

# Richmond Public Schools

## Curriculum Framework

### 7<sup>th</sup> Grade Math

#### Strand: Measurement and Geometry

#### 7.4 The student will

- a) describe and determine the volume and surface area of rectangular prisms and cylinders; and
- b) solve problems, including practical problems, involving the volume and surface area of rectangular prisms and cylinders.

#### Suggested Pacing

Second Nine Weeks- 10 Instructional Days

#### Spiraling Standards

#### Spiraling Down:

#### 6.7 The student will

- b) solve problems, including practical problems, involving circumference and area of a circle; and
- c) solve problems, including practical problems, involving area and perimeter of triangles and rectangles.

#### 5.8 The student will

- a) solve practical problems that involve perimeter, area, and volume in standard units of measure; and
- b) differentiate among perimeter, area, and volume and identify whether the application of the concept of perimeter, area, or volume is appropriate for a given situation.

#### Spiraling Up:

#### 8.6 The student will

- a) solve problems, including practical problems, involving volume and surface area of cones and square-based pyramids; and
- b) describe how changing one measured attribute of a rectangular prism affects the volume and surface area.

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Essential Questions	Common Misconceptions
<p><b>How are volume and surface area related?</b> <i>Volume is a measure of the amount a container holds while surface area is the sum of the areas of the surfaces on the container.</i></p>	<ul style="list-style-type: none"><li>• Students do not find the radius when given the diameter.</li><li>• When finding surface area of a rectangular prism, students do not rewrite the formula correctly leaving out the 2's.</li><li>• When finding the surface area of a cylinder, students only compute the first part of the equation instead of adding the second part.</li><li>• Students do not know when to use volume and when to use surface area.</li> <li>• Students may believe that the formula to find the volume of all figures is <math>lwh</math>. This unit will teach students to find the area of the base of a non-rectangular prism and multiply by the height to find the volume.</li><li>• Students may not correctly use square units when describing area nor cubic units when describing volume. This unit will distinguish between two and three-dimensional measurements.</li><li>• Students are uncomfortable substituting in values for radius, height, length, width.</li></ul>
Understanding the Standard	Essential Knowledge and Skills
<ul style="list-style-type: none"><li>• A polyhedron is a solid figure whose faces are all polygons.</li><li>• A rectangular prism is a polyhedron in which all six faces are rectangles. A rectangular prism has eight vertices and 12 edges.</li><li>• A cylinder is a solid figure formed by two congruent parallel faces called bases joined by a curved surface. In this grade level, cylinders are limited to right circular cylinders.</li></ul>	<p><b>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</b></p> <ul style="list-style-type: none"><li>• Determine the surface area of rectangular prisms and cylinders using concrete objects, nets, diagrams, and formulas. (a)</li></ul>

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- A face is any flat surface of a solid figure.
  - The surface area of a prism is the sum of the areas of all 6 faces and is measured in square units.
  - The volume of a three-dimensional figure is a measure of capacity and is measured in cubic units.
  - Nets are two-dimensional representations of a three-dimensional figure that can be folded into a model of the three-dimensional figure.
  - A rectangular prism can be represented on a flat surface as a net that contains six rectangles — two that have measures of the length and width of the base, two others that have measures of the length and height, and two others that have measures of the width and height. The surface area of a rectangular prism is the sum of the areas of all six faces ( $SA = 2lw + 2lh + 2wh$ ).
  - A cylinder can be represented on a flat surface as a net that contains two circles (the bases of the cylinder) and one rectangular region (the curved surface of the cylinder) whose length is the circumference of the circular base and whose width is the height of the cylinder. The surface area of the cylinder is the sum of the area of the two circles and the rectangle representing the curved surface ( $SA = 2\pi r^2 + 2\pi rh$ ).
  - The volume of a rectangular prism is computed by multiplying the area of the base,  $B$ , (length times width) by the height of the prism ( $V = lwh = Bh$ ).
  - The volume of a cylinder is computed by multiplying the area of the base,  $B$ , ( $\pi r^2$ ) by the height of the cylinder ( $V = \pi r^2 h = Bh$ ).
  - The calculation of determining surface area and volume may vary depending upon the approximation for pi. Common
- Determine the volume of rectangular prisms and cylinders using concrete objects, diagrams, and formulas. (a)
  - Determine if a practical problem involving a rectangular prism or cylinder represents the application of volume or surface area. (b)
  - Solve practical problems that require determining the surface area of rectangular prisms and cylinders. (b)
  - Solve practical problems that require determining the volume of rectangular prisms and cylinders. (b).

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<p>approximations for <math>\pi</math> include 3.14, <math>\frac{22}{7}</math>, or the pi button on the calculator.</p>	
<p style="text-align: center;"><b>Vocabulary</b></p>	<p style="text-align: center;"><b>Instructional Activities Organized by Learning Objective</b></p>
<p>Polyhedron Face Vertex Edge Volume Surface Area Dimensions Length Width Height Tall Wide Radius Diameter Rectangular Prism Cylinder Net Describe Determine Demonstrate</p>	<p><b>Virginia Department of Education</b></p> <ul style="list-style-type: none"> <li>• <u>Surface Area of a Rectangular Prism</u></li> </ul> <p><b>Textbook</b> Virginia Math Connects, Course 2, ©2012, Glencoe/McGraw-Hill page(s) Volume 557 - 568 (not fully aligned); Surface Area 582-593.</p> <p><b>Notes</b> <a href="#">Volume and Surface Area Notes</a></p> <p><b>Resources</b></p> <ul style="list-style-type: none"> <li>• Print             <ul style="list-style-type: none"> <li>o Virginia Coach, New SOL Edition, Mathematics, Grade 7, @2018, Triumph Learning pg(s) 70 - 82</li> <li>o <u>Volume and Surface Area(pages 1,2,3,5 only)</u></li> <li>o <u>Measure and Solve</u></li> </ul> </li> <li>• Technology-based             <ul style="list-style-type: none"> <li>o Discovery Education: Example 2                 <ul style="list-style-type: none"> <li>▪ <a href="#">Properties of Rectangular Prisms and Cylinders</a></li> </ul> </li> <li>o Khan Academy                 <ul style="list-style-type: none"> <li>▪ <a href="#">Volume of Rectangular Prism with Fractional Dimensions</a></li> </ul> </li> <li>o SmartExchange                 <ul style="list-style-type: none"> <li>▪ <a href="#">Smartboard - Find Volume</a></li> <li>▪ <a href="#">Smartboard - About Volume</a></li> </ul> </li> </ul> </li> </ul>
<p style="text-align: center;"><b>Assessment</b></p>	

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	<b>Stations</b> <a href="#">Volume and Surface Area Dominoes</a> <a href="#">Volume and Surface Area Sorting</a> <a href="#">Volume and Surface Area WP</a> <a href="#">Volume Or Surface Area Sort</a>
Cross-Curricular Connections	Tiered Differentiations
<p><b>History</b> – students create a historically accurate model of a town based on a chosen time period from the History Standards (Reconstruction era to post WWII). Students will use volume and surface area to predict the amount of material needed as well as in creating the physical model.</p> <p><b>Real World Math</b> – Music Virginia Math Connects, Course 2, ©2012, Price, et al, McGraw-Hill School Education Group 1 page 601</p>	<p>Tier 1 – Students will be given a picture along with the dimensions of both rectangular prisms and cylinders. They will then be asked to find the volume and surface area of each, then predict how this will change when the height is cut in half, doubled and tripled.</p> <p>Tier 2 – Students will be given a picture along with the dimensions of both rectangular prisms and cylinders. They will then be asked to find the volume and surface area of each.</p> <p>Tier 3 – Students will be given a picture along with the dimensions of both rectangular prisms and cylinders. Students will then use a guiding sheet that requires students to first identify what values need to be replaced (and where), then identify the proper order of operations needed to solve the equation. Finally students will solve. Students will have fewer problems than Tier1 and 2.</p>