Chapter 8: Scale Distances of the Solar System

Student Worksheet

Objective: To understand the true scale distances between the sun and the planets in our solar system by making a scale distance chart of the solar system's planets.

Engage: On the back of this page or on a scrap piece of paper take 2 or 3 minutes to draw a scale model of your country without drawing any borders. Using the entire page, plot the major cities as best you can to approximate the distances between them. You may find that doing the same for your solar system is much more challenging.

Introduction: Drawing to scale is an important feature of map making. If you were tasked to draw a map of your neighborhood it would not make sense to make your house take up most of the page, nor would it make sense to have a largely empty sheet of paper with a tiny neighborhood drawn in the corner. In your life you have probably already seen posters or models of the solar system showing the orbits of planets. These models rarely show the scale sizes or distances. It is tough to do so in such a small space. The model you are about to make will show the scale distances between planets and the sun. (Note: It will **not** show the scale sizes of the sun and the planets themselves.) The chart you make is an important one because it will give you a better sense of your solar neighborhood.

Your Task: You will begin the activity with your guess about the spacing between the planets, and you will end with an answer key on the other side of your strip of paper .

Procedure:

1. At the top of the strip of paper, in very small letters, write: Sun.
2. At the bottom of your strip, in very small letters write: Pluto or Kuiper Belt.
3. The planets Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune should be plotted (in that order) in the space between the Sun and Pluto or the Kuiper belt. Take a few minutes to plot the planets **at your best guess of their appropriate distances.** The planets are not evenly spaced between the Sun and Pluto.
4. Wait for your instructor to give the answer key.

Conclusion:

1. If this scale distance model were to also show scale size the sun would be about the size of a grain of sand. What is an approximate comparison for Jupiter's size if the Sun were a grain of sand?

2. The Kuiper belt is not the edge of our solar system. The edge is determined to be where the gravity from other stars is no longer weaker than the gravity from our Sun. Near this edge lies a hypothetical cloud of icy bodies called the Oort Cloud. On your strip of paper, if the Sun is written at the top and Oort Cloud is written at the bottom (instead of Pluto or the Kuiper belt), where would you write in Pluto? To check your answer, search for the distance from the Sun to the Oort Cloud in AU.

3. In 2006 the International Astronomical Union decided to define the features of a planet since objects very near the size, and some even bigger than Pluto were being found. They made three criteria to define a planet: 1. A planet must orbit the sun. 2. It must be massive enough to have a round shape. 3. It must "clear the neighborhood" around its orbit. How is Pluto in violation of these defining features?

Extend:

- Share this classic activity with your friends and family! It is interesting to see how people guess at the scale distances.

- Define the following terms in relation to the edge of the solar system: Heliopause, Bow Shock, Terminator.

- Investigate the dwarf planets Make- Make and Santa. Compare their physical characteristics with Pluto and other dwarf planets. What characteristics prevent them from being classified as *planets*? How were these dwarf planets discovered?

- On a paper strip, make a scale distance model of the Earth, its atmospheric levels, the orbits of some satellites, and the orbit of the Moon.