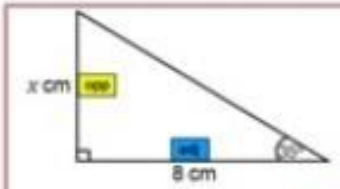
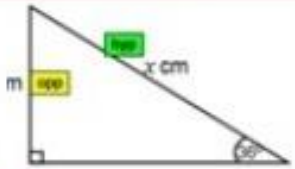
Trigonometry





Finding a side

$\tan A = \frac{opp}{adj}$

$\tan 35^0 = \frac{x}{8}$

$8 \times \tan 35^0 = x$

$5.6016603 = x$

$5.6cm = x$

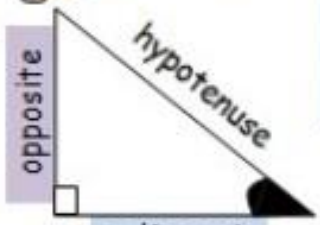
$\sin A = \frac{opp}{hyp}$

$\sin 36^0 = \frac{11}{x}$

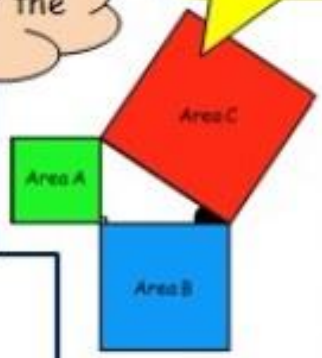
$x = \frac{11}{\sin 36^0}$

$x = 18.7cm$

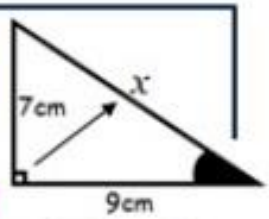
label the sides of the triangle



$A^2 + B^2 = C^2$



Pythagoras' Theorem



$x^2 = 9^2 + 7^2$

$x^2 = 81 + 49$

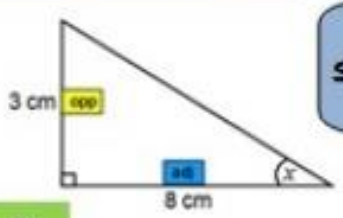
$x^2 = 130$

$x = \sqrt{130} = 11.4$

hypotenuse - ADD!

shorter side - SUBTRACT!

$\sin = \frac{opp}{hyp}$



Finding an angle

$\tan x = \frac{opp}{adj}$

$\tan x = \frac{3}{8} = 0.375$

$x = \tan^{-1} 0.375$

$x = 20.556045$

$x = 20.6^0$

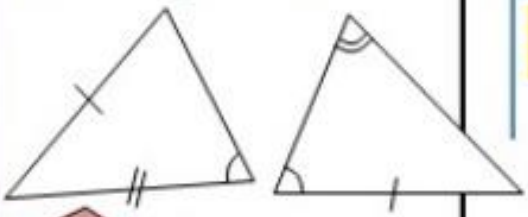
$\cos = \frac{adj}{hyp}$

$\tan = \frac{opp}{adj}$

The Sine Rule

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ sides

$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$ angles



Remember to use the formula page on your exam paper!

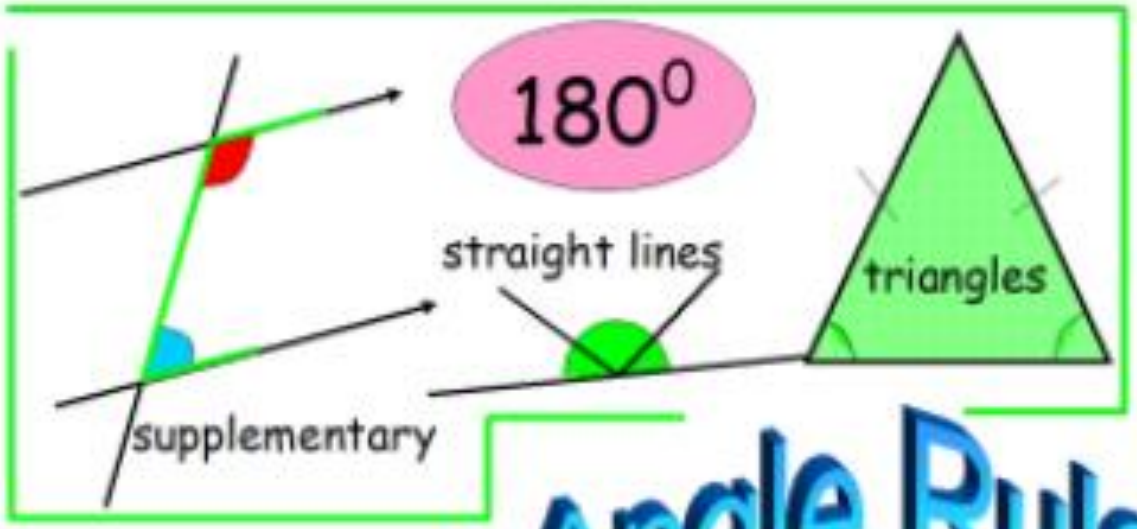
$a^2 = b^2 + c^2 - 2bc \cos A$ sides

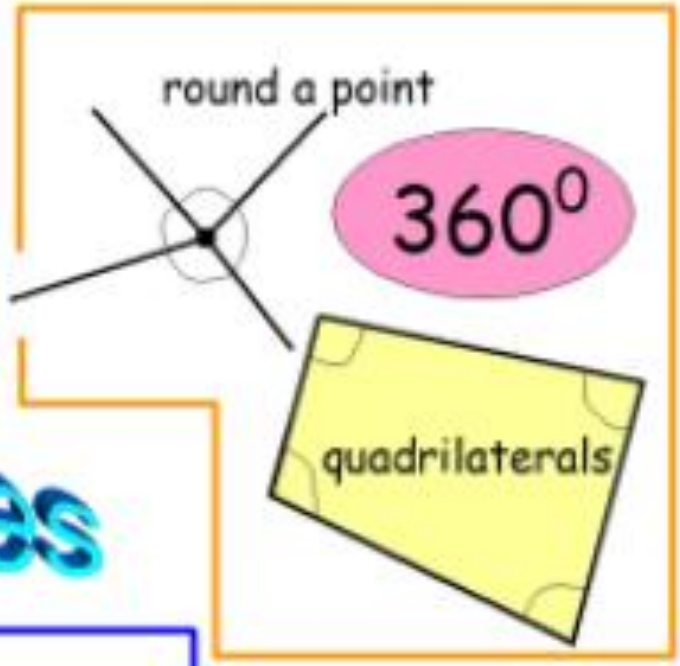
The Cosine Rule

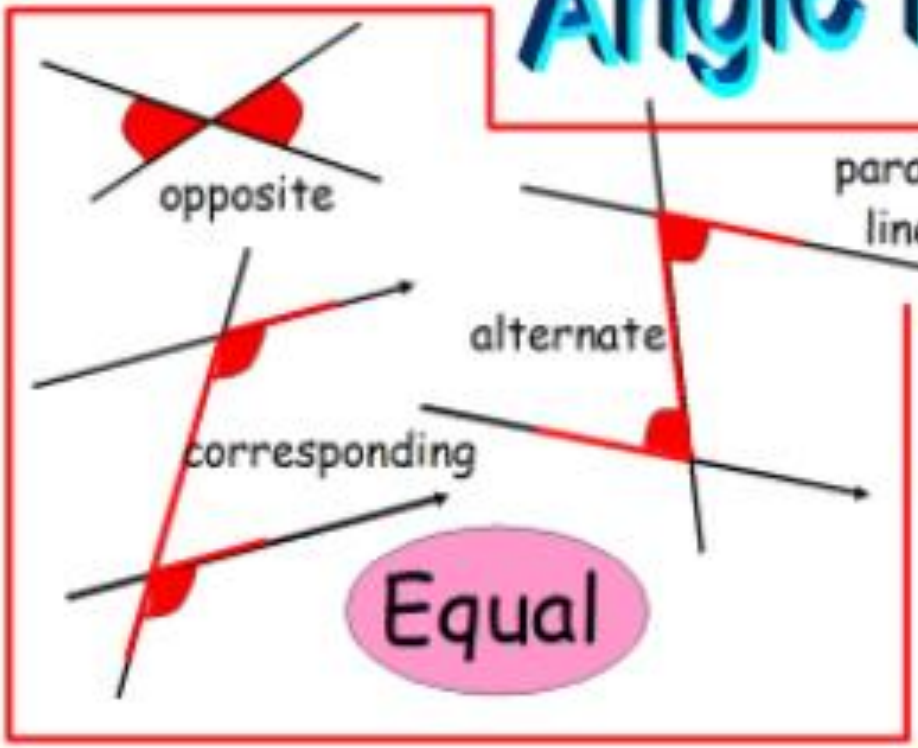
angles $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

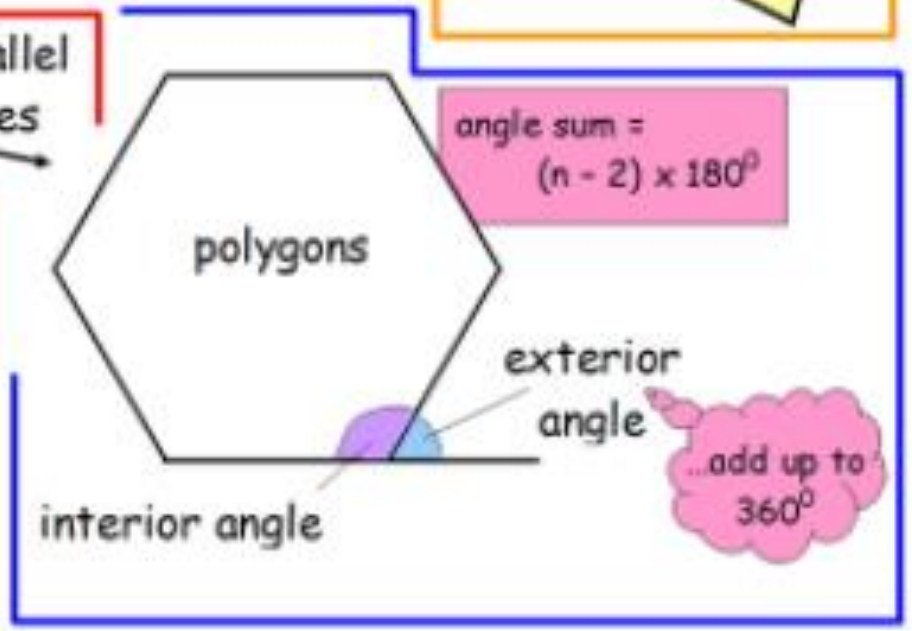
Area of a triangle = ½ ab sinC

Angle Rules


180°
straight lines
triangles
supplementary


round a point
360°
quadrilaterals

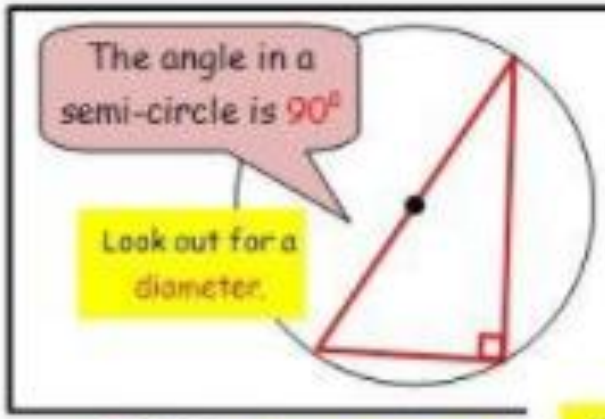

opposite
parallel lines
alternate
corresponding
Equal


angle sum = (n - 2) x 180°
polygons
exterior angle
interior angle
...add up to 360°

Circle Theorems

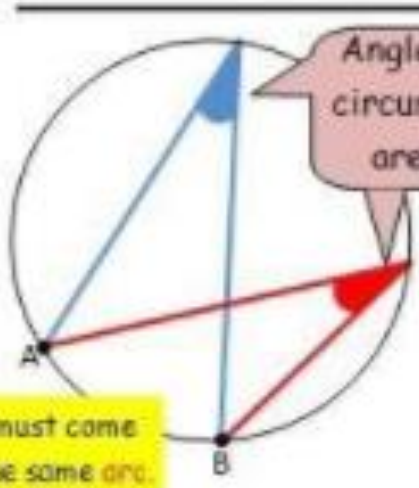
The angle in a semi-circle is 90°

Look out for a diameter.



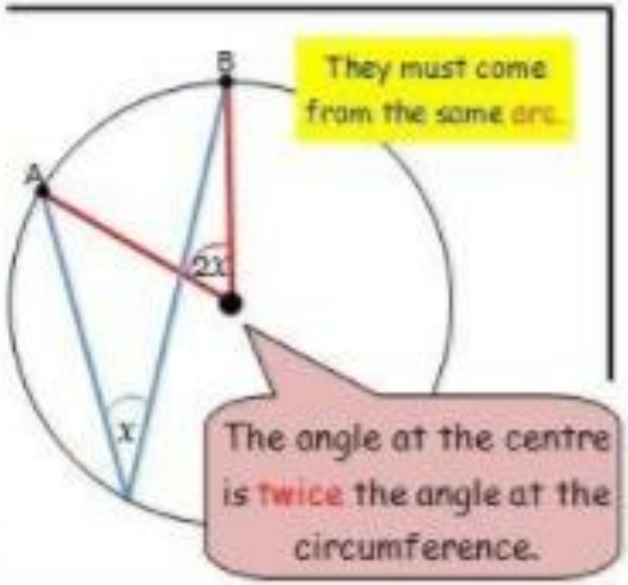
Angles at the circumference are equal.

They must come from the same arc.



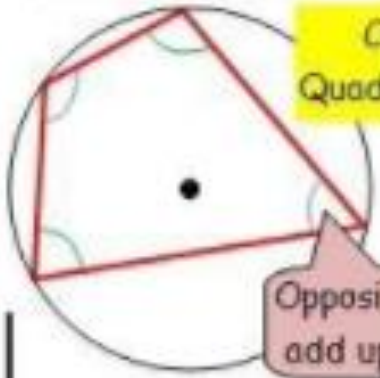
They must come from the same arc.

The angle at the centre is twice the angle at the circumference.



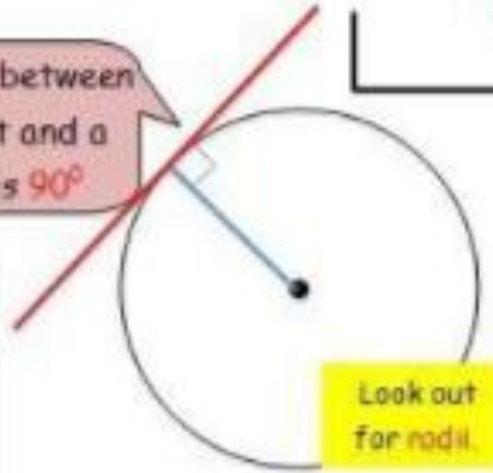
Cyclic Quadrilateral

Opposite angles add up to 180°



The angle between a tangent and a radius is 90°

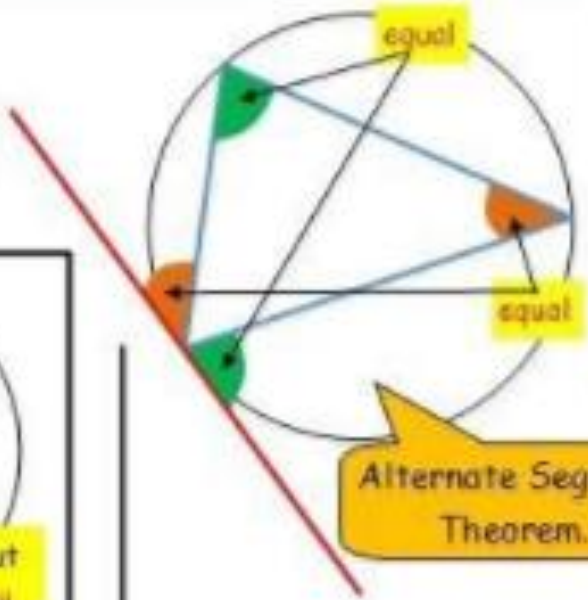
Look out for radii.



equal

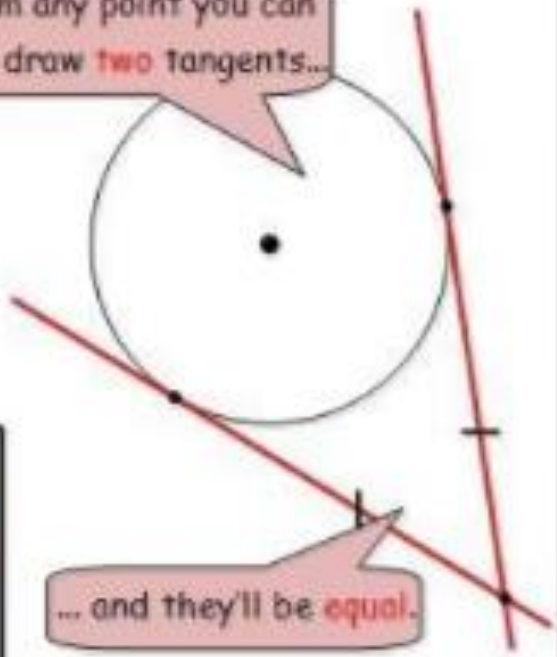
equal

Alternate Segment Theorem.



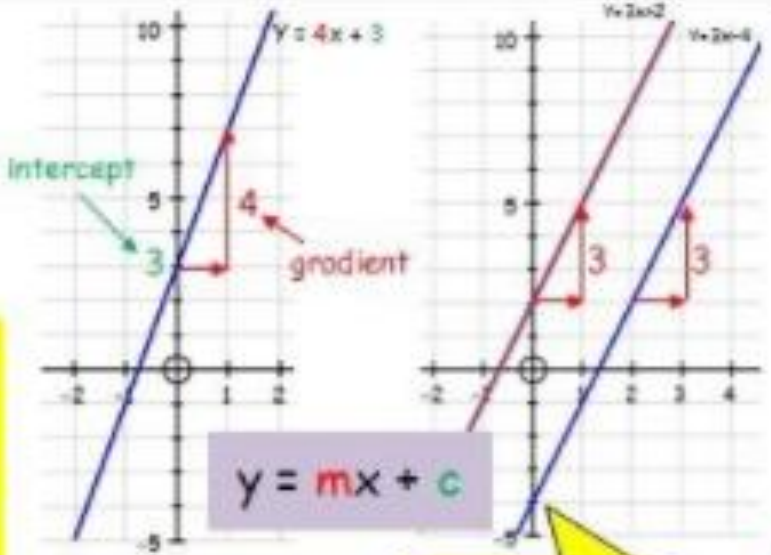
From any point you can only draw two tangents...

... and they'll be equal.



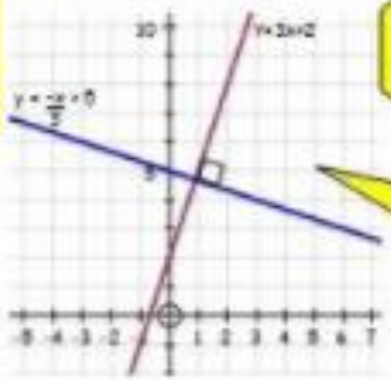
GRAPHS

Linear Graphs



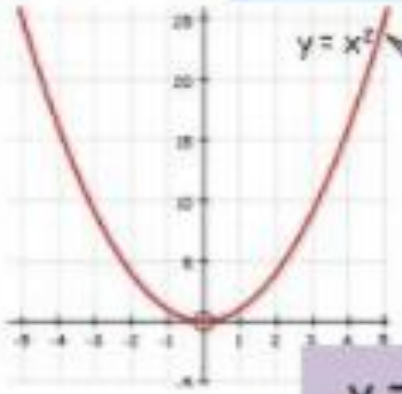
$y = mx + c$

Parallel lines have the same gradient.

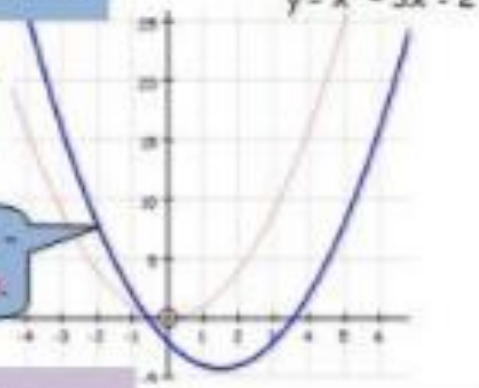


Perpendicular lines have gradients with a product of -1.

Quadratic Graphs



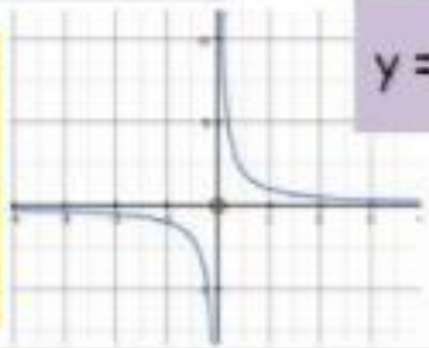
Square numbers.



U shaped - parabola.

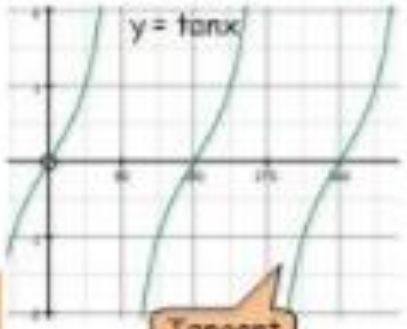
$y = ax^2 + bx + c$

Reciprocal

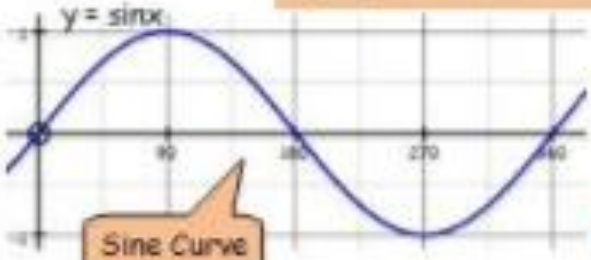


$y = \frac{1}{x}$

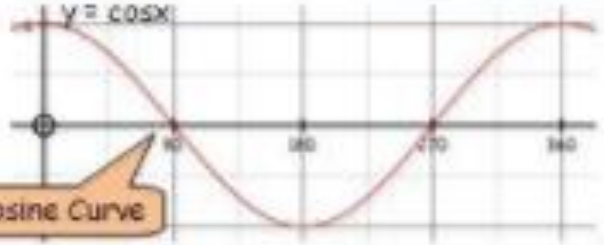
Trigonometric Graphs



Tangent



Sine Curve



Cosine Curve

Cubic Graphs

Cube numbers.

$y = x^3$

Percentages

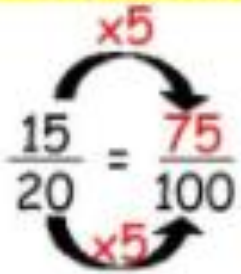
on a calculator

39% of 82

0.39 x 82

Change to a decimal and multiply

fraction to %



= 75%

OR

15 ÷ 20 x 100 = 75%

increasing

Increase £60 by 12%

12% of 60 = 0.12 x 60 = £7.20

New amount = £60 + £7.20
= £67.20

ADD

decreasing

decrease £60 by 12%

12% of 60 = 0.12 x 60 = £7.20

New amount = £60 - £7.20
= £52.80

SUBTRACT

without a calculator

50% - half

25% - half and half

75% - 50% + 25%

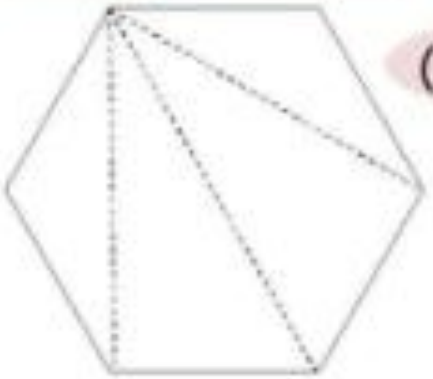
10% - divide by 10

5% - half 10%

20% - double 10%

Polygons

Angle Sum



$(n - 2) \times 180^0$

number of triangles

$4 \times 180^0 = 540^0$

- 3 triangle
- 4 quadrilateral
- 5 pentagon
- 6 hexagon
- 7 - heptagon
- 8 octagon
- 9 - nonagon
- 10 - decagon

interior angle

$$\frac{\text{angle sum}}{\text{number of sides}}$$

OR

180^0 - exterior angle

exterior angle

$$\frac{360^0}{\text{number of sides}}$$

OR

180^0 - interior angle

Quadratic Equations

$ax^2 + bx + c$

Solving:

- Factorising
- Formula
- Completing the square
- Drawing a graph

Factorising:

brackets

easy...

$x^2 + 7x + 12 = 0$

$(x + 3)(x + 4) = 0$

$x = -3$ or $x = -4$

... more difficult!

multiply

6

1x6

2x3

$3x^2 - 5x + 2$

$3x^2 - 3x - 2x + 2$

$3x(x - 1) - 2(x - 1)$

$(3x - 2)(x - 1)$

The formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Completing the square:

$x^2 + 4x - 3 = 0$

half of 4x

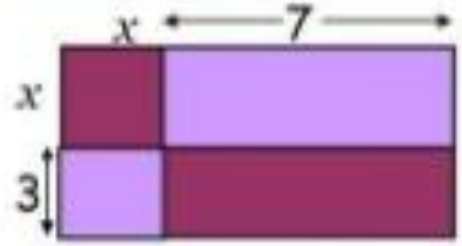
$(x + 2)^2 - 4 - 3 = 0$

subtract 2^2

$(x + 2)^2 - 7 = 0$

$x + 2 = \pm\sqrt{7}$

$x = \pm\sqrt{7} - 2$



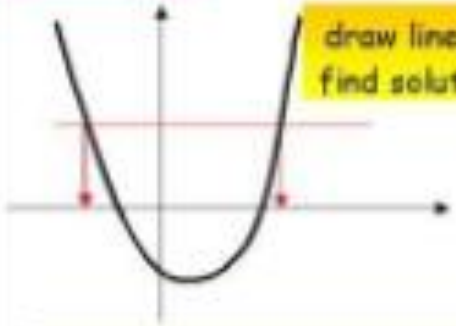
Difference of Two Squares:

$x^2 - 16$

$(x - 4)(x + 4)$

x squared subtract 4 squared

Graphs:



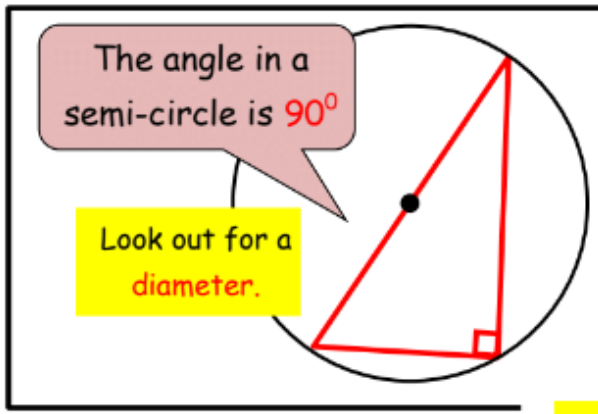
draw lines to find solutions

Parabola - u shaped graph

Circle Theorems

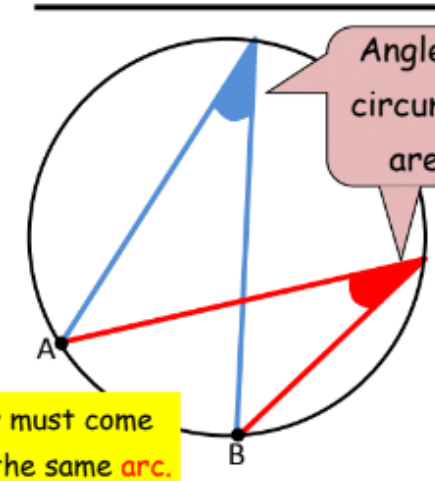
The angle in a semi-circle is 90^0

Look out for a diameter.

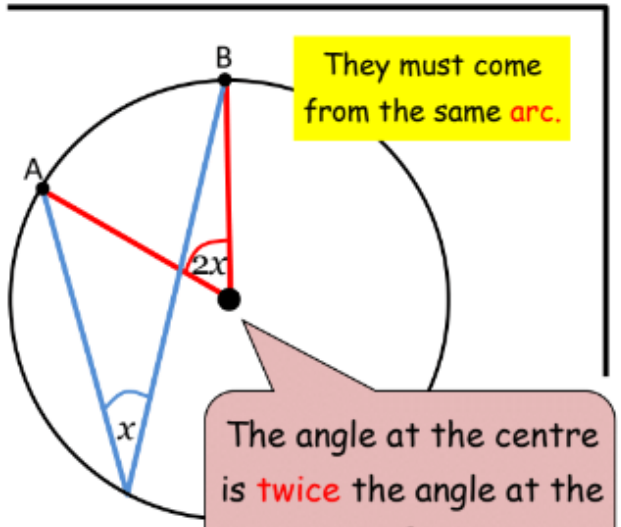


Angles at the circumference are equal.

They must come from the same arc.

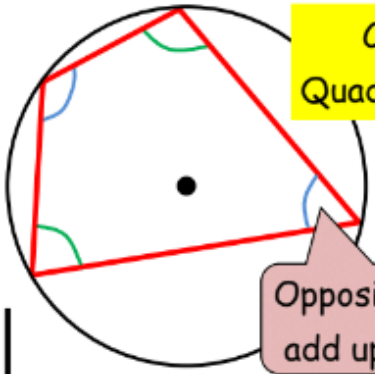


They must come from the same arc.



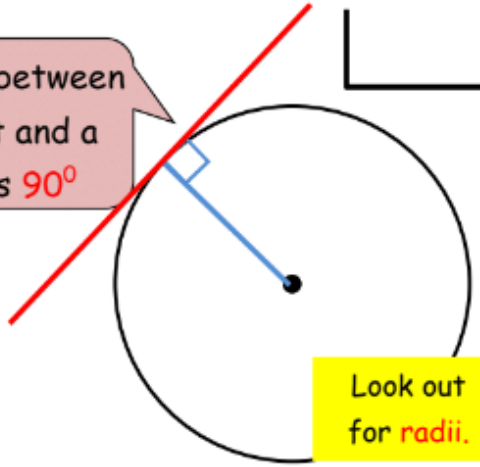
The angle at the centre is twice the angle at the circumference.

Cyclic Quadrilateral

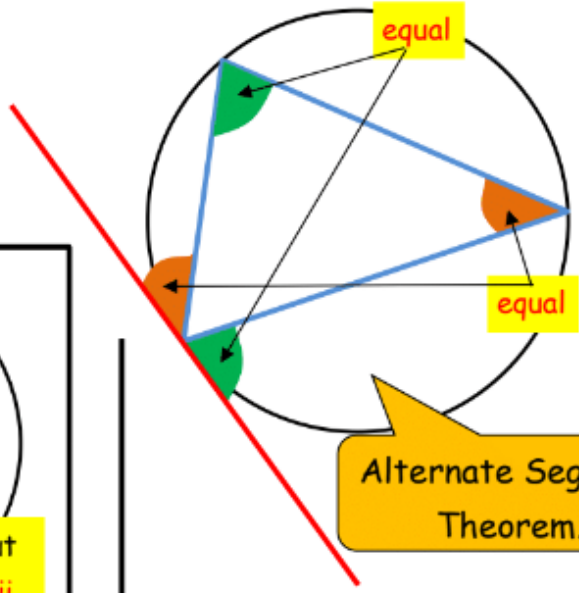


Opposite angles add up to 180^0

The angle between a tangent and a radius is 90^0

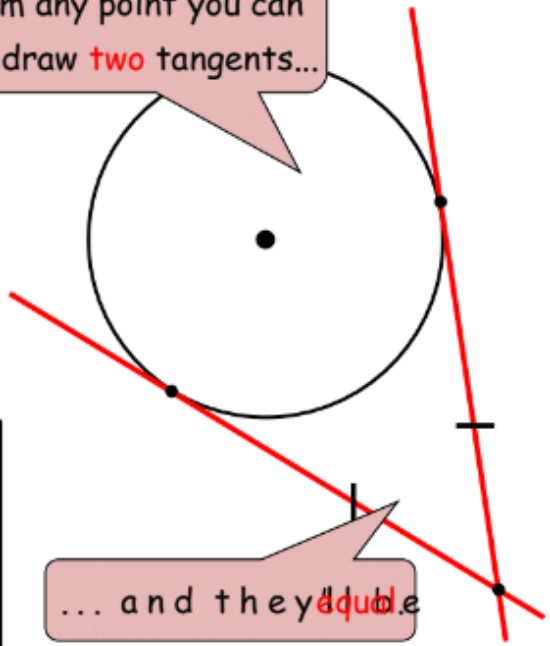


Look out for radii.



Alternate Segment Theorem.

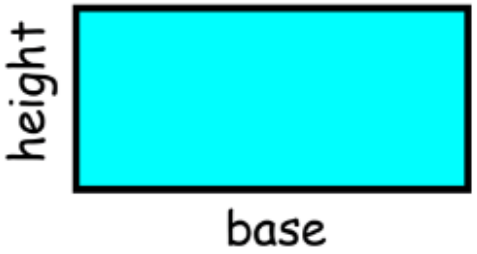
From any point you can only draw two tangents...



... and they should be equal.

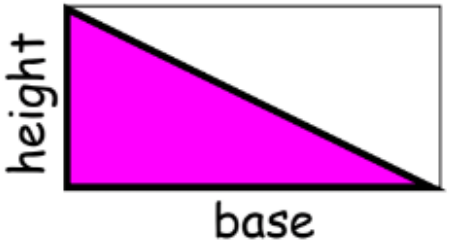
AREA

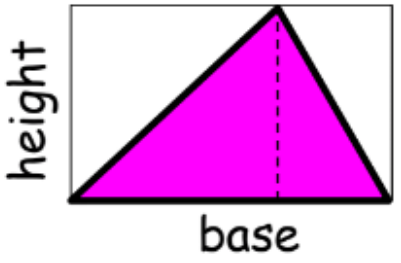
rectangle



Area = base x height

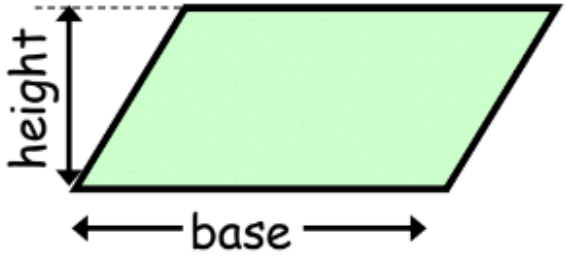
a triangle is half the area of a rectangle





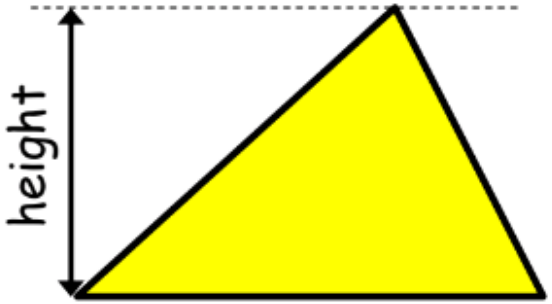
Area = $\frac{\text{base x height}}{2}$

parallelogram



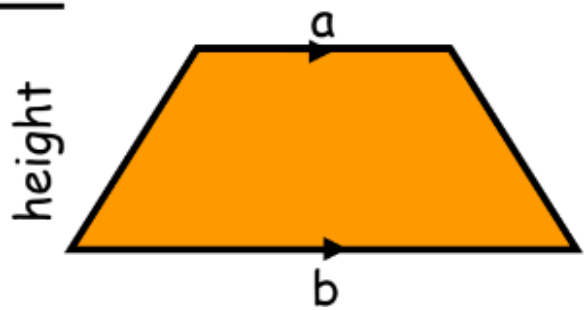
Area = base x height

Always use the perpendicular height

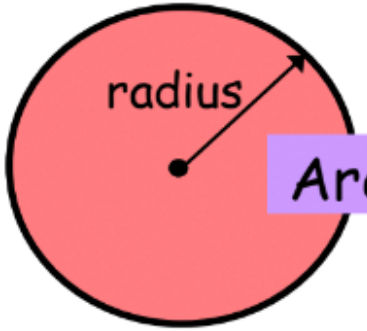


trapezium

Area = $\frac{(a + b) \times h}{2}$



circle



Area = πr^2

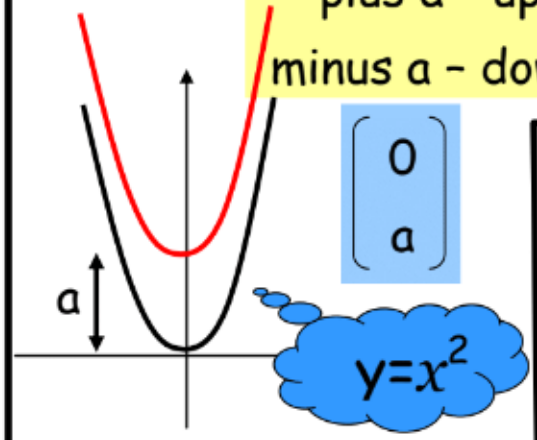
Transforming Curves

$y = fx + a$

plus a - up

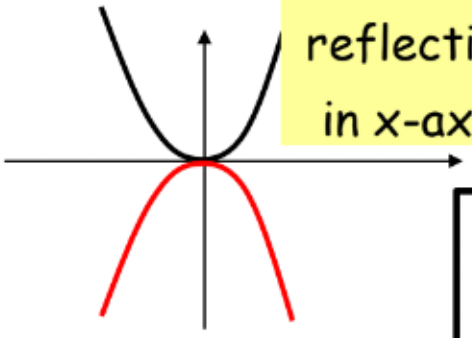
minus a - down

$\begin{pmatrix} 0 \\ a \end{pmatrix}$



$y = -fx$

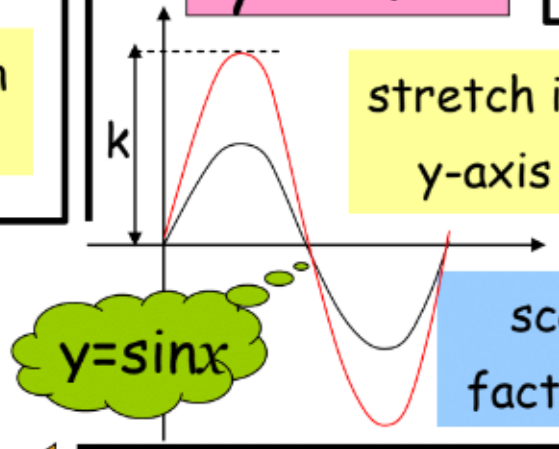
reflection in x-axis



$y = kfx$

stretch in y-axis

scale factor k

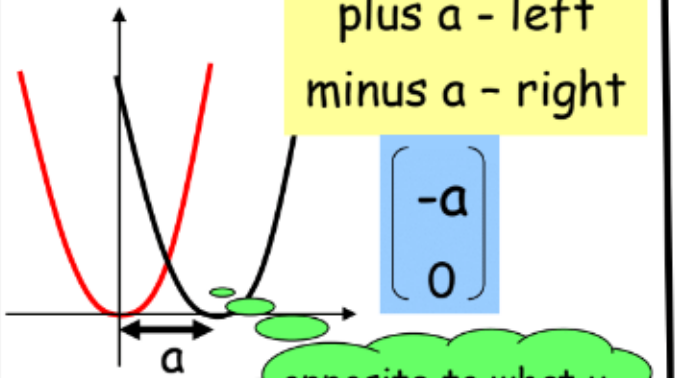


$y = f(x + a)$

plus a - left

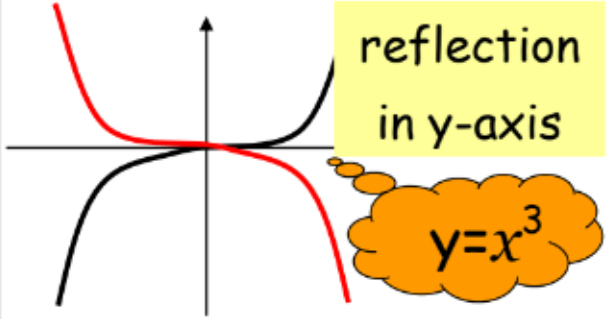
minus a - right

$\begin{pmatrix} -a \\ 0 \end{pmatrix}$



$y = f(-x)$

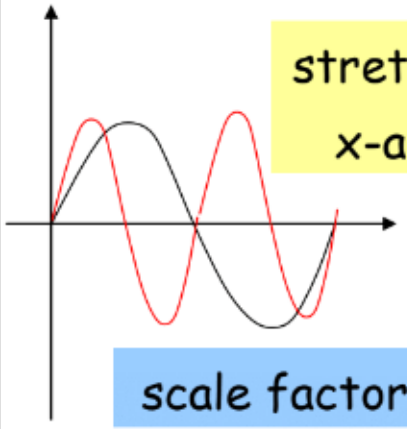
reflection in y-axis



$y = f(Kx)$

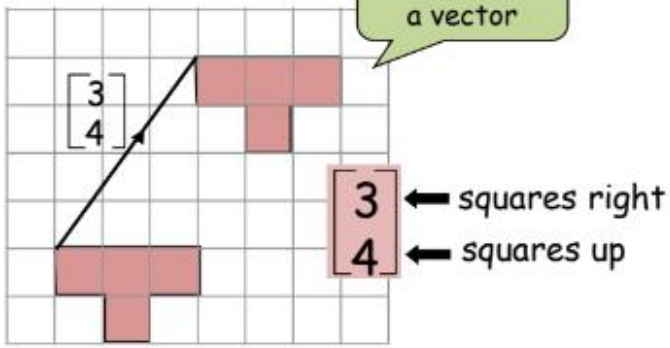
stretch in x-axis

scale factor 1/k



Transformations

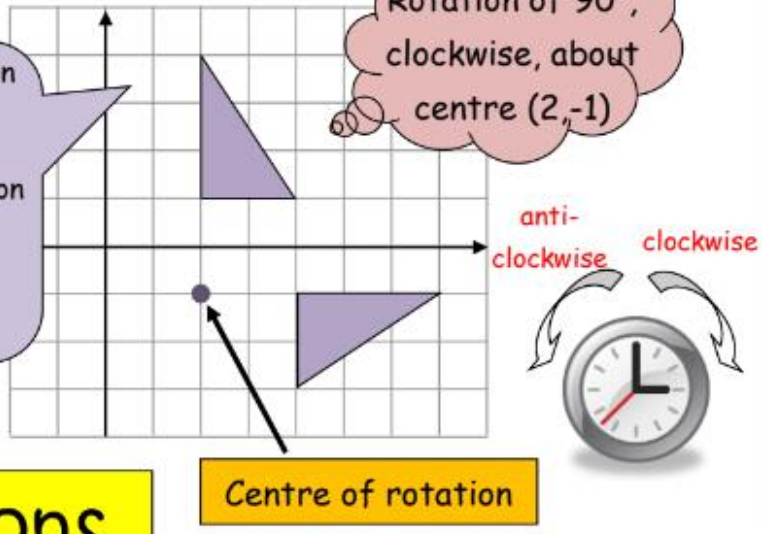
Translation



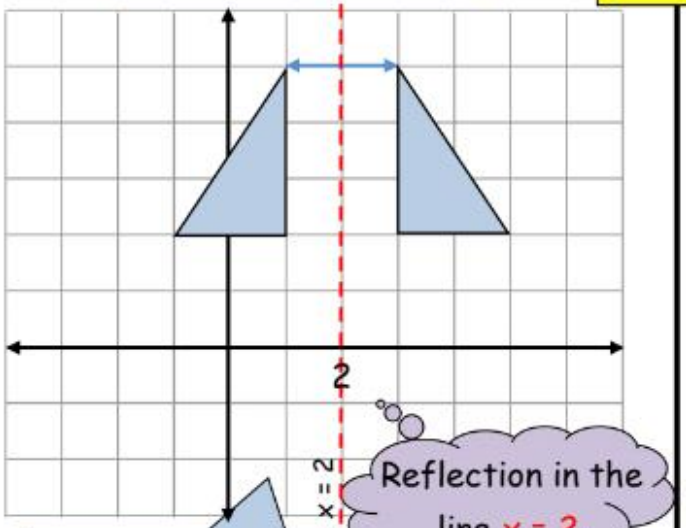
Rotation

To describe a rotation you need:

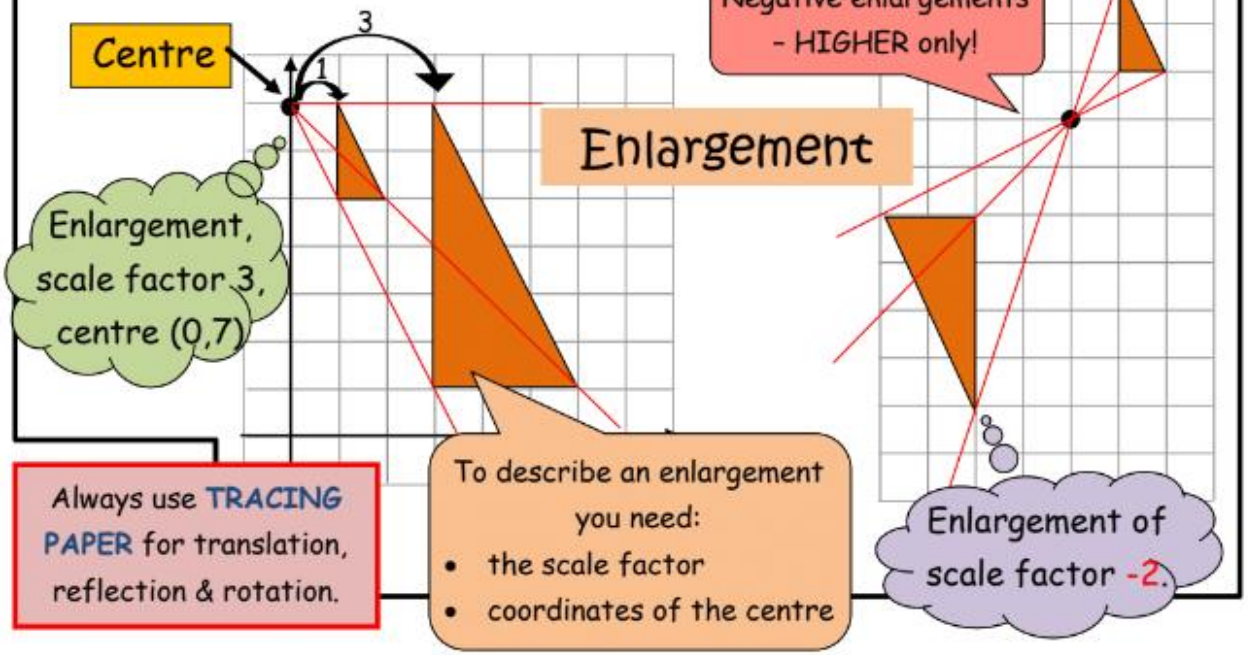
- the angle of rotation
- the direction
- the coordinates of the centre



Reflection



Enlargement



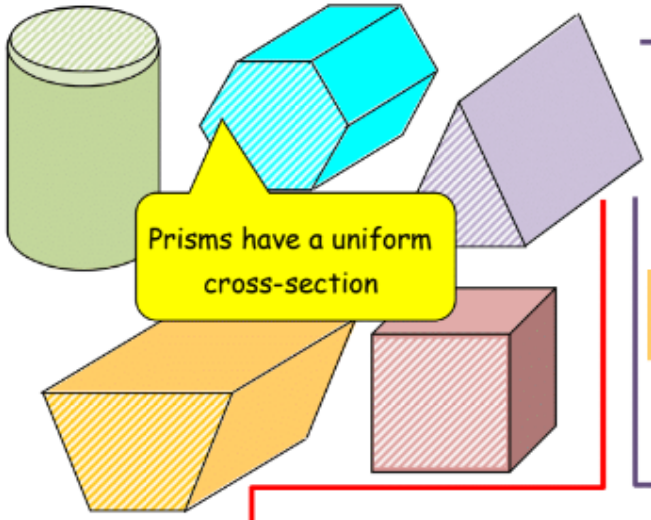
Always use **TRACING PAPER** for translation, reflection & rotation.

To describe an enlargement you need:

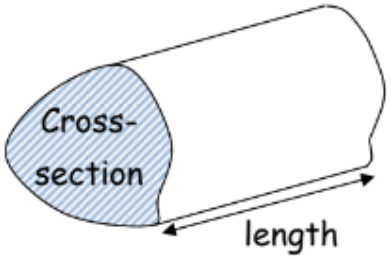
- the scale factor
- coordinates of the centre

Volume

Prisms



Prisms have a uniform cross-section

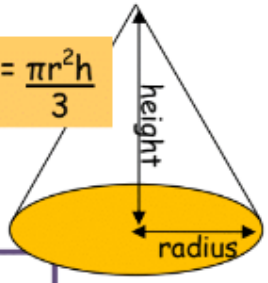


Volume = area of cross-section × length

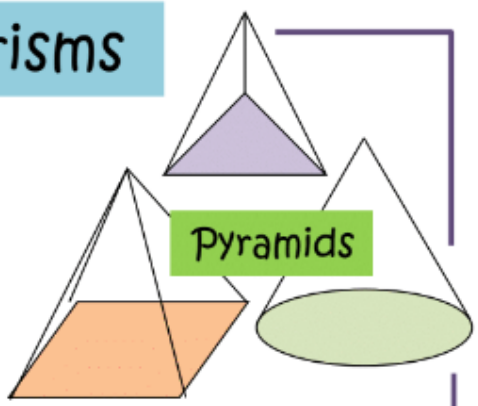
Non-Prisms

Cones

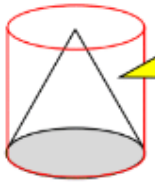
$V = \frac{\pi r^2 h}{3}$



Pyramids



Volume = $\frac{\text{area of base} \times \text{height}}{3}$

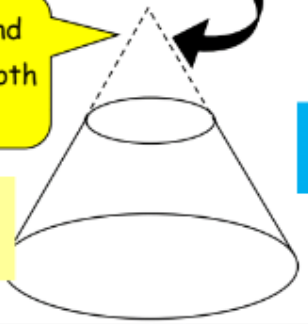


a cone is one third of a cylinder

Frustrums

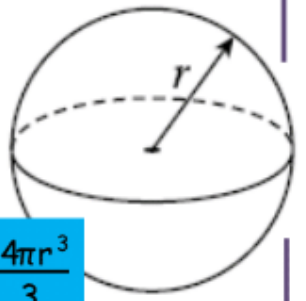
a frustrum is a pyramid with the top cut off.

You need to find the volume of both pyramids.



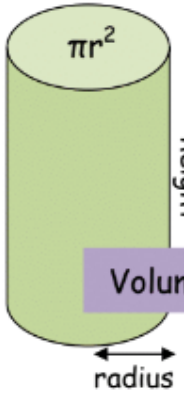
Often you need to use similar shapes in frustrum problems.

Spheres



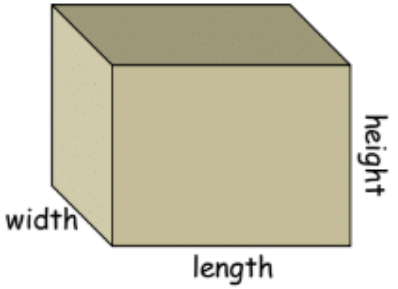
$V = \frac{4\pi r^3}{3}$

cylinders



Volume = $\pi r^2 h$

cuboids



Volume = length x width x height