*AR Remediation Plan –Volume and Surface Area*

# Relational Solids

**STRAND: Measurement and Geometry**

**STRAND CONCEPT: Volume and Surface Area**

**SOL 7.4b, 8.6a**

***Remediation Plan Summary***

Students use mathematical reasoning to compute the volume of prisms, cylinders, cones and square pyramids, using formulas.

***Common Misconceptions***

Students have a difficult time differentiating between prisms and pyramids. They have difficulty differentiating between area and perimeter and volume and surface area. Students use the units for measurement incorrectly.

***Materials***

- Relational solids (having the same height and congruent bases) for a cylinder and a cone and for a prism and a square pyramid
- Rice or water
- Copies of the Grade 8 Mathematics Formula Sheet
- Copies of the attached "Finding Volumes of Solids" worksheet

***Introductory Activity***

- Put on display the relational solids listed above. Ask students how the prism and the square pyramid, which have the same height and congruent bases, compare in volume. Are they the same? Is the volume of one greater? If so, how much greater? Ask students how they could check the two volumes. They may suggest filling the solids with rice or water and measuring the two quantities in order to compare them. Ask them what unit was used in filling up the solids? Was it cups? Then discuss how volume is not always measured in cups, solid volume is measured in cubic units based on measurement.
- Repeat this process with the cylinder and cone.
- Have students write a summary statement about the relationship between the volumes of a prism and a square pyramid and between the volumes of a cylinder and a cone.

***Plan for Instruction***

1. Move from estimating such volumes to finding them exactly. Hand out copies of the Grade 8 Mathematics Formula Sheet. Review the formula for calculating the volume of a prism or cylinder. Model calculating the area of the base and multiplying by the height.
2. Do the same for a pyramid and cone, emphasizing that it is the same process of calculating the area of the base and multiplying by the height except that <u>you divide the resulting</u>

volume by 3, which is the same as multiplying by $\frac{1}{3}$. Ask students what they learned in the warm-up that helps them rationalize dividing by 3 (or multiplying by $\frac{1}{3}$).

3. Hand out copies of the attached “Finding Volumes of Solids” worksheet, and have students work together in pairs to complete it.

***Pulling It All Together (Reflection)***

Have students explain in writing how the formula for finding the volume of a pyramid is like and unlike the formula for finding the volume of a prism. Then, have them explain how the formula for finding the volume of a cone is like and unlike the formula for finding the volume of a cylinder.

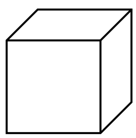
**Note: The following pages are intended for classroom use for students as a visual aid to learning.**

Virginia Department of Education 2018

**Name:**

# Finding Volumes of Solids

Sketch each solid named in the chart below. Write a real-life question that involves finding the volume of the solid. Write the necessary dimensions that must be given in your question in order to answer it. Write the formula for finding the volume of the solid, and use the given dimensions to calculate the volume. Explain the process in words. The first example is done for you.

| Sketch of Solid | Real-life volume question | Necessary dimensions | Formula for volume | Explanation of process |
|---|---|---|---|---|
| **Cube**<br> | What is the volume of an ice cube having a side length of 2 cm? | 2 cm x 2 cm x 2 cm | $l \times w \times h$<br><br>2 x 2 x 2 = 8 $cm^3$ | I multiplied length and width to get the area of the base—4 $cm^2$. Then I multiplied the base area by the height to get the volume—8 $cm^3$. |
| **Rectangular prism (not cube)** | | | | |
| **Square pyramid** | | | | |
| **Cylinder** | | | | |
| **Cone** | | | | |

Explain how the formula for finding the volume of a pyramid or cone is like the formula for finding the volume of a prism or cylinder.

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Explain how it is different.