

Scaling the Distance of the Solar System

Please attach student sheet 91.1 (Scaled Sizes of the Planet) to this paper.

It is hard to imagine the distances in the solar system. In this lab, we will be trying to get a sense of the distances between solar system bodies. In our paper scale of the distances, we used a scale that was 1.0 cm = 200,000,000 km. Today, we increase our scale by a factor of 100. Let's see if we can scale both the distances of the planets and the diameter of the planets.

Challenge: Create a 1.0 m : 200,000,000 km scale model of the solar system.

Prediction: We will be able to / not be able to use the scale above to model both the distance of the planets from the sun and the diameter of the planets.

Materials

- 2 Meter sticks
- 1 piece of sidewalk chalk
- Calculator
- clipboard

Procedure - work as a group

1. Find a starting point that will allow your group to use 30 meters of pavement
2. Decide on a point that represents the center of the sun.
3. Find the scaled distance of each planet / object. The few at the end can be skipped.

$$\textit{scaled distance from the sun (in meters)} = \frac{\textit{actual distance (km)}}{200,000,000 \textit{ km}}$$

4. Label each planet at its scaled distance from the sun. Use a ping pong ball or other marker if you end up on the grass.
5. Use the **scale** above to try to see if you can scale the diameter of the planets on your distance scale.
6. Try to draw the sun at the same scale.

Space object	Scaled distance (m)	Actual distance (km)	Diameter (km)
Sun	0 m	0 km	1,392,000 km
Mercury		57,900,000 km	5,000 km
Venus		108,200,000 km	12,000 km
Earth		149,500,000 km = 1 AU	13,000 km
Mars		227,900,000 km	7,000 km
Jupiter		778,300,000 km	143,000 km
Saturn		1,427,000,000 km	120,500 km
Uranus		2,869,600,000 km	51,000 km
Neptune		4,497,000,000 km	49,500 km
Pluto		5,914,000,000 km	2,400 km
Oort Cloud beginning		50,000 AU	
Voyager 1		20,570,000,000 km	

Analysis

1. Diameter: Was your group successful in using the same scale for the distance and diameter of the planets? Explain why or why not. Use calculations to support your answer.

Highly Proficient Opportunity - please add paper

1. You should have come to the conclusion that even though we increased the scale of our distance 100x, we still cannot use the same scale for both the distances of the planets from the sun and the diameter of the planets.
 - a. Find a scale that will work for both the distance of the planets from the sun and the diameter of the planets. Remember that Mercury has to be big enough to be seen. You will not be making a model in this activity, just providing the scale and the scaled values.
 - b. Make a data table to show the scaled distance and diameters using the scale that you choose.

Analyze and interpret data to determine scale properties of objects in the solar system.

4 Highly Proficient	3 Proficient	2 Close to Proficient	1 Developing
<input type="checkbox"/> I can provide the scale and data for a model that will show both the distance from the sun and diameter of the planets.	<input type="checkbox"/> The scaled model of the solar system is complete and correct. <input type="checkbox"/> The scaled diameter of the planets is complete and correct. <input type="checkbox"/> Analysis questions are correct and show thought. <input type="checkbox"/> HP is attempted but is incorrect or incomplete..	<input type="checkbox"/> Model is incorrect. <input type="checkbox"/> Model is incomplete. <input type="checkbox"/> My answers need more detail. <input type="checkbox"/> My work is incomplete.	<input type="checkbox"/> Not attempted or mostly incomplete.