WAMC Lab Template

Math Concept(s): Geometry
Source / Text: Nasa.gov
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Attach the following documents:

Lab Instructions

Student Handout(s)

Rubric and/or Assessment Tool

Indicate "*SPECIFIC*" relationship to Science, Technology, or Engineering

Science relationship: Earth and space science (solar system) and physics.

Short Description (Be sure to include where in your instruction this lab takes place):

Students will model the solar system's orbit using duct tape, measuring tape, and the formula for circumference.

Lab Plan

Lab Title: Walk the Solar System

Prerequisite skills:
G-CO1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

Lab objective:
Create a scale and circles to display the orbit of the solar system.

Standards:

Mathematics K–12 Learning Standards:

- G-GPE1. Derive the equation of a circle of a given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.
- G-GMD1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.

Standards for Mathematical Practice:

- MP 1 Make sense of problems and preserver in solving them.
- MP 3 Construct viable arguments and critique the reasoning of others.
- MP 4 Model with mathematics
- MP 7 Look for and make use of structure

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- L. 11-12.3 Knowledge of Language

Leadership/21st Century Skills:

21st Century Interdisciplinary themes (Check those that apply to the above activity.)

- ☒ Global Awareness
- ☐ Financial/Economic/Business/Entrepreneurial Literacy
- ☐ Civic Literacy
- ☐ Health/Safety Literacy
- ☒ Environmental Literacy

21st Century Skills (Check those that students will demonstrate in the above activity.)

LEARNING AND INNOVATION

Creativity and Innovation
- ☐ Think Creatively
- ☒ Work Creatively with Others
- ☐ Implement Innovations

Critical Thinking and Problem Solving
- ☒ Reason Effectively
- ☒ Use Systems Thinking
- ☐ Make Judgments and Decisions
- ☐ Solve Problems

Communication and Collaboration
- ☐ Communicate Clearly
- ☒ Collaborate with Others

INFORMATION, MEDIA & TECHNOLOGY SKILLS

Information Literacy
- ☒ Access and Evaluate Information
- ☒ Use and manage Information

Media Literacy
- ☐ Analyze Media
- ☐ Create Media Products

Information, Communications and Technology (ICT Literacy)
- ☐ Apply Technology Effectively

LIFE & CAREER SKILLS

Flexibility and Adaptability
- ☐ Adapt to Change
- ☐ Be Flexible

Initiative and Self-Direction
- ☐ Manage Goals and Time
- ☐ Work Independently
- ☐ Be Self-Directed Learners

Social and Cross-Cultural
- ☒ Interact Effectively with Others
- ☐ Work Effectively in Diverse Teams

Productivity and Accountability
- ☐ Manage Projects
- ☐ Produce Results

Leadership and Responsibility
- ☐ Guide and Lead Others
- ☐ Be Responsible to Others

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Handouts
- Duct Tape
- Measuring Tape
- Open space (gymnasium, parking lot, etc.)

Set-Up Required:

- None

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Listed above.

Expectations:

Students will work together using the following skills:
Measuring
Using a formula to determine circumference
Creating a scale
Students will use a calculator for accurate answers.

Timeline:

- 60 Minutes

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- NASA

Career Applications

- Physicist
- Astronomer
- Astronaut

Optional or Extension Activities

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Lab Instructions:

- Assign each student to a group by counting off to 8. Each number is assigned to a planet.

1. Mercury
2. Venus
3. Earth
4. Mars
5. Jupiter
6. Saturn
7. Uranus
8. Neptune

Planet	Distance from Sun
Mercury	36,800,000 miles
Venus	67,200,000 miles
Earth	93,000,000 miles
Mars	141,600,000 miles
Jupiter	483,600,000 miles
Saturn	886,500,000 miles
Uranus	1,783,700,000 miles
Neptune	2,795,200,000 miles

- Using the formula for circumference, ask students to work as a group to find the radius of their planet's orbit. (In relation to the sun).
- As a class, agree on a scale for recreating the solar system.
- Have students go outside and outline their assigned planet's orbit.
    - Prove that your group's orbit is accurate.

Assessment:

Complete the table with the missing information. In the last row, create your own planet, and determine its distance from the sun, and the circumference of the orbit.

Planet	Distance from Sun	Circumference of Orbit
Mercury	36,800,000 miles	
Venus		422,500,000
Earth	93,000,000 miles	
Mars		888,000,000
Jupiter	483,600,000 miles	
Saturn		5,565,900,000
Uranus		11,201,300,000
Neptune	2,795,200,000 miles	
Create your own planet		