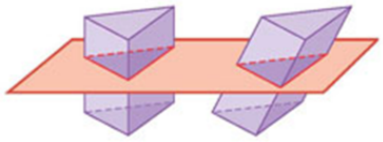
11-2 Volume of Prisms and Cylinders

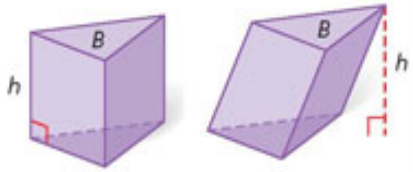
The _____ of a 3-D figure is the number of nonoverlapping unit cubes of a given size that will exactly fill the interior.

_____ principle says that if two 3-D figures have the same height and have the same cross-sectional area at every level, then they have the same _____.

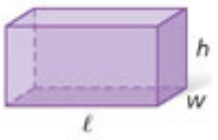


Volume of a Prism

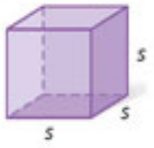
The volume of a prism with base area B and height h is _____



The volume of a right rectangular prism with length ℓ, width w, and height h is _____



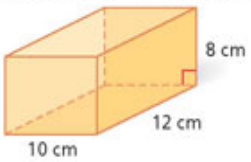
The volume of a cube with edge length s is _____



1 Finding Volumes of Prisms

Find the volume of each prism. Round to the nearest tenth, if necessary.

A

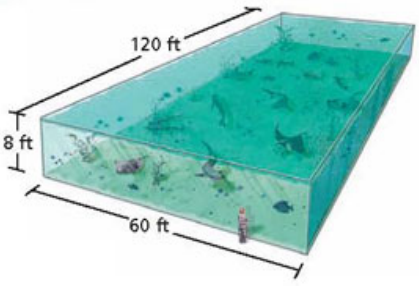


B a cube with edge length 10 cm

C a right regular pentagonal prism with base edge length 5 m and height 7 m

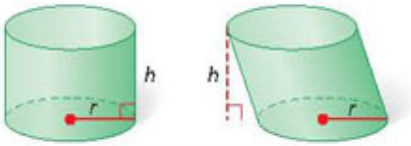
2 Marine Biology Application

The aquarium at the right is a rectangular prism. Estimate the volume of the water in the aquarium in gallons. The density of water is about 8.33 pounds per gallon. Estimate the weight of the water in pounds.
(*Hint:* 1 gallon ≈ 0.134 ft^3)



Volume of a Cylinder

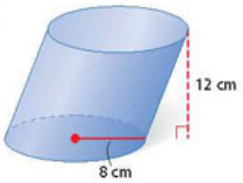
The volume of a cylinder with base area B, radius r, and height h is _____



3 Finding Volumes of Cylinders

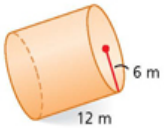
Find the volume of each cylinder. Give your answers both in terms of π and rounded to the nearest tenth.

A



4 Exploring Effects of Changing Dimensions

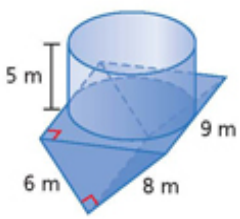
The radius and height of the cylinder are multiplied by $\frac{1}{2}$. Describe the effect on the volume.



original dimensions: | radius and height multiplied by $\frac{1}{2}$:

5 Finding Volumes of Composite Three-Dimensional Figures

Find the volume of the composite figure. Round to the nearest tenth.

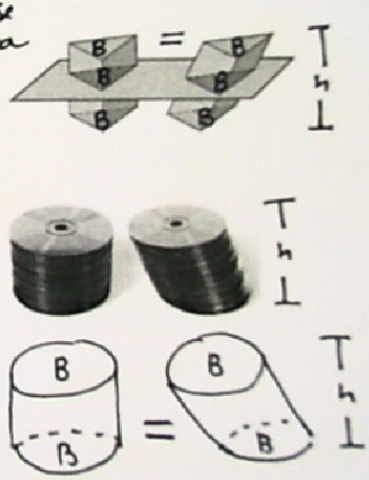


11-2 Volume of Prisms and Cylinders

The Volume of a 3-D figure is the number of nonoverlapping unit cubes of a given size that will exactly fill the interior.

The Cavalieri's principle says that if two 3-D figures have the same height and have the same cross-sectional area at every level, then they have the same Volume.

B = base area



Volume of a Prism

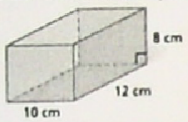
B = area of base

The volume of a prism with base area B and height h is Bh	The volume of a right rectangular prism with length ℓ, width w, and height h is ℓwh	The volume of a cube with edge length s is s^3 or Δ^3

1 Finding Volumes of Prisms

Find the volume of each prism. Round to the nearest tenth, if necessary.

A

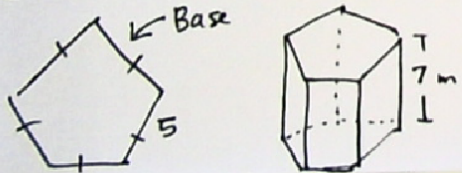


$V = \ell wh$
$= 12 \cdot 10 \cdot 8$
$= 960\ cm^3$ ← watch your units

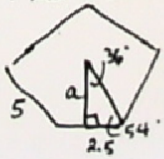
B a cube with edge length 10 cm

$V = s^3$
$= 10^3 = 1000\ cm^3$

C a right regular pentagonal prism with base edge length 5 m and height 7 m



Find area of Base



$A = \frac{ap}{2}$

$\tan 54^\circ = \frac{a}{2.5}$

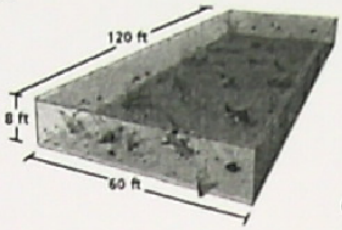
$a = 3.44$

$= \frac{3.44(25)}{2} \approx 43$

$V = Bh$
$= 43(7)$
$\approx 301\ m^3$

2 ***Marine Biology Application***

The aquarium at the right is a rectangular prism. Estimate the volume of the water in the aquarium in gallons. The density of water is about 8.33 pounds per gallon. Estimate the weight of the water in pounds. (*Hint:* 1 gallon ≈ 0.134 ft³)



Find V in cubic feet

$V = l \cdot w \cdot h$

$= (120)(60)(8) = 57{,}600 \text{ ft}^3$

Since 1 gallon ≈ 0.134 ft³ use dimensional analysis to calculate

$$\frac{57{,}600 \text{ ft}^3}{1} \cdot \frac{1 \text{ gallon}}{0.134 \text{ ft}^3} = 429{,}851 \text{ gallons}$$

Since 8.33 lbs of H_2O is in one gallon → $429851 (8.33)$

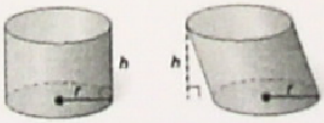
$\approx 3{,}580{,}659$ lbs

Volume of a Cylinder

The volume of a cylinder with base area B, radius r, and height h is

$V = Bh$

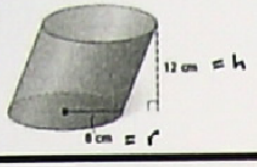
$V = \pi r^2 h$



3 **Finding Volumes of Cylinders**

Find the volume of each cylinder. Give your answers both in terms of π and rounded to the nearest tenth.

A



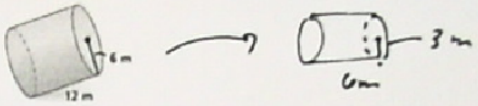
$V = \pi r^2 h$

$= \pi (8)^2 (12)$

$= 768\pi \text{ cm}^3 \approx 2412.7 \text{ cm}^3$

4 **Exploring Effects of Changing Dimensions**

The radius and height of the cylinder are multiplied by $\frac{1}{2}$. Describe the effect on the volume.



original dimensions:

$V = \pi (6)^2 (12)$

$= 432\pi \text{ m}^3$

radius and height multiplied by $\frac{1}{2}$:

$V = \pi (3)^2 (6)$

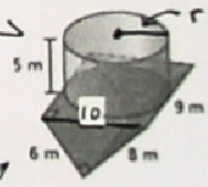
$= 54\pi \text{ m}^3$

So $\frac{432\pi}{54\pi} = 8$

*If both the radius and height are mult by $\frac{1}{2}$ then the new volume will be $\left(\frac{1}{2}\right)^3$ or $\frac{1}{8}$ the original

5 **Finding Volumes of Composite Three-Dimensional Figures**

Find the volume of the composite figure. Round to the nearest tenth.



cylinder $V = \pi r^2 h$

$= \pi (5)^2 (5)$

$= 125\pi \text{ m}^3$

prism $V = Bh = \left(\frac{6 \cdot 8}{2}\right)(9) = 216 \text{ m}^3$

$V = (216 + 125\pi) \text{ m}^3$