Pocket Solar System

Building scale models of the solar system is a challenge because of the vast distances and huge size differences involved. With this activity, you will get to create a simple model to give you an overview of the distances between the orbits of the planets and other objects in our solar system. All you will need is a standard piece of paper and something to write with.

Object	Average distance from the Sun in kilometers (km)	Average distance from the Sun in **Astronomical Units (AU)	Average distance from the Sun converted to scale in millimeters (mm)
Mercury	58 million	0.39	3
Venus	108 million	0.72	5.5
Earth	150 million	1	7.5
Mars	228 million	1.52	11.5
Asteroid Belt	416 million	2.77	21
Jupiter	778 million	5.2	40
Saturn	1,427 million	9.54	73.5
Uranus	2,870 million	19.2	148
Neptune	4,497 million	30.1	232
Kuiper Belt	5,850 million	39.5	280
** An Astronomical Unit is the average distance between the Sun and the Earth. An object with an AU of 5 would be 5 times farther away from the Sun than the Earth is from the Sun.			

Making your Pocket Solar System

You will need a standard, 8 ½ x 11 sheet of paper. You can use a piece of loose leaf notebook paper or printer paper. On one short end, write the word Sun and on the other short end write the word Kuiper Belt. The Kuiper Belt is similar to the Asteroid Belt, but is filled with icy objects and is located beyond the planets. Pluto is located in the inner edge of the Kuiper Belt.

Next, fold the paper in half so the two short ends touch each other. Open the paper up again so the Sun is at the top and place a circle on the crease about two inches from the left edge of the paper. Many will be surprised to know that this is approximately the distance of Uranus. Label the planet as Uranus.

Re-fold the paper back on the same crease, then fold the paper in half again. Unfold the paper and lay it flat. Now you have the paper divided into quarters with the Sun at the top, Uranus in the middle, and the Kuiper Belt at the bottom. Draw a circle on the crease between Uranus and the Kuiper Belt and about one inch from the left side of the paper. This will be labeled Neptune. On the crease between Uranus and the Sun, draw a ringed circle about three inches from the left edge. This should be labeled Saturn.

Take a moment to admire your work. Which part of the solar system has filled ¾ or 75% of your paper? That's right, you've only been mapping out the places for the three most distant planets (and the Kuiper Belt). That means that you've still got five planets and the Asteroid Belt to fit into the quarter page between Saturn and the Sun. Let's keep going to see how this will work.

Fold the Sun down to Saturn (you may find it easier to twist your paper so the Sun is at the bottom for the remaining folds). Unfold and lay the paper flat again. Place a nice sized circle on the crease close to the middle of the paper. This will be Jupiter, and is 1/8th of the distance of the Solar System.

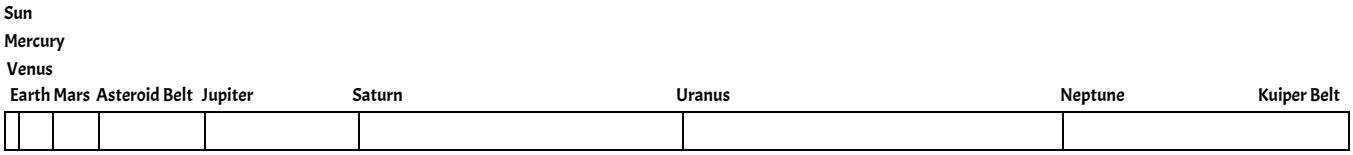
If you take another look at your Pocket Solar System, you will see that you've got the four Gas Giants and the Kuiper Belt all on there. For the remaining celestial bodies in the Solar System, you will place them in the remaining 1/16th of your paper. To do this, fold the Sun to meet Jupiter. On this crease, make a few small dots and label them the Asteroid Belt.

At this point, things start getting a little crowded and it gets difficult to get precise distances by folding. Try to fold the Sun to the Asteroid Belt, labeling this crease as Mars. If you can not make a good fold, just add Mars half-way between the Asteroid Belt and the Sun.

There are still three planets left to label, so we will not be able to fold the paper for these. Mark a dot that is half-way between Mars and the Sun. Label this planet as Venus. The last two planets will be Mercury (half-way between the Sun and Venus) and Earth (half-way between Venus and Mars).

Smooth out your Pocket Solar System and admire your work. Many people are unaware of how empty the outer solar system is (there is a reason it is called SPACE!) and how crowded the inner solar system is (compared to the outer solar system).

Example of Object spacing



Group Questions for Review

1. Are there any surprises when you look at the distances between the planets this way?
2. What do you notice about the distances of the inner planets when compared to the distances of the outer planets?
3. Which planets would be easier for humans to explore, and why?
4. What is the same about all of the Inner Planets?
5. What is the same about all of the Outer Planets?
6. Why do you think the Inner Planets share characteristics and the outer planets share characteristics?
7. Why do you think the Asteroid Belt separates the inner and outer planets?
8. What causes the planets to revolve around the sun?
9. Identify one unique characteristic for each of the planets.
10. How can you remember the order of the planets? Is there a rhyme or other trick you can use?

Extension: Use the information in the Distance Chart to find new (and larger) ways to compare the distances between the planets. For example, instead of using "million of kilometers", use these numbers as inches and draw a scaled solar system on your sidewalk. Maybe the AU can be scaled as feet, or the milimeters can become centimeters. You can also use non-standard measurements such as hand lengths, steps, or spaghetti noodles.