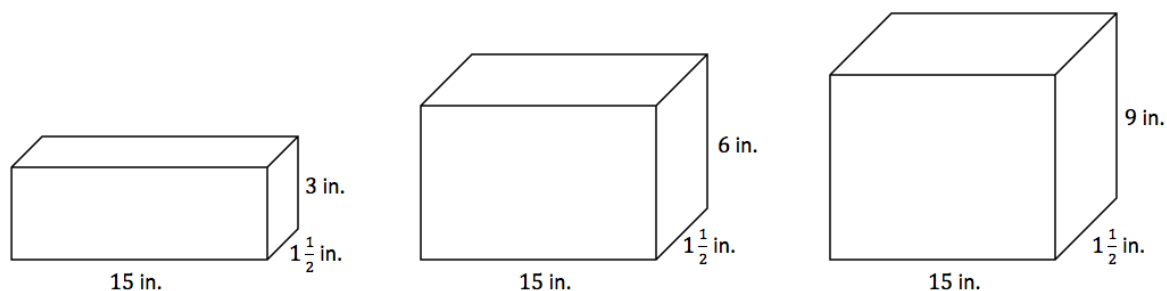# Lesson 12: From Unit Cubes to the Formulas for Volume

Classwork

Example 1

a.   Write a numerical expression for the volume of each of the rectangular prisms above.

b.   What do all of these expressions have in common? What do they represent?

c.   Rewrite the numerical expressions to show what they have in common.

d.   If we know volume for a rectangular prism as length times width times height, what is another formula for volume that we could use based on these examples?

e.   What is the area of the base for all of the rectangular prisms?

f.   Determine the volume of each rectangular prism using either method.

g.   How do the volumes of the first and second rectangular prisms compare? The volumes of the first and third?
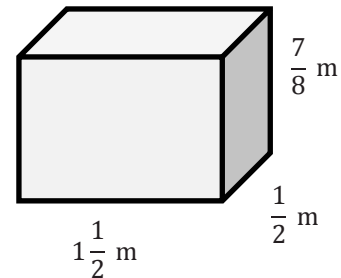
Example 2

The base of a rectangular prism has an area of $3\frac{1}{4}$ in^2. The height of the prism is $2\frac{1}{2}$ in. Determine the volume of the rectangular prism.

Extension

A company is creating a rectangular prism that must have a volume of 6 ft^3. The company also knows that the area of the base must be $2\frac{1}{2}$ ft^2. How can you use what you learned today about volume to determine the height of the rectangular prism?
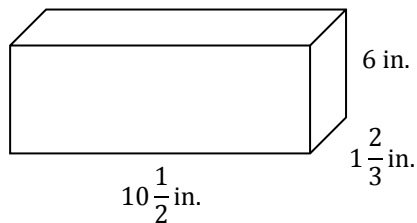
Problem Set

1. Determine the volume of the rectangular prism.

2. The area of the base of a rectangular prism is $4\frac{3}{4}$ ft^2, and the height is $2\frac{1}{3}$ ft. Determine the volume of the rectangular prism.

3. The length of a rectangular prism is $3\frac{1}{2}$ times as long as the width. The height is $\frac{1}{4}$ of the width. The width is 3 cm. Determine the volume.
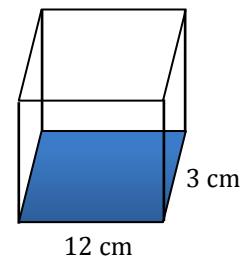
4.

   a. Write numerical expressions to represent the volume in two different ways, and explain what each reveals.
   b. Determine the volume of the rectangular prism.

5. An aquarium in the shape of a rectangular prism has the following dimensions: length $= 50$ cm, width $= 25\frac{1}{2}$ cm, and height $= 30\frac{1}{2}$ cm.
   a. Write numerical expressions to represent the volume in two different ways, and explain what each reveals.
   b. Determine the volume of the rectangular prism.

6.   The area of the base in this rectangular prism is fixed at 36 cm^2. This means that for the varying heights, there will be various volumes.

a.   Complete the table of values to determine the various heights and volumes.

Height in Centimeters	Volume in Cubic Centimeters
2	72
3	108
	144
	180
6	
7	
	288

3 cm

12 cm

b.   Write an equation to represent the relationship in the table. Be sure to define the variables used in the equation.

c.   What is the unit rate for this proportional relationship? What does it mean in this situation?

7.   The volume of a rectangular prism is 16.328 cm^3. The height is 3.14 cm.

a.   Let B represent the area of the base of the rectangular prism. Write an equation that relates the volume, the area of the base, and the height.

b.   Solve the equation for B.