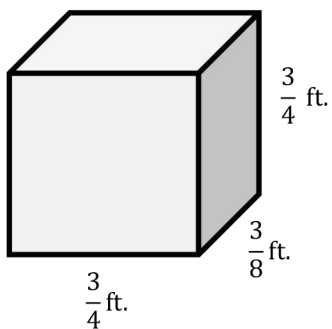


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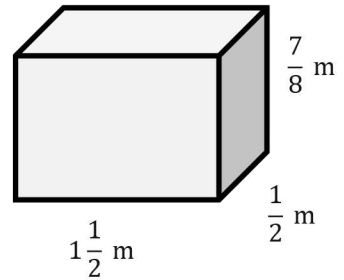
## From Unit Cubes to the Formulas for Volume

1. Determine the volume of the rectangular prism in two different ways.



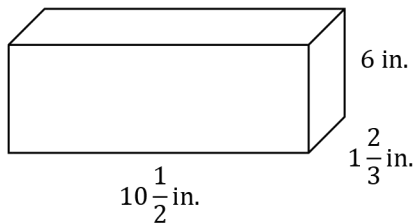
2. The area of the base of a rectangular prism is  $12 \text{ cm}^2$ , and the height is  $3\frac{1}{3}$  cm. Determine the volume of the rectangular prism.

1. Determine the volume of the rectangular prism.



2. The area of the base of a rectangular prism is  $4\frac{3}{4}$  ft<sup>2</sup>, 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.

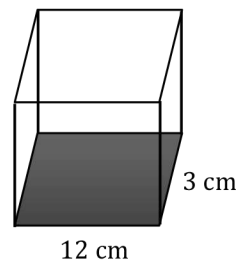


- a. Write numerical expressions to represent the volume in two different ways, and explain what each reveals.
- b. Determine the volume of the rectangular prism.
5. An aquarium in the shape of a rectangular prism has the following dimensions: length = 50 cm, width =  $25\frac{1}{2}$  cm, and height =  $30\frac{1}{2}$  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  $36 \text{ cm}^2$ . 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



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  $16.328 \text{ cm}^3$ . The height is  $3.14 \text{ cm}$ .

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  $B$ .

1. Determine the volume of the rectangular prism in two different ways.

$$V = l \cdot w \cdot h$$

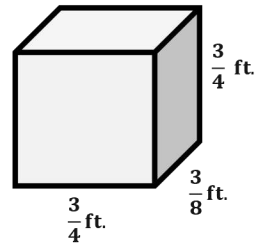
$$V = \left(\frac{3}{4} \text{ ft.}\right) \left(\frac{3}{8} \text{ ft.}\right) \left(\frac{3}{4} \text{ ft.}\right)$$

$$V = \frac{27}{128} \text{ ft}^3$$

$$V = \text{Area of base} \cdot \text{height}$$

$$V = \left(\frac{9}{32} \text{ ft}^2\right) \left(\frac{3}{4} \text{ ft.}\right)$$

$$V = \frac{27}{128} \text{ ft}^3$$



2. The area of the base of a rectangular prism is  $12 \text{ cm}^2$ , and the height is  $3\frac{1}{3} \text{ cm}$ . Determine the volume of the rectangular prism.

$$V = \text{Area of base} \cdot \text{height}$$

$$V = (12 \text{ cm}^2) \left(3\frac{1}{3} \text{ cm}\right)$$

$$V = \frac{120}{3} \text{ cm}^3$$

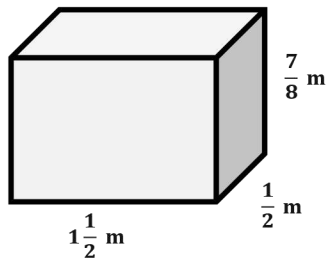
$$V = 40 \text{ cm}^3$$

1. Determine the volume of the rectangular prism.

$$V = l w h$$

$$V = \left(1\frac{1}{2} \text{ m}\right) \left(\frac{1}{2} \text{ m}\right) \left(\frac{7}{8} \text{ m}\right)$$

$$V = \frac{21}{32} \text{ m}^3$$



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

$$V = \text{Area of base} \times \text{height}$$

$$V = \left(4\frac{3}{4} \text{ ft}^2\right) \left(2\frac{1}{3} \text{ ft.}\right)$$

$$V = \left(\frac{19}{4} \text{ ft}^2\right) \left(\frac{7}{3} \text{ ft.}\right)$$

$$V = \frac{133}{12} \text{ ft}^3$$

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.

$$\text{Width} = 3 \text{ cm}$$

$$\text{Length} = 3 \text{ cm} \times 3\frac{1}{2} = \frac{21}{2} \text{ cm}$$

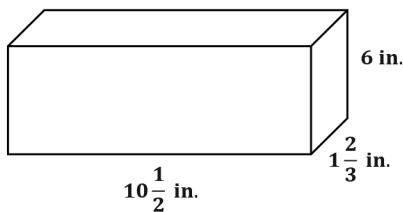
$$\text{Height} = 3 \text{ cm} \times \frac{1}{4} = \frac{3}{4} \text{ cm}$$

$$V = lwh$$

$$V = \left(\frac{21}{2} \text{ cm}\right)(3 \text{ cm})\left(\frac{3}{4} \text{ cm}\right)$$

$$V = \frac{189}{8} \text{ cm}^3$$

4.



- a. Write numerical expressions to represent the volume in two different ways, and explain what each reveals.

$\left(10\frac{1}{2} \text{ in.}\right)\left(1\frac{2}{3} \text{ in.}\right)(6 \text{ in.})$  represents the product of three edge lengths.  $\left(\frac{35}{2} \text{ in}^2\right)(6 \text{ in.})$  represents the product of the base area times the height. Answers will vary.

- b. Determine the volume of the rectangular prism.

$$\left(10\frac{1}{2} \text{ in.}\right)\left(1\frac{2}{3} \text{ in.}\right)(6 \text{ in.}) = 105 \text{ in}^3 \text{ or } \left(\frac{35}{2} \text{ in}^2\right)(6 \text{ in.}) = 105 \text{ in}^3$$

5. An aquarium in the shape of a rectangular prism has the following dimensions: length = 50 cm, width =  $5\frac{1}{2}$  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.

$(50 \text{ cm})\left(25\frac{1}{2} \text{ cm}\right)\left(30\frac{1}{2} \text{ cm}\right)$  represents the product of the three edge lengths.

$(1275 \text{ cm}^2)\left(30\frac{1}{2} \text{ cm}\right)$  represents the base area times the height.

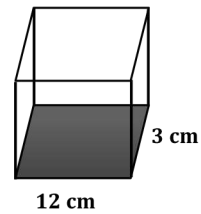
- b. Determine the volume of the rectangular prism.

$$(1275 \text{ cm}^2)\left(30\frac{1}{2} \text{ cm}\right) = 38887\frac{1}{2} \text{ cm}^3$$

6. The area of the base in this rectangular prism is fixed at  $36 \text{ cm}^2$ . 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
1	36
2	72
3	108
4	144
5	180
6	216
7	252
8	288



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

*Let  $x$  be the height of the rectangular prism in centimeters.*

*Let  $y$  be the volume of the rectangular prism in cubic centimeters.*

$$36x = y$$

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

*The unit rate is 36.*

*For every centimeter of height, the volume increases by  $36 \text{ cm}^3$  because the area of the base is  $36 \text{ cm}^2$ . In order to determine the volume, multiply the height by 36.*

7. The volume of a rectangular prism is  $16.328 \text{ cm}^3$ . The height is  $3.14 \text{ cm}$ .

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.

$$16.328 = 3.14B$$

b. Solve the equation for  $B$ .

$$\frac{16.328}{3.14} = \frac{3.14B}{3.14}$$

$$B = 5.2$$

*The area of the base is  $5.2 \text{ cm}^2$ .*