

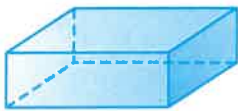
Volume of Prisms

Vocabulary Start-Up



Recall that a prism is a polyhedron with two parallel, congruent bases. The bases of a *rectangular prism* are rectangles, and the bases of a *triangular prism* are triangles.

Write *rectangular prism* or *triangular prism* on the line below each figure.





Essential Question

HOW do measurements help you describe real-world objects?

Vocabulary

volume

Common Core State Standards

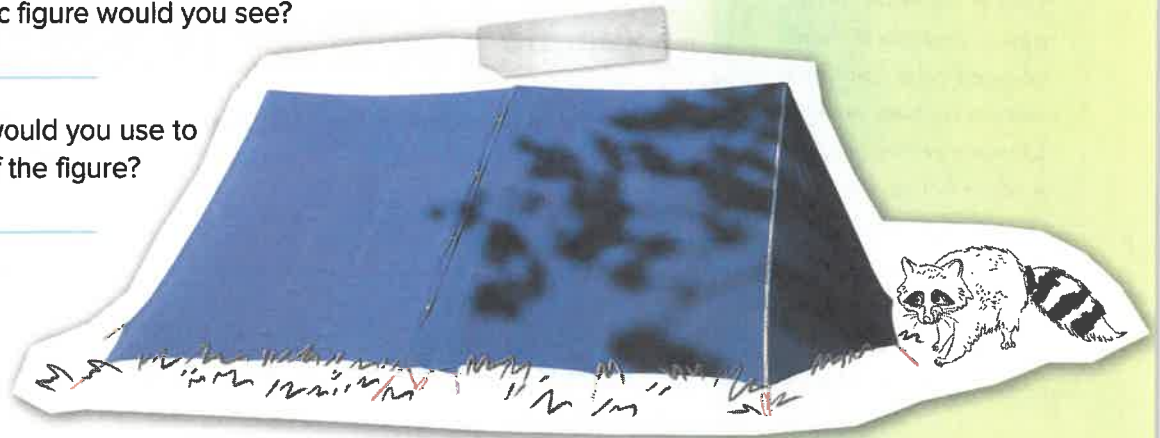
Content Standards
7.G.6

MP Mathematical Practices
1, 2, 3, 4

Real-World Link

- Suppose you observed the camping tent shown from directly above. What geometric figure would you see?

- What formula would you use to find the area of the figure?



Which **MP** Mathematical Practices did you use?
Shade the circle(s) that applies.

- | | |
|--|---|
| <input type="checkbox"/> 1 Persevere with Problems | <input type="checkbox"/> 5 Use Math Tools |
| <input type="checkbox"/> 2 Reason Abstractly | <input type="checkbox"/> 6 Attend to Precision |
| <input type="checkbox"/> 3 Construct an Argument | <input type="checkbox"/> 7 Make Use of Structure |
| <input type="checkbox"/> 4 Model with Mathematics | <input type="checkbox"/> 8 Use Repeated Reasoning |

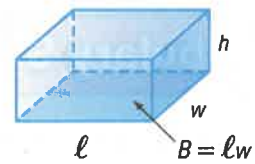
Key Concept

Volume of a Rectangular Prism

Work Zone

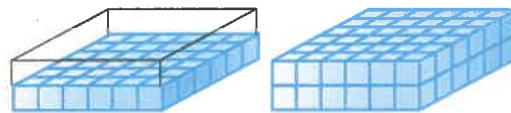
Words The volume V of a rectangular prism is the product of the length ℓ , the width w , and the height h . It is also the area of the base B times the height h .

Model



Symbols $V = lwh$ or $V = Bh$

The **volume** of a three-dimensional figure is the measure of space it occupies. It is measured in cubic units such as cubic centimeters (cm^3) or cubic inches (in^3).



It takes 2 layers of 36 cubes to fill the box. So, the volume of the box is 72 cubic centimeters.

Decomposing Figures

Think of the volume of the prism as consisting of three congruent slices. Each slice contains the base area, 20 square centimeters, and a height of 1 centimeter.



Show your work.

a. _____

Example



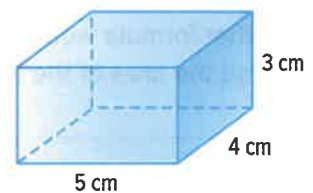
- Find the volume of the rectangular prism.

$$V = lwh \quad \text{Volume of a prism}$$

$$V = 5 \cdot 4 \cdot 3 \quad \ell = 5, w = 4, \text{ and } h = 3$$

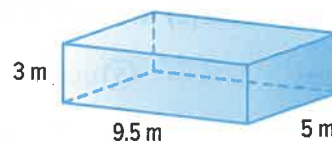
$$V = 60 \quad \text{Multiply.}$$

The volume is 60 cubic centimeters or 60 cm^3 .



Got it? Do this problem to find out.

- Find the volume of the rectangular prism shown below.

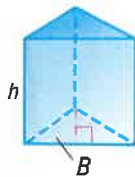


Volume of a Triangular Prism

Key Concept

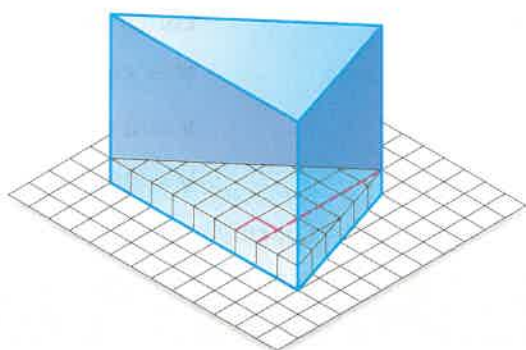
Words The volume V of a triangular prism is the area of the base B times the height h .

Model



Symbols $V = Bh$, where B is the area of the base.

The diagram below shows that the volume of a triangular prism is also the product of the area of the base B and the height h of the prism.



Height

Do not confuse the height of the triangular base with the height of the prism.

Example



2. Find the volume of the triangular prism shown.

The area of the triangle is $\frac{1}{2} \cdot 6 \cdot 8$, so replace B with $\frac{1}{2} \cdot 6 \cdot 8$.

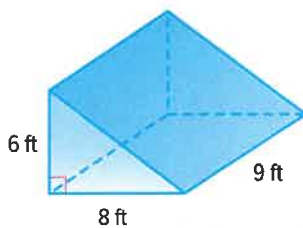
$V = Bh$ Volume of a prism

$V = \left(\frac{1}{2} \cdot 6 \cdot 8\right)h$ Replace B with $\frac{1}{2} \cdot 6 \cdot 8$.

$V = \left(\frac{1}{2} \cdot 6 \cdot 8\right)9$ The height of the prism is 9.

$V = 216$ Multiply.

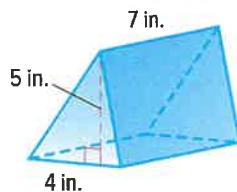
The volume is 216 cubic feet or 216 ft^3 .



Before finding the volume of a prism, identify the base. In Example 2, the base is a triangle, so you replace B with $\frac{1}{2}bh$.

Got it? Do this problem to find out.

b. Find the volume of the triangular prism.



Show your work.

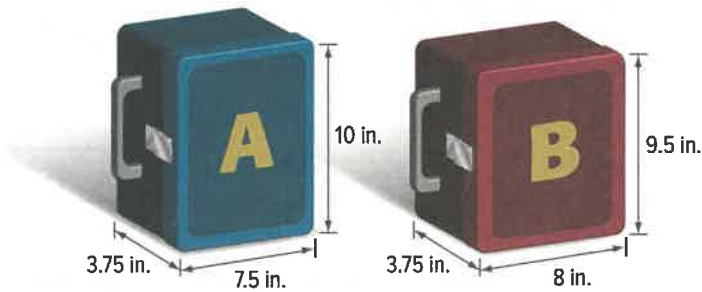
b. _____



Example



3. Which lunch box holds more food?



Find the volume of each lunch box. Then compare.

Lunch Box A

$$V = \ell wh$$

$$V = 7.5 \cdot 3.75 \cdot 10$$

$$V = 281.25 \text{ in}^3$$

Lunch Box B

$$V = \ell wh$$

$$V = 8 \cdot 3.75 \cdot 9.5$$

$$V = 285 \text{ in}^3$$

Since $285 \text{ in}^3 > 281.25 \text{ in}^3$, Lunch Box B holds more food.

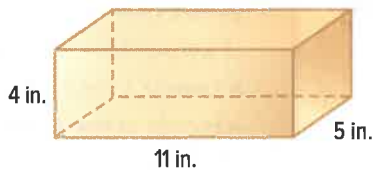
Guided Practice



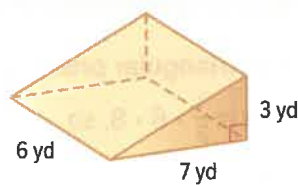
Find the volume of each prism. Round to the nearest tenth if necessary.

(Examples 1–2)

1.



2.



3. One cabinet measures 3 feet by 2.5 feet by 5 feet. A second measures 4 feet by 3.5 feet by 4.5 feet. Which volume is greater? Explain. (Example 3)

4. **Building on the Essential Question** Compare and contrast finding the volume of a rectangular prism and a triangular prism.

Rate Yourself!

How confident are you about finding volume for prisms? Check the box that applies.



For more help, go online to access a Personal Tutor.



FOLDABLES Time to update your Foldable!

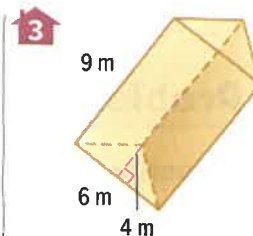
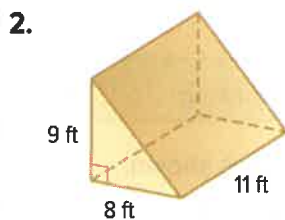
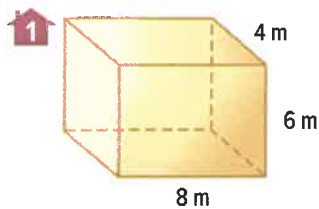
Independent Practice

Go online for Step-by-Step Solutions



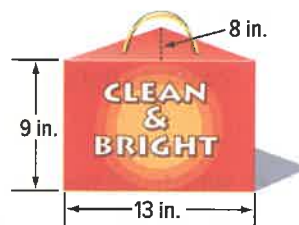
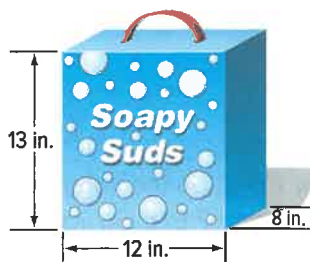
Find the volume of each prism. Round to the nearest tenth if necessary.

(Examples 1–2)



Show your work.

4. Which container holds more detergent? Justify your answer. (Example 3)



5. **MP Model with Mathematics** Refer to the graphic novel frame below. The table shows possible dimensions for the dunk tank.

Length(ft)	Width(ft)	Height(ft)	Surface Area(ft ²)
2	12	4	136
4	4	8	144
4	7	6	160
8	5	4	144
10	4	3	124

a. Find the volume of each given dunk tank.

b. Which dimensions are reasonable for a dunk tank? Explain.

6. The diagram shows the dimensions of an office. It costs about \$0.11 per year to air condition one cubic foot of space. On average, how much does it cost to air condition the office for one month? _____



H.O.T. Problems Higher Order Thinking

7. **MP Reason Inductively** A rectangular prism is shown.

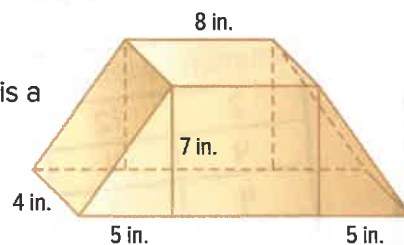


- a. Suppose the length of the prism is doubled. How does the volume change? Explain your reasoning. _____

- b. Suppose the length, width, and height are each doubled. How does the volume change? _____

- c. Which will have a greater effect on the volume of the prism: doubling the height or doubling the width? Explain your reasoning.

8. **MP Persevere with Problems** The prism shown has a base that is a trapezoid. Find the volume of the prism. _____



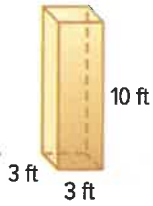
9. **MP Model with Mathematics** Find the volume of a real-world object that is in the shape of a rectangular or triangular prism using appropriate units. Draw a model of the prism including the dimensions. _____



Extra Practice

Find the volume of each prism. Round to the nearest tenth if necessary.

10.



Homework Help

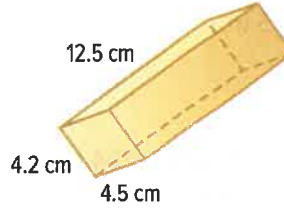
$$V = lwh$$

$$V = 3 \cdot 3 \cdot 10$$

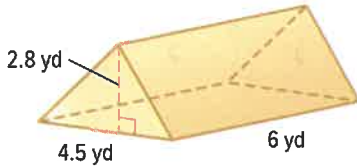
$$V = 90$$

90 ft³

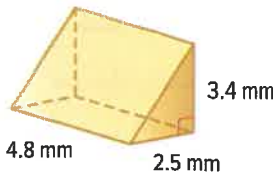
11.



12.



13.

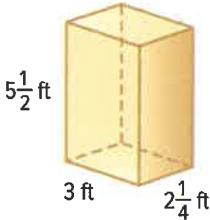


14. A toy company makes rectangular sandboxes that measure 6 feet by 5 feet by 1.2 feet. A customer buys a sandbox and 40 cubic feet of sand. Did the customer buy too much or too little sand? Justify your answer.

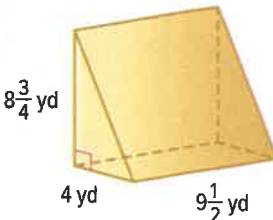
15. The base of a rectangular prism has an area of 19.4 square meters and the prism has a volume of 306.52 cubic meters. Write an equation that can be used to find the height h of the prism. Then find the height of the prism.

Find the volume of each prism.

16.



17.



18. **MP Reason Abstractly** Write a formula for finding the volume of a cube. Use an exponent and the variable s to represent the side lengths. Then use the formula to find the volume of a cube with side lengths of 7 inches.



Power Up! Common Core Test Practice

19. The volume of a paperclip box is 1.5 cubic inches. Which of the following are possible dimensions of the box? Select all that apply.

2 in. by 1.5 in. by 0.5 in.

3 in. by 0.5 in. by 1.5 in.

2 in. by 1 in. by 1 in.

3 in. by 1 in. by 0.5 in.

20. The table shows the dimensions of 4 mailing containers. Sort the containers from least to greatest volume.

Container	ℓ (ft)	w (ft)	h (ft)
A	2	2	2
B	1	3	3
C	3	4	0.5
D	3	2	0.5

	Container	Volume (ft ³)
Least		
Greatest		

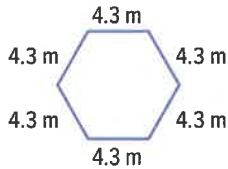
Which container has the greatest volume?



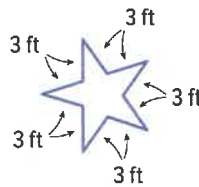
Common Core Spiral Review

Find the perimeter of each figure. **4.MD.3**

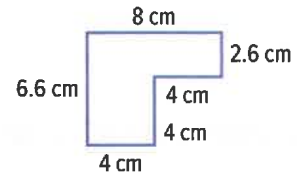
21.



22.



23.



24. Write a formula for finding the perimeter of a square. Use your formula to find the perimeter of a square with side length of 0.5 inch. **6.G.3**
