Pocket Solar System

Building scale models of the solar system is a challenge because of the vast distances and huge size differences involved. This is a simple little model to give you an overview of the distances between the orbits of the planets and other objects in our solar system.

We will also learn about the "Astronomical Unit", which is a predetermined distance that allows us to us smaller number when we talk about distance in space. The length of one "Astronomical Unit" is 93 million miles, which is the average distance from the Sun to Earth.

Materials needed:

1 Yard of paper tape (register tape)
Pen or pencil

Review of the order of planets and large objects going out from the Sun to Eris, and their average distances from the Sun		
Object	**Distance in Miles**	**Distance in A.U.**
Mercury	36 million	.39
Venus	67 million	.72
Earth	93 Million	1.0
Mars	141.6	1.52
Asteroid Belt	257.6 million	2.77
Jupiter	483.6 million	5.2
Saturn	886 million	9.54
Uranus	1.8 billion	19.2
Neptune	2.8 billion	30.1
Pluto and Inner edge of Kuiper belt objects	3.7 billion	39.5
Eris	6.3 billion	67.8
In 2006 the International Astronomical Union, the organization in charge of naming celestial objects, classified Pluto and Eris as "dwarf planets"		

Making your pocket solar system

1. Take a piece of register tape, 36 inch long, and mark Sun on the right end, mark Pluto on the left end.
2. Fold the Sun end toward Pluto, so your tape is in half. Make a crease at the middle. If our model of the solar system, from the Sun to Pluto, is roughly about 40 au's what

planet should be in the center? Look at the chart to find a planet at about 20 au's. Correct Uranus would be the planet, write Uranus by the center fold.

3. Fold the tape back in half again. Now fold it in half again. Open it up, you have 4 parts or it is marked in quarters. Look again at the chart, find the planets that will go at these folds and write them in. Neptune is between Uranus and Pluto and Saturn is between Uranus and the Sun. Stop and admire your work. How many objects of the solar system has filled ¾ of your tape? That's right; you've only been mapping out the places for the 3 most distant planets and Pluto. That means that you've still got 5 plus the asteroid belt to fit into the quarter between the Sun and Saturn.
4. Fold the Sun toward Saturn and crease your tape. Unfold the tape you now have a mark at 1/8. Check the chart, you will find that Jupiter is the planet to write at this crease. Take a look at the tape, from Jupiter out to Pluto look at how much distance is used up on our tape. We still have a lot to fit in, things will be getting tight.
5. Fold the Sun toward Jupiter, and make a crease, you now have a mark at $1/16^{th}$ of our tapes length. Take a guess what do you think would be next. Look at the chart. If you thought the asteroid belt good job. Write asteroid belt at this crease.
6. The folds now are going to get hard to make so fold carefully. Fold the sun to the asteroid belt, make a crease and open it up. If you check the chart you will find that Mars is at this fold. Write Mars by the crease.
7. How many planets are left? There are 3 planets left to squeeze in. fold the Sun to Mars, leave the tape folded this time and fold the folded section in half. Unfold the tape you should have 3 creases. At the crease close to mars write Earth, write Venus on the next crease, and on the crease closest to the sun right Mercury.
8. Take a good look at the tape. Notice how much distance there is between the orbits of our solar system.

Here are some Questions to think about while looking at your work.

1. If Pluto is about 40 au's away from the Sun and Eris's orbit carries it almost 97au's away from the Sun at its farthest point, how much more tape would you need to add Eris to our model.
2. Your model is 1 yard long, where would the nearest star be at this scale.(1 yd = 40 au's, Proxima Centauri is 4.3 light years away from the sun, and 1 light year = 65,000 au's, a light year is the distance light travels in 1 year at the speed of 186,000 miles per second, the distance would be 65,000 au's per year)
3. How big would the Sun and Planets be on this scale model?

Answers:

1. You would need more than another tape of 36 inch length to place Eris in our model. And Eris is not even close to the end of our solar system.
2. The next nearest star would be over 4 miles away at this scale. If you were to get in your car and drive on highway 904 west towards highway 17 you would reach the Mcdonalds. Have a hamburger and just think about how big the Universe must be.
3. The Sun would be just a little smaller than a grain of sand. You would need a microscope to view the Planets on our model.