Lesson 0-9 Volume

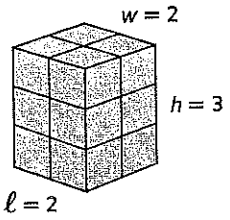
Objective

- Find the volumes of rectangular prisms and cylinders.

New Vocabulary

volume

Volume is the measure of space occupied by a solid. Volume is measured in cubic units.



To find the volume of a rectangular prism, multiply the length times the width times the height. The formula for the volume of a rectangular prism is shown below.

$$V = \ell \cdot w \cdot h$$

The prism at the right has a volume of $2 \cdot 2 \cdot 3$ or 12 cubic units.

Example 1 Volumes of Rectangular Prisms

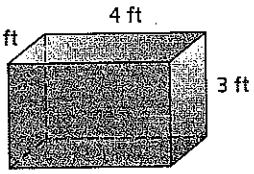
Find the volume of each rectangular prism.

a. The length is 8 centimeters, the width is 1 centimeter, and the height is 5 centimeters.

$V = \ell \cdot w \cdot h$	Volume formula
$= 8 \cdot 1 \cdot 5$	Replace ℓ with 8, w with 1, and h with 5.
$= 40$	Simplify.

The volume is 40 cubic centimeters.

b.



The prism has a length of 4 feet, width of 2 feet, and height of 3 feet.

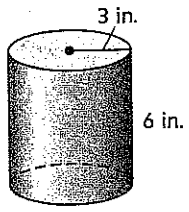
$V = \ell \cdot w \cdot h$	Volume formula
$= 4 \cdot 2 \cdot 3$	Replace ℓ with 4, w with 2, and h with 3.
$= 24$	Simplify.

The volume is 24 cubic feet.

The volume of a solid is the product of the area of the base and the height of the solid. For a cylinder, the area of the base is πr^2. So the volume is $V = \pi r^2 h$.

Example 2 Volume of a Cylinder

Find the volume of the cylinder.



$V = \pi r^2 h$	Volume of a cylinder
$= \pi(3^2)6$	$r = 3$, $h = 6$
$= 54\pi$	Simplify.
≈ 169.6	Use a calculator.

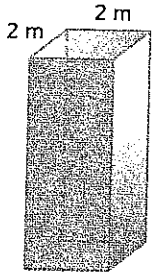
The volume is about 169.6 cubic inches.

Exercises

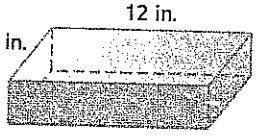
Find the volume of each rectangular prism given the length, width, and height.

1. $\ell = 5$ cm, $w = 3$ cm, $h = 2$ cm $30cm^3$
2. $\ell = 10$ m, $w = 10$ m, $h = 1$ m $100m^3$
3. $\ell = 6$ yd, $w = 2$ yd, $h = 4$ yd $48yd^3$
4. $\ell = 2$ in., $w = 5$ in., $h = 12$ in. $120in^3$
5. $\ell = 13$ ft, $w = 9$ ft, $h = 12$ ft $1404ft^3$
6. $\ell = 7.8$ mm, $w = 0.6$ mm, $h = 8$ mm $37.44mm^3$

Find the volume of each rectangular prism.

7. 

$20m^3$

8. 

$144in^3$

9. **GEOMETRY** A cube measures 3 meters on a side. What is its volume?


$L=3$ $w=3$ $h=3$ $27m^3$

10. **AQUARIUMS** An aquarium is 8 feet long, 5 feet wide, and 5.5 feet deep. What is the volume of the aquarium? $L=8$ $w=5$ $h=5.5$ $220ft^3$

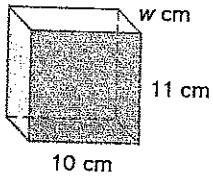
11. **COOKING** What is the volume of a microwave oven that is 18 inches wide by 10 inches long with a depth of $11\frac{1}{2}$ inches? $18 \times 10 \times 11.5 = 2027in^3$

12. **BOXES** A cardboard box is 32 inches long, 22 inches wide, and 16 inches tall. What is the volume of the box? $32 \times 22 \times 16 = 11,264in^3$

13. **SWIMMING POOLS** A children's rectangular pool holds 480 cubic feet of water. What is the depth of the pool if its length is 30 feet and its width is 16 feet? $30 \times 16 = 480ft^3$ Depth = 1ft

14. **BAKING** A rectangular cake pan has a volume of 234 cubic inches. If the length of the pan is 9 inches and the width is 13 inches, what is the height of the pan? $9 \times 13 = 117$ $h = 2in$

$117 \overline{)234}$ 2, $234 - 234 = 0$

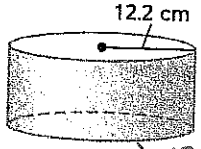
15. **GEOMETRY** The volume of the rectangular prism at the right is 440 cubic centimeters. What is the width?


$11 \times 10 = 110cm$

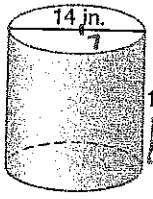
$110 \overline{)440}$, $440 - 440 = 0$, 4

$w = 4cm$

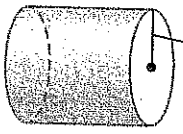
Find the volume of each cylinder. Round to the nearest tenth.

16. 

$3.14 \times (12.2^2) \times 12.2$ $5701.76cm^3$

17. 

$2769.48in^3$

18. 

$467.43m^3$

19. **FIREWOOD** Firewood is usually sold by a measure known as a *cord*. A full cord may be a stack $8 \times 4 \times 4$ feet or a stack $8 \times 8 \times 2$ feet.
   a. What is the volume of a full cord of firewood? $128ft^3$
   b. A "short cord" of wood is $8 \times 4 \times$ the length of the logs. What is the volume of a short cord of $2\frac{1}{2}$-foot logs? $80ft^3$
   c. If you have an area that is 12 feet long and 2 feet wide in which to store your firewood, how high will the stack be if it is a full cord of wood?