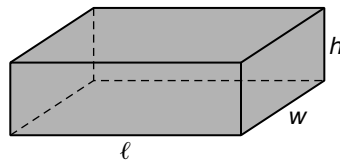


Key Concepts

Volume of Cylinders

Objective Teach students the formula for the volume of a cylinder and how to use it.

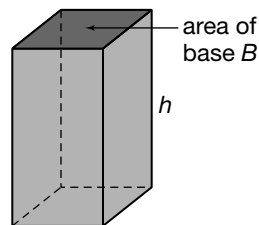
Note to the Teacher *In the previous lesson, students learned that the volume V of a rectangular prism is the product of the length times the width times the height.*



$$V = \ell wh$$

This lesson builds on students' understanding of this formula from the previous lesson.

Sketch the figure above on the chalkboard. Point out that the base (the bottom face) of the prism is a rectangle whose area is $w\ell$. Suggest that students can think of the volume formula above as the product of the area of the base and the height. Generalize this idea to any solid figure. Suppose we have a solid whose height is h . We cut the solid into slices by cutting parallel to the base. Then the top of each slice is the same size and shape as the base of the solid, and the volume of such a solid is the area of the base times the height. Using B to represent the area of the base, the volume of the solid is then given by the formula $V = Bh$.

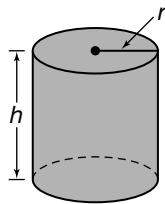


$$V = Bh$$

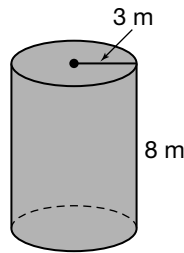
In the figure above, the base is shown as a rectangle to show that B replaces ℓw in the formula from the previous lesson. However, point out that the base could be some other shape, such as a triangle, a hexagon, or a circle. Stress that in this lesson we will be talking about solids called *cylinders*, whose bases are circles.

Cylinders

A **cylinder** is a solid whose bases are two congruent circles that are parallel to each other. So in the volume formula $V = Bh$, the base area B is that of a circle. Remind students that the area of a circle is given by the expression πr^2 . So the volume of a cylinder with radius r and height h is the area of the circular base, πr^2 , times the height h : $V = \pi r^2 h$.



Example Find the volume of the cylinder shown below.



Solution Use the formula for the volume of a cylinder, $V = \pi r^2 h$.

$$\begin{aligned} V &= \pi r^2 h \\ &= \pi(3^2)(8) \quad \text{Replace } r \text{ with } 3 \text{ and } h \text{ with } 8. \\ &= \pi(9)(8) \\ &= 72\pi \end{aligned}$$

So, the volume of the cylinder is 72π cubic meters. Using a calculator and the approximation 3.14 for π , the volume is about 226.08 cubic meters.

Provide students with the dimensions of several additional cylinders and have them find the volumes, both in terms of π and using the approximation 3.14 for π .

