

10.7 Volumes of Prisms and Cylinders

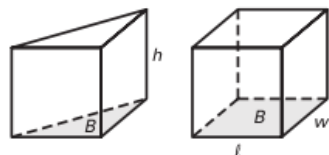
Goal: Find the volumes of prisms and cylinders.

Volume of a Prism

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

Algebra $V = Bh$

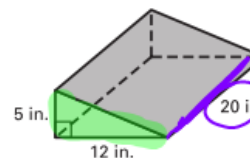
This formula applies to any prism.



Example 1 Finding the Volume of a Prism

Find the volume of the prism shown.

The bases of the prism are triangles, so use the formula for the area of a triangle to find B .



$$V = Bh$$

Write formula for volume of a prism.

$$= \frac{1}{2}(12)(5)(20)$$

Substitute values.

$$= 600 \text{ in}^3$$

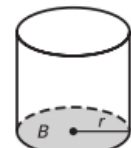
Multiply.

Answer: The volume of the prism is 600 cubic inches

Volume of a Cylinder

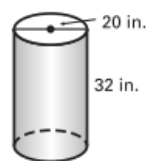
Words The volume V of a cylinder is the product of the base area B and the height h .

Algebra $V = Bh = \pi r^2 h$



Example 2 Finding the Volume of a Cylinder

Find the capacity (in gallons) of the recycling bin shown. Round to the nearest whole number. (Use the fact that $1 \text{ in.}^3 \approx 0.004 \text{ gal.}$)



① Find base area
② multiply by the height

$$A = \pi r^2$$

$$= \pi \cdot 10^2$$

$$= 314.159$$

$$\times 32$$

$$10,053 \text{ in}^3$$

Solution

1. The radius is one half of the diameter. So, $r = 10$.

$$V = \pi r^2 h$$

$$= \pi (\quad)^2 (\quad)$$

$$= \quad$$

Write formula for volume of a cylinder.

Substitute values.

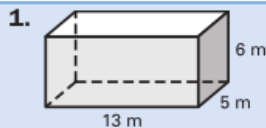
Simplify. Leave in terms of π .

2. Use a conversion factor that converts cubic inches to gallons.

$$\quad \cdot \quad \approx \quad \text{ Evaluate. Use a calculator.}$$

Answer: The capacity of the recycling bin is about \quad .

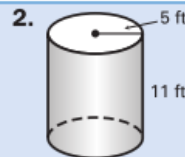
Checkpoint Find the volume of the prism or cylinder. Round to the nearest whole number.



$$V = l \cdot w \cdot h$$

$$= 13 \cdot 5 \cdot 6$$

$$= 390 \text{ m}^3$$



$$A = \pi \cdot 5^2$$

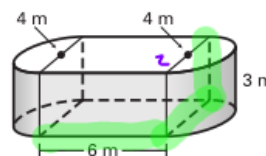
$$= 78.539 \dots$$

$$\times 11$$

$$864 \text{ ft}^3$$

Example 3 Finding the Volume of a Solid

The solid shown is composed of a rectangular prism and two half cylinders. Find the volume of the solid. Round to the nearest cubic meter.



$$V = 6 \cdot 4 \cdot 3 = 72 \text{ m}^3$$

$$V = \pi \cdot 2^2 = 12.5663706$$

$$\times 3 = 37.6991184$$

$$+ 110 \text{ m}^3$$

Solution

1. Find the area of a base. Each end of a base is a half circle with a radius of . Together, the ends form a complete circle.

$$B = \text{Area of rectangle} + \text{Area of circle}$$

$$= \ell w + \pi r^2$$

$$= \text{[]} (\text{[]}) + \pi (\text{[]})^2$$

$$= \text{[]}$$

Use formulas for area of a rectangle and area of a circle.

Substitute values.

Simplify. Leave in terms of π .

2. $V = Bh$

$$= (\text{[]}) (\text{[]})$$

$$= \text{[]}$$

$$= \text{[]}$$

Write formula for volume of a prism.

Substitute values.

Use distributive property.

Evaluate. Use a calculator.

Answer: The volume of the solid is about .