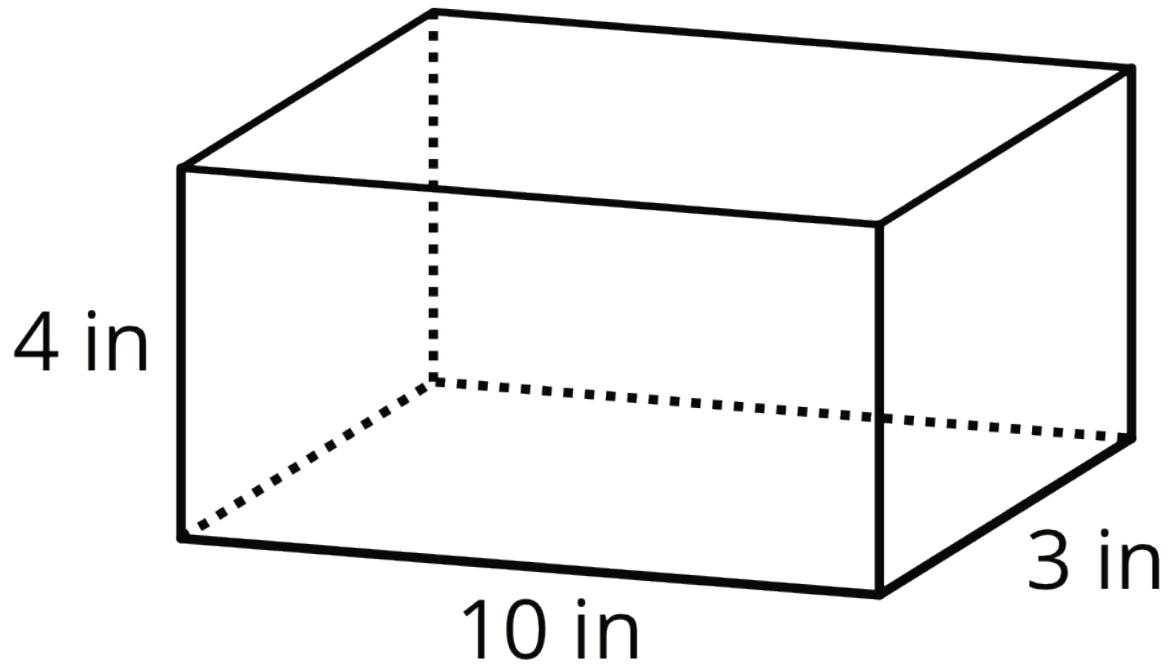


## Unit 3 Lesson 11: Volume of Prisms

### 1 A Box of Cubes (Warm up)

#### Student Task Statement

1. How many cubes with an edge length of 1 inch fill this box?



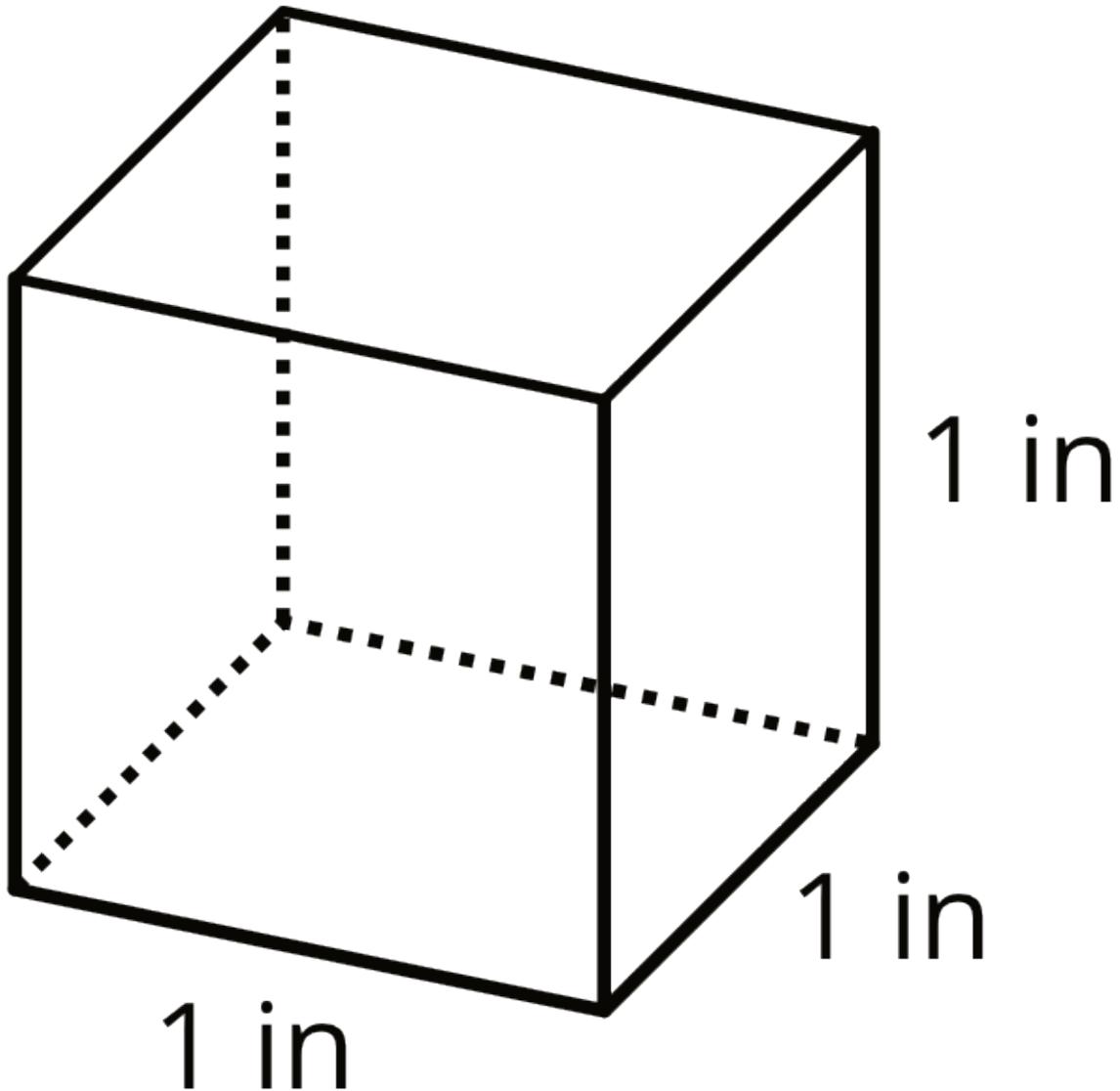
2. If the cubes had an edge length of 2 inches, would you need more or fewer cubes to fill the box? Explain your reasoning.
3. If the cubes had an edge length of  $\frac{1}{2}$  inch, would you need more or fewer cubes to fill the box? Explain your reasoning.

## 2 Volumes of Cubes and Prisms

### Student Task Statement

Your teacher will give you cubes that have edge lengths of  $\frac{1}{2}$  inch.

1. Here is a drawing of a cube with edge lengths of 1 inch.



- a. How many cubes with edge lengths of  $\frac{1}{2}$  inch are needed to fill this cube?
  - b. What is the volume, in cubic inches, of a cube with edge lengths of  $\frac{1}{2}$  inch? Explain or show your reasoning.
2. Four cubes are piled in a single stack to make a prism. Each cube has an edge length of  $\frac{1}{2}$  inch. Sketch the prism, and find its volume in cubic inches.

3. Use cubes with an edge length of  $\frac{1}{2}$  inch to build prisms with the lengths, widths, and heights shown in the table.

a. For each prism, record in the table how many  $\frac{1}{2}$ -inch cubes can be packed into the prism and the volume of the prism.

prism length (in)	prism width (in)	prism height (in)	number of $\frac{1}{2}$ -inch cubes in prism	volume of prism (in <sup>3</sup> )
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$		
1	1	$\frac{1}{2}$		
2	1	$\frac{1}{2}$		
2	2	1		
4	2	$\frac{3}{2}$		
5	4	2		
5	4	$2\frac{1}{2}$		

b. Examine the values in the table. What do you notice about the relationship between the edge lengths of each prism and its volume?

4. What is the volume of a rectangular prism that is  $1\frac{1}{2}$  inches by  $2\frac{1}{4}$  inches by 4 inches? Show your reasoning.

### 3 Cubes with Fractional Edge Lengths

#### Student Task Statement

1. Diego says that 108 cubes with an edge length of  $\frac{1}{3}$  inch are needed to fill a rectangular prism that is 3 inches by 1 inch by  $1\frac{1}{3}$  inch.
  - a. Explain or show how this is true. If you get stuck, consider drawing a diagram.
  - b. What is the volume, in cubic inches, of the rectangular prism? Explain or show your reasoning.
2. Lin and Noah are packing small cubes into a larger cube with an edge length of  $1\frac{1}{2}$  inches. Lin is using cubes with an edge length of  $\frac{1}{2}$  inch, and Noah is using cubes with an edge length of  $\frac{1}{4}$  inch.
  - a. Who would need more cubes to fill the  $1\frac{1}{2}$ -inch cube? Be prepared to explain your reasoning.
  - b. If Lin and Noah each use their small cubes to find the volume of the larger  $1\frac{1}{2}$ -inch cube, will they get the same answer? Explain or show your reasoning.

## 4 Fish Tank and Baking Pan (Optional)

### Student Task Statement

1. A nature center has a fish tank in the shape of a rectangular prism. The tank is 10 feet long,  $8\frac{1}{4}$  feet wide, and 6 feet tall.

- a. What is the volume of the tank in cubic feet? Explain or show your reasoning.



- b. The nature center's caretaker filled  $\frac{4}{5}$  of the tank with water. What was the volume of the water in the tank, in cubic feet? What was the height of the water in the tank? Explain or show your reasoning.
- c. Another day, the tank was filled with 330 cubic feet of water. The height of the water was what fraction of the height of the tank? Show your reasoning.

2. Clare's recipe for banana bread won't fit in her favorite pan. The pan is  $8\frac{1}{2}$  inches by 11 inches by 2 inches. The batter fills the pan to the very top, and when baking, the batter spills over the sides. To avoid spills, there should be about an inch between the top of the batter and the rim of the pan.

Clare has another pan that is 9 inches by 9 inches by  $2\frac{1}{2}$  inches. If she uses this pan, will the batter spill over during baking?