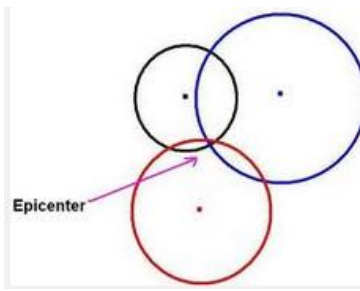Name: Date:

Graded Assignment: Lab Report 2.15

Submit to Dropbox by October 12 for full credit.

Pictures fall, houses shake, buildings crumble. Although an earthquake may be felt in many locations worldwide, it originated, or started, at one location, called the epicenter. In this lab you will be using a method called triangulation to locate the origin of an imaginary earthquake. Use the directions below to get started – and if you need help, check out this video.

Follow the steps below to get started:

Step 1: Download the Student Guide.

Step 2: Read the directions on pages 1-5 carefully to learn how to find the epicenter of the earthquake.
Watch this video for help if you become confused!!

Step 3: Answer all questions below fully.

Note: *Some questions have multiple questions. Be careful to answer all parts of each question in order to receive full credit.*

Step 4: Turn the lab into the Dropbox by October 12 for full points. (Click the link for Instructions to use Dropbox) Any work submitted after the midnight deadline will be counted for up to 70% of the points possible (30% off).

I only need the last two pages of this lab (pages 6&7) to be turned in to the Dropbox!

Note: If you get confused, please send your teacher a kmail asking for help – make sure to ask a *specific question* in your kmail so I can help you best!

Answer the questions below. When you are finished, submit this assignment to your teacher by the due date for full credit. You may type in the answers, but you will need to print this lab report to draw the epicenter.

In this laboratory experiment, you will be working as an amateur seismologist to locate the epicenter of a fictional earthquake. Your task will involve interpreting seismograms from three seismograph stations; determining the difference in time between the arrival of the P waves and arrival of the S waves from the earthquake; using a travel-time graph to determine how far each seismograph station is from the epicenter; and using the technique of triangulation to pinpoint the location of the quake.

Step 1: Interpreting the Seismograms

1. Estimate the times of the first arrival of the P waves and the S waves at each seismograph station. Enter these times into your data table. **Reminder:** You are trying to find the **difference** between the **arrival** time of the P wave and the arrival time of the S wave.

2. Determine the difference between the arrival of the P wave and the arrival of the S wave and enter this difference into the data table.
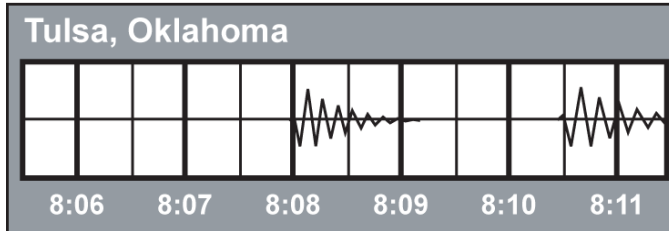
Example:
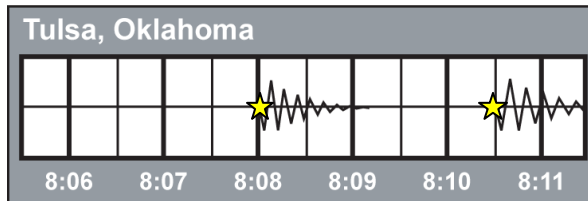
The P wave arrived at 8:08:00 and the S wave arrived at 8:10:30.

The difference is 2 minutes and 30 seconds, or 2½ minutes.

Step 2: Determining the Distance to the Epicenter

You now know the difference between the arrival of the first P wave and the first S wave for each seismic station. Because the waves travel at a known speed, this interval can be converted to distance using the graph below.
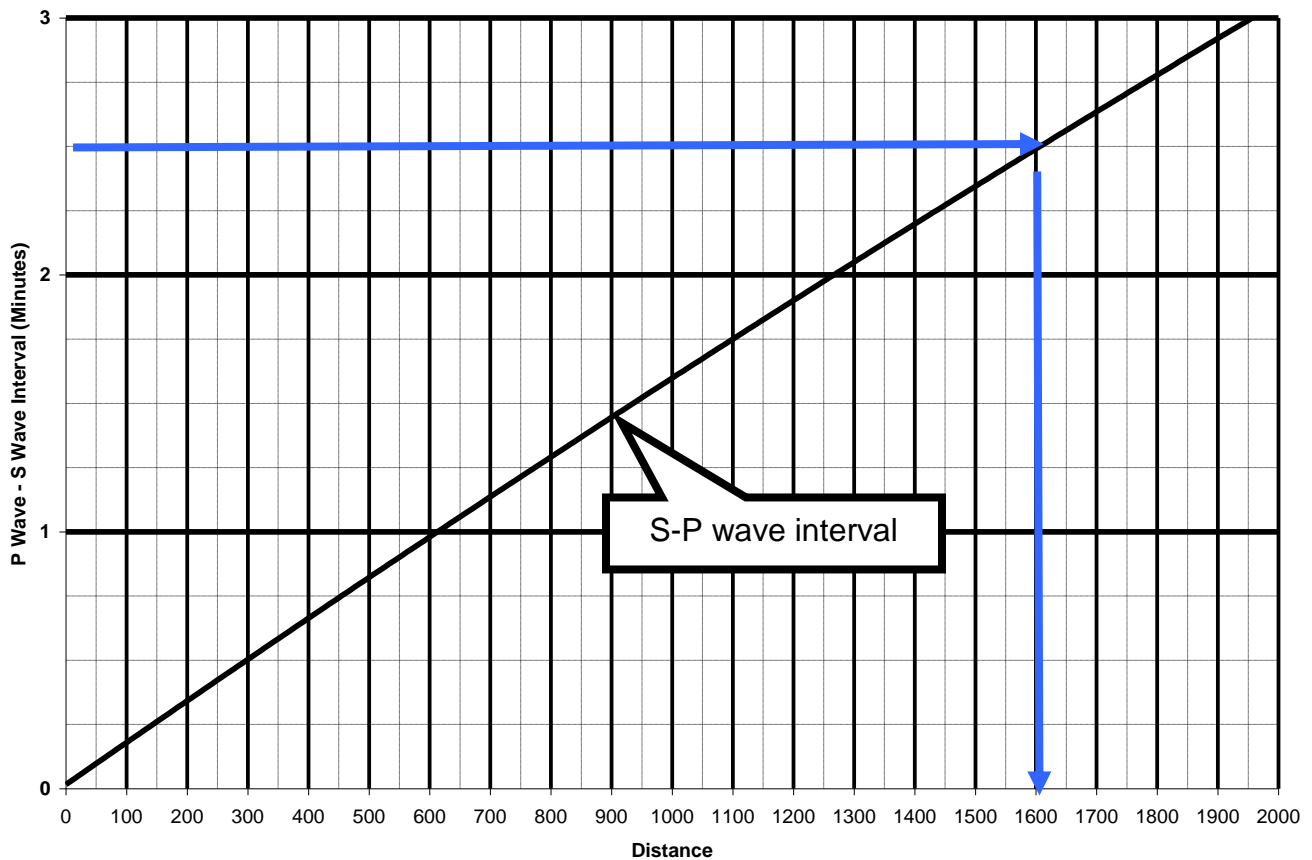
Example:

The P wave arrived at 8:08:00 and the S wave arrived at 8:10:30.
The difference is 2 minutes and 30 seconds, or 2½ minutes.

S-P Wave Interval Chart

Find 2 minutes and 30 seconds on the chart, then drop down to the distance when you intersect the S-P wave interval line = 1,600 km.

Reading the Graph: Tips and Practice

The major lines you read on the *y*-axis (vertical axis) are minutes. The minor lines are quarters of minutes. Starting from 0 the first dotted line would be 15 seconds, then 30 seconds for second line, 45 seconds for the third line and then 1 minute of the next solid line.

The major lines you read on the *x*-axis (horizontal axis) are in kilometers. Each major line is 500 km. Each dotted line is 250 km.

Here's a few to practice.

1 minute = _____ km

45 seconds = _____ km

2 minutes and 45 seconds = _____ km

Check your answers:

2 minutes and 45 seconds = 1800 km

45 seconds = 450 km

1 minute = 600 km

Step 3: Locating the Epicenter

1. Locate a seismograph station on the map.

2. Locate the scale on the map.

3. Placing your drafting compass point at 0 on the scale and the compass pencil at the proper distance for a seismograph station. Then, place your compass point on the seismograph station and draw a circle around the station. Make sure the circle has a radius equal to the distance between the station and the epicenter.

4. The line that you draw is the distance to the earthquake. The earthquake could have happened at any point on the line. To triangulate the epicenter, repeat this process for each station (the information you just added to your data table).

Example:

Circles are drawn around three stations. The intersection of the circle shows the location of the earthquake. Your circles should come close to intersecting on a point, but they may not be exact.
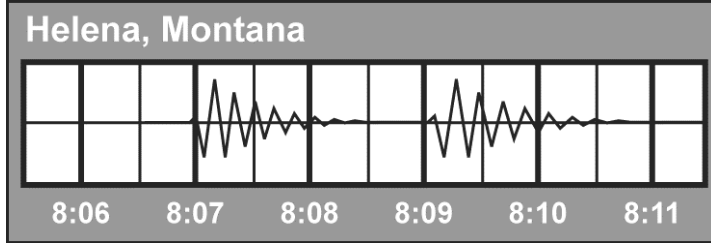
Name: _____ Date: _____

Interpreting the Seismograms

Below are the seismograms that arrived at three different seismograph stations located in Helena, Montana; San Diego, California; and Dallas, Texas.
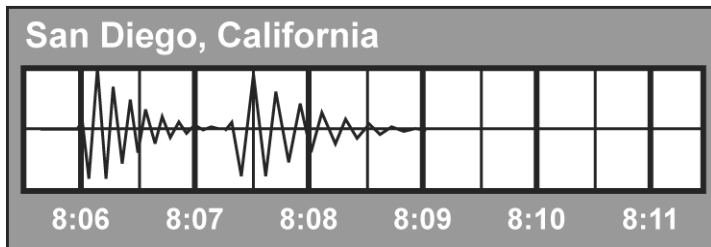
(6 points)

Score

Answer:

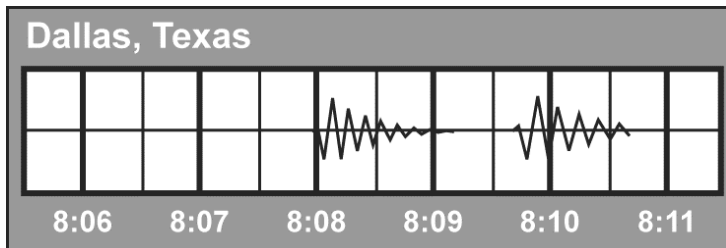| P-Wave Arrival	S-Wave Arrival	Difference Between the P- and S-Wave Arrival Times (minutes)	Distance to Epicenter (km) (convert minutes to distance using the chart)

(6 points)

Score

Answer:

P-Wave Arrival	S-Wave Arrival	Difference Between the P- and S-Wave Arrival Times (minutes)	Distance to Epicenter (km)

(6 points)

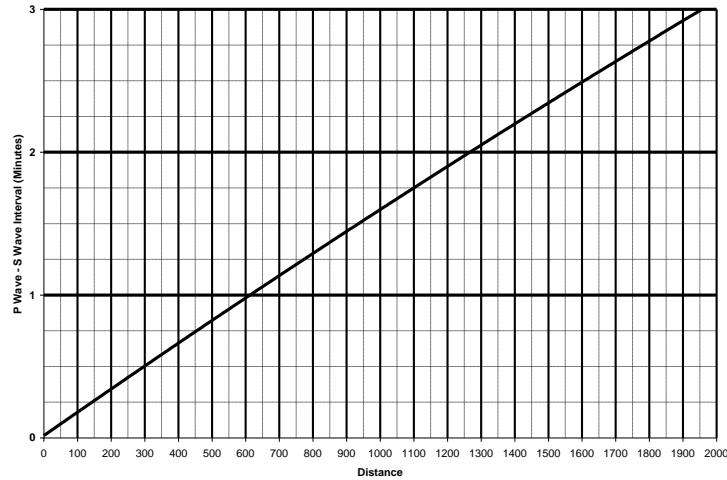| Score |
|---|
| |

Answer:

P-Wave Arrival	S-Wave Arrival	Difference Between the P- and S-Wave Arrival Times (minutes)	Distance to Epicenter (km)

S-P Wave Interval Chart

Map

(12 points)

Draw a circle around each station. Make sure the circle has a radius equal to the distance between the station and the epicenter. Draw a STAR at the epicenter, where the earthquake originated!

Score

Your Score	___ of 30