

HOW FAR IS THE MOON

Ages:

3rd grade – high school

Duration:

10 minutes

Materials:

- Basketball
- Tennis ball
- Tape measure or 23.5 foot-long piece of thick string

OVERVIEW —

Students gain a better perspective on the relationship between the size and distance of the Moon.

OBJECTIVE —

The students will:

- Demonstrate the motion of the Moon's rotation and revolution.
- Compare what we would see of the Moon if it did not rotate to what we see when its period of rotation is the same as its orbital period.

BEFORE YOU START: Do not introduce this topic along with the reason for lunar phases; students may become confused and assume that the Moon's rotation is related to its phases.

Prepare to show the student overhead projected for the class to see.

ACTIVITY —

1. Show the students a basketball. Tell the students that the basketball represents the Earth. Ask them to compare the Earth to the Moon.
 - *How big is the Moon compared to the Earth? What would be a good representation of the Moon? (a tennis ball, about one quarter the width of the basketball)*
2. Now ask one student to hold the basketball and another to hold the tennis ball. Ask the class how far apart the two balls should be to represent the actual distance of the Earth and Moon. Take a variety of estimates.
3. Take out the string or tape measure. Have the students with the basketball and the tennis ball each take one end of the string and walk apart until the string is at its full length. Share the answer: if the Earth was a basketball and the Moon was a tennis ball, they would be 23.5 feet apart. The Moon orbits approximately 238,500 miles from Earth. .) Does the answer surprise the students?

EXTENSIONS —

Have the students try to imagine how small the Moon actually appears in the sky. If they extended their arms and closed one eye, would they be able to cover the Moon up with one hand? One finger? (It would take less than the width of their smallest finger to cover up the Moon.) Have them go outside and try it!

BACKGROUND —

Many illustrations and photos are misleading in the dimensions that they show for the Earth and Moon; often, the Moon is depicted as being much larger and much closer than it really is. The Moon is also shown in photos, movies, and books as larger than it really appears in the sky. Finally, our own minds often trick us into believing the Moon is larger than it truly appears, when it is near the horizon.

The Earth is 7921 miles wide, and the Moon is 2159 miles wide. The Moon's orbit is approximately 238,500 miles from Earth. In fact, the Moon's orbit is somewhat elliptical, so that it actually ranges from 225,600 miles to 251,800 miles. But even when it is at its furthest, and even when it is on the horizon, it can still be covered up with a little finger fully extended.

Understanding the scale of the Earth-Moon system accurately can help students to better understand the cause of lunar phases.

TIES TO STANDARDS —

Connections to the National Science Standard(s)

Content Standard D Earth and Space Science, (grades 5—8): Most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.

Principles & Standards for School Mathematics

Geometry Standard for Grades 3-5: Specify locations and describe spatial relationships using coordinate geometry and other representational systems

Reasoning and Proof: Instructional programs from PK through grade 12 should enable all students to make and investigate mathematical conjectures

Texas TEKS

Scientific investigation and reasoning. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions of relevant scientists. The student is expected to:

- (A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;
- (B) use models to represent aspects of the natural world such as a model of Earth's layers;
- (C) identify advantages and limitations of models such as size, scale, properties, and materials;

3rd grade Science Concept Standards (TEKS)

- (8) Earth and space. The student knows there are recognizable patterns in the natural world and among objects in the sky. The student is expected to: (C) construct models that demonstrate the relationship of the Sun, Earth, and Moon, including orbits and positions...

5th grade Science Concept Standards (TEKS)

- (8) Earth and space. The student knows that there are recognizable patterns in the natural world and among the Sun, Earth, and Moon system. The student is expected to: (D) identify and compare the physical characteristics of the Sun, Earth, and Moon.

6th grade Science Concept Standards (TEKS)

- (11) Earth and space. The student understands the organization of our solar system and the relationships among the various bodies that comprise it. The student is expected to: (A) describe the physical properties, locations, and movements of the Sun, planets, Galilean moons, meteors, asteroids, and comets.