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Brighter Thinking

GCSE MATHEMATICS FORMULAE

ALGEBRA

NOTATION, VOCABULARY AND MANIPULATION

Kinematics

For an object moving at constant acceleration, where:
a = constant acceleration u = initial velocity v = final velocity
s = displacement from its initial position t = time taken

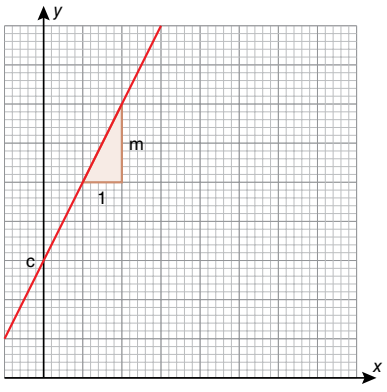
$$v = u + at \qquad s = ut + \frac{1}{2}at^2 \qquad v^2 = u^2 + 2as$$

GRAPHS

Equation of a line

m = gradient of the line
c = where the line crosses the y-axis (y-intercept)

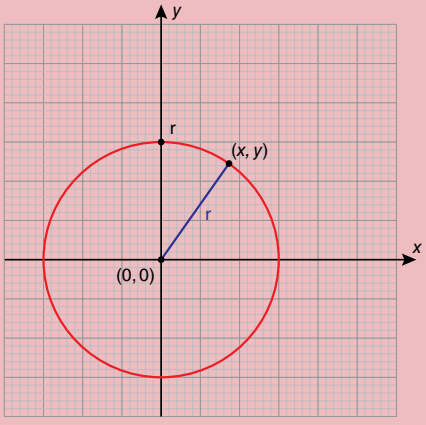
$$y = mx + c$$



Equation of a circle

For a circle with centre (0,0) and radius r

$$x^2 + y^2 = r^2$$



SOLVING EQUATIONS AND INEQUALITIES

Quadratic Formula

For an equation $ax^2 + bx + c = 0$ where $a \neq 0$, the solutions are given by

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

Formulae for both tiers on white background

Formulae for Higher tier only on pink background

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RATIO, PROPORTION AND RATES OF CHANGE

Simple interest

P = principal amount and r = interest rate

$$\text{Interest} = P \times \frac{r}{100}$$

Compound interest*

P = principal amount
r = interest rate
n = number of period of interest

$$\text{Total accrued} = P \times \left(1 + \frac{r}{100}\right)^n$$

* Compound interest appears in both Foundation and Higher tiers, but working with general iterative processes is Higher tier only.

Speed

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

Density

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

Pressure

$$\text{Pressure} = \frac{\text{Force}}{\text{Area}}$$

Proportion

If A is directly proportional to B then

$A = k \times B$

for some constant k

If A is inversely proportional to B then

$A = k \times \frac{1}{B}$

for some constant k

PROBABILITY

For two outcomes, A and B:

$P(A)$ = probability of outcome A
$P(B)$ = probability of outcome B

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$
$$P(A \text{ and } B) = P(A \text{ given } B) \times P(B)$$

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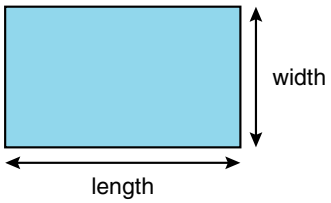
GEOMETRY

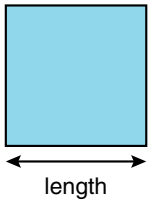
MENSURATION AND CALCULATION

Length



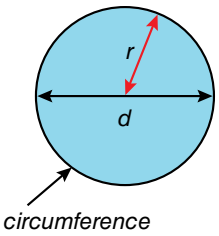
Perimeter of a rectangle =

$2(\text{length} + \text{width})$



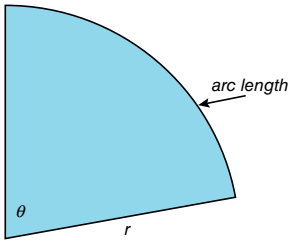
Perimeter of a square =

$4 \times \text{length}$



Circumference of a circle =

$2\pi r = \pi d$

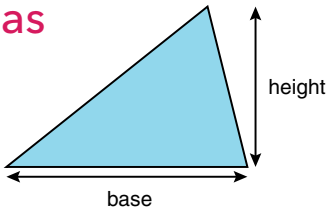


Arc length of a sector =

$\frac{\theta}{180} \times \pi r = \frac{\theta}{360} \pi d$

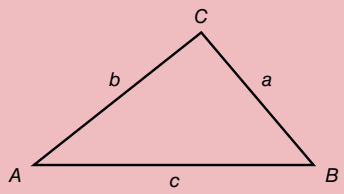
where θ is the angle of the sector

Areas



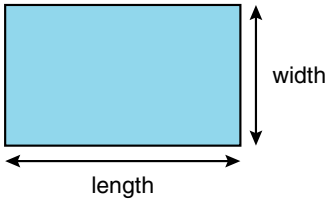
Area of a triangle =

$\frac{1}{2} \times \text{base} \times \text{height}$



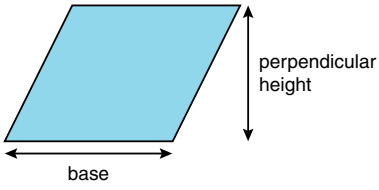
In any triangle *ABC* with sides *a*, *b*, and *c*:
Area of a triangle =

$\frac{1}{2} ab \sin C$



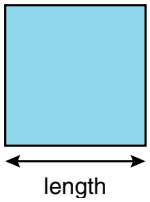
Area of a rectangle =

$\text{length} \times \text{width}$



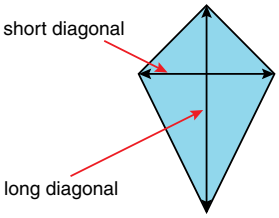
Area of a parallelogram =

base x perpendicular height



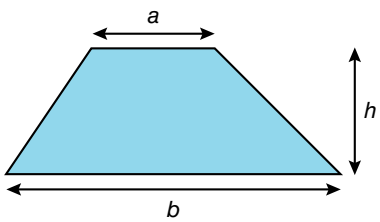
Area of a square =

length^2



Area of a kite =

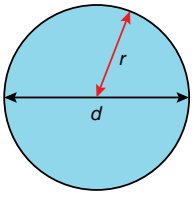
$\frac{1}{2} \times \text{long diagonal} \times \text{short diagonal}$



Area of a trapezium =

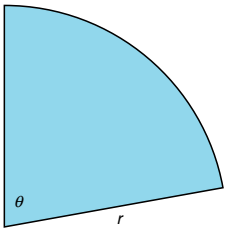
$\frac{1}{2}(a+b)h$

where *a* and *b* are the parallel sides.



Area of a circle =

πr^2



Area of a sector =

$\frac{\theta}{360} \times \pi r^2$

where θ is the angle of the sector

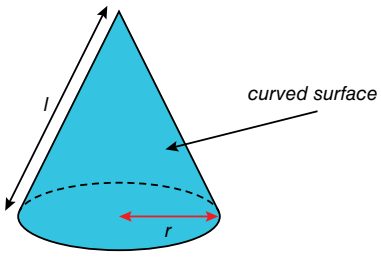
Formulae for both tiers on white background

Formulae for Higher tier only on pink background

GEOMETRY

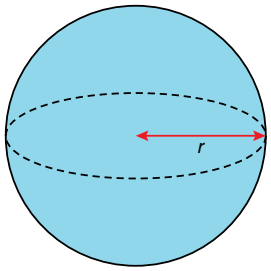
MENSURATION AND CALCULATION (continued)

Surface Area



Curved surface area of a cone =

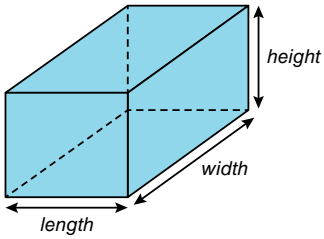
πrl



Surface area of a sphere =

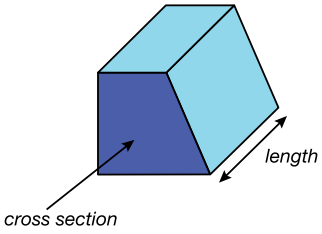
$4\pi r^2$

Volume



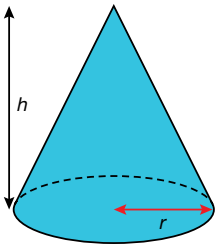
Volume of a cuboid =

length × width × height



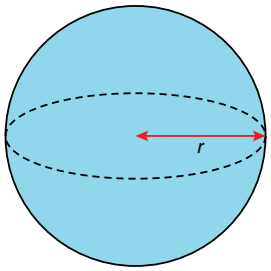
Volume of a prism =

area of the cross section × length



Volume of a cone =

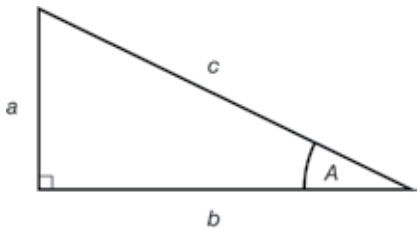
$\frac{1}{3}\pi r^2 h$



Volume of a sphere =

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

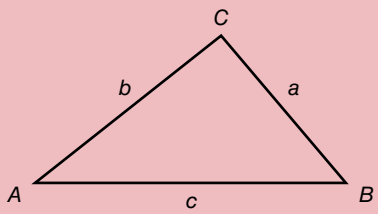
Triangles



Within a right-angled triangle with sides a, b and c where c is the hypotenuse:

Pythagoras' theorem $a^2 + b^2 = c^2$

Trigonometry formulae $\sin A = \frac{a}{c}$, $\cos A = \frac{b}{c}$, $\tan A = \frac{a}{b}$



In any triangle ABC with sides a, b, and c:

The sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

The cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$

Formulae for both tiers on white background

Formulae for Higher tier only on pink background