

## 6.2 SPATIAL RELATIONSHIPS

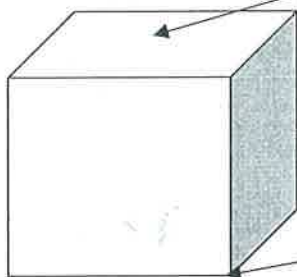
### Figures in Space

The term given to a figure composed of polygons is a polyhedron

Plural terms: polyhedrons or polyhedra

The common term for such figures is \_\_\_\_\_

Examine the cube:



1. Polygons (in this case squares) that compose the figure are called lateral faces

2. The intersection of the faces that compose the figure are called lateral edges

3. The corners of the faces that compose the figure are called vertices

A cube is a special type of polyhedron, a regular polyhedron

All of the faces are ~~equal~~ squares

The same number of polygons \_\_\_\_\_

Again examine the cube

Identify two parallel planes:

Planes are parallel if and only if they never intersect

Identify a line that is perpendicular to a plane:

A line is perpendicular to a plane if and only if it is

perpendicular to every line on that plane that it intersects

Identify a line that is parallel to a plane:

A line that is not contained in a plane is parallel to the plane if and only if

it is parallel to every line on the plane.

Key

### 6.3 PRISMS

Prisms are special polyhedrons

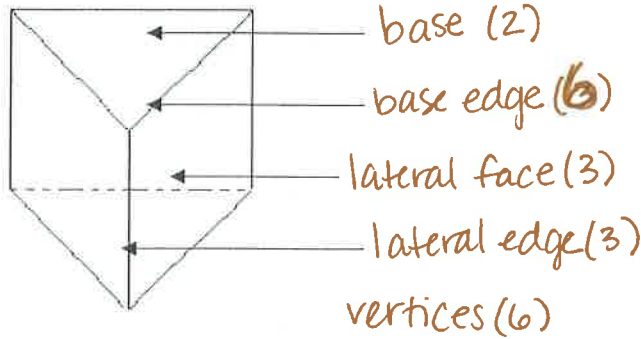
There are two bases that are parallel

There are also multiple lateral faces

The number of lateral faces = the # of sides of the base

Edges connecting lateral faces are called lateral edges

Label the triangular prism:



Let  $n$  = the number of sides of the base

Lateral Faces:  $n$

Total Faces:  $n+2$  (bases)

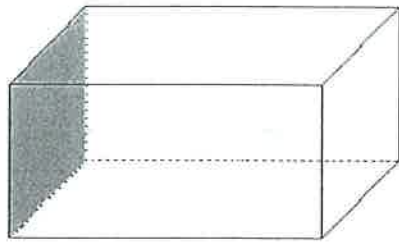
Lateral Edges:  $n$

Total Edges:  ~~$n$~~   $3n$

Total Vertices:  $2n$

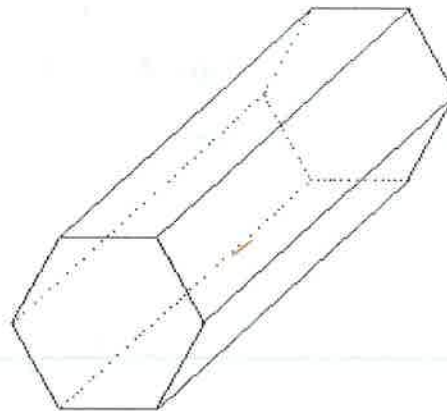
Some other prisms:

2 bases  
4 base edges  
4 lateral faces  
4 lateral edges  
8 vertices



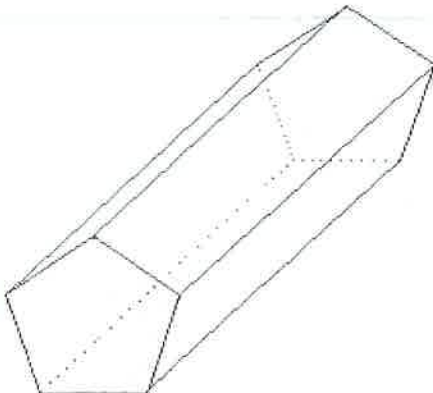
Rectangular prism

2 bases  
~~12~~ 6 base edges  
6 lateral faces  
6 lateral edges  
12 vertices



Hexagonal prism

2 bases  
~~10~~ 5 base edges  
5 lateral faces  
5 lateral edges  
10 vertices



Pentagonal prism

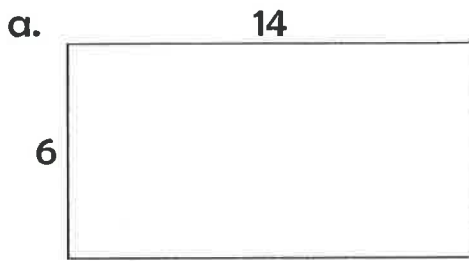
Note that bases are not always the "top" and "bottom."

## 7.1 Surface Area and Volume of Rectangular Prisms

- Objectives:
1. I can find the surface area and volume of rectangular prisms.
  2. I can find the surface area to volume ratio for rectangular prisms.
  3. I can tell when it is appropriate to maximize/minimize surface area or volume of rectangular prisms.

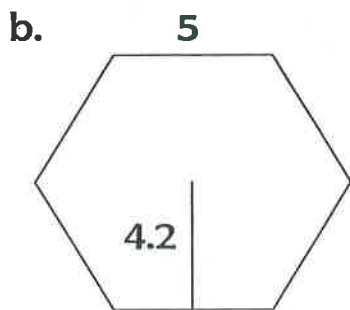
### Warm-UP!

1. Find the perimeter and area of the following figures:



$$\begin{aligned}
 P &= 2l + 2w \\
 &= 2(14) + 2(6) \\
 &= 28 + 12 = 40
 \end{aligned}$$

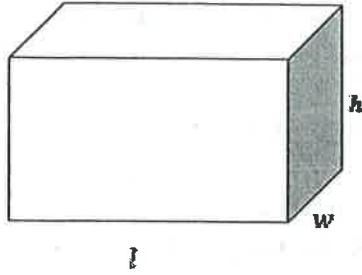
$$\begin{aligned}
 A &= lw \\
 &= (14)(6) = 84
 \end{aligned}$$



$$P = 5 \times 6 = 30$$

$$A = \frac{1}{2}ap = \frac{1}{2}(4.2)(30) = 63$$

## Surface Area and Volume Formulas for Rectangular Prisms:



$$\text{Surface Area} = 2lw + 2lh + 2wh$$

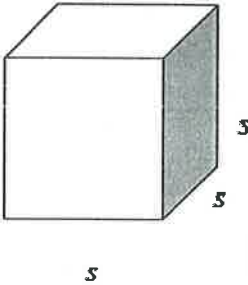
$$\text{Volume} = lwh$$

$l$  = length

$w$  = width

$h$  = height

## Surface Area and Volume Formulas for Cubes:



$$\text{Surface Area} = 6s^2$$

$$\text{Volume} = s^3$$

$s$  = every side length

## Surface Area to Volume Ratio:

1. Find the Surface Area, Volume and Surface Area to Volume Ratio given:

Length = 6 Width = 7 Height = 8

SA = 292

V = 336

Ratio:  $\frac{292}{336} = \frac{73}{84}$

$$SA = 2lw + 2lh + 2wh$$

$$= 2(6)(7) + 2(6)(8) + 2(7)(8)$$

$$\underbrace{84} + \underbrace{96} + \underbrace{112}$$

$$V = lwh$$

$$(6)(7)(8)$$

2. Find the Surface Area, Volume and Surface Area to Volume Ratio given:

Length = 4 Width = 6.2 Height = 10

SA = 253.6

V = 248

Ratio:  $\frac{317}{310}$

## 7.2 Surface Area and Volume of Other Prisms

- Objectives: 1. I can find the surface area and volume of other prisms.  
2. I can recognize which formulas are correct for finding the missing information about a prism.

### Lateral Area and Surface Area of Prisms

Recall that a Prism is composed of two bases and multiple lateral faces.

Lateral Area is the total area of all lateral faces.

Surface Area is the lateral area AND the area of the two bases.

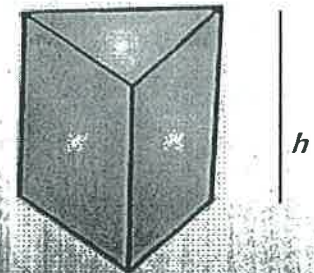
*Lateral Area = perimeter of the base \* height of the prism*

$$L = ph$$

*Surface Area = lateral area + area of the bases*

$$SA = L + 2B$$

$$SA = ph + 2B$$



Note that to find lateral area, you must first calculate the perimeter of the base

For surface area, first find the lateral area and area of the base

### Volume of Prisms

*Volume = area of the base \* height of the prism*

$$V = Bh$$

Like finding surface area, when finding volume, you first find area of the base

**Practice:**

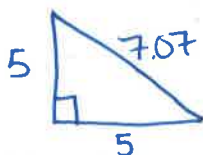
1. A triangular prism –

the base is a right triangle with legs of 5cm, and the height of the prism is 12cm

Formulas to use:

Perimeter of the base	Area of the Base	Lateral Area	Surface Area	
add all sides	$\frac{1}{2}bh$	ph	$L+2B$	Bh
p = 17.07	B = 12.5	L = 204.84	SA = 229.84	V = 150

Picture of the base:



$$5^2 + 5^2 = c^2$$

$$25 + 25 = c^2$$

$$50 = c^2$$

$$7.07 = c$$

(p) perimeter of base: \_\_\_\_\_

$$5 + 5 + 7.07$$

(B) area of the base: \_\_\_\_\_

$$\frac{1}{2}(5)(5)$$

(L) lateral area: \_\_\_\_\_

$$(17.07)(12)$$

(SA) surface area: \_\_\_\_\_

$$204.84 + 2(12.5)$$

(V) volume: \_\_\_\_\_

$$(12.5)(12)$$

2. A triangular prism –

the base is a right triangle with a leg of 8cm, a hypotenuse of 17cm, and the height of the prism is 24cm

Formulas to use:

Perimeter of the base	Area of the Base	Lateral Area	Surface Area	Volume
add all sides	$\frac{1}{2}bh$	ph	$L+2B$	Bh
p = 40	B = 60	L = 960	SA = 1080	V = 1440

Picture of the base:

(p) perimeter of base: \_\_\_\_\_

(B) area of the base: \_\_\_\_\_

(L) lateral area: \_\_\_\_\_

(SA) surface area: \_\_\_\_\_

(V) volume: \_\_\_\_\_

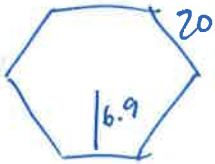
3. A hexagonal prism –

the base is a regular hexagon with sides of 20cm and an apothem of 6.9cm height of the prism is 15cm

Formulas to use:

Perimeter of the base	Area of the Base	Lateral Area	Surface Area	Volume
# of sides × side length	$\frac{1}{2}ap$	$ph$	$L+2B$	$Bh$
$p = 120$	$B = 414$	$L = 1800$	$SA = 2628$	$V = 6210$

Picture of the base:



(p) perimeter of base: \_\_\_\_\_

$$6 \times 20 = 120$$

(B) area of the base: \_\_\_\_\_

$$\frac{1}{2}(6.9)(120)$$

(L) lateral area: \_\_\_\_\_

$$(120)(15)$$

(SA) surface area: \_\_\_\_\_

$$1800 + 2(414)$$

(V) volume: \_\_\_\_\_

$$(414)(15)$$

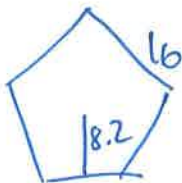
4. A pentagonal prism –

the base is a regular pentagon with sides of 16cm and an apothem of 8.2cm, the height of the prism is 30cm

Formulas to use:

Perimeter of the base	Area of the Base	Lateral Area	Surface Area	Volume
# of sides × side length	$\frac{1}{2}ap$	$ph$	$L+2B$	$Bh$
$p = 80$	$B = 328$	$L = 2400$	$SA = 3056$	$V = 9840$

Picture of the base:



(p) perimeter of base: \_\_\_\_\_

(B) area of the base: \_\_\_\_\_

(L) lateral area: \_\_\_\_\_

(SA) surface area: \_\_\_\_\_

(V) volume: \_\_\_\_\_

7.1 & 7.2 Practice - Prisms

Find the surface area, volume, and surface area to volume ratio of each figure. Round your answers to the nearest thousandth, if necessary.

- 1) A rectangular prism measuring 5 mi and 12 mi along the base and 9 mi tall.

$$SA = 2(5)(12) + 2(5)(9) + 2(12)(9)$$

$$120 + 90 + 216$$

$$426$$

$$V = (5)(12)(9)$$

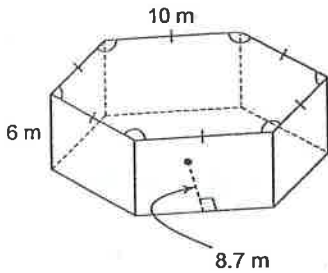
$$540$$

SA/Vol ratio:

$$\frac{426}{540} = \frac{71}{90}$$

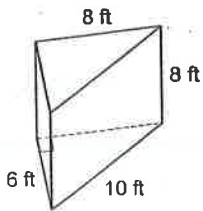
Find the lateral area, surface area, and volume of each figure. Round your answers to the nearest thousandth, if necessary.

- 2)



$p = 60$	$B = 261$	$L = 360$	$SA = 882$	$V = 1566$
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- 3)

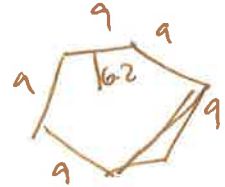
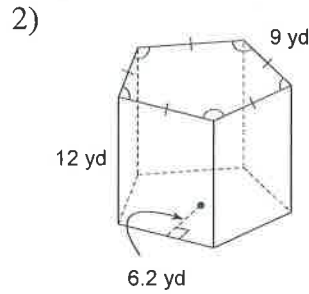
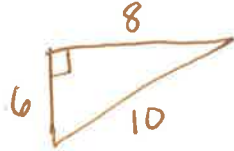
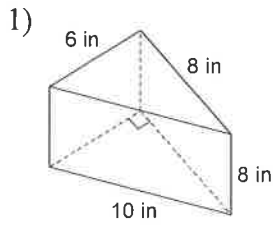


$p = 24$	$B = 24$	$L = 192$	$SA = 240$	$V = 192$
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7.2 Board Practice

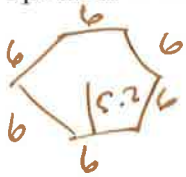
Find the lateral area, surface area, and volume of each figure. Round your answers to the nearest hundredth, if necessary.



$p = 24$   
 $B = 24$   
 $L = 192$   
 $SA = 240$   
 $V = 192$

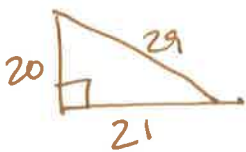
$p = 45$   
 $B = 139.5$   
 $L = 540$   
 $SA = 819$   
 $V = 1674$

3) A hexagonal prism <sup>height</sup> 5 km tall with a regular base measuring 6 km on each edge and an apothem of length 5.2 km.



$p = 36$   $B = 93.6$   $L = 180$   $SA = 367.2$   $V = 468$

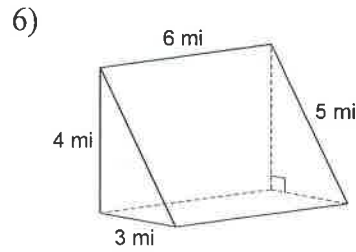
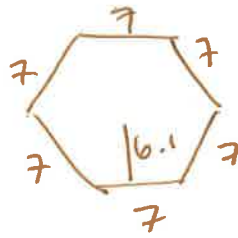
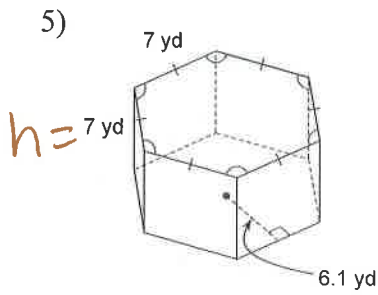
4) A triangular prism whose base is a right triangle with legs of 20 in and 21 in. The height of the prism is 14 in.



$20^2 + 21^2 = c^2$   
 $400 + 441 = c^2$   
 $841 = c^2$   
 $29 = c$

$p = 70$   
 $B = 210$   
 $L = 980$   
 $SA = 1400$   
 $V = 2940$

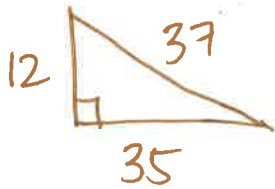
Find the lateral area, surface area, and volume of each figure. Round your answers to the nearest hundredth, if necessary.



$$\begin{aligned}
 p &= 42 \\
 B &= 128.1 \\
 L &= 294 \\
 SA &= 550.2 \\
 V &= 896.7
 \end{aligned}$$

$$\begin{aligned}
 p &= 12 \\
 B &= 6 \\
 L &= 72 \\
 SA &= 84 \\
 V &= 36
 \end{aligned}$$

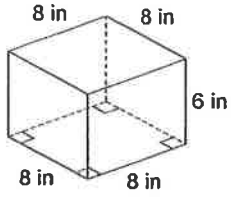
7) A triangular prism whose base is a right triangle with a leg of 12ft and a hypotenuse of 37ft. The height of the prism is 40ft.



$$\begin{aligned}
 a^2 + 12^2 &= 37^2 \\
 a^2 + 144 &= 1369 \\
 a^2 &= 1225 \\
 a &= 35
 \end{aligned}$$

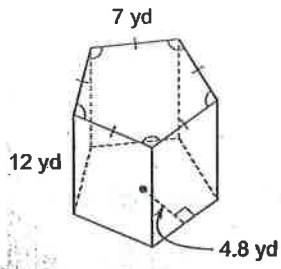
$$\begin{aligned}
 p &= 84 \\
 B &= 210 \\
 L &= 3360 \\
 SA &= 3780 \\
 V &= 8400
 \end{aligned}$$

4)



$P=32$	$B=64$	$L=192$	$SA=320$	$V=384$
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5)



$P=35$	$B=84$	$L=420$	$SA=588$	$V=1008$
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## 7.3 SURFACE AREA AND VOLUME OF PYRAMIDS

- Objectives:
1. I can find the surface area and volume of other pyramids.
  2. I can recognize which formulas are correct for finding the missing information about a pyramid.
  3. I can remember and correctly use vocabulary regarding pyramids.

### What is a Pyramid?

A pyramid consists of at least three lateral faces and a base.

There is one lateral face coming off of each base edge.

The shared edge between a lateral face and the base is called a base edge.

The shared edge between two lateral faces is called a lateral edge.

The height of the pyramid is the segment perpendicular to the base that goes to the vertex. Height is also called altitude.

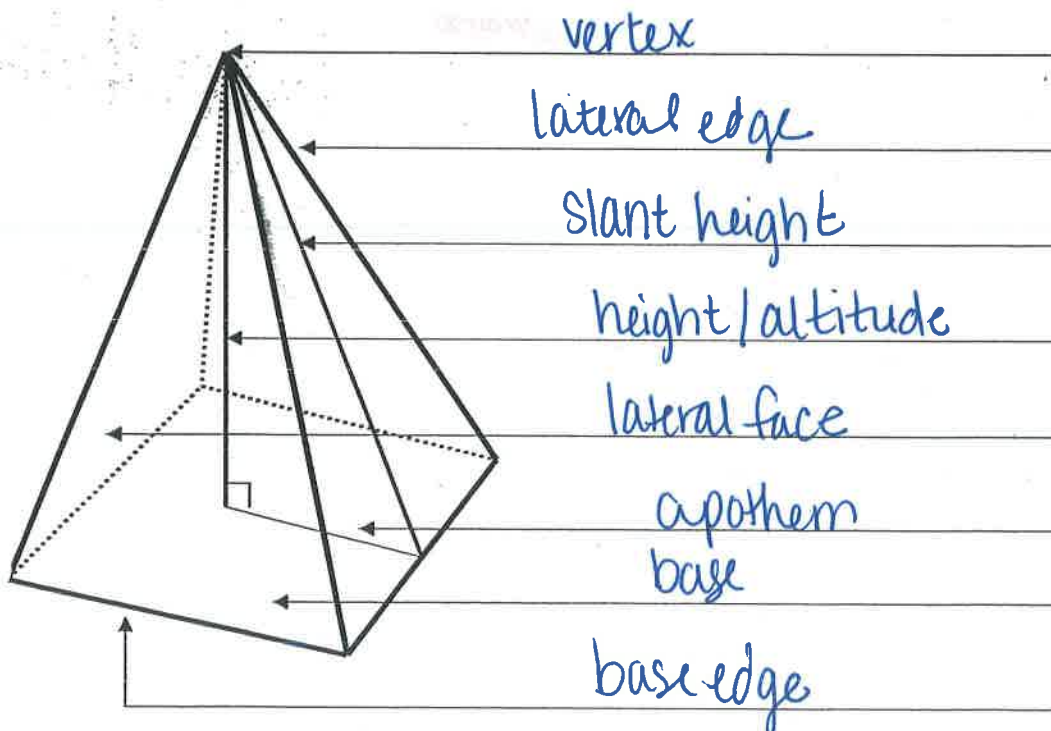
Regular pyramids have a regular polygon for a base and all lateral faces are

congruent isosceles  $\Delta$ s.

In regular polygons, slant height is the distance from the vertex to the base that runs perpendicular to the base edge.

The apothem connects the center of the base to the center of a base edge.

*Label the Pyramid*



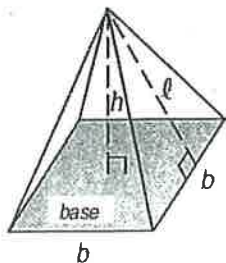
# Surface Area and Volume Formulas for Regular Pyramids

Lateral Area = same formula as SA, just don't add the area of the base!

$$LA = \frac{1}{2}(\text{number of base sides})(b)(l)$$

Surface Area = Area of base + Lateral Area (that you just calculated)

$$SA = (\text{Area of the base}) + \frac{1}{2}(\text{number of sides})(b)(l)$$

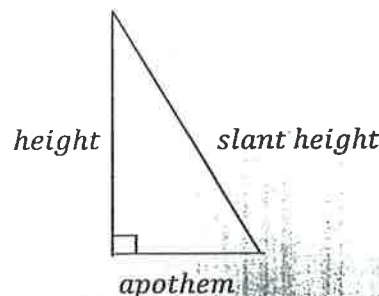


Slant Height = the hypotenuse of a right triangle

$$h^2 + a^2 = l^2$$

Volume

$$V = \frac{1}{3}(\text{Area of the base})(h)$$



## Practice:

*together*

- Find the lateral area, surface area, and volume of a pyramid whose base is a regular pentagon with side lengths of 6cm and an apothem of 2.86cm. The pyramid has a height of 8cm.

Lateral Area

$$LA = \frac{1}{2}(\text{number of base sides})(b)(l)$$

$$= \frac{1}{2}(5)(6)(8.5)$$

$$L = 127.5$$

Surface Area

$$L + B$$

+ area of the base

$$127.5 + 42.9$$

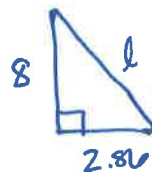
$$SA = 170.4$$

Volume

$$V = \frac{1}{3}(\text{Area of the base}) \times h$$

$$V = \frac{1}{3}(42.9)(8)$$

$$V = 114.4$$



$$8^2 + 2.86^2 = l^2$$

$$64 + 8.18 = l^2$$

$$72.18 = l^2$$

$$8.5 = l$$

on their own

2. Find the lateral area, surface-area, and volume of a pyramid whose base is a regular septagon with side lengths of 5cm and an apothem of 1.94cm. The pyramid has a height of 11cm.

Lateral Area = 195.48

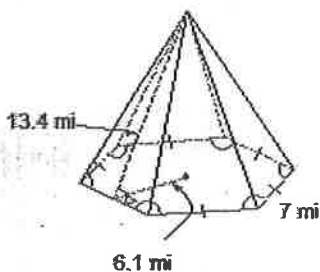
Surface Area = 229.43

Volume = 124.48

3. Lateral Area = 281.4

Surface Area = 409.5

Volume = 502.41

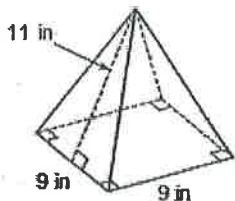


together

4. Lateral Area = 198

Surface Area = 279

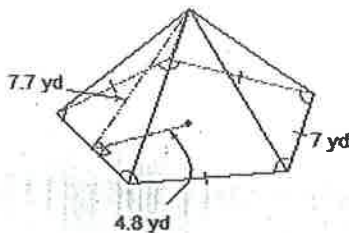
Volume = 271.08



5. Lateral Area = 134.75

Surface Area = 218.75

Volume = 168.56

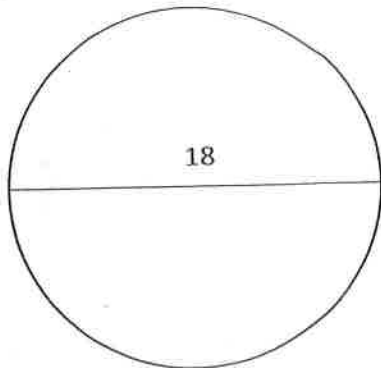


# 7.4 Surface Area and Volume of Cylinders

- Objectives:
1. I can find the surface area and volume of cylinders.
  2. I can recognize which formulas are correct for finding the missing information about a cylinder.

## Warm-UP!

1. Find the area and circumference of the circle.



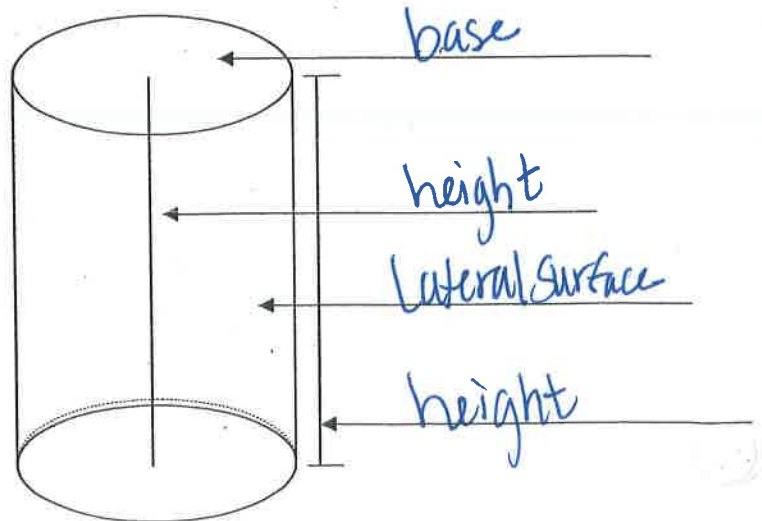
Area =  $81\pi$

Circumference =  $18\pi$

## What is a cylinder?

A cylinder is very similar to a prism.

*Label the Cylinder*

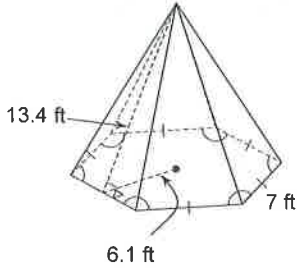




7.3 Board Work

Find the lateral area and surface area of each figure. Round your answers to the nearest hundredth, if necessary.

1)



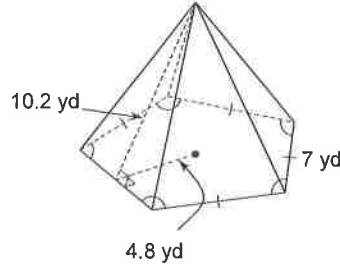
$$p = \text{\# of sides} \times b = 6 \cdot 7$$

$$B = \frac{1}{2} ap$$

$$= \frac{1}{2} (6 \cdot 1) (42)$$

$$= 128.1$$

2)



$$p = 5 \cdot 7 = 35$$

$$B = \frac{1}{2} (4.8) (35)$$

$$= 84$$

$$L = \frac{1}{2} (\text{\# of sides})(b)(l)$$

$$= \frac{1}{2} (6)(7)(13.4)$$

$$= 283.4$$

$$SA = B + L$$

$$= 128.1 + 283.4$$

$$= 411.5$$

$$L = \frac{1}{2} (5)(7)(10.2)$$

$$= 178.5$$

$$SA = B + L$$

$$= 84 + 178.5$$

$$= 262.5$$

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

$$= \frac{1}{3} (128.1)(11.93)$$

$$= 509.46$$



$$h^2 + 6.1^2 = 13.4^2$$

$$h^2 + 37.21 = 179.56$$

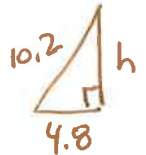
$$h^2 = 142.35$$

$$h = 11.93$$

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

$$= \frac{1}{3} (84)(9)$$

$$= 252$$



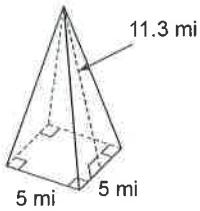
$$4.8^2 + h^2 = 10.2^2$$

$$23.04 + h^2 = 104.04$$

$$h^2 = 81$$

$$h = 9$$

3)



$$p = 20$$

$$B = 25$$

$$L = \frac{1}{2} (4)(5)(11.3)$$

$$= 113$$

$$SA = B + L$$

$$= 25 + 113$$

$$= 138$$

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

$$= \frac{1}{3} (25)(11)$$

$$= \frac{275}{3} \approx 91.67$$



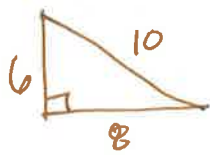
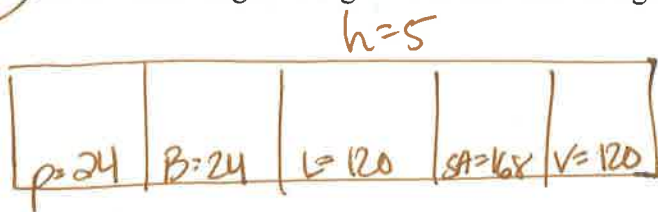
$$h^2 + 2.5^2 = 11.3^2$$

$$h^2 + 6.25 = 127.69$$

$$h^2 = 121.44$$

$$h = 11$$

- 4) A prism 5 m tall with a right triangle for a base with a leg of 6 m and a hypotenuse of 10 m.



$$6^2 + b^2 = 10^2$$

$$36 + b^2 = 100$$

$$b^2 = 64$$

$$b = 8$$

$$p = 6 + 8 + 10$$

$$B = \frac{1}{2}(6)(8)$$

$$= 24$$

$$L = (24)(5)$$

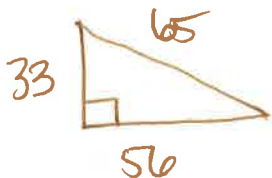
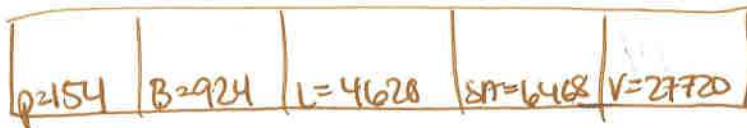
$$= 120$$

$$SA = 120 + 2(24)$$

$$= 168$$

$$V = (24)(5)$$

- 5) A prism 3 cm tall with a right triangle for a base with legs of 6 cm and 8 cm.



$$33^2 + 56^2 = c^2$$

$$1089 + 3136 = c^2$$

$$4225 = c^2$$

$$65 = c$$

$$p = 65 + 33 + 56$$

$$= 154$$

$$B = \frac{1}{2}(33)(56)$$

$$= 924$$

$$L = (154)(30)$$

$$= 4620$$

$$SA = 4620 + 2(924)$$

$$= 6468$$

$$V = (924)(30)$$

Find the lateral area and surface area of each figure. Round your answers to the nearest hundredth, if necessary.

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

$$SA = 2lw + 2lh + 2wh$$

$$= 2(12)(6) + 2(12)(6) + 2(6)(6)$$

$$= 144 + 144 + 72$$

$$= 360$$

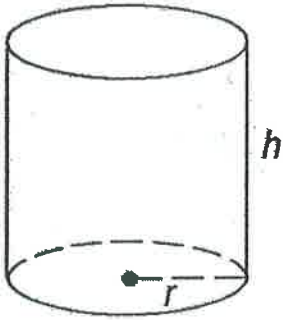
$$V = (12)(6)(6)$$

$$= 432$$

Ratio:

$$\frac{360}{432} = \frac{5}{6}$$

## Formulas:



$$SA = 2\pi r^2 + 2\pi rh$$
$$V = \pi r^2 h$$

## Practice:

Find the Surface Area and Volume for each of the described cylinders.

2. Cylinder: radius of the base is 4cm and height of the cylinder is 12cm.

Surface Area =  $128\pi$

Volume =  $192\pi$

$$SA = 2\pi(4)^2 + 2\pi(4)(12)$$
$$2\pi(16) + 2\pi(48)$$
$$32\pi + 96\pi$$

$$V = \pi(4)^2(12)$$
$$\pi(16)(12)$$

3. Cylinder: radius of the base is 6.5cm and height of the cylinder is 8.7cm.

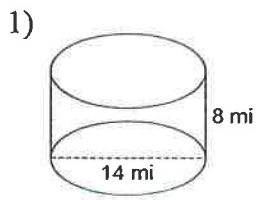
Surface Area =  $197.6\pi$

Volume =  $367.575\pi$

SA =

## Cylinders

Find the surface area of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of  $\pi$  for answers that contain  $\pi$ .



$$d=14$$

$$r=7$$

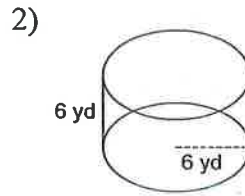
$$SA = 2\pi r^2 + 2\pi rh$$

$$= 2\pi(7)^2 + 2\pi(7)(8)$$

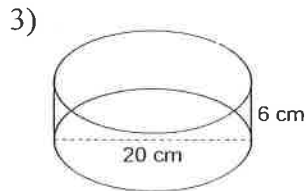
$$= 2\pi(49) + 2\pi(56)$$

$$= 98\pi + 112\pi$$

$$= 210\pi$$



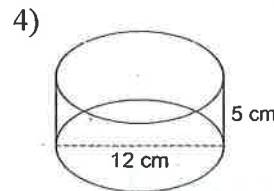
$$SA = 144\pi$$



$$d=20$$

$$r=10$$

$$SA = 320\pi$$

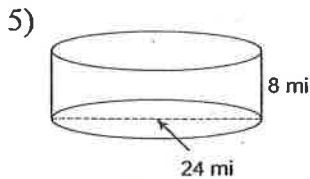


$$d=12$$

$$r=6$$

$$SA = 132\pi$$

Find the volume of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of  $\pi$  for answers that contain  $\pi$ .



$$d=24$$

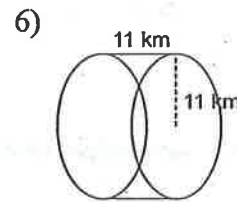
$$r=12$$

$$V = \pi r^2 h$$

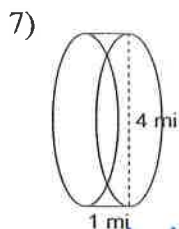
$$V = \pi(12)^2(8)$$

$$V = \pi(144)(8)$$

$$V = 1152\pi$$



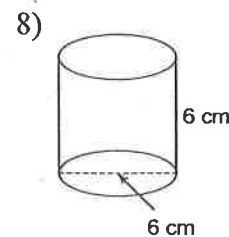
$$V = 1331\pi$$



$$d=4$$

$$r=2$$

$$V = 4\pi$$



$$d=6$$

$$r=3$$

$$V = 54\pi$$

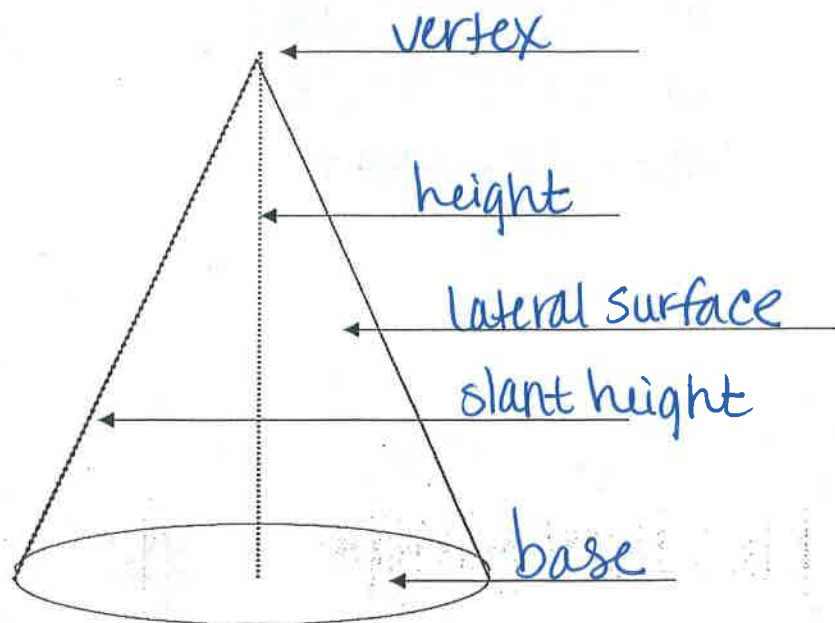
## 7.5 SURFACE AREA AND VOLUME OF CONES

- Objectives:
1. I can find the surface area and volume of cones.
  2. I can recognize which formulas are correct for finding the missing information about a cone.
  3. I can remember and correctly use vocabulary regarding cones.

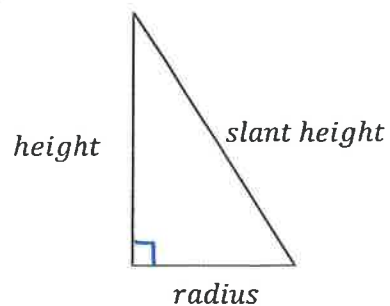
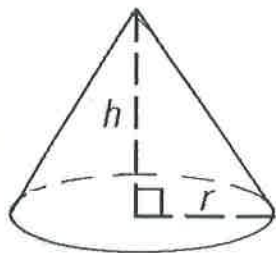
### What is a Cone?

A cone is very similar to a pyramid.

Label the Cone



### Formulas:



$$SA = \pi r^2 + \pi r \sqrt{r^2 + h^2}$$

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

## Practice:

Find the Surface Area and Volume for each of the described cones.

4. Cone: radius of the base is 12cm and slant height of the cone is 37cm

Surface Area =  $588\pi$

Volume =  $1680\pi$

$$SA = \pi r^2 + \pi r \sqrt{r^2 + h^2}$$

$$SA = \pi(12)^2 + \pi(12)\sqrt{12^2 + 35^2}$$

$$SA = 144\pi + 12\pi\sqrt{144 + 1225}$$

$$SA = 144\pi + 12\pi\sqrt{1369}$$

$$SA = 144\pi + 12\pi(37)$$

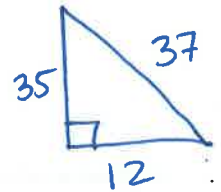
$$SA = 144\pi + 444\pi$$

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

$$V = \frac{1}{3}\pi(12)^2(35)$$

$$V = \frac{1}{3}\pi(144)(35)$$

$$V = \frac{1}{3}\pi(5040)$$



$$x^2 + 12^2 = 37^2$$

$$x^2 + 144 = 1369$$

$$x^2 = 1225$$

$$x = 35$$

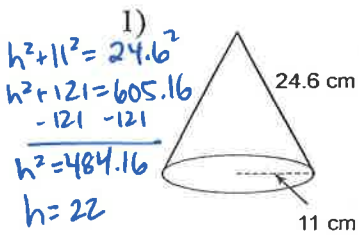
5. Cone: radius of the base is 5cm and slant height of the cone is 13cm.  $h=12$

Surface Area =  $85\pi$

Volume =  $150\pi$

**Cones**

**Find the surface area of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of  $\pi$  for answers that contain  $\pi$ .**



$$SA = \pi (11)^2 + \pi (11) \sqrt{11^2 + 22^2}$$

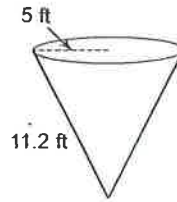
$$SA = 121\pi + 11\pi \sqrt{121 + 484}$$

$$SA = 121\pi + 11\pi \sqrt{605}$$

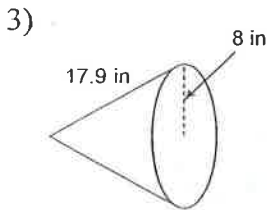
$$SA = 121\pi + 11\pi (24.6)$$

$$SA = 121\pi + 270.6\pi$$

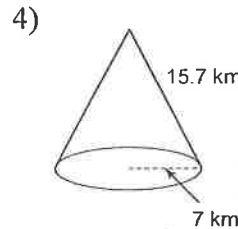
$$SA = 391.6\pi$$



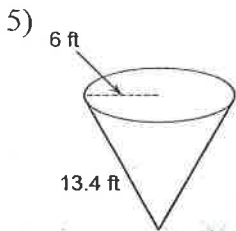
$$SA = 81\pi$$



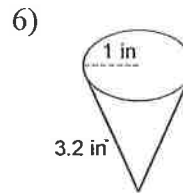
$$SA = 207.2\pi$$



$$SA = 158.9\pi$$

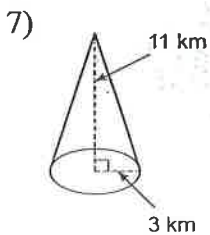


$$SA = 116.4\pi$$



$$SA = 4.2\pi$$

**Find the volume of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of  $\pi$  for answers that contain  $\pi$ .**

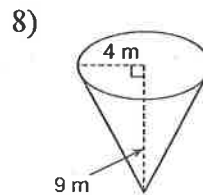


$$V = \frac{1}{3}\pi (3)^2 (11)$$

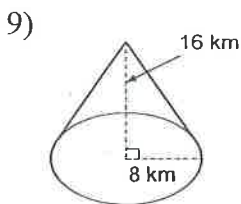
$$V = \frac{1}{3}\pi (9)(11)$$

$$V = \frac{1}{3}\pi (99)$$

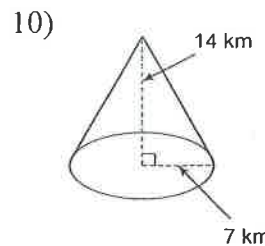
$$V = 33\pi$$



$$V = 48\pi$$



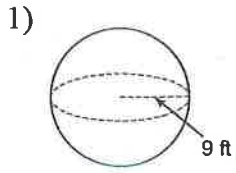
$$V = 341.3\pi$$



$$V = 228.7\pi$$

## Spheres with 7.4-7.6 Review

Find the surface area of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of  $\pi$  for answers that contain  $\pi$ .

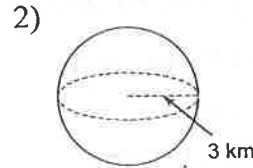


$$SA = 4\pi r^2$$

$$SA = 4\pi(9)^2$$

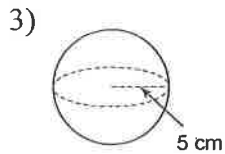
$$SA = 4\pi(81)$$

$$SA = 324\pi$$



$$SA = 36\pi$$

Find the volume of each figure. Round your answers to the nearest hundredth, if necessary. Leave your answers in terms of  $\pi$  for answers that contain  $\pi$ .

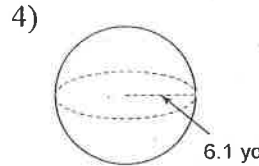


$$V = \frac{4}{3}\pi r^3$$

$$V = \frac{4}{3}\pi(5)^3$$

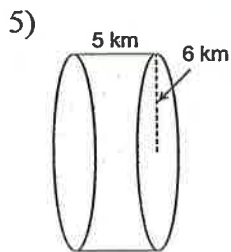
$$V = \frac{4}{3}\pi(125)$$

$$V = 166.7\pi$$

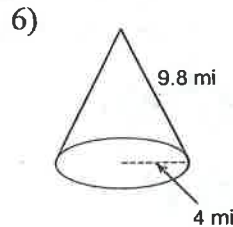


$$V = 302.6\pi$$

Find the surface area of each figure. Round your answers to the nearest hundredth, if necessary.



$$SA = 132\pi$$



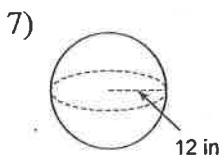
$$SA = 55.2\pi$$

$$h^2 + 4^2 = 9.8^2$$

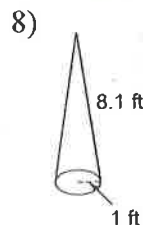
$$h^2 + 16 = 96.04$$

$$h^2 = 80.04$$

$$h = 8.9$$



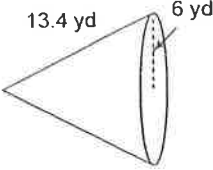
$$SA = 576\pi$$



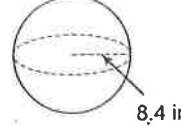
$$SA = 9.1\pi$$

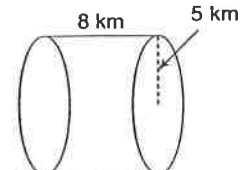
$$h^2 + 1^2 = 8.1^2$$



9)   $SA = 116.4\pi$

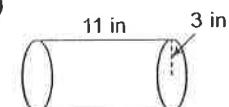
$h^2 + 6^2 = 13.4^2$

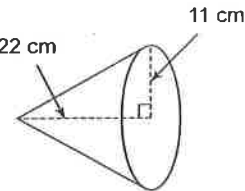
10)   $SA = 282.24\pi$

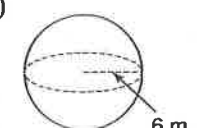
11)   $SA = 130\pi$

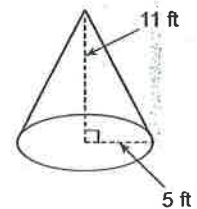
12)   $SA = 196\pi$

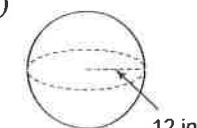
Find the volume of each figure. Round your answers to the nearest hundredth, if necessary.

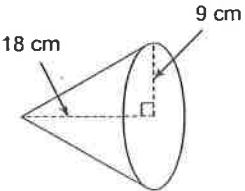
13)   $V = 99\pi$

14)   $V = 887.3$

15)   $V = 288\pi$

16)   $V = 91.7\pi$

17)   $V = 2304\pi$

18)   $V = 486\pi$

