

Learn these by heart before the exam.

Number

Order of operations (BIDMAS): Brackets, Indices, Division/Multiplication, Addition/Subtraction.

$$\text{percentage change} = \frac{\text{new} - \text{old}}{\text{old}} \times 100\%$$

$$\text{compound: } A = P \left(1 + \frac{r}{100}\right)^n$$

$$a^m \times a^n = a^{m+n}, \quad (a^m)^n = a^{mn}, \quad a^{-n} = \frac{1}{a^n}$$

Standard form: $a \times 10^n$ with $1 \leq a < 10$; used for very large or small numbers

Ratio: divide a quantity in ratio $a : b$ by sharing it into $a + b$ equal parts.

Algebra

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

$$(a + b)(a - b) = a^2 - b^2$$

Direct and inverse proportion: direct $y = kx$;

inverse $y = \frac{k}{x}$ – find k from a given pair

n th term (linear) $= a + (n - 1)d$ d = common difference between terms

Inequalities: reverse the sign when multiplying or dividing by a negative number.

Coordinate geometry and graphs

$$\text{gradient } m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y = mx + c \quad \text{straight line; } c = y\text{-intercept}$$

$$\text{midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$\text{length} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Parallel lines have equal gradients; perpendicular gradients multiply to -1 .

Kinematics graphs: gradient of distance-time = speed; area under speed-time = distance.

Geometry and mensuration

$$a^2 + b^2 = c^2 \quad \text{Pythagoras; right-angled triangles only}$$

$$\text{circle: } C = 2\pi r, \quad A = \pi r^2$$

$$\text{sector: arc} = \frac{\theta}{360} \times 2\pi r, \quad \text{area} = \frac{\theta}{360} \times \pi r^2$$

$$\text{cylinder } V = \pi r^2 h, \quad \text{sphere } V = \frac{4}{3}\pi r^3$$

$$\text{cone } V = \frac{1}{3}\pi r^2 h$$

Angles: sum in a triangle 180° , on a straight line 180° , round a point 360° .

Circle theorems: angle at the centre = twice the angle at the circumference; angle in a semicircle = 90° .

Trigonometry

$\sin \theta = \frac{O}{H}$, $\cos \theta = \frac{A}{H}$, $\tan \theta = \frac{O}{A}$ SOH CAH TOA; right-angled triangles

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

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

area $= \frac{1}{2}ab \sin C$ area of a triangle from two sides and the included angle

Statistics and probability

$$\text{mean} = \frac{\sum fx}{\sum f}$$

Averages: mean = total $\div$ count; median = middle value in order; mode = most common; range = highest – lowest

$$P(\text{event}) = \frac{\text{favourable outcomes}}{\text{total outcomes}}$$

$$P(A \text{ or } B) = P(A) + P(B) \quad \text{for mutually exclusive events}$$

$$P(A \text{ and } B) = P(A) \times P(B) \quad \text{for independent events;}$$

use a tree diagram