Location and Magnitude of an Earthquake

Objective - Use seismic wave data to locate the epicenter and calculate the magnitude of an earthquake

Directions
1. Using the table of travel times below, make a graph that shows how the travel time changes as the distance from the epicenter changes.
2. Using a straightedge, create a line of best fit for your data points and answer the questions to the right of your graph.
3. Look at the example seismogram below and familiarize yourself with the different parts.
4. Using the seismograms on the back of this page, determine the difference in arrival times for the S and P waves at each of the three locations. Enter this in your data table.
5. Use your travel time graph and the S-P interval to determine the distance from each station. Enter this information in your data table.
6. Using your compass and the scale on your map, draw circles around each station using the distance you calculated in the previous step.
7. The location of the earthquake is where the 3 circles intersect. Enter this information below your data table.
8. Now read the amplitude (**maximum height of the S wave**) of the seismograms and record it in your data table.
9. Use the "Richter Scale" nomogram on the back of this page to determine the magnitude of this earthquake. Enter this below data table.
10. Write a conclusion paragraph that explains how you were able to determine the location and the magnitude of the earthquake. This paragraph should also include all sources of error that were encountered in this exercise, **ESPECIALLY** if your circles did not intersect at an exact point. Be sure that you use all the vocabulary learned in this exercise.

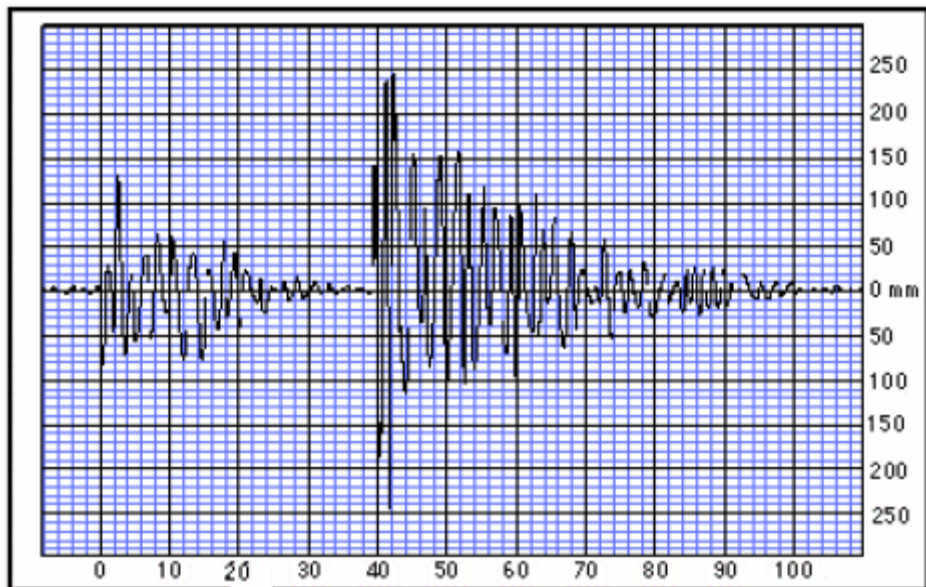| Station	S-P Interval (s)	Distance (km)
1	20	194
2	43	450
3	80	786
4	29	303
5	41	371
6	64	612
7	71	682
8	65	679
9	36	351
10	53	509

What's a Seismogram?

A highly simplified simulated recording of earthquake waves (a seismogram) can be seen to the right. Study this sample seismogram and be sure you can identify these parts:
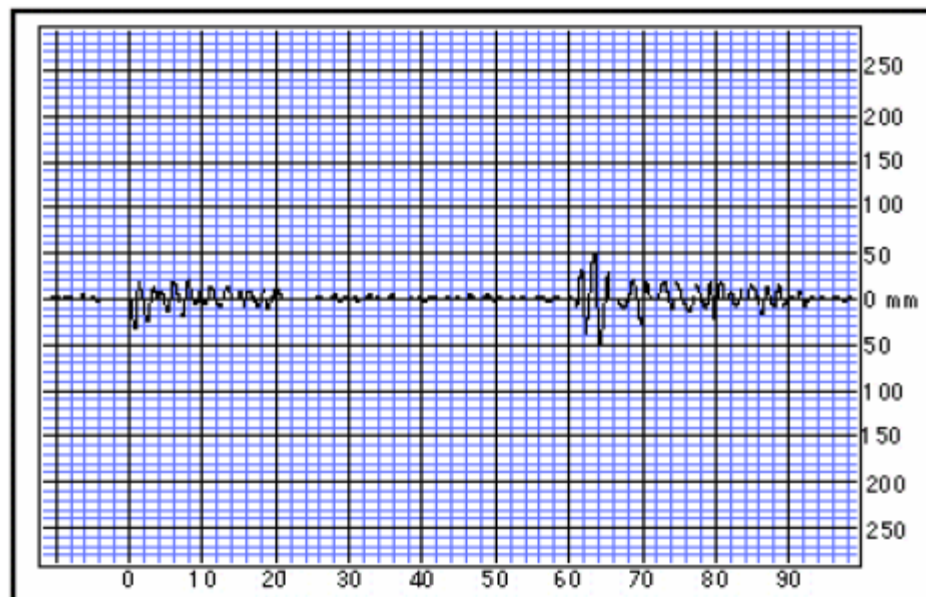
- P-wave and the P-wave arrival time
- S-wave and the S-wave arrival time
- S-P interval (expressed in seconds)
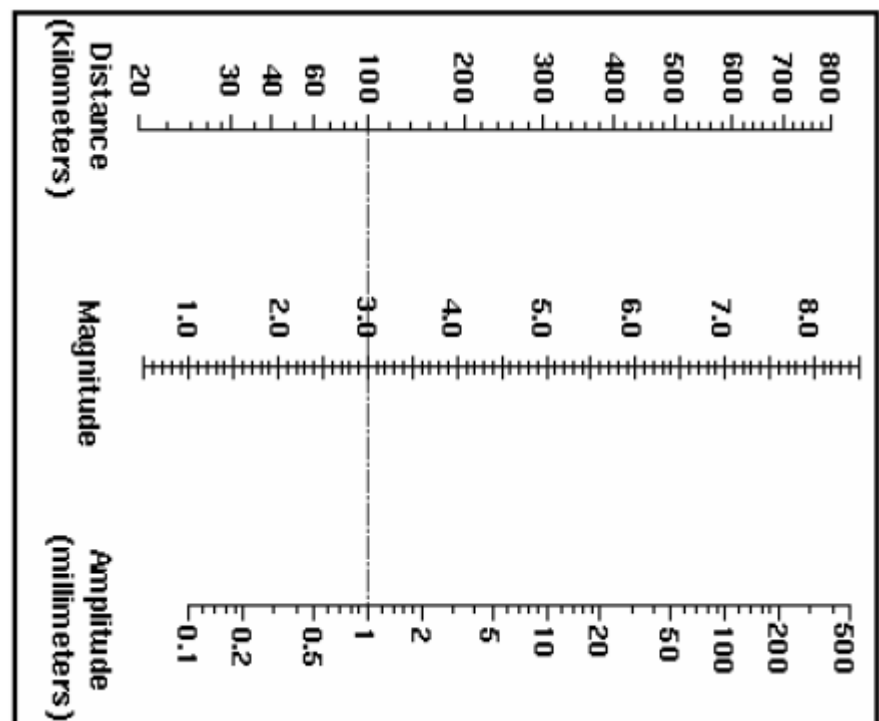- S-wave maximum amplitude
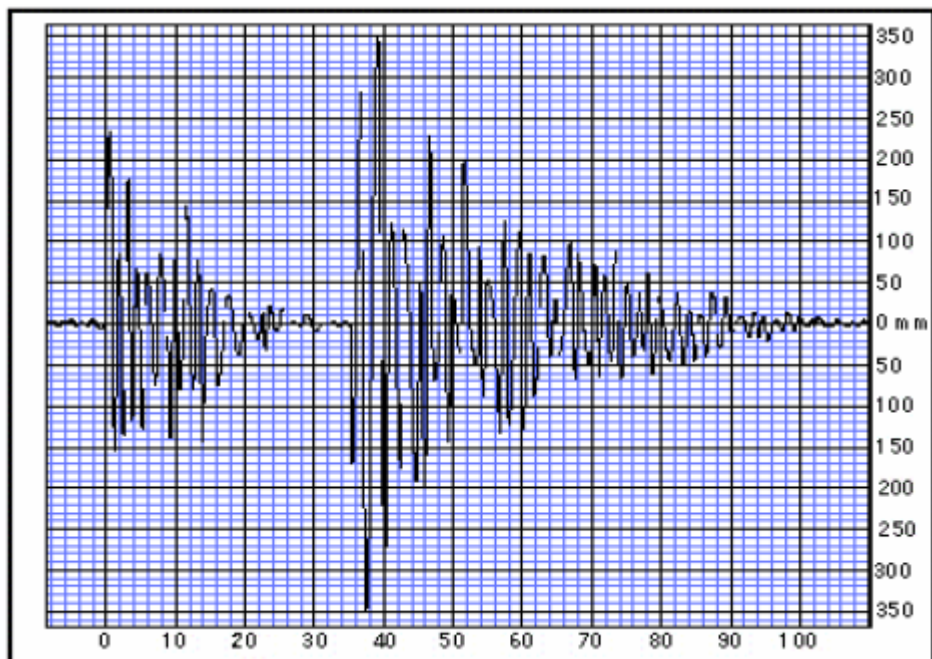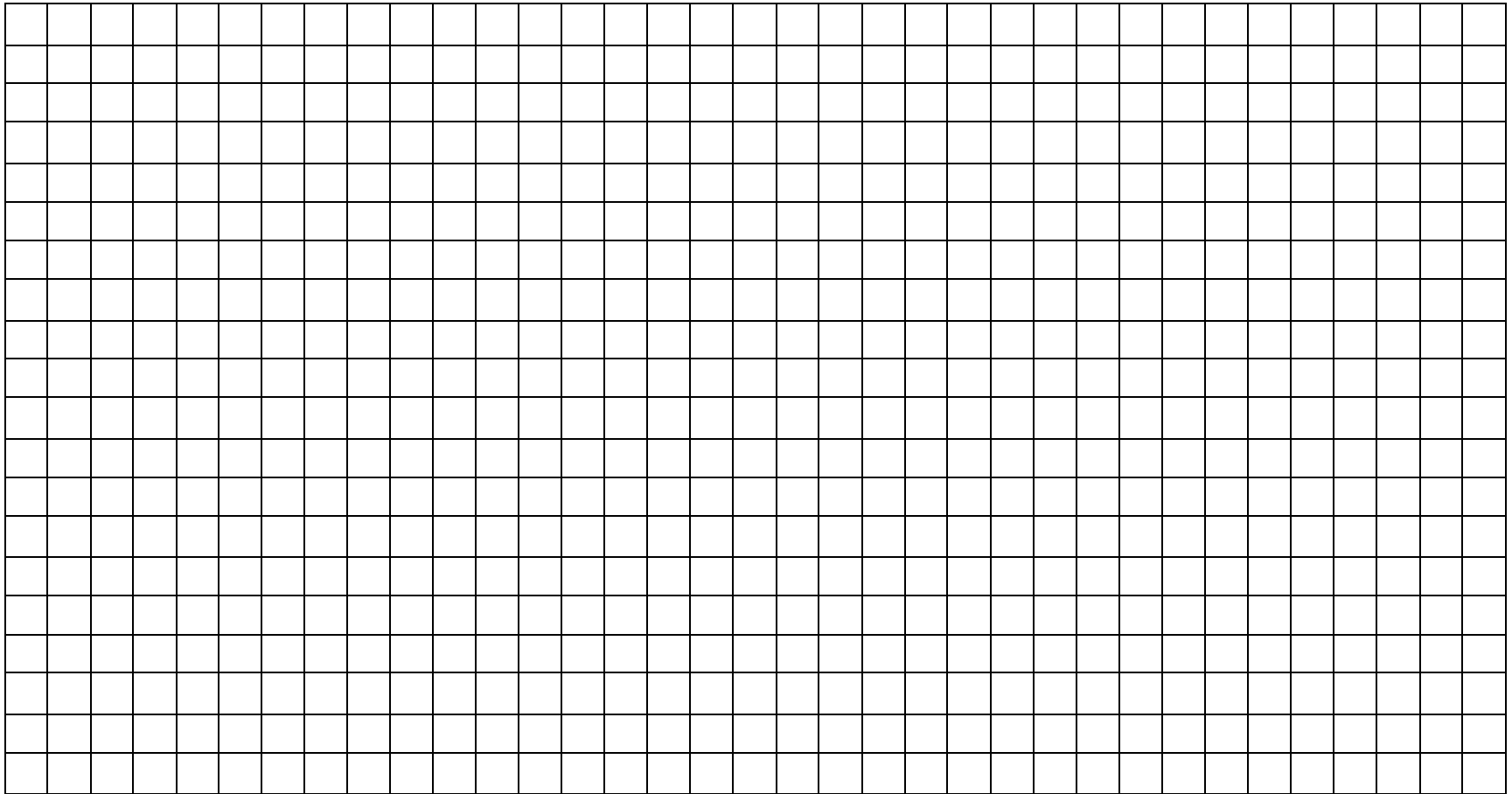- (measured in mm from centerline)
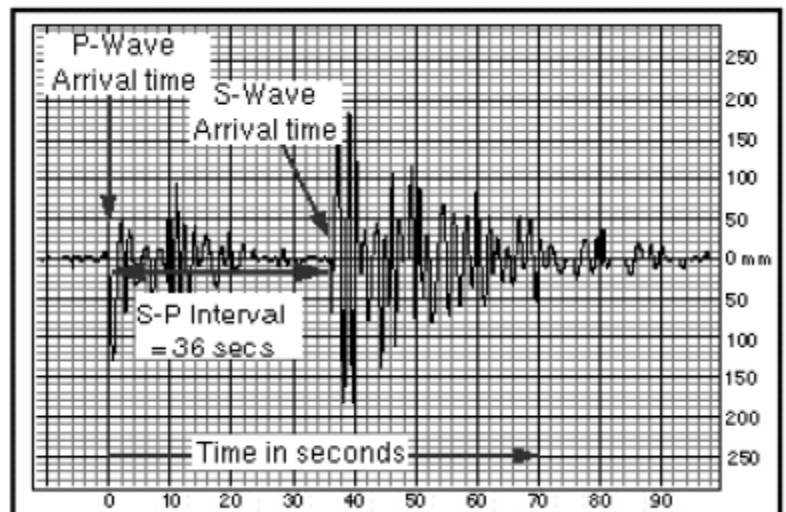
Las Vegas, NV.

Phoenix, AZ.

Fresno, CA.

The "Richter Scale" (nomogram)

1. Make sure that your graph has the following things: a title, labels for the axes, units, and a line of best fit.
2. Briefly describe the relationship between the S-P interval and the distance from the epicenter.

3. Based on your line of best fit, what would be the distance of a station that has an S-P interval of 45 sec?_____

4. What would be the S-P interval of a station that is 650 km away from the epicenter?_____

Data Table

Station	S-P Interval	Distance	Amplitude

Location of the Earthquake _____

Magnitude of the Earthquake _____

1. Briefly describe the relationship between amplitude and magnitude.

2. What happens to the amplitude as you move further away from the epicenter?