Name: _____ Period: _____ Date: _____

Lab: Locating Epicenters

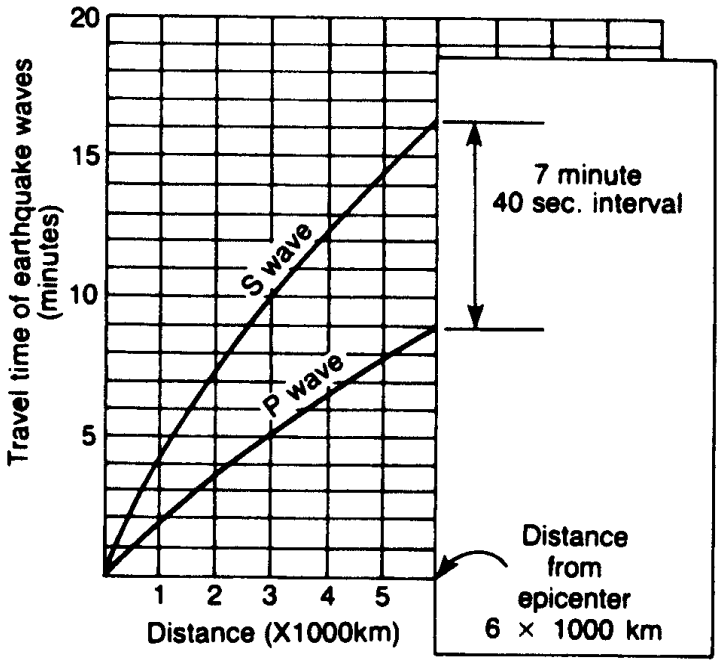
Earthquakes occur when there is movement along a **fault**. The friction between rock masses rubbing against one another generates shock waves which travel through Earth. These shock waves (**seismic waves**) created by the earthquake are radiated in every direction from the **focus**, the point within Earth where the actual movement takes place. An earthquake occurs every 30 seconds, day after day. Most of these are so weak they would go unnoticed without the use of sensitive modern instruments called **seismographs**. While seismologists use many stations, in this lab you will use seismograms from three distant stations to locate the epicenter, the point on Earth's surface directly above the focus.

Objective: You will learn to interpret a seismogram and, using differences in seismic waves, locate the epicenter of an earthquake.

Procedure A:

The diagram, Finding Epicenters, illustrates the method of using the difference in arrival times of P and S waves to determine the distance to the epicenter. Using the three seismograms provided and the "Earthquake P-wave and S-wave Time Travel" graph on the Reference Page, calculate the following for each city: (Enter values in table below).

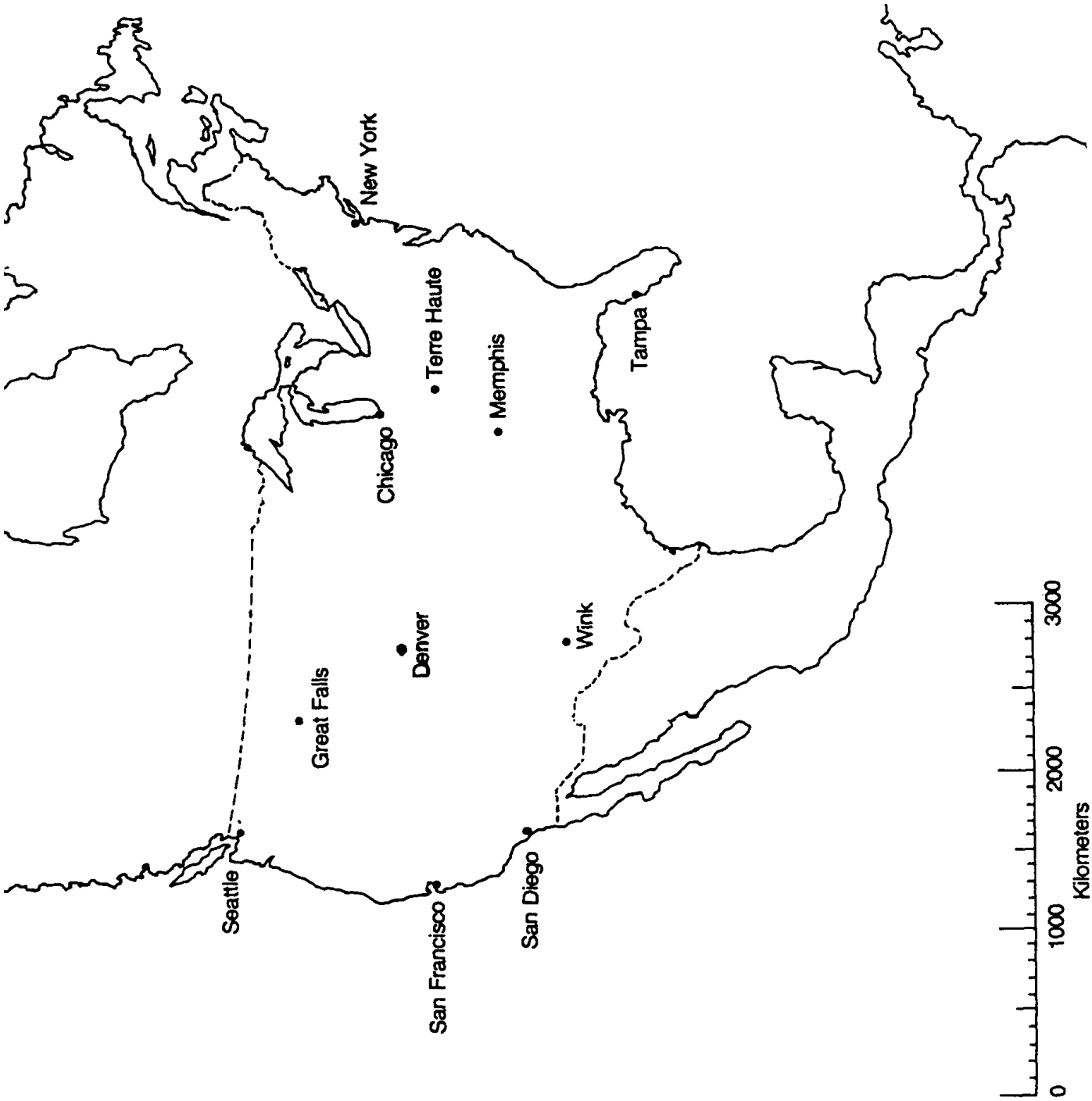
1. The arrival times for P and S-waves.
2. The difference in the arrival time between P and S-waves.
3. The distance (in km) of the epicenter from each city.
4. The length of time it took for the P-wave to travel from the epicenter to each city.
5. Since you now know when the P-wave arrived at a city and how long it had to travel, calculate the time at which the P-wave started (Origin Time).



SEISMOGRAPH STATION	Arrival (clock time) "P" Wave	"S" Wave	Difference in Arrival Time (min. and sec.)	Distance to Epicenter (km)	"P" Wave Travel Time (min. & sec.)	Time of Origin (hr., Min. & sec.)
CHICAGO						
TAMPA						
WINK						

Procedure B:

1. To locate the epicenter on the map, for each city construct a circle whose radius is equal to the distance from the city to the epicenter.
2. Use the scale of distance of your map to set the drawing compass at the correct radius.
3. Mark and label the epicenter on the map where all three circles intersect.



Questions:

1. How do P-waves and S-waves differ?

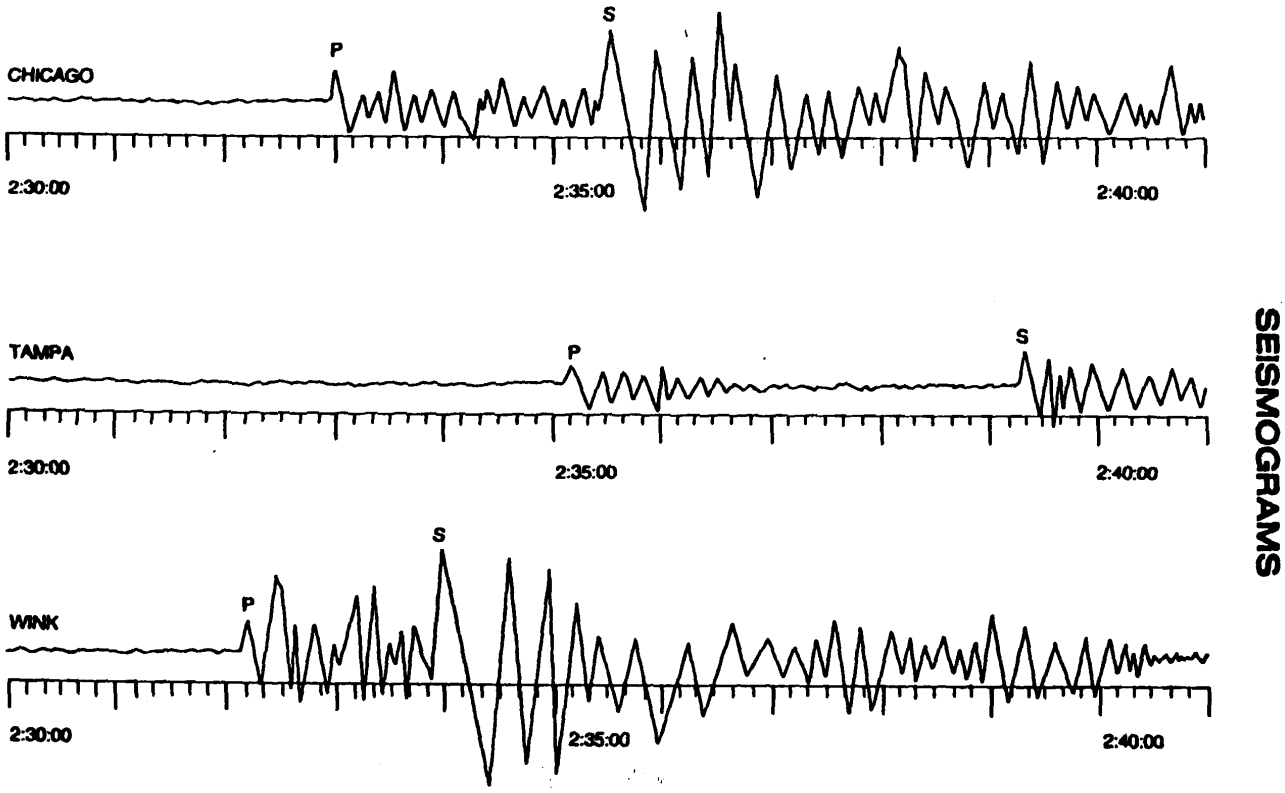
2. What was the approximate location of the epicenter of this earthquake?

3. Why is three the minimum number of stations necessary to locate an epicenter?

4. Why does the time between the arrival of the P-wave and S-wave become greater and greater as you get farther away from the epicenter?

Conclusion: Describe, step by step, how the epicenter of an earthquake can be located.

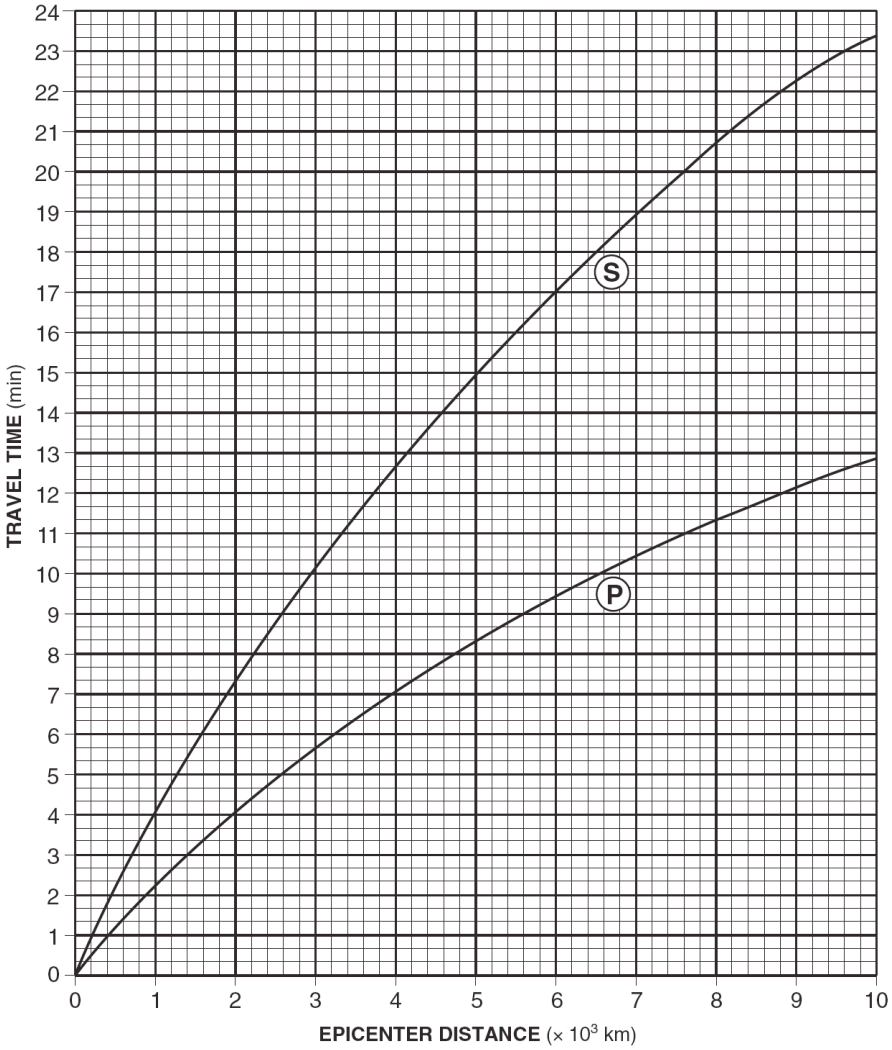
Locating Epicenters || Reference Page



SEISMOGRAMS

Earthquake P-Wave and S-Wave Travel Time

All times corrected to Greenwich Mean Time



Example: If the difference in arrival time is 4:00 minutes
Measure four minutes on vertical axis take that distance and move to where it lines up as distance between S and P. Read down to horizontal axis to get distance to epicenter. The distance to the earthquake is 2.6 x 10^3 km or 2600km.