Geometry Unit 11

12-3: Area and Volume of Cylinders and Cones

12.1 – 12.2 Warm -up

Complete the worksheet provided

*Keep the backside for your notes.

Cylinders and Cones

- **Content Objective**: Students will be able to compare and contrast cylinders and cones to prisms and pyramids to determine their area and volume equations.

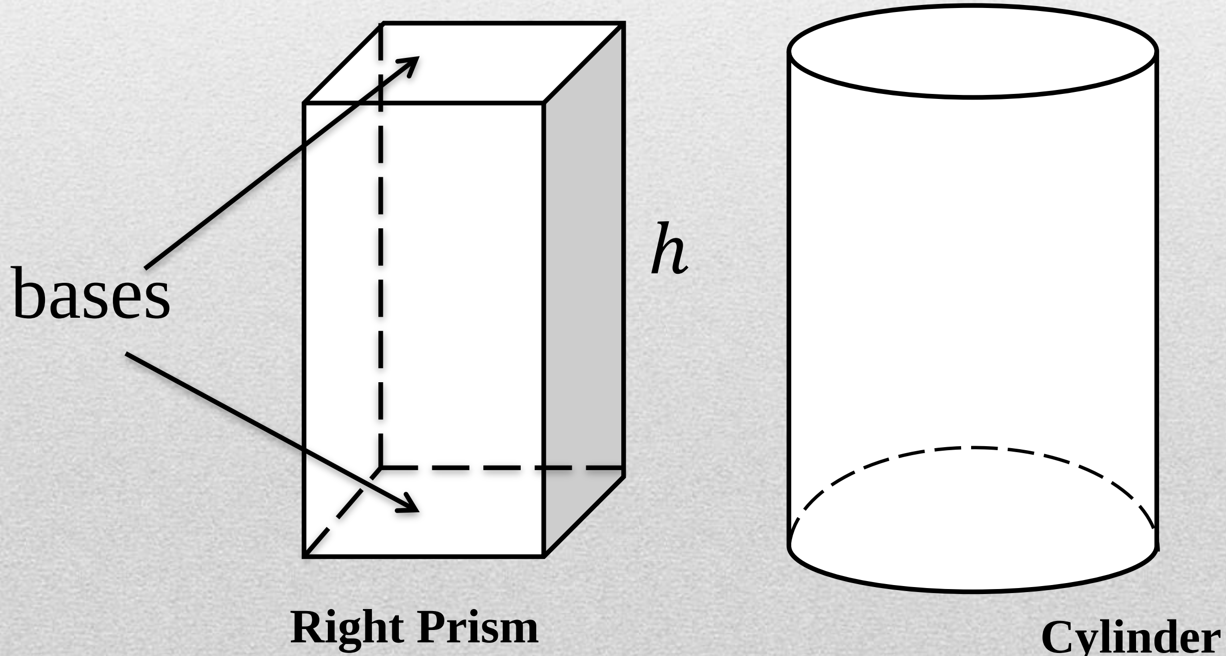
- **Language Objective**: Students will be able to use equations to solve for the areas and volume of cylinders and cones.

Cylinders – A Introduction

For the following diagrams, compare and contrast a Right Prism to a Cylinder. Discuss your thoughts in your group, and take notes of your thoughts in the space provided.

For the discussion, focus on these questions:

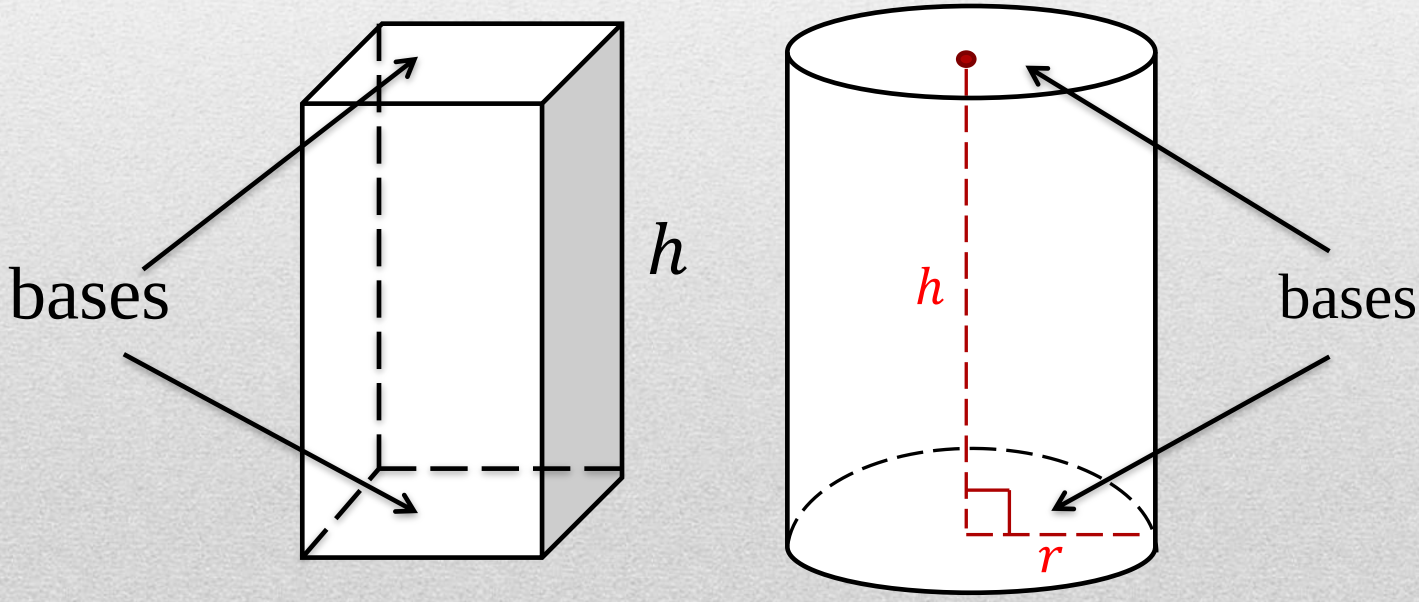
- What do you notice about each the cylinder?
- How do its parts compare to that of the prism? How do they differ?



Cylinders

- A Cylinder shares similar properties to the right prism.
- It has two bases, and these bases are always **circles**.
- The line segment joining the bases is the ***height, h.***
- The **radius** of the base is also the **radius** of the cylinder.

***How would the lateral area and volume of a cylinder be similar to those of Prisms?**



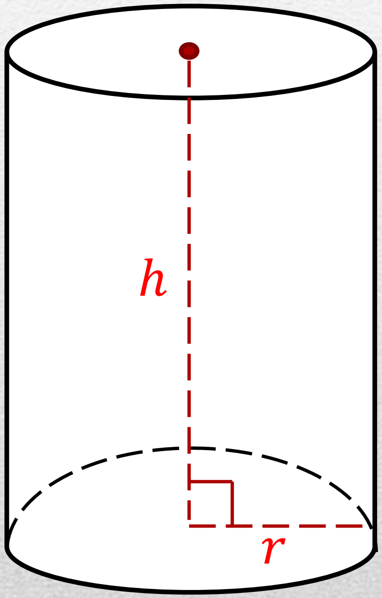
Right Prism

Cylinder

Cylinders – Lateral Area

<u>Theorem 12-5:</u> The lateral area of a cylinder equals the circumference of a base time the height of the cylinder.

Equation: $\boldsymbol{L.A. = 2\pi r h}$

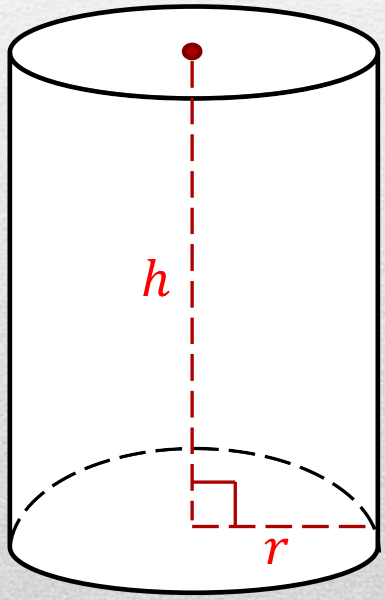


*Total Area: $\boldsymbol{T.A. = L.A. + 2B}$

Cylinders – Volume

Theorem 12-6: The volume of a cylinder equals the area of a base time the height of the cylinder.

Equation: $\boldsymbol{V = \pi r^2 h}$

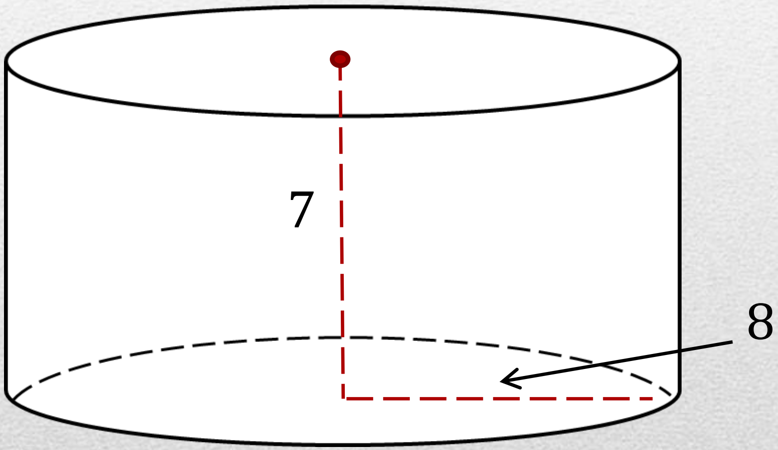


Cylinders – Examples

For the following Cylinders, find the

a.) Lateral Area
b.) Total Area
c.) Volume

1.)



$r = 8$

$h = 7$

$B = \pi(8^2) = \boldsymbol{64\pi}$

Cylinder Example #1 Solution

Lateral Area

$$L.A. = 2\pi rh$$

$$= 2\pi \times 8 \times 7$$

$$= \mathbf{112\pi}$$

Total Area

$$T.A. = L.A. + 2B$$

$$= 112\pi + 2(64\pi)$$

$$= 112\pi + 128\pi$$

$$= \mathbf{240\pi}$$

Volume

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

$$= 64\pi \times 7$$

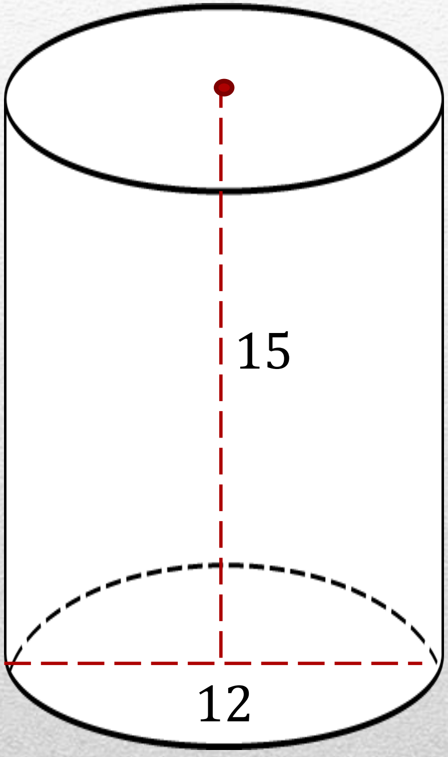
$$= \mathbf{448\pi}$$

Cylinders – Examples

For the following Cylinders, find the

a.) Lateral Area
b.) Total Area
c.) Volume

2.)



$r = 6$

$h = 15$

$B = \pi(6^2) = \boldsymbol{36\pi}$

Cylinder Example #2 Solution

Lateral Area

$$L.A. = 2\pi rh$$

$$= 2\pi \times 6 \times 15$$

$$= \mathbf{180\pi}$$

Total Area

$$T.A. = L.A. + 2B$$

$$= 180\pi + 2(36\pi)$$

$$= 180\pi + 72\pi$$

$$= \mathbf{252\pi}$$

Volume

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

$$= 36\pi \times 15$$

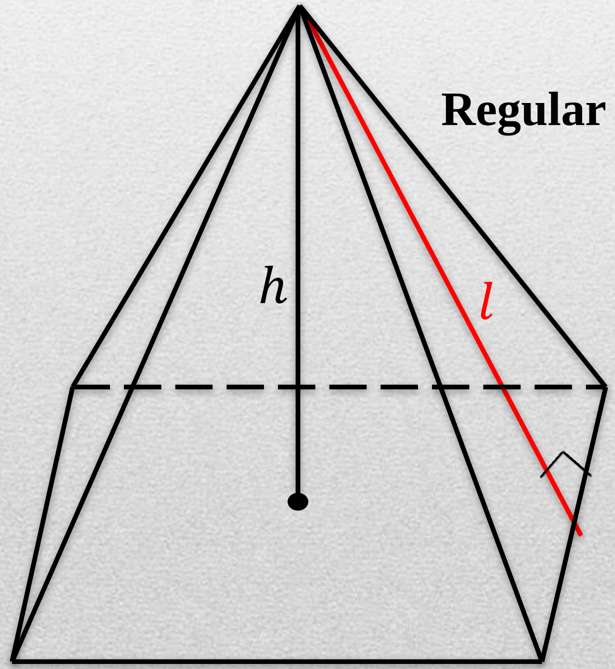
$$= \mathbf{540\pi}$$

Cones

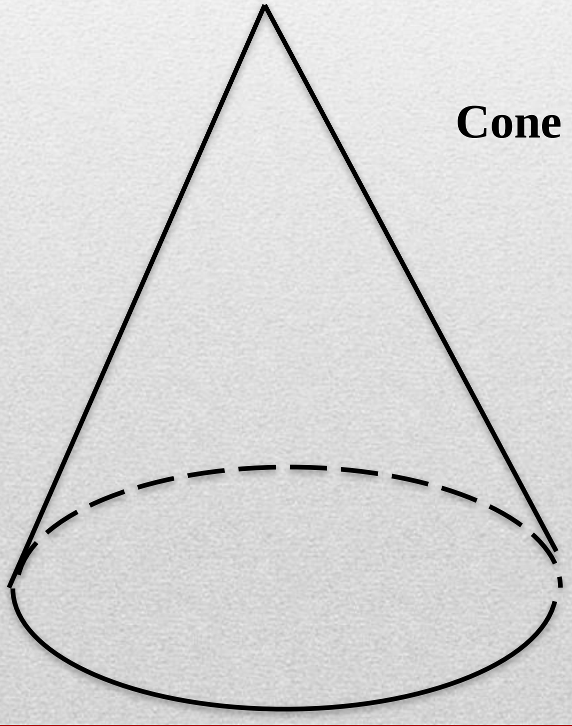
For the following diagrams, compare and contrast a Regular Pyramid to a Cone. Discuss your thoughts in your group, and take notes of your thoughts in the space provided.

For the discussion, focus on these questions:

- What do you notice about each the cone?
- How do its parts compare to that of the pyramid? How do they differ?



Regular Pyramid



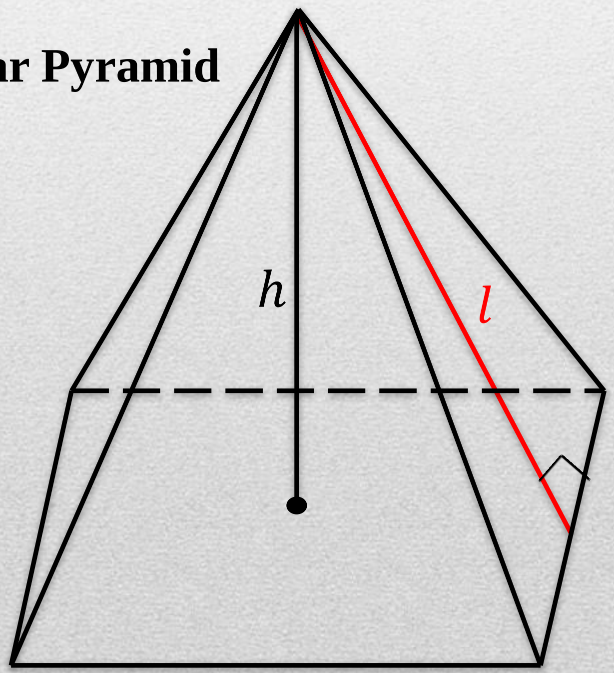
Cone

Cones

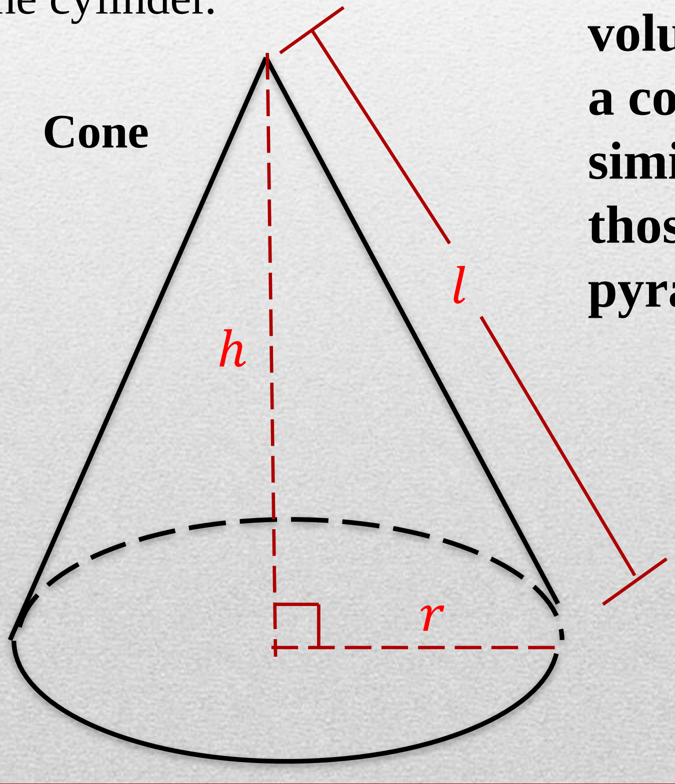
- A Cone shares similar properties to the regular pyramid.
- It has a single bases, and that base will always be a **circle**.
- The line segment joining the vertex to the base is the ***height, h.***
- The segment joining the vertex to an end of the diameter of the base is the ***slant height, l***.
- The **radius** of the base is also the **radius** of the cylinder.

***How would the lateral area and volume of a cone be similar to those of pyramids?**

Regular Pyramid



Cone



Cones – Lateral Area

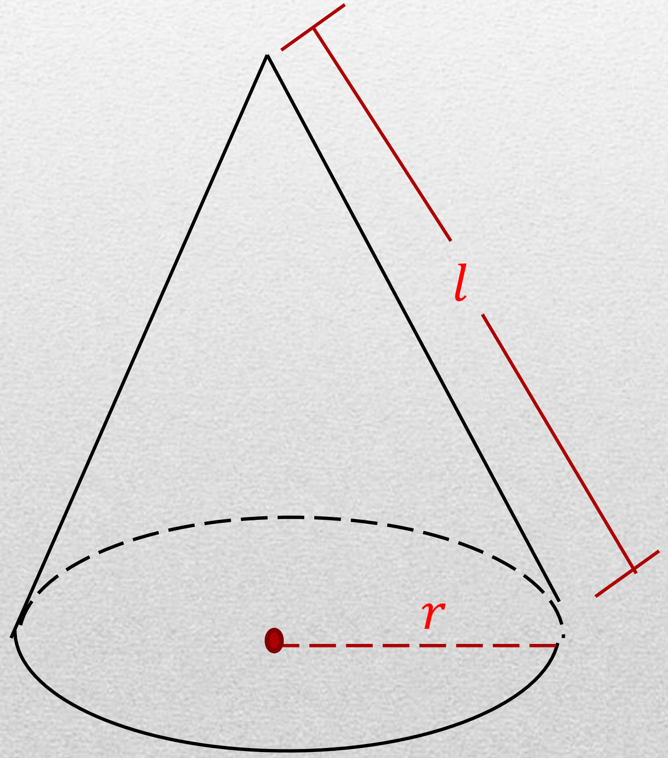
<u>Theorem 12-7:</u> The lateral area of a cone equals half the circumference of the base time the slant height.

Equation: $\boldsymbol{L.A. = \frac{1}{2} \times 2\pi r l}$

Or

$\boldsymbol{L.A. = \pi r l}$

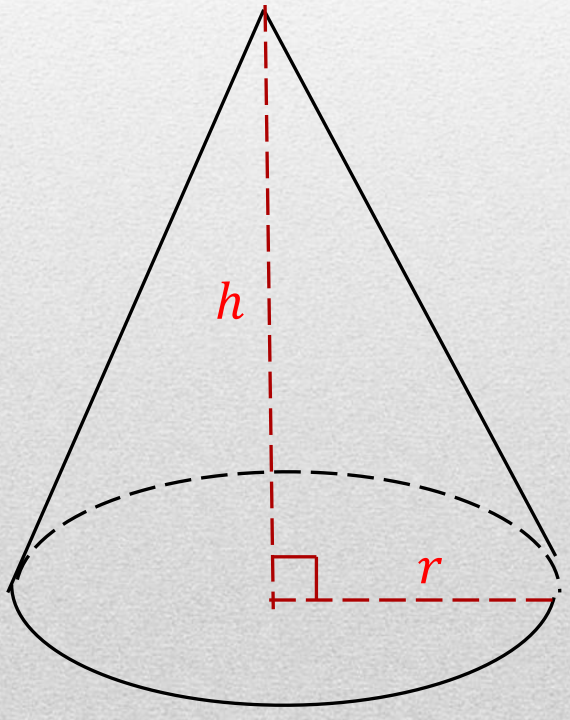
*Total Area: $\boldsymbol{T.A. = L.A. + B}$



Cones – Volume

Theorem 12-8: The volume of a cones equals one third the area of the base times the height of the cone.

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

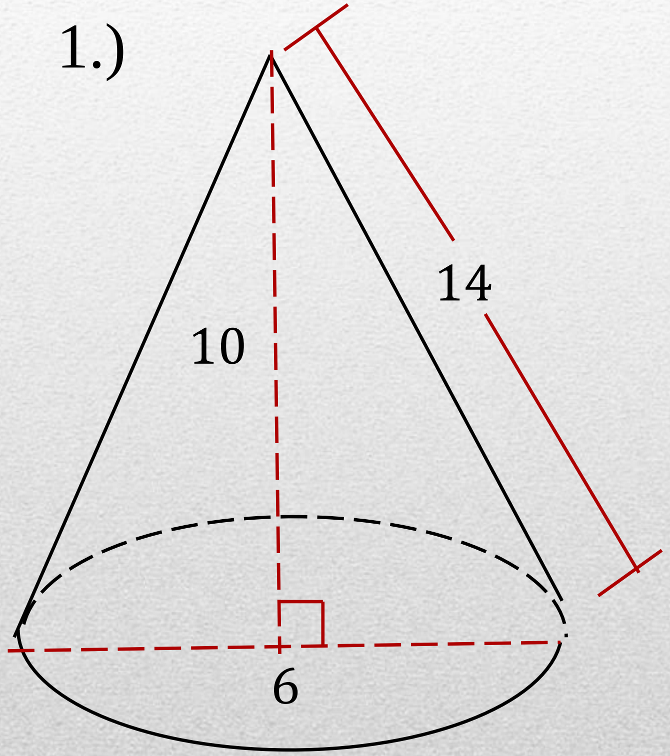


Cones – Examples

For the following Cones, find the

a.) Lateral Area
b.) Total Area
c.) Volume

1.)



$r = 3$

$l = 14$

$h = 10$

$B = \pi(3^2) = \boldsymbol{9\pi}$

Cone Example #1 Solution

Lateral Area

$$L.A. = \pi r l$$

$$= \pi \times 3 \times 14$$

$$= \boldsymbol{42\pi}$$

Total Area

$$T.A. = L.A. + B$$

$$= 42\pi + 9\pi$$

$$= \boldsymbol{51\pi}$$

Volume

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

$$= \frac{1}{3} \times 9\pi \times 10$$

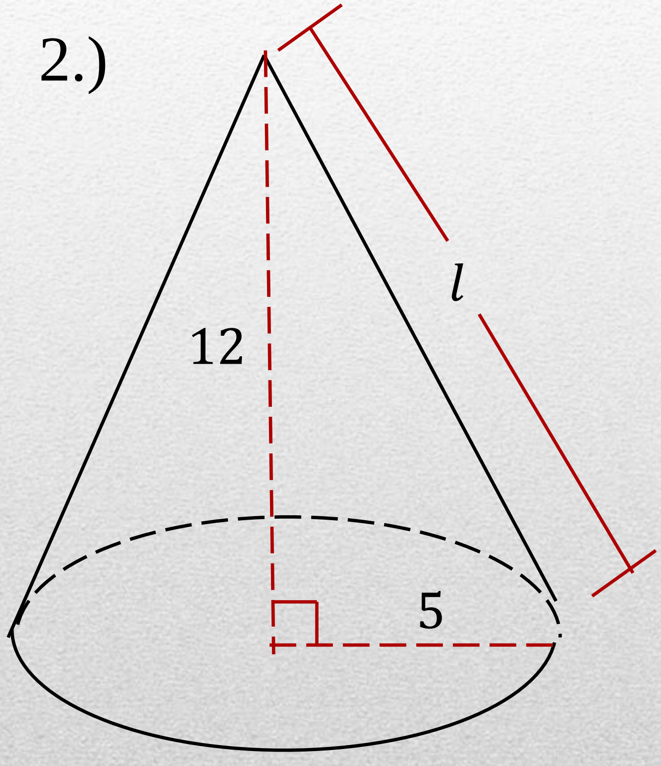
$$= \boldsymbol{30\pi}$$

Cones – Examples

For the following Cones, find the

a.) Lateral Area
b.) Total Area
c.) Volume

2.)



$r = 5$

$l = 13$

$h = 12$

$B = \pi(5^2) = \boldsymbol{25\pi}$

Cone Example #1 Solution

Lateral Area

$$L.A. = \pi r l$$

$$= \pi \times 5 \times 13$$

$$= \boldsymbol{65\pi}$$

Total Area

$$T.A. = L.A. + B$$

$$= 65\pi + 25\pi$$

$$= \boldsymbol{90\pi}$$

Volume

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

$$= \frac{1}{3} \times 25\pi \times 12$$

$$= \boldsymbol{100\pi}$$