10.7 Volumes of Prisms and Cylinders

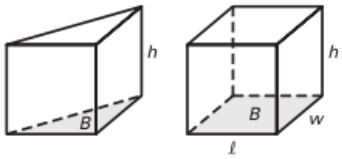
Goal: Find the volumes of prisms and cylinders.

Volume of a Prism

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

Algebra $V = Bh$

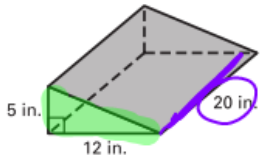
This formula applies to any prism.



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.

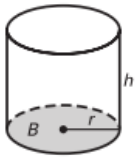
$= 600 \text{ in}^3$ Multiply.

Answer: The volume of the prism is 600 cubic inches

Volume of a Cylinder

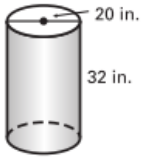
Words The volume V of a cylinder is the product of the base area B and the height h.

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



Example 2 ***Finding the Volume of a Cylinder***

Find the ~~capacity (in gallons)~~ Volume of the recycling bin shown. Round to the nearest whole number. (Use the fact that 1 in.^{3} ≈ 0.004 gal.)



① Find base area
② multiply by the height

$A = \pi r^2$
$= \pi \cdot 10^2$
$= 314.159$
$\times 32$
10,053 in^3

Solution

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

$V = \pi r^2 h$ — Write formula for volume of a cylinder.

$= \pi(\square)^2(\square)$ — Substitute values.

$= \square$ — Simplify. Leave in terms of π.

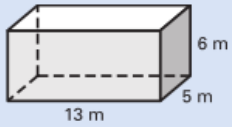
2. Use a conversion factor that converts cubic inches to gallons.

$\square \cdot \square \approx \square$ — Evaluate. Use a calculator.

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

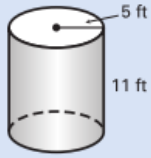
Checkpoint **Find the volume of the prism or cylinder. Round to the nearest whole number.**

1.



$V = l \cdot w \cdot h$
$= 13 \cdot 5 \cdot 6$
$= 390 m^3$

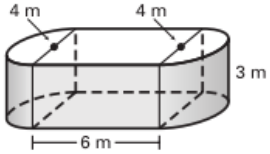
2.



$A = \pi \cdot 5^2$
$= 78.539....$
$\times 11$
$864 ft^3$

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.



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.

$B =$ Area of rectangle $+$ Area of circle

$= \ell w + \pi r^2$ Use formulas for area of a rectangle and area of a circle.

$=$ ☐(☐) $+ \pi$(☐)^2 Substitute values.

$=$ ☐ Simplify. Leave in terms of π.

2. $V = Bh$ Write formula for volume of a prism.

$=$ (☐)☐ Substitute values.

$=$ ☐ Use distributive property.

$\approx$ ☐ Evaluate. Use a calculator.

Answer: The volume of the solid is about ☐.