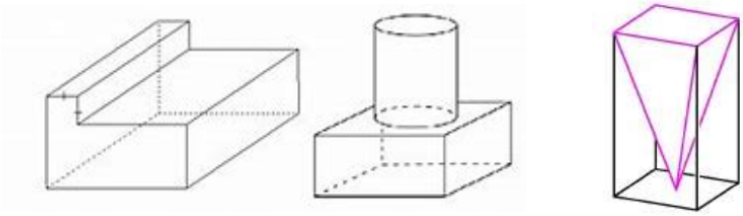
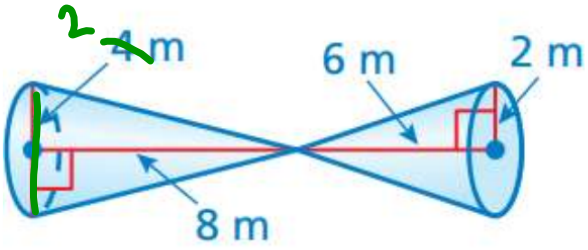
# Volume of Composite Fiaures



To find the volume of a composite figure, find the volume of the simple figures that create it and Add or Subtract the individual volumes.

Find the volume of the composite figure.




$V = \frac{32\pi}{3} + \frac{8}{1}\pi \frac{24\pi}{3}$

$= \frac{56\pi}{3}$

$\approx 58.64\ m^3$

$V_{left} = \frac{1}{3}\pi r^2 h$ (r = 2, h = 8)

$= \frac{\pi 4(8)}{3}$

$= \frac{32\pi}{3}$

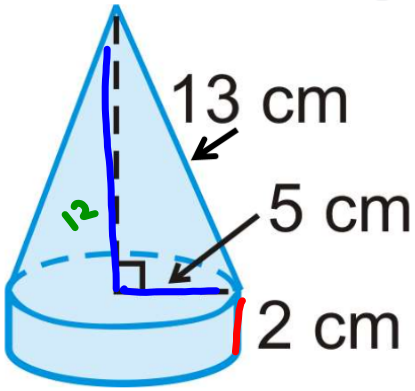
$V_{right} = \frac{1}{3}\pi r^2 h$ (r = 2, h = 6)

$= \frac{12\pi(4)(6)}{3}$

$= 8\pi$

$a^2 + b^2 = c^2$
$a^2 + 5^2 = 13^2$
$a^2 = 144$
$a = 12$

6. Find the volume of the composite figure.

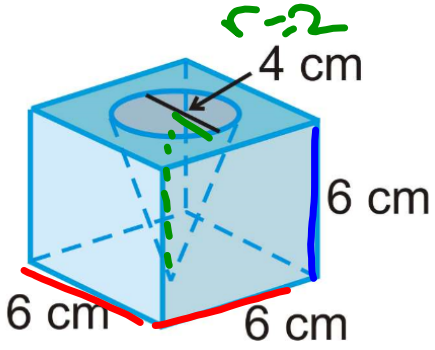



$V_{cylinder} = \pi r^2 h$
$= \pi(5)^2(2)$
$= 50\pi \text{ cm}^3$

$V_{cone} = \frac{1}{3}\pi r^2 h$
$= \frac{1}{3}\pi(5)^2(12)$
$= 100\pi \text{ cm}^3$

$V = 50\pi + 100\pi$
$V = 150\pi \text{ cm}^3$

7. Find the volume of the composite figure.




$V_{cube} = Bh$
$= 6 \times 6 \times 6$
$= 216 \text{ cm}^3$

$V_{cone} = \frac{1}{3}\pi r^2 h$
$= \frac{1}{3}\pi (2)^2 (6)$
$= 8\pi \text{ cm}^3$

$V = 216 - 8\pi$

$V \approx 190.87 \text{ cm}^3$

# Ratio Relationships

| | |
|---|---|
| **a:b** | Ratio of the **scale factor** |
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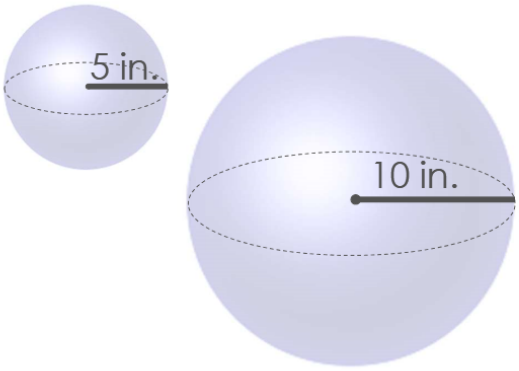
| **a:b** | Ratio of the **perimeters** |
| $a^2:b^2$ | Ratio of the **area** |
| $a^3:b^3$ | Ratio of the **volume** |

## Volume of a Sphere

A spherical balloon has an initial radius of 5 in. When more air is added, the radius becomes 10 in. How does volume change as the radius changes.



## Volume of a Sphere

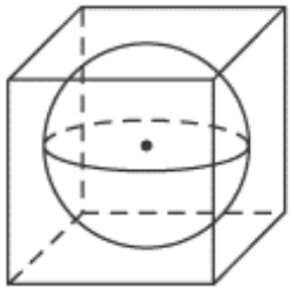
A sphere has an initial volume of 400 $cm.^3$ The sphere is made bigger by making the radius 4 times larger. What is the new volume of the sphere?

## Volume of a Sphere

A sphere is inscribed in a cube-shaped box as pictured below. To the nearest centimeter, what is the volume of the empty space in the box?

$V_{sphere} =$

$V_{cube} =$



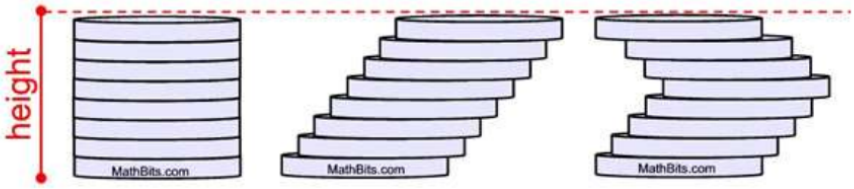
16 cm.

$V_{\text{empty space}} =$

# Practice: Volume of Composite Figures

# Cavalieri's Principle

If two shapes have the same _height_ and matching cross sectional _areas_ everywhere along the height, then the shapes have the same _volume_.



## Cavalieri's Principle

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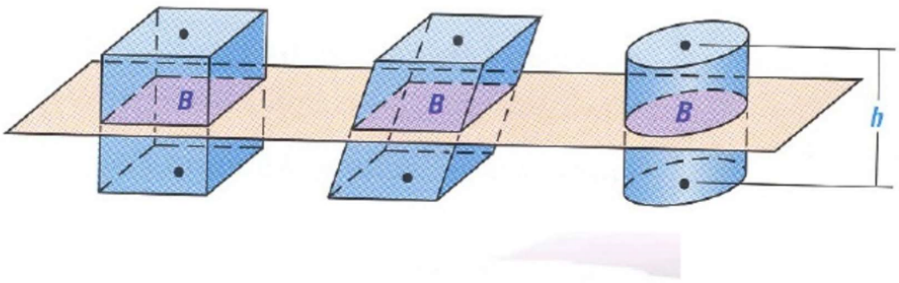
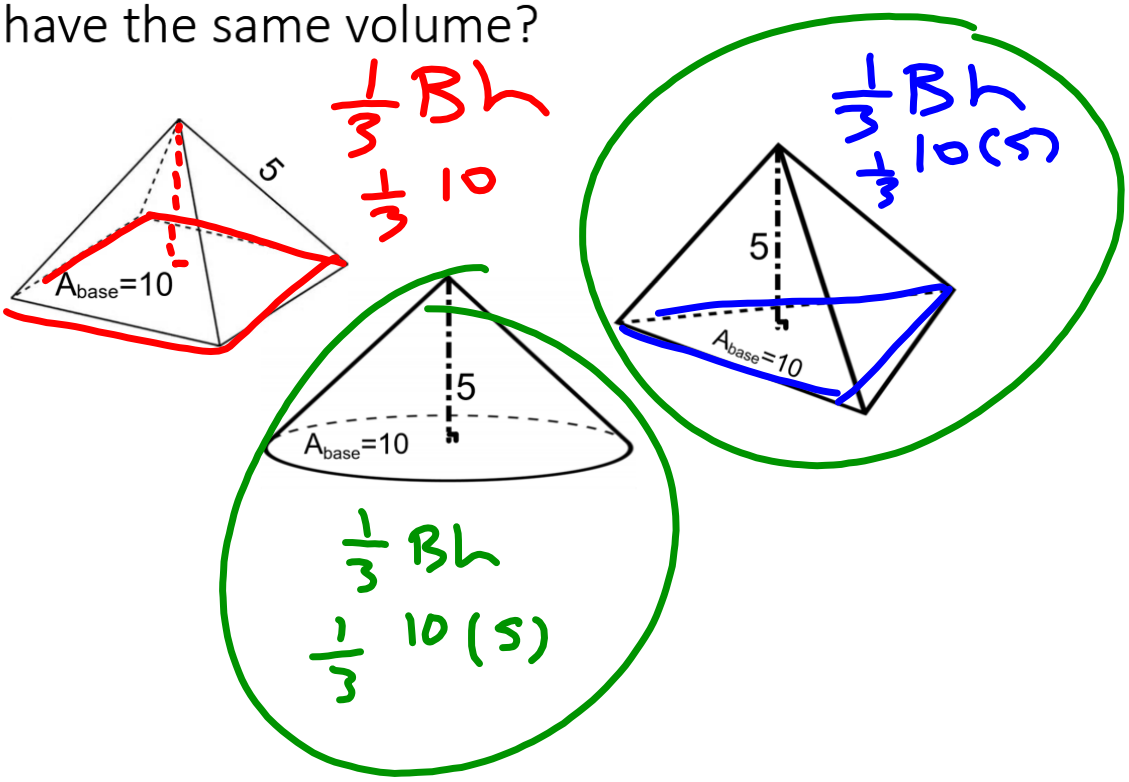


Based on Cavaleri's Principle, which figures have the same volume?




$\frac{1}{3}Bh$

$\frac{1}{3}$ 10

$\frac{1}{3}Bh$

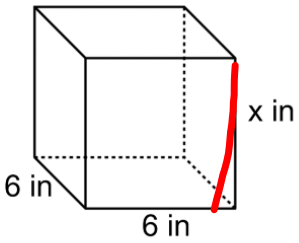
$\frac{1}{3}$ 10(5)

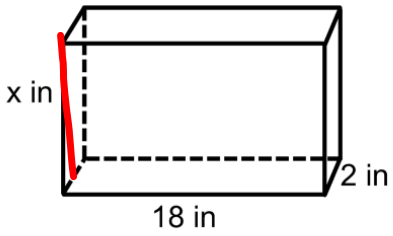
$\frac{1}{3}Bh$

$\frac{1}{3}$ 10 (5)

Based on Cavaleri's Principle, do the following figures have the same volume? Explain how you know.

$V = Bh$




Yes, $6^2 = 36 = 18(2)$, so areas of base are same with same height.

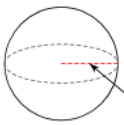
Geometry Name_____

# Volume Quiz Review

Date_____ Period____

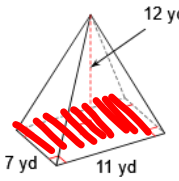
**Find the volume of each figure. Round your answers to the nearest hundredth, if necessary.**

1)




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

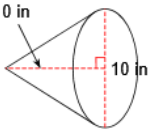
2)




$V = \frac{1}{3}Bh$

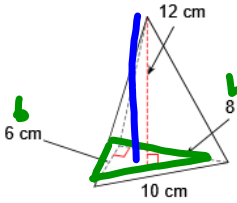
$= \frac{1(7(11))(12)}{3}$

3)




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

4)



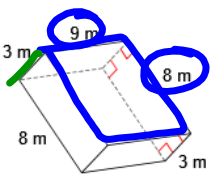

$V = \frac{1}{3}Bh$

$\frac{1}{2}bh$

$= \frac{1}{3} \cdot \frac{1}{2}(6)(8)(10)$

$=$

5)

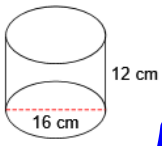



$V = Bh$

$2(5)(3)$

$V = 216\ m^3$

6)



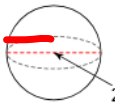

$r = 8$

$V = \pi r^2 h$

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

$V = 768\pi\ cm^3$

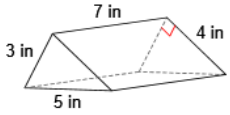
7)



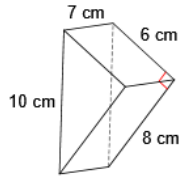

$r = 12$ $V = \frac{4}{3}(12)^3\pi$

$V = 7238.23\ yd^3$

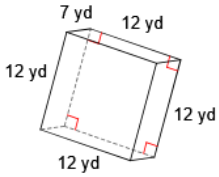
8)



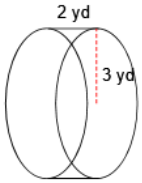
9)




10)




11)

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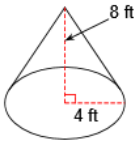



13) A cone with diameter 4 ft and a height of 10 ft.

14) A rectangluar pyramid of height 8 m measuring 4 m and 8 m along the base.

15) A prism 1 m tall with a right triangle for a base with side lengths 3 m, 4 m, and 5 m.

16) A rectangular prism measuring 5 cm and 6 cm along the base and 12 cm tall.


$V = Bh$

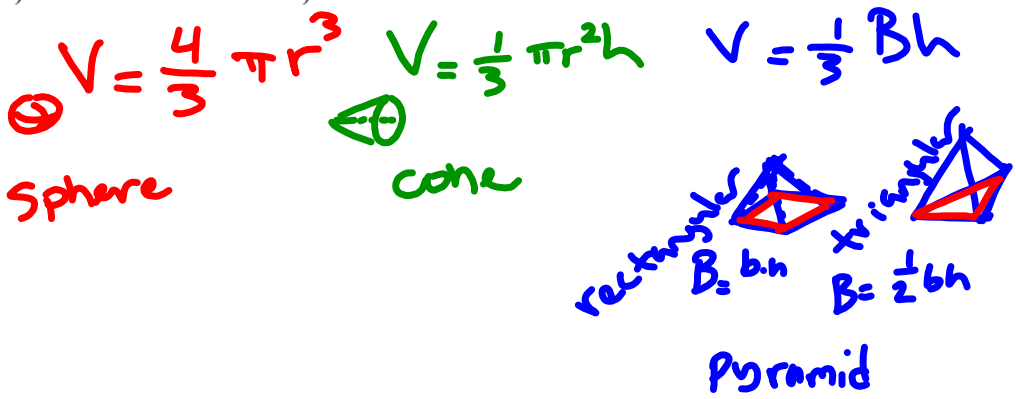
$V = 5(6)(12) = 360\ cm^3$

17) A cylinder with a diameter of 22 ft and a height of 9 ft.

18) A sphere with a radius of 6 mi.

# Answers to Volume Quiz Review

| | | | |
|---|---|---|---|
| 1) 5575.28 m³ | 2) 308 yd³ | 3) 261.8 in³ | 4) 96 cm³ |
| 5) 216 m³ | 6) 2412.74 cm³ | 7) 7238.23 yd³ | 8) 42 in³ |
| 9) 168 cm³ | 10) 1008 yd³ | 11) 56.55 yd³ | 12) 134.04 ft³ |
| 13) 41.89 ft³ | 14) 85.33 m³ | 15) 6 m³ | 16) 360 cm³ |
| 17) 3421.19 ft³ | 18) 904.78 mi³ | | |



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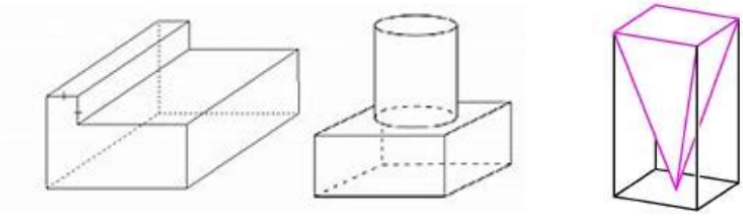

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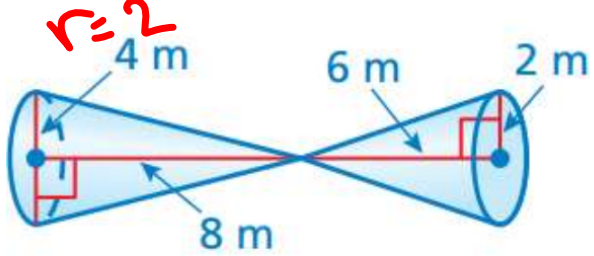



$V_{left} = \frac{1}{3}\pi r^2 h$ (r = 2, h = 8)

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

$= \frac{32\pi}{3}\ m^3$

$V_{right} = \frac{1}{3}\pi r^2 h$ (r = 2, h = 6)

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

$= 8\pi\ m^3$

$V = \frac{32\pi}{3} + \frac{8\pi}{1}$

$= \frac{56\pi}{3}\ m^3 \approx 58.64\ m^3$

p.32

$a^2+b^2=c^2$

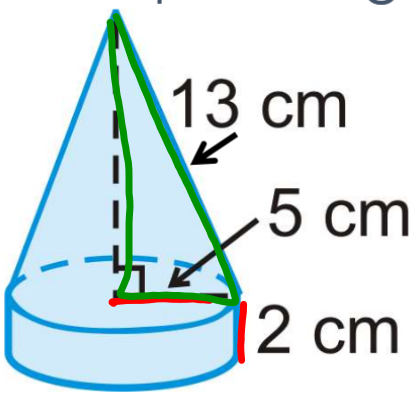
$5^2+b^2=13^2$

$25+b^2=169$

$b^2=144$

$b=12$

6. Find the volume of the composite figure.




$V_{cylinder} = \pi r^2 h$

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

$= 50\pi \text{ cm}^3$

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

$= \frac{1}{3}\pi(5)^2(12)$

$= 100\pi \text{ cm}^3$

$V = 50\pi + 100\pi$

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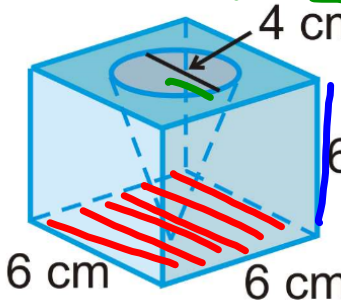


$r = 2$

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$= 6 \times 6 \times 6$

$= 216 \text{ cm}^3$

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$V \approx 190.87 \text{ cm}^3$

# Ratio Relationships

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| **a:b** | Ratio of the **scale factor** |
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| $a^2:b^2$ | Ratio of the **area** |
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## Volume of a Sphere

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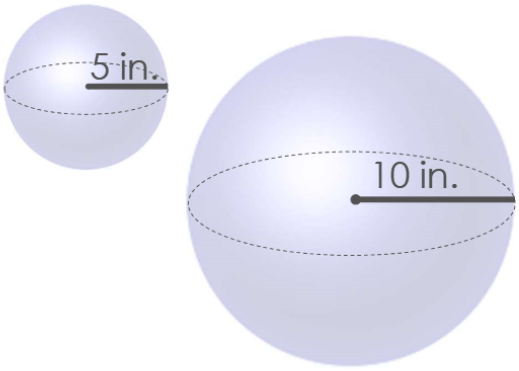

## Volume of a Sphere

A sphere has an initial volume of 400 $cm.^3$ The sphere is made bigger by making the radius 4 times larger. What is the new volume of the sphere?

## Volume of a Sphere

A sphere is inscribed in a cube-shaped box as pictured below. To the nearest centimeter, what is the volume of the empty space in the box?

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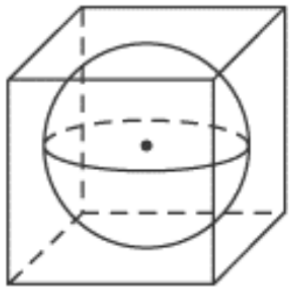


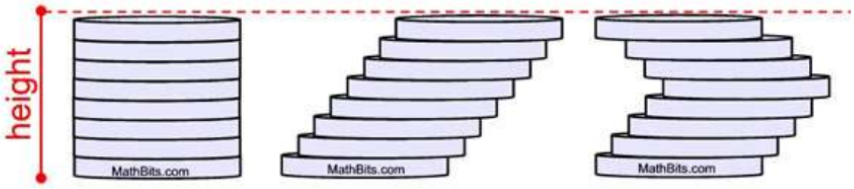
16 cm.

$V_{\text{empty space}} =$

# Practice: Volume of Composite Figures

# Cavalieri's Principle

If two shapes have the same height and matching cross sectional areas everywhere along the height, then the shapes have the same volume.



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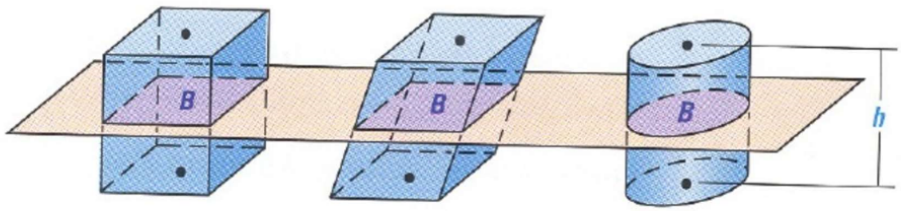
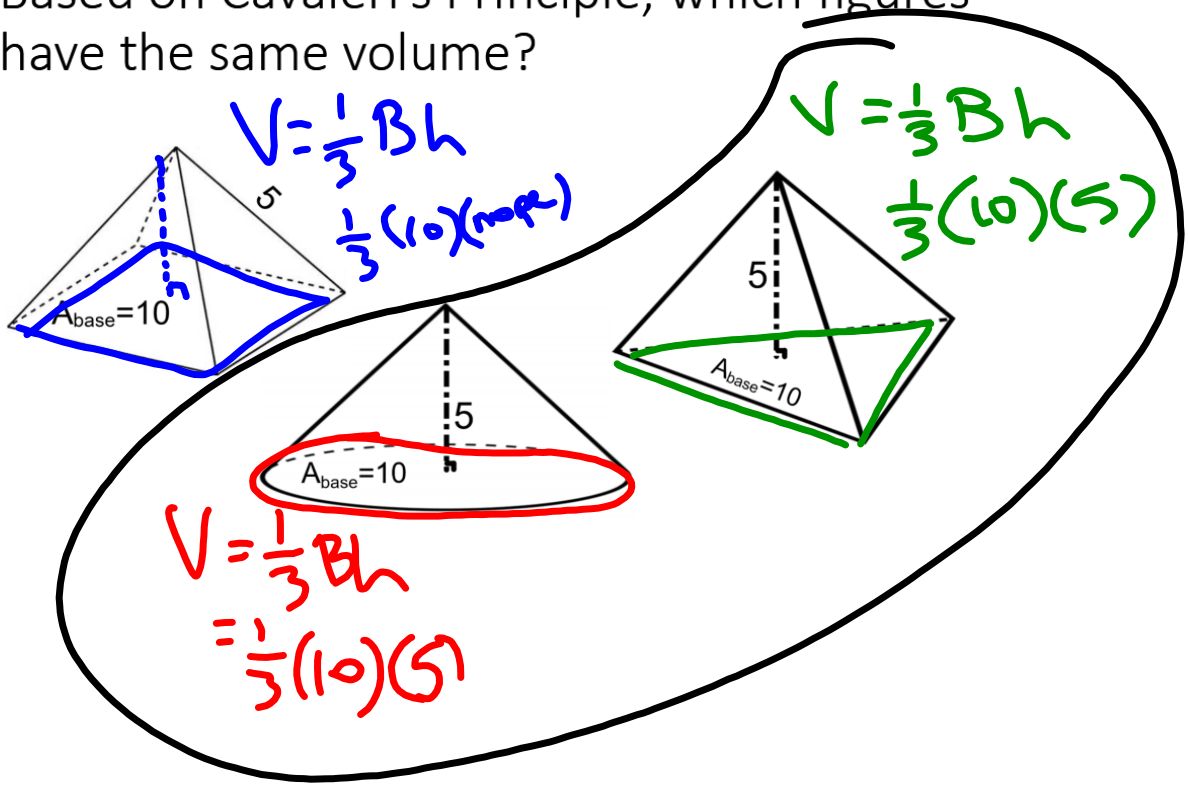
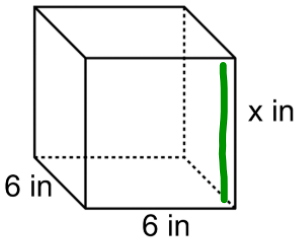
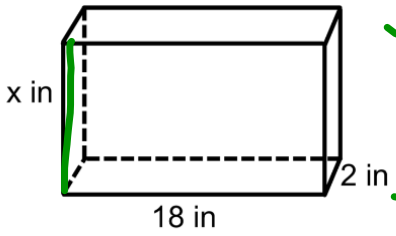


Based on Cavaleri's Principle, which figures have the same volume?



Based on Cavaleri's Principle, do the following figures have the same volume? Explain how you know.




$6(6)=36$

$18(2)=36$

Yes, according to Cav's Principle, they have same base and height, so same volume.

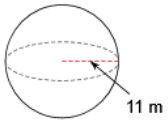
Geometry Name_____

# Volume Quiz Review

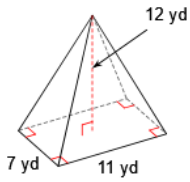
Date_____ Period____

**Find the volume of each figure. Round your answers to the nearest hundredth, if necessary.**

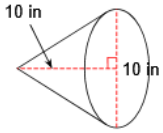
1)



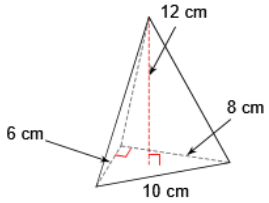

2)



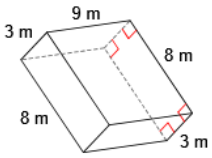

3)




4)




5)

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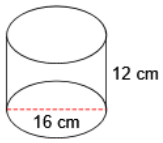


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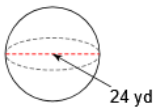
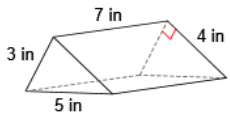
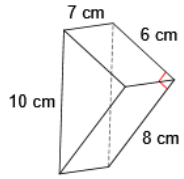


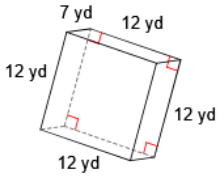

8)



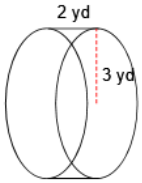
9)



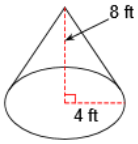

10)




11)




12)




13) A cone with diameter 4 ft and a height of 10 ft.

14) A rectangluar pyramid of height 8 m measuring 4 m and 8 m along the base.

15) A prism 1 m tall with a right triangle for a base with side lengths 3 m, 4 m, and 5 m.

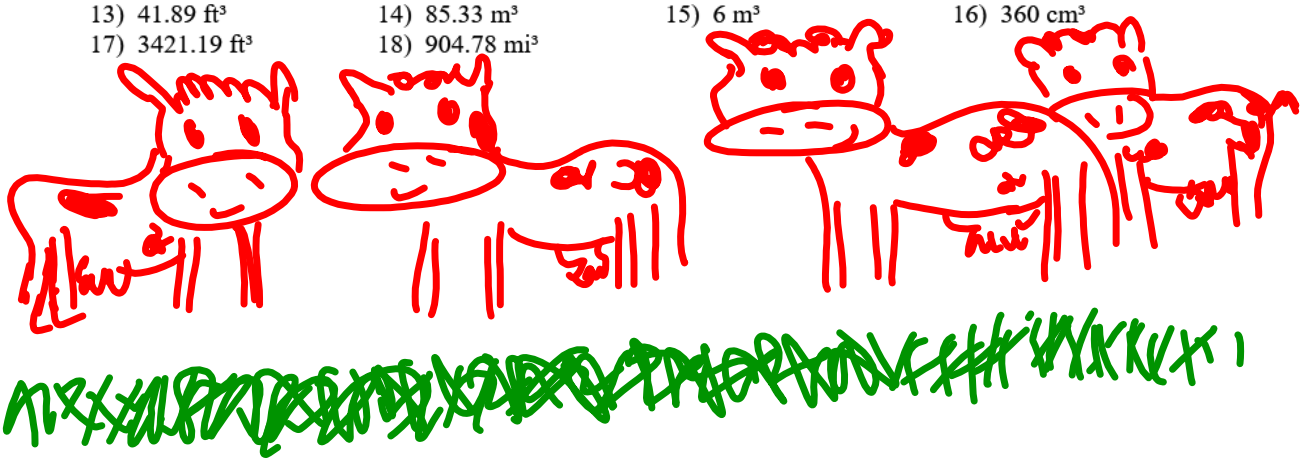
16) A rectangular prism measuring 5 cm and 6 cm along the base and 12 cm tall.

17) A cylinder with a diameter of 22 ft and a height of 9 ft.

18) A sphere with a radius of 6 mi.

## Answers to Volume Quiz Review

| | | | |
|---|---|---|---|
| 1) 5575.28 $m^3$ | 2) 308 $yd^3$ | 3) 261.8 $in^3$ | 4) 96 $cm^3$ |
| 5) 216 $m^3$ | 6) 2412.74 $cm^3$ | 7) 7238.23 $yd^3$ | 8) 42 $in^3$ |
| 9) 168 $cm^3$ | 10) 1008 $yd^3$ | 11) 56.55 $yd^3$ | 12) 134.04 $ft^3$ |
| 13) 41.89 $ft^3$ | 14) 85.33 $m^3$ | 15) 6 $m^3$ | 16) 360 $cm^3$ |
| 17) 3421.19 $ft^3$ | 18) 904.78 $mi^3$ | | |

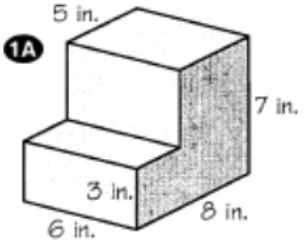


| PARTNER A (left side) | TEAM NAME | PARTNER B right side) |
|---|---|---|
| | | |

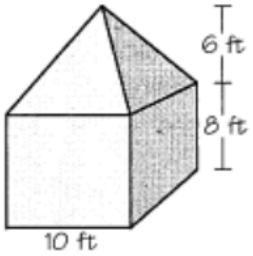
# What Might You Send to People Who Buy a House With No Water?

Find the volume of each composite space figure (some answers are rounded). Partner A should do the left side and Partner B the right side. Cross out the letters above each correct answer. When you finish, write the remaining letters in the spaces at the bottom of the page.

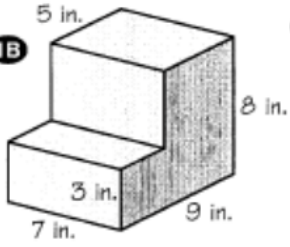
**1A**



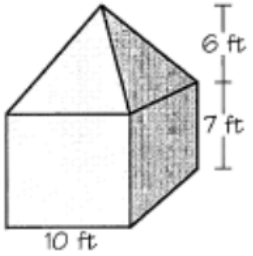

**2A** The floor of this tent is square.



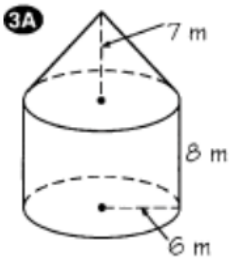

**1B**



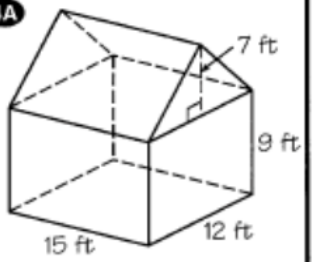

**2B** The floor of this tent is square.



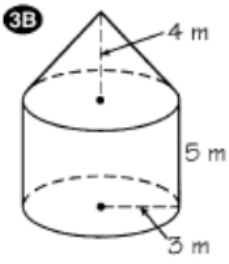

**3A**



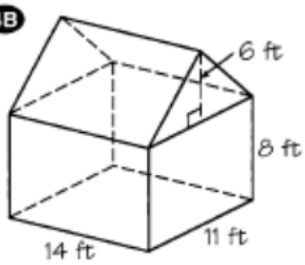

**4A**



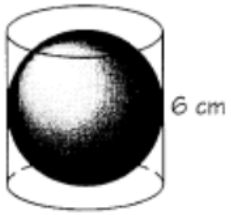

**3B**



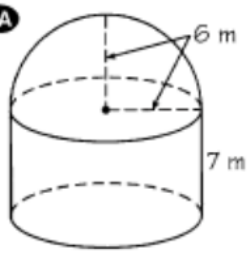

**4B**



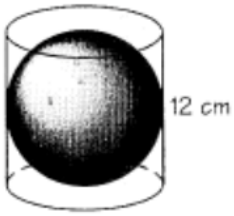

**5A** Find the volume inside the cylinder but outside the sphere.



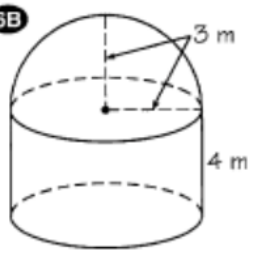

**6A**




**5B** Find the volume inside the cylinder but outside the sphere.




**6B**




| DR | AG | IF | TO | ET | WE | TS | EA | LL | IT |
|---|---|---|---|---|---|---|---|---|---|
| 2250 $ft^3$ | 63.8 $cm^3$ | 1243 $m^3$ | 1000 $ft^3$ | 1224 $m^3$ | 1840 $ft^3$ | 56.5 $cm^3$ | 264 $in.^3$ | 238 $in.^3$ | 1168 $m^3$ |

| AL | SO | LD | ON | LY | CA | LL | ME | BI | RD |
|---|---|---|---|---|---|---|---|---|---|
| 900 $ft^3$ | 435 $cm^3$ | 170 $m^3$ | 1370 $ft^3$ | 1694 $ft^3$ | 175 $m^3$ | 452 $cm^3$ | 364 $in.^3$ | 179 $m^3$ | 375 $in.^3$ |





Measurements in Geometry:
Volume of Composite Space Figures