

# 12.5 Honors Geometry

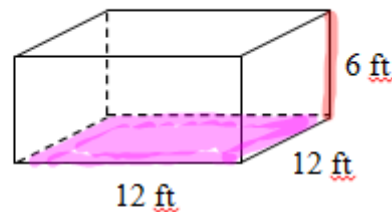
DATE: 5/28

VOLUME Formulas			
Volume of a Prism	$V = Bh$	Volume of a Pyramid	$V = \frac{1}{3} Bh$
Volume of a Cylinder	$V = \pi r^2 h$	Volume of a Cone	$V = \frac{1}{3} \pi r^2 h$
Volume of a Sphere	$V = \frac{4}{3} \pi r^3$		
B = area of the base, r = radius, h = height (altitude)			

## Discovery Activity

Find the volume of the prism.

$$\begin{aligned}
 V &= B \cdot h \\
 &= 12 \cdot 12 \cdot 6 \\
 &= 864 \text{ ft}^3
 \end{aligned}$$

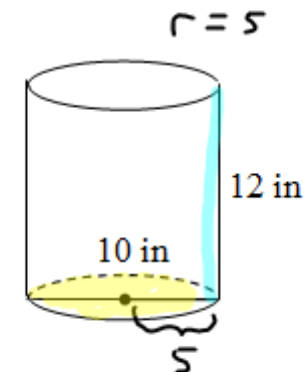


Find the volume of the pyramid.

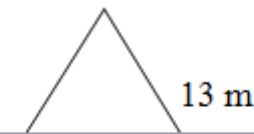


Find the volume of the cylinder.

$$\begin{aligned}
 V &= B \cdot h \\
 &= \pi r^2 h \\
 &= \pi (5)^2 \cdot 12 \\
 &= 300 \pi \text{ in}^3
 \end{aligned}$$



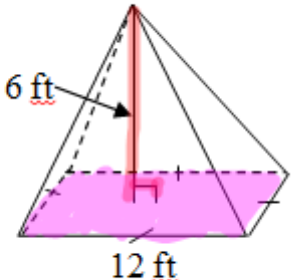
Find the volume of the cone.



Find the volume of the pyramid.

$$\begin{aligned}
 V &= \frac{1}{3} \cdot B \cdot h \\
 &= \frac{1}{3} (144) \cdot 6 \\
 &= 288 \text{ ft}^3
 \end{aligned}$$

$B = 12 \cdot 12 = 144$



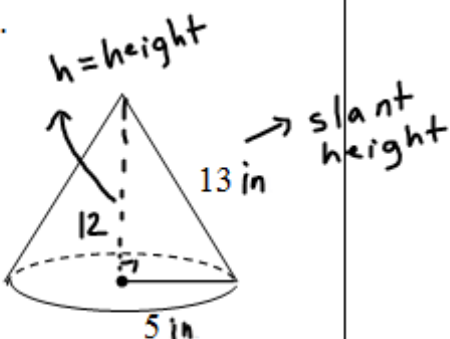
Find the ratio of the volume of the pyramid to the volume of the prism.

$$\text{Ratio: } \frac{288}{864} = \frac{1}{3}$$

What can you conclude?

If a prism and a pyr. have the same base dimensions and height, then  $\frac{1}{3} \text{ Prism} = \text{Pyramid}$   
 $\text{Prism} = 3 \text{ Pyramids}$   
Volume

Find the volume of the cone.

$$\begin{aligned}
 V &= \frac{1}{3} \pi r^2 h \\
 &= \frac{1}{3} \pi (5)^2 (12) \\
 &= 100\pi \text{ in}^3
 \end{aligned}$$


Find the ratio of the volume of the cone to the volume of the cylinder.

$$\text{Ratio: } \frac{100\pi}{300\pi} = \frac{1}{3}$$

What can you conclude?

Same:  $\frac{1}{3} \text{ Cylinder} = \text{Cone}$   
 $\text{Cylinder} = 3 \text{ cones}$   
Volume

12.5 Notes with formulas [Compatibility Mode] - Microsoft Word

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### Examples

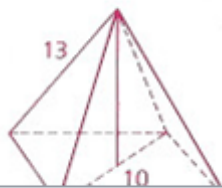
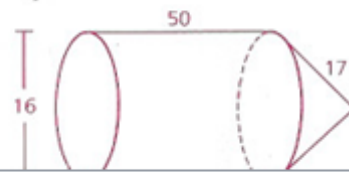
- If the volume of a cone is 24 cubic inches. What is the volume of a cylinder with the same base and height as the cone?  

$$24 \cdot 3 = 72 \text{ cu. in.}$$
- If the volume of a cylinder is 47 cubic feet. What is the volume of a cone with the same base and height as the cone?  

$$\frac{47}{3} \text{ cu. ft.}$$
- If the volume of a prism is 450 cubic centimeters. What is the volume of a pyramid with the same base and height as the prism?  

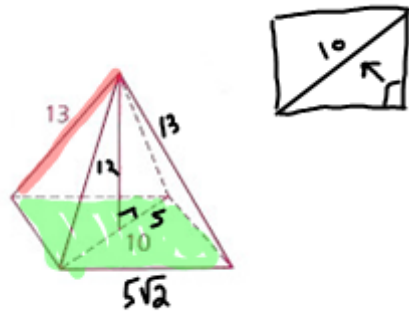
$$\frac{450}{3} = 150 \text{ cu. cm.}$$
- If the volume of a pyramid is 15 cubic meters. What is the volume of a prism with the same base and height as the pyramid?  

$$15 \cdot 3 = 45 \text{ cu. m.}$$

- A pyramid has a square base with a diagonal of 10. Each lateral edge measures 13. Find the volume of the pyramid.  

- A rocket has the dimensions shown. If 60% of the space in the rocket is needed for fuel, what is the volume, to the nearest whole unit, of the portion of the rocket that is available for nonfuel items?  


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5. A pyramid has a square base with a diagonal of 10. Each lateral edge measures 13. Find the volume of the pyramid.



$$s^2 = (5\sqrt{2})(5\sqrt{2}) = 50$$

$$V = \frac{1}{3} B \cdot h = \frac{1}{3} (50)(12) = 200 \text{ u}^3$$

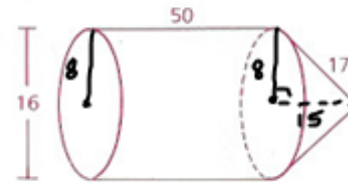


$$\begin{array}{ccc} 45 & -45 & -90 \\ \downarrow & \downarrow & \downarrow \\ x & x & x\sqrt{2} \\ & & 10 \end{array}$$

$$\frac{10}{\sqrt{2}} = \frac{x\sqrt{2}}{\sqrt{2}}$$

$$\frac{10}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{10\sqrt{2}}{2} = 5\sqrt{2}$$

6. A rocket has the dimensions shown. If 60% of the space in the rocket is needed for fuel, what is the volume, to the nearest whole unit, of the portion of the rocket that is available for nonfuel items?



40% non-fuel

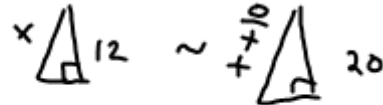
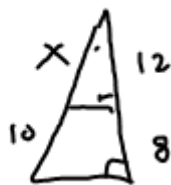
$$0.40 \cdot 3520\pi = 4423 \text{ u}^3$$

$$\begin{aligned} V &= V_{\text{cyl}} + V_{\text{cone}} \\ &= \pi r^2 h + \frac{1}{3} \pi r^2 h \\ &= \pi (8)^2 \cdot (50) + \frac{1}{3} \pi (8)^2 (15) \\ &= 3200\pi + 320\pi \\ &= 3520\pi \text{ u}^3 \end{aligned}$$

7. Use the diagram at the right to find

- $x$
- The radii of the circles
- The volume of the smaller cone
- The volume of the larger cone
- The volume of the frustum

a)

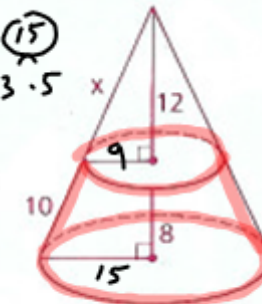


$$\frac{x}{x+10} = \frac{8}{12}$$

$$\begin{aligned} 20x &= 12(x+10) \\ 20x &= 12x + 120 \\ 8x &= 120 \\ x &= 15 \end{aligned}$$

$$\begin{aligned} \text{c) } \frac{1}{3} \pi (9)^2 (12) \\ &= 324\pi \text{ u}^3 \end{aligned}$$

$$\begin{aligned} \text{d) } \frac{1}{3} \pi (15)^2 (20) \\ &= 1500\pi \text{ u}^3 \end{aligned}$$



e)

$$\begin{aligned} V_F &= V_{\text{BC}} - V_{\text{SC}} \\ &= 1500\pi - 324\pi \\ &= 1176\pi \text{ u}^3 \end{aligned}$$

THE END!