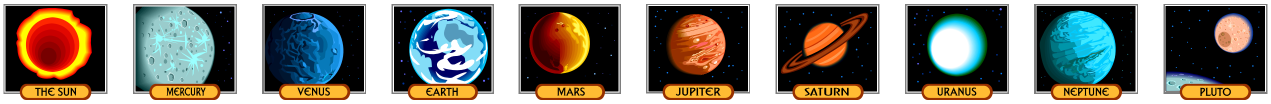


Solar System Bead Distance Activity

| Adapted for Students with Special Needs |

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

National Math Education Standards:
NM.5-8.5 Number Relationships
NM.5-8.13 Measurement

Materials:

- Planet beads:

Sun	BELL
Mercury	SMALL BLACK
Venus	ORANGE
Earth	DARK BLUE
Mars	RED
Asteroid belt	TRI-SHAPED-color varies
Jupiter	GOLD
Saturn	YELLOW
Uranus	LIGHT BLUE
Neptune	CLEAR GREEN
Pluto	SMALL PURPLE

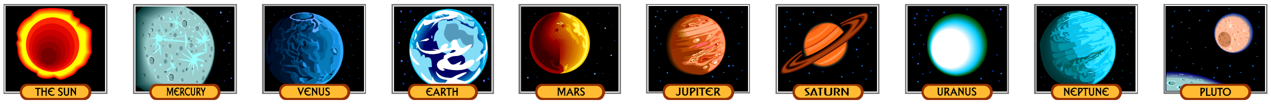
- 4.5 meters of string for each student
- Small piece of cardboard to wrap Solar System string around (10 cm x 10 cm)
- Meter sticks or measuring device
- Student handout

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 zip lock bag for each student. Also, for younger students, a measured marking grid can be put on a tabletop 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.

Credits: Tom Gates - NASA Educator, NASA Ames Research Center.

- Adapted by Steve Klug, Fees Middle School and Sheri Klug, ASU Mars K-12 Education Program, Tempe, AZ. http://marsed.asu.edu/
- Adapted for students with special needs by Cassandra Runyon, Southeast Regional Clearinghouse (SERCH), Charleston, SC. http://serch.cofc.edu/



Student Procedure:

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

Adaptations for Students with Special Needs:

FOR VISUALLY IMPAIRED:

1. Vary the bead sizes and shapes to distinguish between the planets.
2. Talk your students through the tour of the solar system – have their fellow students play "tour guide" and describe which planet they are touching, what it looks like and where they will be heading next. This might also be a good time to discuss some of the simple characteristics of each planet (solid surface vs. gaseous surface; close to the sun = hotter, further away = colder)
3. Add a rotating ceramic heater near the Sun and a fan blowing over a pan of ice near Pluto for the cooler outer solar system.

FOR THE ORTHOPAEDICALLY IMPAIRED:

1. Use large pom-poms instead of wooden beads.

Planet Orbits:

To simulate solar system rotation have the student holding the end of the string with the Sun stand still while other students placed at Jupiter and Pluto along the string walk (orbit) around the Sun. Talk about the fact that the planets DO NOT orbit the Sun at the same rate.

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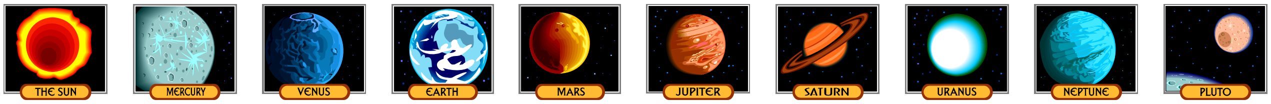

Solar System Bead Distance Activity
| STUDENT SHEET |

<u>Introduction:</u> 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	BELL
Mercury	0.4 AU	_____________cm	SMALL BLACK
Venus	0.7 AU	_____________cm	ORANGE
Earth	1.0 AU	_____________cm	DARK BLUE
Mars	1.5 AU	_____________cm	RED
Asteroid belt	2.8 AU	_____________cm	TRI-SHAPED
Jupiter	5.0 AU	_____________cm	GOLD
Saturn	10.0 AU	_____________cm	YELLOW
Uranus	19.0 AU	_____________cm	LIGHT BLUE
Neptune	30.0 AU	_____________cm	CLEAR GREEN
Pluto	39.0 AU	_____________cm	SMALL PURPLE

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!

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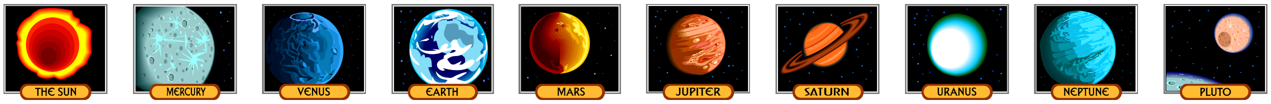

Planet	AU	Color
Sun	0.0	Bell
Mercury	0.4	Small black
Venus	0.7	Orange
Earth	1.0	Dark Blue
Mars	1.5	Red
Asteroid Belt	2.8	Tri-shaped; Color Varies
Jupiter	5.0	Gold
Saturn	10	Yellow
Uranus	19	Light Blue
Neptune	30	Clear Green
Pluto	39	Small Purple

1 AU = 10 cm

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