Q- Earthquakes are essentially sound waves traveling through the earth. They are called seismic waves. Because the earth is solid, it can support both longitudinal and transverse seismic waves. These travel at different speeds. The speed of longitudinal waves, called P waves, is 8000 m/s. Transverse waves, called S waves, travel at a slower 4500 m/s. A seismograph records the two waves from a distant earthquake. If the S wave arrives 7.6 min after the P wave, how far away was the earthquake? You can assume that the waves travel in straight lines.

Let the distance of the center of earthquake is x from the seismograph then

Time taken by the P waves to reach $t_1 = x/8000$

Time taken by the S waves to reach $t_2 = x/4500$

But according to the question

$\qquad t_2 - t_1 = 7.6*60$ s

hence, we have

$$\frac{x}{4500} - \frac{x}{8000} = 7.6*60$$

Gives $\quad x = 456*\dfrac{8000*4500}{8000-4500} = 4.6903*10^6 m = 4690.3 km$

Thus, the center of the earthquake is 4690.3 km away from the point of measurement.