RAFT IDEAS

Topics: Solar System, Planets, Scaling, Modeling

Materials List
- ✓ 8 Pony Beads (1 color for each planet)
- ✓ Optional: pony bead for the Sun
- ✓ String (1 per student group)
- ✓ Permanent marker
- ✓ Glue
- ✓ Meter stick or equivalent

This activity can be used to teach:
Next Generation Science Standards:
- Seasonal night sky (Grade 5, Earth & Space Science, 1-2)
- Scale of objects in the Solar system (Middle School, Earth & Space Science, 1-3)

Common Core Math Standards:
- Solve problems involving distance (Grade 4, Measure. & Data, 2)
- Measurement and units (Measurement and Data, Grade 4, 1; Grade 5, 1)
- Ratios and proportions (Ratios and Proportional Relationships, Grade 6, 1-3; Grade 7, 2)

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Planet Beads
Each Bead Represents a Planet

Students select beads to represent the planets and place them at the appropriate **spacing** on a string to represent the **distances** between the planets.

To Do and Notice

1. Select eight beads to represent the eight planets in the solar system. Use a different color for each planet, and arrange them in the proper order. Challenge the students to explain colors selected.
2. The distance between planets is commonly measured in Astronomical Units (AU). Determine the scale to be used (e.g., 1 AU = 10 cm) and then cut a piece of string long enough to **more than** accommodate the set of beads. The string needs to be about 31 AU (scaled) for 8 planets. Allow extra length to tie off the ends of the string and/or tie on beads. (Optional: Tie a bead on one end for the sun)
3. The chart below shows the distance in AU from the Sun to each planet.

Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune
0.4	0.7	1	1.5	5.2	9.6	19	30

4. This chart shows the distance in AU **between** each planet starting from the Sun.

Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune
0.4	0.3	0.3	0.5	3.7	4.4	9.4	11

5. Using the information in the charts above, have students **measure** the correct locations for the planet beads and mark the location on the string with a permanent marker. REMEMBER: A spot for the Sun is the zero (0) location!
6. Tie or glue the selected bead to represent each planet in its appropriate location. (Allow ~1 cm (½") extra at each planet location if beads are tied to the string).
7. Hold the beaded string in a straight line. Viewers can now see the entire set of planets in order from the Sun and the relative distances between them.

The Content Behind the Activity

The Solar System contains 1 star (the Sun), 8 planets (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune), 10's of satellites that orbit the planets, dwarf planets (Pluto, Ceres, and Eris), 1000's of asteroids that orbit the Sun, and billions of comets. Astronomers use the Astronomical Unit [1 AU = Sun to Earth distance = 150,000,000 km (93,000,000 miles)] to express Solar System distances. It wasn't until the 18th century that astronomers knew the value of the AU and the great distances between the planets.

Although this model shows the planets in a line, **syzygy**, the alignment of three or more celestial bodies, is not a common occurrence.

Taking it Further

- Create a larger model scaled for use in a multi-purpose room or the playground.
- Using a community map (or roadmap), select a scaled distance on the map to represent 1 AU and then using your school location as the Sun, find landmarks (or towns) at the correct scaled distances from the school (Sun).
- See RAFT Idea Sheet *Solar System in the Round* for a radial model of the solar system.

Web Resources (Visit www.raft.net/raft-idea?isid=324 for more resources!)

- Teacher designed math courses – https://njctl.org/courses/math