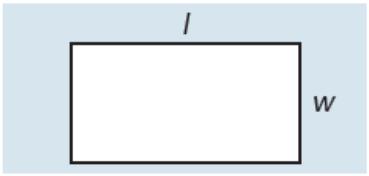
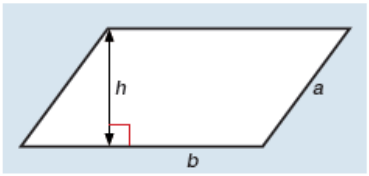
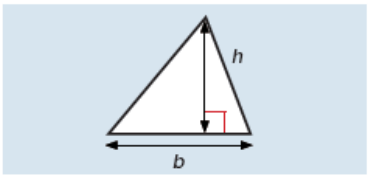
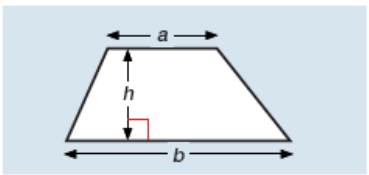
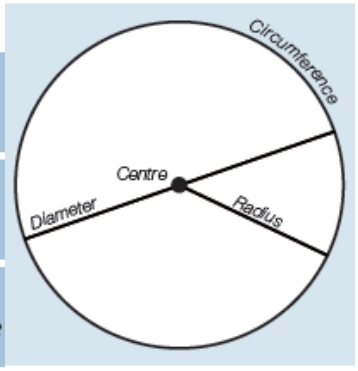
Higher Tier : Formulae to learn

Areas

Rectangle = $l \times w$	
Parallelogram = $b \times h$	
Triangle = $\frac{1}{2} b \times h$	
Trapezium = $\frac{1}{2}(a + b)h$	

Circles

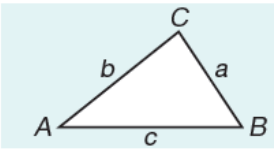
Circumference = $\pi \times$ diameter, $C = \pi d$	
Circumference = $2 \times \pi \times$ radius, $C = 2\pi r$	
Area of a circle = π x radius squared $A = \pi r^2$	

Trigonometric formulae

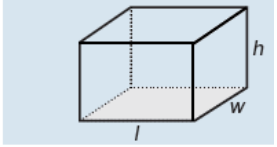
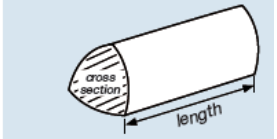
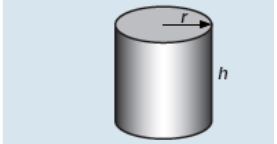
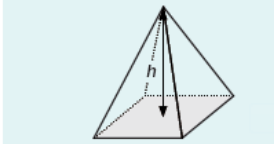
Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



Volumes

Cuboid = $l \times w \times h$	
Prism = area of cross section × length	
Cylinder = $\pi r^2 h$	
Volume of pyramid = $\frac{1}{3}$ × area of base × h	

Compound measures

Speed

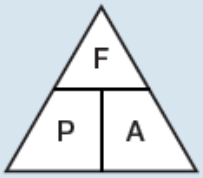
$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

Density

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

Pressure

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$



Quadratic equations

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

GCSE Maths – Higher Tier : Learn all the Foundation Key Facts and remember these 'top tips'!

Laws of Indices

$$y^a \times y^b = y^{a+b} \qquad y^a \div y^b = y^{a-b} \qquad y^0 = 1$$

$$(y^a)^b = y^{a \times b} \qquad y^{-n} = \frac{1}{y^n} \qquad y^{a/b} = \sqrt[b]{y^a}$$

Congruent Triangles: SSS, SAS, ASA or RHS

Estimating Mean from a table

Create 2 extra columns, one for midpoint and the other for midpoint x frequency. Find the total for mp x f and divide by total frequency.

Solving Quadratics:

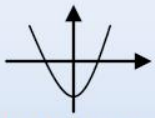
first rearrange into $ax^2 + bx + c = 0$ then…

- **Factorise** put into 2 brackets and one of the brackets must = 0
- **Complete the Square** $(x + a)^2 - b = 0$
- **Use the Formula**

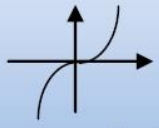
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Types of Graph

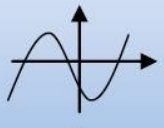
Linear (y=mx+c)



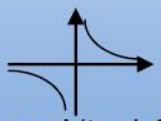
Quadratic (contains x^2)



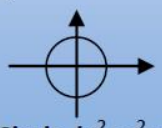
or



Cubic (contains x^3)



Reciprocal (Look for 1/x)



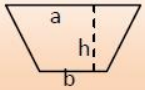
Circle ($x^2+y^2=r^2$)

y = mx + c

m = gradient c = y-intercept

gradient (steepness) = change in y / change in x

Area of a Trapezium (LEARN this)



Area = ½ (a + b) h

Simultaneous Equations

Linear eg 2x + 3y = 1 **Make y terms** (or x) **equal**

3x – 5y = 11 Same Signs Subtract

Different Signs Add

Quadratic and Linear

Make y (or x) the subject in the linear equation

Substitute into the quadratic equation and solve

Remember to work out the value of both letters

Surds

$$\sqrt{a} \times \sqrt{a} = a \qquad \sqrt{a} \times \sqrt{b} = \sqrt{a \times b} \qquad \frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$$

Displaying Statistics:

Histograms – remember that the frequency is given by the **area of each bar** not the height. Use the clues given in the question to label the area or to find frequency densities.

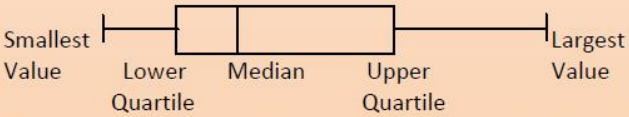
Frequency Density = Frequency ÷ Class Width

Frequency Polygons – plot each frequency against the mid-point of the group and join them with straight lines. Don't forget to join to the horizontal axis.

Scatter Graphs – positive or negative correlation? You must draw a **line of best fit** when asked to estimate a value.

Cumulative Frequency- add up frequencies as you go and plot against the **top** of each group

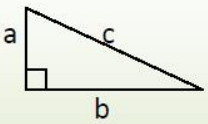
Box Plots



To compare 2 box plots make 1 comment about medians and 1 comment about ranges (or IQR)

Triangles:

Right-angled

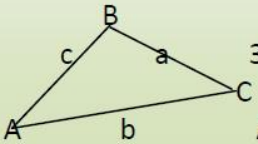


3 sides use **Pythagoras** $a^2 + b^2 = c^2$

2 sides and an **angle** use **SOHCAHTOA**

Area = base x height ÷ 2

Not right-angled 2 sides, 2 angles use **Sine Rule**

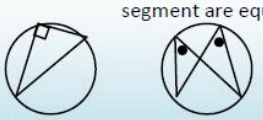


3 sides, 1 angle use **Cosine Rule**

Area = ½ absinC

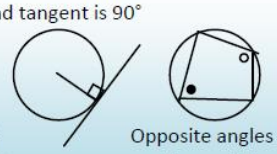
Angle Rules:

Angles in the same segment are equal



Angle in a semicircle is 90°

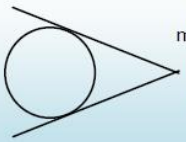
Angle between radius and tangent is 90°



Angle in the centre is double the angle at the circumference

Opposite angles in a cyclic quadrilateral add up to 180°

Alternate Segment Theorem



Tangents meeting at a point are equal in length