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

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?

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.

Standards in Mathematics

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-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).
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.

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