Problem of the Week
Problem B and Solution
Are We There Yet?

Problem

Planets travel around the sun in elliptical orbits (ovals). Mercury is the planet closest to the sun. The distance between Earth and Mercury ranges from 77 000 000 km at its closest distance to 222 000 000 km at its farthest distance.

Because distances are so great in the solar system, scientists measure them in **Astronomical Units**, or **AU**. One AU is equal to the average distance between the Earth and the Sun, or about 149 600 000 km.

Complete the missing information in the table.

To calculate the travel time, assume you are travelling from Earth to the planet in a rocket at a speed of 28 000 km per hour throughout your flight. Pick the most reasonable unit of measure for time (for example, 15 000 hours doesn't mean much, but when divided by 24 to get 625 days, you know that it's almost 2 years).

Solution

The completed table is shown below.

Planet	Distance in AU from Earth	Distance in km from Earth	Travel Time
Mars	0.52	77 792 000	2 778 hr = 116 days
Venus	0.27	40 992 000	61 days
Saturn	8.52	1 275 000 000	45 536 hr = 1897 days = 5+ years
Neptune	29.09	4 351 864 000	155 424 hr = 6476 days = 17+ years

Since 1 AU = 149 600 000 km, to convert from the distance in AU to the distance in km (for Mars and Neptune), we multiply the distance in AU by 149 600 000. Similarly, to convert from the distance in km to the distance in AU (for Saturn), we divide the distance in km by 149 600 000. This allows us to fill in both distance columns for Mars, Saturn, and Neptune.

To calculate the travel time, we use the speed of the rocket, which is 28 000 km per hour. If we divide the distance in km by 28 000 km per hour, we will get the number of hours it takes to travel that distance, which is the travel time. We can then convert this to a more appropriate unit as we see fit.

To calculate the distance in km from the travel time (for Venus), note that 61 days is equal to $61 \times 24 = 1464$ hours. Thus, travelling at 28 000 km per hour, the distance covered would be $28\,000 \times 1464 = 40\,992\,000$ km. We can then convert the distance in km to the distance in AU as we did for Saturn.