

Year 9 and 10 Mathematics – Key Word Glossary

Key Words

Number

Indices

1. common factor

A whole number that divides into two (or more) other numbers exactly, eg 4 is a common factor of 8, 12 and 20.

2. denominator

The bottom part of a fraction. For $\frac{5}{8}$, the denominator is 8, which represents 'eighths'.

3. indices

Indices is the plural of index.

4. numerator

The top part of a fraction. For $\frac{5}{8}$, the numerator is 5.

5. reciprocal

The reciprocal of a number is 1 divided by that number. The reciprocal of a fraction is that fraction turned upside down, eg the reciprocal of $\frac{3}{4}$ is $\frac{4}{3}$.

6. root

The root of an equation is the same as the solution to the equation.

7. simplify

A fraction is simplified when there are no more common factors shared by the numerator and denominator. For example, the fraction $\frac{8}{10}$ simplifies to $\frac{4}{5}$ by dividing the numerator and denominator by the common factor of 2.

Standard Form

1. Standard Form (or Scientific Notation): A method of writing numbers using powers of 10.

2. (coefficient): The number that comes before the " $\times 10^n$ ". It must be greater than or equal to 1 and less than 10.

3. 10^n : The power of ten, where 'n' is an integer (positive, negative, or zero).

4. Integer: A whole number (positive, negative, or zero).

5. Positive Exponent (n): Indicates a large number (greater than 1).

6. Negative Exponent (n): Indicates a small number (less than 1).

HCF/LCM and prime factorisation

- Prime Number

A number greater than 1 that has exactly two distinct positive divisors: 1 and itself.

- Prime Factorisation

Breaking a number down into its basic prime number building blocks (e.g. $60 = 2^2 \times 3 \times 5$).

- Venn Diagram

A tool often used to compare the prime factors of two (or more) numbers, aiding in the calculation of HCF and LCM.

- Highest Common Factor (HCF)

The largest number that divides exactly into two or more numbers.

- Lowest Common Multiple (LCM)

The smallest number that is a multiple of two or more numbers.

- Index Notation

A shorthand way of writing repeated multiplication of the same number (e.g. $2 \times 2 \times 2 = 2^3$), especially useful in prime factorisation.

- Multiples and Factors

A foundational concept; multiples are numbers that result from multiplying a number by integers, and factors are numbers that divide into another number exactly.

Fractions

- Equivalent Fractions

Fractions that represent the same value, even though they have different numerators and denominators (e.g. $\frac{1}{2} = \frac{2}{4} = \frac{4}{8}$).

- Improper Fraction

A fraction where the numerator is greater than or equal to the denominator (e.g. $\frac{7}{4}$).

- **Mixed Number**
A number made up of a whole number and a fraction (e.g. $1\frac{3}{4}$).
- **Simplifying Fractions**
Reducing a fraction to its simplest form by dividing the numerator and denominator by their HCF (e.g. $6/8$ simplifies to $3/4$).
- **Common Denominator**
A shared multiple of two or more denominators, needed for adding or subtracting fractions (e.g. $\frac{1}{3} + \frac{1}{4} \rightarrow$ common denominator = 12).
- **Reciprocal**
The flipped version of a fraction; used when dividing fractions (e.g. the reciprocal of $2/3$ is $3/2$).
- **Multiplying and Dividing Fractions**
Key operations in KS4 - multiply straight across; divide by multiplying by the reciprocal.

Percentages

- **Percentage**
A way of expressing a number as a fraction of 100 (e.g. $45\% = 45$ out of $100 = 45/100$).
- **Percentage Change**
The amount something increases or decreases as a percentage of the original value (e.g. increase from 50 to 60 is a 20% increase).
- **Percentage Increase/Decrease**
Applying a percentage to make a value larger or smaller (e.g. increasing £80 by 10% gives £88).
- **Multiplier**
A decimal used to calculate percentage change in one step (e.g. multiplying by 1.2 increases by 20%, multiplying by 0.85 decreases by 15%).
- **Simple Interest**
A fixed percentage added to an amount over time, based on the original amount only.
- **Compound Interest**
A percentage added over time where each new amount includes interest on previous interest.

Reverse Percentages

Finding the original amount before a percentage change occurred (e.g. if 120 is 80% of a number, the original is $120 \div 0.8 = 150$).

Algebra

Writing expressions, substitution and collecting like terms

1. **Terms:** A term is a single number, variable, or a combination of numbers and variables connected by multiplication or division. For example, in the expression $3x + 2y - 7$, $3x$, $2y$, and -7 are all terms.
2. **Coefficients:** A coefficient is the numerical factor that multiplies a variable in a term. For instance, in the term $3x$, the coefficient is 3.
3. **Like Terms:** Like terms are terms that have the same variables raised to the same powers. For example, $5x$ and $-2x$ are like terms, while $5x$ and $5x^2$ are not.
4. **Expressions:** An expression is a mathematical phrase that combines numbers, variables, and operations (addition, subtraction, multiplication, division).
5. **Order of Operations (BODMAS/BIDMAS):** This acronym (Brackets, Orders, Division and Multiplication, Addition and Subtraction) or (Brackets, Indices, Division and Multiplication, Addition and Subtraction) specifies the order in which operations should be performed to correctly simplify an expression.

Expanding single and double brackets

1. **Expanding:** The process of removing brackets by multiplication.
 2. **Single Bracket:** An expression where one term is multiplied by a bracket containing multiple terms.

3. Double Bracket: An expression where two brackets, each containing multiple terms, are multiplied together.
4. Term: A single number, variable, or combination of both, separated by addition or subtraction.
5. Simplify: Combining like terms after expanding brackets.
6. Like Terms: Terms that have the same variable and exponent.
7. Factorisation: The reverse process of expanding brackets

Factorising (simple and quadratic)

Highest Common Factor (HCF): The largest factor that divides into all terms of an expression

- Factorising: The process of rewriting an expression as a product of its factors.
- Expanding: The opposite of factorising, where brackets are multiplied out.
- Coefficient: The numerical part of a term (e.g., 3 in $3x$).
- Constant: A term without a variable (e.g., 6 in $x^2 + 5x + 6$)

Linear Equations (forming and solving)

1. Expression: A combination of numbers, variables, and operations (addition, subtraction, multiplication, division) that does not include an equals sign. For example, $2x + 3$ is an expression.
2. Equation: A statement that two expressions are equal, indicated by an equals sign. For example, $2x + 3 = 7$ is an equation.
3. Variable: A letter or symbol (usually x , y , or z) that represents an unknown value.
4. Coefficient: The number that multiplies a variable in a term. For example, in $2x$, the coefficient is 2.
5. Constant: A number that stands alone without a variable. For example, in $2x + 3$, the constant is 3.
6. Solve: To find the value(s) of the variable(s) that make the equation true.
7. Isolate: To get the variable alone on one side of the equation.
8. Rearrange: To change the position of terms in an equation, often to isolate the variable.
9. Expand: To remove brackets in an expression by multiplying each term inside the bracket by the term outside. For example, expanding $2(x + 3)$ gives $2x + 6$.

10. **Factor:** To find the factors of an expression, which are the terms that multiply together to give the original expression.
11. **Identity:** An equation that is true for all values of the variable. For example, $2x + 3x = 5x$ is an identity.
12. **Linear Equation:** An equation where the highest power of the variable is 1. It can be written in the form $ax + b = c$ where a , b , and c are constants.
13. **Simultaneous Equations:** A set of two or more equations with the same variables. The solution is a set of values that satisfies all equations in the system.

Rearranging Formulae

1. **Subject of the formula:**

The variable that is isolated on one side of the equation, and whose value is to be found.

2. **Inverse operations:**

Operations that reverse the effect of another operation. For example, addition and subtraction are inverse operations, as are multiplication and division, and squaring and taking the square root.

3. **Algebraic manipulation:**

Using rules of algebra to rearrange equations, including adding, subtracting, multiplying, and dividing both sides by the same term, as well as expanding and factorizing.

Isolate:

To get the desired variable on its own, with no other terms or operations affecting it.

Fractions:

When a formula contains fractions, the first step is often to eliminate the fractions by multiplying both sides of the equation by the denominator.

6. **Factorizing:**

A technique used to simplify expressions, especially when the desired variable appears in multiple terms on one side of the equation.

Order of operations:

When rearranging, apply inverse operations in the reverse order of operations (BODMAS).

Solving quadratic equations by factorisation

Quadratic Equation:

An equation of the form $ax^2 + bx + c = 0$, where a , b , and c are constants and $a \neq 0$.

Factorization:

The process of expressing a polynomial as a product of its factors (e.g., $x^2 + 5x + 6$ factors to $(x + 2)(x + 3)$)

Simultaneous equations

Variables:

Unknown values represented by letters (e.g., x , y) in the equations.

Coefficients:

The numerical values that multiply the variables in an equation (e.g., in $3x$, the coefficient is 3).

Elimination:

A method for solving simultaneous equations where one variable is eliminated by adding or subtracting the equations.

Substitution:

A method for solving simultaneous equations where the value of one variable is substituted into another equation to solve for the remaining variable.

Linear Equations:

Equations where the highest power of the variable is 1, and their graphs are straight lines.

Sequences

- **Sequence:** An ordered list of numbers that follow a specific rule or pattern.
- **Term:** Each number in a sequence.
- **Nth Term:** A formula that allows you to calculate any term in a sequence, given its position (n).

- **Term-to-term rule:** Describes how to find the next term in a sequence if you know the previous term.
- **Position-to-term rule:** Describes how to find any term in a sequence based on its position.

Straight Line Graphs

Core Concepts

1. Linear Equation

An equation that represents a straight line when plotted on a graph (e.g. $y=2x+3$).

2. Gradient (Slope)

A measure of how steep the line is; calculated as "rise over run"

3. Y-Intercept

The point where the line crosses the y-axis

4. X-Intercept

The point where the line crosses the x-axis

5. Equation of a Line

Typically written in the form $y= mx + c$, where m is the gradient and c is the y-intercept.

6. Plotting Points

Placing coordinates on a graph to draw a line (e.g. plotting (2, 5)).

Relationships and Properties

7. Parallel Lines

Lines that have the same gradient but different y-intercepts—they never meet.

8. Perpendicular Lines

Lines that intersect at 90° , with gradients that are negative reciprocals

9. Coordinate

A pair of numbers (x, y) that locate a point on a graph.

10. Table of Values

A table used to substitute x-values into an equation to generate corresponding y-values for plotting.

Further Applications

11. Real-Life Graphs

Graphs representing real-world situations like speed-time, cost-distance, or conversions.

12. Rearranging to $y = mx + c$

The skill of manipulating a linear equation into gradient-intercept form for easy graphing.

Shape and Space

Area and Perimeter

- **Perimeter**
The total distance around the outside of a 2D shape; found by adding the lengths of all sides.
- **Area**
The amount of space inside a 2D shape, measured in square units (e.g. cm^2 , m^2).
- **Compound Shapes**
Shapes made from a combination of basic shapes (e.g. rectangles and triangles); area and perimeter are found by splitting the shape into parts.
- **Units of Measurement**
Standard units used for length and area (e.g. cm, m for perimeter; cm^2 , m^2 for area).
- **Formula**
A mathematical rule or equation used to calculate area or perimeter (e.g. Area of a triangle = $\frac{1}{2} \times \text{base} \times \text{height}$).
- **Dimensions**
The measurements (length, width, height) of a shape, crucial for calculating area and perimeter.

Angles in Polygons

- **Interior Angle**
The angle formed between two sides inside a polygon. The sum of

interior angles = $(n-2) \times 180^\circ$ (n - 2) × 180°(n-2)×180°, where n is the number of sides.

- Exterior Angle

The angle formed between a side of a polygon and the extension of its adjacent side. For regular polygons, each exterior angle = $360^\circ \div n$ $360^\circ \div n$.

- Regular Polygon

A polygon with all sides and all angles equal. Key for exploring consistent interior and exterior angles.

- Irregular Polygon

A polygon with sides and/or angles of different lengths and sizes. Often requires angle reasoning rather than formulas.

- Sum of Interior Angles

The total of all interior angles in a polygon, calculated using $(n-2) \times 180^\circ$ (n - 2) × 180°(n-2)×180°.

- Angle Properties

Rules used to find unknown angles, such as "angles on a straight line sum to 180° " or "angles around a point sum to 360° ."

Pythagoras Theorem

- Right-Angled Triangle

A triangle with one 90° angle; Pythagoras' Theorem only applies to this type of triangle.

- Hypotenuse

The longest side of a right-angled triangle, always opposite the right angle.

- Pythagoras' Theorem

A formula used to relate the sides of a right-angled triangle:

$$a^2 + b^2 = c^2$$

where c is the hypotenuse.

Trigonometry

- Right-Angled Triangle

Trigonometry at KS4 typically applies to right-angled triangles, where one angle is exactly 90° .

- **Hypotenuse**
The longest side in a right-angled triangle, opposite the right angle; a key side in all trigonometric ratios.
- **Opposite**
The side opposite the given angle in a right-angled triangle.
- **Adjacent**
The side next to the given angle (but not the hypotenuse) in a right-angled triangle.
- **Sine (sin), Cosine (cos), Tangent (tan)**
The three primary trigonometric ratios used to relate angles to side lengths:

$$\sin(\theta) = \text{opposite} / \text{hypotenuse}$$

$$\cos(\theta) = \text{adjacent} / \text{hypotenuse}$$

$$\tan(\theta) = \text{opposite} / \text{adjacent}$$

- **SOHCAHTOA**
A mnemonic to help students remember the trigonometric ratios:

Sin = Opposite / Hypotenuse

Cos = Adjacent / Hypotenuse

Tan = Opposite / Adjacent

Volume and Surface Area

General Concepts

1. **Volume**
The amount of 3D space a solid object occupies, measured in cubic units (e.g. cm^3 , m^3).
2. **Surface Area**
The total area of all the faces (outer surfaces) of a 3D shape, measured in square units (e.g. cm^2).
3. **Net**
A 2D layout of a 3D shape's surfaces, used to help calculate surface area.

Prisms and Cylinders

4. Prism

A 3D shape with two parallel, congruent bases and rectangular sides (e.g. cuboid, triangular prism).

5. Cross-Section

The constant 2D shape seen when a prism or cylinder is cut perpendicular to its length.

6. Cylinder

A 3D shape with circular cross-sections and a consistent height—treated like a circular prism in volume calculations.

Key Formulas and Terms

7. Total Surface Area

The sum of all outer surfaces of a 3D object, including bases and curved surfaces.

8. Base Area

The area of the base shape of a prism or cylinder, essential for volume calculation.

Handling Data

Set Theory

Basic Terminology

1. Set

A well-defined collection of distinct elements or objects (e.g. $A=\{1,2,3\}$).

2. Element (or Member)

An individual object within a set (e.g. 2 is an element of set A).

3. Universal Set (ξ)

The set that contains all possible elements in a given context.

4. Subset

A set whose elements all belong to another set (e.g. $\{1,2\} \subseteq \{1,2,3\}$ and $\{1,2\} \subseteq \{1,2,3\}$).

5. Complement (A')

The set of all elements in the universal set that are *not* in set A.

Operations with Sets

6. Union ($A \cup B$)

The set of all elements that are in A, or B, or both.

7. Intersection ($A \cap B$)










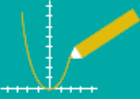













The set of elements that are in *both* sets A and B.

8. Empty Set (\emptyset)

A set with no elements.

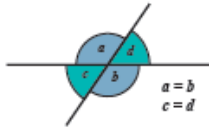
Command Words

Here are the most commonly used command words that you might see in different questions throughout your exam.

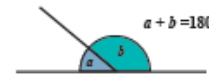
<p>Explain</p> <p>Write a sentence or a mathematical statement to show how you got to your answer or reached your conclusion.</p> 	<p>Show</p> <p>All working needed to get to a given answer or complete a diagram to show given information.</p> 	<p>Expand</p> <p>Remove brackets.</p> 	<p>Describe</p> <p>Write a sentence that gives the features of the situation.</p> 	<p>Justify</p> <p>Show all working and/or give a written explanation.</p> 												
<p>Draw</p> <p>Produce an accurate drawing (unless a sketch is being drawn).</p> 	<p>Find</p> <p>Some working will be needed to get to the final answer.</p> 	<p>Expand and simplify</p> <p>Remove brackets and then collect like terms.</p> 	<p>Complete</p> <p>Fill in missing values.</p> <table border="1" data-bbox="970 757 1107 875"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr> <td></td> <td>-3</td> </tr> <tr> <td>-1</td> <td></td> </tr> <tr> <td>0</td> <td>1</td> </tr> <tr> <td></td> <td>3</td> </tr> <tr> <td>2</td> <td>5</td> </tr> </tbody> </table>	x	y		-3	-1		0	1		3	2	5	<p>Solve</p> <p>Find the solution of an equation or inequality.</p> 
x	y															
	-3															
-1																
0	1															
	3															
2	5															
<p>Draw a sketch of... Sketch</p> <p>Produce a drawing that does not have to be drawn to scale or a graph that is drawn without working out each coordinate.</p> 	<p>Factorise</p> <p>Insert brackets by taking out common factors.</p> 	<p>Work out</p> <p>Some working will be needed in order to get the answer.</p> 	<p>Write down</p> <p>No working is needed.</p> 	<p>Solve algebraically</p> <p>Find the solution of an equation or inequality; algebraic manipulation must be shown.</p> 												
<p>Simplify</p> <p>Simplify the given expression.</p> 	<p>Factorise fully</p> <p>Insert brackets by taking out all the common factors.</p> 	<p>Change</p> <p>Usually convert from one unit to another either using known metric unit conversions or the use of a conversion graph.</p> 	<p>Write</p> <p>No working needed for 1 mark questions. Working may be needed for questions with more than 1 mark.</p> 	<p>Prove</p> <p>More formal than 'show', all steps must be present. In the case of a geometrical proof, reasons must be given.</p> 												
<p>Simplify fully</p> <p>Simplify the given expression. Answer must be given in its simplest form.</p> 	<p>Express</p> <p>Re-write in another form, some working may be needed.</p> 	<p>Give a reason</p> <p>Must be clear and accurate reasons. If the reasons are geometrical then make sure you:</p> <ul style="list-style-type: none"> ✓ provide a reason for each stage of working (if required) ✓ use correct geometric terminology. 	<p>Calculate</p> <p>A calculator and some working will be needed.</p> 	<p>Prove algebraically</p> <p>Use algebra in the proof.</p> 												

Geometric Reasoning Vocabulary

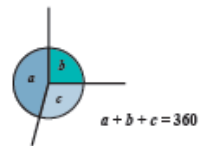
Lines



Vertically opposite angles are equal

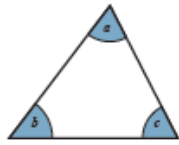


Angles on a straight line add up to 180



Angles at a point add up to 360

Triangles

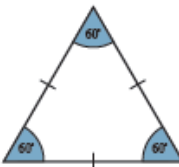


$$a + b + c = 180$$

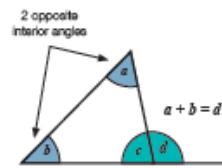
Angles in a triangle add up to 180



Base angles of an isosceles triangle are equal



Angles in an equilateral triangle are equal



2 opposite interior angles
An exterior angle (of a triangle) is equal to the sum of the interior opposite angles

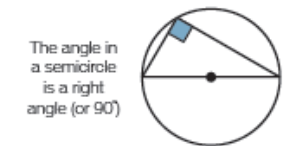
Circle Theorems



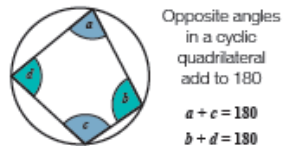
The angle at the centre of a circle is twice the angle at the circumference



Angles in the same segment are equal



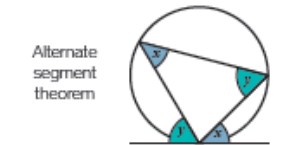
The angle in a semicircle is a right angle (or 90°)



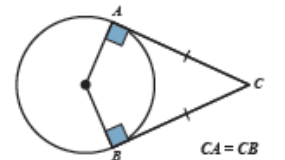
Opposite angles in a cyclic quadrilateral add to 180

$$a + c = 180$$

$$b + d = 180$$

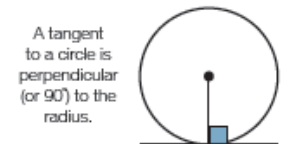


Alternate segment theorem



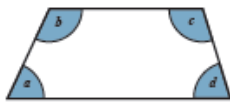
$$CA = CB$$

Tangents to a circle from an external point are equal in length



A tangent to a circle is perpendicular (or 90°) to the radius.

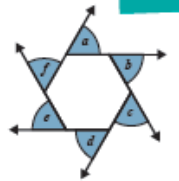
Quadrilaterals



$$a + b + c + d = 360$$

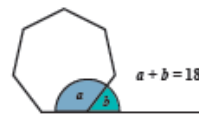
Angles in a quadrilateral add up to 360

Polygons



$$a + b + c + d + e + f = 360$$

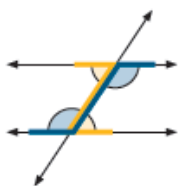
Exterior angles of a polygon add up to 360



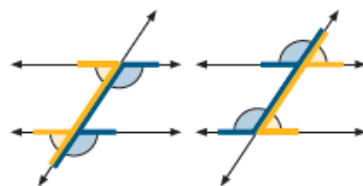
$$a + b = 180$$

The interior and exterior angle of any polygon add up to 180

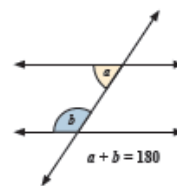
Parallel lines



Alternate angles are equal



Corresponding angles are equal



Allied (or co-interior) angles add up to 180