

## KS3 Mathematics

Mathematics is incredibly important in our lives and, without realising it, we use mathematical concepts, as well as the skills we learn from doing maths problems, every day. The laws of mathematics govern everything around us, and with a good understanding of them, we can accomplish some truly exceptional things.

We want all our students to see the beauty of maths, to be proud of their achievements and be supported by passionate staff through incorporating their ASPIRE learning habits in their mathematical endeavours.

All students will have the opportunity to benefit fully from a broad, balanced and challenging programme, which supports their studies across all subjects. Our overarching aim is to develop the mathematical knowledge of students through the application and study of mathematical concepts, terminology, notation, facts, generalisations, methods and techniques.

### Knowledge Outline for KS3 Maths

We want all students to be willing to try, confident to make mistakes and understand mistakes are part of the learning process. We want to teach students the mathematical skills needed for them to be able to go forward independently and apply them to any problem or context. We will encourage students to be self-reflecting both when answering specific questions and when monitoring their progress. The key stage curriculum forms the foundation of GCSE and we want all students to be numerate, be exposed to problem solving questions and abstract reasoning. We aim to set all work at an appropriate level to both support and challenge as necessary. We will support students to develop extensive subject-specific vocabulary.

# Year 7

Term/Week	Topic	Core Knowledge- Year 7	Key Vocabulary
Autumn Term 1	Sequences	Generate terms of a sequence from term-to-term and position to term rules Plot sequences on cartesian graphs Find the nth term for an increasing linear sequence Find the nth term for a decreasing linear sequence	
2	Place Value	Integers and decimals, ordering positive numbers, using symbols =, ≠, <, >, ≤, ≥ Using number lines rounding dp and sf Multiplying/dividing by powers of 10 extension decimals (covered in numeracy)	Decimal, Integer, Rounding, approximate, powers, Significant figures, Place value and powers of 10
3	Negative Numbers	Addition and subtraction Ordering negative numbers Multiplication, division and Powers of negative numbers	Positive, Negative, Multiply, Divide, Subtract
4	Order of operations	BIDMAS Associativity and non-associativity (practice with brackets) Order of operations using negatives	Multiply , Divide, Order, Powers, Indices
5	Algebraic Expressions	Algebraic notation - ab for $a^*b$ , 3y for $y+y+y$ and $3*y$ , $a^4$ for $a*a*a*a$ , $a^2b$ for $a*a*b$ , collecting like terms Simplifying simple expressions (no brackets) Substitution into formulae (inc negatives)	Formula, Formulae, Expression, Variable, Substitute
Spring Term 6	Number Theory	Multiples and LCM Factors and HCF Prime numbers, product of primes, <i>using venn diagrams for HCF,LCM</i> Squares to $15^2$ and cubes to $10^3$	Common) multiple (Common) factor, Divisible Prime number, Composite number
7	Fractions	Equivalent fractions, proper and improper fractions, complement of a fraction Adding and subtracting fractions Inc mixed Fraction of an amount, one quantity as a fraction of another, find original amount if you know a fraction of it	Fraction Numerator, denominator, Improper fraction, Proper fraction, Proportion, Simplify, Equivalent, Lowest terms, Mixed number
8	Area and perimeter	Rectilinear area, area of triangles and quadrilaterals (incl. kite, parallelogram, trapezium) Ext use fractional lengths Lots of triangles oriented differently, incl where the vertex goes past the end of the base Convert between square centimetres ( $cm^2$ ) and square metres ( $m^2$ )	Perimeter, area, volume, capacity, Square, rectangle, parallelogram, triangle Composite rectilinear Polygon, Length, breadth, depth, height, width
9	Percentages	Calculate Percentage of an amount (using multipliers) Equivalence of FDP, techniques to convert percentages greater than 100 Express one quantity as a percentage of another	Percent, Equivalent Decimal, Numerator, Denominator
10	Single Brackets	Expanding a single bracket including simplifying expressions with more than 1 single bracket Link to substitution but extending with brackets and fractions	Algebra, algebraic, algebraically, Symbol, Expression, Variable, Expand Simplify
11	Algebra form and solve	Solve worded equations Simple one-step solutions (four rules) Two-step solutions (four rules) inc brackets Solve 3 step equations Writing formulae in words and letters Substitution, including inputs and outputs (function machines where necessary)	Algebra, algebraic, algebraically, Symbol, Expression, Variable, Substitute, Equation, Unknown, Enumerate

Term/Week	Topic	Core Knowledge- Year 7	Key Vocabulary
Summer Term 12	Shapes and angles	Angles on a straight line, around a point, vertically opposite Naming, labelling and recognising the features of triangles Angles in a triangle exterior and interior Naming, labelling and recognising the features of quadrilaterals Angles in quadrilaterals angle sum, parallelograms and rectangles Naming and recognising the features of other polygons	Protractor, Measure, Degrees, Right angle, Acute angle, Obtuse angle, Reflex angle, Protractor, Vertically opposite, Construct, Quadrilateral, Square, Rectangle, Parallelogram, (Isosceles) Trapezium, Kite, Rhombus, Delta, Arrowhead Triangle, Scalene, Right-angled, Isosceles, Equilateral, Parallel, Diagonal, Angle
13	Ratio and scale	Ratio notation, expressing relationship as ratios Simplifying ratios Unit ratios, fractions from ratios Dividing a quantity into a ratio Metric and imperial units Convert between Imperial units; e.g. feet and inches, pounds and ounces, pints and gallons Know rough equivalents between inches and cm, feet and cm, kg and lb, pint and ml Scale drawings, maps	Mile, Kilometre, Metric, Imperial, Scale factor, Group, Share, Multiples, Proportion, Quantity, Integer, Metre, centimetre, millimetre, Tonne, kilogram, gram, milligram Litre, millilitre, Hour, minute, second, Inch, foot, yard, Pound, ounce, Pint, gallon
14	Charts and averages	Graphical representations of categorical data - bar charts, pictograms, pie charts Graphical representations of discrete numerical data - vertical line, bar charts, pie charts Measures of central tendency of ungrouped data - mean, mode and median, including from a frequency table Measures of spread – range	Data, Scale, Axis, axes, Graph Frequency, Time graph, Time series, Line graph, Pie chart, Sector, Angle, Protractor, Degrees, Average, Mean, Measure, Data, Statistics
15	Transformations and the coordinate grid	Plotting 2D coordinates in four quadrants Symmetry Rotation, Translation (as a vector), Reflection over lines $y=x$ , $y=k$ $x=k$ Combinations of transformations, including successive translations, Tessellating shapes	2-D, Grid, Axis, axes, x-axis, y-axis, Origin, Quadrant (Cartesian) coordinates Point, Translation, Reflection Transformation, Object, Image Congruent, congruence
16	Nets and Volume	Nets - construct and interpret Construct 3D shapes from given nets Draw accurate nets for common 3D shapes Find all the nets for a cube Volumes and surface area of Cuboids Volumes of composite cuboids	Construct, Sketch, Cube, Cuboid, Cylinder, Pyramid, Prism, Net, Edge, Face, Vertex (Vertices), Visualise, Length, distance, Mass, weight, Volume, Capacity.

# Year 8

Term/Week	Topic	Core Knowledge- Year 8	Key Vocabulary
Autumn Term 1	Place value & Standard form	Write and read large and small numbers in standard form Order numbers in standard form Convert a 'near miss' into standard form; e.g. $23 \times 10^7$ Adding and subtracting in standard form, including distributivity (not multiply and divide)	Standard form, Significant figure Power, Indices
2	Algebra Factorise single bracket and solving	Solve linear equations with the unknown on both sides when the solution is a whole number, fraction, negative Solving equations involving single brackets Factorising into a single bracket Identify common factors (numerical and algebraic) of terms in an expression Factorise an expression by taking out common factors	Product, Variable, Term, Coefficient, Common factor, Factorise, Algebra, algebraic, algebraically, Unknown, Equation, Operation, Solve, Solution, Brackets, Symbol.
3	Fractions	Identify if a fraction is terminating or recurring Multiplying and dividing fractions Fraction of an amount (incl. fractions of fractions) with link to multiplying Reciprocals (multiplicative inverse) Use more complex order of operations questions too, especially where division is presented with a fraction	Fraction, Mixed number Top-heavy fraction, Percentage, Decimal, Proportion, Terminating, Recurring Simplify, Cancel
4	Indices – Positive	Calculating other powers, evaluating numerical expressions with powers. Include type $(0.03)^3$ (link to fractions) Addition and subtraction rules with positive indices, power of zero Simplifying indices and coefficients when multiplying and dividing, include $(2x)^3$ or $(5xy^2)^4$ multiplication rule for indices Roots as inverses of powers	Powers, Indices, Coefficients, Roots
5	Changing the subject	Know the meaning of the 'subject' of a formula Change the subject of a formula when one step is required Change the subject of a formula when two steps are required Could extend into factorising using single bracket to rearrange	Power, Indices, Formula, Formulae, Subject, Change the subject
6	Angles: Parallel Polygons Bearings	Calculate Interior and exterior angles in polygons Angles in parallel lines (alternate, corresponding, cointerior) Bearings Measure and state a specified bearing Construct a scale diagram involving bearings Use bearings to solve geometrical problems	Degrees, Right angle, acute angle, obtuse angle, reflex angle Vertically opposite, Geometry, geometrical, Parallel Alternate angles, Corresponding angles, Interior angle, exterior angle, Regular polygon
Spring Term 7	Constructions Congruence	Identifying congruent shapes by sight Use ruler and compasses to construct the perpendicular bisector of a line segment Use ruler and compasses to bisect an angle Use a ruler and compasses to construct a perpendicular to a line from a point (at a point) Choose techniques to construct 2D shapes; e.g. rhombus Choose techniques to draw triangles leading to SSS,SAS,ASA,RHS Use known facts to form conjectures about lines and angles in geometrical situations Use known facts to derive further information in geometrical situations Test conjectures using known facts Know the structure of a simple mathematical proof Use known facts to create simple proofs Explain why the base angles in an isosceles triangle must be equal	Angle, Bisect, Perpendicular, Congruent, Geometrical, Conjectures, Proof, Isosceles Construct

Term/Week	Topic	Core Knowledge- Year 8	Key Vocabulary
8	Percentages	Identify the multiplier for a percentage increase or decrease when the percentage is greater than 100% Use calculators to increase an amount by a percentage greater than 100% Solve problems involving percentage change Solve original value problems when working with percentages Solve financial problems including simple interest	Percent, percentage, Percentage change, Original amount Multiplier, (Simple) interest
9	Probability	Record, describe and analyse the frequency of outcomes of simple probability experiments Language of probability Theoretical probability - calculating Sum of probabilities of all mutually exclusive events = 1 Generate theoretical sample spaces, including systematic listing of combinations and outcomes, tables and use these to calculate probabilities Experimental probability	Probability, Theoretical probability, Event, Outcome Impossible, Unlikely, Evens chance, Likely, Certain, Equally likely, Mutually exclusive, Exhaustive, Possibility space, Experiment, Sample space
10	Charts and averages	Numerical data - discrete and continuous, Ungrouped and grouped frequency tables calculating Mean, Mode, Median and range Analyse and compare 2 or more data sets Justify and choose appropriate statistical average Plot a scatter diagram of bivariate data Understand the meaning of 'correlation' Interpret a scatter diagram using understanding of correlation	Categorical data, Discrete data Continuous data, Grouped data Table, Frequency table, Frequency, Scale, Graph, Average, Spread, Consistency, Mean, Median, Mode, Range, Statistic, Statistics
11	Quadratics Expand Factorise	Expanding 2 brackets leading to $a = 1$ Factorising a quadratic where $a = 1$ <ul style="list-style-type: none"> <li>• Multiply two linear expressions of the form <math>(x + a)(x + b)</math></li> <li>• Multiply two linear expressions of the form <math>(x \pm a)(x \pm b)</math></li> <li>• Understand the meaning of an identity</li> <li>• Expand the expression <math>(x \pm a)^2</math></li> <li>• Simplify an expression involving '<math>x^2</math>' by collecting like terms</li> <li>• Factorise a quadratic expression of the form <math>x^2 + bx + c</math></li> </ul>	Linear, Quadratic, Expand , Factorise, Term, Variable, Coefficient, Simplify, Expression, Equation, Formulae
Summer Term 12	Ratio and scale	Comparing quantities (value for money, exchange rates, etc) Scaling up/down - recipes Find a relevant multiplier in a situation involving proportion Use fractions fluently in situations involving ratio or proportion Understand the connections between ratios and fractions Understand the meaning of a compound unit Know the connection between speed, distance and time Solve problems involving speed Density when it is necessary to convert quantities in order to use a sensible unit of measure Which is the faster speed: 60 km/h or 10 m/s? Explain why. Changing between units (time, length)	Ratio, Proportion, Proportional, Multiplier, Speed, Unitary method, Units, Compound unit
13	Circles	Circle parts and properties ( radii,diameter, chord, pi) Recall pi to 2 dp Circumference of a circle Area of a circle, always give answers in exact form and rounded Problems with circumference and area of part of a circle - Including semicircles, quarter-circles, compound shapes with circular part (no segments or sectors)	Area , Perimeter, Circle, Centre Radius, diameter, chord, circumference, Pi
14	Volume prism and cylinder	Volume of prisms and cylinders Surface area of prisms and cylinders Calculate exactly with multiples of $\pi$ or round to a specified amount	Prism, Cross-section Cylinder, Polygon, polygonal Solid

Term/Week	Topic	Core Knowledge- Year 8	Key Vocabulary
15	Pythagoras Theorem	Pythagoras' Theorem in 2D Identify the hypotenuse in a right-angled triangle Know when to apply Pythagoras' theorem Calculate the hypotenuse of a right-angled triangle using Pythagoras' theorem Calculate one of the shorter sides in a right-angled triangle using Pythagoras' theorem Explain and use Pythagorean triples	Pythagoras, Theorem Square, Square root Hypotenuse, Pythagorean Triple
16	Transformations – Enlargement	Know the vocabulary of enlargement Use the centre and scale factor to carry out an enlargement with positive integer, fractional and negative scale factor Find the centre of enlargement Find the scale factor of an enlargement Explore how the scale factor changes the area of shapes	Quadrants, Reflection Rotation, Translate, Tesselate, Enlarge, Scale factor, Centre of enlargement

# Year 9

Term/Week	Topic	Core Knowledge- Year 9	Key Vocabulary
Summer Term 1	<b>Place value Standard form</b>	Multiplying and dividing in standard form, including associativity problems and applications, including order of operations SI prefixes and engineering form	Standard form, Significant figure, Power, Indices
2	<b>Algebra sequences</b>	Recognise Fibonacci numbers and sequence Generate Fibonacci type sequences Find the next three terms in any Fibonacci type sequence Substitute numbers into formulae including terms in $x^2$ Generate terms of a quadratic sequence from a written rule and nth term Identify quadratic sequences Find the next three terms in any quadratic sequence Establish the first and second differences of a quadratic sequence to find nth term	Term-to-term rule Position-to-term rule nth term, Generate, Linear, Quadratic, First (second) difference, Fibonacci number Fibonacci sequence
3	<b>Inequalities (Linear)</b>	Understand the meaning of the four inequality symbols Choose the correct inequality symbol for a particular situation Represent practical situations as inequalities Recognise a simple linear inequality Find the set of integers that are solutions to an inequality Use set notation to list a set of integers Use a formal method to solve an inequality Know how to deal with negative number terms in an inequality Know how to show a range of values that solve an inequality on a number line Know when to use an open circle or closed circle at the end of a range of values shown on a number line Use a number line to find the set of values that are true for two inequalities	Linear inequality, Unknown, Manipulate, Solve, Solution set Integer
4	<b>Rearranging formulae</b>	Rearranging non-linear formulae (involving powers and roots)	Power, Indices, Formula, Formulae, Subject, Change the subject
5	<b><math>y=mx+c</math></b>	Representing equations in the form $y = mx + c$ on a Cartesian grid Read gradient using 1 across, 'm' up/down and find y-intercept from a given graph, use these to give the equation in the form $y = mx + c$ . Sketch a graph given the gradient and y-intercept (without plotting a table of values) Calculate the gradient of a line using change in y/change in x Use the form $y = mx + c$ to identify parallel lines Rearrange an equation into the form $y = mx + c$ Find the equation of a line through one point with a given gradient Find the equation of a line through two given points Interpret the gradient of a straight line graph as a rate of change	Sketch, plot, Gradient, y-intercept, x-intercept,
6	<b>Indices Negative and Fractional</b>	Completing the number line - introduction of irrational numbers Negative and fractional indices Addition and subtraction rules with indices Include problems like $8^{x/2} = 2^x$	Powers, Indices, Coefficients, R Roots

Term/Week	Topic	Core Knowledge- Year 9	Key Vocabulary
7	<b>Fractions</b>	Algebraic Fraction arithmetic simplifying algebraic fractions, including numerical factors, single letter factors	Fraction, Mixed number, Top-heavy fraction, Percentage, Decimal, Proportion, Terminating, Recurring, Simplify, Cancel
Spring Term 8	<b>Angles: Parallel Polygons Bearings</b>	Calculate Interior and exterior angles in polygons Angles in parallel lines (alternate, corresponding, co-interior) Bearings Measure and state a specified bearing Construct a scale diagram involving bearings Use bearings to solve geometrical problems	Degrees, Right angle, acute angle, obtuse angle, reflex angle Vertically opposite, Geometry, geometrical, Parallel, Alternate angles, corresponding angles Interior angle, exterior angle Regular polygon
9	<b>Constructions Loci</b>	Understand the meaning of locus (loci) Know how to construct the locus of points a fixed distance from a point (from a line) Identify when a perpendicular bisector is needed to solve a loci problem Identify when an angle bisector is needed to solve a loci problem Know that the shortest distance from a point to a line is the perpendicular Contextual problems - drawing and reading scale drawings Combine techniques to solve more complex loci problems	Angle, Bisect, Perpendicular, Congruent, Geometrical, Conjectures, Proof, Isosceles, Construct, Locus, Loci, Arc
10	Rounding	rounding errors and error intervals (upper and lower bounds of a rounded number) using inequalities Truncating vs. rounding Approximations to calculations calculations with upper and lower bounds, percentage error of these calculations	Inequality, Truncate, Round Minimum, Maximum, Interval Decimal place, Significant figure
11	<b>Simultaneous Equations</b>	Understand that there are an infinite number of solutions to the equation $ax + by = c$ ( $a \neq 0, b \neq 0$ ) Find approximate solutions to simultaneous equations using a graph Solve simultaneous equations by elimination including multipliers for both equations Derive and solve two simultaneous equations Interpret the solution to a pair of simultaneous equations	Equation, Simultaneous equation, Variable, Manipulate, Eliminate, Solve, Derive, Interpret
12	<b>Ratio and proportion</b>	GCSE problems and applications, including fractions in problems Equations in ratio (e.g. $x:x+5 = 4:5$ ) Know the difference between direct and inverse proportion Recognise direct (inverse) proportion in a situation Know the features of a graph that represents a direct (inverse) proportion situation Know the features of an expression (or formula) that represents a direct (inverse) proportion situation Understand the connection between the multiplier, the expression and the graph	Direct proportion, Inverse proportion, Multiplier, Linear, Ratio, Proportion, Proportional, Multiplier
13	<b>Percentages</b>	Identify the multiplier for a percentage increase or decrease when the percentage is greater than 100% Use calculators to increase an amount by a percentage greater than 100% Solve problems involving percentage change Solve original value problems when working with percentages Solve financial problems including simple interest	Percent, percentage, Percentage change, Original amount, Multiplier, (Simple) interest
14	<b>Units And graphing</b>	Compound units - density, pressure, speed, including conversions between compound units Real-life graphs (of all sorts, including distance-time and velocity-time)	Compound, Units, Velocity, Density, Pressure, Speed, Conversion

Term/Week	Topic	Core Knowledge- Year 9	Key Vocabulary
Summer Term 15	<b>Probability</b>	<p>Recording outcomes and possibilities using frequency trees, two-way tables and simple Venn diagrams.</p> <p>Use these diagrams to calculate probabilities</p> <p>Draw and interpret tree diagrams and associated probabilities for independent events</p> <p>Use a tree diagram to calculate probabilities of independent combined events</p> <p>Label a tree diagram with probabilities when events are dependent</p> <p>Use a tree diagram to calculate probabilities of dependent combined events</p> <p>Understand that relative frequency tends towards theoretical probability as sample size increases</p>	<b>Probability, Theoretical probability, Event, Outcome</b> <b>Impossible, Unlikely, Evens chance, Likely, Certain, Equally likely, Mutually exclusive</b> <b>Exhaustive, Possibility space, Experiment, Sample space</b>
16	<b>Quadratics</b> <b>Factorising and expanding</b>	<p>Know how to set up a mathematical argument</p> <p>Pupils should be taught to use the equivalency symbol '<math>\equiv</math>'</p> <p>What is wrong with this statement? How can you correct it? <math>(x + 3)(x + 4) \equiv x^2 + 12x + 7</math>.</p> <p>Jenny thinks that <math>(x - 2)^2 = x^2 - 4</math>. Do you agree with Jenny? Explain your answer.</p> <p>Expanding more than two binomials</p> <p>Factorising the difference of two squares</p> <p>Identify when it is necessary to remove factors to factorise a quadratic expression to simplify to a =1</p> <p>factorising a quadratic where <math>a &gt; 1</math></p>	<b>Product, Variable, Term, Coefficient, Common factor, Factorise, Algebra, algebraic, algebraically, Unknown, Equation, Operation, Solve, Solution, Brackets, Symbol</b>
17	<b>Area segments and sectors</b>	<p>Know how to find arc length</p> <p>Calculate the arc length of a sector when radius is given</p> <p>Know how to find the area of a sector</p> <p>Calculate the area of a sector when radius is given</p> <p>Calculate the angle of a sector when the arc length and radius are known</p> <p>Know the vocabulary of circles</p>	<b>Circle, Pi, Radius, diameter, chord, circumference, arc, tangent, sector, segment</b>
18	<b>Enlargement and similarity</b>	<p>Enlargement (including negative and fractional enlargements)</p> <p>Multiple Transformations and invariance</p> <p>Similarity – triangles missing sides</p> <p>Similarity of length and area, including conversions between square and cube units</p>	<b>Ratio, Similar, Congruent</b> <b>Scale factor, Conversion, Transformation, Invariance</b>
19	<b>Charts and averages</b>	<p>Numerical data - discrete and continuous, Ungrouped and grouped frequency tables calculating Mean, Mode, Median and range</p> <p>Analyse and compare 2 or more data sets</p> <p>Justify and choose appropriate statistical average</p> <p>Plot a scatter diagram of bivariate data</p> <p>Understand the meaning of 'correlation'</p> <p>Interpret a scatter diagram using understanding of correlation</p>	<b>Categorical data, Discrete data</b> <b>Continuous data, Grouped data</b> <b>Table, Frequency table, Frequency, Scale, Graph, Average, Spread, Consistency, Mean, Median, Mode, Range, Statistic, Statistics</b>
20	<b>Similarity and Trigonometry</b>	<p>Similarity – triangles relate to angles</p> <p>Unit circle</p> <p>Plotting ratios 0 to 360</p> <p>Link to Calculator</p> <p>Using trig ratios to calculate sides</p> <p>Using Trig to calculate angles</p>	<b>Sin, Cos , Tan, Pythagoras</b> <b>Opposite, Adjacent, Hypotenuse</b> <b>Ratio</b> <b>Angle</b>