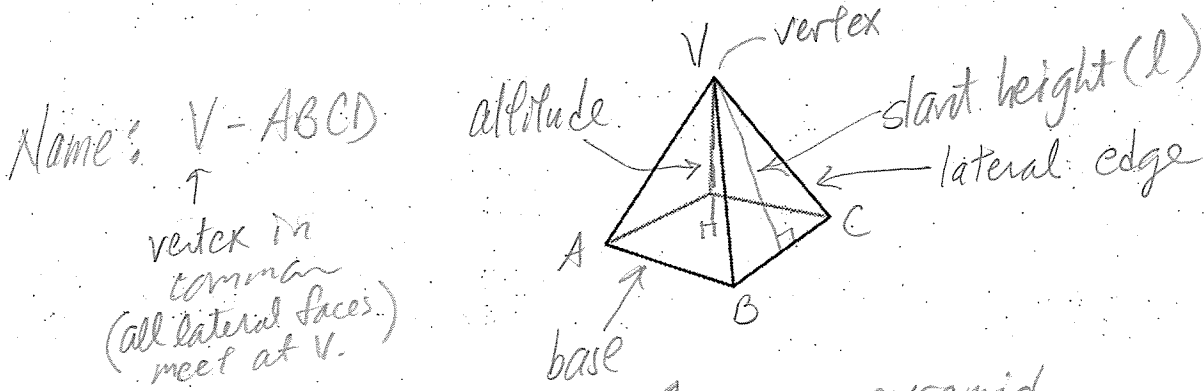


Section - Pyramids and Cones

Today we will discuss lateral area, total area and volume of pyramids and cones

A **pyramid** is a polyhedron in which all faces but one have a vertex in common.

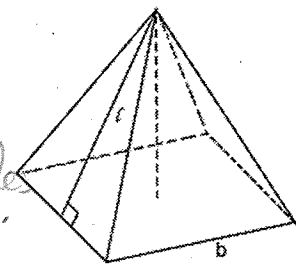


Like prisms, pyramids are named by their base.

↑ square pyramid

A pyramid is **regular** if: (properties of)

- base is a regular polygon
- all lateral edges are  $\cong$ .
- All lateral faces are  $\cong$  isosceles  $\Delta$ .
- Altitude meets the base at its center.



The lateral area of a regular pyramid is equal to half the product of the perimeter of the base and the slant height. ( $LA = \frac{1}{2}pl$ )

2 methods to get LA.

Method 1

Find Area of 1 lateral face;  
Then multiply by  $n$  # of faces.

Use  $A = \frac{1}{2}bl$

↑  
slant height

Method 2

derived from  $A = \frac{1}{2}bl$

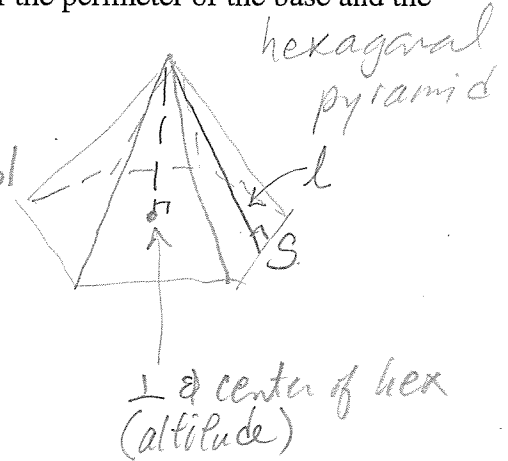
$$A = \frac{1}{2}bl$$

$$= \frac{1}{2}bl(S)$$

$$= \frac{1}{2}(bs)l$$

↓ perimeter

$$LA = \frac{1}{2}pl$$

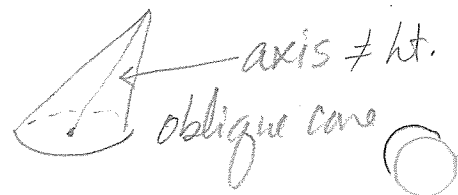
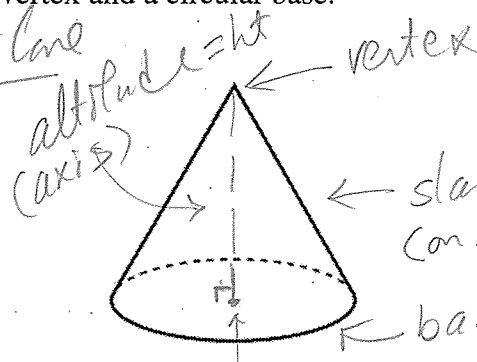


**Total area = LA + B**

**Volume =  $\frac{1}{3}Bh$**

A **cone** is a solid figure with a vertex and a circular base.

Right Cone



Formulas related to those of pyramid. (Cone is a pyramid with infinite # of lateral faces)  
 The lateral area of a right cone is equal to the product of  $\pi$ , the radius, and the slant height. ( $LA = \pi r l$ )

$$LA = \frac{1}{2} \text{circumference of base} \times \text{slant height}$$

$$= \frac{1}{2} (2\pi r) l$$

$$LA = \pi r l$$

Total area = LA + B

$$\text{Volume} = \frac{1}{3} Bh = \frac{1}{3} \pi r^2 h$$

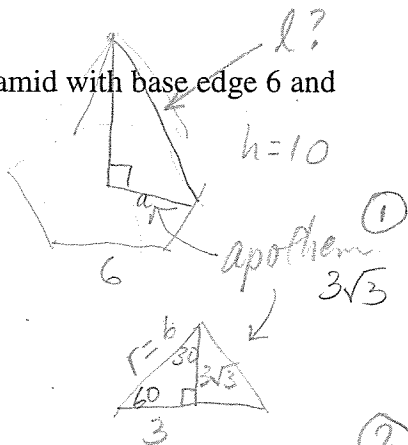
Example: Find the LA, TA and V of each solid.



a) hexagonal pyramid with base edge 6 and  $h = 10$

$$LA = \frac{1}{2} p l$$

$$= \frac{1}{2} \cdot 36 (\sqrt{127})$$



$$LA = 18\sqrt{127}$$

$$TA = LA + B$$

$$18\sqrt{127} + \frac{1}{2} ap$$

$$\frac{1}{2} 3\sqrt{3} (36)$$

$$(3\sqrt{3})^2 + 10^2 = l^2$$

$$27 + 100 = l^2$$

$$\sqrt{127} = l$$

$$V = \frac{1}{3} Bh = \frac{1}{3} 54\sqrt{3} (10) = 180\sqrt{3}$$

b) A cone with a radius 4 and slant height 12

$$LA = \pi r l$$

$$= \pi (4) (12)$$

$$= 48\pi$$

$$TA = LA + B \leftarrow \pi r^2 = B$$

$$48\pi + 16\pi$$

$$= 64\pi$$

$$V = \frac{1}{3} Bh \leftarrow 4^2 + h^2 = 12^2$$

$$= \frac{1}{3} 16\pi (8\sqrt{2})$$

$$= \frac{128\pi\sqrt{2}}{3}$$

$$h^2 = 128$$

$$h = 8\sqrt{2}$$