EUREKA MATH™ TIPS FOR PARENTS

KEY CONCEPT OVERVIEW

In this topic, students begin to think of **volume** as the area of two or more two-dimensional shapes stacked on one another. They develop the general **formulas for the volume** of cones, cylinders, and spheres. Students explore how cones, cylinders, and spheres are related and discover that the volume of a cone is one-third the volume of a cylinder with the same dimensions. They also discover that the volume of a sphere is two-thirds the volume of the cylinder that fits tightly around it. Students use these new formulas to solve real-world and mathematical problems related to volume. Please note that in this topic the terms *cylinder* and *cone* generally refer to a right circular cylinder and a right circular cone.

To LEARN MORE by viewing videos about comparing volumes, visit eurmath.link/volume-sphere and eurmath.link/volume-cone.

You can expect to see homework that asks your child to do the following:

- Find the area of two-dimensional figures, including those composed of many shapes.
- Find the volume of three-dimensional figures, including those composed of many **solids**.
- Determine how many of one solid it will take to fill another.
- Identify which solid has a greater volume.

SAMPLE PROBLEMS *(From Lesson 11)*

Use the diagram to answer the problems.
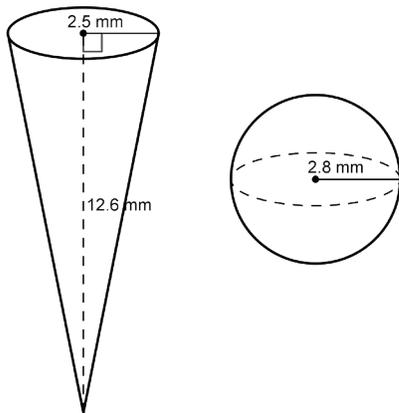
a. Predict which of the figures has the greater volume. Explain.

Student answers will vary. Students will probably say the cone has a greater volume because it looks larger.

b. Find the volume of each figure and determine which has the greater volume.

$$V = \frac{1}{3}\pi r^2 h$$

$$V = \frac{1}{3}\pi(2.5)^2(12.6)$$

$$V = 26.25\pi$$

The volume of the cone is 26.25π mm³.

$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3}\pi(2.8)^3$$

$$V = 29.\overline{269}\pi$$

The volume of the sphere is about 29.27π mm³.

The volume of the sphere is greater than the volume of the cone.

Additional sample problems with detailed answer steps are found in the *Eureka Math Homework Helpers* books. Learn more at GreatMinds.org.

HOW YOU CAN HELP AT HOME

You can help at home in many ways. Here are some tips to help you get started.

- Help your child locate solids in your home. For example, a soup can is a perfect representation of a cylinder; dice and children's alphabet blocks are examples of cubes; and a child's pointy party hat is an example of a cone. Measure these objects and calculate the volume of each.

- Have your child explain why the volume formulas for cones and spheres contain fractional values when compared with the volume formula for cylinders with the same radius sizes. The formula for the volume of a cone includes the value *one-third* because it takes three cones to fill a cylinder with the same **base** size. The formula for the volume of a sphere includes the value *four-thirds* because the height of the cylinder is two radii, and when the contents of a sphere are poured into a cylinder with the same radius, the cylinder is two-thirds full. Many videos online show these experiments.

TERMS

Base/Base shape: The two-dimensional shape that is stacked upon itself to create the three-dimensional object. For example, a stack of circles forms a cylinder.

Solids: Three-dimensional figures such as cylinders, cones, rectangular prisms (boxes), and spheres.

Volume: The amount of space inside a three-dimensional object such as a cone or sphere. Volume is measured in cubic units.

Volume formulas: The general formula is $V = Bh$ where V represents the volume of the solid, B represents the area of the base shape, and h represents the height of the solid. Since the base is a circle in the following solids, $B = \pi r^2$, where r is the radius of the circle.

The equation for finding the volume of a cylinder is $V = \pi r^2 h$.

The equation for finding the volume of a cone is $V = \dfrac{1}{3}\pi r^2 h$.

The equation for finding the volume of a sphere is $V = \dfrac{4}{3}\pi r^3$.