Richmond Public Schools
Curriculum Framework
Geometry

<table>
<tr><th colspan="2">Strand: Three-Dimensional Figures</th></tr>
<tr><td colspan="2">G.14 The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include
a) comparing ratios between lengths, perimeters, areas, and volumes of similar figures;
b) determining how changes in one or more dimensions of a figure affect area and/or volume of the figure;
c) determining how changes in area and/or volume of a figure affect one or more dimensions of the figure; and
d) solving problems, including practical problems, about similar geometric figures.</td></tr>
<tr><th>Suggested Pacing</th><th>Cognitive Demand</th></tr>
<tr><td rowspan="2">Third Nine Weeks

2 instructional days</td><td>G.14a-d</td></tr>
<tr><td>Apply</td></tr>
<tr><th>Spiraling Down Standards</th><th>Spiraling Up Standards</th></tr>
<tr><td>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.

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.</td><td>N/A</td></tr>
<tr><th>Essential Questions</th><th>Common Misconceptions</th></tr>
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G.14a **What does it mean for two objects to be similar to each other?** *The ratio of any two linear dimensions of one object will be same for any geometrically similar object.* **How could you determine the surface area or volume of a three-dimensional figure if the ratio of the dimensions is known and vice versa?** *If two solids are similar with a scale factor of* $\frac{a}{b}$*, then the surface areas are in a ratio of* $(\frac{a}{b})^2$*. If two solids are similar with a scale factor of* $\frac{a}{b}$*, then the volumes are in a ratio of* $(\frac{a}{b})^3$*.* **What is a real world scenario where the ratio of two similar three-dimensional figures must be known?** *If you were to make a scale model for a garden bed and the amount of paint it took to cover the model was known, using ratios would help determine the amount of paint it would take to cover the actual bed so that the correct amount of paint would be purchased.* **G.14b, c, d** **How does changing one dimension affect the overall surface area or volume of an object?** *When the dimensions of the shape, such as radius, height, or length, change, both surface area and volume also change. However, the volume of the object always changes more than the surface area for the same change in dimensions.* **How does changing multiple dimensions affect the overall surface area or volume of an object?** *When the dimensions of a solid are multiplied by k, the surface area is multiplied by* k^2 *and the volume is multiplied by* k^3*.*	● Students assume that when any dimension is changed by a factor, everything else: other dimensions, volume, surface area, etc. are changed by the same factor. ● Students confuse some linear measurements with units that are squared or cubed.

What is a real world scenario where understanding how changing a dimension affects the overall surface area or volume must be known? *When companies are creating these different size vessels, they need to ensure that the labels and designs are not distorted and that they are filling them to their maximum capacity; therefore, the change in dimensions from one to the other must be known.*	
Understanding the Standard	**Essential Knowledge and Skills**
● A change in one dimension of a figure results in predictable changes in area and/or volume. The resulting figure may or may not be similar to the original figure. ● A constant ratio, the scale factor, exists between corresponding dimensions of similar figures. ● If the ratio between dimensions of similar figures is a:b then: The ratio of their areas is $a^2:b^2$. The ratio of their volumes is $a^3:b^3$. ● Proportional reasoning is important when comparing attribute measures in similar figures.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Compare ratios between side lengths, perimeters, areas, and volumes, given two similar figures. (a) • Describe how changes in one or more dimensions affect other derived measures (perimeter, area, surface area, and volume) of a figure. (b) • Describe how changes in one or more measures (perimeter, area, surface area, and volume) affect other measures of a figure. (c) • Solve real-world problems involving measured attributes of similar figures. (d)

Vocabulary			**Instructional Activities Organized by Learning Objective**
Ratio	Side length	Perimeter	**Virginia Department of Education** ● Similar Solids and Proportional Reasoning **Textbook**
Surface Area	Volume	Similar figures	
Scale factor	Dimensions	Affect	

<table>
<tr><th>Assessment</th><th></th></tr>
<tr><td>
1. Powerschool Assessments
G.14a (E:24B29D)
G.14b (E:22P665)
G.14c (E:24VYJM)
G.14d (E:1RXR8H)

2. Mulligan Checkpoint G.14
Checkpoint G.14

3. Formative Assessments
G.14a-d FA

4. Cumulative Assessment
Cumulative Assessment G.13, G.14
</td><td>
• Geometry, ©2012, Price, et al, McGraw-Hill School Education Group page(s) 802-808 and 880-886

Notes and Homework
• G.14 Notes and Keys
• G.14 Homework and Keys

Resources
• Print
○ Coach book, Virginia edition, Lessons 29-30 page(s) 239-254
• Technology
○ Gizmo
■ Perimeters and Areas of Similar Figures
○ Youtube Videos
■ Ratios of Similar Solids
■ How does changing a linear dimension affect surface area and volume
○ Quizizz Practice
■ G.14a Practice
■ G.14b Practice
■ G.14c Practice
■ G.14d Practice

Instructional Activities
Similar Solids Warm-up Activity
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<tr><th>Cross-Curricular Connections</th><th>Tiered Interventions</th></tr>
<tr><td>
Real-World
Companies manufacture grocery products in many different sizes; for example, sodas can be purchased in 20 ounce, 1 liter, or 2 liter bottles; cereals can be purchased in regular or family size boxes; candy can be purchased as bite size, regular size, or jumbo, and so
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Tier 3: Recall and Reproduction
Vocabulary
Have students study flashcards, create their own flashcards, play a matching game or test themselves on Quizlet.
3D Figures Flashcards on Quizlet
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much more. When companies are creating these different size vessels, they need to ensure that the labels and designs are not distorted and that they are filling them to their maximum capacity; therefore, the change in dimensions from one to the other must be known.	**Tier 2: Basic Skills and Concepts** Practice and Drill Similar Solids Drills SOL G.14 Practice Problems **Tier 1: Strategic Thinking and Reasoning** Application Make A Box Activity: You and your partner will each select an interesting (not a cylinder or a shoe) box to scale up or down. You will make a scaled version of the box, either double or half in every dimension. · Name the solid specifically using all words necessary to describe it. · Draw a sketch of your box. · Sketch a net of it (to scale), giving dimensions of each box (your original and the scaled one) in cm. · State the shapes and number of faces. · Calculate the surface area of both boxes. · Calculate the volume of both boxes.