RAFT IDEAS

Topics: Moon, Scaling, Modeling

Materials List
- ✓ Larger balloons, inflated diameter 20 cm - 30 cm (8" - 12")
- ✓ Smaller balloons inflated diameter (2" to 3")
- ✓ Optional: Balloon pump

This activity can be used to teach:
- Scale in the Solar System (Next Generation Science Standards: Middle School, Earth and Space Science 1-3)
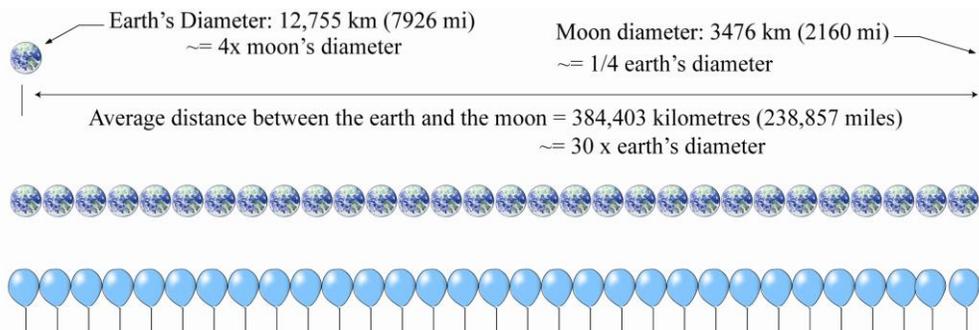
Common Core Math Standards:
- Ratios & Proportions (Ratios/Proportional Relationships, Grade 6, 1 & 3; Grade 7, 1 & 2)
- Problem Solving and Reasoning (Mathematical Practices Grades 3-8)

Ball-oon Moon
Modeling the Earth – Moon distance

Use balloons to approximate the relative diameters of the Earth and the Moon and estimate the relative distance between them using the scale of the inflated balloons.

To Do and Notice
1. Students calculate the relative sizes of the Earth and the Moon, using one of the following methods (select method based on student ability)
   - Use the actual dimensions to calculate the ratio: Earth's diameter is 12,755 km (7926 mi); the Moon's diameter is 3476 km (2160 mi). The Earth's diameter is roughly 4 (3.669) times **larger** than the Moon's diameter.
   - Use approximate dimensions: 12,800 km (8000 mi) for Earth's diameter, 3200 km (2000 mi) for the Moon's diameter.
   - Use the ratio of 4 to 1.
2. Inflate the larger balloon to 20 cm - 32 cm (8"-12") and the smaller balloon to 5 cm - 8 cm (2"-3") to get the 4 to 1 ratio.
3. Working in pairs or small teams, students estimate the distance between the Earth and Moon, using what they think is the appropriate distance between them for the scale represented by the balloons.
4. Students calculate the ratio between the Earth's diameter and the average distance between the Earth and the Moon which is 382,500 km (237,674 mi). Calculate the separation distance given the scale of the Earth (larger) balloon. Model the separation with the actual balloons. (Distance is ~30 times Earth's diameter, separation will be depend on the size of the balloons.)
5. Alternative Method: the teacher inflates **one** larger balloon for Earth and students each work with smaller balloons to model moon size and distance from Earth.

The Science Behind the Activity
The distance between Earth and Moon is beyond personal experience for all but those 24 astronauts who have traveled to the Moon (12 of whom walked on its surface). Modeling is a way to gain a rough idea of this distance. Students actively apply math to find and model the distance between the Earth and the Moon.

Taking it Further
- Model the relative **volumes** of the Earth and Moon; ratio is $(3.669)^3$ ~49 to 1.
- Explore ways to model the planets and their relative distances. See RAFT Idea Sheets *Space Stuff to Scale* and *Planet Beads*.

Web Resources (Visit www.raft.net/raft-idea?isid=293 for more resources!)
- Earth and Moon to scale - http://www.freemars.org/jeff/planets/Luna/Luna.htm
- More about the Moon - http://www.nineplanets.org/luna.html