

7.6 Finding Dimensions of Prisms

Essential Question How can you use a volume formula to find missing dimensions of prisms?

1 ACTIVITY: Finding Missing Dimensions

Work with a partner. Solve the equation for x .

a. Volume: $264 = 24x$



b. Volume: $162 = 18x$



c. Volume: $45 = 9x$



d. Volume: $12 = 8x$



e. Volume: $288 = 48x$



2 ACTIVITY: Finding Dimensions

Work with a partner. Is there enough information given to estimate the volume of each building? If not, explain why. If there is enough information, estimate the volume of the building.



Republic Plaza
Denver, CO
56 Stories: 714 ft
1,340,000 ft² floor space



Seagram Building
New York, NY
38 Stories: 515 ft
820,000 ft² floor space



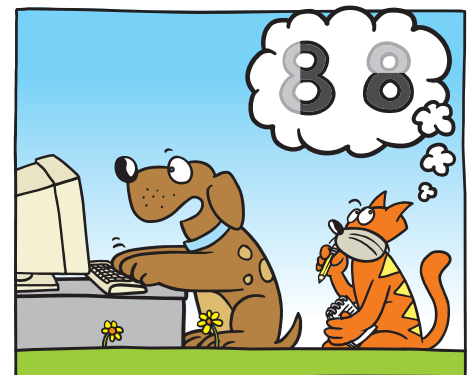
Espirito Santo Plaza
Miami, FL
37 Stories: 483 ft
750,000 ft² floor space

What Is Your Answer?

3. **IN YOUR OWN WORDS** How can you use a volume formula to find missing dimensions of prisms?
4. Design a skyscraper that will be 10% taller than one of the skyscrapers in Activity 2. Find its volume.



"Dear Sir. The question 'How much is half of 8?' is confusing."



"If you mean up and down, the answer is 3. If you mean sideways, the answer is 0."

Practice

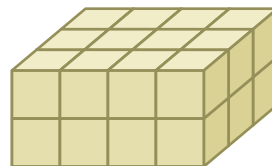
Use what you learned about finding dimensions of prisms to complete Exercises 9–11 on page 316.

EXAMPLE 1 Counting Cubes

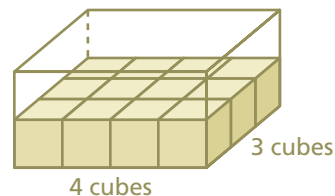
Key Vocabulary

rectangular prism,
p. 314
volume, p. 314
cubic units, p. 314

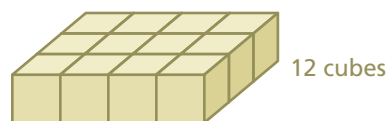
How many cubes do you need to fill the box?



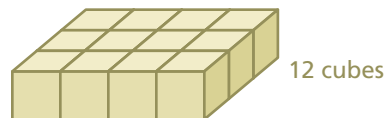
The bottom layer of the box is 4 cubes long and 3 cubes wide. So, you need 4×3 , or 12 cubes to cover the bottom layer.



To fill the box, you need two layers of 12 cubes.



So, you need $2 \times 12 = 24$ cubes to fill the box.

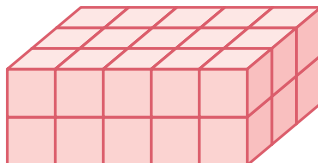


On Your Own

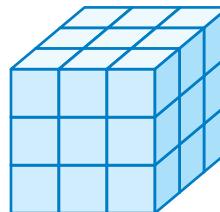
Find the number of cubes it takes to fill the box.

Now You're Ready
Exercises 3–5

1.



2.



Remember

A three-dimensional figure has length, width, and height.

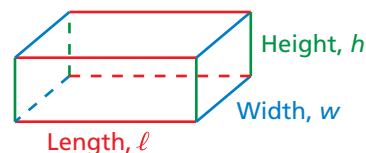
A **rectangular prism** is a three-dimensional figure that has six rectangular sides. The **volume** of a prism is a measure of the amount of space that it occupies. Volume is measured in **cubic units**.

Key Idea

Volume of a Rectangular Prism

Words The volume V of a rectangular prism is the product of its length ℓ , width w , and height h .

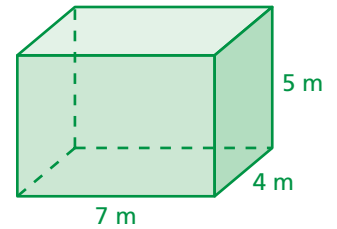
Algebra $V = \ell wh$



EXAMPLE 2 Finding the Volume of a Rectangular Prism

Find the volume of the rectangular prism.

$$\begin{aligned} V &= \ell wh && \text{Write formula for volume.} \\ &= 7(4)(5) && \text{Substitute values.} \\ &= 140 && \text{Multiply.} \end{aligned}$$



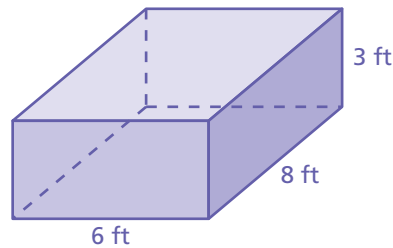
∴ The volume is 140 cubic meters.

On Your Own

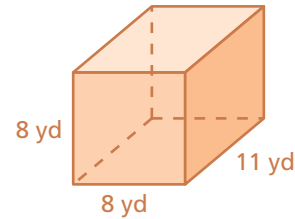
Now You're Ready
Exercises 6–8

Find the volume of the rectangular prism.

3.



4.



EXAMPLE 3 Finding a Missing Dimension of a Rectangular Prism

Write and solve an equation to find the height of the computer tower.



$$\text{Volume} = 1792 \text{ in.}^3$$

$$\begin{aligned} V &= \ell wh && \text{Write formula for volume.} \\ 1792 &= 7(16)h && \text{Substitute 1792 for } V, 7 \text{ for } \ell, \text{ and } 16 \text{ for } w. \\ 1792 &= 112h && \text{Simplify.} \\ \frac{1792}{112} &= \frac{112h}{112} && \text{Divide each side by 112.} \\ 16 &= h && \text{Simplify.} \end{aligned}$$

∴ The height is 16 inches.

On Your Own

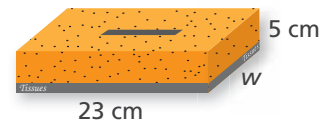
Now You're Ready
Exercises 9–13

Find the missing dimension of the rectangular prism.

5. Volume = 72 in.^3



6. Volume = 1380 cm^3



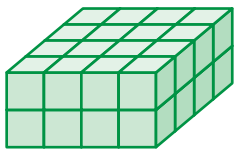
Vocabulary and Concept Check

- VOCABULARY** What types of units are used to describe volume?
- VOCABULARY** What types of units are used to describe area?

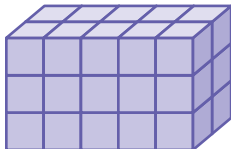
Practice and Problem Solving

Find the number of cubes it takes to fill the box.

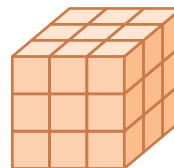
1 3.



4.

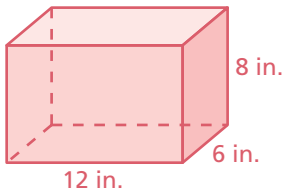


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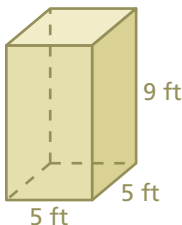


Find the volume of the rectangular prism.

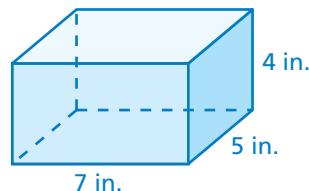
2 6.



7.



8.



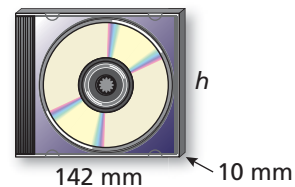
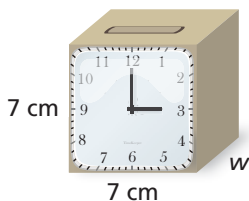
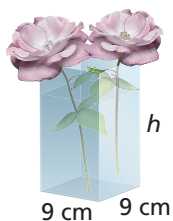
Write and solve an equation to find the missing dimension of the rectangular prism.

3 9.

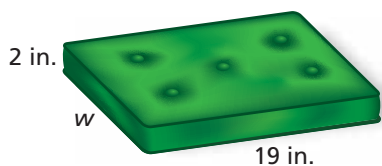
Volume = 1620 cm^3

10. Volume = 220.5 cm^3

11. Volume = $177,500 \text{ mm}^3$



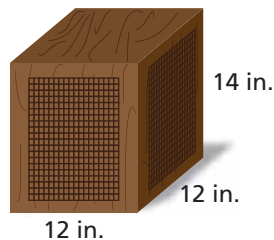
12. Volume = 646 in.^3



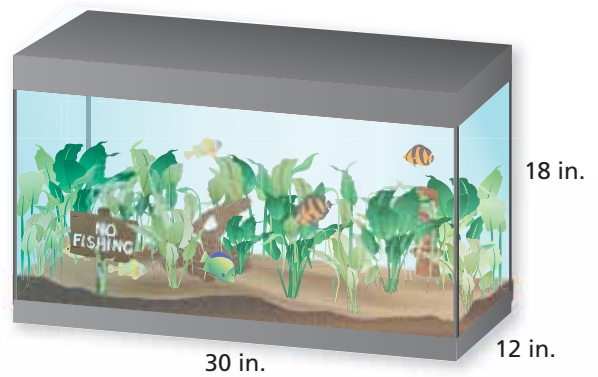
13. Volume = 936 in.^3



14. **BUG TRAP** What is the volume of the trap used to collect bugs?



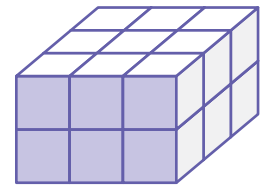
15. **CUBE** How many 1-centimeter cubes are needed to create a cube with a side length of 6 centimeters?
16. **FISH TANK** The fish tank is 80% full. After adding stones to the bottom of the tank, the tank is 92% full. What is the volume of the stones?



17. **RESEARCH** Use the Internet or some other resource to estimate the sizes of the seashells in the shadow box.

- Draw a box that will hold all of the shells.
- Find the volume of your box.

18. **GEOMETRY** The area of the shaded face is 96 square centimeters. What is the volume of the rectangular prism?



19. **FOOD STORAGE**

- Estimate the amount of macaroni and cheese left in the casserole.
- Will the macaroni and cheese fit in the storage container? Explain your reasoning.



20. **Critical Thinking** The outside dimensions of a rectangular cooler without its top are 26 inches by 14 inches by 16 inches. The cooler is 2 inches thick. What is the volume inside the cooler?



Fair Game Review what you learned in previous grades & lessons

Tell whether the given value is a solution of the equation.

21. $x + 17 = 24$; $x = 7$

22. $6x = 72$; $x = 13$

23. $x - 19 = 42$; $x = 21$

24. **MULTIPLE CHOICE** What is the area of the semicircular region?

(A) 127.17 ft^2

(B) 254.34 ft^2

(C) 506.68 ft^2

(D) 1017.36 ft^2

