

# Scale Models of the Solar System

Object	Distance from Sun AU*	Distance kilometers	Diameter kilometers
Sun	--	--	1,391,980
Mercury	0.39	58,000,000	4,880
Venus	0.72	108,000,000	12,000
Earth	1.00*	150,000,000	12,800
Mars	1.52	228,000,000	6,800
Jupiter	5.20	778,000,000	142,000
Saturn	9.54	1,430,000,000	120,000
Uranus	19.2	2,870,000,000	51,800
Neptune	30.1	4,500,000,000	49,500
Pluto	39.4	5,900,000,000	2,300

(\*) Note that 1 AU (astronomical unit) is 150,000,000 km (about 93,000,000 miles). It is the average distance from Sun to Earth.

## Introduction

This data will allow you to make a scale model of the solar system. For younger students, do a distance-only model. For older students, you might want to scale the size of the planets to the same scale as for the distances.

Distance and sizes in the solar system are difficult to visualize because the numbers are so large. In making a scale model, you need to divide the actual figure by any standard number to make a scaling factor. For example, if the wheels of a model car are 9 cm in diameter, and the wheels of a real car are 72 cm in diameter, then the scaling factor is 72 divided by 9 or 8. The model car is a 1/8-scale model of a real car. Looking at the model, measuring the part, and multiplying by 8 can determine the true size of any other part of the car.

## Engage

Show several items, such as toys, of various scales and ask students to describe them. Ask the students to write down or draw a picture of what they think the solar system looks like.

## Explore

Use the data table to measure out a scale model of the solar system. [If you don't have space to use one meter = 1 AU in your model, you or your students may wish to calculate a new scale for the class, or to do only part of the solar system.] One way to make a model is to measure out pieces of string of the proper lengths and put a piece of masking tape at each end. All the pieces begin at the position of the Sun. The strings can be attached to a ring in the center and go out in all directions. (For lower elementary grades, don't worry about the exact positions of the planets in relation to each other. They change every day!)

## Explain

Ask the students to compare their initial description from the model they made. Since the planets orbit the Sun in almost the same plane, it is correct for you to make a model on a flat surface, like a floor.

## Extend

The nearest star to the Sun is Alpha Centauri, at 274,332 AU. Where would this star be in the model you have made? Another extension might be to add drawings or three-dimensional models of the planets. How big are the sun and planets if you make them to the same scale you used for distance? (Answer: The diameters are much smaller than the distances and unless your model is *very* large it will be difficult to do.)

## Evaluate

What are the advantages and disadvantages of making a scale model? (Answer: The advantage is that it is small enough to see all at once and that it may fit into the space available. It is like the real solar system because it shows the distances of the planets relative to the sun. A disadvantage is that most students make a model in which all the planets are in a straight line, which is not their usual arrangement. Another disadvantage is that it is very difficult to do both distances and diameters to the same scale.)