

Name: \_\_\_\_\_

***Virtual Earthquake***  
Due Thursday, Sept. 22<sup>nd</sup>

<http://vcourseware.sonoma.edu/VirtualEarthquake/VQuakeExecute.html>

In this exercise you will find the epicenter of an earthquake and determine its Richter magnitude. Read **all** the information and instructions to complete this online exercise. Everyone should choose the San Francisco area for the earthquake location. Record the information you enter into the *Virtual Earthquake* program in the spaces below (i.e., write them down as you make your estimates). Use your textbook to answer any general questions.

1) What is the epicenter of an earthquake? \_\_\_\_\_

**2) *Determining the Earthquake Epicenter***

List the S-P intervals you entered for the following seismic stations in the column for your first attempt: To do this, subtract the P-wave arrival time from the S-wave arrival time:

Eureka, CA \_\_\_\_\_ seconds      Elko, NV \_\_\_\_\_ seconds      Las Vegas, NV \_\_\_\_\_ seconds

**3) *Determining the Earthquake Distance***

Using the S-P graph and the S-P intervals you listed above, determine the distance to the epicenter:

Eureka, CA \_\_\_\_\_ km      Elko, NV \_\_\_\_\_ km      Las Vegas, NV \_\_\_\_\_ km

4) Using the same graph, how long does it take the P-wave to travel 300 kilometers if the S-wave takes about 70 seconds to travel the same distance?

Time (in seconds) it takes a P-wave to travel 300 kilometers: \_\_\_\_\_ seconds

5) Why does the P-wave arrive first when you feel an earthquake? \_\_\_\_\_

6) List 3 characteristics of a P-wave: \_\_\_\_\_

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7) List 3 characteristics of an S-wave: \_\_\_\_\_

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**8) *Triangulation of the Epicenter***

If you read the graphs correctly on the previous screens, your epicentral circles will intersect at a single point. In this case, you will see a screen showing the three epicentral circles intersecting at the actual epicenter and it will read "Excellent work!". If you had trouble reading the graphs or weren't precise enough with the values you entered, your epicentral circles will intersect over a large region and the screen will read "Very close!" or "Oops!". How close were you? Use the scale at the bottom of the figure. Answer on the next page....

How far from the true epicenter was your calculation? \_\_\_\_\_ km (answer “exact” if your epicenter was in the same location as the true epicenter)

If you got an “**Oops!**”, click the “Remeasure S-P Interval” button, re-read the graphs and re-enter all values. Remeasure everything until you get at least a “Very close!”. Look closely at the grid on the graphs to make sure you are reading them correctly.

Click on the “**View true epicenter**” button and fill in the following information:

9) What was the difference for the S-P interval and the epicentral distance between your data and the actual data?

	<u>Your data</u>	<u>Actual data</u>
Eureka, CA:	_____ seconds _____ km	_____ seconds _____ km
Elko, NV:	_____ seconds _____ km	_____ seconds _____ km
Las Vegas, NV:	_____ seconds _____ km	_____ seconds _____ km

10) Measure the distance between the actual epicenter and the one you calculated. Use the scale at the bottom of the figure

Distance between the actual epicenter and your calculated epicenter: \_\_\_\_\_ km (if you’re very close, you won’t be able to measure accurately so just write “a few kilometers”)

11) What sources of error exist in trying to determine the location of an earthquake epicenter?

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12) If you only had information from seismic stations in Las Vegas and Eureka (the blue and green epicentral circles), the epicenter could be in one of two places – near San Jose or northeast of Reno, Nevada.

Using your knowledge of plate tectonics, which of the two points is more likely to be your earthquake epicenter? \_\_\_\_\_

Why? Be specific. \_\_\_\_\_

13) *Computing the Richter Magnitude*

List the maximum S-wave amplitude (in millimeters) for your seismic stations:

Eureka, CA \_\_\_\_\_ mm      Elko, NV \_\_\_\_\_ mm      Las Vegas, NV \_\_\_\_\_ mm

What is your estimate for the Richter magnitude of your earthquake? \_\_\_\_\_

**No, I don’t want or need the “Certificate of Completion”**