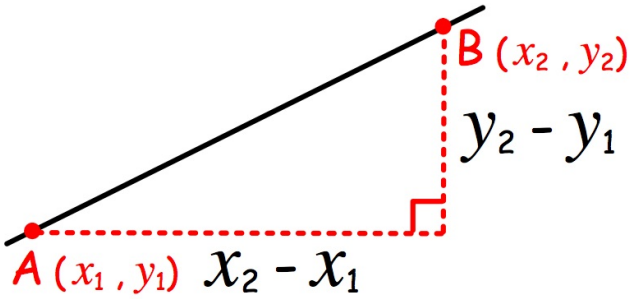
STRAIGHT LINE: GRADIENT

GRADIENT $\quad m = \dfrac{\text{vertical change}}{\text{horizontal change}}$

$$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1} \quad , \; x_2 \neq x_1$$

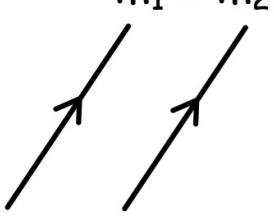


NOTE:

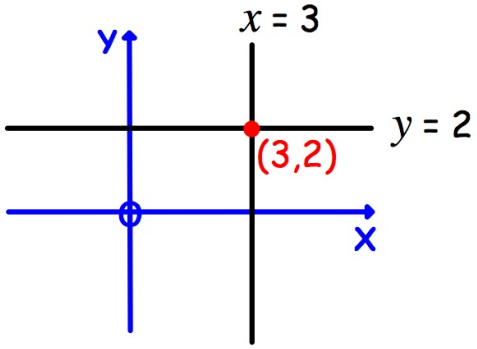
positive	negative	horizontal	vertical
$m > 0$	$m < 0$	$m = 0$	m= undefined (infinite)

parallel lines:

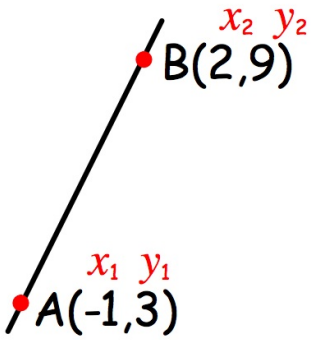
$m_1 = m_2$



equations:



(1)



$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

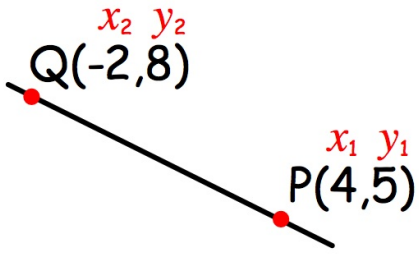
NOTE: same result whichever is the first point

$$m_{PQ} = \frac{9 - 3}{2 - (-1)} \qquad m_{PQ} = \frac{3 - 9}{-1 - 2}$$

$$= \frac{6}{3} \qquad = \frac{-6}{-3}$$

$$= 2 \qquad = 2$$

(2)



$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

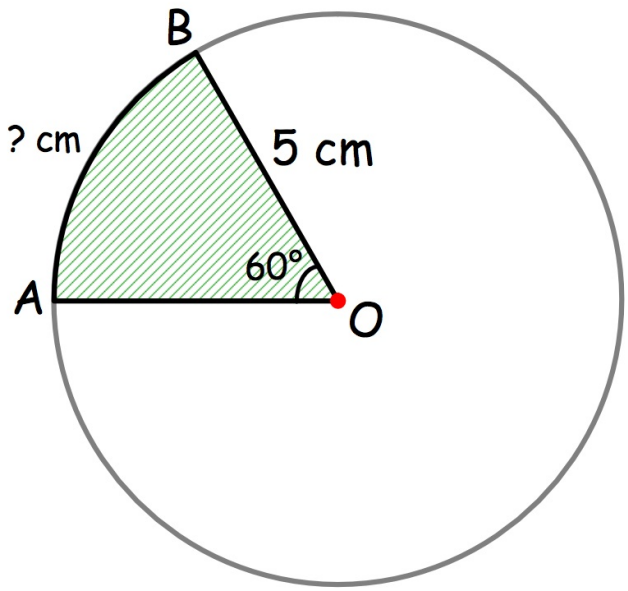
$$m_{PQ} = \frac{8 - 5}{-2 - 4} \qquad m_{PQ} = \frac{5 - 8}{4 - (-2)}$$

$$= \frac{3}{-6} \qquad = \frac{-3}{6}$$

$$= -\frac{1}{2} \qquad = -\frac{1}{2}$$

CIRCLES: SECTORS

$$\frac{\text{angle AOB}}{360°} = \frac{\text{arc AB}}{\pi d} = \frac{\text{area of sector AOB}}{\pi r^2}$$



$$\frac{\text{arc AB}}{\pi d} = \frac{\text{angle AOB}}{360°}$$

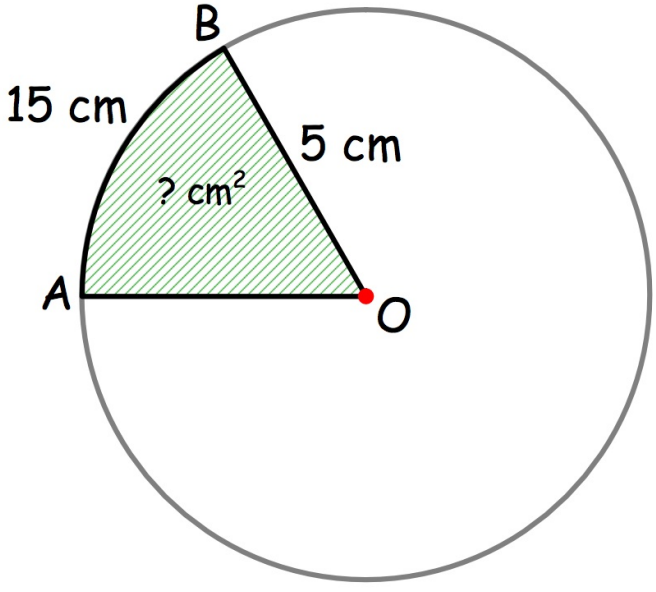
$$\text{arc AB} = \frac{60°}{360°} \times \pi d$$

$$= \frac{60°}{360°} \times \pi \times 10$$

$$= 5.2359...$$

$$= \underline{\underline{5.2 \text{ cm}}}$$

$$\frac{\text{area of sector AOB}}{\pi r^2} = \frac{\text{arc AB}}{\pi d}$$



$$\text{area AOB} = \frac{15}{\pi d} \times \pi r^2$$

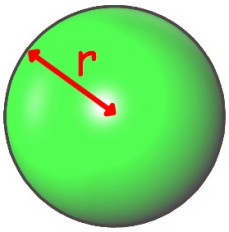
$$= \frac{15}{\pi \times 10} \times \pi \times 5 \times 5$$

$$= 15 \times 5 \times 5 \div 10$$

$$= \underline{\underline{37.5 \text{ cm}^2}}$$

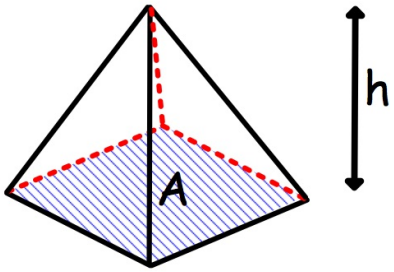
VOLUMES OF SOLIDS

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



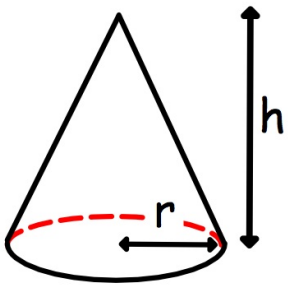
sphere

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



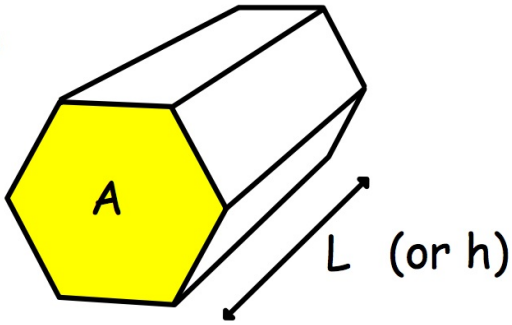
pyramid

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



cone

prism

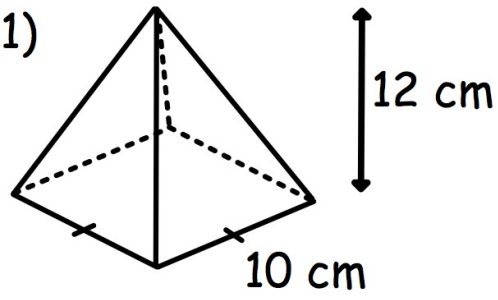


$V = AL$ (or $V = Ah$)

Ensure that the length units match the area units.

eg. cm with cm^2

(1)



$A = lb$

$= 10 \times 10$

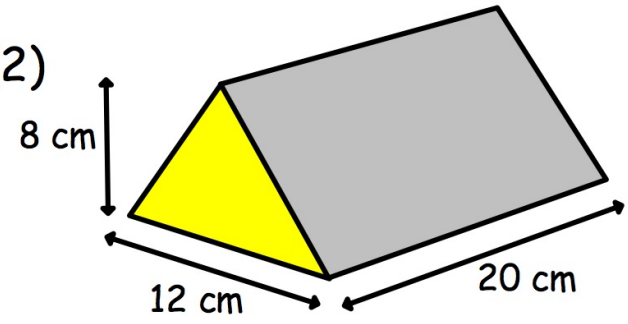
$= 100\ cm^2$

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

$= 100 \times 12 \div 3$

$= \underline{400\ cm^3}$

(2)



$A = {}^1/_2\,bh$

$= 12 \times 8 \div 2$

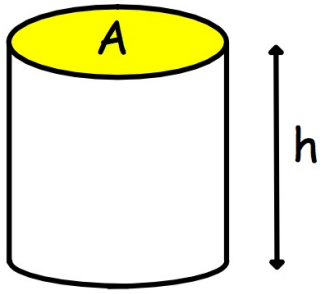
$= 48\ cm^2$

$V = AL$

$= 48 \times 20$

$= \underline{960\ cm^3}$

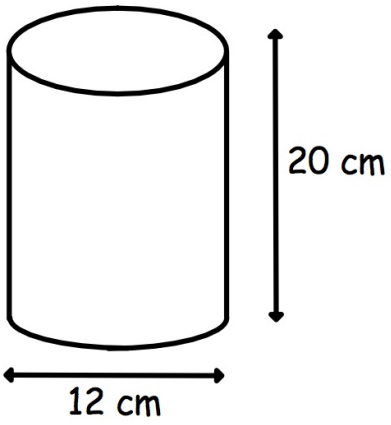
CYLINDERS Circular prism: $V = Ah$ and $A = \pi r^2$



$V = \pi r^2 h$

Ensure radius and height units match. eg. cm with cm

(1)



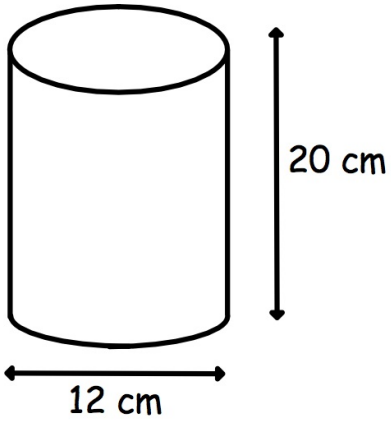
$V = \pi r^2 h$

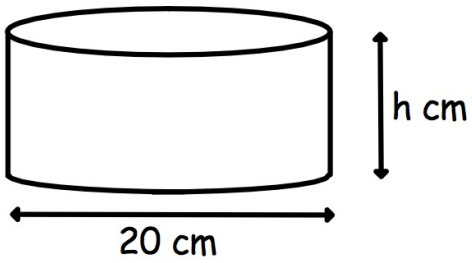
$= \pi \times 6 \times 6 \times 20$

$= 2261.946...$

$\approx \underline{\underline{2260 \text{ cm}^3}}$

(2) The cylinders have the same volume.





$V = \pi r^2 h$

$= \pi \times 6 \times 6 \times 20$

$= 720\pi$

$V = \pi r^2 h$

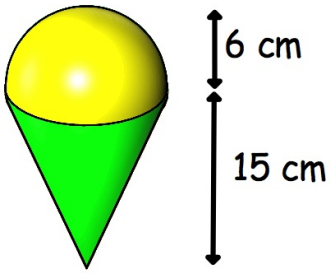
$720\pi = \pi \times 10 \times 10 \times h$

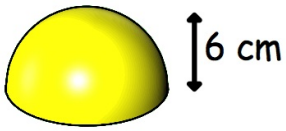
$720\pi = 100\pi \times h$

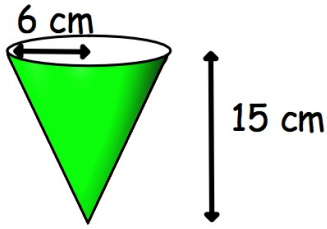
$h = 720\pi \div 100\pi$

$\underline{\underline{h = 7.2}}$

COMPOSITE SHAPES: split into known solids.







hemisphere

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

$= 4 \div 3 \times \pi \times 6 \times 6 \times 6 \div 2$

$= 452.38...\ cm^3$

cone

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

$= \pi \times 6 \times 6 \times 15 \div 3$

$= 565.48...\ cm^3$

Volume $452.38... + 565.48... = 1017.876...$

$\approx \underline{\underline{1020\ cm^3}}$

EFFECT OF CHANGE:

Examine the effect that changes in the variables have on the subject of a formula.

(1) $V = \pi r^2 h$ treble the radius and double the height

$V = \pi(3r)^2(2h) = \pi \times 9r^2 \times 2h = 18 \times \pi r^2 h$ $18 \times V$

or assume easy numbers:

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

$r = 3$, $h = 2$ $V = \pi \times 3^2 \times 2 = 18\pi$ $18 \times V$

(2) $h = \frac{V}{A}$

(a) $2 \times V$ $h = \frac{2V}{A} = 2 \times \frac{V}{A}$ $2 \times h$

(b) $2 \times A$ $h = \frac{V}{2A} = \frac{1}{2} \times \frac{V}{A}$ $\frac{1}{2} \times h$

(c) $\frac{1}{2} \times A$ $h = \frac{V}{\frac{1}{2}A} = 2 \times \frac{V}{A}$ $2 \times h$

SIGNIFICANT FIGURES

Indicate the accuracy of a measurement.

eg. 3400 cm = 34 m = 0.034 km

Same measurement, same accuracy: each 2 significant figures.

Count the number of figures used but not zeros:
at the end of a whole number,
at the start of a decimal.

These zeros simply keep the place value of the digits.

Examples:

0.030	2 sig fig	30100	3 sig fig
5.030	4 sig fig	30100.0	6 sig fig

ROUNDING:

Round to the place value of the number of significant figures required.

Examples: rounding to 2 significant figures.

nearest HUNDRED ↓

5731.4

= 5700

nearest THOUSANDTH ↓

0.057314

= 0.057

NOTE: 0.057000 is wrong