EUREKA MATH™ TIPS FOR PARENTS

KEY CONCEPT OVERVIEW

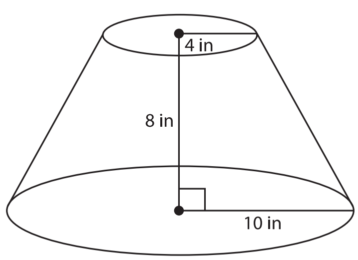
In this topic, students use the Pythagorean theorem to determine an unknown dimension (e.g., radius, **lateral length/slant height**) of a cone or a sphere, given the length of a **chord**, and to find the volume or surface area of a figure by using that dimension. Students are introduced to **truncated cones** and calculate their volumes. Students also learn that the volume of a pyramid is exactly one-third the volume of a rectangular prism with the same base area and height. In addition, students determine the volumes of **composite solids** composed of cylinders, cones, and spheres. Students then apply their knowledge of volume to compute the average rate of change in the height of the water level when water drains into a cone-shaped container. The lessons in this topic challenge students to reason while making sense of problems. Students apply their knowledge of concepts they have learned throughout the year to persevere in solving problems.

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

- Use the Pythagorean theorem to find unknown lengths of segments in three-dimensional figures.
- Find the volume and surface area of a variety of solids, including composite solids.
- Use similar triangles to find unknown lengths of segments in pyramids and truncated cones.
- Using knowledge of volume, determine the number of minutes it would take to fill a particular three-dimensional figure.

SAMPLE PROBLEM *(From Lesson 20)*

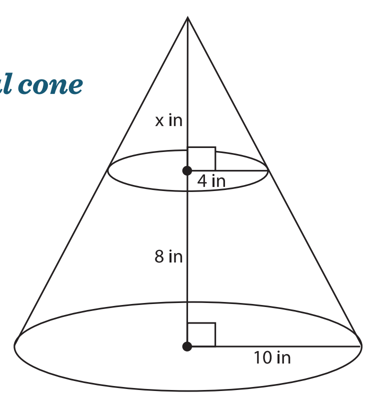
Determine the volume of the truncated cone shown below.



Let x inches represent the height of the small cone on top of the truncated cone.

$$\frac{4}{10} = \frac{x}{x+8}$$
$$4(x+8) = 10x$$
$$4x + 32 = 10x$$
$$32 = 6x$$
$$\frac{32}{6} = \frac{6x}{6}$$
$$5.\overline{3} = x$$

We must use the original cone to determine the height.



The volume of the whole cone is approximately $\frac{1}{3}\pi(10)^2(13.3)\text{in}^3$ ***or*** $\frac{1330}{3}\pi\ \text{in}^3$.

SAMPLE PROBLEM *(continued)*

The volume of the top small cone is approximately $\frac{1}{3}\pi(4)^2(5.3)\text{in}^3$ ***or*** $\frac{84.8}{3}\pi\ \text{in}^3$.

The volume of the truncated cone is equal to the volume of the larger cone minus the volume of the smaller cone. $\frac{1330}{3}\pi\ \text{in}^3 - \frac{84.8}{3}\pi\ \text{in}^3 = \frac{1245.2}{3}\pi\ \text{in}^3$

Therefore, the volume of the truncated cone is approximately $\frac{1245.2}{3}\pi\ \text{in}^3$.

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.

- Review the formulas for volume with your child. (See Module 5 Topic B.) Students will use these formulas in application problems throughout this topic.
- With your child, examine objects in your home or outdoors. Talk about which solids make up each object. For example, a game piece in a board game may be composed of a sphere on top, a cylinder in the middle, and a cone as the base. Practicing this method of visual decomposition will help your child find the volumes of composite solids.

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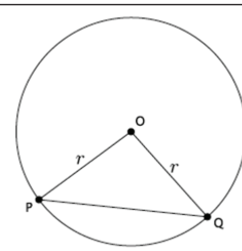

Figure 1

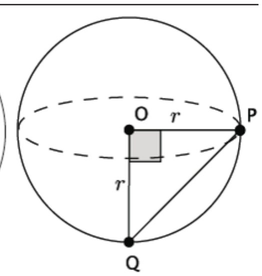

Figure 2

Chord: A straight line segment connecting two points on the outer edge of a circle or sphere. In Figures 1 and 2, $\overline{PQ}$ is a chord.

Composite solid: A solid figure made up of two or more solid figures. For example, a sharpened pencil can be viewed as a cylinder (the unsharpened portion) combined with a cone (the sharpened portion).

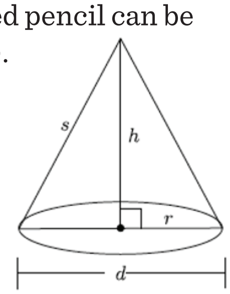

Figure 3

Lateral length/Slant height: The length of the shortest segment that connects the vertex of a pyramid or cone to a point on the edge of its base. In Figure 3, the slant height is represented by the variable s.

Truncated cone: The part of a cone that remains after a portion of the top of the cone has been removed. (See Sample Problem.)