

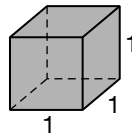
# Key Concepts

Lesson  
12-2

## Volume of Rectangular Prisms

**Objective** Teach students the concept of the volume of a 3-dimensional object, and also the formula for the volume of a rectangular prism.

**Note to the Teacher** *Volume may be a new concept for your students. Begin with a classroom discussion about the meaning of volume. Guide the discussion so that students talk about the idea of how much liquid a 3-dimensional object would hold, or how much air a balloon shaped like the object would hold. In order to make this idea more precise, stress that the volume of an object is the measure of the space it occupies. Then talk about the basic unit of volume, which is a cube of side length 1 unit. The volume of such a cube is 1 cubic unit. Refer to this cube as a unit cube.*



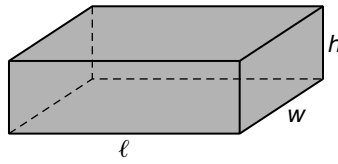
*The volume of a cube of side length 1 unit (i.e. 1 inch) is 1 cubic unit (i.e. 1 in<sup>3</sup>).*

## Volume of Rectangular Prisms

Explain to your students that when we compute the volume of a rectangular prism, we are basically counting how many cubes of side length one unit can fit inside the solid. This is analogous to computing the area of a region by counting how many squares of side length one unit can fit inside that region.

A rectangular prism has three important dimensions, its length, width, and height. Stress that if a rectangular prism is 10 units long, then 10 of the unit cubes can be lined up along its length. Similarly, if its height is 5 units then 5 unit cubes can be stacked up along its height, and if its width is 7 units then 7 unit cubes can be lined up along its width. Help students visualize such a prism completely filled with unit cubes. Point out that there would be 5 layers of unit cubes, each of which would have  $10 \times 7$  or 70 unit cubes in it. Help them see that this means there would be  $5 \times 70$  or 350 unit cubes inside the prism.

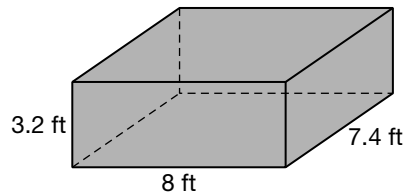
In general, a rectangular prism of length  $\ell$ , width  $w$ , and height  $h$  can be filled by  $\ell \cdot w \cdot h$  unit cubes. That is, its volume  $V$  is given by the product  $\ell wh$ .



*volume of a rectangular prism =  $\ell wh$*

Now discuss the following example.

**Example** Find the volume of a rectangular prism whose length is 8 feet, whose height is 3.2 feet, and whose width is 7.4 feet.



**Solution** Use the volume formula  $V = \ell wh$ .

$$\begin{aligned} V &= \ell wh \\ &= 8 \times 7.4 \times 3.2 && \text{Substitute 8 for } \ell, 7.4 \text{ for } w, \text{ and } 3.2 \text{ for } h. \\ &= 189.44 && \text{Use a calculator.} \end{aligned}$$

The volume of the rectangular prism is 189.44 cubic feet (also written as  $189.44 \text{ ft}^3$ ).

