Scale Models of the Solar System

Objective

To make a scale model of the Solar System

National Science Content Standards:	Science Process skills:	Math Process skills:
• Objects in the sky • Systems, order and organization • Position of objects • Models of objects	• Making observations • Replicating procedures • Organizing data • Forming generalizations • Communicating findings	• Communication • Connections • Reasoning

Background

- The true distances of the planets are so vast that most young children and many adults have a hard time comprehending them. This activity will give the idea that the planets are very far away from the sun and are not evenly "spaced."
- Our Solar System is made up of one star (the Sun) and nine planets with many other smaller bodies in it. Astronauts have traveled as far as our Moon, but radio-controlled spacecraft have gone to all the planets except Pluto.
- In our Solar System we find that the innermost planets are rocky and the outer planets are gaseous. Pluto is an exception to this as it is a rocky outer planet. The outer planets, although gaseous, are suspected to have icy or solid cores.
- When we measure distances in the Solar System we use astronomical units (A.U.). An A.U. is the average distance between the Earth and the Sun – 93,000,000 miles (150 km).

Activity One

Students will make a scale model of the Solar System using a roll of toilet paper.

Materials Needed

- Roll of toilet paper
- Planet lithographs or pictures

Procedure

This activity can be done as a demonstration or in small groups of students. (This activity will take around 45 minutes).

- Begin the activity by having students use the lithographs, Internet, or other resources to determine the average distance from the Sun for each planet. Then, have students determine the scale distance. The answers are provided at the end of this activity.
- Ask one student to stand at the front of class and be the "Sun." This student should hold onto the beginning end of the toilet paper (TP). Have another student hold the roll of TP and unroll it as needed.

- Unroll the TP and either have a student hold the spot for each planet (demonstration) or use a marker (small group) to mark that spot. If you are doing this as a demonstration, have each student also hold the picture of the planet for the rest of the class to see.

Activity Two

Students will create directions for a scale model of the Solar System based on the size of the planets.

Materials Needed

- Round balloon
- Model Planet Cards
- Model Distances Chart
- Metric Ruler

Procedure

This activity should be done in small groups.

- As class begins, blow up a balloon to 14 centimeters in diameter. This balloon is a model Sun that is approximately one ten-billionth (1/10,000,000,000) the size of the real Sun. The Model Planet Cards uses this scale for the planets.
- Have students use the Model Planet Cards to make a predicted scale model of the Solar System. After the students have made their predictions, have them determine the actual distance between the planets and the Sun (in Kilometers or Miles). Students should then calculate the scale distance (in meters). Have students determine the length of their "pace" and then complete the Model Distance Chart by calculating the number of paces from the Sun for each planet.
- Alternatively, students can use modeling clay to create models of the planets based on size compared to the balloon/ Sun. In this case, use the Model Planet Cards as the answer key.

Discussion Questions for Activity One and Two

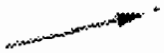
WARNING: The planets do not actually line up on one side of the Sun. They orbit the Sun on different paths at different speeds.

1. What were you surprised to learn about the size of the planets?
2. What were you surprised to learn about the distances between the planets?

Extension

Where would the next nearest star (Proxima Centauri) be located? The distance from the Sun to this star is 25 trillion miles (41 trillion kilometers).

Model Planet Cards



Mercury

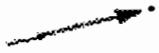
Jupiter

Saturn

Earth

Venus

Pluto



Mars

Uranus

Neptune

Scale Model of the Solar System Student Worksheet

Activity 2: Student Model Distances Chart

Planet	Average Distance from Sun (Millions of Kilometers)	Average Scale Distance from Sun (Meters)	Average Scale Distance from Sun (Paces)
Mercury			
Venus			
Earth			
Mars			
Jupiter			
Saturn			
Uranus			
Neptune			
Pluto			

Answers

The following table shows the actual distances from the Sun for each planet.

Planet	Average Distance from Sun (Millions of Miles)	Average Distance from Sun (Millions of Kilometers)	Average Distance from Sun (A.U.)
Mercury	36	58	0.39
Venus	67	108	0.72
Earth	93	150	1
Mars	142	228	1.52
Jupiter	484	778	5.2
Saturn	887	1427	9.5
Uranus	1783	2870	19.2
Neptune	2799	4504	30
Pluto	3666	5900	39

Scale Distances

The Sun's diameter is actually 865,000 miles or 1,392,000 kilometers. The number of paces in activity 2 will vary with each student, however it is important to note that at this scale, Pluto will be nearly 6.5 football fields away from the Sun!

Planet	Average Distance from Sun -- Activity 1 (Squares of TP)	Average Distance from Sun (Millions of Kilometers)	Average Distance from Sun -- Activity 2 (meters)
Mercury	0.39	58	5.83
Venus	0.72	108	10.86
Earth	1	150	15.1
Mars	1.52	228	22.9
Jupiter	5.2	778	78.2
Saturn	9.5	1427	143.4
Uranus	19.2	2870	288.5
Neptune	30	4504	452.7
Pluto	39	5900	593