SHAPE

RBW

TYPES OF TRIANGLE

There are ……………….. types of triangle.

Name	Diagram	Properties

TYPES OF QUADRILATERAL

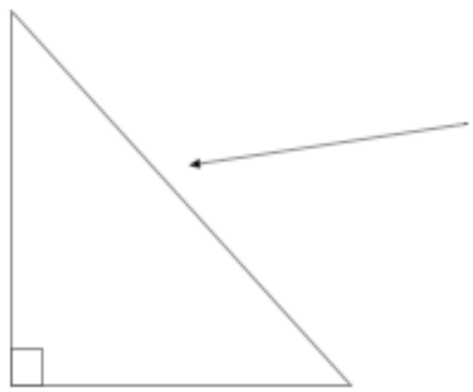
Name	Diagram	Properties
Square		
Rhombus		
Rectangle		
Parallelogram		
Trapezium		
Kite		

TYPES OF POLYGON

Name	Diagram	Properties
Triangle		
Quadrilateral		

PYTHAGORAS' THEOREM

This theorem only works for……………………………………………………



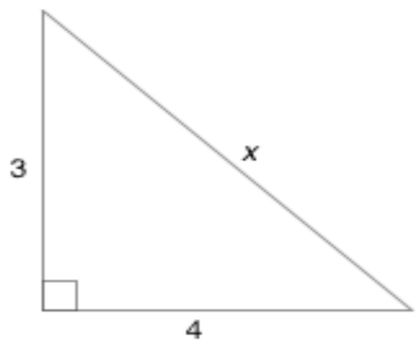
The side opposite the right angle is called the

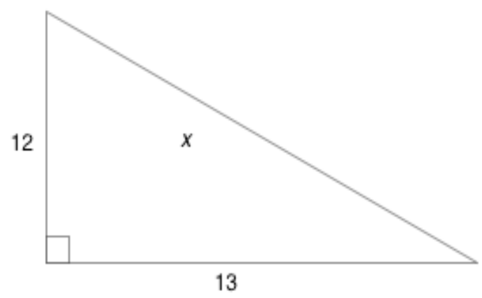
………………………………………

Pythagoras' Theorem says:

$(\text{hypotenuse})^2 =$

<u>Examples</u>



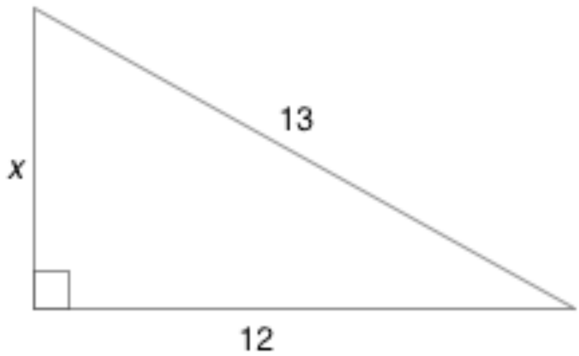


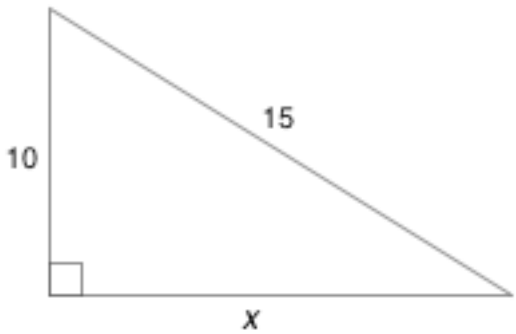
Finding the shorter sides

Pythagoras' Theorem says:

$(\text{hypotenuse})^2$ =

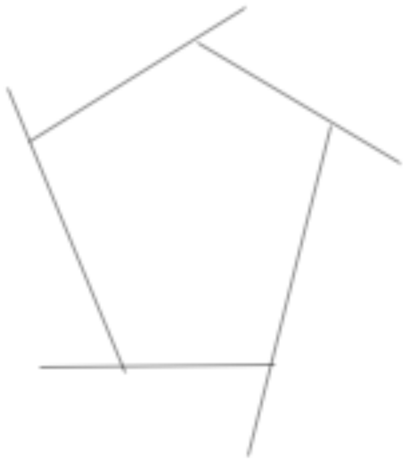
Examples





Interactive Qns **here** & **here**

INTERNAL AND EXTERNAL ANGLES



i = internal angle

e = external angle

i + e

To find the external angle

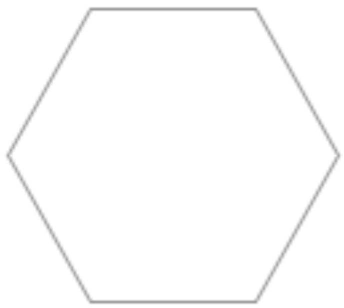
e =

To find the internal angle

i =

Examples

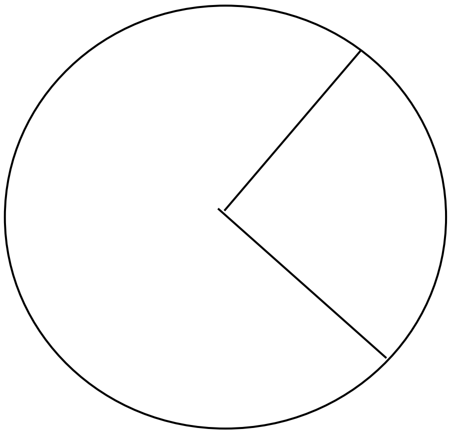
Find the external and internal angles of a regular hexagon.



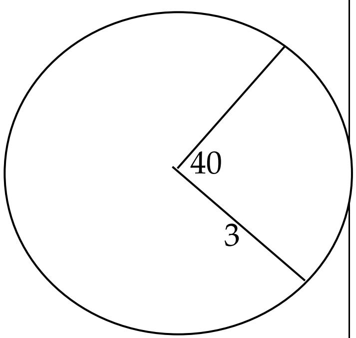
Find the internal angle of a regular 12 sided shape.

ARCS AND SECTORS

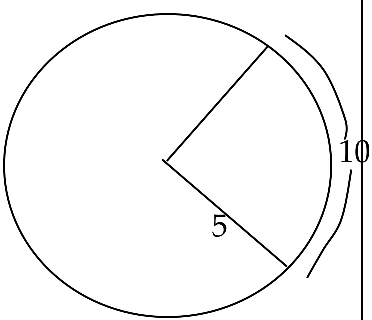
Definitions



Example 1

	Find the length of the minor arc	Find the area of the minor sector

Example 2

	Find the angle at the centre.	Find the area of the minor sector

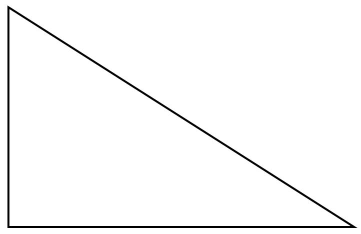
Common Question

A sector of a circle has radius 8cm and an angle of 210° at its centre. The sector is folded up to make a cone. Find the height of the cone and the angle between the cone and the base.

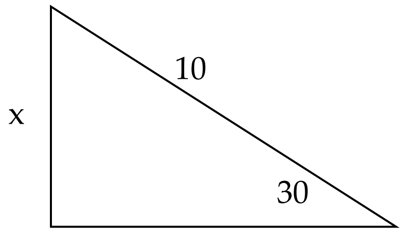
TRIGONOMETRY

1 This only works for right-angled triangles.

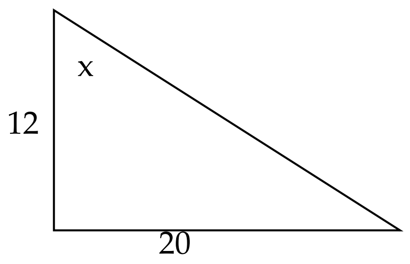
2 Label the sides of the triangle.



Example 1



Example 2



Interactive Questions here

BEARINGS

Basically Pythagoras and Trigonometry (+ sine + cosine rule) Problems

Three points to remember

1

2

3

Example

A ship sails 20 km on a bearing of 040˚ before turning onto a bearing of 130˚ for 15 km. How far is it from home?

SIMILAR FIGURES

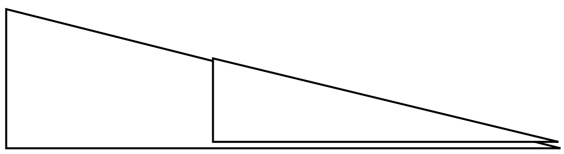
Two figures are *mathematically* similar if one figure is an enlargement of the other.

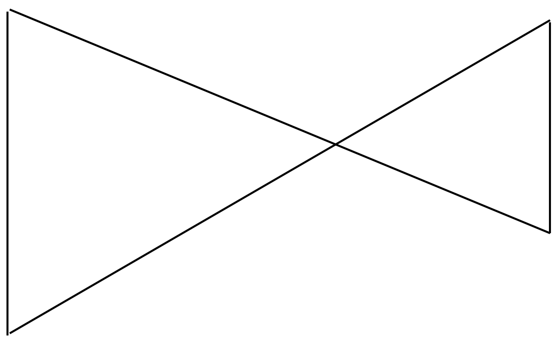
This means that, for the two figures

Angles

Lines

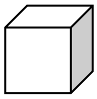
Examples

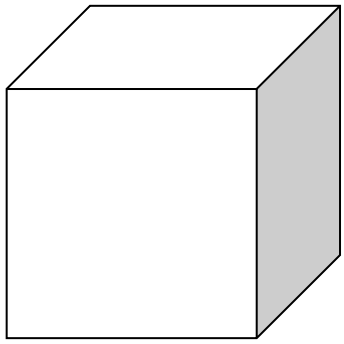




AREAS AND VOLUMES OF SIMILAR FIGURES

The diagrams show two cubes. Label the smaller with sides 1cm long and the larger one with sides 5cm long





Complete the table

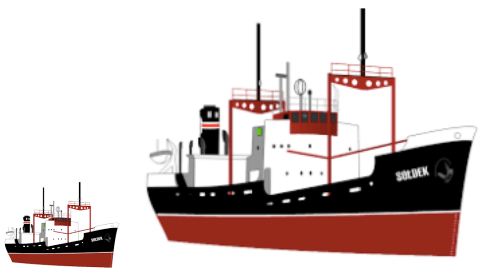
	Small Cube	Large Cube	Ratio
Length			
Area			
Volume			

If lengths increase by a factor a,

Areas will increase by

Volume will increase by

Example 1



An Oil Tanker is built so that every length is double that in the original design.

How much more paint will be required for the new tanker than for the original design?

How much more oil will it hold than the original design?

Example 2.

A new ‘King Size’ drinks can is to hold twice as much liquid as the standard can.

By what percentage must all of the lengths be increased compared to the original can?

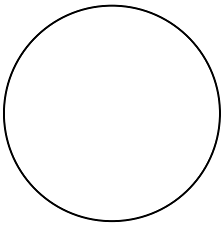
By what factor will the area have increased compared to the original?

VOLUME AND AREA FORMULAE

Trapezium

Area =

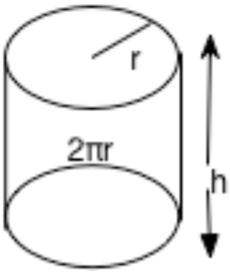
Circles



Area =

Circumference =

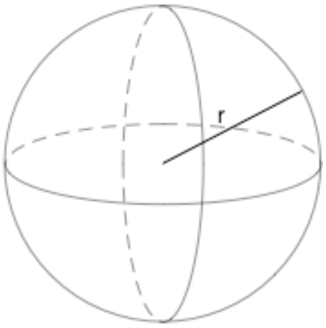
Cylinders



Volume =

Area =

Sphere

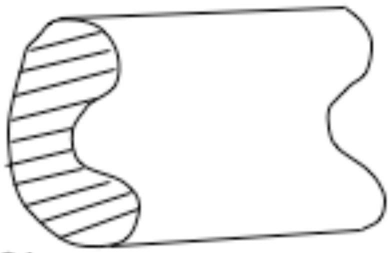


Volume =

Area =

Prism

(Cross section is same all the way through, e.g. cylinder, toblerone, cuboid….)



CSA

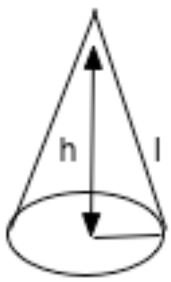
Volume = CSA x height

Pyramids

(Cones, tetrahedrons, square-based …. etc

Vol =

Cones

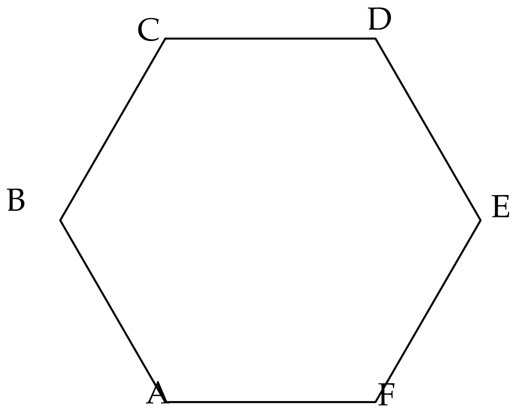


Right circular cone

VECTORS

A vector is just a movement between two points. The route is unimportant.
A vector has both 'direction' and 'length' (magnitude)

e.g.



Examples

$\overrightarrow{AB} =$

$\overrightarrow{BC} =$

$\overrightarrow{CF} =$

Parallel vectors

Parallel vectors have the same direction

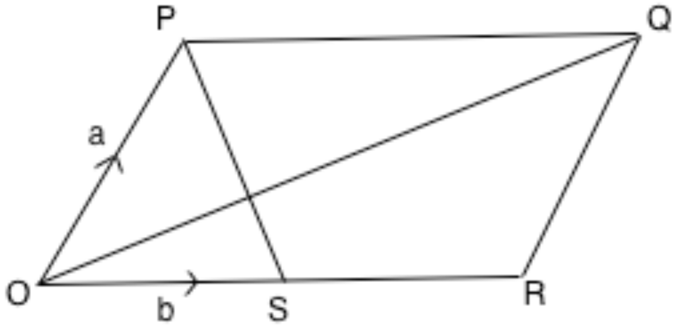
e.g. $\overrightarrow{OA}$ and $5\,\overrightarrow{OA}$

To prove 2 vectors are parallel show that one vector is a multiple of the other

Ratio

Given that P divides BE in the ratio 3:1 find BP.

Example GCSE Question



OPQR is a parallelogram. *S* is the midpoint of *OR*

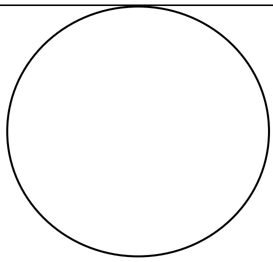
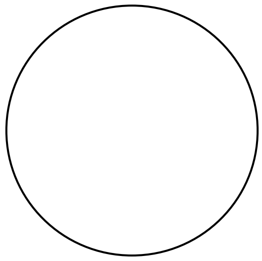
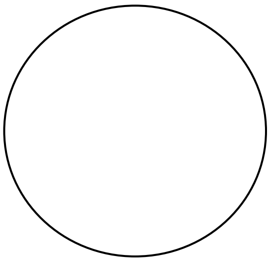
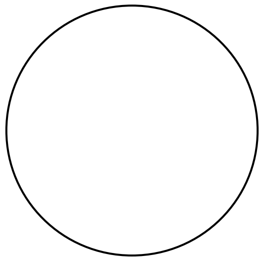
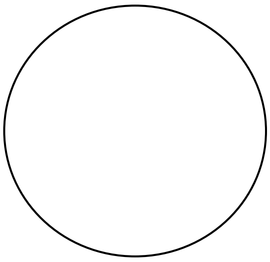
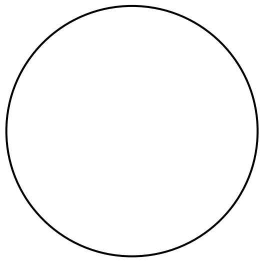
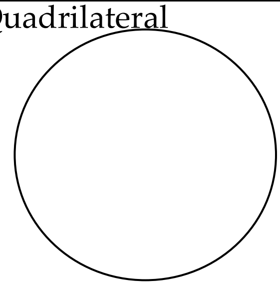
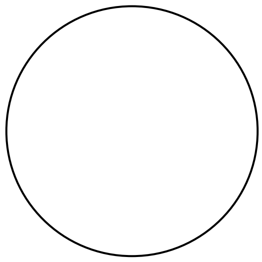
a) Find in terms of *a* and *b* (i) $\overrightarrow{OR}$ (ii) $\overrightarrow{OQ}$ (iii) $\overrightarrow{PS}$

T is on *PS*, so that $\overrightarrow{PT} = \frac{2}{3}\overrightarrow{PS}$

b) show that *T* is also on *OQ*, and find the ratio *OT*:*TQ*

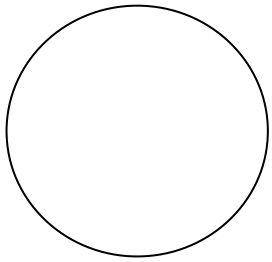
OCR Qns here. AQA Qns here. Worksheet here

CIRCLE LAWS

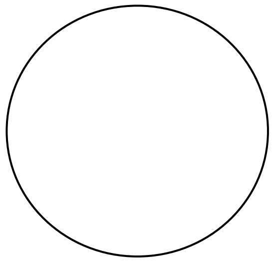
 'Angles in the same segment'	 Definitions of Terms
 Angles starting from the ends of a diameter are always 90˚	 NB. 2 radii make isosceles Δ Angles in a Δ add to 180˚
 Angle of centre = 2 x angle at edge	 Intersecting Chords
Cyclic Quadrilateral  Opposite angles add to 180˚	 Intersecting Chords

AQA A Qns here
Online Demo here

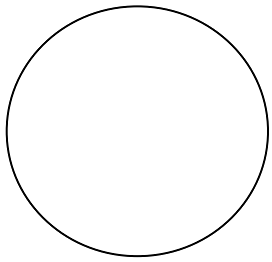
TANGENT LAWS



Equal distance to a point



90˚ to a radius



Alternate Segment Theorem

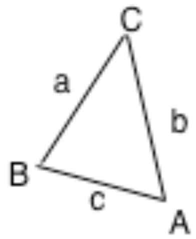
SINE AND COSINE RULES

SOHCAHTAO (basic trig) only works for

Sine and Cosine rules work for

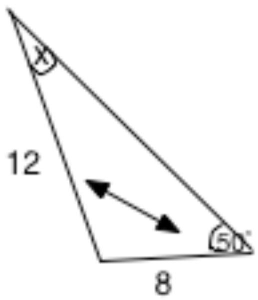
Sine rule

You must have a complete side-angle pair. Else use Cosine Rule

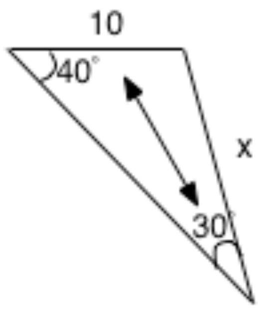


or

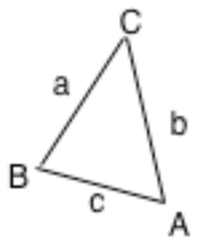
Example 1



Example 2

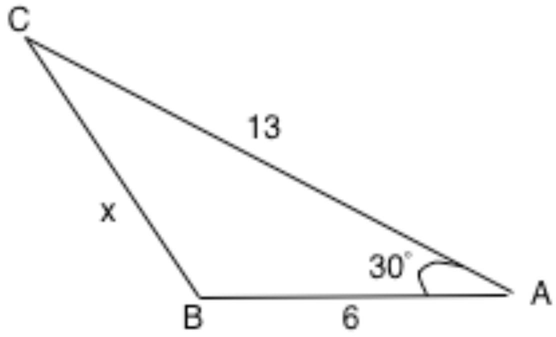


Cosine Rule

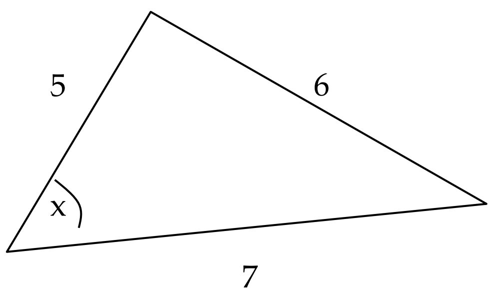


To find a Length

Example 1



Example 2



AQA A Trig Qns [here]

AREA OF A TRIANGLE

You can use the basic formula;

But it is often useful to use

Common Question

Find the area in the shaded segment

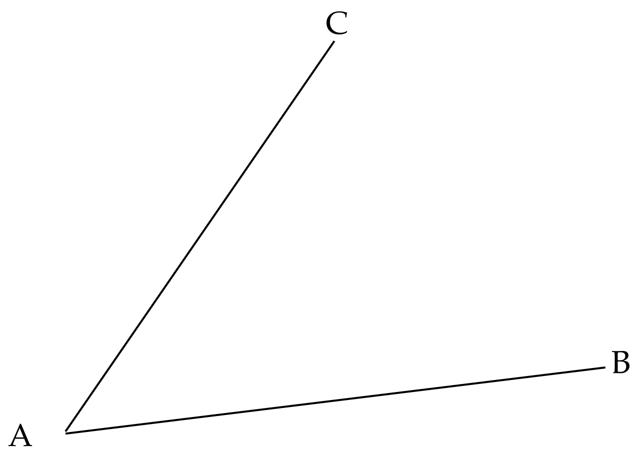
Constructions

You must be able to construct the following;

1 A 60° Angle

2 A Right Angle (Bisector of a Line)

3 An Angle Bisector



TRANSFORMATIONS

There are four transformations

Translation
Reflection
Rotation
Enlargement

Translations – just a 'shift' e.g. $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$ means 2 along, 4 up

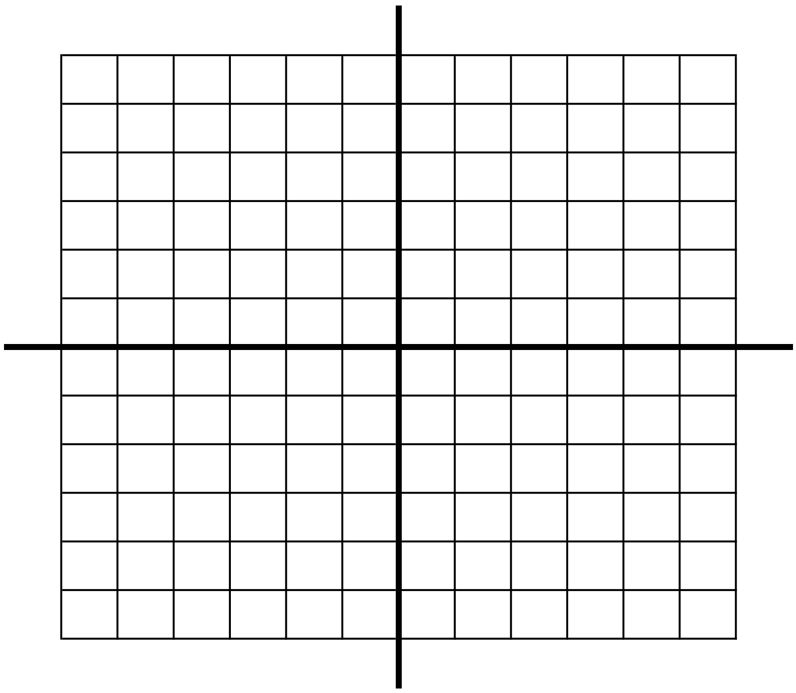
$\begin{pmatrix} -1 \\ -2 \end{pmatrix}$ means 1 back, 2 down

Reflections – Need to know reflection lines such as x = 2, y = -1, y = x, y = -x

Example; Plot the triangle A with vertices at (3,1) (6,1) and (6,2)

Reflect A in the line y = -1 and label your answer B

Reflect A in the line y = x and label your answer C

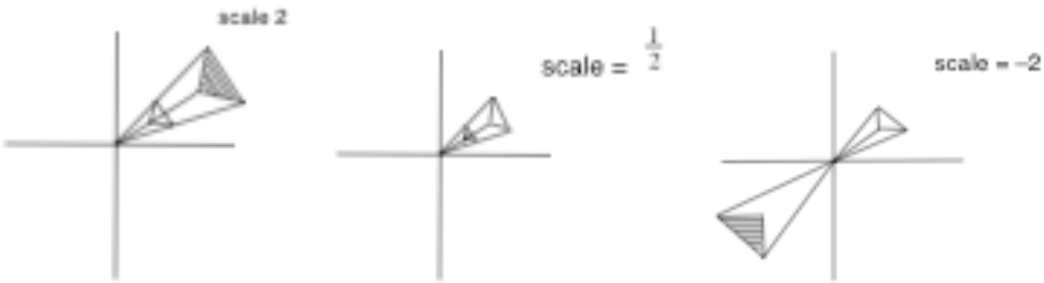


Rotations – Need to know three things: Centre
Angle
Direction

(will usually be worth 3 marks on a GCSE paper)

Enlargements – Need to know centre of enlargement and scale factor.

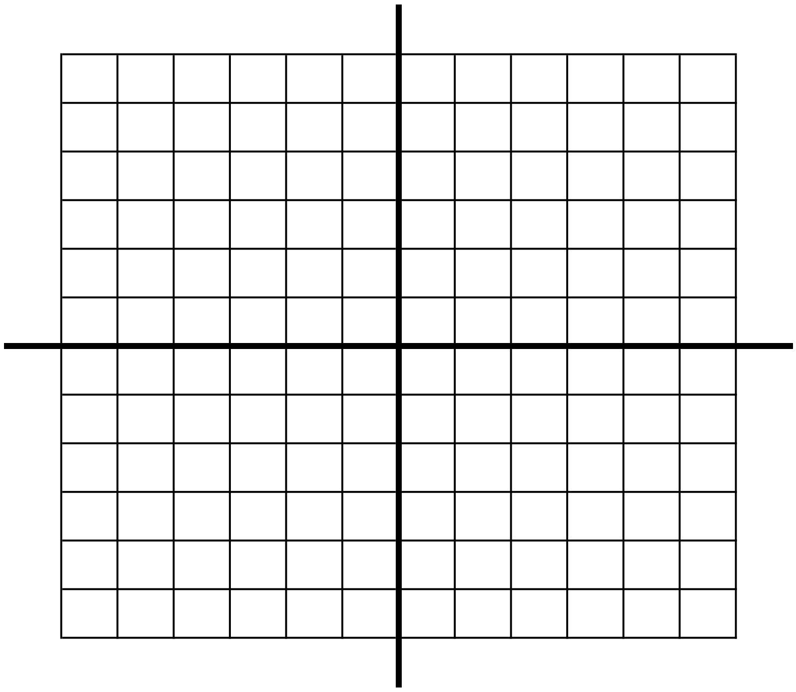
Need to know e.g. scale = 2
scale = $\frac{1}{2}$
scale = – 2 online demo [here]



Examples

Plot triangle ABC at (1,1), (4,1), (3,2).

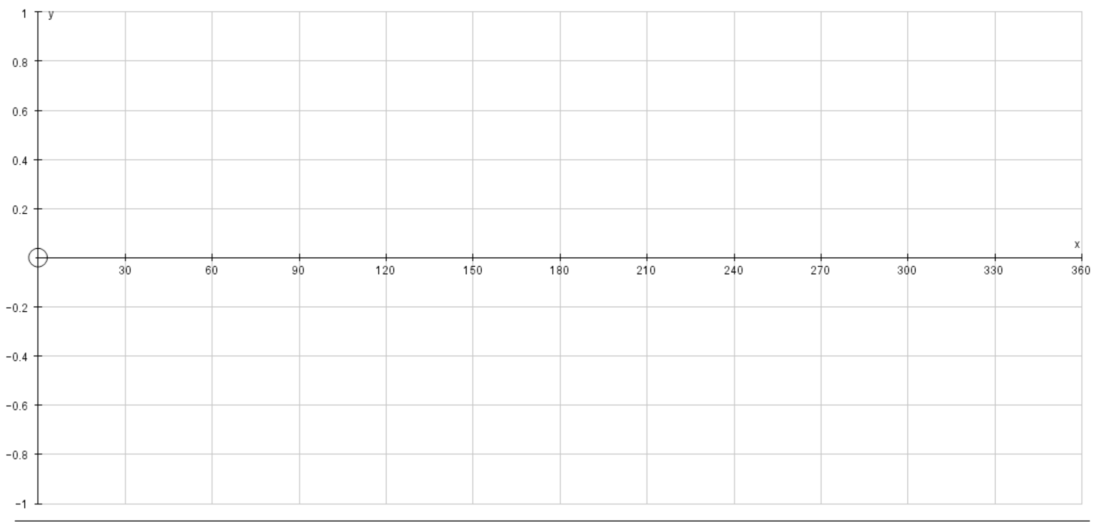
1. Translate your triangle through $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$ and label it 1.
2. Reflect the original triangle in the line y = x and label it 2.
3. Rotate the original triangle 90° clockwise about the point (0,0) and label it 3.
4. Enlarge your triangle, scale factor $-\frac{1}{2}$, centre (-1,-1) and label it 4.



SOLUTIONS TO TRIG PROBLEMS FOR 0 < x < 360

The Sine Curve

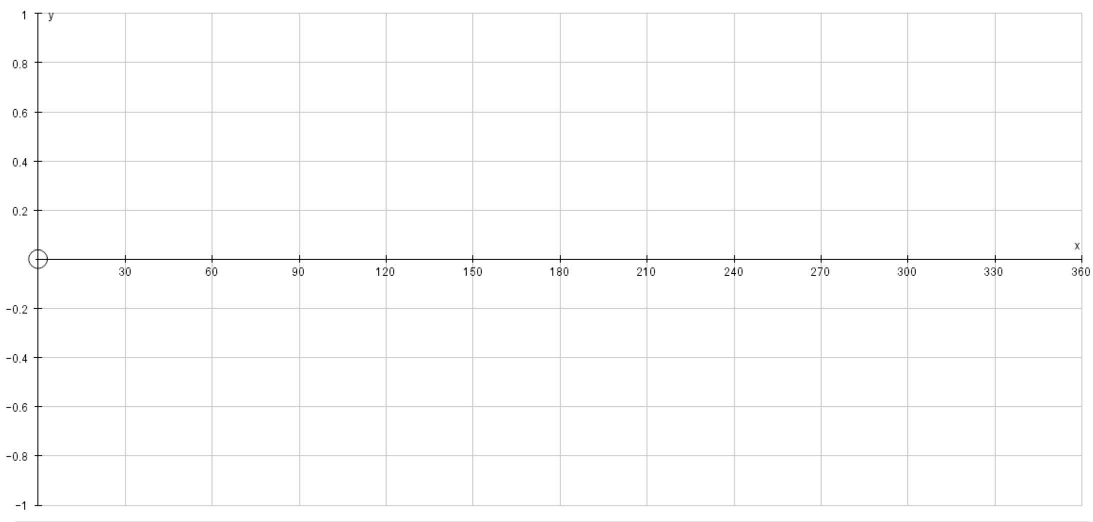
Sketch the graph of y = sin(x) on the axes below.



Hence use the graph to find all solutions between x = 0 and 360 to $\sin x = \frac{1}{2}$

The Cosine Curve

Sketch the graph of y = cos(x) on the axes below.



Hence use the graph to find all solutions between x = 0 and 360 to
$\cos x =$ -0.4