Just In Time Quick Check

Standard of Learning (SOL) G.14d

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 solving problems, including practical problems, about similar geometric figures.

Grade Level Skills:

- Solve real-world problems involving measured attributes of similar figures.

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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 2–Practical Problems Incolving Similar Two- and Three- Dimensional Figures[eMediaVA]

Supporting and Prerequisite SOL: G.7, 8.6, 7.3, 7.5

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1. The ratio of the radii of two spheres is 2:3. The volume of the smaller sphere is $267.95\ cm^3$. Find the volume of the larger sphere to the nearest hundredth.

2. A rectangular fish aquarium can hold 5 gallons of water. How much can a similar rectangular aquarium hold if it's dimensions are 3 times those of the smaller aquarium?

3. A scale model of a narrow boat for use on canals is built on a scale of 1 inch to 20 inches. The flat top of the actual narrow boat has a suface area of of $364\ ft^2$. Find the surface area of the flat top of the model of the narrow boat, to the nearest square inch. Hint: $1\ ft^2 = 144\ in^2$

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Common Errors/Misconceptions and their Possible Indications

1. The ratio of the radii of two spheres is 2:3. The volume of the smaller sphere is $267.95\ cm^3$. Find the volume of the larger sphere to the nearest hundredth.

   A common error that some students may make is to use the ratio of 2:3 to set up and solve the problem instead of 8:27.This may indicate that students do not understand how ratios of similar figures change in relationship from linear ratios to volume ratios. Students making this misconception would benefit from watching the emedia Module 14 topic 2 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 manipulate dimensions and then to analyze the resulting values for the volume.

2. A rectangular fish aquarium can hold 5 gallons of water. How much can a similar rectangular aquarium hold if it's dimensions are 3 times those of the smaller aquarium?

   A common misconception that some students may have is that the volume will simply triple instead of increasing by a rate of 27. This may indicate that students do not understand that all the dimensions are increasing, not just one dimension. Students making this error would 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 the ratios of the volumes change with one or more dimension change. Teachers could have the students use a DESMOS slider to investigate how the changes in the dimensions affect volume.

3. A scale model of a narrow boat for use on canals is built on a scale of 1 inch to 20 inches. The flat top of the actual narrow boat has a suface area of of $364\ ft^2$. Find the surface area of the flat top of the model of the narrow boat, to the nearest square inch. Hint: $1\ ft^2 = 144\ in^2$

   A common misconception that some students may have is that the surface area will also increase at a 1:20 ratio rather than a 1:400 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, as well as from watching the emedia Module 14 topic 2 video listed in the supporting resources where these concepts are applied to problems. Teachers should encourage their students to use the correct measurements by converting square feet to square inches.