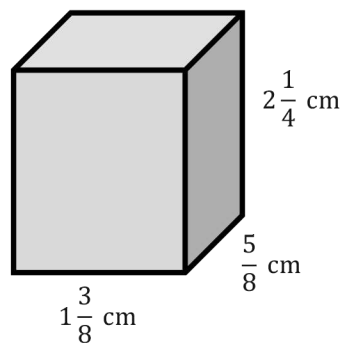


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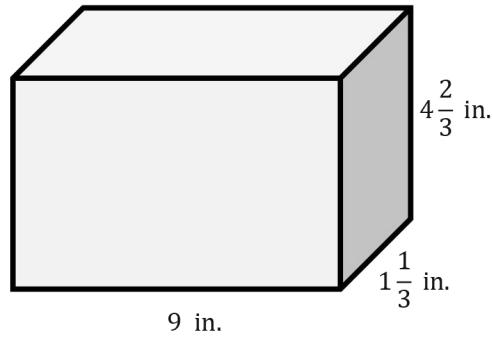
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Volume with Fractional Edge Lengths and Unit Cubes

Calculate the volume of the rectangular prism using two different methods. Label your solutions Method 1 and Method 2.

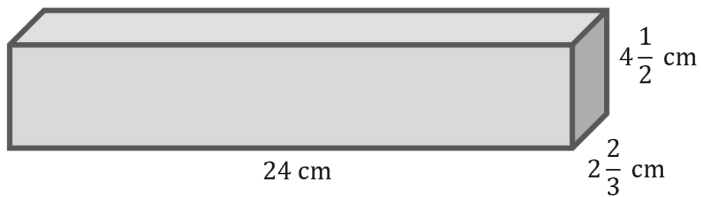


1. Answer the following questions using this rectangular prism:

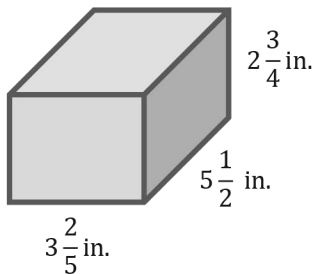


- a. What is the volume of the prism?
- b. Linda fills the rectangular prism with cubes that have side lengths of $\frac{1}{3}$ in. How many cubes does she need to fill the rectangular prism?
- c. How is the number of cubes related to the volume?
- d. Why is the number of cubes needed different than the volume?
- e. Should Linda try to fill this rectangular prism with cubes that are $\frac{1}{2}$ in. long on each side? Why or why not?
2. Calculate the volume of the following prisms.

a.



b.



3. A rectangular prism with a volume of 12 cubic units is filled with cubes. First, it is filled with cubes with $\frac{1}{2}$ -unit side lengths. Then, it is filled with cubes with $\frac{1}{3}$ -unit side lengths.
- How many more of the cubes with $\frac{1}{3}$ -unit side lengths than cubes with $\frac{1}{2}$ -unit side lengths will be needed to fill the prism?
 - Finally, the prism is filled with cubes whose side lengths are $\frac{1}{4}$ unit. How many $\frac{1}{4}$ -unit cubes would it take to fill the prism?
4. A toy company is packaging its toys to be shipped. Some of the toys are placed inside a cube-shaped box with side lengths of $3\frac{1}{2}$ in. These boxes are then packed into a shipping box with dimensions of 14 in. \times 7 in. \times $3\frac{1}{2}$ in.
- How many toys can be packed into the larger box for shipping?
 - Use the number of toys that can be shipped in the box to help determine the volume of the box.
5. A rectangular prism has a volume of 34.224 cubic meters. The height of the box is 3.1 meters, and the length is 2.4 meters.
- Write an equation that relates the volume to the length, width, and height. Let w represent the width, in meters.
 - Solve the equation.

Calculate the volume of the rectangular prism using two different methods. Label your solutions Method 1 and Method 2.

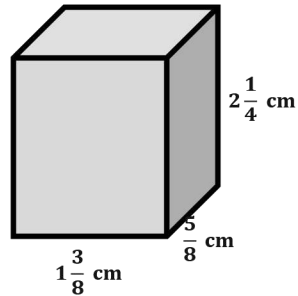
Method 1:

$$V = lwh$$

$$V = \left(1\frac{3}{8} \text{ cm}\right)\left(\frac{5}{8} \text{ cm}\right)\left(2\frac{1}{4} \text{ cm}\right)$$

$$V = \frac{11}{8} \text{ cm} \times \frac{5}{8} \text{ cm} \times \frac{9}{4} \text{ cm}$$

$$V = \frac{495}{256} \text{ cm}^3$$



Method 2:

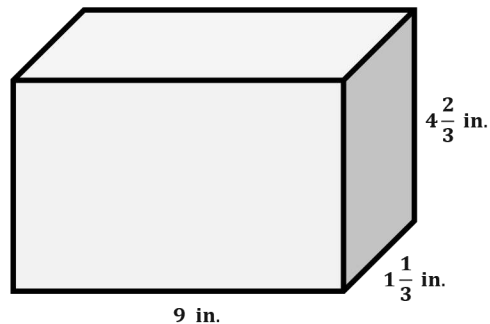
Fill shape with $\frac{1}{8}$ cm cubes.

$$11 \times 5 \times 18 = 990 \text{ cubes}$$

Each cube has a volume of $\frac{1}{8} \text{ cm} \times \frac{1}{8} \text{ cm} \times \frac{1}{8} \text{ cm} = \frac{1}{512} \text{ cm}^3$.

$$V = 990 \times \frac{1}{512} \text{ cm}^3 = \frac{990}{512} \text{ cm}^3 = \frac{495}{256} \text{ cm}^3$$

1. Answer the following questions using this rectangular prism:



a. What is the volume of the prism?

$$V = lwh$$

$$V = (9 \text{ in.})\left(1\frac{1}{3} \text{ in.}\right)\left(4\frac{2}{3} \text{ in.}\right)$$

$$V = \left(\frac{9}{1} \text{ in.}\right)\left(\frac{4}{3} \text{ in.}\right)\left(\frac{14}{3} \text{ in.}\right)$$

$$V = \frac{504}{9} \text{ in}^3$$

$$V = 56 \text{ in}^3$$

- b. Linda fills the rectangular prism with cubes that have side lengths of $\frac{1}{3}$ in. How many cubes does she need to fill the rectangular prism?

She would need 27 across by 4 wide and 14 high.

$$\text{Number of cubes} = 27 \times 4 \times 14$$

$$\text{Number of cubes} = 1,512 \text{ cubes with } \frac{1}{3} \text{ in. side lengths}$$

- c. How is the number of cubes related to the volume?

$$56 \times 27 = 1512$$

The number of cubes needed is 27 times larger than the volume.

- d. Why is the number of cubes needed different from the volume?

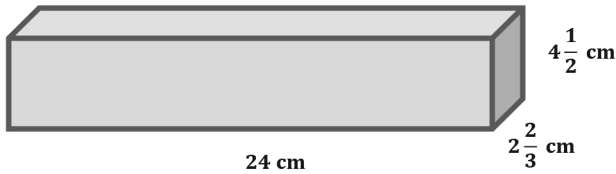
Because the cubes are not each 1 in., the volume is different from the number of cubes. However, I could multiply the number of cubes by the volume of one cube and still get the original volume.

- e. Should Linda try to fill this rectangular prism with cubes that are $\frac{1}{2}$ in. long on each side? Why or why not?

Because some of the lengths are $\frac{1}{3}$ and some are $\frac{2}{3}$, it would be difficult to use side lengths of $\frac{1}{2}$ to fill the prism.

2. Calculate the volume of the following prisms.

a.



$$V = lwh$$

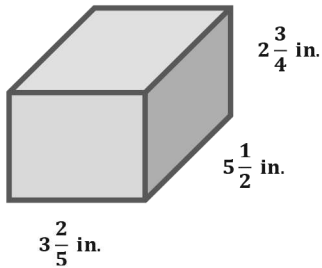
$$V = (24 \text{ cm}) \left(2\frac{2}{3} \text{ cm}\right) \left(4\frac{1}{2} \text{ cm}\right)$$

$$V = (24 \text{ cm}) \left(\frac{8}{3} \text{ cm}\right) \left(\frac{9}{2} \text{ cm}\right)$$

$$V = \frac{1,728}{6} \text{ cm}^3$$

$$V = 288 \text{ cm}^3$$

b.



$$V = lwh$$

$$V = \left(3\frac{2}{5} \text{ in.}\right) \left(5\frac{1}{2} \text{ in.}\right) \left(2\frac{3}{4} \text{ in.}\right)$$

$$V = \left(\frac{17}{5} \text{ in.}\right) \left(\frac{11}{2} \text{ in.}\right) \left(\frac{11}{4} \text{ in.}\right)$$

$$V = \frac{2057}{40} \text{ in}^3$$

$$V = 51\frac{17}{40} \text{ in}^3$$

3. A rectangular prism with a volume of 12 cubic units is filled with cubes. First, it is filled with cubes with $\frac{1}{2}$ unit side lengths. Then, it is filled with cubes with $\frac{1}{3}$ unit side lengths.

- a. How many more of the cubes with $\frac{1}{3}$ unit side lengths than cubes with $\frac{1}{2}$ unit side lengths will be needed to fill the prism?

There are 8 cubes with $\frac{1}{2}$ -unit side lengths in 1 cubic unit because the volume of one cube is $\frac{1}{8}$ cubic units.

Since we have 12 cubic units, we would have $12 \times 8 = 96$ total cubes with $\frac{1}{2}$ -unit side lengths.

There are 27 cubes with $\frac{1}{3}$ -unit side lengths in 1 cubic unit because the volume of one cube is $\frac{1}{27}$ cubic units.

Since we have 12 cubic units, we would have $12 \times 27 = 324$ total cubes with $\frac{1}{3}$ -unit side lengths.

$$324 - 96 = 228 \text{ more cubes}$$

- b. Finally, the prism is filled with cubes whose side lengths are $\frac{1}{4}$ unit. How many $\frac{1}{4}$ unit cubes would it take to fill the prism?

There are 64 cubes with $\frac{1}{4}$ -unit side lengths in 1 cubic unit because the volume of one cube is $\frac{1}{64}$ cubic units.

Since there are 12 cubic units, we would have $12 \times 64 = 768$ total cubes with side lengths of $\frac{1}{4}$ unit.

4. A toy company is packaging its toys to be shipped. Some of the toys are placed inside a cube-shaped box with side lengths of $3\frac{1}{2}$ in. These boxes are then packed into a shipping box with dimensions of 14 in. \times 7 in. \times $3\frac{1}{2}$ in.

- a. How many toys can be packed into the larger box for shipping?

$$4 \times 2 \times 1 = 8 \text{ toys}$$

- b. Use the number of toys that can be shipped in the box to help determine the volume of the box.

One small box would have a volume of $3\frac{1}{2}$ in. \times $3\frac{1}{2}$ in. \times $3\frac{1}{2}$ in. = $42\frac{7}{8}$ in³.

Now, I will multiply the number of cubes by the volume of the cube. $8 \times 42\frac{7}{8}$ in³ = 343 in³

5. A rectangular prism has a volume of 34.224 cubic meters. The height of the box is 3.1 meters, and the length is 2.4 meters.

- a. Write an equation that relates the volume to the length, width, and height. Let w represent the width, in meters.

$$34.224 = (3.1)(2.4)w$$

- b. Solve the equation.

$$34.224 = 7.44w$$

$$w = 4.6$$

The width is 4.6 m.