Pocket Solar System

Originally developed by Amie Gallagher (Raritan Valley Community College).
Adapted by Suzanne Gurton and Anna Hurst, of the Astronomical Society of the Pacific for Astronomy from the Ground Up.
Modified for Skynet Junior Scholars.

What's This Activity About?

You will build a quick model of the solar system by folding a piece of register tape. The relative distances between the orbits of the planets will be illustrated. Images in textbooks often depict the planets squeezed together, but this model shows how far apart they are, especially beyond Mars.

Materials

For each model:

- 1 meter length of cash register tape
- pencil
- colored pencils, crayons or stickers

Setting up the Activity

If you are doing this activity with a large group, you can **pre-cut 1 m strips of register tape** and **divide out groups of stickers** for each participant**.** If you wish, **practice** the steps a few times so you don't have to refer to your notes.

Introducing the Activity

For any scale model activity, it is useful to start by exploring the notion of models. Referring to playthings, such as dolls or toy cars, can be a useful reference for talking about scale models.

Doing the Activity

Have participants predict where the planets go. Say: "First, let's predict! On one side of the register tape, lightly draw two dots, one on each end, right at the edge. Label one "Sun" and the other "Pluto". Even though Pluto has been reclassified as a dwarf planet it serves as a useful reference point here. We can use it as the first example of such a dwarf planet ever found. Now, lightly draw and label the planets in between. Where do you think they go?"

Once they have predicted, turn the tape over and have the participants create their accurate Pocket Solar system models. Lead them through the following steps:

1. Once again, draw 2 objects on each end of the tape, one large and one small, right at the edge. Put the Sun and Pluto in the same locations on this side of the tape. You can use stickers if you have them. Label the large one Sun and the small one Pluto.

2. Fold the tape in half, crease it, unfold and lay flat. A planet goes there! You can ask for guesses as to which of the planets might be at this halfway point. Draw and label the planet Uranus.

3. Fold the tape back in half, then in half again. If there are mixed ages, give those with some knowledge of fractions the opportunity to show off by asking “What is half of a half?" Unfold and lay flat. Planets go in each of these creases! Ask for guesses again. Then draw and label Saturn the quarter mark and Neptune at the 3/4 mark (Saturn closer to the Sun and Neptune closer to Pluto).

4. No need to fold up the whole tape again. Just fold the Sun edge up to meet Saturn. What planet goes in that crease? Jupiter! Draw and label Jupiter.

5. Fold the Sun out to meet Jupiter to mark the 1/16th spot. A planet does not go here, but you can draw lots of little dots and label them the Asteroid Belt!

6. At this point, things start getting a little crowded and folding is tough to get precise distances, so fold the remaining 1/16th in half and crease at the 1/32nd spot. Place a small dot for the Earth just inside this fold (closer to the Sun) and a small dot for Mars just outside the fold (closer to the Asteroid Belt) and label them.

7. Place small dot for Mercury and then Venus, between the Earth and Sun, pretty much dividing the space into thirds and label them as Mercury closest to the Sun and Venus closest to the Earth.

Wrap-up

At the end of the discussion, be sure to have everyone put their names on their tapes and fold them up to put it in their pockets. But before you put them away, here are some questions you might ask to get participants thinking about insights they can get from building this model.

1. Are there any surprises? Look how empty the outer solar system is: there is a reason they call it space! And how crowded the inner solar system is (relatively speaking).

2. Do you know anything about the physical properties of the ones that are spread out versus the ones that are crowded in close to the Sun? All the inner ones are small and rocky and the outer ones are gassy giants (except small, icy Pluto).

3. Given this spacing, why do you think little, rocky Venus can outshine giant Jupiter in the night sky? Both are covered with highly reflective clouds, and although it is much smaller, Venus is also much, much closer.

4. Does anyone know where the Eris, the largest dwarf planet would go on this model? It would more than double the size of the model.

5. Discuss the ways in which this Pocket Solar system is a good model for the real solar system and a not so good model. Examples of ways in which the model is not accurate include:
    - The sizes of the planets are not to scale;
    - We ran out of room for the inner planets;
    - The planets never appear in a straight line in order out from the Sun. The planets orbit in a circle this far from the Sun and would be somewhere along the circle.

Extension: You can try other scale sizes for the solar system and other cosmic distances with this interactive scale builder: http://exploratorium.com/ronh/solar_system/