How To Use The Earthquake Travel Time Chart
(Reference Tables - Page 11)

1) Note:
   - a) Distance (bottom axis) is in thousands of kilometers and that each thousand is divided into 5 smaller boxes so that each smaller box is 200 km.
   - b) Travel time (vertical axis) is in minutes and each minute is divided into 3 smaller box so that each smaller box is 20 seconds.

2) Below are *ALL* the facts about a particular earthquake. Each problem will give you *SOME* of the facts and ask you to find *ONE* of the other facts.

FACTS:
   - a) Time of quake: <u>1:20:40 PM</u> (20 minutes and 40 seconds after 1 PM)
   - b) Distance from epicenter to seismic station: <u>5200 km</u>
   - c) P wave travel time from epicenter to station: <u>8:40</u> (8 minutes and 40 seconds)
   - d) S wave travel time from epicenter to station: <u>15:20</u> (15 minutes and 20 seconds)
   - e) Difference in P - S wave arrival times: <u>6:40</u> (6 minutes and 40 seconds)
     This is the time interval between when P waves arrived and when S waves arrived. The time between D and E or B and C on the chart.
   - f) Time P waves arrived at the station: <u>1:29:20 PM</u> *(The P waves would arrive 8 min. and 40 sec. after they started out. They started at 1:20:40 so just add 8:40 to their start time. But remember that you are adding seconds so 80 seconds = 1 minute and 20 seconds.)*
   - g) Time S waves arrived at the station: <u>1:36:00 PM</u> *(The S waves arrived 15 min. and 20 seconds after they started which was 1:20:40. So add 1:20:40 and 15:20)*

3) The problems:
   - q1) How long will it take P waves to travel 5200 km?
   - a1) Find 5200 km on the bottom line (A). Go up to the P wave line (B). Go left to the vertical axis (D) and read the time: *<u>8:40</u>*

   - q2) It takes P waves 8 minutes and 40 seconds to travel from the epicenter of an earthquake to a seismic station. How long will it take S waves to travel to the same station?
   - a2) Find 8:40 on the vertical axis (D). Go to the P wave line (B). Go straight up to the S wave line (C). Go left and read the time (E) *<u>15:20</u>*

   - q3) If a seismic station is 5200 km from the epicenter of an earthquake, how long after P waves arrive will the S waves arrive?
   - a3) Find 5200 km on the bottom axis (A). Go up to the P wave line (B). Count the time interval between (B) and (C): *<u>6:40</u>*

q4) A seismic station is 5200 km from the epicenter of an earthquake. The earthquake occurs at 1:20:40 PM. At what time will P waves arrive at the seismic station?

a4) Find 5200 km on the bottom axis (A). Go up to the P wave line (B). Go left and read the time on the vertical axis (D). The time you should read is 8:40. This is how long the P waves must travel to reach the station. If they started out at 1:20:40 then you must add the travel time to this value:

$$1:20:40$$
$$+ \quad 8:40$$

$$\textit{\underline{1:29:20}}$$

Remember that when adding seconds, each 60 seconds is a minute. 80 seconds is one minute and 20 seconds.

q5) P waves arrive at a seismic station at 1:29:20 PM. S waves from the same earthquake arrive at 1:36:00 PM. How far is the seismic station from the epicenter of the earthquake?

a5) First we must find the *difference* in arrival times between P and S waves.

$$1:36:00$$
$$- \quad 1:29:20$$

$$6:40 = \text{the difference.}$$

Now find the place on the graph where the space between the P and S lines is 6 minutes and 40 seconds*. This is exactly between B and C. Follow the line from C to B straight down and read the distance: *5200 km*

Helpful hint. To quickly find the place where the difference between the P and S lines is 6:40, do this: Take a blank sheet of paper and place one edge on the vertical axis (time). Mark off two points on the paper: 0 and 6:40. Now slide the paper keeping the 0 mark on the P line. Keep the edge of the paper straight. When the 6:40 mark is exactly on the S line look straight down the edge of the paper. It should be on the 5200 km mark.

Earthquake P-wave and S-wave Travel Time

TRAVEL TIME (minutes) vs EPICENTER DISTANCE (×10³ km)