

10-7 Volume of Prisms

Warm Up

Problem of the Day

Lesson Presentation

10-7 Volume of Prisms

Warm Up

Find the area of each figure. Use 3.14 for π .

1. rectangle with base length 8 in. and height 12 in. **96 in²**
2. circle with diameter 8 ft **50.24 ft²**

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Problem of the Day

A rectangular park is bordered by a 3-foot-wide sidewalk. The park, including the sidewalk, measures 125 ft by 180 ft. What is the area of the park, not including the sidewalk?

20,706 ft²

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Learn to estimate and find the volumes of rectangular prisms and triangular prisms.

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Vocabulary

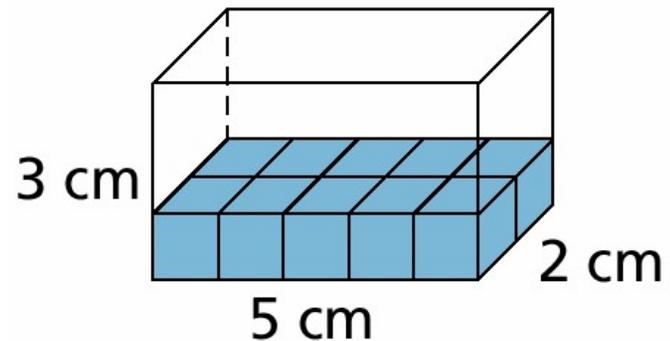
volume

10-7 Volume of Prisms

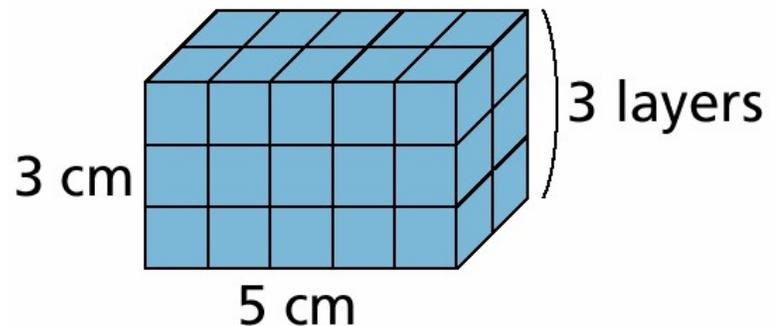
Volume is the number of cubic units needed to fill a space.

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It takes 10, or $5 \cdot 2$, centimeter cubes to cover the bottom layer of this rectangular prism.



There are 3 layers of 10 cubes each to fill the prism. It takes 30, or $5 \cdot 2 \cdot 3$, cubes.

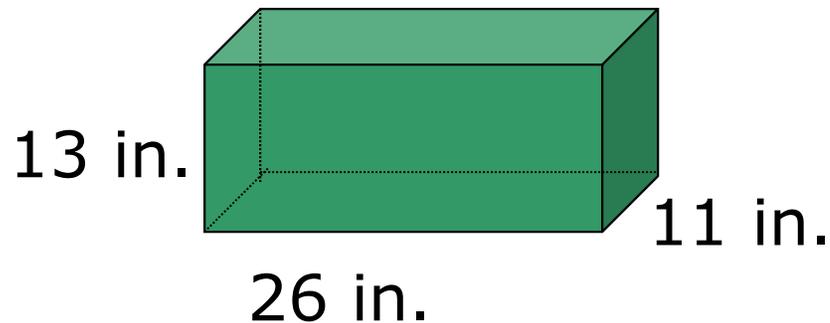


Volume is expressed in cubic units, so the volume of the prism is $5 \text{ cm} \cdot 2 \text{ cm} \cdot 3 \text{ cm} = 30 \text{ cm}^3$.

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Additional Example 1: Finding the Volume of a Rectangular Prism

Find the volume of the rectangular prism.



$$V = lwh$$

Write the formula.

$$V = 26 \cdot 11 \cdot 13$$

$$l = 26; w = 11; h = 13$$

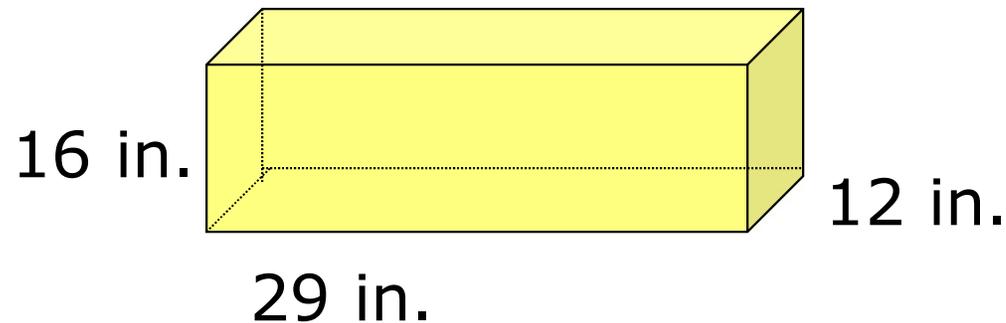
$$V = 3,718 \text{ in}^3$$

Multiply.

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Check It Out: Example 1

Find the volume of the rectangular prism.



$$V = lwh$$

Write the formula.

$$V = 29 \cdot 12 \cdot 16$$

$$l = 29; w = 12; h = 16$$

$$V = 5,568 \text{ in}^3$$

Multiply.

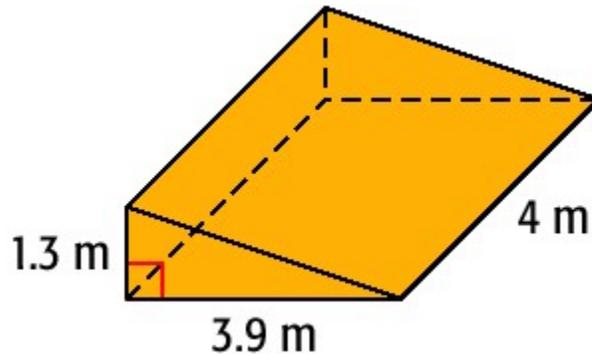
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To find the volume of any prism, you can use the formula $V = Bh$, where B is the area of the base, and h is the prism's height. So, to find the volume of a triangular prism, B is the area of the triangular base and h is the height of the prism.

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Additional Example 2A: Finding the Volume of a Triangular Prism

Find the volume of each triangular prism.



$$V = Bh$$

$$V = \left(\frac{1}{2} \cdot 3.9 \cdot 1.3\right) \cdot 4$$

$$V = 10.14 \text{ m}^3$$

Write the formula.

$$B = \frac{1}{2} \cdot 3.9 \cdot 1.3; h = 4.$$

Multiply.

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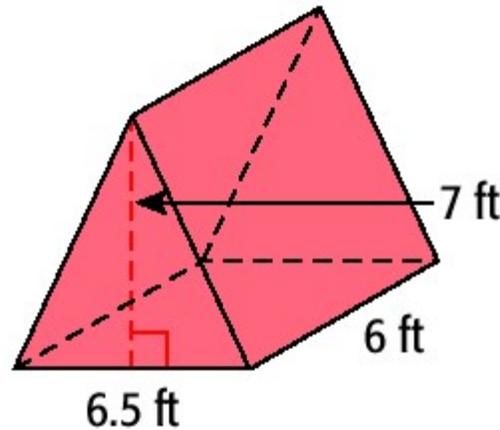
Caution!

The bases of a prism are always two congruent, parallel polygons.

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Additional Example 2B: Finding the Volume of a Triangular Prism

Find the volume of the triangular prism.



$$V = Bh$$

$$V = \left(\frac{1}{2} \cdot 6.5 \cdot 7\right) \cdot 6$$

$$V = 136.5 \text{ ft}^3$$

Write the formula.

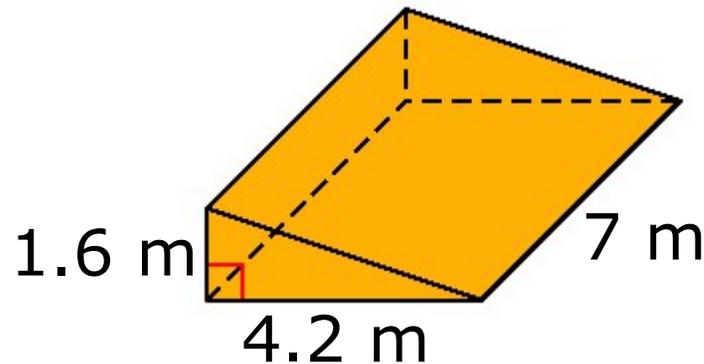
$$B = \frac{1}{2} \cdot 6.5 \cdot 7; h = 6.$$

Multiply.

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Check It Out: Example 2A

Find the volume of each triangular prism.



$$V = Bh$$

$$V = \left(\frac{1}{2} \cdot 4.2 \cdot 1.6\right) \cdot 7$$

$$V = 23.52 \text{ m}^3$$

Write the formula.

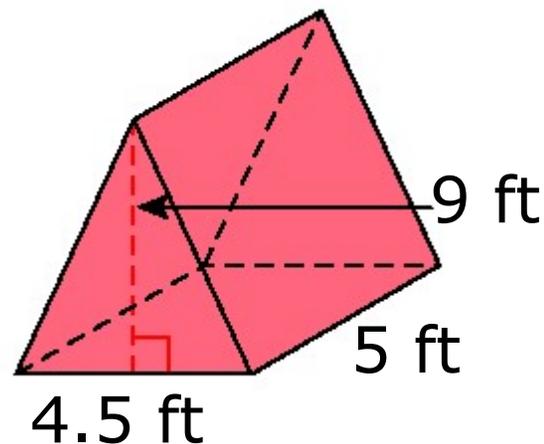
$$B = \frac{1}{2} \cdot 4.2 \cdot 1.6; h = 7.$$

Multiply.

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Check It Out: Example 2B

Find the volume of each triangular prism.



$$V = Bh$$

$$V = \left(\frac{1}{2} \cdot 4.5 \cdot 9\right) \cdot 5$$

$$V = 101.25 \text{ ft}^3$$

Write the formula.

$$B = \frac{1}{2} \cdot 4.5 \cdot 9; h = 5.$$

Multiply.

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Additional Example 3: Problem Solving Application



Suppose a facial tissue company ships 16 cubic tissue boxes in each case. What are the possible dimensions for a case of tissue boxes?



1 Understand the Problem

The **answer** will be all possible dimensions for a case of 16 cubic boxes.

List the **important information**:

- There are 16 tissue boxes in a case.
- The boxes are cubic, or square prisms.

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Additional Example 3 Continued

2

Make a Plan

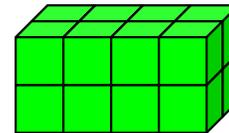
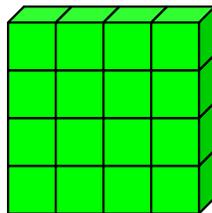
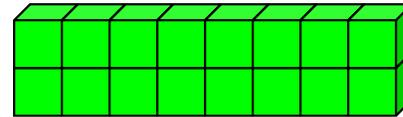
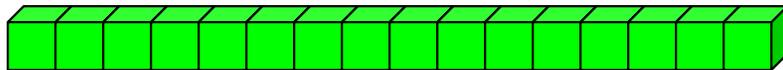
You can make models using cubes to find the possible dimensions for a case of 16 tissue boxes.

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Additional Example 3 Continued

3 Solve

You can make models using cubes to find the possible dimensions for a case of 16 cubes.



The possible dimensions for a case of 16 cubic tissue boxes are the following: $16 \times 1 \times 1$, $8 \times 2 \times 1$, $4 \times 4 \times 1$, and $4 \times 2 \times 2$.

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Additional Example 3 Continued



4 Look Back

Notice that each dimension is a factor of 16. Also, the product of the dimensions (length • width • height) is 16, showing that the volume of each case is 16 cubes.

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Check It Out: Example 3



Suppose a paper company ships 12 cubic boxes of envelopes in each case. What are the possible dimensions for a case of envelope boxes?



1 Understand the Problem

The **answer** will be all possible dimensions for a case of 12 cubic boxes.

List the **important information**:

- There are 12 envelope boxes in a case.
- The boxes are cubic, or square prisms.

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Check It Out: Example 3 Continued



2 Make a Plan

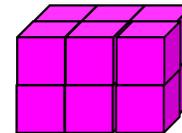
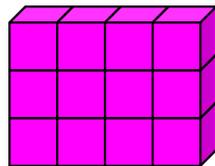
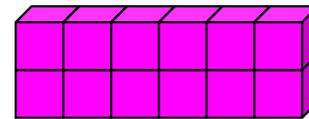
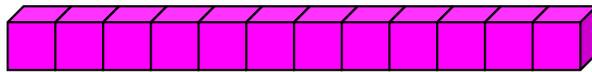
You can make models using cubes to find the possible dimensions for a case of 12 boxes of envelopes.

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Check It Out: Example 3 Continued

3 Solve

You can make models using cubes to find the possible dimensions for a case of 12 cubes.



The possible dimensions for a case of 12 cubic envelope boxes are the following: $12 \times 1 \times 1$, $6 \times 2 \times 1$, $4 \times 3 \times 1$, and $3 \times 2 \times 2$.

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Check It Out: Example 3 Continued



4 Look Back

Notice that each dimension is a factor of 12. Also, the product of the dimensions (length • width • height) is 12, showing that the volume of each case is 12 cubes.

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Lesson Quiz

Find the volume of each figure.

1. rectangular prism with length 20 cm, width 15 cm, and height 12 cm **$3,600 \text{ cm}^3$**
2. triangular prism with a height of 12 cm and a triangular base with base length 7.3 cm and height 3.5 cm **153.3 cm^3**
3. Find the volume of the figure shown
 38.13 cm^3

