

# LAB: LOCATING AN EARTHQUAKE'S EPICENTER

By calculating the difference in arrival times between the primary and secondary waves of an earthquake, scientists can determine the distance to an earthquake's epicenter. In this activity, you will use *triangulation* to locate the epicenter of an earthquake.

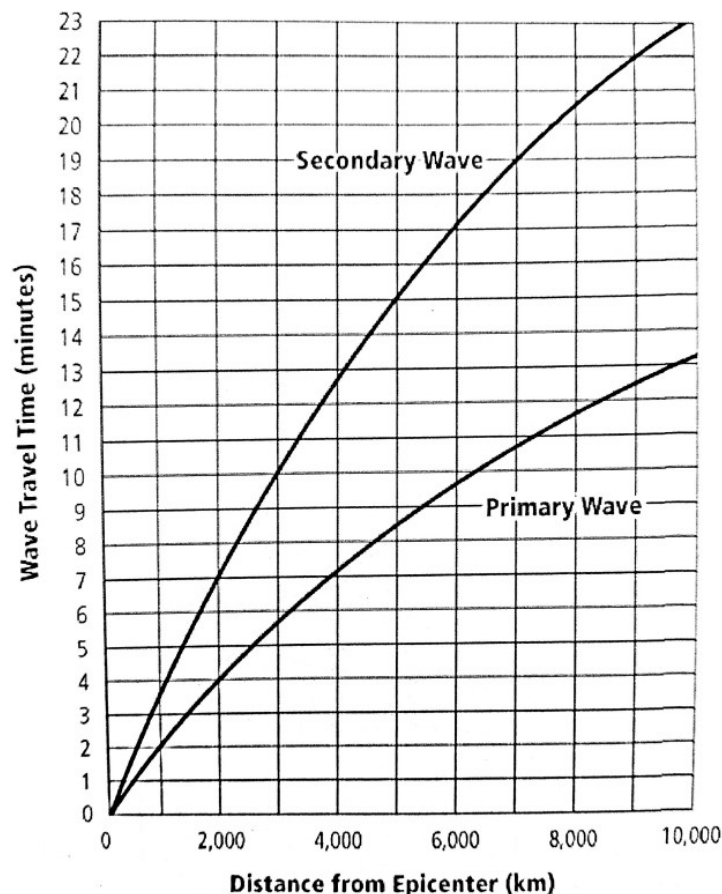
**Objective:** Locate the epicenter of an earthquake.

**Materials:** Science Journal, map of United States, safety compass, calculator, ruler (optional)

## **Part 1:** GRAPH ANALYSIS

*Directions* → Use the graph shown below to answer the following questions in your Science Journal. Use complete sentences to answer #4.

1. About how long does it take a primary wave to travel 1,000 kilometers?
2. About how long does it take a secondary wave to travel the same distance?
3. What is the difference in time?
4. Look at the two curves on the chart. Compare the difference in travel times between a P-wave and an S-wave traveling 1,000 kilometers and a P-wave and an S-wave traveling 4,000 kilometers. How do the differences in travel times compare?



## **Part 2:** DATA TABLE ANALYSIS

*Directions* → Copy and complete the table below in your Science Journal. The table shows the location and wave arrival time of seismic waves. Find the difference for each. Then, use the following formula to find the distance from the epicenter to each station:

$$\text{Distance} = (S-P) \times 8 \text{ km/sec.}$$

**Location and Arrival Times for Seismic Waves**

Station Location	Wave	Wave Arrival Time	Difference in Time (sec)	Distance from Epicenter (km)
A	P	7:45:00 AM		
	S	7:45:56 AM		
B	P	7:46:00 AM		
	S	7:47:17 AM		
C	P	7:47:10 AM		
	S	7:48:14 AM		

## **Part 3:** MAP ANALYSIS

*Directions* → Find the three station locations on the provided map of the United States. Use the center of the "X" at each station to make measurements. Use the compass to draw a circle around the location of each station. The radius of each circle should equal the distance of the station from the epicenter of the earthquake (see your data table). When you finish, glue or tape your map in your Science Journal.

## **Part 4:** CONCLUSION

*Directions* → Answer the questions below using complete sentences in your Science Journal.

1. In which state do your 3 drawn circles overlap? What is this location called?
2. What is the relationship between the distance of the station from the epicenter and the arrival times of the waves? (Use the term *direct* or *indirect* in your answer.)
3. Can the epicenter of an earthquake be found using only two stations? Why or why not?

