

7-3**Volumes of Prisms and Cylinders**

© CONTENT STANDARDS

7.G.6

What You'll Learn

To find the volumes of prisms and cylinders

🔊 **New Vocabulary** volume, cubic unit

Why Learn This?

Many storage silos are shaped like cylinders. You can use volume formulas to find the amount of storage space inside a figure like a silo.

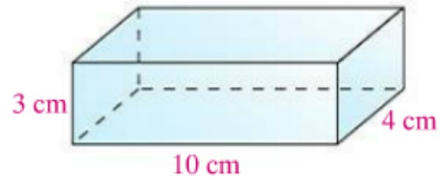


The **volume** of a three-dimensional figure is the number of cubic units needed to fill the space inside the figure.

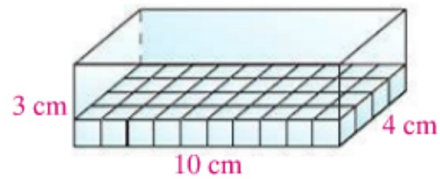
A **cubic unit** is a cube with edges one unit long. A cubic centimeter is a cube with edges one centimeter long.



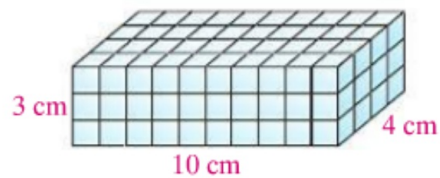
Consider filling the rectangular prism below with cubic centimeters.



The bottom layer of the prism contains $10 \cdot 4$, or 40, cubes.



Three layers of 40 cubes fit in the prism. $3 \cdot 40 = 120$



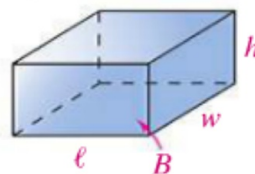
The volume of the prism is 120 cm^3 .

The previous calculation of volume suggests the following formula.

KEY CONCEPTS

Volume of a Rectangular Prism

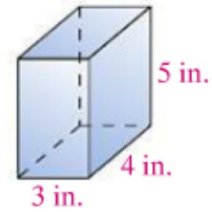
$$\begin{aligned} V &= \text{area of base} \cdot \text{height} \\ &= Bh \\ &= \ell wh \end{aligned}$$



Put this into your notes

EXAMPLE**Finding the Volume of a Rectangular Prism**

- 1 Gridded Response** Mr. Cho is building a craft box like the one shown at the right. What is the volume of the craft box in cubic inches?



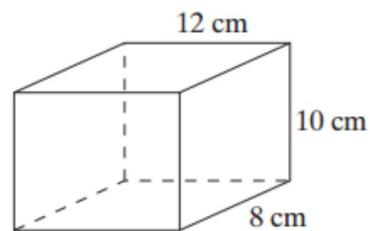
$$\begin{aligned}
 V &= \ell wh && \leftarrow \text{Use the formula.} \\
 &= (3)(4)(5) && \leftarrow \text{Substitute.} \\
 &= 60 && \leftarrow \text{Multiply.}
 \end{aligned}$$

The volume of the craft box is 60 cubic inches.

Examples

- 1 Finding the Volume of a Rectangular Prism** Find the volume of the rectangular prism.

$$\begin{aligned}
 V &= \boxed{} && \leftarrow \text{Use the formula.} \\
 &= (\boxed{})(\boxed{})(\boxed{}) && \leftarrow \text{Substitute.} \\
 &= \boxed{} && \leftarrow \text{Multiply.}
 \end{aligned}$$



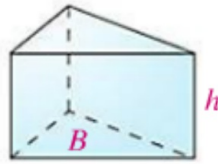
The volume of the rectangular prism is $\boxed{}$ cm^3 .

The volume formulas for rectangular and triangular prisms are similar.

KEY CONCEPTS

Volume of a Triangular Prism

$$\begin{aligned} V &= \text{area of base} \cdot \text{height} \\ &= Bh \end{aligned}$$



put this into your notes

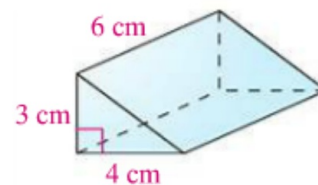
EXAMPLE

Finding the Volume of a Triangular Prism

- 2 Find the volume of the triangular prism.

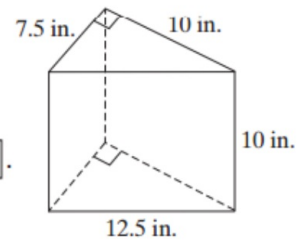
$$\begin{aligned} V &= Bh && \leftarrow \text{Use the formula.} \\ &= (6)(6) && \leftarrow \text{Substitute: } B = \frac{1}{2} \times 3 \times 4 = 6. \\ &= 36 && \leftarrow \text{Multiply.} \end{aligned}$$

The volume of the triangular prism is 36 cm^3 .



2 **Finding the Volume of a Triangular Prism** Find the volume of the triangular prism.

$$\begin{aligned} V &= Bh && \leftarrow \text{Use the formula.} \\ &= \boxed{} (10) && \leftarrow \text{Substitute } h \text{ and } B = \frac{1}{2} \times 7.5 \times \boxed{} = \boxed{}. \\ &= \boxed{} && \leftarrow \text{Multiply.} \end{aligned}$$

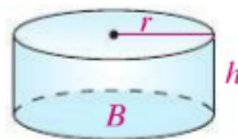


The volume of the triangular prism is cubic inches.

The volume formula for a cylinder is also similar to the volume formula for a prism.

KEY CONCEPTS Volume of a Cylinder

$$\begin{aligned} V &= \text{area of base} \cdot \text{height} \\ &= Bh \\ &= \pi r^2 h \end{aligned}$$



Put this into your notes.

EXAMPLE**Finding the Volume of a Cylinder**

- 3 Painting** Estimate the volume of the cylindrical paint can. Then find the volume to the nearest cubic unit.

**Estimate**

$$\begin{aligned}
 V &= \pi r^2 h && \leftarrow \text{Use the formula.} \\
 &\approx (3)(4)^2(9) && \leftarrow \text{Use 3 to estimate } \pi. \\
 &\approx (50)(9) && \leftarrow \text{Use 50 to estimate 48 (3} \cdot \text{16).} \\
 &\approx 450
 \end{aligned}$$

The estimated volume is 450 in.³.

Calculate

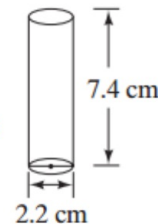
$$\begin{aligned}
 V &= \pi r^2 h && \leftarrow \text{Use the formula.} \\
 &\approx (\pi)(4)^2(9) && \leftarrow \text{Substitute.} \\
 &\approx 452.38934 && \leftarrow \text{Use a calculator.} \\
 &\approx 452 && \leftarrow \text{Round to the nearest whole number.}
 \end{aligned}$$

The calculated volume is about 452 in.³.

Check for Reasonableness The calculated volume is close to the estimated volume, so the answer is reasonable.

- 3 Finding the Volume of a Cylinder** A glass is 7.4 cm tall. The base of the glass has a diameter of 2.2 cm. Estimate the volume that the glass can hold if it is filled to the top. Then find the volume to the nearest cubic unit that the glass can hold if it is filled to the top.

$$\begin{aligned}
 V &= \boxed{} && \leftarrow \text{Use the formula.} \\
 &\approx (\boxed{})(\boxed{})^2(\boxed{}) && \leftarrow \text{Use 3 to estimate } \pi. \\
 &\approx \boxed{} \boxed{} = \boxed{} && \leftarrow \text{Use 4 to estimate 3.63 (3} \cdot \text{1.21).}
 \end{aligned}$$

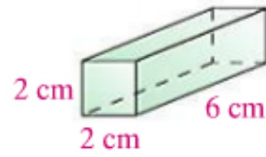
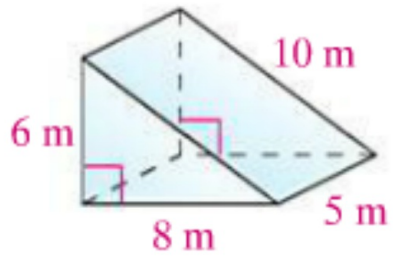


The estimated volume is $\boxed{}$ cm³.

Calculated volume: $V = \pi(\boxed{})^2(\boxed{}) \approx \boxed{}$. \leftarrow Use a calculator.

The calculated volume is about $\boxed{}$ cm³. \leftarrow Round to the nearest whole number.

Find the volume



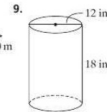
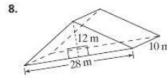
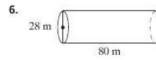
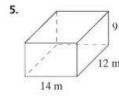
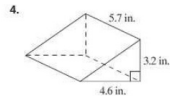
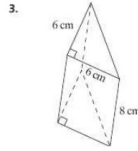
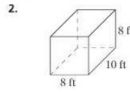
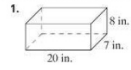
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Practice 7-3

Volumes of Prisms and Cylinders

Find each volume. Round to the nearest cubic unit.



Find the height of each rectangular prism given the volume, length, and width.

10. $V = 122,500 \text{ cm}^3$
 $l = 50 \text{ cm}$
 $w = 35 \text{ cm}$

11. $V = 22.05 \text{ ft}^3$
 $l = 3.5 \text{ ft}$
 $w = 4.2 \text{ ft}$

12. $V = 3,375 \text{ m}^3$
 $l = 15 \text{ m}$
 $w = 15 \text{ m}$