degrees with N or S; the equator is 0°. When a student gets stuck, ask for the pencil path: "Show me the line you followed. Where is this point compared with the equator?" This lets you see whether the difficulty is tracing the line, reading the scale, or choosing the direction.

Student notes page 4. Slides 24–25: Return to the partner challenge with latitude lines added. Students record the new question count, switch roles, and compare the experience with the first attempt

PLOT THE SHAKE! | LATITUDE & LONGITUDE TRAINING

BUILD & PRACTICE LONGITUDE | SLIDES 30–39

4. CONTINUED: BUILD THE SECOND SYSTEM | SLIDES 30–36

Student notes page 5. Slides 30–31: Introduce the Prime Meridian as 0° longitude, running from the North Pole to the South Pole. Compare its role with the equator's role in latitude. Explicitly announce the viewpoint change: students are now looking down over the North Pole, rather than at the side view used to build latitude.

"We still need a starting reference and an angle. This time we measure around Earth from the Prime Meridian. Watch how that angle connects to a line on the globe."

Slides 32–33: Follow the displayed 45° E construction from the 0° meridian. Mark the angle in the top-down view, then connect it to the matching pole-to-pole meridian in the globe view. Have students mark and draw in the two views on student notes page 5. Point out that the meridian curves in the globe drawing; the angle identifies the whole meridian, not just one point on it.

Student notes page 5. Slides 34–35: Compare 45° E and 45° W. The number is the same, but the directions place the meridians on opposite sides of 0°. Add 90° E and 90° W and ask what happens to the lines near the poles. Students should notice that meridians converge at the poles. Note that longitude can be labeled up to 180° E or W.

Student notes page 6. Slide 36: Have students explain the two parts of a longitude reading: the number gives the angle from the Prime Meridian, and E or W gives the direction. Use that explanation to complete the definition and reading prompts on student notes page 6.

"If I only wrote 45°, what would still be missing? What does the E or W tell the next investigator?"

5. ADD THE CUE AND PRACTICE LONGITUDE | SLIDES 37–39

Student notes page 6. Slide 37: Exaggerate "LOOONG-itude," showing the tall, open mouth shape. Have students say it and sketch the cue. Demonstrate tracing the actual meridian toward its degree label at the top or bottom of this map. Follow its curve; a straight vertical pencil path can cross other meridians and lead to the wrong number.

"Your mouth opens up and down. Follow this pole-to-pole line toward its label, even where the line curves. Then check which side of the Prime Meridian the point is on."

Student notes page 6. Slides 38–39: Distribute the separate Longitude Field Map (A–Z) and pause for all 26 longitude readings. Students record degrees with E or W; the Prime Meridian is 0°. Ask students to demonstrate the path they followed and explain their direction choice. Keep connecting the cue to meaning: the pencil follows a meridian, while its number measures east or west from the Prime Meridian.

And More...

Why Teachers Love It

- Minimal prep: open the slides and print the student pages.
- Makes the logic behind coordinates clear, which transfers to learning
- Complete lesson with slides, notes, Frayer models, and practice.

"I thought it was cool how the last graph connected back to the first two. It was like the whole lesson came full circle."

— Why Kids Love It

What's Included

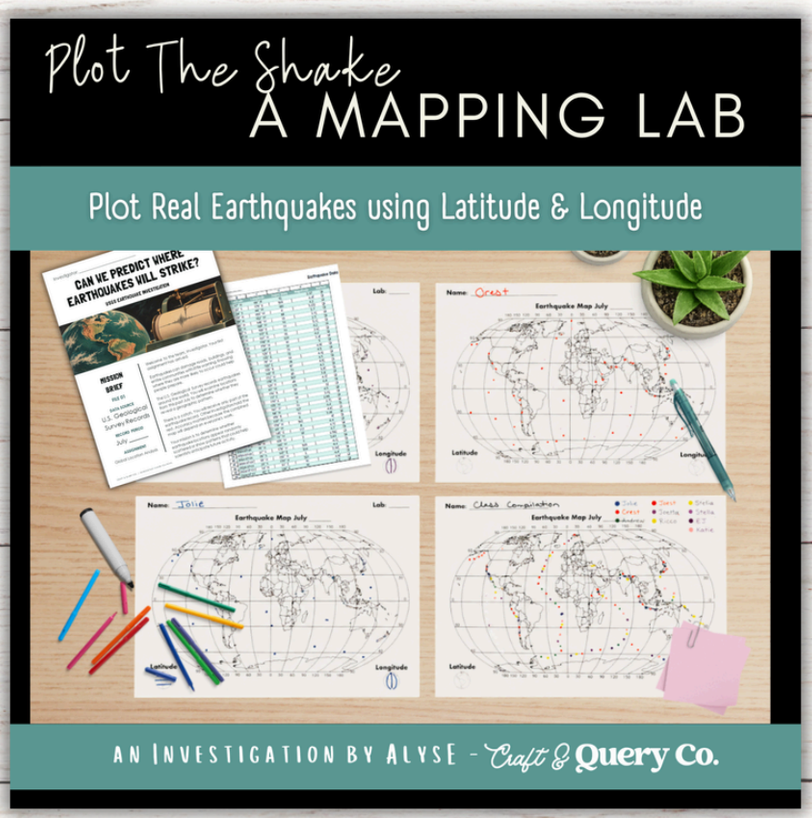


- 46-Slide Graphing PowerPoint
- 8-Page Guided Student Notes
- 2 Completed Handwritten Frayer Models
- 3 Latitude/Longitude/Combined practice sheets
- Frayer Vocab Activity
- Keys
- Teacher Guide

READY FOR THE NEXT MISSION?

They know how to find a location. Now, what can those ~~locations tell us? Put those newly acquired latitude~~ and longitude skills to work in Plot the Shake! — An Earthquake Mapping Lab.

Students become earthquake investigators, plotting real earthquake data, updated every July! As their findings come together on a class map, patterns begin to emerge. Are earthquakes really as unpredictable as they seem?



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Hope to See You There!

~ Anya