



A Level Mathematics Vocabulary

Tier 2 vocabulary: general academic language used across topics (e.g. justify, derive, interpret).

Tier 3 vocabulary: subject-specific technical terms for each topic.

Pure Mathematics

Tier 2 Vocabulary (General Academic)

Word	Use in this Section
Derive	Obtaining a result or formula from other known facts
Prove	Showing something is true using a complete logical argument
Justify	Giving a mathematical reason to support a method or answer
Deduce	Working out a new result from previously established facts
Show that	Demonstrating a given result using rigorous algebraic steps
Hence	Using a previous result directly to answer the next part
Sketch	Drawing a graph showing key features, not to exact scale
Interpret	Reading meaning from a graph, model or set of values
Model	Representing a real-world situation using mathematics
Verify	Checking that a given value or statement satisfies a condition
Rationalise	Removing a surd or complex number from a denominator
Simplify	Writing an expression in its most concise equivalent form

Tier 3 Vocabulary (Subject Specific)

Algebraic Expressions

Tier 3 Term	Definition / Notes
Index law	A rule for combining or simplifying powers
Surd	An irrational root that cannot be simplified to a whole number
Rationalise the denominator	Remove a surd or complex number from the bottom of a fraction
Conjugate surd	A surd expression with the opposite sign, used to rationalise

Quadratics

Tier 3 Term	Definition / Notes
Discriminant	$b^2 - 4ac$; determines the number and nature of roots
Completing the square	Rewriting a quadratic in the form $a(x + p)^2 + q$
Repeated root	A single solution occurring twice, where the discriminant is zero
Turning point	The maximum or minimum point of a curve

Equations and Inequalities

Tier 3 Term	Definition / Notes
Simultaneous equations	Two or more equations solved together for common solutions
Quadratic inequality	An inequality containing a squared term
Critical value	A boundary value where an inequality changes truth value
Set notation	Formal notation used to describe a solution set, e.g. $\{x : x > 2\}$

Graphs and Transformations

Tier 3 Term	Definition / Notes
Asymptote	A line a curve approaches but never touches
Transformation	A change to a graph's position, orientation or scale
Translation	Moving a graph without changing its shape, e.g. $f(x) + a$
Stretch	Scaling a graph in one direction, e.g. $f(ax)$ or $af(x)$
Reflection	Flipping a graph in a line, e.g. $-f(x)$ or $f(-x)$

Straight Line Graphs

Tier 3 Term	Definition / Notes
Gradient	The rate of change of y with respect to x
Perpendicular	Lines meeting at a right angle, gradients multiply to -1
Collinear	Points lying on the same straight line

Circles

Tier 3 Term	Definition / Notes
Equation of a circle	$(x - a)^2 + (y - b)^2 = r^2$, centre (a, b) , radius r
Tangent	A line touching a circle at exactly one point
Chord	A line segment joining two points on a circle
Perpendicular bisector	A line at right angles through the midpoint of a chord

Algebraic Methods

Tier 3 Term	Definition / Notes
Algebraic long division	Dividing one polynomial by another using a formal method
Factor theorem	If $f(a) = 0$, then $(x - a)$ is a factor of $f(x)$
Remainder theorem	The remainder of $f(x) \div (x - a)$ equals $f(a)$
Proof by contradiction	Assuming the opposite of a statement to reach a contradiction
Partial fractions	Splitting a single algebraic fraction into simpler fractions

The Binomial Expansion

Tier 3 Term	Definition / Notes
Binomial expansion	Expanding an expression of the form $(a + b)^n$
Binomial coefficient	The value nC_r , found from Pascal's triangle or a formula
Pascal's triangle	A triangular array giving binomial coefficients
Validity	The range of x for which a binomial series converges

Trigonometric Ratios and Identities

Tier 3 Term	Definition / Notes
Sine rule	A rule relating sides and angles in any triangle
Cosine rule	A rule relating sides and angles in any triangle

Tier 3 Term	Definition / Notes
Radian	A unit of angle measure based on arc length equal to the radius
Identity	A statement true for all values of the variable
Trigonometric equation	An equation involving sine, cosine or tangent to be solved
Small angle approximation	Approximations for $\sin\theta$, $\cos\theta$ and $\tan\theta$ when θ is small

Vectors

Tier 3 Term	Definition / Notes
Magnitude	The size (length) of a vector
Unit vector	A vector with magnitude 1
Position vector	A vector describing a point's position relative to the origin
Resultant vector	The vector formed by combining two or more vectors

Differentiation

Tier 3 Term	Definition / Notes
Derivative	The rate of change of a function; the gradient function
Differentiate	Find the derivative of a function
Chain rule	A rule for differentiating a function of a function
Product rule	A rule for differentiating the product of two functions
Quotient rule	A rule for differentiating the quotient of two functions
Stationary point	A point where the gradient of a curve is zero
Point of inflection	A point where the curve changes concavity
Implicit differentiation	Differentiating an equation not written explicitly as $y = f(x)$

Integration

Tier 3 Term	Definition / Notes
Integrate	Find the antiderivative of a function
Definite integral	An integral evaluated between two limits, giving a numerical value
Indefinite integral	An integral with a constant of integration, $+c$
Integration by substitution	A method changing the variable to simplify an integral
Integration by parts	A method for integrating a product of two functions
Area under a curve	The region between a curve and the x-axis, found by integrating

Exponentials and Logarithms

Tier 3 Term	Definition / Notes
Exponential function	A function where the variable appears in the power, e.g. e^x
Logarithm	The inverse of an exponential; the power to which a base is raised
Natural logarithm (ln)	A logarithm to the base e
Exponential	A quantity changing at a rate proportional to its size

Tier 3 Term	Definition / Notes
Growth/decay	The processes where a quantity increases or decreases at a rate proportional to its current value

Sequences and Series

Tier 3 Term	Definition / Notes
Arithmetic sequence	A sequence with a constant common difference
Geometric sequence	A sequence with a constant common ratio
Sum to infinity	The limiting sum of an infinite geometric series
Sigma notation	Notation (Σ) used to represent the sum of a sequence
Recurrence relation	A rule defining each term using previous terms

Numerical Methods

Tier 3 Term	Definition / Notes
Iteration	Repeating a process, using each output as the next input
Change of sign	Evidence a root lies between two values where $f(x)$ changes sign
Newton-Raphson method	An iterative method for finding approximate roots of $f(x) = 0$
Converge	Values approaching a fixed solution through iteration

Parametric Equations

Tier 3 Term	Definition / Notes
Parameter	A variable, often t , used to define x and y separately
Parametric equations	Equations expressing x and y in terms of a parameter
Cartesian equation	An equation in x and y only, with the parameter eliminated

Mechanics

Tier 2 Vocabulary (General Academic)

Word	Use in this Section
Model	Representing a real physical situation using mathematics
Assume	Stating a simplification made within a model, e.g. no air resistance
Resolve	Splitting a force into perpendicular components
Justify	Giving a reason for a modelling assumption or answer
Interpret	Reading meaning from a graph of motion or a diagram

Tier 3 Vocabulary (Subject Specific)

Kinematics

Tier 3 Term	Definition / Notes
Displacement	Distance travelled in a given direction from a fixed point
Velocity	The rate of change of displacement
Acceleration	The rate of change of velocity
SUVAT equations	The set of equations linking motion under constant acceleration
Velocity-time graph	A graph showing how velocity changes over time
Variable acceleration	Acceleration that changes over time, requiring calculus

Forces and Newton's Laws

Tier 3 Term	Definition / Notes
Newton's first law	An object stays at rest or constant velocity unless acted on by a resultant force
Newton's second law	Resultant force equals mass multiplied by acceleration ($F = ma$)
Newton's third law	Every action has an equal and opposite reaction
Resultant force	The single force equivalent to all forces acting on a body
Equilibrium	A state where the resultant force on a body is zero
Tension	The pulling force transmitted through a string or rod
Normal reaction	The force perpendicular to a surface, opposing contact
Friction	A force opposing relative motion between two surfaces
Coefficient of friction	A constant relating friction to the normal reaction

Connected Particles

Tier 3 Term	Definition / Notes
Connected particles	Two or more objects linked, e.g. by a string over a pulley
Pulley	A device changing the direction of tension in a string

Inextensible string	A string that does not stretch, so connected particles share acceleration
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Moments

Tier 3 Term	Definition / Notes
Moment	The turning effect of a force about a point
Pivot	The fixed point about which an object turns
Uniform rod	A rod whose weight acts at its midpoint
Non-uniform rod	A rod whose centre of mass is not at its midpoint

Projectiles

Tier 3 Term	Definition / Notes
Projectile	An object moving under gravity only, with horizontal and vertical motion
Range	The horizontal distance travelled by a projectile
Time of flight	The total time a projectile is in the air
Trajectory	The path followed by a projectile

Vectors in Mechanics

Tier 3 Term	Definition / Notes
Position vector	A vector giving an object's location relative to the origin
Velocity vector	A vector describing speed and direction of motion
i, j notation	Vectors written using perpendicular unit vectors $\mathbf{i}$ and $\mathbf{j}$

Statistics

Tier 2 Vocabulary (General Academic)

Word	Use in this Section
Interpret	Reading meaning from data, a diagram or a calculated statistic
Justify	Giving a statistical reason for a conclusion or method
Model	Representing a real data set using a statistical distribution
Compare	Contrasting two or more data sets or distributions
Criticise	Identifying a weakness in a sampling method or model

Tier 3 Vocabulary (Subject Specific)

Statistical Sampling

Tier 3 Term	Definition / Notes
Population	The entire group being studied
Sample	A smaller group taken from a population
Sampling frame	A list of all members of a population used for sampling
Simple random sample	A sample where every member has an equal chance of selection
Stratified sample	A sample reflecting the proportions of subgroups in a population
Systematic sample	A sample selected at regular intervals from a list
Opportunity sample	A sample taken from those readily available
Bias	A sample that is not representative of the population

Data Presentation and Interpretation

Tier 3 Term	Definition / Notes
Outlier	A value that does not fit the general pattern of the data
Interquartile range	The spread of the middle 50% of the data
Standard deviation	A measure of the spread of data around the mean
Variance	The square of the standard deviation
Skewness	A measure of the asymmetry of a data distribution
Correlation	The strength and direction of a linear relationship between variables
Regression line	A line of best fit used to predict one variable from another

Probability

Tier 3 Term	Definition / Notes
Mutually exclusive	Events that cannot happen at the same time
Independent events	Events where one outcome does not affect another
Conditional probability	The probability of an event given another has occurred
Venn diagram	A diagram showing overlapping sets of outcomes

Tree diagram	A diagram showing outcomes and probabilities of combined events
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Statistical Distributions

Tier 3 Term	Definition / Notes
Discrete random variable	A variable that can take a countable set of values
Binomial distribution	A distribution modelling the number of successes in fixed independent trials
Normal distribution	A continuous, symmetric bell-shaped distribution
Standardised score (z-value)	The number of standard deviations a value is from the mean
Probability density function	A function describing the likelihood of a continuous variable's values

Statistical Hypothesis Testing

Tier 3 Term	Definition / Notes
Null hypothesis	The assumption of no effect or no difference, tested against evidence
Alternative hypothesis	The statement suggesting a genuine effect or difference
Significance level	The threshold probability for rejecting the null hypothesis
Critical region	The set of values that would lead to rejecting the null hypothesis
Test statistic	A value calculated from sample data used to test a hypothesis
One-tailed test	A test considering deviation in only one direction
Two-tailed test	A test considering deviation in both directions

Correlation and Regression

Tier 3 Term	Definition / Notes
Product moment correlation coefficient	A value between -1 and 1 measuring linear correlation
Explanatory variable	The variable used to predict another (independent variable)
Response variable	The variable being predicted (dependent variable)
Extrapolation	Predicting values outside the range of the given data