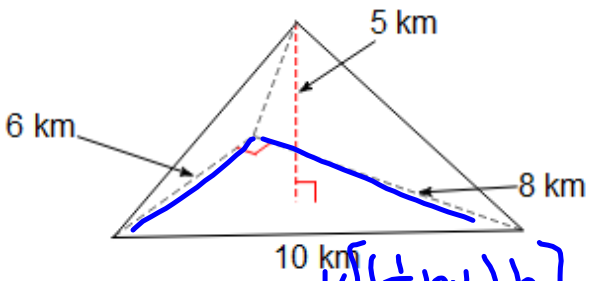
# Warm Up:

1



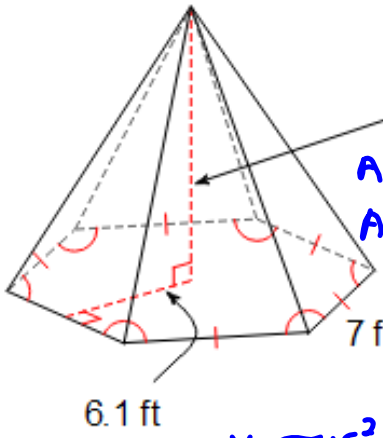

40 km³

$\frac{1}{3}\left[\left(\frac{1}{2}b \cdot h\right)h\right]$

$\frac{1}{2}(6 \cdot 8)$

$\frac{24 \cdot 5}{3}$

2




$A = \frac{1}{2}asn$

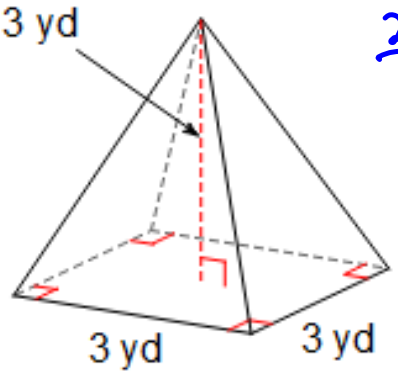
$A = \frac{1}{2}(6.1)(7)$

469.7 ft³

$V = \pi r^2 h$

$V = \pi(10)^2(12)$

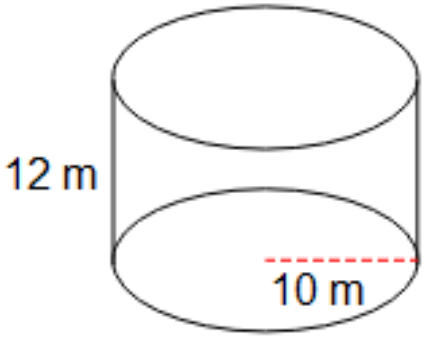
3




9 yd³

$\frac{3(3)(3)}{3}$

4



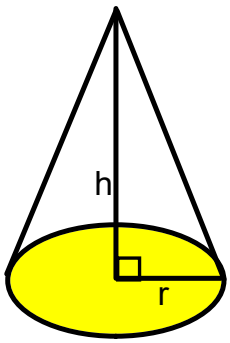

3769.91 m³

Learning Goal: Today I will learnhow to find the volume of a cone.

Success Criteria: I am able to find the area of the base in order to calculate volume.

# 11-5 Volume of Cones

19 Volume of a Cone




20

- circle base (one) and a vertex not in the same plane

h = height of cone (inside)

r = radius of base

Volume

$V = \frac{1}{3}\pi r^2 h$

Example:

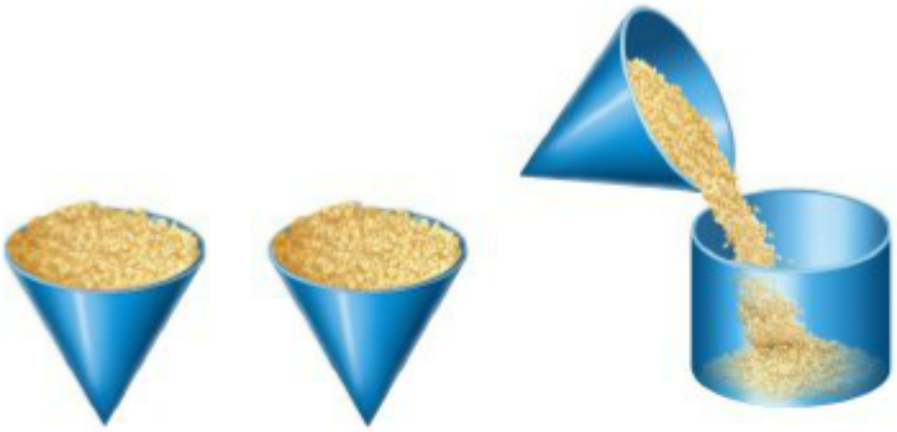
A cone has a radius of 2 mm and a height of 6mm. What is the volume?

$V = \frac{1}{3}\pi (2)^2 (6)$

$V = 8\pi \text{ mm}^3$

$V = 25.1 \text{ mm}^3$

**Essential Understanding** The volume of a cone is related to the volume of a cylinder with the same base and height.



The cones and the cylinder have the same base and height.
It takes three cones full of rice to fill the cylinder.

Take note

## Theorem 11-9 Volume of a Cone

The volume of a cone is one third the product of the area of the base and the height of the cone.

$$V = \frac{1}{3}Bh, \text{ or } V = \frac{1}{3}\pi r^2 h$$

## Problem 3 Finding the Volume of a Cone

**Traditional Architecture** The covering on a tepee rests on poles that come together like concurrent lines. The resulting structure approximates a cone. If the tepee pictured is 12 ft high with a base diameter of 14 ft, what is its approximate volume?

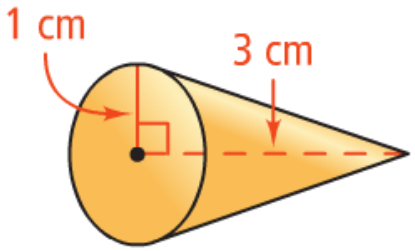
$V = \frac{1}{3}\pi r^2 h$ Use the formula for the volume of a cone.

$= \frac{1}{3}\pi(7)^2(12)$ Substitute $\frac{14}{2}$, or 7, for $r$ and 12 for $h$.

$\approx 615.7521601$ Use a calculator.

The volume of the tepee is approximately 616 $ft^3$.

Find the volume.




$V = \frac{1}{3}\pi(1)^2(3)$

$\frac{1}{3}(3)\pi$

$V = \pi\ cm^3$

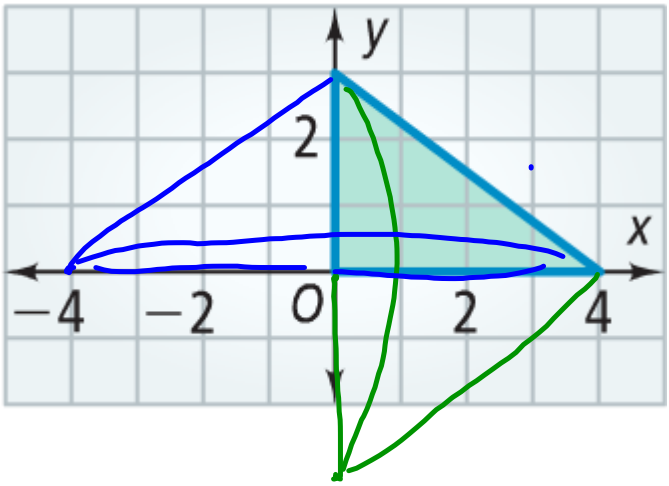
# Rotations about a line

Rotate: x axis

$V = \frac{1}{3}(3)^2\pi(4)$

$V = \frac{1}{3}(36)\pi$

$V = 37.7$



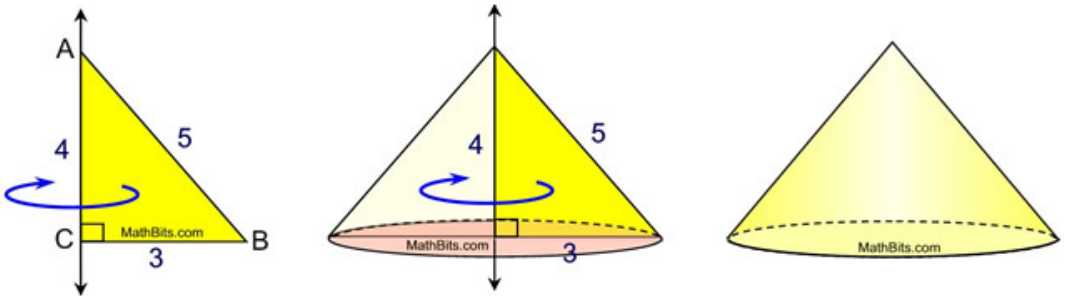

Rotate: y-axis

$V = \frac{1}{3}(4)^2\pi(3)$

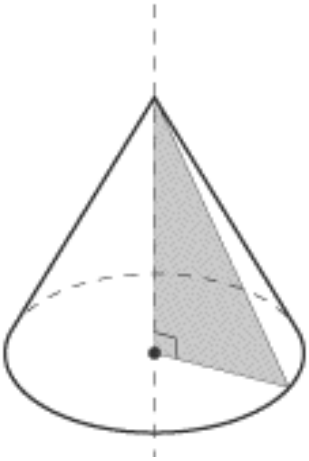
$V = \frac{1}{3}(16)\pi(3)$

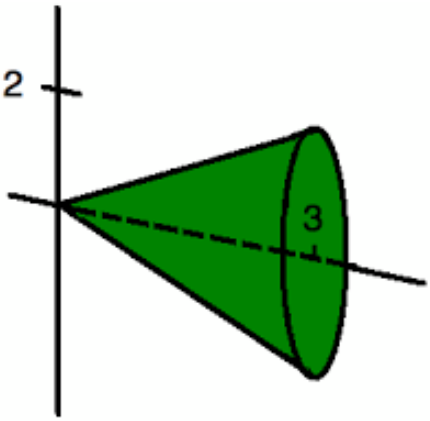
$V = 50.3$

http://www.schoolmath.jp/3d/e/student/lesson01/lesson_02.htm



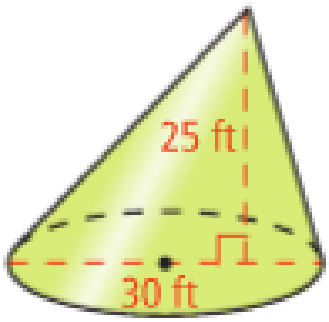

e volume of the cone is $V_{cone} = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi(3)^2(4) = 12\pi$ cubic units.




2
3

## Problem 4 Finding the Volume of an Oblique Cone

**What is the volume of the oblique cone at the right? Give your answer in terms of $\pi$ and also rounded to the nearest cubic foot.**




$V = \frac{1}{3}\pi r^2 h$ Use the formula for volume of a cone.

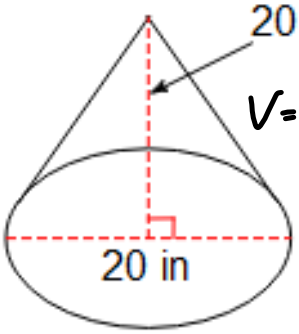
$= \frac{1}{3}\pi(15)^2(25)$ Substitute 15 for $r$ and 25 for $h$.

$= 1875\pi$ Simplify.

$\approx 5890.486225$ Use a calculator.

The volume of the cone is $1875\pi$ ft$^3$, or about 5890 ft$^3$.

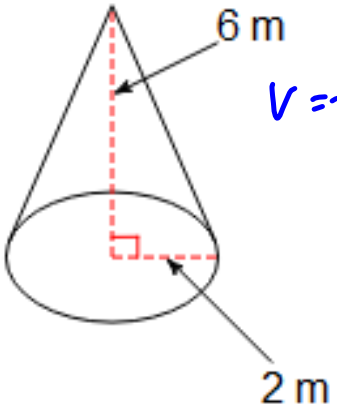
1)




$V = \frac{1}{3}(10)^2(20)\pi$

2094.4 in³

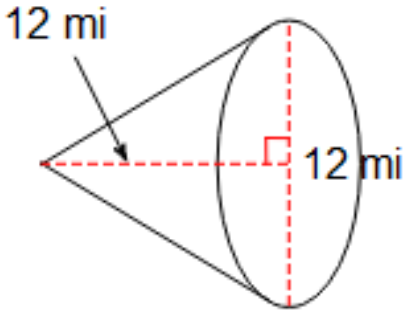
2)




$V = \frac{1}{3}\pi(2)^2(6)$

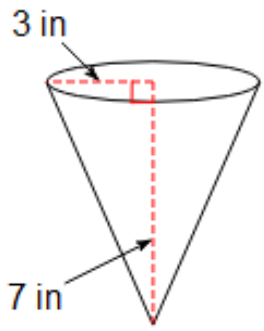
25.13 m³

3)

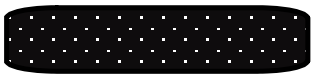



452.39 mi³

4)




65.97 in³



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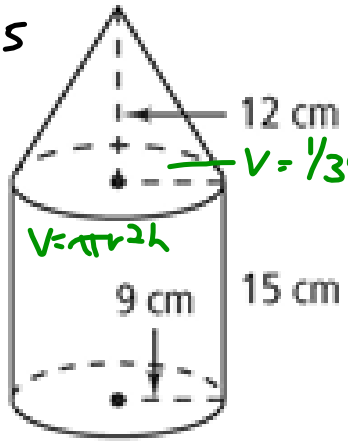


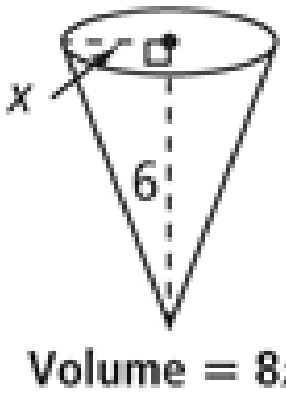

$V = \frac{1}{3}\pi r^2 h$

$V = \pi r^2 h$

$V = \pi(9)^2(15) =$

$\frac{1}{3}\pi(9)^2(12) =$

6




$V = \frac{1}{3}\pi r^2 h$

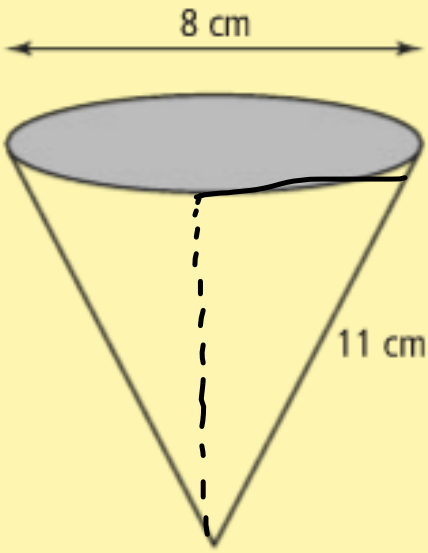
$8\pi = \frac{1}{3}\pi(r)^2 6$

$\frac{8\pi}{2\pi} = \frac{2\pi r^2}{2\pi}$

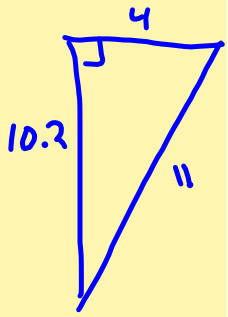
$\sqrt{4} = \sqrt{r^2}$

$r = 2$

About how many cubic centimeters of water does the paper drinking cup hold?




**ANSWER** about 172 $cm^3$

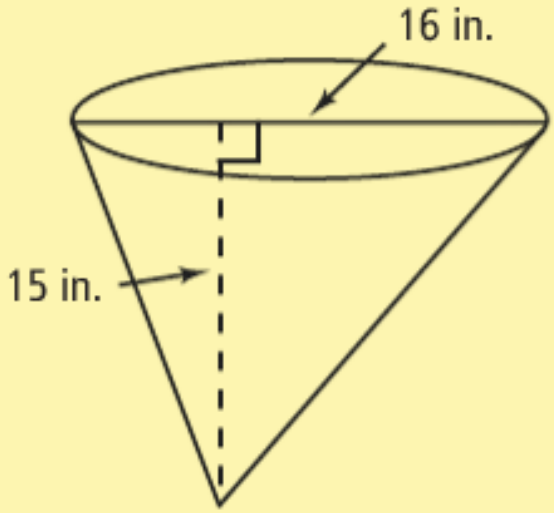



$11^2 - 4^2 = h^2$

$V = \frac{1}{3}\pi(4)^2(10.2)$

$V = 170.9\ cm^3$

. What is the volume of the oblique cone below? Give your answer in terms of $\pi$ and also rounded to the nearest cubic inch.

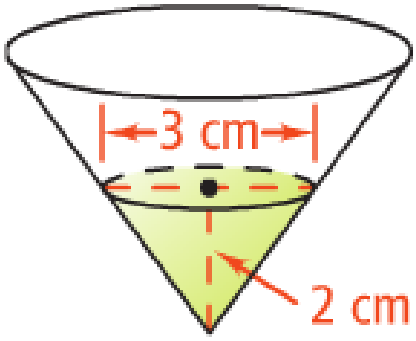



**ANSWER** or about

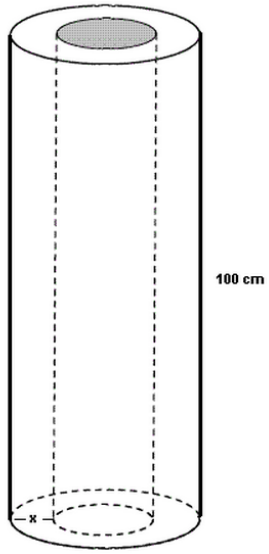
**Landscaping** To landscape her 70 ft-by-60 ft rectangular backyard, your aunt is planning first to put down a 4-in. layer of topsoil. She can buy bags of topsoil at \$2.50 per 3-$ft^3$ bag, with free delivery. Or, she can buy bulk topsoil for \$22.00/$yd^3$, plus a \$20 delivery fee. Which option is less expensive? Explain.

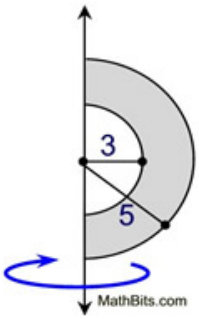
*1 $yd^3$ = 27 $ft^3$*

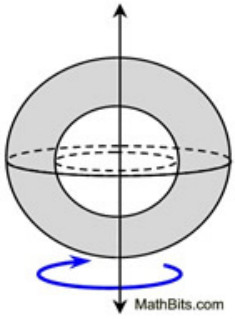
**Chemistry** This cone has a filter that was being used to remove impurities from a solution but became clogged and stopped draining. The remaining solution is represented by the shaded region. How many cubic centimeters of the solution remain in the cone?

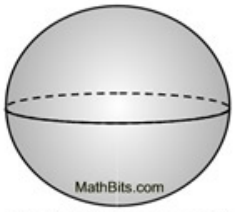


Find the thickness x of the hollow cylinder of height 100 cm if the volume between the inner and outer cylinders is equal to $1100\pi$ $cm^3$ and the outer diameter is 12 cm.

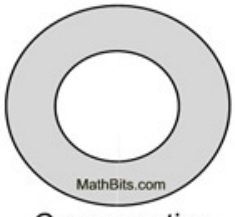




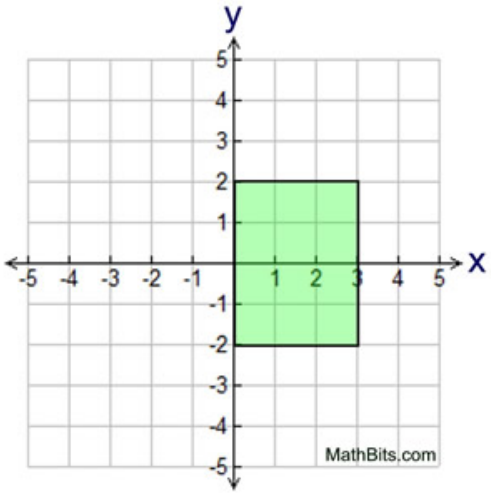




Solid Sphere with Hollow Center Sphere




Cross-section of Solid

: volume of the solid is $V = \frac{4}{3}\pi r_2^3 - \frac{4}{3}\pi r_1^3 = \frac{4}{3}\pi 5^3 - \frac{4}{3}\pi 3^3 = 130\frac{2}{3}\pi$ cubic units.


y
x
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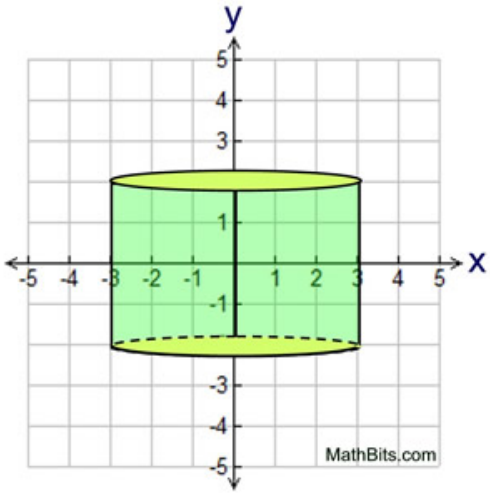
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MathBits.com

door filled the entire space as it revolved, a cylindrical solid would be formed.

With the idea of revolution (rotation) in mind,

Closure: Today I learned how to use the base area and height to calculate volume.