

Name: KEY!

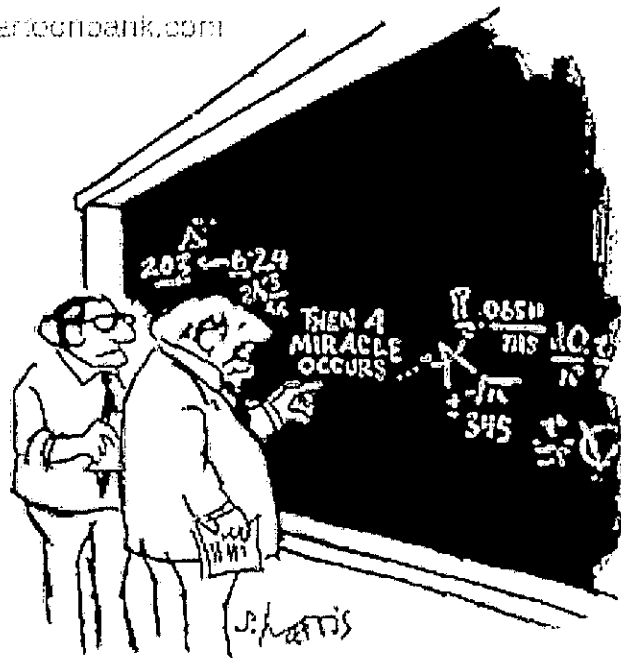
Hour: \_\_\_\_\_

# Unit I:

## Surface Area & Volume

### Geometry 2nd Semester

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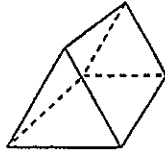
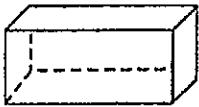
"I think you should be more explicit here in step two."

## Lesson 10-1: Surface Area Prisms/Cylinders

### Vocabulary

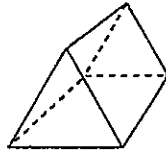
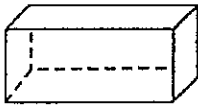
Surface Area: <sup>add them up!</sup> the sum of the areas of ALL of the faces of a figure \*bases included\*

Examples:



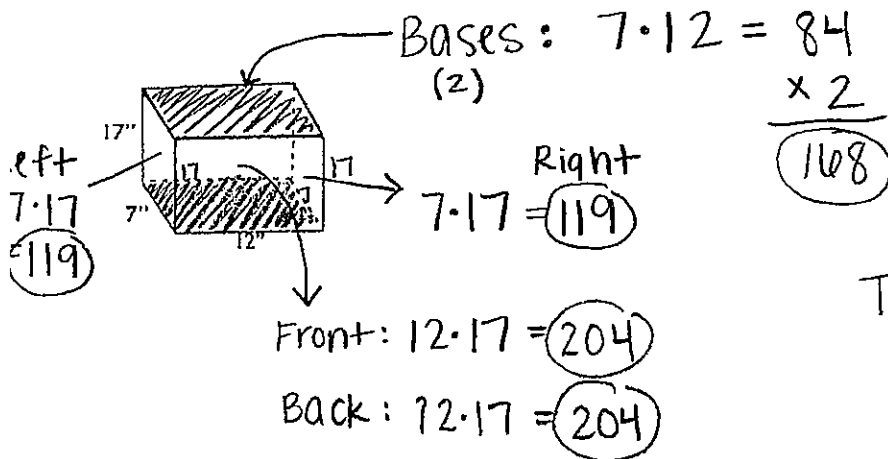
Lateral Area: <sup>add them up!</sup> the sum of the areas of the lateral faces of a figure \*not including bases\*

Examples:



### Practice

- A cardboard box has a base 7" by 12" and a height of 17". What is the total surface area of the box?



Then...  $119 + 119 + 168 + 204 + 204 =$

$814 \text{ in}^2$

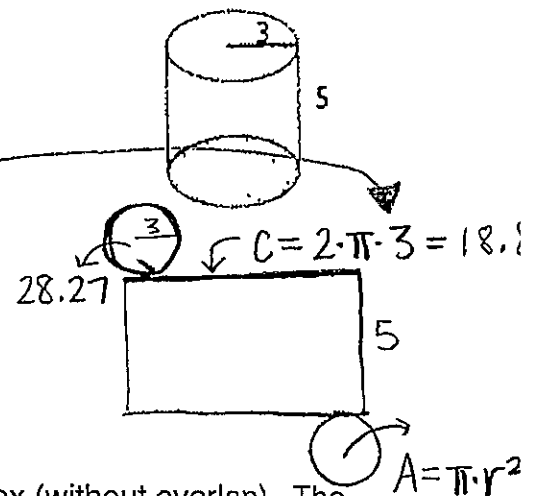
2. Using the figure at the right, answer the following:

- a) Find its lateral area. → no bases!

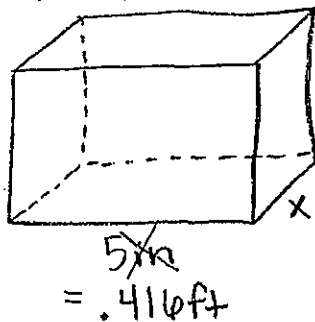
$$5 \cdot 18.8 = 94 \text{ units}^2$$

- b) Find its surface area. (add bases)

$$94 + 28.27 + 28.27 = 150.5 \text{ units}^2$$



3. 16 square feet of wrapping paper is needed to wrap a box (without overlap). The height of the box is 10 inches and the width of the box is 5 inches. What is the depth of the box?



$$\text{Surface Area} = 16 \text{ ft}^2$$

Top & Bottom:  $.416 \cdot x$   
&  $.416 \cdot x$

Left & Right:  $.83 \cdot x$   
&  $.83 \cdot x$

Front & Back:  $.416 \cdot .83 = .345$   
&  $.345$

2) Add:

$$.416x + .416x + .83x + .83x + .345 + .345 = 16$$

$$2.492x + .69 = 16 - .69$$

4. How much paper is needed (without overlap) to create a soup can label for the following figure?

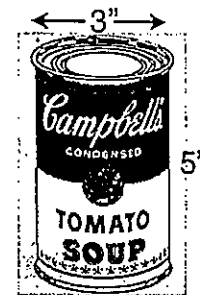
$$\frac{.492x = 15.31}{2.492 \quad 2.492}$$

$$x = 6.14 \text{ ft}$$

Label = rectangle

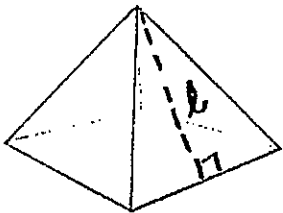

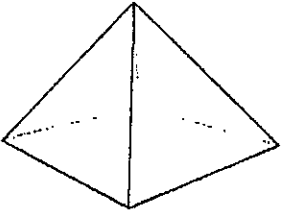
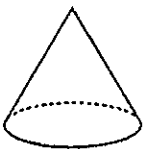
$$9.42 \cdot 5 = 47.1 \text{ in}^2$$

$C = 2 \cdot \pi \cdot r$   
 $= 2 \cdot \pi \cdot 1.5$   
 $= 9.42$



## Lesson 10-2: Surface Area of Pyramids & Cones

### Formulas

Type	Figure	Formula	Variable Meanings
Lateral Area	<b>Pyramid</b> 	$LA = \frac{1}{2} \cdot l \cdot P$	$l$ = slant height $P$ = perimeter of base
	<b>Cone</b> 	$LA = \frac{1}{2} \cdot l \cdot P$	↗
Surface Area	<b>Pyramid</b> 	Find the lateral area & add the area of the base!	
	<b>Cone</b> 	Find the lateral area & add the area of the base!	

## Practice

1. Pyramid Khufu has dimensions given.

- a. Find the slant height.

\*use Pythag!  $a^2 + b^2 = c^2$

$$147^2 + 115.5^2 = l^2$$

$$\sqrt{34,949.25} = l^2$$

$$l = 186.9 \text{ m}$$

- b. Find the lateral area.

$$LA = \frac{1}{2} \cdot l \cdot (P) \rightarrow 231 \cdot 4 = 924$$

$$= \frac{1}{2} \cdot 186.9 \cdot 924 = 86,347.8 \text{ m}^2$$

- c. Find the surface area.

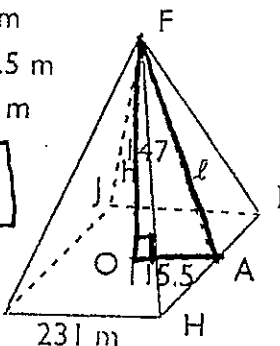
add the base!

$$\text{Base: } 231 \cdot 231$$

$$= 53,361 \rightarrow +$$

$$= 139,708.8 \text{ m}^2$$

$$\begin{aligned} h &= 147 \text{ m} \\ OA &= 115.5 \text{ m} \\ GH &= 231 \text{ m} \end{aligned}$$



2. Find the lateral area & surface area of the cone pictured.

Lateral Area:

$$LA = \frac{1}{2} \cdot l \cdot (P) \rightarrow C = 2 \cdot \pi \cdot r$$

$$= 2 \cdot \pi \cdot 10 = 62.8$$

$$= \frac{1}{2} \cdot 13 \cdot 62.8$$

$$= 408.2 \text{ units}^2$$

Surface Area:

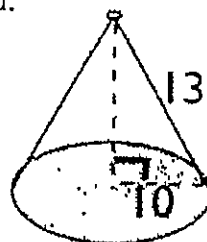
add the base!



$$A = \pi r^2$$

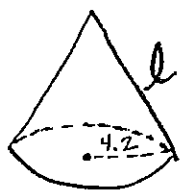
$$= \pi \cdot 10^2 = 314.2 \rightarrow +$$

$$= 722.4 \text{ units}^2$$



3. A cone has radius 4.2 and a surface area of 187.4. What is the slant height?

w/ base



$$LA = \frac{1}{2} \cdot l \cdot (P) \rightarrow C = 2 \cdot \pi \cdot r$$

$$= 2 \cdot \pi \cdot 4.2 = 26.4$$

$$= \frac{1}{2} \cdot l \cdot 26.4$$

$$= 13.2 l$$

$$+ \text{base } A = \pi \cdot r^2$$

$$= \pi \cdot 4.2^2$$

$$= 55.4$$

$$13.2 l + 55.4 = 187.4$$

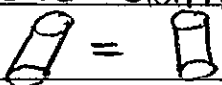

$$-55.4 \quad -55.4$$

$$\frac{13.2 l = 132}{13.2 \quad 13.2}$$


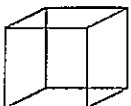
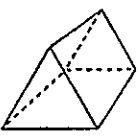
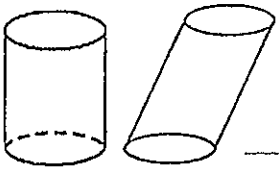
$$l = 10 \text{ units}$$

## Lesson 10-3 & 10-5: Volume of Prisms & Cylinders

### Vocabulary

Cavalleri's Principle: whether a figure is slanted or upright,  
the volume is the same. Ex:  = 

### Formulas

Type	Figure	Formula	Variable Meanings
Volume	<b>Box</b> 	Multiply the length, width & height	X
	<b>Cube</b> 	↑ same	X
	<b>Prism</b> 	Find the area of the base, multiply it by the height	X
	<b>Cylinder</b> 	↑ same	X

### Practice

1. Find the volume of the cylinder at the right.

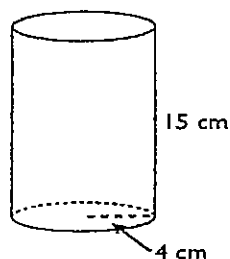
Base:  $A = \pi \cdot r^2$

$$= \pi \cdot 4^2$$

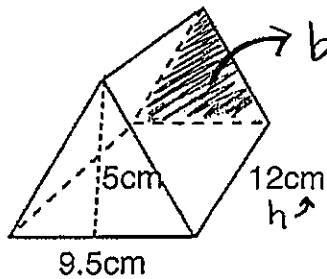
$$= 50.27$$

$$\hookrightarrow \times 15 \text{ height}$$

$$= \boxed{754.05 \text{ cm}^3}$$



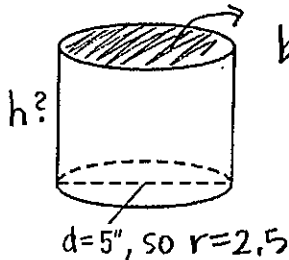
2. Find the volume of the figure below.



$$\begin{aligned} \text{base} &= \frac{1}{2} \cdot b \cdot h \\ &= \frac{1}{2} \cdot 9.5 \cdot 5 \\ &= 23.75 \end{aligned}$$

$$\rightarrow \times \underset{\text{height}}{12} = \boxed{285 \text{ cm}^3}$$

3. If the volume of the cylinder below is 78.5. Find the height of the cylinder.



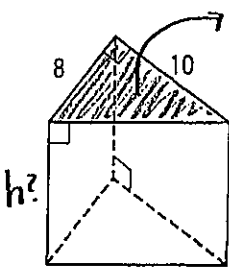
$$\begin{aligned} \text{base: } A &= \pi \cdot r^2 \\ &= \pi \cdot 2.5^2 \\ &= 19.6 \end{aligned}$$

$$\rightarrow \times h$$

$$\frac{19.6 \cdot h = 78.5}{19.6} \quad \text{volume}$$

$$\boxed{h = 4 \text{ units}}$$

4. The volume of the triangular prism below is 400. Find the height of the prism.



$$\begin{aligned} \text{base: } \frac{1}{2} \cdot b \cdot h \\ &= \frac{1}{2} \cdot 8 \cdot 10 \\ &= 40 \end{aligned}$$

$$\rightarrow \times h$$

$$\frac{40 \cdot h = 400}{40} \quad \text{volume}$$

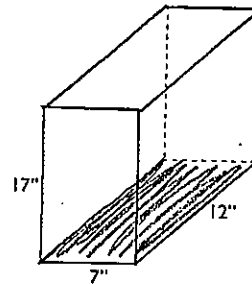
$$\boxed{h = 10 \text{ units}}$$

5. What is the volume of the following paper bag?

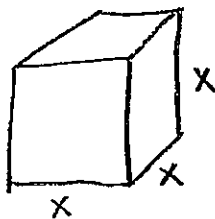
$$\text{Base: } 7 \cdot 12$$

$$= 84$$

$$\rightarrow \times 17 = \boxed{1428 \text{ in}^3}$$



6. A cube has volume of 50 cubic centimeters. What is the length of an edge?



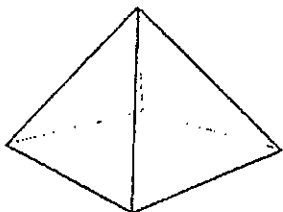
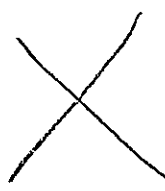
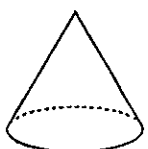

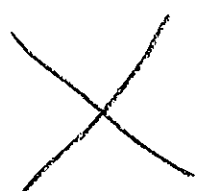
$$x \cdot x \cdot x = 50$$

$$\sqrt[3]{x^3} = \sqrt[3]{50}$$

$$\boxed{x = 3.68 \text{ cm}}$$

## Lesson 10-7: Volume of Pyramids & Cones

### Formulas

Type	Figure	Formula	Variable Meanings
Volume	<b>Pyramid</b> 	Find the area of base, multiply by height... Then $\div$ by 3!	
	<b>Cone</b> 		

### Practice

1. What is the volume of the Pyramid of Khufu with dimensions as shown?

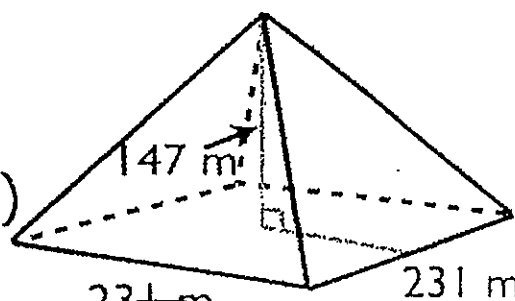
$$\text{Base: } 231 \cdot 231$$

$$= 53,361$$

$$\rightarrow \times 147 \text{ (height)}$$

$$= 7,844,067$$

$$\div 3 = \boxed{2,614,689 \text{ m}^3}$$



2. If a cone has a height of 6 inches and a volume of 40 cubic inches, what is the radius of the base?

$$\text{Base: } A = \pi \cdot r^2$$

$$\rightarrow \times 6 \text{ (height)}$$

$$= \frac{6\pi r^2}{3}$$

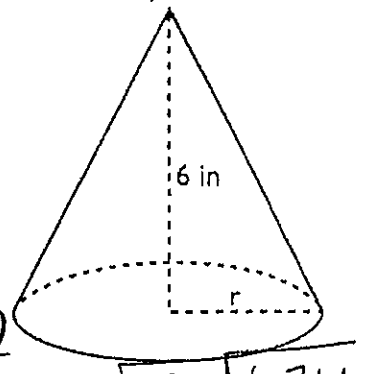
$$= 2\pi r^2$$

$$\frac{2\pi r^2}{2} = \frac{40}{2}$$

$$\frac{\pi r^2}{\pi} = \frac{20}{\pi}$$

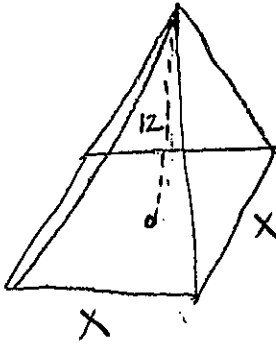
$$r^2 = \boxed{6.366}$$

$$r = \boxed{2.52 \text{ in}}$$





3. If a square pyramid has a height of 12 and a total volume of 484, find the length of one side of the base.



$$\text{Base: } x \cdot x$$

$$= x^2$$

$$\hookrightarrow x \cdot 12 \text{ (height)}$$

$$= 12x^2$$

$$\div 3$$

$$= 4x^2$$

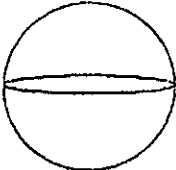
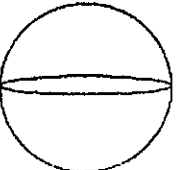
$$\text{So, } \frac{4x^2}{4} = \frac{484}{4}$$

$$\sqrt{x^2} = \sqrt{121}$$

$$\boxed{x = 11 \text{ units}}$$

## Lesson 10-8 & 10-9: Volume & Surface Area of Spheres

### Formulas

Type	Figure	Formula	Variable Meanings
Volume	Sphere 	$V = \frac{4}{3} \cdot \pi \cdot r^3$	$r = \text{radius}$
Surface Area	Sphere 	$SA = 4 \cdot \pi \cdot r^2$	$r = \text{radius}$

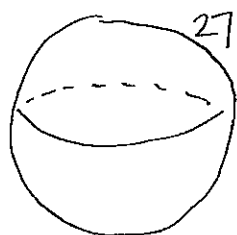
### Practice

1. Find the volume and surface area of a sphere with radius 12 inches. Give an exact answer and an approximate answer for each. Round to the nearest hundredth.

$$\begin{aligned}
 V &= \frac{4}{3} \cdot \pi \cdot 12^3 \\
 &= 7,238.2 \\
 &\text{or } 2304\pi
 \end{aligned}$$

$$\begin{aligned}
 SA &= 4 \cdot \pi \cdot r^2 \\
 &= 4 \cdot \pi \cdot 12^2 \\
 &= 1809.6 \text{ or } 576\pi
 \end{aligned}$$

2. A standard bowling ball cannot be more than 27 inches in circumference. What is the maximum volume and surface area of such a bowling ball?



$$\begin{aligned}
 C &= 2\pi r \\
 \frac{27}{2\pi} &= \frac{2\pi r}{2\pi} \\
 4.3 &= r
 \end{aligned}$$

$$\begin{aligned}
 V &= \frac{4}{3} \pi \cdot 4.3^3 \\
 &= 333.04
 \end{aligned}$$

$$\begin{aligned}
 SA &= 4\pi \cdot 4.3^2 \\
 &= 232.4
 \end{aligned}$$

3. How many times as great is the volume of a giant squid eyeball, as the volume of a human eyeball? Round your answer to the nearest hundredth.

Giant Squid Eyeball

radius = 12.5cm

$$V = \frac{4}{3} \cdot \pi \cdot 12.5^3$$

$$= 8181.23$$

Human Eyeball

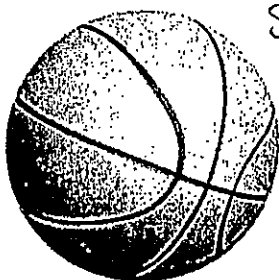
radius = 1.25cm

$$V = \frac{4}{3} \cdot \pi \cdot 1.25^3$$

$$= 8.18123$$

1000 times bigger

4. How much material is needed to cover the basketball below with radius 20cm?



SA

$$SA = 4 \cdot \pi \cdot 20^2$$

$$= 5026.55 \text{ cm}^2$$

5. Find the ~~volume~~ <sup>surface area</sup> of a sphere with ~~surface area~~ <sup>volume</sup>  $144\pi \text{ in}^3$ .

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

$$\frac{144\pi}{\frac{4}{3}\pi} = \frac{\frac{4}{3}\pi r^3}{(\frac{4}{3}\pi)}$$

$$\sqrt[3]{108} = \sqrt[3]{r^3}$$

$$4.76 \approx r$$

$$SA = 4\pi r^2$$

$$= 4 \cdot \pi \cdot 4.76^2$$

$$= 284.7 \text{ in}^2$$

6. Find the surface area of a sphere with a great circle that has an area of  $4\pi \text{ in}^2$ .

$$A = \pi \cdot r^2$$

$$\frac{4\pi}{\pi} = \frac{\pi \cdot r^2}{\pi}$$

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

$$2 = r$$

$$SA = 4 \cdot \pi \cdot 2^2$$

$$= 50.27 \text{ in}^2$$