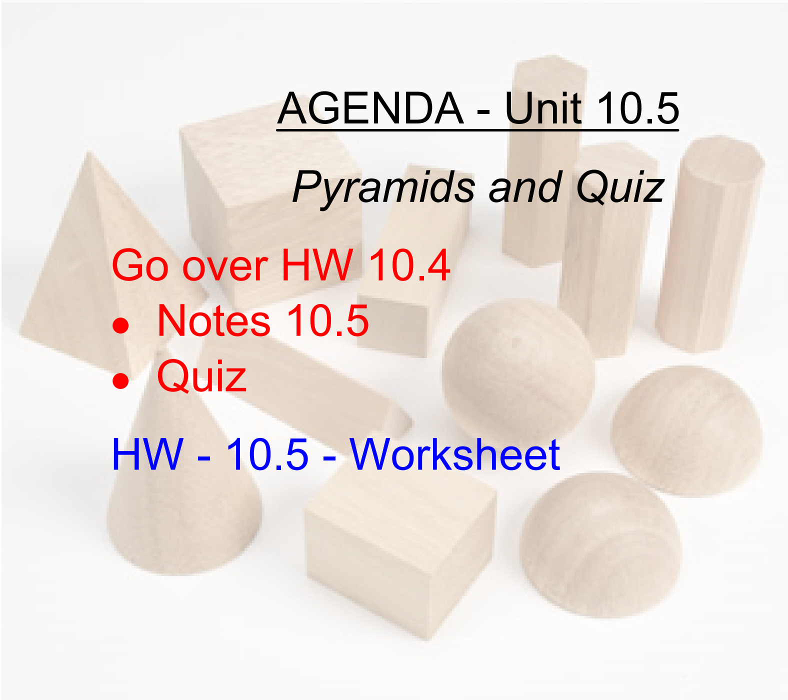
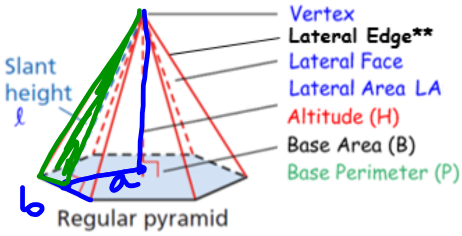


Geometry LAB Name ______________________ Section __________ Date________

10-5 Notes: Pyramids

SIGNIFICANT SEGMENTS

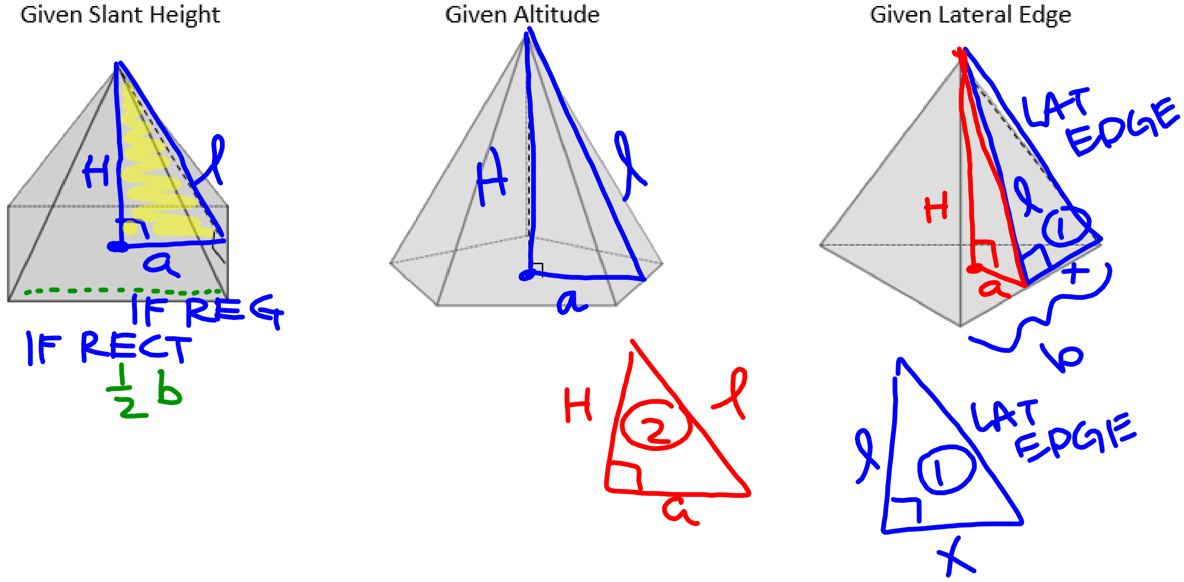


- **Axis:** The segment connecting the vertex of a pyramid to the center of its base. If the pyramid is right, the axis is coincident with the altitude.
- **Slant Height (ℓ):** The segment connecting the vertex of a pyramid perpendicular to the edge of its base.
  - This segment is on a lateral face of the pyramid.
  - The segments forming the right triangle for a right pyramid are (1) the altitude (leg), an APOTHEM (leg), and the slant height (hypotenuse) or (2) half of the b edge (leg – what we've been calling 'x'), the slant height (leg), and a LATERAL EDGE (hypotenuse).

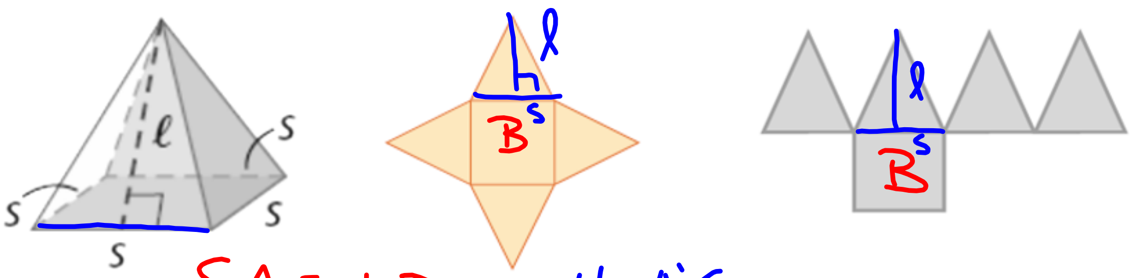
SLANT HEIGHT (Lateral Face) VS. ALTITUDE/AXIS (Solid)

Draw in the essential right triangle in each of the solid that would help you solve for a missing dimension. →GET TO H

Given Slant Height Given Altitude Given Lateral Edge



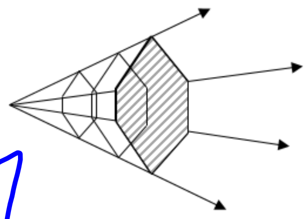
USING A NET TO FIND SURFACE AREA OF A PYRAMID



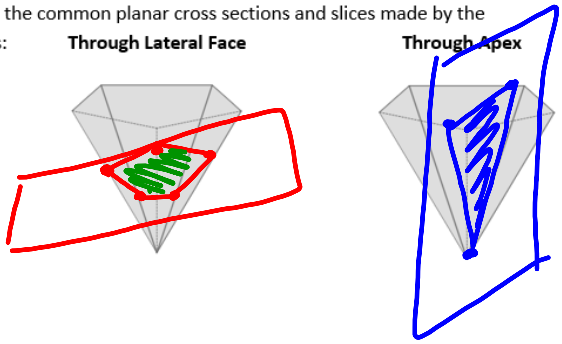
SA = 1 B + 4 Δ's

CROSS SECTIONS AND SLICES

If we think of creating a solid as a dilation from the top vertex (called the apex) as the center of dilation, we would be looking at **similar** cross sections all parallel to the base:



Draw and describe the common planar cross sections and slices made by the intersecting planes: **Through Lateral Face** **Through Apex**



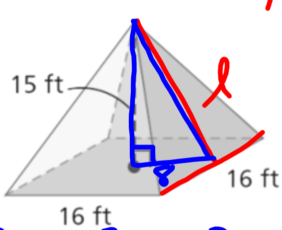
Δ

Summary: Common intersecting planes create slices that are 3 – NUMBER OF SIDES OF BASE **or** Δ.

http://www.shodor.org/interactivate/activities/CrossSectionFlyer/

Example: Find the area of one lateral face of the right regular pyramid to the nearest tenth.

1.



$A_\Delta = \frac{bh}{2}$

$= \frac{(16)(17)}{2}$

$= 136$ ft^2

$a^2+b^2=c^2$

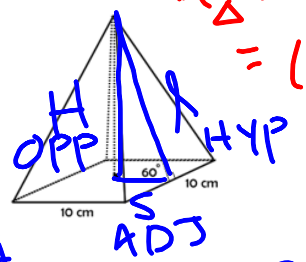
$8^2+15^2=\ell^2$

$64+225=\ell^2$

$289=\ell^2$

$\pm 17=\ell$

2.



$A_\Delta = \frac{bh}{2}$

$= \frac{(10)(10)}{2}$

$= 50$ cm^2

C $\frac{A}{H}$

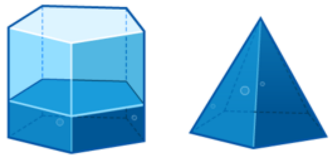
$\cos 60° = \frac{s}{\ell}$

$\ell = \frac{5}{\cos 60°}$

$\ell = 10$

VOLUME OF A PYRAMID

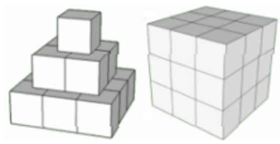
How then does the volume of a pyramid relate to the volume of a prism? Using the same pouring rate as we used with cones & cylinders, a pyramid will fill 1/3 of a prism with the same base and height.



$$\text{VOLUME}_{\cancel{\text{CONE}}\ \text{PYR}} = \frac{1}{3}BH$$

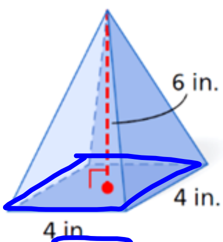
Due to **Cavalieri's Principle,** the volume of a pyramid will be the same for both right and oblique pyramids as similar base areas are stacked to the same height.

Another technique is to approximate the pyramid using cubes and to compare the cubes in the prism to the cubes in the pyramid to see if it is a 1/3 relationship. This is only an approximation because the cubes do not form the smooth sided pyramid and so some volume is lost. If we hold the height constant but increase the number of layers in the pyramid the bumpy sides will become less and less dramatic.



PRACTICE:

1) Determine the capacity of the square pyramid, to the nearest whole cubic inch.



$V = \frac{BH}{3}$

$= \frac{(16)6 \text{ IN}^3}{3}$

$= \boxed{32 \text{ IN}^3}$

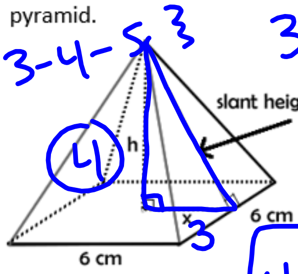
$\boxed{B}$ 4, 4

$B = bh$

$= 4 \cdot 4$

$= 16 \text{ IN}^2$

2) Find the altitude of the following right square pyramid.



$\{3\text{-}4\text{-}5\}$ 3

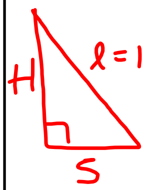
$3^2 + H^2 = 5^2$

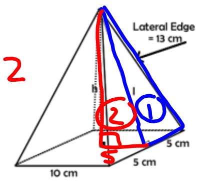
4

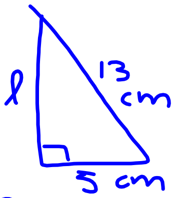
3

$\boxed{4 \text{ cm} = H}$

3) Find the altitude of the right square pyramid to the nearest tenth.







$5^2 + H^2 = 12^2$

$25 + H^2 = 144$

$H^2 = 119$

$H = \pm\sqrt{119}$

≈ 10.9087

$\boxed{H \approx 10.9 \text{ cm}}$

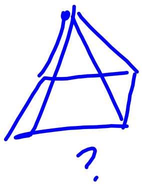
$5^2 + \ell^2 = 13^2$

$25 + \ell^2 = 169$

$\ell^2 = 144$

$\ell = \pm 12$

4) A pyramid has a volume of 24 ft³ with a height of 6 ft. What is the area of the base?



$V = \frac{BH}{3}$

$24 \text{ ft}^3 = \frac{B(6)}{3}$

$24 = 2B$

$\boxed{12 = B \text{ ft}^2}$