Unit 9: Surface Area, Volume, Cross Sections

Content Area: **Mathematics**
Course(s): **Geometry Honors 8**
Time Period: **May**
Length: **4 weeks**
Status: **Published**

Transfer

Previous coursework: know area, perimeter, surface area, and volume formulas and use them in real world applications, describe cross sections, informally derive the relationship between area and circumference of a circle, find area of irregular figures in real world applications, break down 3-D figures into nets

By the end of this unit: Students should be able to provide an informal explanation for area and circumference of a circle, and volume of a circle, pyramid, and cone using a variety of methods. Comparing the affect of manipulating dimensions and real world applications involving density and design are a big focus.

Instructional strategies:

- Project and problem based coursework is ideal for this unit- check the resources for ideas.
- Remember that the focus is not how to use the formulas, but where they come from.
- If time allows, review how to find the area and perimeter of figures on the coordinate plane.
- (+) = denotes Honors only skill not on PARCC

Enduring Understandings

The formulas for circular 2-D and 3-D shapes are derived from other geometric concepts.

Area and volume problems arise in many fields, such as shipping, efficiency, and optimization.

Essential Questions

Where do the formulas for circular 2-D and 3-D shapes come from?

How do volume and area apply to real life?

Critical Knowledge and Skills

Vocabulary

Derive Formulas

Apply Volume Formulas

Rotational Volume

Area/Volume Density

Solve Design Problems

Learning Objectives

Use informal and formal arguments to explain where the circumference, area, and volume formulas come from for circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone.

Use Cavalieri's Principle to relate volumes of different solids.

Use informal limit arguments to discuss the formula for the area of a circle and volume of a pyramid.

Calculate the perimeter and circumference of 2-D figures.

Calculate the area of 2-D figures.

Calculate the volume of prisms, cylinders, pyramids, cones and spheres.

Describe the cross sections formed by a cut to a solid.

Determine the 3-D shape created after rotating it a 2-D about an axis.

Use 3-D shapes to describe objects in application problems.

Solve density problems involving area and volume

Solve design problems using 2-D and 3-D shapes.

Use Pick's theorem to determine the area of irregular figures (+)

Resources

Pearson Resources:

CB 10-7, 11-1, 11-2, 11-3, 11-4, 11-5, 11-6, 11- 7, 12-6, 8-3, 10-1, 10-2, 10-3, 3-4

Online Resources:

- http://www.shmoop.com/common-core-standards/math-geometry-geometric-measurement-dimension.html
- http://www.shmoop.com/common-core-standards/math-geometry-modeling-geometry.html
- http://fawnnguyen.com/2013/02/13/from-listerine-to-fuji-water.aspx
- http://mrmeyer.com/threeacts/youpourichoose/
- http://www.yummymath.com/2012/penny-wars/
- http://map.mathshell.org/materials/lessons.php?taskid=439&subpage=concept
- http://map.mathshell.org/materials/lessons.php?taskid=216&subpage=concept
- http://map.mathshell.org/materials/lessons.php?taskid=213&subpage=concept

Standards

RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

CRP11. Use technology to enhance productivity.

9.1.8.A.2 Relate how career choices, education choices, skills, entrepreneurship, and economic conditions affect income.

9.1.8.C.5 Calculate the cost of borrowing various amounts of money using different types of credit (e.g., credit cards, installment loans, mortgages).

9.1.8.D.3 Differentiate among various investment options.

9.1.8.E.6 Compare the value of goods or services from different sellers when purchasing large quantities and small quantities.

9.2.8.B.7 Evaluate the impact of online activities and social media on employer decisions.

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

8.2.8.C.8 Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.

MA.7.G.B	Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.
MA.7.G.B.4	Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
MA.7.G.B.6	Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
MA.G-GMD.A	Explain volume formulas and use them to solve problems
MA.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.
MA.G-GMD.A.3	Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
MA.G-GMD.B	Visualize relationships between two-dimensional and three-dimensional objects
MA.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.
MA.G-MG.A	Apply geometric concepts in modeling situations
MA.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).
MA.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).
MA.G-MG.A.3	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).