

Richmond Public Schools  
Curriculum Framework  
*Geometry*

Strand: Three-Dimensional Figures	
<b>G.13 The student will use surface area and volume of three-dimensional objects to solve practical problems.</b>	
Suggested Pacing	Cognitive Demand
Third Nine Weeks	G.13
2 instructional days	Apply
Spiraling Down Standards	Spiraling Up Standards
<p><b>8.6</b> The student will</p> <p>a) solve problems, including practical problems, involving volume and surface area of cones and square-based pyramids; and</p> <p><b>8.8</b> The student will construct a three-dimensional model, given the top or bottom, side, and front views.</p> <p><b>7.4</b> The student will</p> <p>a) describe and determine the volume and surface area of rectangular prisms and cylinders; and</p> <p>b) solve problems, including practical problems, involving the volume and surface area of rectangular prisms and cylinders.</p>	N/A
Essential Questions	Common Misconceptions
<p><b>How can you find the total surface area of a composite 3 dimensional figure?</b></p> <ul style="list-style-type: none"> <li>Identify the objects making up the composite figure. Anytime the surface area of a composite figure is found, ask if the top or bottom is open or the connection of the two shapes. If there</li> </ul>	<ul style="list-style-type: none"> <li>Students confuse B (area of base) with b (length of base). Students should identify the type of base, draw it, and the apply the area formula for the figure to avoid this mistake.</li> <li>Students assume that all figures are laying on their base and can mistake the height of a solid for the base of a solid.</li> </ul>

is an opening or a common side, only the areas of the enclosed sides or non-common sides are found.

**How can you find the surface area of a prism, pyramid, cone, and cylinder without using the surface area formula?**

- Find all the unit squares that fit on the exterior of the solid. Add all the areas of each face of the solid.

**How can you use water displacement to determine the volume of an irregular object?**

- Fill a graduated cylinder with adequate water. When placing in the cylinder, the object must be fully submerged in the water. Record the volume of the water prior to submerging the object. Call this number "a." Place the object in the graduated cylinder, and record the resulting water volume as "b." Subtract the volume of the water alone from the volume of the water plus the object.

**What are real world examples of needing to calculate lateral area vs. surface area?**

- If a company is selling soup cans they can use lateral area to figure out what size to make the labels.

**What is an example of a time when you would need to be able to calculate the volume of an object?**

- If you own a swimming pool and need to fill it with water. Some people have well water and need to purchase the water from a company to fill their pool and would need to know the volume to figure out the cost.

- When finding the surface area of a hemisphere, students will tend to divide the surface area of the sphere in half and not include the area of the great circle.
- When first using pi in algebraic expressions, students sometimes treat it as a variable rather than as a constant. Give students some problems using total area and perimeter in terms of pi.

**Understanding the Standard**

- A cylinder is a solid figure formed by two congruent parallel faces called bases joined by a curved surface. In this course, cylinders are limited to right circular cylinders.

**Essential Knowledge and Skills**

**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to**

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| <ul style="list-style-type: none"><li>• A cone is a solid figure formed by a face called a base that is joined to a vertex (apex) by a curved surface. In this course, cones are limited to right circular cones.</li><li>• A prism is a polyhedron that has a congruent pair of parallel bases and faces that are parallelograms. In this course, prisms are limited to right prisms with bases that are triangles, rectangles, or regular hexagons.</li><li>• A rectangular prism is a polyhedron in which all six faces are rectangles.</li><li>• A triangular prism is a polyhedron that has a congruent pair of parallel triangular bases and faces that are parallelograms.</li><li>• A pyramid is a polyhedron with a base that is a polygon and three or more faces that are triangles with a common vertex.</li><li>• A regular pyramid is a pyramid with a base that is a regular polygon. In this course, pyramids are limited to right regular pyramids with triangular, square, or hexagonal bases.</li><li>• A regular polygon has congruent sides and congruent interior angles.</li><li>• Subdivision of polygons may assist in determining the area of regular polygons.</li><li>• The surface area of a prism or pyramid is the sum of the areas of all its faces.</li><li>• The surface area of a cylinder, cone, or hemisphere is the sum of the areas of the curved surface and bases.</li><li>• The surface area of a sphere is the area of the curved surface.</li></ul> | <ul style="list-style-type: none"><li>• Determine the surface area of cylinders, prisms, pyramids, cones, hemispheres, and spheres, using the appropriate formulas.</li><li>• Determine the volume of cylinders, prisms, pyramids, cones, hemispheres, and spheres, using the appropriate formulas.</li><li>• Solve problems including practical problems, involving surface area and volume of cylinders, prisms, pyramids, cones, hemispheres, and spheres, as well as composite three-dimensional figures.</li><li>• Solve problems, including practical problems, involving the lateral area of circular cylinders, prisms, and regular pyramids.</li><li>• Given information about a three-dimensional figure such as length of a side, area of a face, or volume, determine missing information.</li></ul> |
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<ul style="list-style-type: none"> <li>• The lateral area of a cylinder is the area of the curved surface of the cylinder, not including the parallel bases.</li> <li>• The lateral area of a rectangular-based prism is the sum of the areas of all faces, not including the parallel bases.</li> <li>• The lateral area of a triangular-based prism is the sum of the areas of all faces, not including the triangular-shaped, parallel bases.</li> <li>• The volume of a three-dimensional figure is the number of unit cubes that would fill the figure.</li> <li>• Composite figures consist of two or more three-dimensional figures. The surface area of a composite figure may not be equal to the sum of the surface areas of the individual figures.</li> <li>• Volume and surface area of spheres, cones and cylinders should be considered in terms of <math>\pi</math> or as a decimal approximation.</li> <li>• Calculators may be used to determine decimal approximations for results.</li> </ul>	
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Vocabulary			Instructional Activities Organized by Learning Objective
Surface area	Volume	Composite solid	<p><b>Virginia Department of Education</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Surface Area and Volume</a></li> </ul> <p><b>Text</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Geometry</a>, ©2012, Price, et al, McGraw-Hill School Education Group page(s) 830-871</li> </ul> <p><b>Notes and Homework</b></p> <ul style="list-style-type: none"> <li>• <a href="#">G.13 Notes and Keys</a></li> <li>• <a href="#">G.13 Homework and Keys</a></li> </ul> <p><b>Resources</b></p>
Cylinder	Prism	Pyramid	
Cone	Hemisphere	Sphere	
formula	Two-dimensional	Three-dimensional	
Lateral area	Base	height	
Slant height	Face	Polyhedron	
Vertex	Right regular pyramid	Curved surface	
Regular polygon	Net	Unit	

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Parallel bases	Cube	Parallel bases	<ul style="list-style-type: none"> <li>● <b>Print</b> <ul style="list-style-type: none"> <li>○ Coach book, Virginia edition, Lessons 27-28 page(s) 222-238</li> </ul> </li> <li>● <b>Technology</b> <ul style="list-style-type: none"> <li>○ <b>Gizmo</b> <ul style="list-style-type: none"> <li>■ <a href="#">Surface and Lateral Areas of Prisms and Cylinders</a></li> </ul> </li> <li>○ <b>Geogebra</b> <ul style="list-style-type: none"> <li>■ <a href="#">Volume and Surface Area Activities</a></li> </ul> </li> <li>○ <b>Desmos</b> <ul style="list-style-type: none"> <li>■ <a href="#">Volume of Rectangular Prism Activity</a></li> <li>■ <a href="#">Volumes of Prisms and Cylinders Activity</a></li> <li>■ <a href="#">Volume of a Sphere Activity</a></li> <li>■ <a href="#">Volume of a Cone Activity</a></li> <li>■ <a href="#">Surface area of a Rectangular Prism Activity</a></li> </ul> </li> <li>○ <b>Youtube Videos</b> <ul style="list-style-type: none"> <li>■ <a href="#">Volume and Surface Area of Cylinder (MashUp Math)</a></li> <li>■ <a href="#">Volume and Surface Area of a Sphere (MashUp Math)</a></li> <li>■ <a href="#">Volume of a Cone (MashUp Math)</a></li> <li>■ <a href="#">Real-World problems of Volume of a Cylinder (MashUp Math)</a></li> <li>■ <a href="#">Volume (Math Antics)</a></li> </ul> </li> <li>○ <b>Quizizz Practice</b> <ul style="list-style-type: none"> <li>■ <a href="#">G.13 Practice</a></li> </ul> </li> </ul> </li> </ul> <p><b>Instructional Activities</b> <a href="#">G.13 Snapshot and Exit Ticket</a></p>
Apex			
<b>Assessment</b>			
<ol style="list-style-type: none"> <li>1. Powerschool Assessments G.13 (E:0W3CAW)</li> <li>2. Mulligan Checkpoint G.13 <a href="#">Checkpoint G.13</a></li> <li>3. Formative Assessments <a href="#">G.13 FA</a></li> <li>4. Cumulative Assessment <a href="#">Cumulative Assessment G.13, G.14</a></li> </ol>			
<b>Cross-Curricular Connections</b>			<b>Tiered Interventions</b>

### Real-World

Every day questions and curiosities arise from three dimensional objects. If I choose one drinking glass over another, will I get more or less beverage? If I want to build a rectangular garden bed, how much mulch do I need? If I am going to wrap a present, what shape is it and how much wrapping paper will I need? Being able to apply surface area, lateral area, and volume formulas will help answer these [and so many other] daily questions.

### Tier 3: Recall and Reproduction

#### Vocabulary

Have students study flashcards, create their own flashcards, play a matching game or test themselves on Quizlet.

[3D Figure Flashcards on Quizlet](#)

[Formula Overview Reference Sheet](#)

### Tier 2: Basic Skills and Concepts

#### Practice and Drill

[Volume and Surface Area Drills](#)

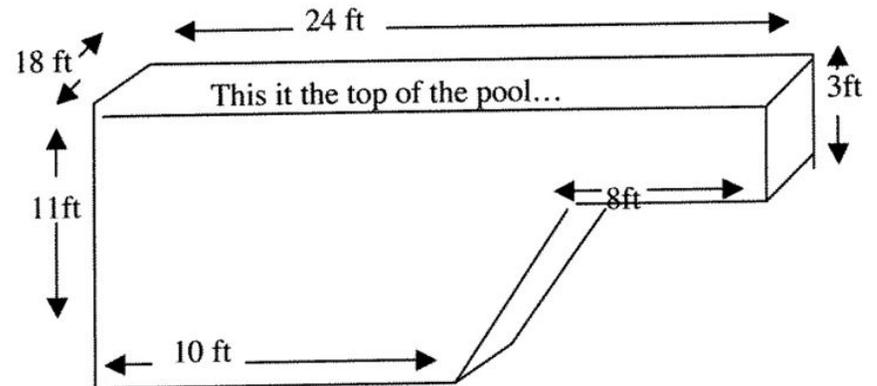
[SOL G.13 Practice Problems](#)

### Tier 1: Strategic Thinking and Reasoning

#### Application

Have students answer the following problems:

- a. Find the volume of water held by this swimming pool. Show all work.



- b. If water enters the pool at 8 cubic yards per hour, how many hours will it take to fill? How many days is that?
- c. If you want to tile the surface area of the pool (bottom, sides, etc) how many square feet of tile will it take?

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