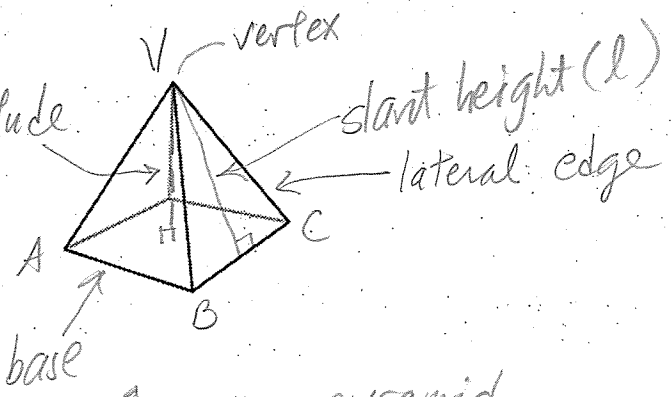
Notes

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.

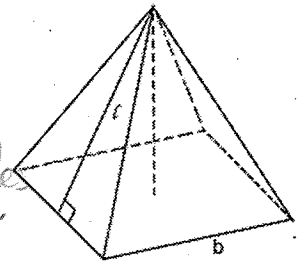


Name: V-ABCD
↑ vertex in common (all lateral faces meet at V.)

Like prisms, pyramids are named by their base. → square pyramid

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

a) base is a regular polygon
b) all lateral edges are ≅.
c) All lateral faces are ≅ isosceles △.
d) 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 = ½ *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

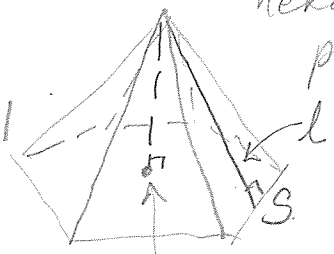
Method 2

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

$A = \frac{1}{2}bl$
$= \frac{1}{2}bl(S)$
$= \frac{1}{2}(bS)l$
↓ perimeter

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

hexagonal pyramid



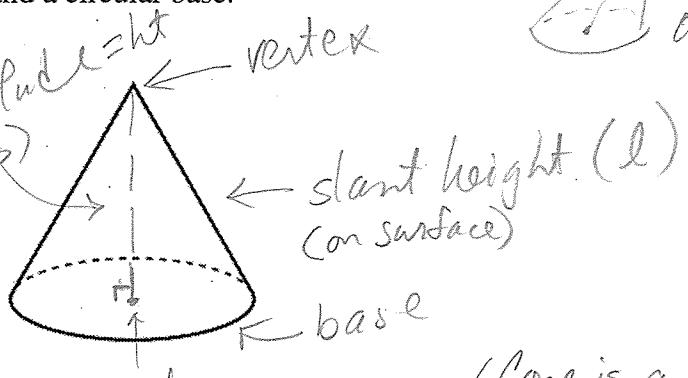
⊥ & center of hex (altitude)

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 π, the radius, and the slant height. **(LA = πrl)**

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

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

$\boxed{LA = \pi rl}$

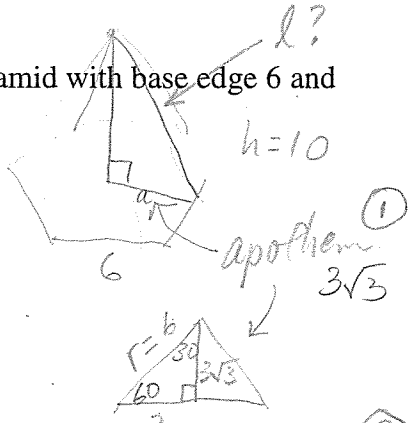
Total area = LA + B

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

πr^2

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

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



$LA = \frac{1}{2}pl$ (3)

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

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

$TA = LA + B$

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

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

$TA = \boxed{18\sqrt{127} + 54\sqrt{3}}$

(1) $(3\sqrt{3})^2 + 10^2 = l^2$

(2) $27 + 100 = l^2$

$\sqrt{127} = l$

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

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

$LA = \pi rl$

$= \pi(4)(12)$

$= 48\pi$

$TA = LA + B$ ← $\pi r^2 = B$

$B = 16\pi$

$48\pi + 16\pi$

$= \boxed{64\pi}$

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

$h^2 = 128$

$h = 8\sqrt{2}$

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

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