

Scaling the Solar System

Grade Levels 3–5

Grade Level Expectations

Grade 3

Identify in order the planets of the solar system (ESS-E-B1)

Locate information found in graphic organizers such as timelines, charts, graphs, schedules, tables, diagrams, and maps (ELA-5-E6)

Grade 4

Read and interpret timelines, charts, graphs, schedules, tables, diagrams, and maps generated from grade-appropriate materials (ELA-5-E6)

Grade 5

Identify Earth's position in the solar system (ESS-M-C5)

Describe the characteristics of the inner and outer planets (ESS-M-C5)

Interpret information from a variety of grade-appropriate sources, including timelines, charts, schedules, tables, diagrams, and maps (ELA-5-M6)

Assessment

Rubric/checklist

Completed project and worksheet

Content Overview

Teacher's Note: It is important to realize that the sizes of the planets are not to scale. Jupiter's diameter is about 63 times that of the dwarf planet, Pluto, and the Sun's diameter is about 10 times that of Jupiter. On the scale of 1 AU = 10 cm, the Sun would only be 1 mm in diameter, and the planets would be mere dots.

Background: Astronomers have chosen a unit to measure distances in space called the astronomical unit (AU). The length of an astronomical unit is the average distance of the Earth from the Sun. The distance is about 93,000,000 miles (mi), or 150,000,000 kilometers (km). Using 150,000,000 km as one astronomical unit, create a model solar system.

Essential Questions

1. Why do astronomers need astronomical units to measure distances in space?
2. Which planets are the inner planets? Outer planets?
3. What separates the inner planets from the outer planets?
4. Explain a scale model and why it is useful.

Objectives

- To define an astronomical unit and explain its purpose
- To create a model demonstrating the scale distances of the solar system by using astronomical units
- To identify and describe objects in our solar system
- To calculate each planet's astronomical unit

Materials

4.5 m string
Meter sticks
Beads of 11 different colors
Small cup to hold beads
Marker
AU chart

Student Procedures

1. Determine the color of the bead to represent each planet and the asteroid belt. Record in the chart below. Save a yellow bead to represent the Sun.
2. Complete the chart to determine each planet's astronomical unit.
3. Using the scale of 1 AU = 10 centimeters (cm), determine the distance in cm and complete the chart. Multiply the AU by 10 cm.
4. Attach the Sun bead on one end of the string and secure with a knot.
5. Use a meter stick and measure the distance from the Sun (determined in the chart) for Mercury and mark.
6. Slide the bead onto the string to the mark and secure with a knot.
7. Repeat for each of the other planets and the asteroid belt.

Lesson Launcher

Write the essential questions on the board.

Ask for answers and discuss to identify possible misconceptions.

Divide the class into teams for research purposes.

Distribute the AU chart to be completed by each team.

Assign roles for each team participant (i.e., materials gatherer, recorder, presenter, task manager, etc.)

Subject Areas

Math, Science, Social Studies

Duration

45 minutes

Answer Key: AU Chart

Planet	Bead Color	Distance in million of km (Average)	÷ 150	Relative Distance (AU)	Rounded to the nearest tenth	Distance in cm (AU) x 10 cm
Mercury		57	÷ 150	0.38	0.4	4cm
Venus		108	÷ 150	0.72	0.7	7cm
Earth		150	÷ 150	1	1.0	10cm
Asteroid Belt		420	÷ 150	1.52	1.5	15cm
Mars		228	÷ 150	2.8	2.8	28cm
Jupiter		778	÷ 150	5.18	5.2	52cm
Saturn		1,427	÷ 150	9.51	9.5	95cm
Uranus		2,280	÷ 150	19.13	19.1	191cm
Neptune		4,497	÷ 150	29.98	30.0	300cm

Extension Activities

1. Create a solar system in the classroom and/or on the playground by using a different scale for the AU of each planet.
2. Conduct research to learn more about asteroids and how they differ from planets.

AU Chart

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