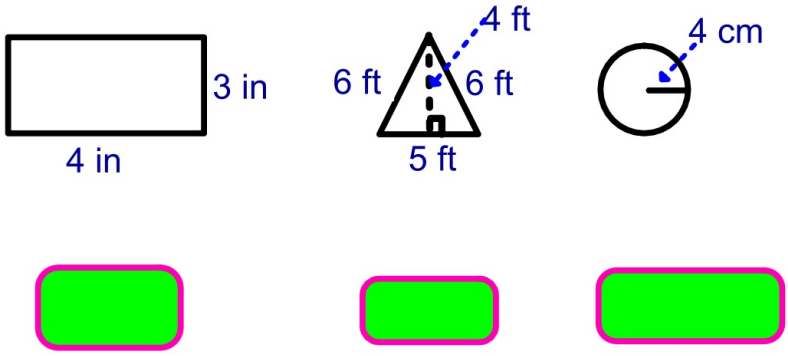
You will need to remember how to find area of these basic shapes:



9-2 Volumes of Prisms and Cylinders

CONTENT STANDARDS
8.G.7, 8.G.9

What You'll Learn

To find the volumes of prisms and cylinders

New Vocabulary volume

Why Learn This?

When you load a car, you consider the amount of space, or volume, each object occupies.

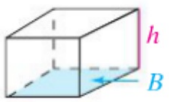
Volume is the number of unit cubes, or cubic units, needed to fill a solid. In the prism to the right, each layer has 2×4, or 8, cubes. The prism has 3 layers, so its volume is 8×3, or 24, cubic units.

Please put in your notes:

KEY CONCEPTS **Volume of a Prism**

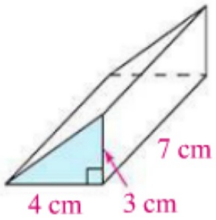
The volume V of a prism is the product of the base area B and the height h.

$$V = Bh$$



EXAMPLE Finding Volume of a Triangular Prism

1 Find the volume of the triangular prism.



Step 1 Find the base area B.

$B = \frac{1}{2}bh$ ← area of triangle

$= \frac{1}{2} \cdot 4 \cdot 3$ ← Substitute.

$= 6$ ← Multiply.

Step 2 Use the base area to find the volume.

$V = Bh$ ← volume of a prism

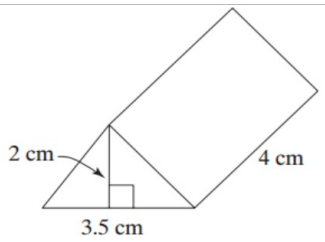
$= 6 \cdot 7$ ← Substitute.

$= 42$ ← Multiply.

The volume of the triangle is 42 cm^3.

Examples

1 **Finding Volume of a Triangular Prism** Find the volume of this prism.



Step 1 Find the area B of the base.

$B = \frac{1}{2}$ [bh] ← Use the triangle area formula.

$= \frac{1}{2} \cdot$ [3.5] $\cdot$ [2] ← Substitute 3.5 for *b*. For *h*, substitute 2, the height of the triangle.

$=$ [3.5] ← Multiply.

The area of the base is [3.5] cm^2.

Step 2 Use the base area to find the volume.

$V =$ [Bh] ← Use the prism volume formula.

$=$ [3.5] $\cdot$ [4] ← Substitute 3.5 for *B*. For *h*, substitute 4, the height of the prism.

$=$ [14] ← Multiply.

The volume of the prism is [14] cm^3.

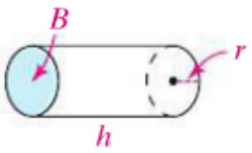
You can think of a cylinder with height h as having h layers of circles stacked on top of each other. Then the volume of the cylinder is the product of its base area and its height.

Since the bases of cylinders are circles, you can use the formula for the area of a circle to find a cylinder's base area.

KEY CONCEPTS Volume of a Cylinder

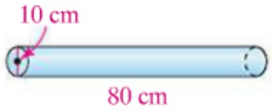
The volume V of a cylinder is the product of the base area B and the height h.

$$V = Bh$$



EXAMPLE 2 Finding the Volume of a Cylinder

Find the volume of the cylinder below to the nearest cubic centimeter.



Estimate Use 3 for π. The area of the base is about 3×5^2 cm^2, or 75 cm^2. The volume is about 75×80 cm^3, or 6,000 cm^3.

Step 1 Find the area of the base.

$$\begin{aligned} B &= \pi r^2 && \leftarrow \text{area of a circle} \\ &= \pi(5^2) && \leftarrow \text{Substitute.} \\ &= 25\pi && \leftarrow \text{Simplify.} \end{aligned}$$

Step 2 Use the base area to find the volume.

$$\begin{aligned} V &= Bh && \leftarrow \text{volume of a cylinder} \\ &= 25\pi \cdot 80 && \leftarrow \text{Substitute } 25\pi \text{ for } B \text{ and } 80 \text{ for } h. \\ &= 2{,}000\pi && \leftarrow \text{Simplify.} \\ &\approx 6283.185307 && \leftarrow \text{Use a calculator.} \end{aligned}$$

The volume of the cylinder is about 6,283 cm^3.

❷ Finding Volume of a Cylinder Find the volume of a cylindrical cake that is 5 in. tall with a diameter of 15 in. Give your answer to the nearest cubic inch.

Estimate Use 3 for π. The area of the base is about 3×64 in.^{2}, or [192] in.^{2}. The volume is about 190×5 in.^{3}, or [192] in.^{3}.

Step 1 Find the area of the base.

$B = \pi$ [r^2]

$= \pi$([7.5^2])

$=$ [56.25π]

Step 2 Use the base area to find the volume.

$V =$ [Bh]

$=$ [56.25π] $\cdot 5$

$\approx$ [883.5729338]

← Substitute. →

← Simplify. →

The base area is [56.25π] in.^{2}.

The volume of the cylindrical cake is about [884] in.^{3}.

Check for Reasonableness The answer [884] is close to the estimate of [950]. The answer is reasonable.

More Than One Way

Find the volume of a cylinder with a radius of 3 m and a height of 8 m.

Jasmine's Method

I can first find base area B. Then I can multiply by the height h.

$B = \pi r^2$ ← area of a circle

$= \pi(3^2)$ ← Substitute.

$= 9\pi$ ← Simplify.

$V = Bh$ ← volume of a prism

$= 9\pi \cdot 8$ ← Substitute 9π for B and 8 for h.

$= 72\pi$ ← Multiply.

≈ 226.1946711 ← Use a calculator.

The volume is about 226 m^3.

Kevin's Method

I can find the volume by combining formulas first.

$V = Bh$ ← volume of a prism

$= \pi r^2 h$ ← Use πr^2 for B.

$= \pi(3^2)(8)$ ← Substitute 3 for r and 8 for h.

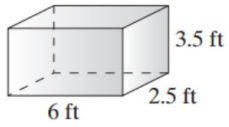
$= 72\pi$ ← Simplify.

≈ 226.1946711 ← Use a calculator.

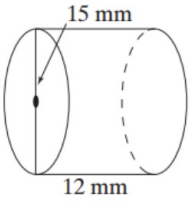
The volume is about 226 m^3.

Quick Check

1. Find the volume of the prism.



2. a. Estimation Estimate the volume of the cylinder at the right. Use 3 for π.



b. Find the volume of the cylinder to the nearest cubic millimeter.

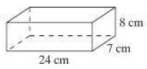
Name _____ Class _____ Date _____

Practice 9-2

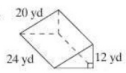
Volumes of Prisms and Cylinders

Find the volume of each solid to the nearest whole number.

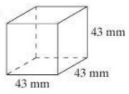
1.



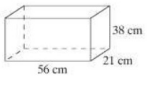
2.



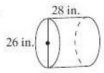
3.



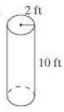
4.



5.



6.



7. Suppose you want to buy concrete for a 36 ft by 24 ft by 9 in. patio. If concrete costs \$55/yd^3, how much will the concrete for the patio cost?

8. A cylinder has a volume of about 500 cm^3 and a height of 10 cm. What is the length of the radius to the nearest tenth of a cm?