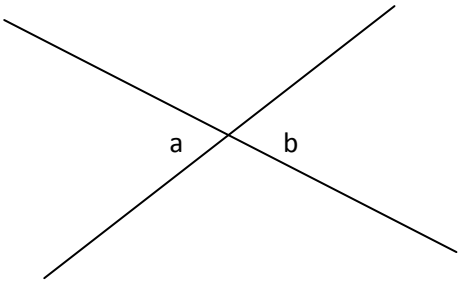
# Geometry – Key topics for C/B Grade

**Angle rules**

Opposite angles are equal

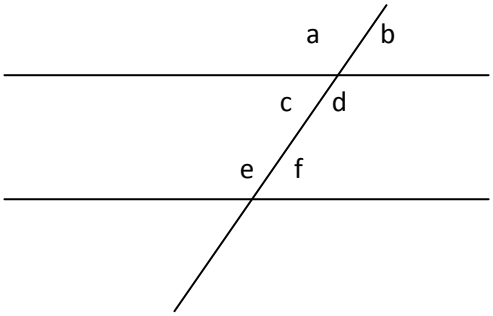
a = b




Alternate angles are equal  c = f and d = e

Corresponding angles are equal  a = e, b = f

Interior angles add up to 180°  c + e = 180




Angles on a straight line add up to 180°

Angles round a point add up to 360°

Angles in a triangle add up to 180°

Angles in a quadrilateral add up to 360°

**You must give reasons (name the angle rules you have used) if required. "Angles on parallel lines" is <u>not</u> a valid reason.**

A <u>bearing</u> is an angle measured clockwise from North

**Polygons**

You must know the names of basic polygons e.g. isosceles, equilateral and scalene triangles, parallelogram, rhombus, kite, pentagon, hexagon etc.

The <u>exterior</u> angles of any polygon add up to 360°

The <u>interior</u> angles of a polygon add up to 180×(number of sides – 2)
E.g. the interior angles of a pentagon add up to 180×(5-2) = 540°

A <u>regular</u> polygon has equal sides and equal angles.

**Constructions**

You need to be able to construct triangles **accurately** using a ruler and protractor.

You need to know how to use compasses to construct

- a triangle given 3 sides
- the perpendicular bisector of a line
- the bisector of an angle

Look these up on MyMaths if you are unsure.

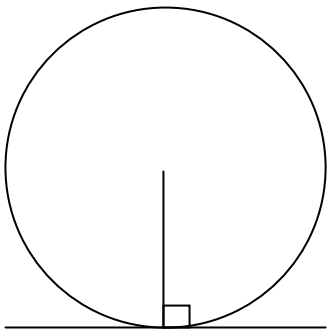
**Circles**

Make sure you know the names of the parts of a circle:

- radius
- diameter
- chord
- tangent
- segment
- sector
- arc
- circumference

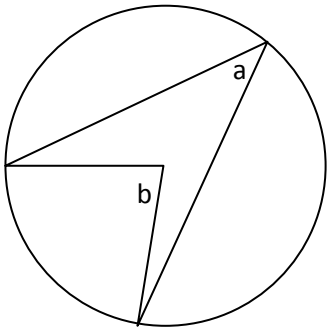
**Angles in circles**

The angle between a radius and tangent is 90°



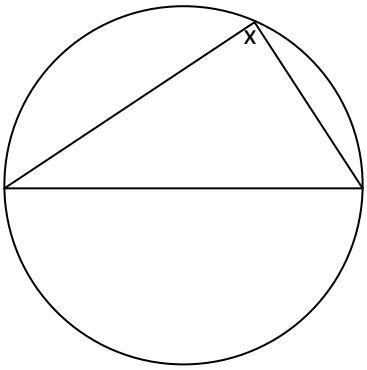
The angle at the centre is double the angle at the circumference

b = 2×a



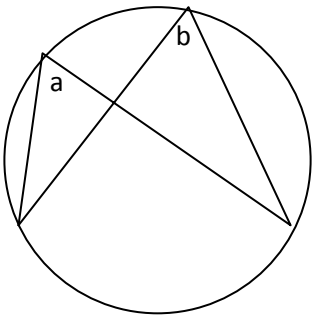
The angle in a semicircle is 90°

x = 90°



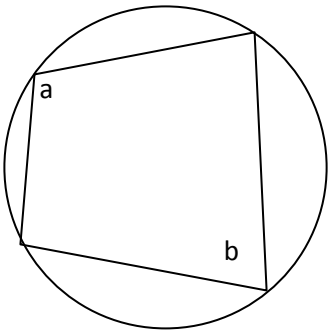

Angles in the same segment are equal

a = b



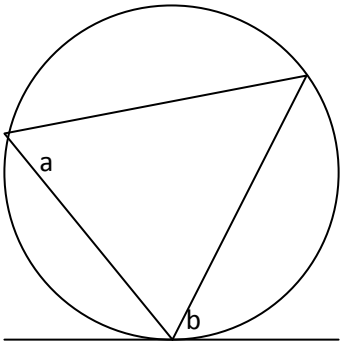

Opposite angles in a cyclic quadrilateral add up to 180°

a + b = 180°




The alternate segment theorem

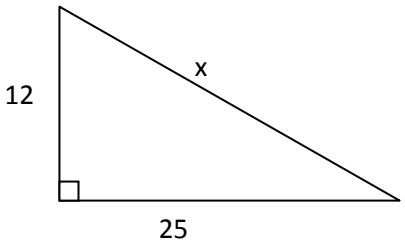
a = b



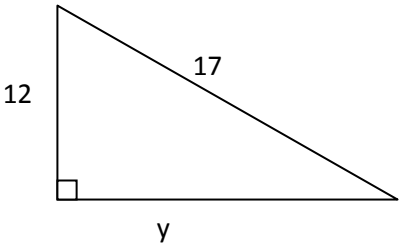
**Pythagoras Theorem**

In a right-angled triangle, where c is the hypotenuse, $a^2 + b^2 = c^2$

$12^2 + 25^2 = x^2$
$769 = x^2$
$x = \sqrt{769}$
$x = 27.7$

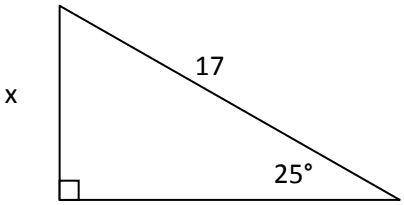



$12^2 + y^2 = 17^2$
$17^2 - 12^2 = y^2$
$145 = y^2$
$y = \sqrt{145}$
$y = 12.0$

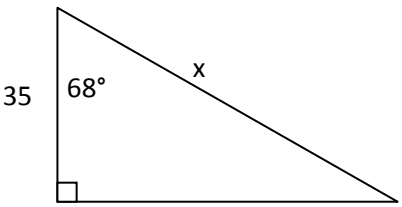



**Trigonometry**

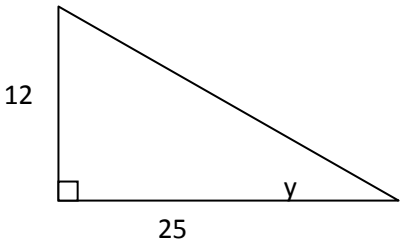
$sin = \frac{opp}{hyp}$
$sin25 = \frac{x}{17}$
$17 \times sin25 = x$
$x = 7.18$




$cos = \frac{adj}{hyp}$
$cos68 = \frac{35}{x}$
$x = \frac{35}{\cos 68}$
$x = 93.4$




$tan = \frac{opp}{adj}$
$\tan y = \frac{12}{25}$
$y = \tan^{-1}\frac{12}{25}$
$y = 25.6°$



**Sine and Cosine Rules – for non-right angled triangles**

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

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

Area of a triangle = $\frac{1}{2}ab\sin C$, where the angle is between the two sides.
*Correct substitution into the formula will get you marks, even if you cannot rearrange and finish the question. Usually worth 3 marks – if worth more you may need to use more than one of the formulae.*

**Area and Perimeter**

Rectangle – Area = length × width

Triangle – Area = $\frac{1}{2}$ of base × height

Parallelogram – Area = base × height

For compound shapes, split it into rectangles, triangles and circles.

To find a perimeter, ensure you add up <u>every</u> side.

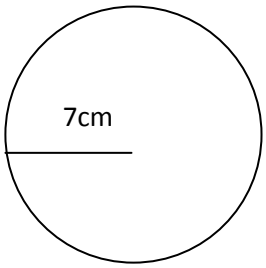
**Area and perimeter of a circle**

$$A = \pi r^2$$
$$C = 2\pi r$$

Example

Circumference = $2 \times \pi \times 7 = 44.0cm$

Area = $\pi \times 7^2 = 154cm^2$




These are given on the formula sheet, so look them up.

If you know the diameter, half it to find the radius

**Volume**

Cuboid; length × width × height

Sphere; $\frac{4}{3}\pi r^3$

Cylinder; $\pi r^2 h$

Cone; $\frac{1}{3}\pi r^2 h$

All except the first are given on the formula sheet

**Similarity**

Similar shapes have the same angles, and sides in proportion.
Find the scale factor for the lengths, and then use it to find missing sides.