

Solar System Distance Activity

Goal:

The students will understand the distances between the Sun, planets, and small objects in the Solar System.

Objective:

To create a model demonstrating the scale distances of the Solar System using astronomical units that have been converted into a 10 centimeter scale.

National Science Education Standards:

Standard D: Earth in the Solar System

Materials:

- Planet beads (large craft pony beads in 11 colors):

Sun	yellow
Mercury	solid red
Venus	cream
Earth	clear blue
Mars	clear red
Asteroid belt	black
Jupiter	orange
Saturn	clear gold
Uranus	dark blue
Neptune	light blue
Pluto	brown

- 4.5 meters of string for each student
- Small piece of cardboard to wrap Solar System string around (10 cm x 10 cm)
- Meter sticks or measuring device
- Student handout

Background:

- To speed up the activity for younger students, the string may be pre-cut and a set of Solar System beads may be put into a plastic ziplock bag for each student. Also, for younger students, a measured marking grid can be put on a table top so the students can mark their measured distances and then tie off the beads. If the pre-marking method is used, extra distance must be added to each planet distance to accommodate the string within each knot (approximately 4 cm for a double knot around the bead). Tape newspapers to the surface where the students will be marking their strings, so they do not mark up the counter or floor.
- For older students, measurements are made each time from the Sun to the planet and tied on after each measurement.

Student Procedure:

- Convert the various AU distances to centimeters and complete the chart on the student hand-out sheet.
- Measure and cut a piece of string 4.5 m long.
- Using the calculated cm distances, tie the bead onto the string using a double knot.
- When finished with the activity wrap the Solar System string (with beads) around the cardboard holder.

Solar System Distance Activity

Introduction:

Our Solar System is immense in size by normal standards. We think of the planets as revolving around the Sun, but rarely consider how far each planet is from the Sun. Furthermore, we fail to appreciate the even greater distances to the other stars. Astronomers use the distance from the Sun to the Earth as one "astronomical unit". This unit provides an easy way to calculate the distances of the other planets from the Sun.

Vocabulary:

Astronomical Unit - 1 AU = approximately 150 million kilometers (93 million miles)

Activity:

We will construct a distance model of the Solar System to scale, using colored beads as planets. The chart below shows the planets and asteroid belt in order along with their distance from the Sun in astronomical units. First, complete the chart by multiplying each AU distance by our scale factor of 10 cm per astronomical unit. Next, use the new distance to construct a scale model of our Solar System. Start your model by cutting a 4.5 m piece of string. Use the distances in cm that you have calculated in the chart below to measure the distance from the Sun on the string to the appropriate planet and tie the colored bead in place. When you are finished, wrap your string Solar System around the cardboard holder.

Planet	AU	Scale value (cm)	Color
Sun	0.0 AU	_____cm	yellow
Mercury	0.4 AU	_____cm	solid red
Venus	0.7 AU	_____cm	cream
Earth	1.0 AU	_____cm	clear blue
Mars	1.5 AU	_____cm	clear red
Asteroid belt	2.8 AU	_____cm	black
Jupiter	5.0 AU	_____cm	orange
Saturn	10.0 AU	_____cm	clear gold
Uranus	19.0 AU	_____cm	dark blue
Neptune	30.0 AU	_____cm	light blue
Pluto	39.0 AU	_____cm	brown

Consider that if you were traveling at the speed of light, it would take 8 minutes to travel from the Sun to the Earth (1 AU). It would take 4.3 years (traveling at the speed of light - 300,000 kilometers per second) to reach the next nearest star, Alpha Centauri!

Show the model to your teacher for a grade. You may keep the model!

<u>Planet</u>	<u>AU</u>	<u>Color</u>
Sun	0.0 AU	Yellow
Mercury	0.4 AU	Solid Red
Venus	0.7 AU	Cream
Earth	1.0 AU	Clear Blue
Mars	1.5 AU	Clear Red
Asteroid belt	2.8 AU	Black
Jupiter	5.0 AU	Orange
Saturn	10.0 AU	Clear Gold
Uranus	19.0 AU	Dark Blue
Neptune	30.0 AU	Light Blue
Pluto	39.0 AU	Brown

<u>Planet</u>	<u>AU</u>	<u>Color</u>
Sun	0.0 AU	Yellow
Mercury	0.4 AU	Solid Red
Venus	0.7 AU	Cream
Earth	1.0 AU	Clear Blue
Mars	1.5 AU	Clear Red
Asteroid belt	2.8 AU	Black
Jupiter	5.0 AU	Orange
Saturn	10.0 AU	Clear Gold
Uranus	19.0 AU	Dark Blue
Neptune	30.0 AU	Light Blue
Pluto	39.0 AU	Brown

<u>Planet</u>	<u>AU</u>	<u>Color</u>
Sun	0.0 AU	Yellow
Mercury	0.4 AU	Solid Red
Venus	0.7 AU	Cream
Earth	1.0 AU	Clear Blue
Mars	1.5 AU	Clear Red
Asteroid belt	2.8 AU	Black
Jupiter	5.0 AU	Orange
Saturn	10.0 AU	Clear Gold
Uranus	19.0 AU	Dark Blue
Neptune	30.0 AU	Light Blue
Pluto	39.0 AU	Brown

<u>Planet</u>	<u>AU</u>	<u>Color</u>
Sun	0.0 AU	Yellow
Mercury	0.4 AU	Solid Red
Venus	0.7 AU	Cream
Earth	1.0 AU	Clear Blue
Mars	1.5 AU	Clear Red
Asteroid belt	2.8 AU	Black
Jupiter	5.0 AU	Orange
Saturn	10.0 AU	Clear Gold
Uranus	19.0 AU	Dark Blue
Neptune	30.0 AU	Light Blue
Pluto	39.0 AU	Brown

<u>Planet</u>	<u>AU</u>	<u>Color</u>
Sun	0.0 AU	Yellow
Mercury	0.4 AU	Solid Red
Venus	0.7 AU	Cream
Earth	1.0 AU	Clear Blue
Mars	1.5 AU	Clear Red
Asteroid belt	2.8 AU	Black
Jupiter	5.0 AU	Orange
Saturn	10.0 AU	Clear Gold
Uranus	19.0 AU	Dark Blue
Neptune	30.0 AU	Light Blue
Pluto	39.0 AU	Brown

<u>Planet</u>	<u>AU</u>	<u>Color</u>
Sun	0.0 AU	Yellow
Mercury	0.4 AU	Solid Red
Venus	0.7 AU	Cream
Earth	1.0 AU	Clear Blue
Mars	1.5 AU	Clear Red
Asteroid belt	2.8 AU	Black
Jupiter	5.0 AU	Orange
Saturn	10.0 AU	Clear Gold
Uranus	19.0 AU	Dark Blue
Neptune	30.0 AU	Light Blue
Pluto	39.0 AU	Brown