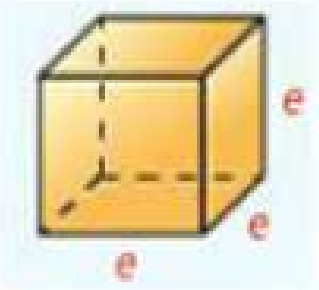
11-4 Volumes of Prisms and Cylinders

Objective To find the volume of a prism and the volume of a cylinder

"capacity"

Volume is the space that a figure occupies. It is measured in cubic units such as cubic inches ($in.^3$), cubic feet (ft^3), or cubic centimeters (cm^3). The volume V of a cube is the cube of the length of its edge e, or $V = e^3$.

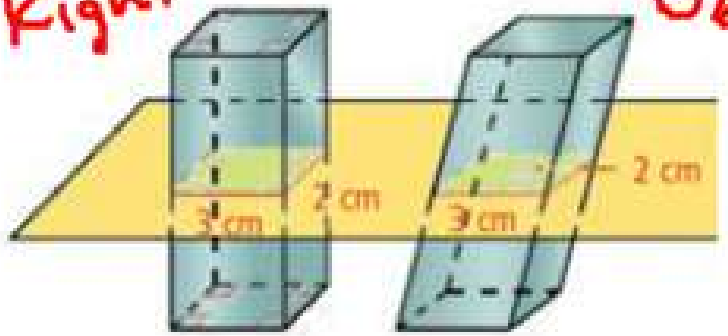


take note

Theorem 11-5 Cavalieri's Principle

If two space figures have the same height and the same area at every level, then they have the same volume.

The area of each shaded cross section below is 6 cm^2. Since the prisms have the same height, their volumes must be the same by Cavalieri's Principle.



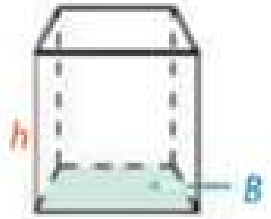
You can find the volume of a right prism by multiplying the area of the base by the height. Cavalieri's Principle lets you extend this idea to any prism.

take note

Theorem 11-6 Volume of a Prism

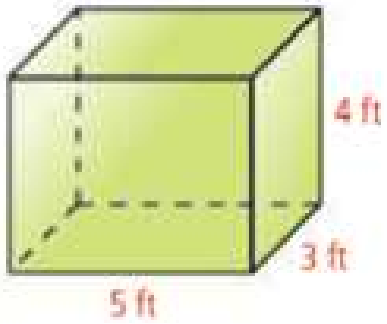
The volume of a prism is the product of the area of the base and the height of the prism.

$$V = Bh$$



Area of Base

Got It? **1. a.** What is the volume of the rectangular prism at the right?



$V = Bh$

$= \ell \cdot w \cdot h = 5 \cdot 3 \cdot 4$

$V = 60 \text{ ft}^3$

Got It? 2. **a.** What is the volume of the triangular prism at the right?

b. Reasoning Suppose the height of a prism is doubled. How does this affect the volume of the prism? Explain.

$V = Bh$ ← height of Δ

$= \frac{1}{2}bH \cdot h$

$= \frac{1}{2} \cdot 6 \cdot 10 \cdot 5$

$V = 150\ m^3$

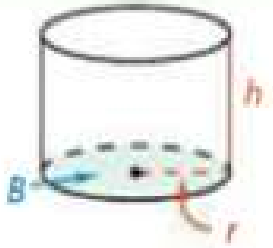
* Rt Δ - Legs are b and H !

take note

Theorem 11-7 Volume of a Cylinder

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

$$V = Bh, \text{ or } V = \pi r^2 h$$



Got It? 3. **a.** What is the volume of the cylinder at the right in terms of π?

b. Reasoning Suppose the radius of a cylinder is halved. How does this affect the volume of the cylinder? Explain.

= d

r = 1m

Oblique

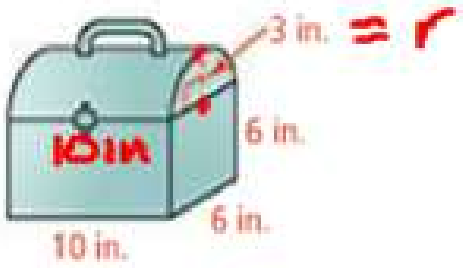
$V = Bh$

$= \pi r^2 h = \pi \cdot 1^2 \cdot 3$

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

A **composite space figure** is a three-dimensional figure that is the combination of two or more simpler figures. You can find the volume of a composite space figure by adding the volumes of the figures that are combined.

Got It? 4. What is the approximate volume of the lunch box shown at the right? Round to the nearest cubic inch.



Rectangular Prism + $\frac{1}{2}$ Cylinder

RP: $V = Bh = \ell \cdot w \cdot h = 10 \cdot 6 \cdot 6 = 360 \text{ in}^3$

C: $V = Bh = \pi r^2 h = \pi \cdot 3^2 \cdot 10 = 282.7 \text{ in}^3$

$\frac{1}{2}C = \frac{1}{2}(282.7) = 141 \text{ in}^2$

$V = RP + \frac{1}{2}C = 360 + 141 = \boxed{501 \text{ in}^3}$

#7-27(odd)
35.37

Inclass: p. 721-723 #20, 30, 32, 38, 40

Homework: p. 721-723 #7-41(odd), not #31

Interactmath: #7, 11, 13, 14, 17, 19, 24, 32, 39