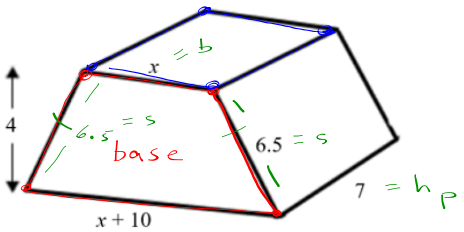
Lesson 9 continued : page 4

2.2.1 Example: Determine the lateral area of the following isosceles trapezoidal prism if the below units are in cm and its volume is 0.224 *litres*.



WANT : lateral area

TOOL :

$A_\ell = P_B \times h$

$A_\ell = (b + B + s + s) \times h_P$

INFO

$b = ? = x$

$B = ? = x + 10$

$s = 6.5$

$h = 7$

WANT : $b = x$

TOOL : $V = A_B \times h$

have all info

Volume = 0.224 L

$= 0.224\ dm^3$

$\times 1000$

(3) $V = 224\ cm^3$

find b & volume

(4) $V = A_B \times h$ ← height of Prism (7)

$A_B = \frac{(b + B) \times h}{2}$ ← height of trapezoid (4)

$A_B = \frac{(x + (x+10)) \times 4}{2}$ · sub · simplify

$A_B = (2x + 10) \times 2$

(1) $A_B = 4x + 20$ (2) $h = 7\ cm$

sub (1) (2) (3) into (4)

$224 = (4x + 20) \times 7$

$224 = 28x + 140$ · Simplify · solve for x · find lateral area

$-140 \quad -140$

$\frac{84}{28} = \frac{28x}{28}$

$x = 3 = b$

$b = 3$

$\therefore B = x + 10$

$B = 3 + 10$

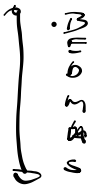
$B = 13$

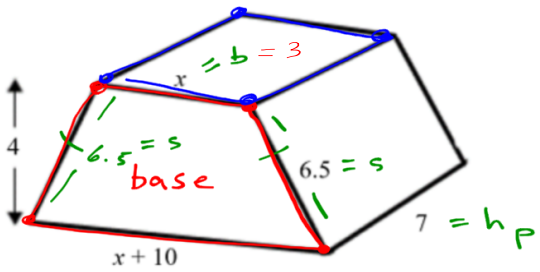
Find $A_\ell = P_B \times h$

$A_\ell = (b + B + 2s) \times h$ (3D)

$A_\ell = (3 + 13 + 2(6.5)) \times 7$

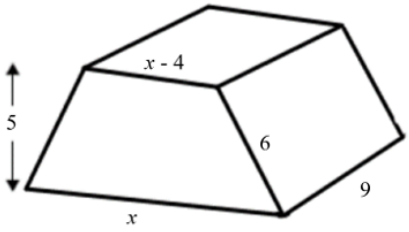
$A_\ell = 203\ cm^2$





You do 2.2.2 practice L10 @ 9 a.m.

2.2.2 Practice: Determine the lateral area of the following isosceles trapezoidal prism if the below units are in cm and its volume is $0.0315\ daL$.



$x = 9\,cm$

$A_\ell = 234\,cm^2$

Lesson 10: Areas and Volume of Regular Pyramids + mini tasks

June 6th, 2023

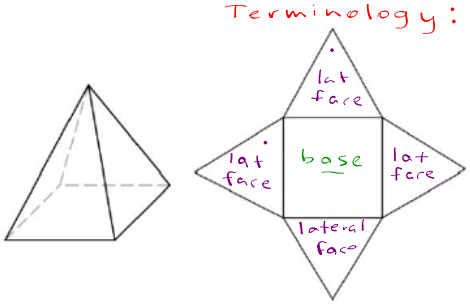
↳ the ones w bases in the shape of regular polygons

e.x. · equilateral △
· square
→ equiangular

1 The Surface Area of Pyramids

1.1 How do we determine the Total Surface Area of a Pyramid?

Terminology:

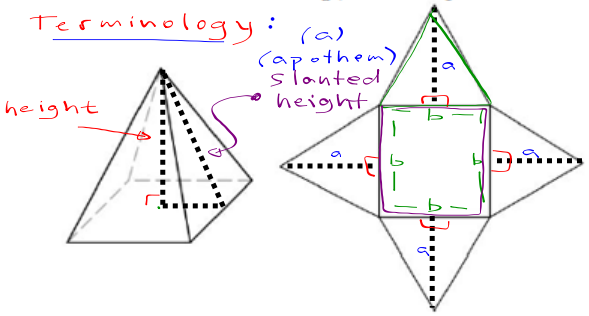


$$A_T = A_L + A_B$$

Regular

1.2 How do we determine the Lateral Area of a Pyramid?

Let's consider the net of a pyramid again. How would we go about determining the lateral area?



gcf = $\frac{a}{2}$

$$A_\ell = A_{\Delta_1} + A_{\Delta_2} + A_{\Delta_3} + A_{\Delta_4}$$

$$A_\ell = \underbrace{\frac{b \times a}{2}}_{/a/2} + \underbrace{\frac{b \times a}{2}}_{/a/2} + \underbrace{\frac{b \times a}{2}}_{/a/2} + \underbrace{\frac{b \times a}{2}}_{/a/2}$$

$$A_\ell = \frac{a}{2}(b + b + b + b)$$

$$A_\ell = \frac{a}{2}(P_B)$$

$$A_\ell = \frac{P_B \times a}{2}$$

where a = apothem, P_B = perimeter of base

Determine Formula for Total Area of Regular Pyramid

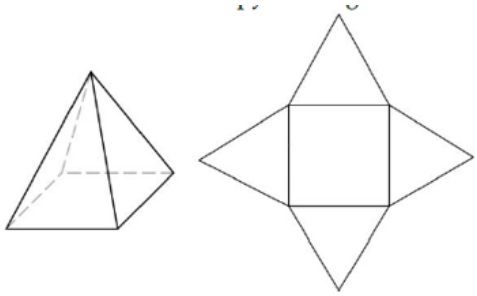
$$A_\ell = \frac{P_B \times a}{2}$$

$$A_T = A_\ell + A_B$$

$$A_T = \frac{P_B \times a}{2} + A_B$$

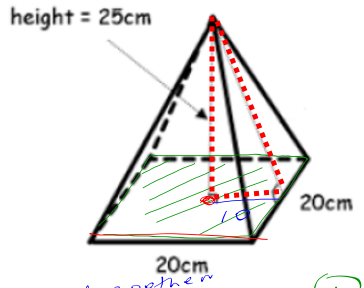
where

a = apothem of pyramid



mini-task ~ Area.

1.3.1 Example: Robin wants to make a model of a pyramid tent in the shape of a square pyramid. He buys 2.5 bags of canvas. It cost him \$5.60 per bag and each one contains 600 cm^2 of canvas. Will the 2.5 bags be enough to make his tent model?



WANT: area of pyramid and amount (area) of canvas we have cm^2

TOOL:

$A_T = A_\ell + A_B$

2.5	5.60	600
bags	$\frac{\$}{bag}$	$\frac{cm^2}{bag}$

$A_\ell = \frac{P_B \times a}{2}$

$A_\ell = \frac{(4 \times 20) \times 26.9258}{2}$

① $A_\ell = 1077.03$

$A_B = s^2$

$A_B = 20^2$

③ $A_B = 400$

$A_T = A_\ell + A_B$

$A_T = 1077.03 + 400$

$A_T = 1477.03 cm^2$

to find apothem: $c^2 = a^2 + b^2$

a (apothem), c (hypo)

11.25 cm, 10 cm = b

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

$\sqrt{c^2} = \sqrt{(25^2 + 10^2)}$

$c = 26.9258$

$c = 5\sqrt{29}$ apothem

2.5×5.60 bags $\times \frac{\$}{bags}$

$2.5 \times 5.60 \times 600$ bags $\times \frac{\$}{bags} \times \frac{cm^2}{bag}$

2.5×600 bags $\times \frac{cm^2}{bags}$ area

we have $= 1500 cm^2$ of canvas

compare

∴ yes, we will have enough canvas to cover tent since $1500 cm^2 > 1477.03 cm^2$

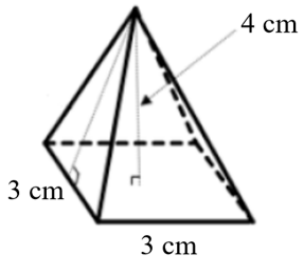
You do:

1.3.2 Practice

Bonus

1.3.3 Example

1.3.2 Practice: This time Robin wants to be thrifty when making his tent model, so he reduces the dimensions of the square pyramid as shown below. He buys 3.5 bags of plastic wrap and 2 highlighters. If each bag contains $9cm^2$ of plastic, will he have enough to make his tent model?

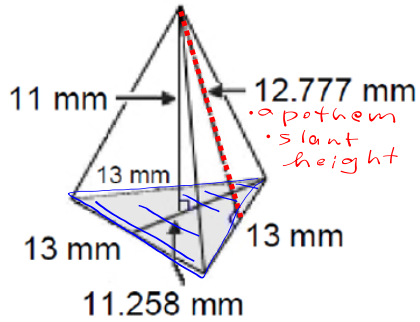


we have $31.5\ cm^2$ of plastic

$A_T = 34.63\ cm^2$

no won't have enough

1.3.3 Example: An architect buys 2 packs of shingles to use on the roof of the model of a triangular pyramid with the dimensions indicated in the drawing below. If each pack covers $120cm^2$ and contains 55 shingles, will the architect have enough to shingle the roof?



"roof"

want: Lateral area of pyramid mm^2

amount (area) of shingles mm^2

2 packs | 120 cm^2 / pack | 55 shingles

TOOL:

$A_\ell = \frac{P_B \times a}{2}$; (a) apothem

$A_\ell = \frac{((3 \times 13) \times 12.777)}{2}$

$A_\ell = 249.15\ mm^2$

Yes we have enough

$2 \times 120 = 240\ cm^2$

240×10^2

$24000\ mm^2$ we have.

$1\ cm = 10\ mm$

$(1\ cm)^2 = (10\ mm)^2$

$1\ cm^2 = 10^2\ mm^2$

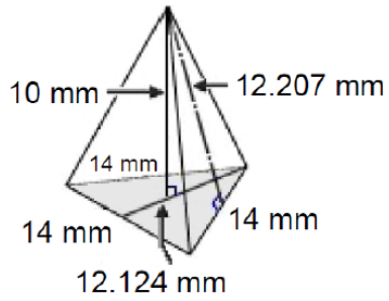
$1\ cm^2 = 100\ mm^2$

You do:

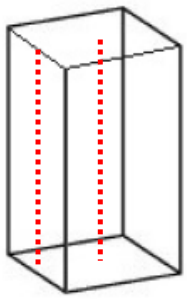
1.3.4

You do 1.3.4 bâche
no base

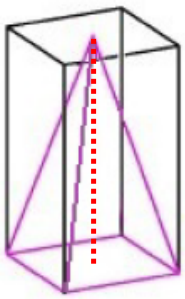
1.3.4 Practice: The architect makes a different model of a triangular pyramid and wants to protect it with a waterproof tarp. He will use half a tarp that measures $700mm^2$ and that costs \$2. Will he have enough to cover the pyramid?



Volume of a Pyramid



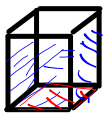
$V = A_B \times h$



$V = \frac{A_B \times h}{3}$

Recall : write on memory aid

Prisms :



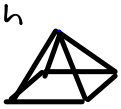
$A_\ell = P_B \times h$

$A_T = A_\ell + 2A_B$

$A_T = P_B \times h + 2A_B$

$V = A_B \times h$

Pyramid



$A_\ell = \frac{P_B \times a}{2}$

$A_T = A_\ell + A_B$

$A_T = \frac{P_B \times a}{2} + A_B$

$V = \frac{A_B \times h}{3}$

Where

A_ℓ = Lateral Area of solid (3D)

P_B = Perimeter of base (2D)

h = height of 3D solid

A_T = Total Area of solid (3D)

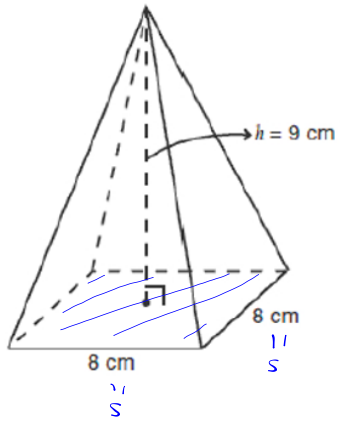
A_B = Area of base (2D)

V = Volume of solid (3D)

a = apothem of pyramid

Finding the Volume of Pyramid

2.2.1 Example: Find the volume of the following pyramid. Give final answer is dL.



$$V = \frac{A_B \times h}{3}$$ label

$$V = \frac{s^2 \times h}{3}$$

$$V = \frac{8^2 \times 9}{3}$$

$$V = 192\,cm^3$$ ← convert units to dL

$$= 192\,mL$$

$$192 \div 10 \div 10$$

$$V = 1.92\,dL$$

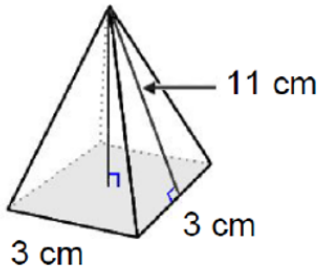
You do

2.2.2

2.2.3

2.2.4 ← check notes from yesterday about how to find area of hexagon.

2.2.2 Practice: Find the volume of the following pyramid. Give the final answer in *cL*.



$h = ?$

use

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

$h = 10.897$

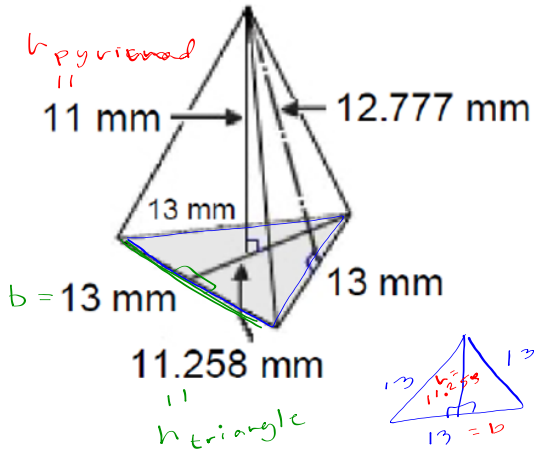
$V = 32.7\ cm^3$

$= 32.7\ mL$

$= 3.27\ cL$

2.2.3 Practice

Find the volume of the following pyramid. Give the final answer in mL.



a triangle

$$V = \frac{A_B \times h}{3}$$

$$V = \frac{\left(\frac{b \times h_\Delta}{2}\right) \times h_{pyramid}}{3}$$

$$A_B = \frac{b \times h}{2}$$

$$A_B = \frac{13 \times 11.258}{2} \qquad h = 11$$

$$A_B = 73.177\ mm^2$$

$$V = \frac{73.177 \times 11}{3}$$

$$V = 268.3156\ mm^3$$

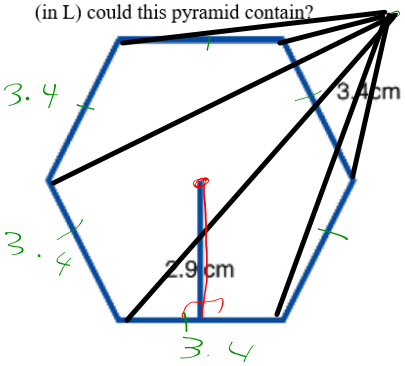
$$\div 10^3$$

$$0.2683156\ cm^3$$

$$0.268\ mL$$

2.2.4 Practice

Calculate the volume of a pyramid whose height is 17 cm and whose base is the regular hexagon as shown below. How much water (in L) could this pyramid contain?



hexagon

$$V = \frac{A_B \times h}{3}$$

$h = 17$ cm

$$A_B = \frac{P \times a}{2}$$

$$A_B = \frac{(3.4 \times 6)\, 2.9}{2}$$

$A_B = 29.58$ cm

$$V = \frac{29.58 \times 17}{3}$$

$V = 167.62\ cm^3$

$= 167.62\ mL \times \frac{1}{10^3}$

$0.16762\ L$

homework

p 115 #3.9 b)
#3.10 b)

p 134 #3.20

p 142 #3.24 p 143 #3.26

AND missed handouts from yesterday