eometry/Trig

Name: KEY
Date: _____

Lesson 2-5: Volume of Prisms and Cylinders
Learning Goals: #10: How do I find the volume of a rectangular prism?
#11: How do I find the volume of a triangular prism?
#12: How do I find the volume of a cylinder?

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Warm Up

1) What is volume?
- How much space an object takes up
- Space inside a 3D shape

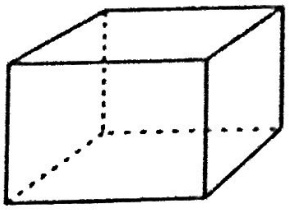
2) How is volume similar to surface area? How is it different?

What units do we use for volume?
units ③ → 3D shape

Volume of Prisms and Cylinders

for any 3D figure: $V = B \cdot H$

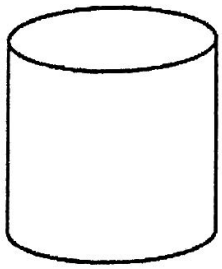
B → Area of the base
H → height/depth of a 3D object



Base Shape:

Area of base:

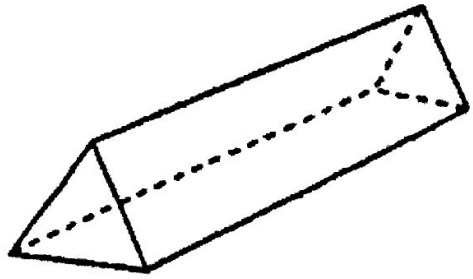
$V = L \cdot W \cdot H$



Base Shape:

Area of base:

$V = (\pi r^2)(H)$



Base Shape:

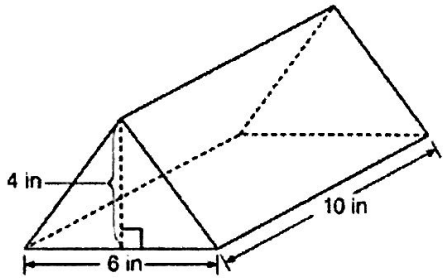
Area of base:

$V = \left(\frac{1}{2} b \cdot h\right) H$

Let's try it!

Watch Me!

Example 1: A packing carton in the shape of a triangular prism is shown in the diagram below.



Base Shape: Triangle

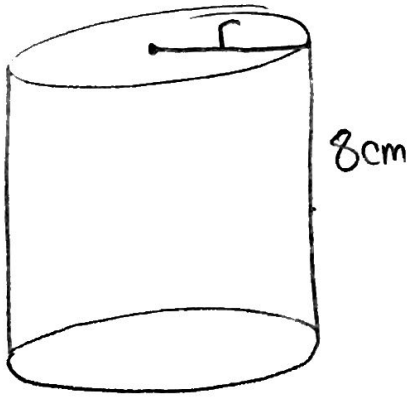
Area of base: $\frac{1}{2}(b)(h) = \frac{1}{2}(6)(4) = 12\text{in}^2$

What is the **volume**, in cubic inches, of this carton?

$V = \left(\frac{1}{2}b \cdot h\right)H$

$V = (12)(10) = \boxed{120\text{in}^3}$

Example 2: The volume of a cylinder is 12,566.4 cm³. The height of the cylinder is 8 cm. Find the radius of the cylinder to the *nearest tenth of a centimeter*.



$V = \pi r^2 \cdot H$

$V = 12{,}566.4$

$r = ?$

$H = 8$

$\frac{12{,}566.4}{8} = \frac{\pi r^2 (8)}{8}$

$\frac{1570.8}{\pi} = \frac{\pi r^2}{\pi}$

$\sqrt{500.00116892} = \sqrt{r^2}$

$r = 22.36070592$

$\boxed{r = 22.4\text{ cm}}$

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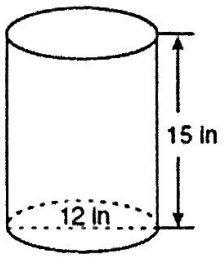
Practice!

3. Find the *volume* of the three-dimensional figure. ***Round to the nearest hundredth.***



$V = \pi r^2 H$

$V = \pi(6)^2(15)$

$V = 1696.460033$

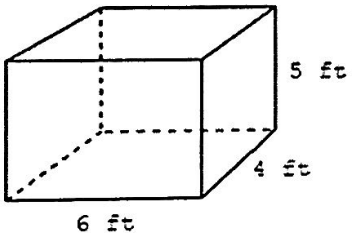
$V = 1696.46 \text{ in}^3$

$V = ?$

$r = 6 \text{ in}$

$H = 15$

4. Find the *volume* of the following three-dimensional figure. Use appropriate units in your answers.

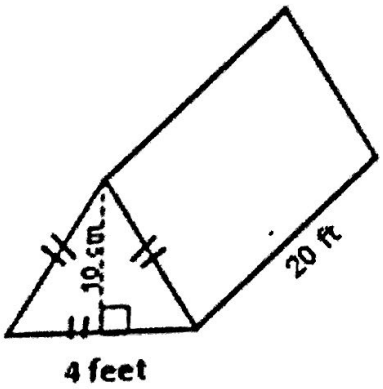


$V = L \cdot W \cdot H$

$V = (6)(4)(5)$

$V = 120 \text{ ft}^3$

5. Calculate the volume of the following figure.



$V = \left(\frac{1}{2}bh\right)H$

$V = \frac{1}{2}(4)(10)(20)$

$V = 400 \text{ ft}^3$

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Lesson 2-5: Homework

Homework Scale	
Score	Description (must complete all components to earn score)
3	• Homework Complete • Use *different* color to check work • Mark correct answers with check mark ✓ • For incorrect answers, *circle specific mistakes* • Incorrect answers should have *thorough corrections*
2.5	• Corrections made but not in a different color
2	• Homework complete • Marked answers right/wrong, but no corrections made
1.5	• Completed but not checked
1	• Homework incomplete
0	• Homework missing/no effort or attempt

1. The Parkside Packing Company needs a **rectangular** shipping box. The box must have a length of 11 inches and a width of 8 inches. Find, to the *nearest tenth of an inch*, the height of the box if the volume is 800in^3.

$V = L \cdot W \cdot H$

$800 = (11)(8)H$

$\frac{800}{88} = \frac{88H}{88}$

$H = 9.090909091$

$H = 9.1$ inches

$V = 800$
$L = 11$
$W = 8$
$H = ?$

2. What is the volume, in cubic centimeters, of a cylinder that has a height of 15 cm and a diameter of 12 cm? **Leave your answer in terms of Pi.**

$V = \pi r^2 \cdot H$

$V = \pi(6)^2(15)$

$V = \pi(36)(15)$

$V = 540\pi\ cm^3$

$V = ?$
$H = 15$
$r = \frac{d}{2} = \frac{12}{2} = 6$

3. A fish tank with a **rectangular** base has a volume of 3,360 cubic inches. The length and ~~height~~ width of the tank are 14 inches and 12 inches, respectively. Find the height, in inches, of the tank.

$V = L \cdot W \cdot H$

$3{,}360 = (14)(12)H$

$\frac{3{,}360}{160} = \frac{160H}{160}$

$21_{in} = H$

$V = 3{,}360$
$L = 14$
$W = 12$
$H = ?$

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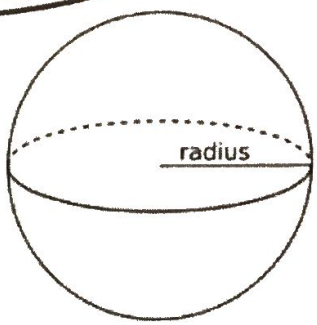
Volume of Spheres

The volume of a sphere can be found using the following formula:

$V = \frac{4}{3}\pi r^3$ where r = radius



Watch Me!

Example 1: What is the volume, to the nearest hundredth of a cubic inch, of a sphere with a radius of 3 inches?

$V = ?$
$r = 3$

$V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi (3)^3$

$V = 113.09733555 \rightarrow \boxed{113.10 \text{ in}^3}$

You Try!

Example 2: If a sphere has a volume of $972\pi\ in^3$ what is the radius of the sphere?

$V = 972\pi$
$r = ?$

$V = \frac{4}{3}\pi r^3$

$\frac{972\pi}{\pi} = \frac{\frac{4}{3}\pi r^3}{\pi}$

$\frac{972}{\frac{4}{3}} = \frac{\frac{4}{3}r^3}{\frac{4}{3}}$

$\sqrt[3]{729} = \sqrt[3]{r^3}$

$\boxed{r = 9 \text{ in}}$

* watch the video for Guided NOTES *