**Unit Abstract:**  Students solve real-life and mathematical problems involving area, surface area and volume. Students will make connections among the volumes of differently shaped objects, including cones, spheres, and cylinders.

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| **Overarching Question:** How can the calculations of the volume of cylinders, cones, and spheres be useful to people in the real world? | | | | | | |
|  | | **This Unit:** area of polygons, area and circumference of circles, volume and surface area of rectangular and right triangular prisms, make connections between area and volume, and know and use the volume formulas of cones, spheres, and cylinders | | | |  |
| **Questions to Focus Assessment and Instruction:**   * How can you determine volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, right prisms, and circles? * Why are the units between area and volume different? * How can we determine the volume of three-dimensional shapes? * How can determine the volume of cones, spheres, and cylinders * What connections can you make between geometric solids? | | | | **Standards for Mathematical Practice**  **1.Make sense of problems and persevere in solving them.**  2.Reason abstractly and quantitatively.  3.Construct viable arguments and critique the reasoning of others.  4.Model with mathematics.  **5.Use appropriate tools strategically.**  **6.Attend to precision.**  7.Look for and make use of structure.  8.Look for and express regularity in repeated reasoning. | | |
| **Academic Vocabulary**  *(5-8 most important content specific vocabulary words)* | Volume (blue gr 7)  Surface area  Right prism  Circumference  Radius  Diameter  Cubic unit  Cone  Cylinder  Sphere | |  | |  | |

| **Standards** | **Learning Targets** *(including relevant practice standards)* | **Explanations and Examples\*** | **Assured Experiences**  *(common assessments and learning activities)* |
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| **7.G.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.** | Students will investigate the relationship between circumference and diameter.    Students will derive a formula for area of circles from relationships.  Students will use the formulas for area and circumference of a circle to solve problems. | • Students measure the circumference and diameter of several circular objects in the room (clock, trash can, door knob, wheel, etc.). Students organize their information and discover the relationship between circumference and diameter by noticing the pattern in the ratio of the measures. Students write an expression that could be used to find the circumference of a circle with any diameter and check their expression on other circles.  • Students will use a circle as a model to make several equal parts as you would in a pie model. The greater number the cuts, the better. The pie pieces are laid out to form a shape similar to a parallelogram. Students will then write an expression for the area of the parallelogram related to the radius (note: the length of the base of the parallelogram is half the circumference, or *πr*, and the height is *r*, resulting in an area of *πr*2. Extension: If students are given the circumference of a circle, could they write a formula to determine the circle’s area or given the area of a circle, could they write the formula for the circumference? | * Unit 6 common summative assessment * assured learning experience * [Web link to Circular Reasoning](http://rda.aps.edu/RDA/Performance_Task_Bank/Documents/7th_Grade/Circular%20Reasoning%20-%20POM.pdf)   [Hyperlink to circular reasoning](file:///R:\BuildingCommons\Math\Math%20Curriculum%20Work%202015\Pre-Algebra\Unit%206%20Volume\Resources\Circular%20Reasoning%20-%20POM%20(1).pdf)  [Resources\mess\_8-7ab.pdf](file:///C:\Users\jderose\Downloads\Resources\mess_8-7ab.pdf)  Hyperlink  [Resources\circles.pdf](http://Resources/circles.pdf)  [weblink to I speak math](http://ispeakmath.org/2014/05/02/volume-of-cones-discovery-lesson/)  [weblink to mr meyer hot coffee](http://threeacts.mrmeyer.com/hotcoffee/) |

| **Standards** | **Learning Targets** *(including relevant practice standards)* | **Explanations and Examples\*** | **Assured Experiences**  *(common assessments and learning activities)* |
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| **8.G.9. Know the formulas for the volumes of cones, cylinders and spheres and use them to solve real-world and mathematical problems.** | Students will demonstrate the memorization of the volume formulas for cones, cylinders, and spheres.  Students will be able to use the formulas to solve real world problems. | Students understanding of volume can be supported by focusing on the area of base times the height to calculate volume. Students understanding of surface area can be supported by focusing on the sum of the area of the faces. Nets can be used to evaluate surface area calculations.  Examples:  • Choose one of the figures shown below and write a step by step procedure for determining the area. Find another person that chose the same figure as you did. How are your procedures the same and different? Do they yield the same result?    • A cereal box is a rectangular prism. What is the volume of the cereal box? What is the surface area of the cereal box? (Hint: Create a net of the cereal box and use the net to calculate the surface area.) Make a poster explaining your work to share with the class.  **8.G.9.** Example:  • James wanted to plant pansies in his new planter. He wondered how much potting soil he should buy to fill it. Use the measurements in the diagram below to determine the planter’s volume. | * Unit 6 common summative assessment * assured learning experience   F,{94e9eeea-168f-4dd4-b4e4-cdc7212310ac}{16},5.291667,2.81258. Emma gets a scoop of ice cream in a cone, and Jenna gets a scoop in a cylindrical cup. Each container has a height of 8 centimeters and a radius of 4 centimeters. Each scoop of ice cream is a sphere with a radius of 4 centimeters.    a. Suppose Jenna allows her ice cream to melt. Will the melted ice cream fill her cup exactly? Explain your reasoning using calculations.    b. Suppose Emma allows her ice cream to melt. Will the melted ice cream fill her cone exactly? Explain.  c. How many same-sized scoops of ice cream of the size shown can be packed into each container? |

| **Standards** | **Learning Targets** *(including relevant practice standards)* | **Explanations and Examples\*** | **Assured Experiences**  *(common assessments and learning activities)* |
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| **7.G.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.** | Students will 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. | • The seventh grade class is building a mini golf game for the school carnival. The end of the putting green will be a circle. If the circle is 10 feet in diameter, how many square feet of grass carpet will they need to buy to cover the circle? How might you communicate this information to the salesperson to make sure you receive a piece of carpet that is the correct size? | * Unit 6 common summative assessment * Learning activity:   [Web link to Lawn Mowing](http://rda.aps.edu/RDA/Performance_Task_Bank/Documents/7th_Grade/Lawn%20Mowing%20-%20Tasks.pdf)  [Hyperlink to lawn mowing](file:///R:\BuildingCommons\Math\Math%20Curriculum%20Work%202015\Pre-Algebra\Unit%206%20Volume\Resources\Lawn%20Mowing%20-%20Tasks.pdf)  [Web link to Sample Volume question](http://rda.aps.edu/RDA/Performance_Task_Bank/Documents/7th_Grade/MAT.07.CR.1.0000G.F.488_v1.pdf)  [Hyperlink to sample volume question](file:///\\hkms-st01\FacultyCommons\BuildingCommons\Math\Math%20Curriculum%20Work%202015\Pre-Algebra\Unit%206%20Volume\Resources\MAT.07.CR.1.0000G.F.488_v1.pdf)  [Web link to Parallelagram question](http://rda.aps.edu/RDA/Performance_Task_Bank/Documents/7th_Grade/Parallelogram%20-%20Task.pdf)  [Hyperlink to parallelogram question](file:///R:\BuildingCommons\Math\Math%20Curriculum%20Work%202015\Pre-Algebra\Unit%206%20Volume\Resources\Parallelogram%20-%20Task.pdf)  [Hyperlink to popcorn](file:///R:\BuildingCommons\Math\Math%20Curriculum%20Work%202015\Pre-Algebra\Unit%206%20Volume\Resources\Popcorn-AS-Cylinders.pdf)  [weblink to popcorn](http://illuminations.nctm.org/Lesson.aspx?id=2927)  [hyperlink to perfume bottles](file:///\\hkms-st01\FacultyCommons\BuildingCommons\Math\Math%20Curriculum%20Work%202015\Pre-Algebra\Unit%206%20Volume\Resources\Volume%20of%20spheres%20cones%20cylinder%20perfume%20bottle%20comparison.docx)  [Hyperlink to Jelly beans](Resources/how%20many%20jellybeans%20r1%20(2).pdf)  [Hyperlink to volume of cone](Resources/volume%20cone%20(3).docx) |

**Instructional resources** (including manipulatives, literature connections, professional resources)

7.G.4

7.G.6

8.G.9