

# A large earthquake just hit San José!! What fault caused it?

Be a seismologist-detective: Determine the epicenter of this earthquake. Your answer will help direct emergency crews to the hardest-hit area, even if communication lines are down.

[epicenter: point on Earth's surface directly above an underground earthquake.]

To do this, you need to apply this equation to the data collected from seismic stations that recorded the earthquake waves:

$$d = \frac{T(V_P)(V_S)}{(V_P - V_S)}$$

**d** is the distance (la distancia) from the epicenter to a particular seismic station.

**T** is the time (el tiempo) between arrival of the P wave and arrival of the S wave.

**V<sub>p</sub>** is the velocity (la velocidad) of the P wave.

**V<sub>s</sub>** is the velocity (la velocidad) of the S wave.

In the Bay Area, **P waves travel 6 km/sec, and S waves travel 4 km/sec.**

[km/sec = kilometers per second]

Look at the map on the back of this page. At seismic measuring station 1 (large dot), the earliest **P waves arrived at 10:14:30**, and the earliest **S waves arrived at 10:14:34**.

[P waves travel faster than S waves, so they arrive first.]

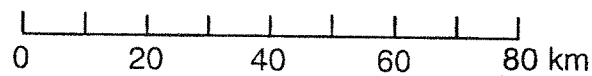
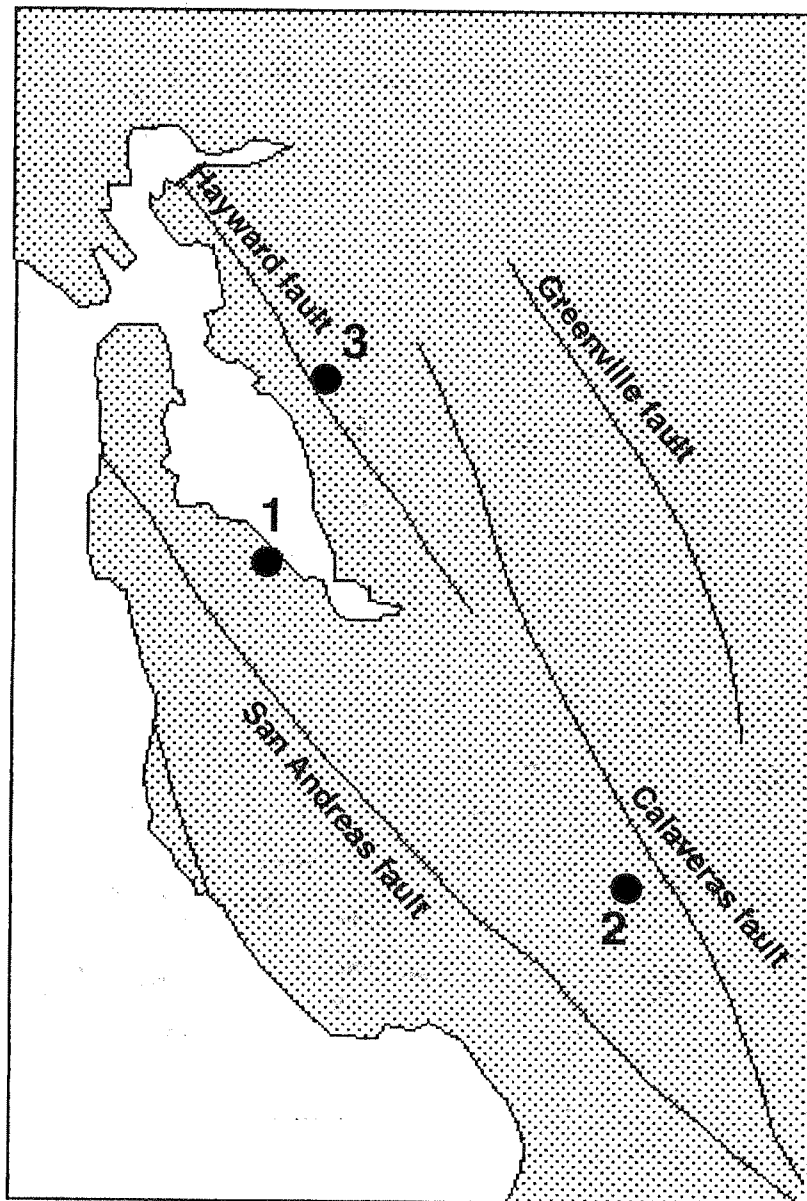
**T** is just the difference between those two times: 10:14:34 - 10:14:30 = 4 seconds.

How far was the earthquake from Station 1?

$$d = \frac{(4 \text{ sec})(6 \text{ km/sec})(4 \text{ km/sec})}{(2 \text{ km/sec})} = 48 \text{ km}$$

But a whole circle of points is 48 km away from Station 1 -- use the compass to draw a circle with radius 48 km that is centered on Station 1 (put sharp point on the dot for station 1).

Where on the circle was the earthquake epicenter? Use the records from Stations 2 and 3!



Station 2: first P-wave arrived at 10:14:28  
 Station 2: first S-wave arrived at 10:14:31

Station 3: first P-wave arrived at 10:14:32  
 Station 3: first S-wave arrived at 10:14:37

Have extra time? Try answering this: to the nearest second, when did the earthquake occur?