Unit 12 - Surface Area & Volume

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 4**
Length: **1-2 weeks**
Status: **Published**

Brief Summary of Unit

This chapter will conclude the study of measurements by applying previous information to surface area and volume. Some of the concepts should be familiar to students from middle school, but the formulas may be new. Students will work on their spatial skills to visualize relationships between two-dimensional shapes and three-dimensional objects. Using physical models can be useful at this time.

Revision Date: July 2024

Standards

ELA.L.KL.9–10.2.A	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
MATH.9-12.G.GMD.A.1	Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments.
MATH.9-12.G.GMD.A.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
MATH.9-12.G.GMD.B.4	Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.
MATH.9-12.G.MG.A.1	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).
MATH.9-12.G.MG.A.2	Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).
ELA.SL.PE.11–12.1.A	Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
WRK.9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
WRK.9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.

Essential Questions

- How can you solve for the surface area and volume of a composite figure?
- What are the formulas to solve for the surface area and volume of a sphere?
- What are the similarities of a prism and cylinder when solving for surface area and volume?

- What are the similarities of a pyramid and cone when solving for surface area and volume?

Enduring Understandings

- Describe and draw cross sections of figures in a real life setting.
- Find and use surface areas and volumes of cones using various STEM applications.
- Find and use surface areas and volumes of spheres using various STEM applications.
- Find and use volumes of prisms and cylinders using various STEM applications.
- Find and use volumes of pyramids using various STEM applications.
- Understand the concept of density and modeling with volume.

Students Will Know

- How to describe attributes of solids.
- How to find missing dimensions of solids.
- How to find surface areas and volumes of solids.
- How to solve real-life problems involving surface area and volume.

Students Will Be Skilled At

- Describing and drawing cross sections.
- Describing attributes of solids.
- Explaining what density means.
- Finding surface areas and volumes of cones.
- Finding surface areas and volumes of similar solids.
- Finding the surface areas and volumes of spheres.
- Finding the volumes of composite solids containing pyramids.
- Finding the volumes of similar cones.
- Finding volume of composite solids containing spheres.
- Finding volumes of composite solids containing pyramids.
- Finding volumes of prisms and cylinders.
- Finding volumes of pyramids.
- Finding volumes of similar pyramids.
- Solving real-life problems involving cross sections.
- Solving real-life problems involving volumes of prisms and cylinders.
- Using geometric shapes to model objects and solve modeling problems.
- Using the formula for density to solve problems.
- Using volumes of pyramids to find measures.

Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, NJSLA test bank problems, and/or Albert/AP Classroom assessments
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Albert/AP Classroom and/or Big Ideas Math unit assessments
- Benchmark: IXL or teacher created diagnostic assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and differentiated learning tasks in Khan Academy, DeltaMath, and IXL

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

Learning Plan

The following list is meant to create a day-to-day plan. Teachers are encouraged to slow down or condense days as appropriate to the student population in the class. Assessment(s) should be given when appropriate.

- Begin by having students recall as many three-dimensional shapes as they can. Focus on prisms and cylinders on this first day. Define the similarities of these shapes, as their similar surface area and volume formulas. Carefully discuss how to find the area of each type of prism base.
- Relate a pyramid to a like-base prism. Relate a cone to a cylinder. Discuss how the surface area and volume formulas for pyramids and cones are similar to each other.
- Students will likely need additional time to practice solving for various figures' surface areas and volumes. Also take this day to build composite figures and determine their surface area and volume.
- Introduce the surface area and volume formulas for a sphere. Use half-spheres in composite figures with cones and cylinders.

Materials

Core instructional materials: Core Book List including Big Ideas Math Common Core Geometry

Supplemental materials: Khan Academy, Edia, DeltaMath

- District approved textbook
- Khan Academy
- Teacher created activiites
- Teacher created notes
- Whiteboard tables

Suggested Strategies for Modifications

Possible accommodations/modification for Geometry