Lesson 11: · Creation of memory aid

· Review of Volume and Area of Prisms and Pyramid

· Review of Substitution / Simplification /

Spheres

April 11th 2024

· Pythagorus
· Conversion
· toute!
· medium-tasks

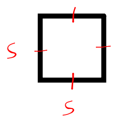
·· take out memory aid

·· take out laws of exponents

·· take out conversion charts

write on memory aid:

square

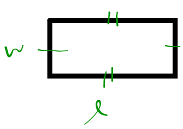


$A = s^2$

$P = 4s$

$P = s + s + s + s$

rectangle

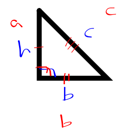


$A = \ell \cdot w$

$P = 2\ell \cdot 2w$

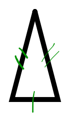
$P = \ell + \ell + w + w$

triangle (right) (scalene)

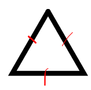


$A = \frac{b \times h}{2}$

$P = b + h + c$

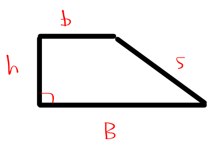


(isosceles)



(equilateral)

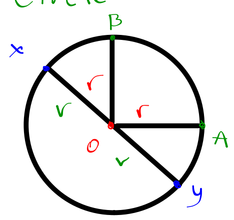
trapezoid



$A = \frac{(b+B) \times h}{2}$

$P = b + B + h + s$

circle



O – origin

$\overline{OA} = r$ = radius

$\overline{xy} = d$ = diameter

$d = 2r$

$r = \frac{1}{2}d$

$A = \pi r^2$

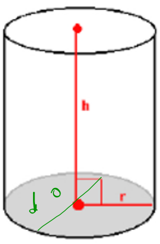
$\pi = pi \cong 3.14$

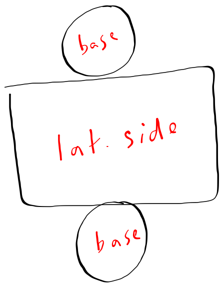
$C = 2\pi r$

C = circumference ≅ perimeter

a prism or a pyramid?

3.1 Volume of a Cylinder





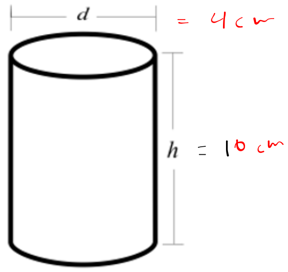
sub in

$V = A_B \times h$ $\qquad$ $A_B = \pi r^2$

$V = \pi r^2 \times h$, r = radius

h = height

3.1.1 Example: Calculate the volume (in dL) of the following cylinder if $d = 4cm$ and $h = 10cm$:



You do

3.1.2

and

3.1.3

tool

$V = A_B \times h$

$V = \pi r^2 \times h$

$V = \pi (2)^2 \times 10$

$V = 40\pi \text{ cm}^3$

$V \cong 125.66 \text{ cm}^3$

$V \cong 125.66 \text{ mL}$

$V \cong 1.26 \text{ dL}$

$A_B = \pi r^2$

label diagram

$h = 10 \text{ cm}$

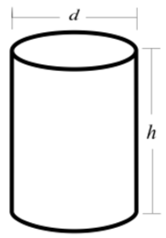
$d = 4 \text{ cm}$

$r = \frac{1}{2} \cdot d$

$r = \frac{1}{2} \cdot 4$

$r = 2 \text{ cm}$

3.1.2 Practice: 3.1.1 Example: Calculate the volume (in kL) of the following cylinder if $d = 7dam \text{ and } h = 13\ dam$:



$V = A_B \times h$

$V = \pi r^2 \times h$

$V = \pi (3.5)^2 \times 13$

$V = 500.2986\ dam^3$ ← to m^3

$\times 10^3$

$V = 500\,298.63\ m^2$ ← kL

$V = 500\,298.63\ kL$

3.1.3 Practice: Calculate the capacity (in mL) of a cylinder if $r = 20cm \text{ and } h = 75cm$:

$V = A_B \times h$

$V = \pi r^2 \times h$

$V = \pi\ 20^2 \times 75$

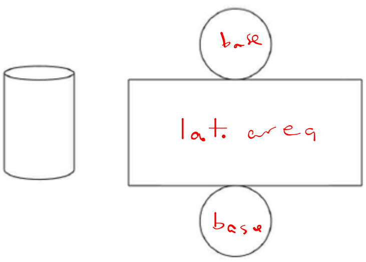
$V = 94\,247.7796\ cm^3$

$V = 94\,247.7796\ mL$

prism or pyramid ?

2 base

3.2.1 Discovering the Surface Area of a Cylinder



sub in

$A_L = P_B \times h$

$P_B = C = 2\pi r$

$A_0 = \pi r^2$

$A_T = A_L + 2A_B$

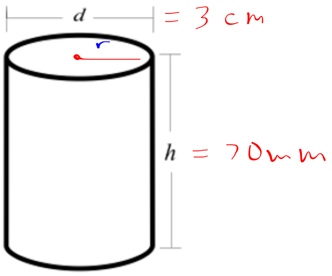
$A_T = P_B \times h + 2A_B$

$A_T = 2\pi r \times h + 2\pi r^2$

$A_L = 2\pi r h$

total area

3.2.1 Example: Calculate the surface area (in cm^2) of the following cylinder if $d = 3\ cm\ and\ h = 70\ mm$:



You do:

3.2.2
and
3.2.3

$A_T = P_B \times h + 2A_B$

$A_T = 2\pi r \times h + 2\pi r^2$

$A_T = 2\pi(1.5)(7) + 2\pi(1.5)^2$

$A_T = \frac{51\pi}{2}\ cm^2$

$A_T \cong 80.11\ cm^2$

$h = 7\,cm$

$\div 10$

$h = 70\,mm$

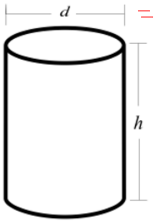
$d = 3\,cm$

$r = \frac{1}{2}d$

$r = \frac{1}{2} \times 3$

$r = 1.5\,cm$

3.2.2 Practice: Calculate the surface area (in m^2) of the following cylinder if $d = 1\ dam$ and $h = 17\ m$:

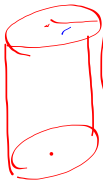


$= 1\ dam$
$= 10m$

$h = 17\ m$

$A_T = 691.1504\ m^2$

3.2.3 Practice: Calculate the surface area (in mm^2) of a cylinder if $r = 25\ mm$ and $h = 7\ cm$:



$h = 7cm$
$h = 70mm$

$A_T = A_L + 2A_B$

$A_T = P_B \times h + 2A_B$

$A = 14922.5651\ mm^2$

$C = 2\pi r$

$A = \pi r^2$

$A_T = 2\pi r \times h + 2\pi r^2$

$r = 25\ mm$

$A_T = 2\pi(25) \times 70 + 2\pi(25)^2$

$h = 7\ cm$
$\times 10$
$h = 70\ mm$

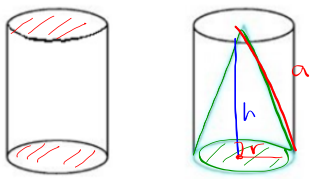
$A_T = 14922.5151\ mm^2$

prism or pyramid ?

2 bases 1 base

3 The Volume of Cones

3.1 Thinking about the Volume of a Cone Relative to a Cylinder



a – apothem

sub in

$A_B = \pi r^2$

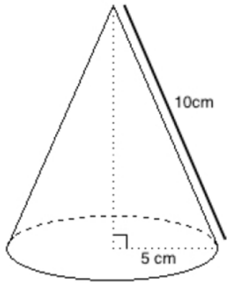
$V = A_B \times h$

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

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

3.2.1 Example

Calculate the volume of the following cone:

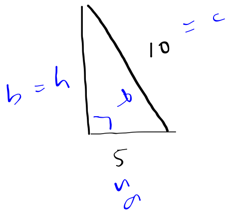


label

$a = 10\ cm$

$r = 5\ cm$

to find h:



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

$10^2 = \cancel{5^2} + b^2$

$-5^2 \quad \cancel{-5^2}$

$\sqrt{b^2} = \sqrt{(10^2 - 5^2)}$

$b = \sqrt{75}$

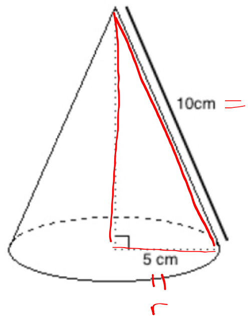
$b = \sqrt{25 \times 3}$

$b = 5\sqrt{3}\ cm$

$h = b \approx 8.66\ cm$

3.2.1 Example

Calculate the volume of the following cone:



tool

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

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

you do
3.2.2
3.2.3

bonus
4.2.1

$$V = \frac{\pi (5)^2 \times 5\sqrt{3}}{3}$$

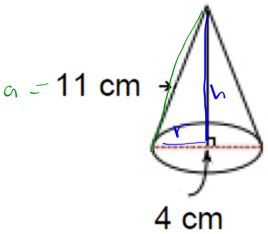
$V = 226.7249205\ cm^3$

$$V = \frac{\pi (5)^2 \times 8.66}{3}$$

$V \approx 226.71827\ cm^3$

3.2.2 Example

Calculate the volume of the following cone:

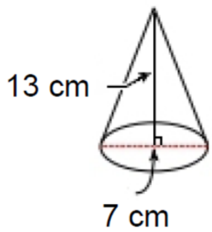


h = 10.82 cm

V = 45.32 cm^3

3.2.3 Practice

Calculate the volume of the following cone

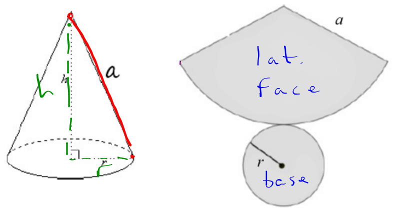


V = 166.77 cm^3

pyramid

4 The Surface Area of Cones

4.1 Thinking about the Total Area and Lateral Area of Cones



sub in

$A_L = P_B \times \frac{a}{2}$

$A_T = A_L + A_B$

$P_B = 2\pi r$

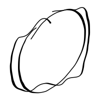
$A_T = P_B \times \frac{a}{2} + A_B$

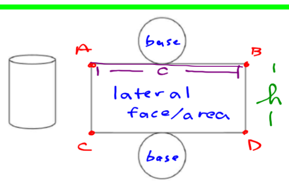
$A_B = \pi r^2$

$A_T = \frac{\cancel{2}\pi r}{1} \times \frac{a}{\cancel{2}} + \pi r^2$

$A_T = \pi r \times a + \pi r^2$

π = pi
= pie





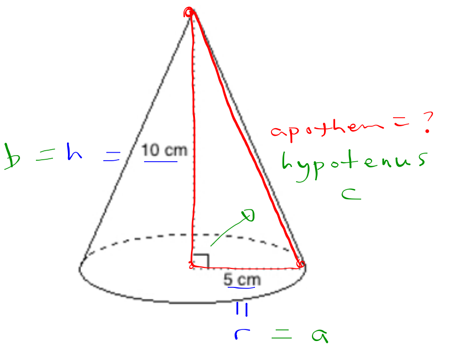
$A_T = A_\ell + 2A_B$

$A_T = P_B \times h + 2A_B$

$A_T = 2\pi r \cdot h + 2\pi r^2$

4.2.1 Example

Calculate the surface area of the following cone



to find a (apothem)

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

$\sqrt{c^2} = \sqrt{(5^2 + 10^2)}$

$c = 11.18\ cm = a_p$

$A_T = A_L + A_B$

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

$A_T = 2\pi r \times \frac{a}{2} + \pi r^2$

$A_T = \pi r \times a + \pi r^2$

$A_T = \pi(5)(11.18) + \pi(5)^2$

$A_T = 254.15\ cm^2$

label

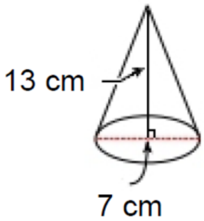
you do

4.2.2

4.2.3

4.2.2 Practice

Calculate the surface area of the following cone



apothem

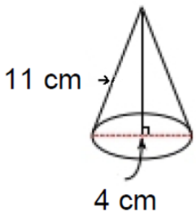
$r = 3.5\ cm$

$a \cong 13.46\ cm$

$A_T = 186.48\ cm^2$

4.2.3 Practice

Calculate the surface area of the following cone:



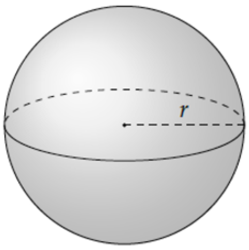
$r = 2\ cm$

$a = 11\ cm$

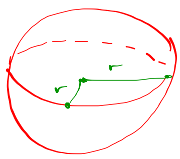
$A = 81.68\ cm^2$

write on memory aid

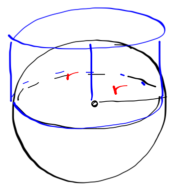
1.1 The Volume of a Sphere



· sphere:



$V = \frac{4\pi r^3}{3}$



$V = A_B \times h$

$V = \pi r^2 \times r^1$

$V = \pi r^3$

The sphere is 4/3 x greater than the blue cylinder.

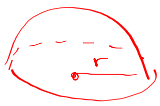
· half disk

(half sphere)

(hemisphere)

$\frac{1}{2} V = \frac{1}{\cancel{2}} \left(\frac{\overset{2}{\cancel{4}} \pi r^3}{3} \right)$

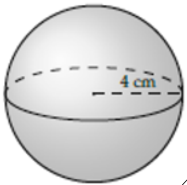
$\frac{V}{2} = \frac{\frac{4\pi r^3}{3}}{\frac{2}{1}}$



$V = \frac{2\pi r^3}{3}$

1.1.1 Example

Calculate the volume of the following sphere.



$r = 4$

$$V = \frac{4\pi r^3}{3}$$

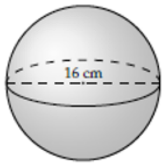
$\boxed{x^3}$ or $\boxed{\wedge}$ $\boxed{3}$

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

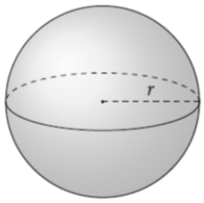
$$V = 268.08 \text{ cm}^3$$

1.1.3 Practice

Calculate the volume of the following sphere.



1.2 The Surface Area of a Sphere



· sphere :

no base $\rightarrow$ $A_L = 4\pi r^2$

still no base

$A_T = 4\pi r^2$

· half sphere :

· hemisphere :

$\frac{1}{2} A = \frac{1}{2} \cdot 4\pi r^2$

$= 2\pi r^2$

no base

$\rightarrow A_L = 2\pi r^2$

has a base

$A_T = A_L + A_B$

$A_T = 2\pi r^2 + \pi r^2$

$A_T = 3\pi r^2$

You do · 1.1.3 – $2144.66\,cm^3$

· 1.2.2

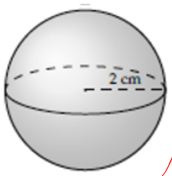
together handout 2 before exit ticket

start solving: · 4.1 · 4.2 · 4.3

1.2 The Surface Area of a Sphere

1.2.1 Example

Calculate the surface area of the following sphere



$r = 2\,cm$

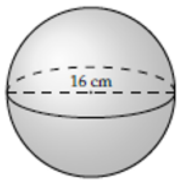
$A_T = 4\pi r^2$

$A_T = 4\pi(2)^2$

$A_T = 50.27\,cm^2$

1.2.2 Practice

Calculate the surface area of the following sphere.

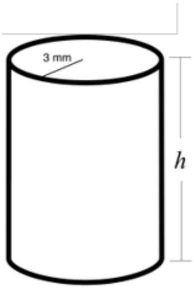


$A_T = 804.25\,cm^2$

4 Finding a Missing Measurement in a Cylinder

4.1 Example

Find the height of the following cylinder if its volume is $1000mm^3$:



$= ?$

tool

$V = A_B \times h$

$\boxed{V = \pi r^2 \times h}$

equation

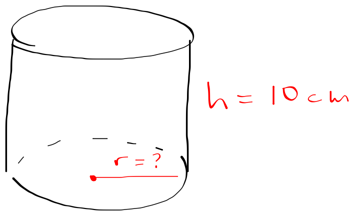
· which tool?

· based on given info.

4.2 Example

Determine the total surface area of a cylinder if the area of one of its bases is $50.625cm^2$ and the height of the cylinder is 10cm.

which tool to find r ?



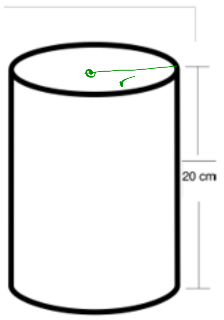
tool

$$A_B = \pi r^2$$

base circle

4.3 Example

Find the radius of the following cylinder if its lateral area is $1200cm^2$:



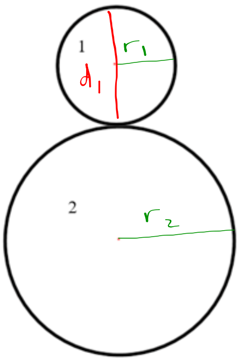
which tool to find r?

$A_L = P_B \times h$

$A_L = 2\pi r \times h$ ✓

Practice: Solving for Unknown measurements

The following two circles have a total area of $5\pi\ cm^2$. The diameter of the first circle is congruent to the radius of the second circle. What is the circumference of the second circle?



tips:
- labeling
- take notes

$C_2 = ?$

$r_1 = ?$ $r_2 = ?$

which tool? based on given info!

$A_T = 5\pi\ cm^2$ ✓

$A_T \doteq 15.71\ cm^2$

$d_1 = r_2$

$A = \pi r^2$

rewrite 2nd unknown in terms of first

$d_1 = 2r_1$

$r_2 = d_1$

$r_2 = 2r_1$

sub in →

$A_T = 5\pi$

$A_T = A_{O_1} + A_{O_2}$

$A_T = \pi r_1^2 + \pi r_2^2$

$A_T = \pi r_1^2 + \pi (2r_1)^2$

- sub
- simplifying
- law 6
- add like terms!

$A_T = \pi r^2 + \pi \cdot 4r^2$

$A_T = 1\boxed{\pi r^2} + 4 \cdot \boxed{\pi r^2}$

$A_T = 5\pi r^2$

- solve for r by doing o.o.

B
E
D
M
A
S

steps

$\frac{5\pi}{5\pi} = \frac{\cancel{5\pi} \cdot r^2}{\cancel{5\pi}}$

$\sqrt{1} = \sqrt{r^2}$

$\boxed{r_1 = 1\ cm}$

$\therefore$

$r_2 = 2r_1$

$r_2 = 2(1)$

$\boxed{r_2 = 2\ cm}$

$C = 2\pi r_2$

$C = 2\pi (2)$

$C = 4\pi\ cm$

$C = 12.57\ cm$

You do:
- exit ticket
- from textbook:

HMWK:
page 184 (not #4.17)
page 186
page 220 #5.11
BONUS: p170 and p 221 #5.16

3.1.3 Example: The architect is now making the actual triangular pyramid whose roof he will shingle with 3.5 bags of shingles. The total surface area of the pyramid is $96.588m^2$. Each bag covers $25m^2$ and contains 28 shingles. If the apothem of the pyramid is $9\ m$ and the height of the base is $3\sqrt{3}\ m\ (or\ 5.196m)$, will the 3.5 bags be enough to shingle the roof?