VOLUME AND TOTAL SURFACE AREA OF PRISMS & CYLINDERS

TSA is the Total Surface Area of a three dimensional object and is found by the sum of all of the faces, or sides, of the figure.

> *Use 4 steps for "area sub-problems":*
> 1. Picture Equation
> 2. Formulas
> 3. Simplify
> 4. Answer (exact and approximate)

This will help to justify your work and communicate your strategy clearly.

For any figure that has two congruent, parallel bases (that is, the figure could be formed by stacking many thin "slices" of the exact same shape all the way through):

$$\textbf{V} = (\text{Area of base}) \cdot \boxed{\text{height}}$$

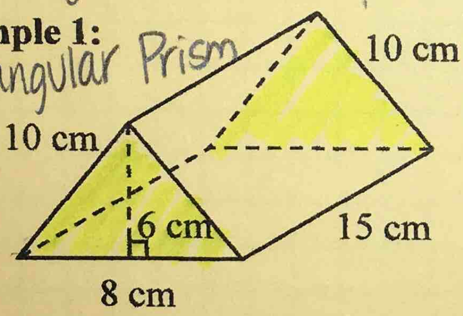
This is the DISTANCE between the 2 bases!

lateral faces

NOTE: The base is NOT always located on the "bottom" of prisms!!!

In figures that can be dissected this way, the two bases are connected by quadrilaterals*:* rectangles, parallelograms, *or* rhombuses or squares.

Example 1: Triangular Prism



V = (6, 8) $\cdot 15$

$= \left(\frac{1}{2} 6 \cdot 8\right) \cdot 15$

$= 24 \cdot 15$

$= 360\ cm^3$ ← 3 dimensional

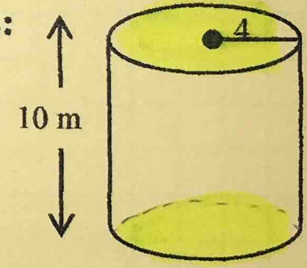
TSA = 2(6, 8) $+ 2$(10, 15) $+ 8$(15)

$= 2\left(\frac{1}{2} 6 \cdot 8\right) + 2(10 \cdot 15) + (8 \cdot 15)$

$= 48 + 300 + 120$

$= 468\ cm^2$ ← 2 dimensional

Example 2: cylinder



V = (4) $\cdot 10$

$= (\pi 4^2) \cdot 10$

$= 16\pi \cdot 10 = 160\pi\ m^3$

$\approx 502.65\ m^3$

TSA = 2(4) $+$ 10 ($2\pi \cdot 4$)

$= 2(\pi \cdot 4^2) + (10 \cdot 8\pi)$

$= 32\pi + 80\pi = 112\pi\ m^2$

$\approx 351.86\ m^2$

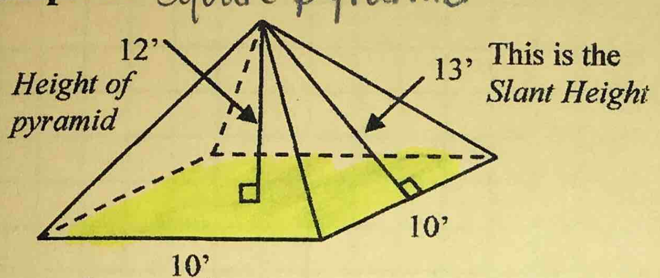
Volume and Total Surface Area of Pyramids & Cones

A pyramid has a single base, and three or more triangular faces that meet at a single point called the apex. A cone, has a circular base, and can be thought of to have an infinite number of triangular faces meeting at the apex.

$$V = \frac{1}{3}(\text{Base Area}) \cdot \boxed{\text{height}}$$

← distance between apex & base

Example 3: square pyramid



$V = \frac{1}{3}\left(\square_{10}^{10}\right) \cdot 12$

$= \frac{1}{3}(10 \cdot 10) \cdot 12$

$= \frac{1}{3}(1200)$

$= 400 \text{ ft}^3$

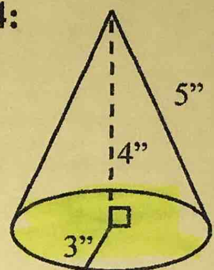
TSA = $\square$ (10, 10) $+ 4(\triangle)$ (13, 10)

$= (10 \cdot 10) + 4\left(\frac{1}{2} 10 \cdot 13\right)$

$= 100 + 4(65)$

$= 360 \text{ ft}^2$

Example 4: Cone



$V = \frac{1}{3}\left(\bigcirc_{3}\right) \cdot 4$

$= \frac{1}{3}(3^2\pi) \cdot 4$

$= \frac{1}{3}(9\pi \cdot 4)$

$= 12\pi \text{ in}^3 \approx 37.70 \text{ in}^3$

****We are not going to worry about the TSA of cones at this point!!!**