

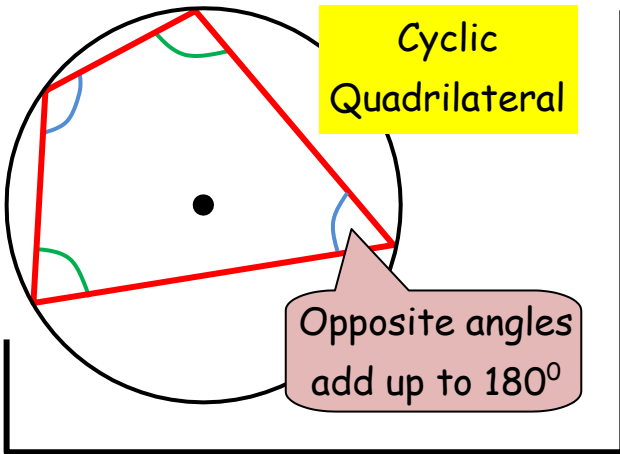
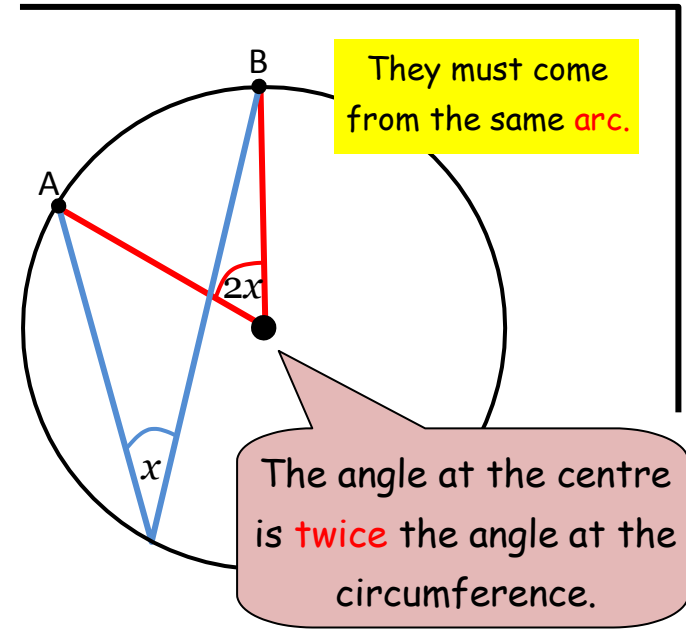
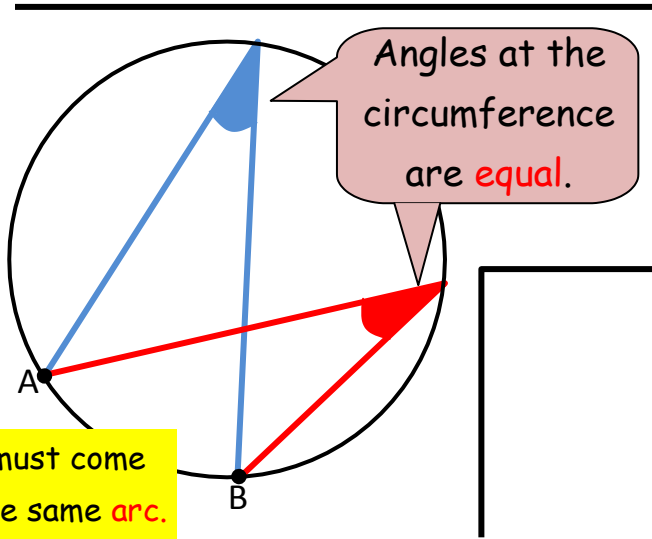
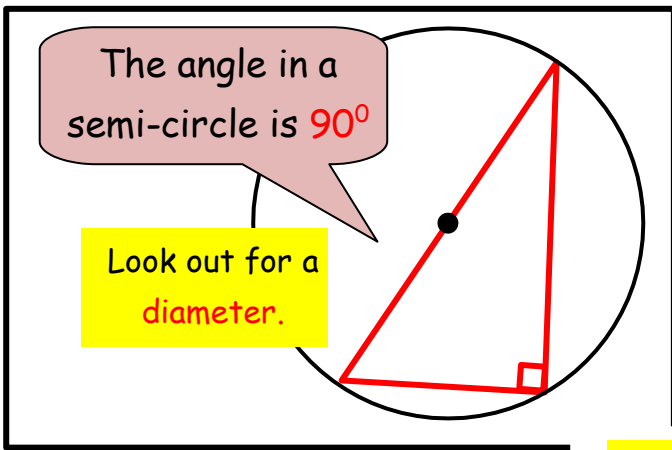
The City School

North Nazimabad Boys Campus

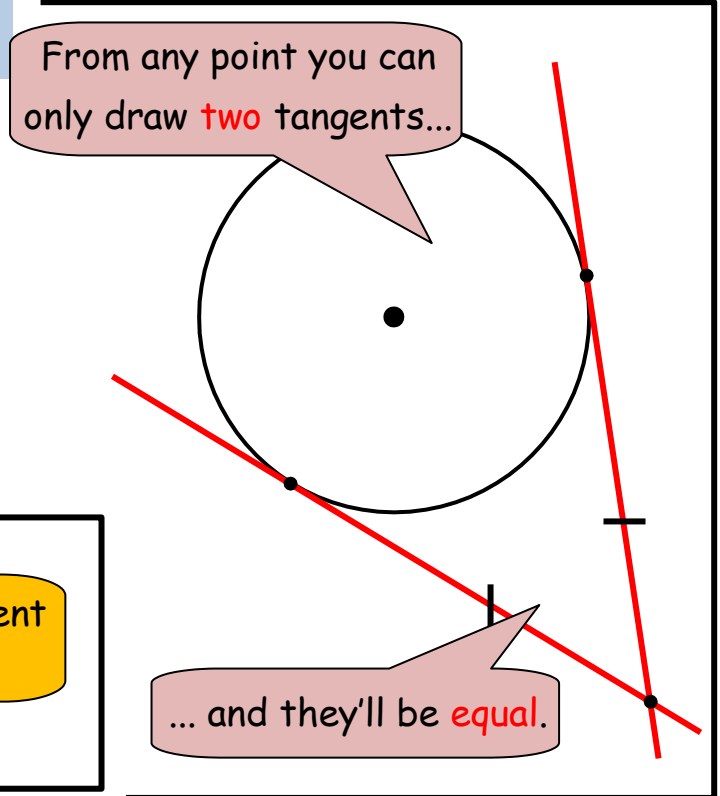
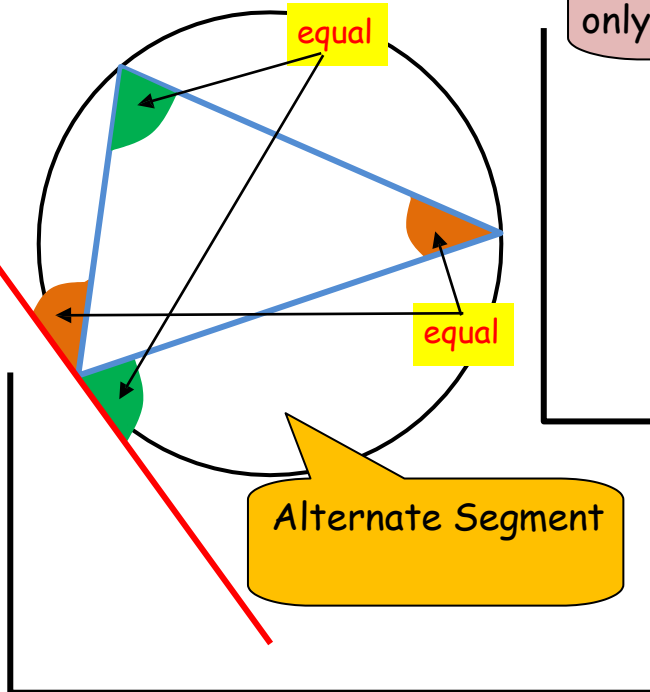
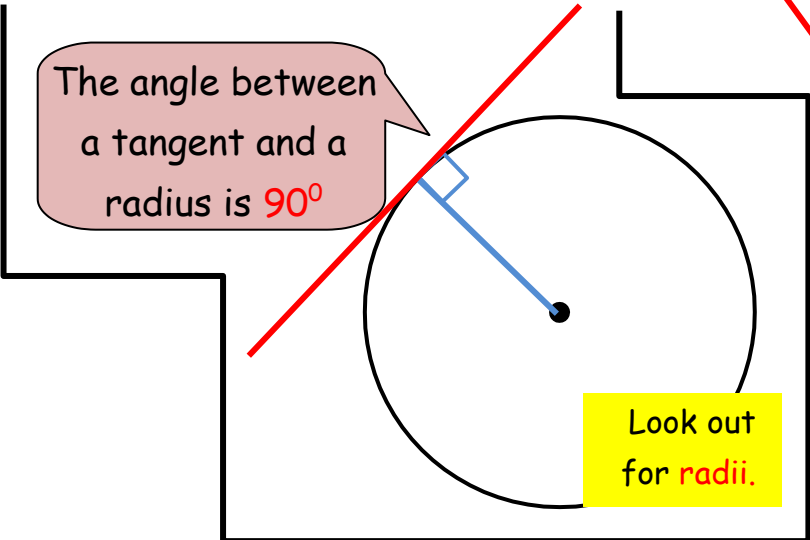
Subject: Maths

Class: 11

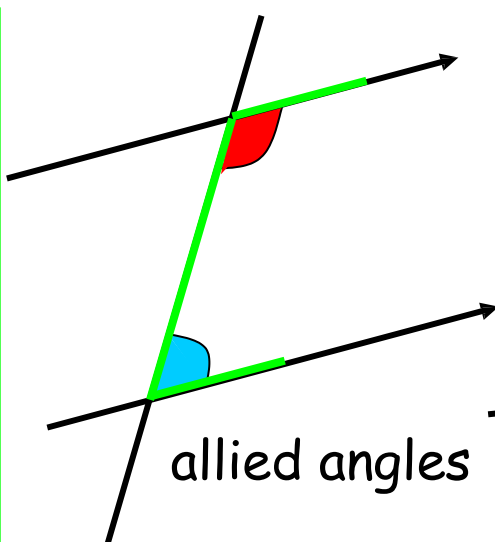




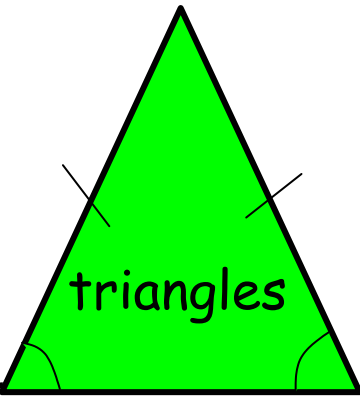
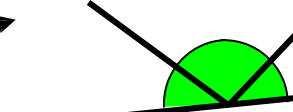
Circle Theorems



180°

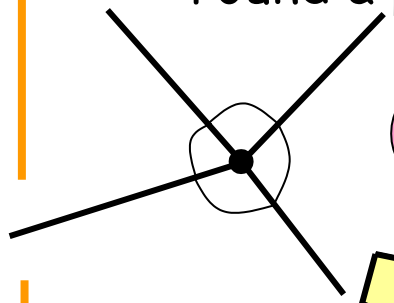


straight lines

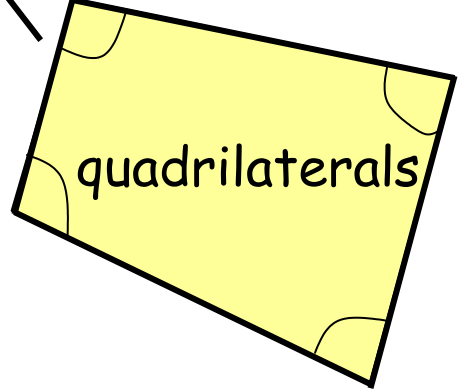


triangles

round a point



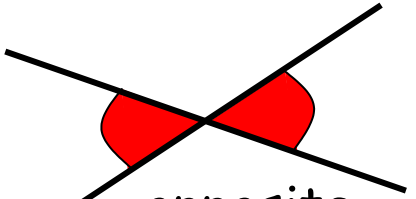
360°



quadrilaterals

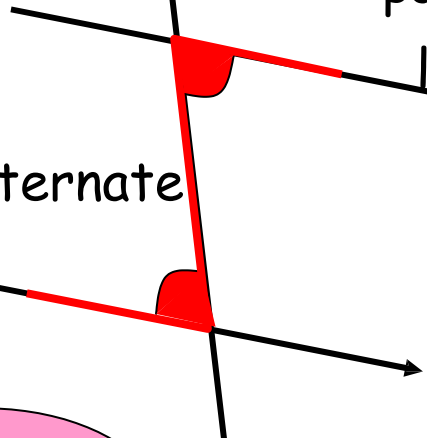
Angle Rules

opposite

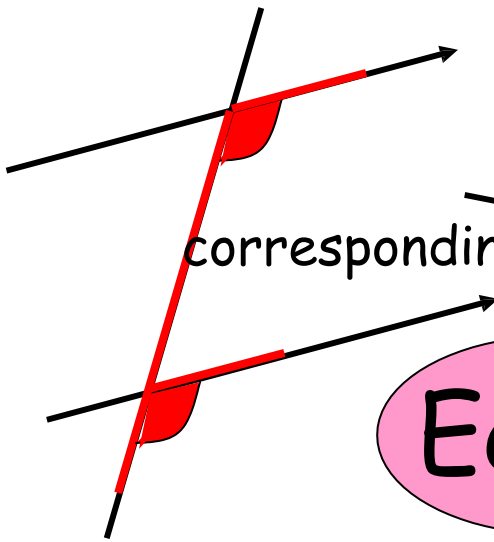


parallel lines

alternate

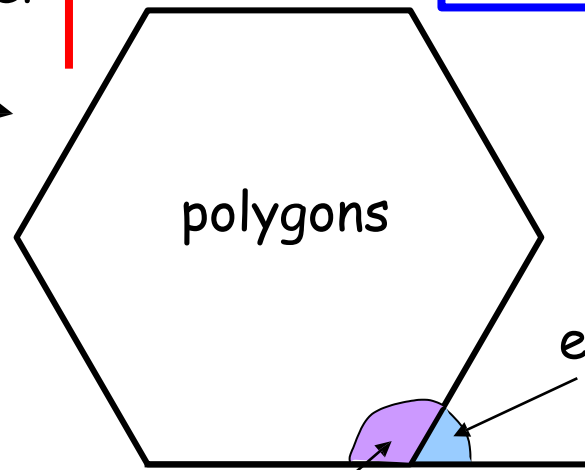


corresponding



Equal

polygons



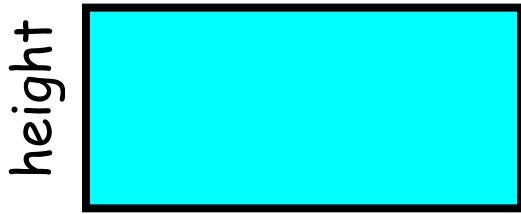
interior angle

exterior angle

angle sum =

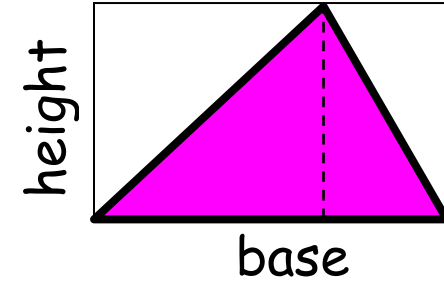
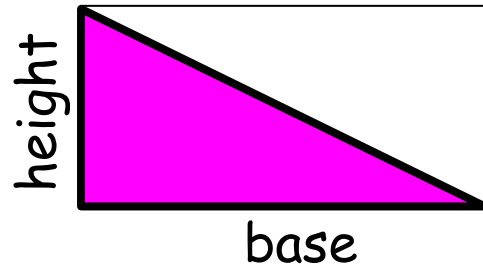
360°

rectangle



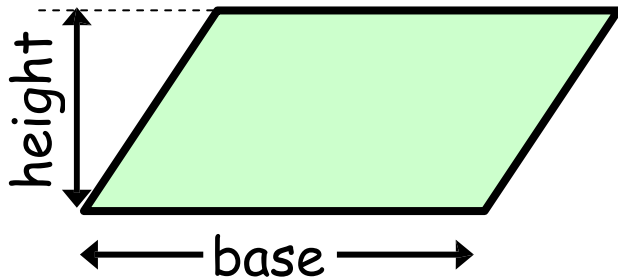
$$\text{Area} = \text{base} \times \text{height}$$

a **triangle** is half the area of a rectangle



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

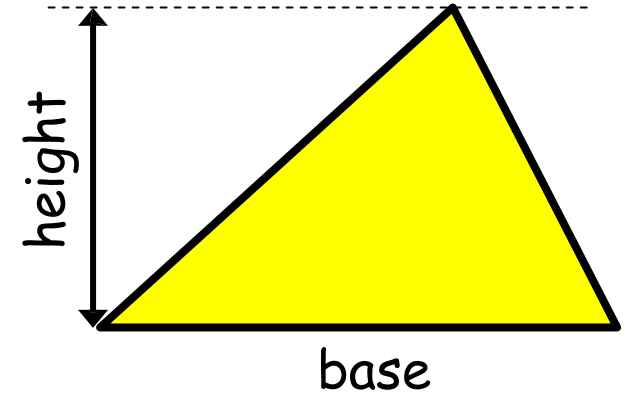
parallelogram



$$\text{Area} = \text{base} \times \text{height}$$

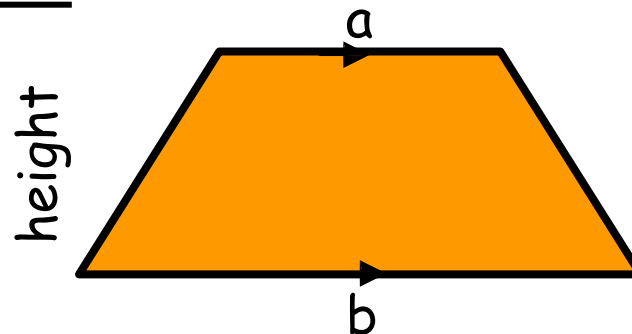
AREA

Always use the
perpendicular
height

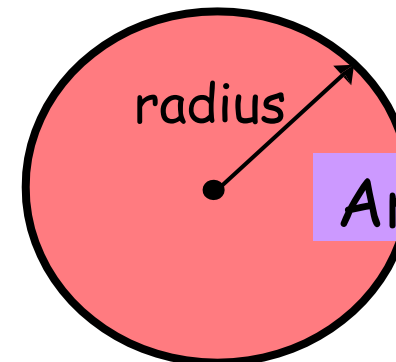


trapezium

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

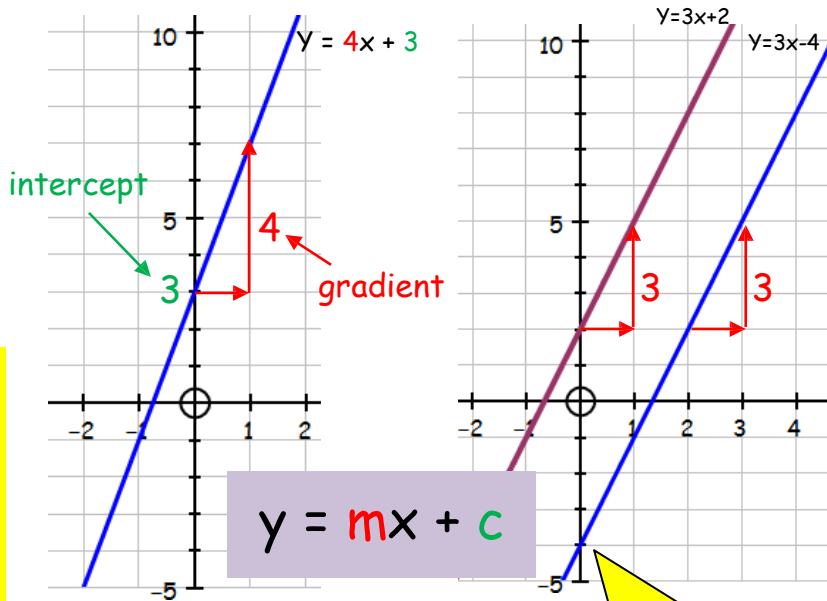


circle



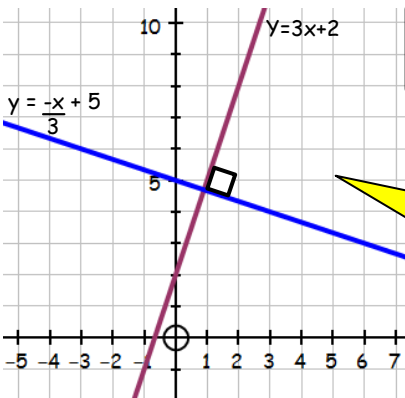
$$\text{Area} = \pi r^2$$

Linear Graphs



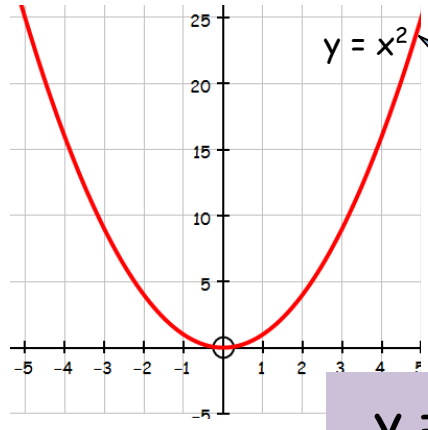
$$y = mx + c$$

Parallel lines have



Perpendicular lines have gradients with a product of -1.

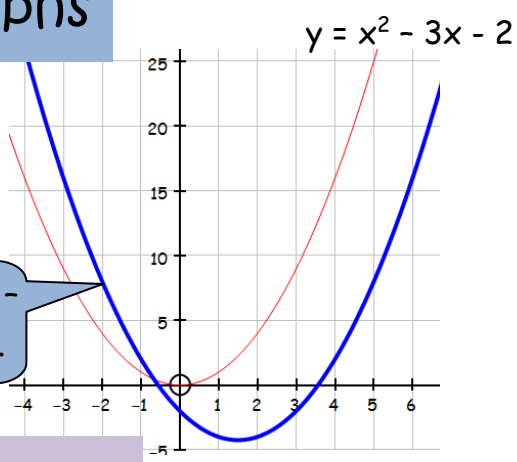
Quadratic Graphs



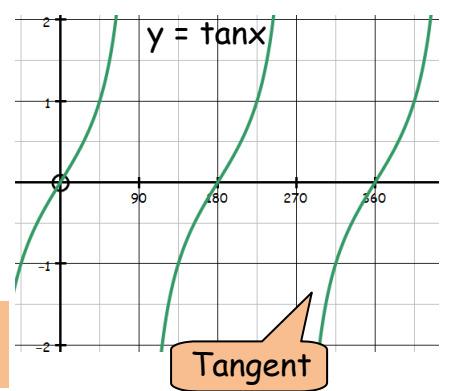
Square numbers.

U shaped - parabola.

$$y = ax^2 + bx + c$$

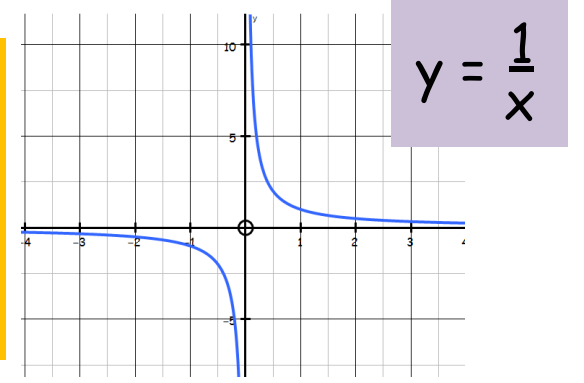


GRAPHS



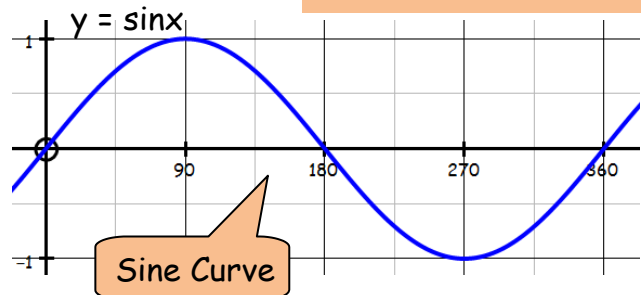
Tangent

Reciprocal

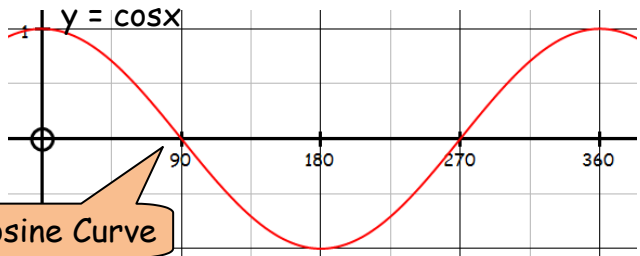


$$y = \frac{1}{x}$$

Trigonometric Graphs

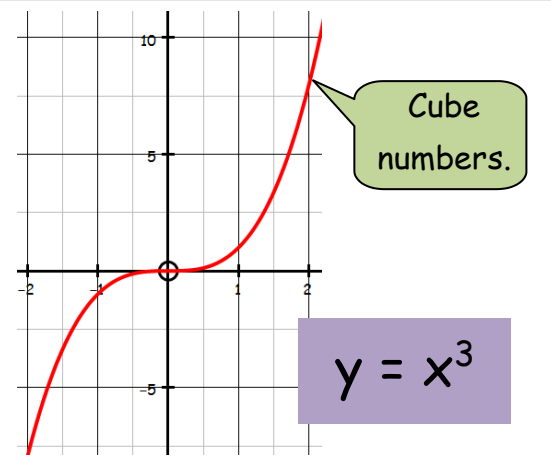


Sine Curve



Cosine Curve

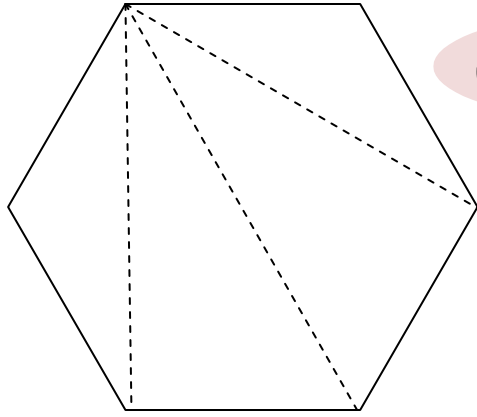
Cubic Graphs



Cube numbers.

$$y = x^3$$

Angle Sum



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

number of
triangles

$$4 \times 180^\circ = 720^\circ$$



triangle



quadrilateral



pentagon



hexagon

7 - heptagon



octagon



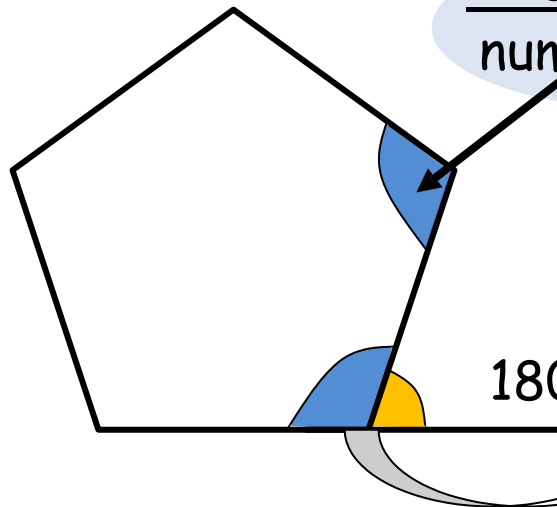
9 - nonagon

10 - decagon



Polygons

interior angle



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

OR

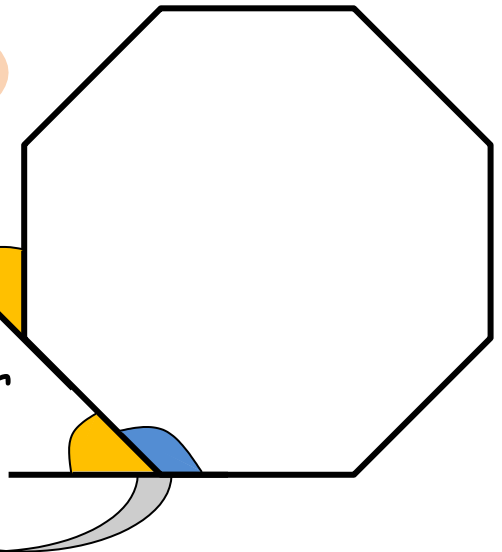
$$180^\circ - \text{exterior angle}$$

exterior angle

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

OR

$$180^\circ - \text{interior angle}$$



Solving:

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

Factorising:

easy... $x^2 + 7x + 12 = 0$
 $(x + 3)(x + 4) = 0$
 $x = -3$ or $x = -4$

brackets

... more difficult!

multiply

$$\begin{array}{r} 3x^2 - 5x + 2 \\ \underline{3x^2 - 3x - 2x + 2} \\ 3x(x - 1) - 2(x - 1) \\ (3x - 2)(x - 1) \end{array}$$

$\frac{6}{1 \times 6}$
 2×3

Quadratic Equations

$$ax^2 + bx + c$$

The formula:

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

Completing the square:

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

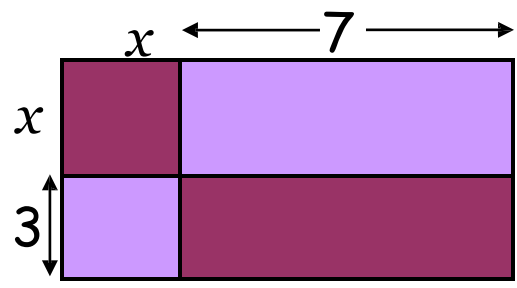
half of 4x

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

subtract 2²

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

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

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


Difference of Two Squares:

$$x^2 - 16$$

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

x squared subtract 4 squared

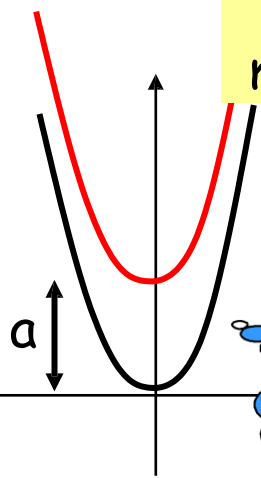
Graphs:

draw lines to find solutions

Parabola - u shaped graph

$$y = fx + a$$

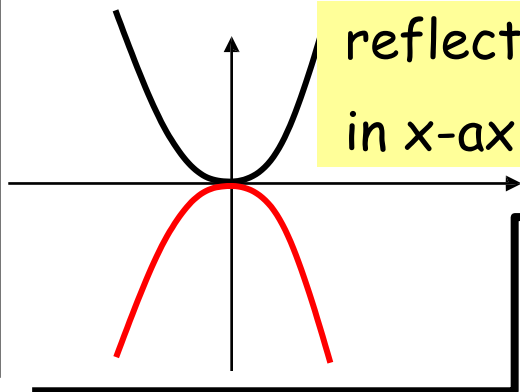
plus a - up
minus a - down



$y = x^2$

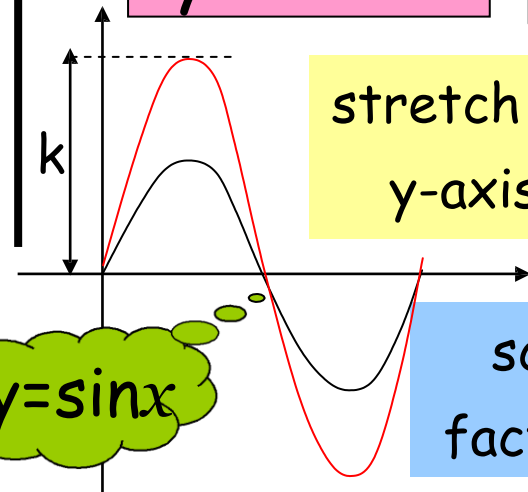
$$y = -fx$$

reflection
in x-axis



$$y = kfx$$

stretch in
y-axis



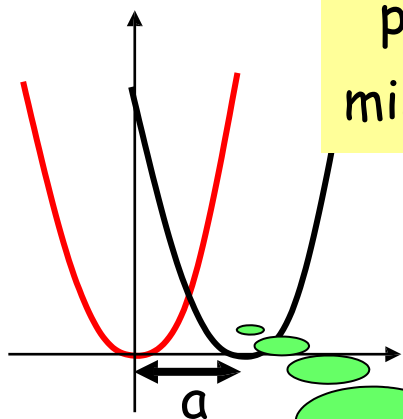
$y = \sin x$

scale
factor k

Transforming Curves

$$y = f(x + a)$$

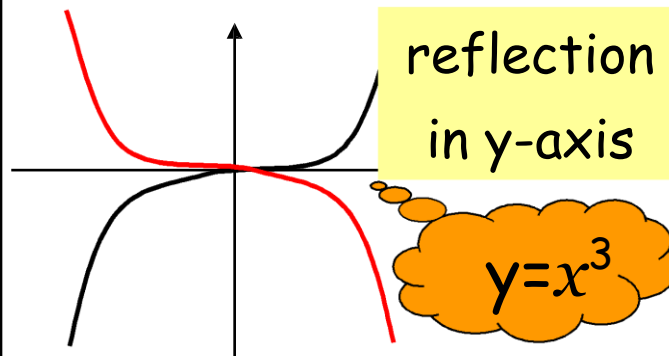
plus a - left
minus a - right



opposite to what u
might think!

$$y = f(-x)$$

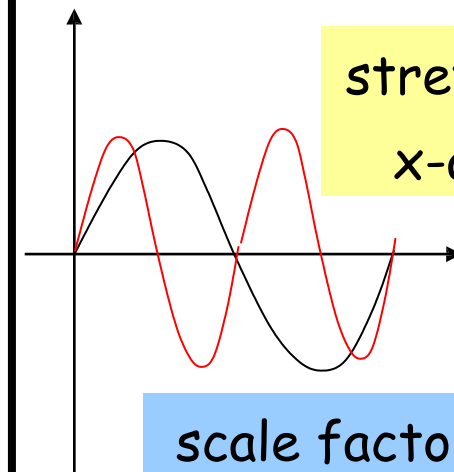
reflection
in y-axis



$y = x^3$

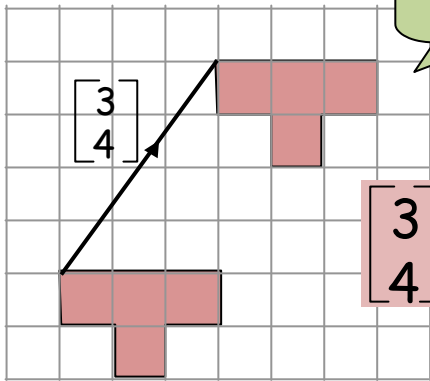
$$y = f(Kx)$$

stretch in
x-axis



scale factor 1/k

Translation



a vector

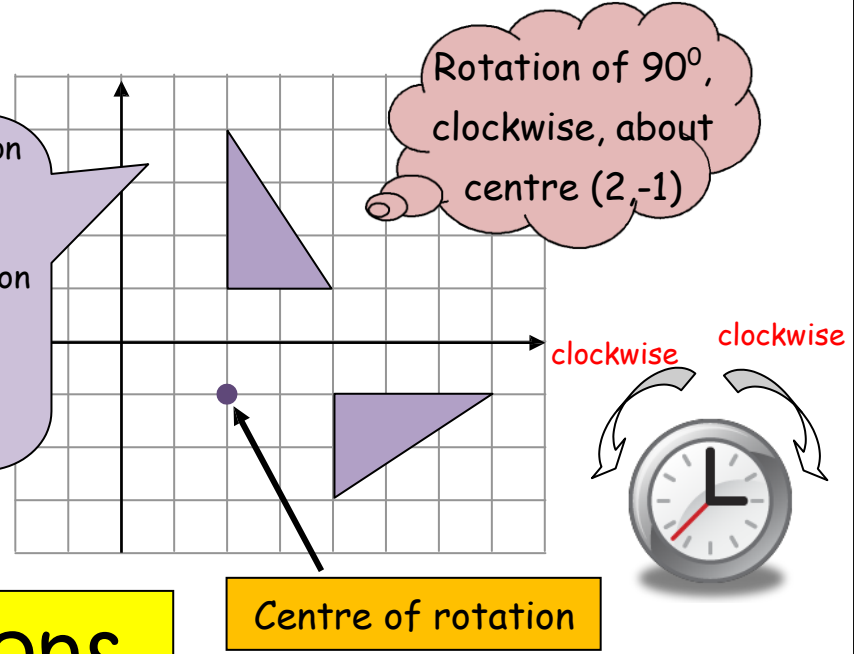
3 ← squares right
4 ← squares up

Rotation

To describe a rotation you need:

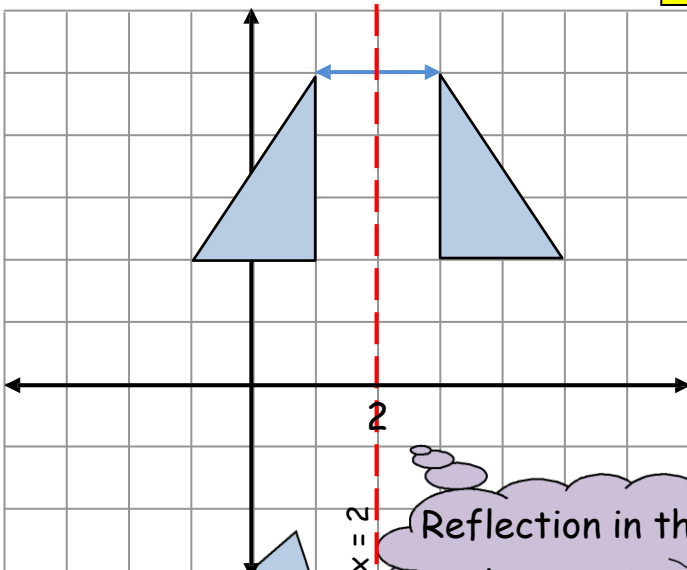
- the angle of rotation
- the direction

the centre



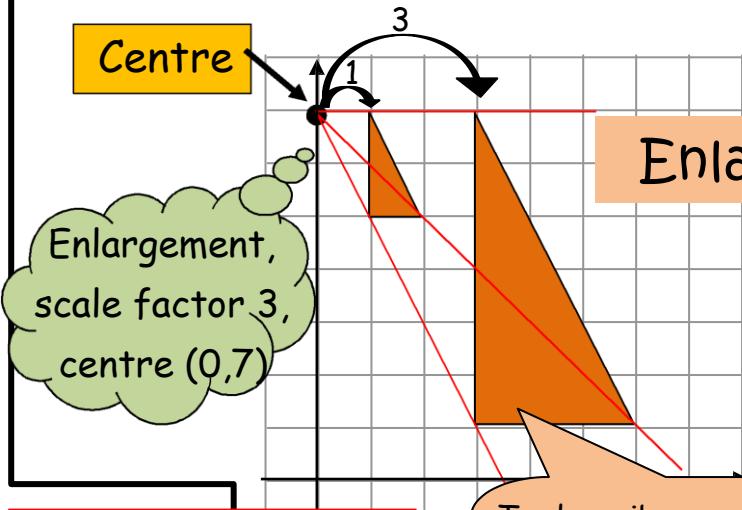
Transformations

Reflection



Describe by naming the line of symmetry

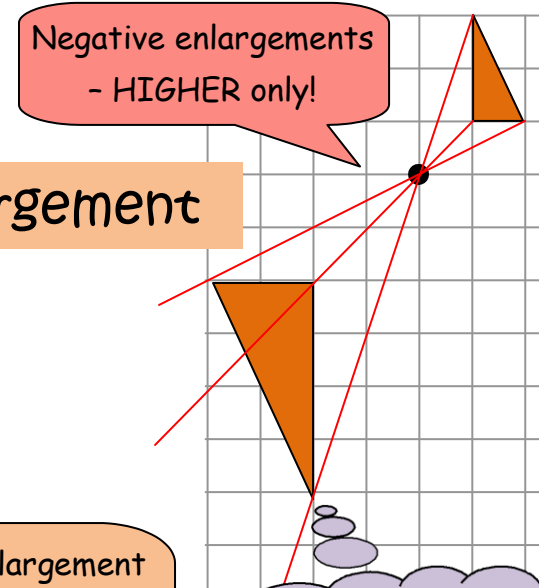
Reflection in the line $x = 2$.



Enlargement, scale factor 3, centre (0,7)

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

Enlargement



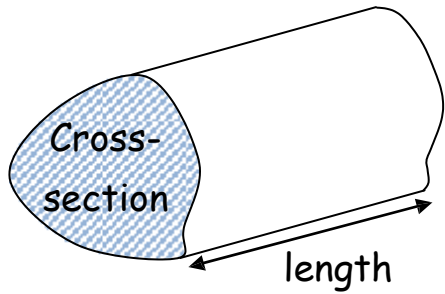
Negative enlargements - HIGHER only!

Enlargement of scale factor -2 .

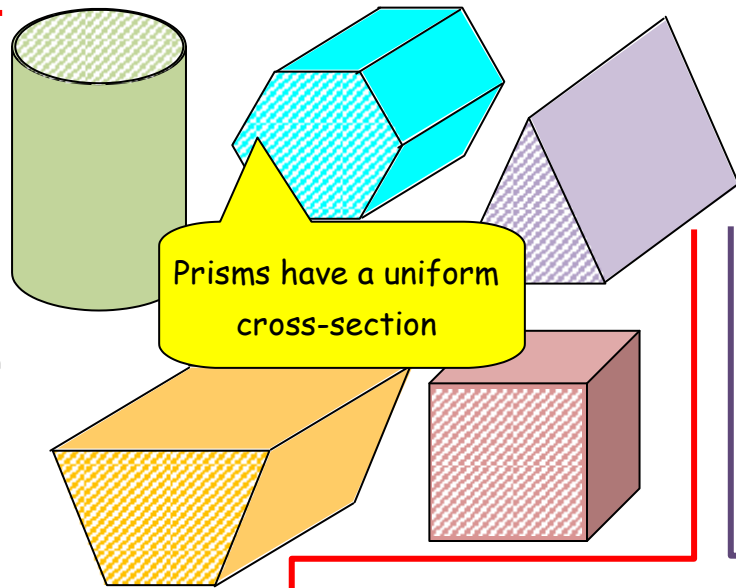
To describe an enlargement you need:

- the scale factor
- coordinates of the centre

Prisms



Prisms have a uniform cross-section

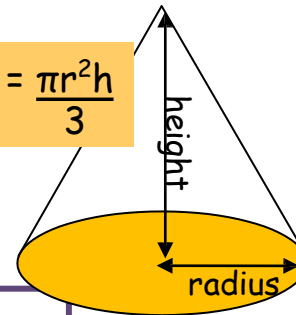


$$\text{Volume} = \text{area of cross-section} \times \text{length}$$

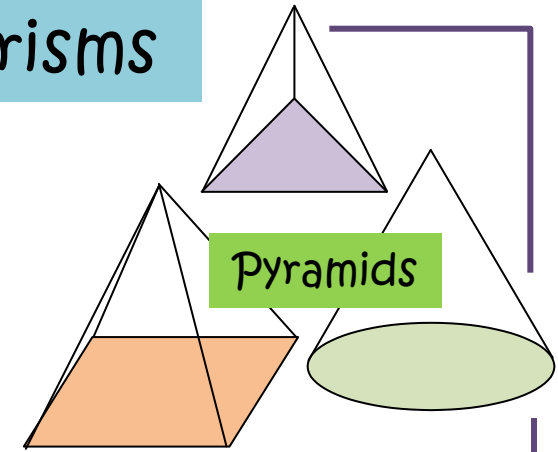
Non-Prisms

Cones

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



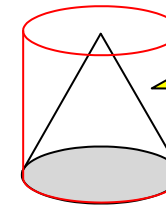
Pyramids



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

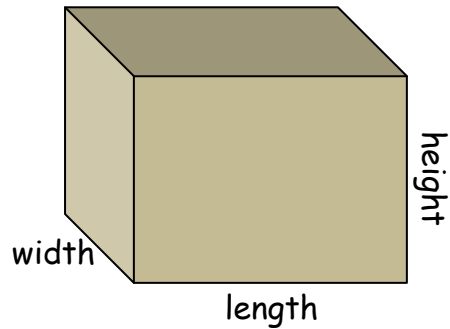
Volume

a cone is one third of a cylinder

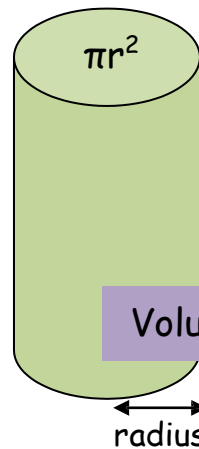


Cylinders

Cuboids



$$\text{Volume} = \text{length} \times \text{width} \times \text{height}$$



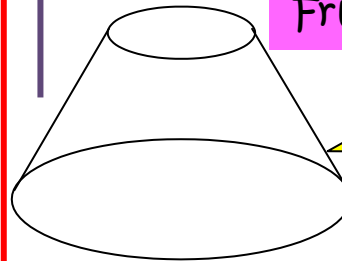
$$\text{Volume} = \pi r^2 h$$

Frustrums

a frustrum is a pyramid with the top cut off.

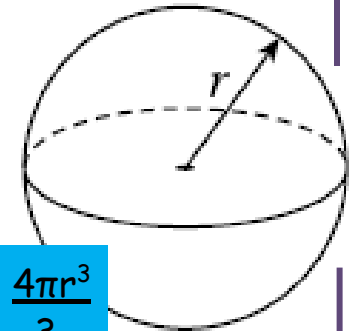
You need to find the volume of both pyramids.

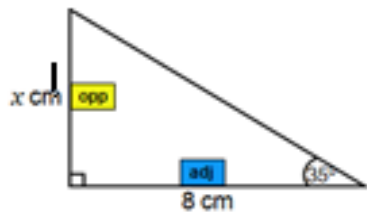
Often you need to use **similar shapes** in frustrum problems.



Spheres

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





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

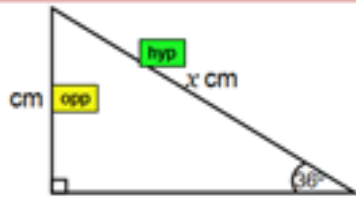
$$\tan 35^\circ = \frac{x}{8}$$

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

$$5.6016603 = x$$

$$5.6 \text{ cm} = x$$

Finding a side



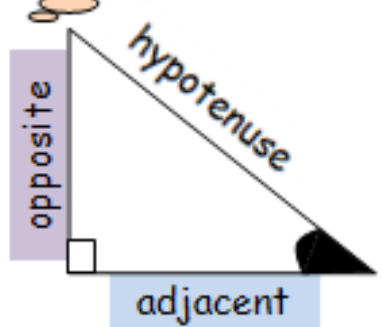
$$\sin A = \frac{\text{opp}}{\text{hyp}}$$

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

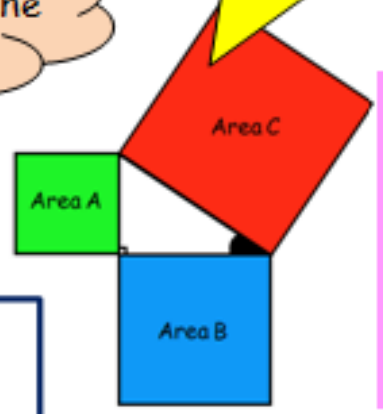
$$x = \frac{11}{\sin 36^\circ}$$

$$x = 18.7 \text{ cm}$$

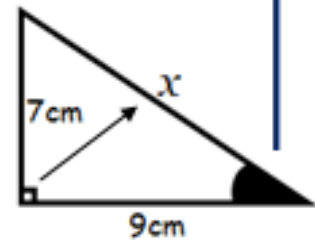
label the sides of the triangle



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



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!

Trigonometry

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

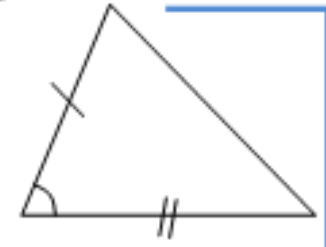
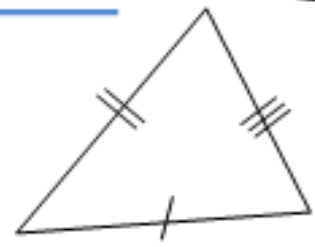
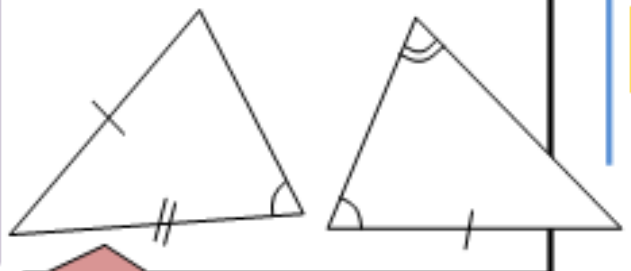
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

sides

The Sine Rule

angles

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



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

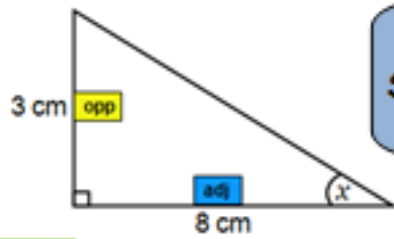
sides

The Cosine Rule

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

angles

Finding an angle



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

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

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

$$x = 20.556045$$

$$x = 20.6^\circ$$

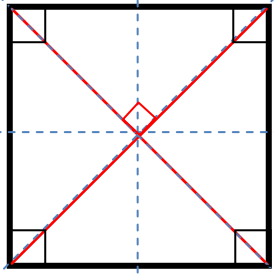
$$\cos = \frac{\text{adj}}{\text{hyp}}$$

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

Remember to use the formula page on your exam paper!

$$\text{Area of a triangle} = \frac{1}{2} ab \sin C$$

Square



4 equal sides
opposite sides
are parallel

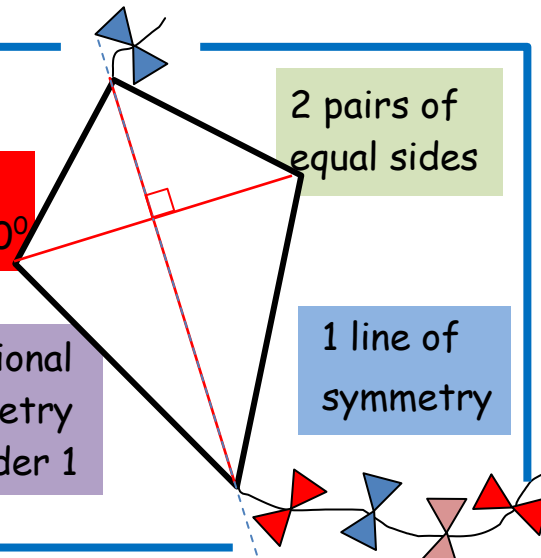
rotational
symmetry
of order 4

diagonals
meet at 90°

diagonals of
equal length

4 lines of symmetry

Kite



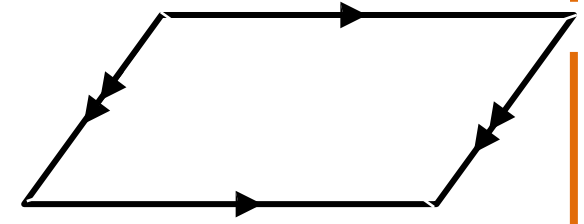
diagonals
meet at 90°

2 pairs of
equal sides

rotational
symmetry
of order 1

1 line of
symmetry

Parallelogram



rotational
symmetry
of order 2

opposite sides
are equal &
parallel

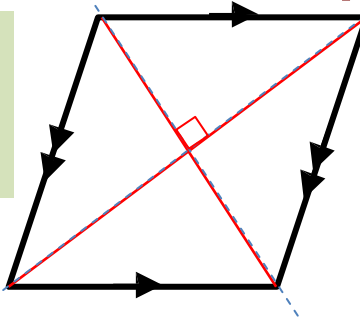
no line symmetry

Quadrilaterals

Rhombus

4 equal sides
opposite sides
are parallel

rotational
symmetry
of order 2

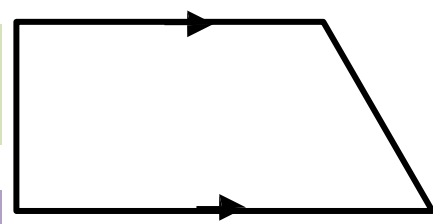


diagonals
meet at 90°

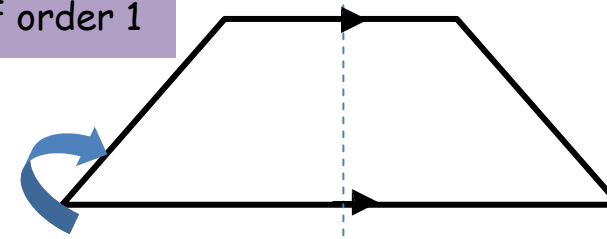
2 lines of symmetry

Trapezium

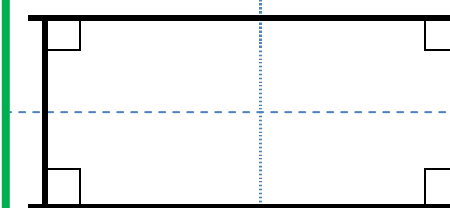
one pair of



rotational
symmetry
of order 1



Rectangle



sides are
parallel

rotational
symmetry
of order 2

2 lines of symmetry

equal length

add up to 360°

10 millimetres = 1 Centimetre

Imperial units 1000 grams = 1 **kilogram**

100 Centimetre = 1 **METRE**

ounces Metric units

1000 **METRES** = 1 kilometre

pounds (lbs)

STONES

Metric units inches **feet**
yards **MILES**

Units

1 inch = 2.5 cm

Imperial units

1 kg = 2.2 pounds

5 miles = 8 km

1 mile = 1.6 km



An average man is about 1.7 or 1.8 metres tall. (6 foot)

pints Imperial units

1 gallon = 4.5 litres

gallons

4 litres = 7 pints

1 litre = $1\frac{3}{4}$ pints

1 foot = 12 inches

That's 30cm – the length of a ruler!

Metric units

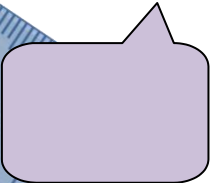
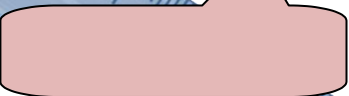
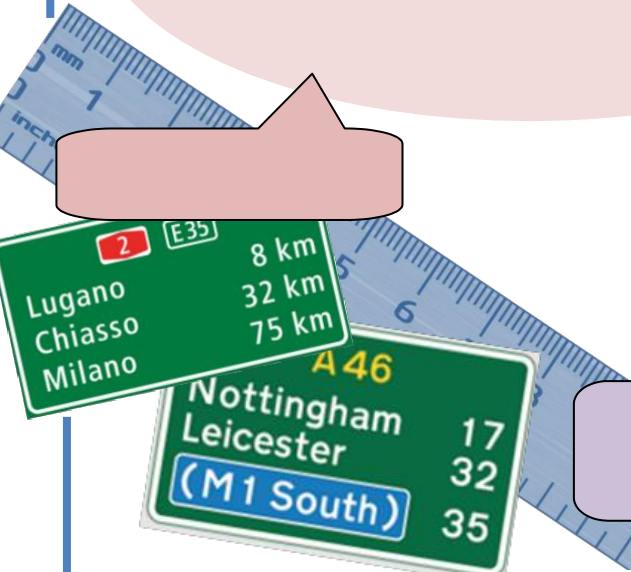
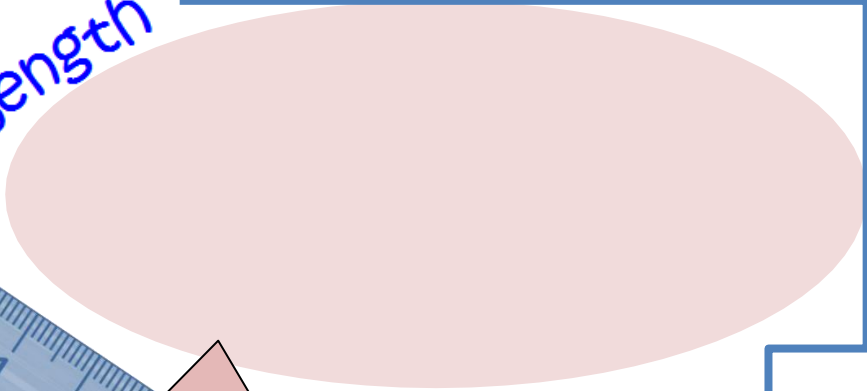
3 feet = 1 yard

A yard is almost 1 metre (its 90cm).

1000 millilitres = 1 **litre**

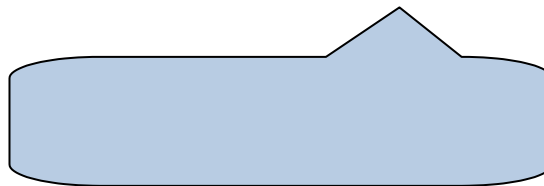
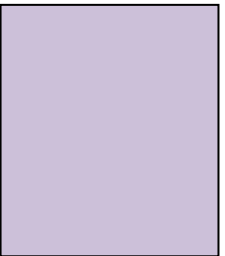
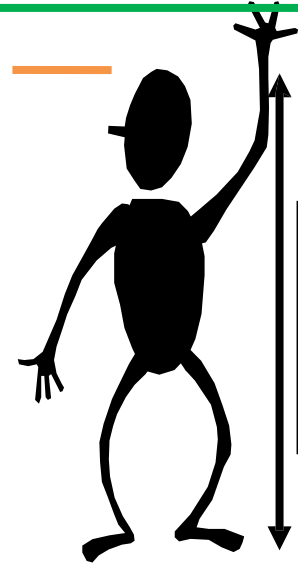
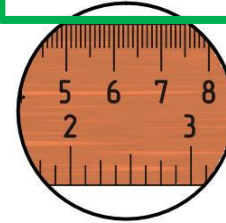
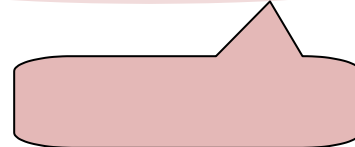
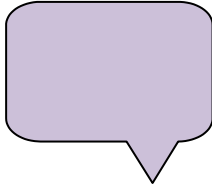
'A litre of water is a pint and three quarters'

Length



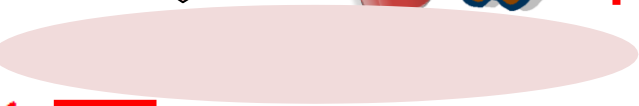
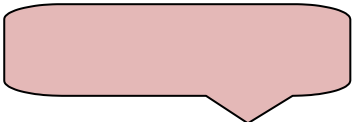
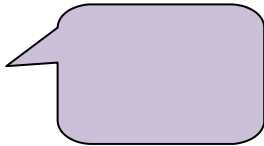
Lesley Hall @ Soar Valley College

Mass



Conversions

Capacity



on a calculator

39% of 82

0.39×82

Change to a decimal and multiply

increase £60 by 12%

$12\% \text{ of } 60 = 0.12 \times 60 = \text{£}7.20$

New amount = $\text{£}60 + \text{£}7.20$

Percentages

decreasing

decrease £60 by 12%

$12\% \text{ of } 60 = 0.12 \times 60 = \text{£}7.20$

New amount = $\text{£}60 - \text{£}7.20$
 $= \text{£}52.80$

SUBTRACT

Lesley Hall @ Soar Valley College

$$\frac{15}{20} = \frac{75}{100} = 75\%$$

$\times \frac{5}{5}$ OR

without a calculator

50% - half

25% - half and half

75% - 50% + 25%

10% - divide by 10

5% - half 10%

20% - double 10%