

Space Odyssey Online Teacher's Guide

How Big Is Our Earth

Postvisit Activity for Deep Space



courtesy NASA/JPL

Grades 9- 12
CDE Standards
Science: 4.4

How Big Is Our Earth
Postvisit Activity for “Solar System Pathway”

Grades 9-12

CDE Standards

Science: 4.4

Preparation and Materials

Estimated Preparation Time: 10 minutes

Estimated Activity Time: 45 minutes

Materials

The Librarian Who Measured the Earth by Kathryn Lasky

Protractor

Calculators

Styrofoam balls of various sizes

Toothpicks

Markers

Flashlight

Learning Goals/Objectives

Students will

- Describe Eratosthenes’s method of measuring the Earth
- Reproduce Eratosthenes’s measurement of the circumference of the Earth

Connections to *Space Odyssey*

Visit the Space Screen during your visit to *Space Odyssey* to see a presentation of *The Librarian Who Measured the Earth*. One of the Museum’s Galaxy Guides will retell the story as it is projected on the giant Space Screen. Ask a friendly Museum Galaxy Guide for a special presentation!

Advanced Preparation

Familiarize yourself with the book *The Librarian Who Measured the Earth*. It can be checked out from your local library. Though this book is a picture

book, the concepts contained within are very appropriate for a high school audience.

Classroom Activity

1. Read *The Librarian Who Measured the Earth* by Katherine Lasky or review it from your visit to *Space Odyssey*.
2. Reread the section describing how Eratosthenes measured the circumference of the Earth.
3. Have students sketch how he accomplished that task in their science journals. Ask students to label the angles and measurements in their sketches.
4. Instruct students that they will be re-creating Eratosthenes's experiment using several different spheres.
5. Divide students into teams of two to four students.
6. Provide students with one of each size Styrofoam ball and two toothpicks for each ball.
7. Have students insert two toothpicks into each ball and use a marker to label them *A* for Alexandria and *S* for Syrene.
8. Shine the flashlight on the ball so that it's shining directly on the toothpick labeled *S* and does not cast a shadow.
9. Have students mark the length of the shadow at toothpick *A*. Repeat for each Styrofoam ball.
10. Have students record the experiment in their science journals. Ask them to use a protractor and compass so that diagrams are labeled accurately.
11. Ask students to use the following proportion to solve for the circumference of each Styrofoam ball.

$$\frac{\text{angle}}{360^\circ} = \frac{\text{distance}}{\text{circumference}}$$

12. Using the calculated circumference, have students find the radius of each Styrofoam ball.
13. Have students measure the actual radius and circumference of each Styrofoam ball. Ask them to calculate the difference between the actual measurement and their calculated measurements.
14. Discuss why students' calculations may not have been correct.

Variations/Extensions

1. Complete further research on Eratosthenes and his other mathematical experiments.
2. Use the lesson found on the website at: <http://math.rice.edu/~ddonovan/Lessons/eratos.html> to find a partner school and use Eratosthenes's experiment to measure the circumference of the Earth.
3. Even if you choose or are unable to complete the extension with a partner school, use the discussion questions in part 4 on the rice.edu website.
4. Use a ball made of earthen clay. Find the molecular weight of what the clay. Weigh the clay ball. Now using Avogadro's number, estimate how many molecules are in the ball.

Resources

Books

Lasky, Kathryn. *The Librarian Who Measured the Earth*. Boston: Little, Brown, and Company, 1994.

Web sites

<http://math.rice.edu/~ddonovan/Lessons/eratos.html>