Just In Time Quick Check

Standard of Learning (SOL) G.14c

Strand: Three Dimensional Figures

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The student will apply the concepts of similarity to two- or three-dimensional geometric figures. This will include determining how changes in area and/or volume of a figure affect one or more dimensions of the figure.

Grade Level Skills:

- Describe how changes in one or more measures (perimeter, area, surface area, and volume) affect other measures of a figure.

Just in Time Quick Check

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Supporting Resources:

- VDOE Mathematics Instructional Plans (MIPS)
  - G.14 - Similar Solids and Proportional Reasoning (Word) / PDF Version
- VDOE Word Wall Cards: Geometry (Word) | (PDF)
  - Similar Solids Theorem]
  - Cone
  - Cylinder
  - Sphere
  - Pyramid
- Other VDOE Resources
  - Geometry, Module 14, Topic 3–Determining How Changes in One Dimension Affect Perimeter Area and Volume and Vice Versa [eMediaVA]

Supporting and Prerequisite SOL: 8.6a, 8.6b, 8.10, 7.3, 7.4a, 7.4b

SOL G.14c - Just in Time Quick Check

1. For the volume of a rectangular solid to double, which four of the following scenarios could occur? Explain why the other choices would not work.
   - The length could be doubled.
   - The width and height could be doubled.
   - The length or the width or the height could be doubled.
   - The width could be doubled.
   - The length and width could be doubled.
   - The length and the width and the height could be doubled.
   - The height could be doubled.
   - The length and height could be doubled.

2. A small cylindrical container holds 16 ounces of soup. A larger similar cylindrical container holds 128 ounces of soup. What is the relationship between the linear dimensions of the smaller container and the linear dimensions of the larger container?

3. Alicia has a small round table with area $4\pi ft^2$. She want to buy a larger round table that will have an area 4 times as large as the small table. What should the radius be for the new table? Explain how you found your answer.

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Common Errors/Misconceptions and their Possible Indications

1. For the volume of a rectangular solid to double, which four of the following scenarios could occur? Explain why the other choices would not work.
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   - The length and the width and the height could be doubled.
   - The height could be doubled.
   - The length and height could be doubled.

   A common error that some students may make is to assume that all the dimensions will double. This may indicate that students do not understand that the concept of how one or more dimension changes affect volume. Students having this misconception would benefit from watching the eMedia Module 14 topic 3 video listed in the supporting resources where these concepts are applied to problems. Teachers are encouraged to model this concept using dynamic software in order to allow students to double one or more dimensions at a time and then analyze the resulting values for the volume.

2. A small cylindrical container holds 16 ounces of soup. A larger similar cylindrical container holds 128 ounces of soup. What is the relationship between the linear dimensions of the smaller container and the linear dimensions of the larger container?

   A common misconception that some students may have is that if the volume increases at a 1:8 ratio then so will each dimension. This may indicate that students do not understand that the volumes of similar objects increase at a cubed ratio as compared to the linear dimensions of those objects. Students making this error may benefit from exploring what happens to volume as each dimension changes separately versus all the dimensions changing to maintain similarity. Teachers are encouraged to use dymanic software to explore these concepts with their students so that the students may draw conclusions as to how a volume change affects one or more dimensions. Throughout this discussion, students should be reminded that figures only maintain similarity if all dimensions change by the same ratio. Teachers could have the students use a DESMOS slider to investigate how the volume change affects each dimension.

3. Alicia has a small round table with area $4\pi\ ft^2$. She wants to buy a larger round table that will have an area 4 times as large as the small table. What should the radius be for the new table? Explain how you found your answer.

   A common misconception that some students may have is that the radius will also increase at a 1:4 ratio rather than a 1:2 ratio. This may indicate that students do not understand that the surface areas of similar figures grow at a square ratio compared to the linear growth. Students with this misconception would benefit from hands-on activities that demonstrate how changes in linear dimensions affect surface area and vice versa, as well as from watching the eMedia Module 14 topic 3 video listed in the supporting resources where these concepts are applied to problems.