

WAMC Lab Template

Math Concept(s): Spheres, Volume, and Surface Area

Source / Text:

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Date: Summer Conference 2022

Attach the following documents:

- Lab Instructions- see page 3
- Student Handout(s)- none
- Rubric and/or Assessment Tool- formative assessment: calculations on notebook paper

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

Lab Plan

Lab Title: Sphere Lab

Prerequisite skills: The student must understand how to find the diameter, radius, surface area and volume of a sphere.

$$V=4/3\pi r^3 \quad SA=4\pi r^2 \quad d=2r \quad r=d/2$$

Lab objective: The objective of the lab is for students to gain an understanding of how to construct a sphere, find the diameter, and calculate surface area and volume.

Standards: (Note SPECIFIC relationship to Science, Technology, and/or Engineering)

Mathematics K–12 Learning Standards:

- [CCSS.MATH.CONTENT.7.G.B.4](#)
- [CCSS.MATH.CONTENT.8.G.C.9](#)
- [CCSS.MATH.CONTENT.7.EE.B.4.A](#)

Standards for Mathematical Practice:

- 4 Model with mathematics
- 2 Reason abstractly and quantitatively

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

- [Ccss.ELA-LITERACY.SL9-10.1.B](#)

K-12 Science Standards

-

Technology

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Engineering

- [MS-ETS1-4](#)

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

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

Materials

- Construction paper, scissors, tape, ruler, brads, calculator and notebook paper

Set-Up Required:

- Students will do the lab in pairs. They will construct a sphere out of construction paper, then measure the diameter, radius, surface area, and volume.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

- Think Creatively
- Work Creatively with Others
- Solve Problems
- Interact Effectively with Others

Cooperative Learning:

- Students will do the lab in pairs. They will construct a sphere out of construction paper, then measure the diameter, radius, surface area, and volume.

Expectations:

- Students will be able to construct a sphere out of construction paper.
- Students will be able to measure the diameter of sphere.
- Students will be able to calculate the surface area and volume of their sphere.
- Students will be able to work cooperatively.

Timeline:

- This lab should take 30 minutes to construct and find calculations.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

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Career Applications

- Astronomy and Physics Careers
- Design Careers

Optional or Extension Activities

- This lab can be extended to other 3d shapes and their calculations for volume and surface area. This can also be adapted for concepts like arcs.

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Lab Instructions:

Students will pair up and gather materials. Together they will construct a paper sphere. Once the sphere is complete, students will measure the length of the diameter. Once measurements are taken, students will calculate the radius, Surface Area, and Volume of their sphere. All notes and calculations will be recorded on a notebook paper, which will be turned in at the end of class (acting as the formative assessment).

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WAMC Lesson Plan

Name(s): Katie vanderVis

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Lesson Title: Surface Area: Sphere

Date: Summer Conference 2022

Text:

STEM Correlation:

Lesson Length: 50 min

Big Idea (Cluster): 3D Shapes	
Mathematics K–12 Learning Standards: <ul style="list-style-type: none">• CCSS.MATH.CONTENT.7.G.B.4• CCSS.MATH.CONTENT.7.EE.B.4.A	
Mathematical Practice(s): <ul style="list-style-type: none">• CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively• CCSS.MATH.PRACTICE.MP4 Model with mathematics	
Content Objectives: <ul style="list-style-type: none">• Students will correctly identify the formula of a sphere's surface area• Students will recall the formula for the volume of a sphere• Students will use the formula for the volume of a sphere to find the volume of a sphere given its radius	Language Objectives (ELL): <ul style="list-style-type: none">• Access prior knowledge, we will be able to target new vocabulary, as well as reinforce previous vocabulary words
Vocabulary: <ul style="list-style-type: none">• face• surface area• volume	Connections to Prior Learning <ul style="list-style-type: none">• calculating areas and circumferences of circles and of fractions of circles• calculating areas and volume of other 3D shapes
Questions to Develop Mathematical Thinking: <ul style="list-style-type: none">• How will you make your prediction?• How did you come to this prediction?• Can you do bigger spheres?	Common Misconceptions: <ul style="list-style-type: none">• Confusion with 2D circles

Assessment (Formative and Summative):

<ul style="list-style-type: none">• Formative assessment— “How to find surface area of a sphere” worksheet• Summative assessment—end of unit test
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Materials:

<ul style="list-style-type: none">• Worksheet• Assortment of spheres (baseball, basketball, orange, yoga ball, etc.)• Calculator
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Instruction Plan:

Introduction: <ul style="list-style-type: none">• We will begin by reviewing 3D objects and what surface area on a 3D object means.• Discuss faces. How many faces does a sphere have?• Introduce the sphere surface area formula.
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WAMC Lesson Plan

<ul style="list-style-type: none"> We will do a 3-5 practice problems on the board, as a formula review.
<p>Explore:</p> <ul style="list-style-type: none"> After introducing the surface area formula, spheres, and the formula as a class, students will be given the worksheet. Around the room will be a range of spheres, each with the diameter given. Students will go around the room and calculate the surface area of 5 spheres, recording answers on their worksheet.
<p>When I observe students:</p> <ul style="list-style-type: none"> I will ask how they came to their prediction. Check to make sure they are correctly doing the formula.
<p>Questions to Develop Mathematical Thinking as you observe:</p> <ul style="list-style-type: none"> How did you come to your prediction? Was your prediction close to the actual surface area? Why do you think you were that far off/that accurate? Would you be able to figure out really big surface areas, like the Earth for example? Why?
<p>Answers:</p> <ul style="list-style-type: none"> "I made an educated guess based on the size of the sphere and our practice problems." "Yes, I was pretty close." "The practice problem was close to this size, so it was easy to judge based on that." "Maybe. I could google the diameter of the Earth, and use the formula to figure that out."
<p>Summarize:</p> <p>In this lesson, students will review previously covered topics. Then be introduced to the new formula (surface area of a sphere). They will then apply that knowledge to their worksheet activity. By the end they will be able to accurately calculate the surface area of the given spheres, as well as be able to predict and calculate the surface area of larger spheres.</p>

Career Application(s):

<ul style="list-style-type: none"> Astronomy and Physics careers Design careers

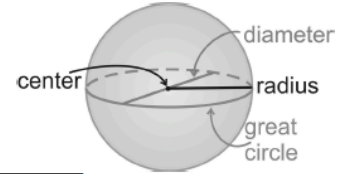
Leadership/21st Century Skills:

<p><u>21st Century Interdisciplinary themes</u> (Check those that apply to the above activity.)</p>			
<input type="checkbox"/> Global Awareness	<input type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy	<input type="checkbox"/> Civic Literacy	
<input type="checkbox"/> Health/Safety Literacy	<input type="checkbox"/> Environmental Literacy		
<p><u>21st Century Skills</u> (Check those that students will demonstrate in the above activity.)</p>			
<p>LEARNING AND INNOVATION</p> <p><u>Creativity and Innovation</u></p> <input type="checkbox"/> Think Creatively <input type="checkbox"/> Work Creatively with Others <input type="checkbox"/> Implement Innovations	<p>INFORMATION, MEDIA & TECHNOLOGY SKILLS</p> <p><u>Information Literacy</u></p> <input type="checkbox"/> Access and Evaluate Information <input type="checkbox"/> Use and manage Information	<p>LIFE & CAREER SKILLS</p> <p><u>Flexibility and Adaptability</u></p> <input type="checkbox"/> Adapt to Change <input type="checkbox"/> Be Flexible	<p>Productivity and Accountability</p> <input type="checkbox"/> Manage Projects <input type="checkbox"/> Produce Results
<p><u>Critical Thinking and Problem Solving</u></p> <input checked="" type="checkbox"/> Reason Effectively <input type="checkbox"/> Use Systems Thinking <input type="checkbox"/> Make Judgments and Decisions <input checked="" type="checkbox"/> Solve Problems	<p><u>Media Literacy</u></p> <input type="checkbox"/> Analyze Media <input type="checkbox"/> Create Media Products	<p><u>Initiative and Self-Direction</u></p> <input type="checkbox"/> Manage Goals and Time <input type="checkbox"/> Work Independently <input type="checkbox"/> Be Self-Directed Learners	<p><u>Leadership and Responsibility</u></p> <input type="checkbox"/> Guide and Lead Others <input type="checkbox"/> Be Responsible to Others
<p><u>Communication and Collaboration</u></p> <input type="checkbox"/> Communicate Clearly <input type="checkbox"/> Collaborate with Others	<p><u>Information, Communications and Technology (ICT Literacy)</u></p> <input type="checkbox"/> Apply Technology Effectively	<p><u>Social and Cross-Cultural</u></p> <input type="checkbox"/> Interact Effectively with Others <input type="checkbox"/> Work Effectively in Diverse Teams	

Washington

Name: _____

HOW TO FIND... SURFACE AREA OF A SPHERE



What is surface area? _____

How many faces does a sphere have? _____

What object are you measuring?	Radius	Predicted Surface Area	Show Work for Calculated Surface Area Here:	Surface Area

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