$LA = \frac{1}{2} \ell p$ $\quad SA = \frac{1}{2} \ell p + B$

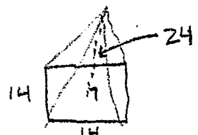
Examples:

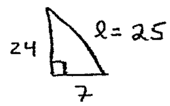
Me!

1. Find the lateral area and total area of a square pyramid with altitude 24 cm and base edge 14 cm.

$h = 24$

need to find ℓ





$LA = \frac{1}{2}(25)(14 \cdot 4)$

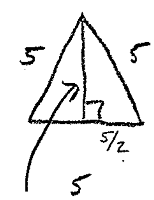
$LA = 700\,cm^2$

$SA = \frac{1}{2}(25)(14 \cdot 4) + (14 \cdot 14)$

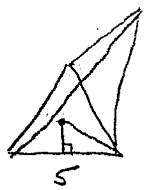
$SA = 700 + 196$

$SA = 896\,cm^2$

2. Find the total area of a regular triangular pyramid whose base-edge length is 5 in. and whose slant height is 8 in.



$\frac{5\sqrt{3}}{2}$



$LA = \frac{1}{2}(8)(5 \cdot 3)$

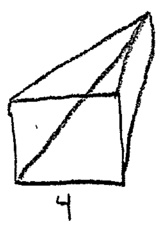
$LA = 60\,in^2$

$SA = \frac{1}{2}(8)(5 \cdot 3) + \frac{1}{2}(5)\left(\frac{5\sqrt{3}}{2}\right)$

$SA = \left(60 + \frac{25\sqrt{3}}{4}\right) in^2$

3. Find the slant height of a regular square pyramid with base-edge length 4 cm if its lateral area is 72 cm^2.

ℓ



$LA = 72$

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

$72 = \frac{1}{2} \ell (4 \cdot 4)$

$\ell = 9\,cm$

4. Find the slant height of a regular hexagonal pyramid with base-edge length 6 cm and lateral area 198 cm^2.

6 sides

$LA = 198$

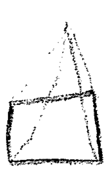
$LA = \frac{1}{2} \ell p$

$198 = \frac{1}{2} \ell (6 \cdot 6)$

$\ell = 11\,cm$

Me!

5. The surface area of a regular square pyramid is 48 cm^2. If the slant height is equal to the base-edge length, find the area of the base.



$SA = 48$

slant height = base-edge = x

$SA = \frac{1}{2} \ell p + B$

$48 = \frac{1}{2} x (4x) + (x \cdot x)$

$48 = 2x^2 + x^2$

$3x^2 = 48$

$x^2 = 16$

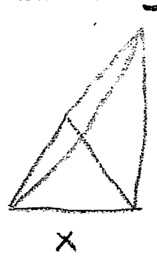
$x = 4$

Area of Base = $(4 \cdot 4) = 16$

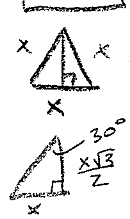
$16\,cm^2$

Me!

6. A regular triangular pyramid with equilateral triangular lateral faces has edge length x. Find the surface area of this pyramid in terms of x.



Base



$B = \frac{1}{2}(x)\left(\frac{x\sqrt{3}}{2}\right)$

$B = \frac{x^2\sqrt{3}}{4}$

slant height is same height as base.

$SA = \frac{1}{2} \ell p + B$

$SA = \frac{1}{2}\left(\frac{x\sqrt{3}}{2}\right)(3x) + \frac{x^2\sqrt{3}}{4}$

$SA = \frac{3x^2\sqrt{3}}{4} + \frac{x^2\sqrt{3}}{4}$

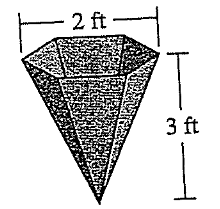
$SA = \frac{4x^2\sqrt{3}}{4}$

$SA = x^2\sqrt{3}\ u^2$

Me!

7. A large container shaped like a regular hexagonal pyramid has an open top. If one hundred of these containers are to be painted, both inside and out, with a paint that covers 450 sq ft per gallon, how many gallons of paint must be purchased?

LA times two



side length =

$P = 6$

ℓ, 3, $\sqrt{3}/2$

$\ell^2 = 3^2 + \left(\frac{\sqrt{3}}{2}\right)^2$

$\ell^2 = 9 + \frac{3}{4}$

$\ell = \sqrt{\frac{39}{4}}$

$\ell = \frac{\sqrt{39}}{2}$

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

$LA = \frac{1}{2}(6)\left(\frac{\sqrt{39}}{2}\right)$

$LA = \frac{3\sqrt{39}}{2}$

$\frac{3\sqrt{39}}{2} \times 2 = 3\sqrt{39}$ ft^2 needed

$\frac{100(3\sqrt{39})}{450} \approx 4.16 \approx$ 5 gallons

Volume:

Show prism/ pyramid demistration

The volume of a pyramid equals one-third the area of the base times the height of the pyramid. $V = \frac{1}{3}Bh$

Note: Pyramids can be "non-regular" for volume.

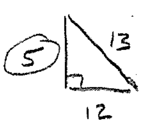
Examples.

Me!

1. The height of a pyramid is 14 cm and the base is a right triangle having a hpotenuse of 13 cm and a leg of 12 cm. Find the volume.

$h = 14$

13, 12cm



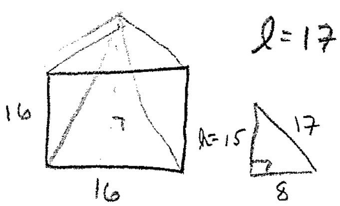
$B = \frac{1}{2}(12)(5)$

$B = 30$ cm^2

$V = \frac{1}{3}(30)(14)$

$V = 140$ cm^3

2. A regular pyramid with a square base 16 cm on a side has a slant height of 17 cm. What is the volume of the pyramid?



$\ell = 17$

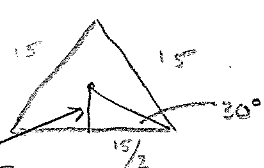
$B = 16(16) = 256$

$V = \frac{1}{3}(256)(15)$

$V = 1280$ cm^3

Keep in terms of radicals

3. Find the height of a pyramid if its volume is 2500 cm^3 and the base is an equilateral triangle 15 cm on a side.



$\frac{15}{2\sqrt{3}} = \frac{15\sqrt{3}}{6} = \frac{5\sqrt{3}}{2}$

$A = \frac{1}{2} a p$

$A = \frac{1}{2}\left(\frac{5\sqrt{3}}{2}\right)(15 \cdot 3)$

$A = \frac{225\sqrt{3}}{4}$

$V = \frac{1}{3} B h$

$2500 = \frac{1}{3}\left(\frac{225\sqrt{3}}{4}\right) h$

$225\sqrt{3}\, h = 30000$

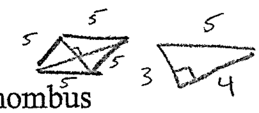
$\sqrt{3}\, h = \frac{400}{3}$

$h = \frac{400}{3\sqrt{3}}$

$h = \frac{400\sqrt{3}}{9}$ cm

~~4. The bases of the two pyramids below have equal area. How do their volumes compare?~~

$V = \frac{1}{3}Bh$



$h = 14$

5. Find the volume of a pyramid whose height is 14 cm and whose base is a rhombus with diagonals 6 cm and 8 cm.

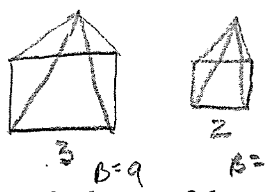
$B = \frac{1}{2}(6 \cdot 8)$

$B = 24$

$V = \frac{1}{3}(24)(14)$

$V = 112\ cm^3$

6. Two square pyramids have equal heights. The edge of a side of one base is 3 and of the other base is 2. How do their volumes compare?



heights equal

$V = \frac{1}{3}Bh$

$\frac{V_{base=3}}{V_{base=2}} = \frac{\frac{1}{3}(9)h}{\frac{1}{3}(4)h} = \frac{9}{4}$

7. The bases of the two pyramids ~~to the~~ below have equal area. How do their volumes compare?

$V = \frac{1}{3}Bh$

$\frac{V_{I}}{V_{II}} = \frac{\frac{1}{3}Bh}{\frac{1}{3}B\,2h} = \frac{1}{2}$