



Year 7 Maths Scope and Sequence

Aim:

Our aim is for all students to develop a mathematical mind and be able to tackle real life problems. In year 7 & 8 students need to move fluently between mathematical concepts. The programme of study for key stage 3 is organised into distinct strands and builds on key stage 2. Connections are to be made to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. Students should apply their mathematical knowledge in science, geography, computing and other subjects. We teach a spiral curriculum maths where every strand is taught each term, the basics are revisited and when children are secure new concepts are introduced.

The scope and sequence comprises objectives from the National Curriculum and ISEB 13+ curriculum.

A minimum of 6 hours of mathematics should be taught each week.

The mathematical strands for year 7 are:

- Number
- Algebra
- Ratio, proportion and rates of change
- Geometry and measures
- Probability
- Statistics



Through the year oral and mental activities

Curriculum Objectives

- Read and write whole numbers in figures and words.
- Multiply and divide whole numbers by 10, 100, 1000.
- Multiply and divide decimals by 10, 100, 1000 and small multiples of 10.
- Count on and back in steps of 0.1, 0.2, 0.25, $\frac{1}{2}$, $\frac{1}{4}$...
- Round whole numbers to the nearest 10 or 100.
- Order, add and subtract positive and negative numbers in context.
- Recognise multiples and use tests of divisibility.
- Know pairs of factors of numbers to 100.
- Know or derive quickly prime numbers less than 30.
- Know or derive quickly squares to at least 12×12 , multiples of 10, 0.1 to 0.9 and the corresponding roots.
- Convert between fractions, decimals and percentages.
- Find fractions and percentages of quantities.
- Know complements of 0.1, 1, 10, 50, 100.
- Add and subtract pairs of numbers, e.g. 76 ± 38 , 760 ± 380 .
- Find doubles and halves of numbers, e.g. 6500, 670, 5.6.
- Use doubling and halving to calculate, e.g. 6×4.5 , 1.38×50 .
- Find two decimals with a sum of 1 or 0.1 (two decimal places).
- Find doubles and halves of decimals and fractions.
- Add several small numbers and find their mean.
- Recall multiplication facts to 12×12 and derive associated division facts.
- Multiply and divide a two-digit number by a one-digit number.
- Use factors to multiply and divide mentally, e.g. 35×12 , $144 \div 36$, 3.2×30
- Use approximations to estimate the answers to calculations, e.g. 39×2.8 .
- Derive answers to calculations, e.g. 60×80 , 0.4×9 .
- Visualise, describe and sketch 2-D & 3-D shapes in different orientations.
- Estimate and order acute and obtuse angles.
- Use metric units (length, area, mass, capacity) and units of time for calculations.
- Use metric units for estimation (length, area, mass, capacity).
- Convert between m, cm and mm, km and m, kg and g, litres and ml.
- Know rough metric equivalents of common imperial units.
- Calculate perimeter and area of rectangles.
- Discuss and interpret graphs.
- Apply mental skills to solve simple problems.



Autumn 1 – Number

Focus: Place value, integers, calculations

Curriculum Objectives

Place value

- Understand and use decimal notation and place value; multiply and divide integers and decimals by 10, 100, 1000, and explain the effect.
- Compare and order decimals in different contexts; know that when comparing measurements they must be in the same units.

Integers & Calculations:

- Understand negative numbers as positions on a number line.
- Order, add and subtract positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥
- Use the 4 operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative.
- Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals (reciprocals will be described in the form $\frac{1}{x}$ and not x^{-1})
- Recognise and use relationships between operations including inverse operations
- Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations (Square and cube roots and powers up to 5 may be tested; candidates should understand that $\sqrt{2} \neq 1.4$).
- Interpret and compare numbers in standard form $A \times 10^n$ $1 \leq A < 10$, where n is a positive or negative integer or 0
- Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 and $\frac{3}{8}$)
- Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures]
- Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$
- Make and justify estimates and approximations of calculations.
- Use standard column procedures to add and subtract whole numbers and decimals with up to two places.
- Solve word problems and investigate in a range of contexts: number; compare and evaluate solutions.
- Enter numbers and interpret the display in different contexts (decimals, percentages, money, metric measures).
- Appreciate the infinite nature of the sets of integers, real and rational numbers
- Round positive whole numbers to the nearest 10, 100 or 1000 and decimals to the nearest whole number or one decimal place.
- Understand addition, subtraction, multiplication and division as they apply to whole numbers and decimals; know how to use the laws of arithmetic and inverse operations.
- Know and use the order of operations, including brackets.
- Consolidate and extend mental methods of calculation to include decimals, fractions and percentages, accompanied where appropriate by suitable jottings; solve simple word problems mentally.

Knowledge:

- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property
- Consolidate the rapid recall of number facts, including positive integer complements to 100 and multiplication facts to 12×12 , and quickly derive associated division facts.
- Know and use the order of operations, including brackets.



Autumn 1 – Number
Focus: Place value, integers, calculations

Curriculum Objectives

Application:

- Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods and resources, including ICT.
- Present and interpret solutions in the context of the original problem; explain and justify methods and conclusions, orally and in writing.
- Check a result by considering whether it is of the right order of magnitude and by working the problem backwards.
- Use a calculator and other technologies to calculate results accurately and then interpret them appropriately

Autumn 2 - Geometry

Curriculum Objectives

Shape:

- Use 2-D representations to visualise 3-D shapes and deduce some of their properties.
- Begin to identify and use angle, side and symmetry properties of triangles and quadrilaterals.
- Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies
- Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures
- Use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles

Angles & Construction:

- Use angle measure; distinguish between and estimate the size of acute, obtuse and reflex angles.
- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings
- Derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line
- Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric
- Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles
- Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids
- Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles
- Understand and use the relationship between parallel lines and alternate and corresponding angles
- Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons
- Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs
- Begin to identify and use angle, side and symmetry properties of triangles and quadrilaterals; solve geometrical problems involving these properties, using step-by-step deduction and explaining reasoning with diagrams and text.

Knowledge:

- Use correctly the vocabulary, notation and labelling conventions for lines, angles and shapes.
- Identify parallel and perpendicular lines; know the sum of angles at a point, on a straight line and in a triangle and recognise vertically opposite angles.
- Use conventions and notation for 2-D coordinates in all four quadrants; find coordinates of points determined by geometric information.



Spring 1 – Algebra

Focus: Sequences, Equations & Formulae

Curriculum Objectives

Formulae & Equations:

- Use and interpret algebraic notation, including:
 - ab in place of $a \times b$
 - $3y$ in place of $y + y + y$ and $3 \times y$
 - a^2 in place of $a \times a$
 - a^3 in place of $a \times a \times a$;
 - $a^2 b$ in place of $a \times a \times b$
 - a/b in place of $a \div b$
 - coefficients written as fractions rather than as decimals
 - brackets
- Substitute numerical values into formulae and expressions, including scientific formulae
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Simplify and manipulate algebraic expressions to maintain equivalence by:
 - collecting like terms
 - multiplying a single term over a bracket
 - taking out common factors
- Expanding products of two or more binomials
- Understand and use standard mathematical formulae; rearrange formulae to change the subject
- Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement)
- Express simple functions in words, then using symbols; represent them in mappings.
- Suggest extensions to problems by asking 'What if...?'; begin
- Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors
- Use letter symbols to represent unknown numbers or variables; know the meanings of the words term, expression and equation.
- Understand that algebraic operations follow the same conventions and order as arithmetic operations.
- Use algebraic methods to solve linear equations in 1 variable (including all forms which require rearrangement)
- use algebraic methods to solve linear equations in 2 variables (including all forms which require rearrangement)
- Develop algebraic and graphical fluency, including understanding linear and simple quadratic functions.
- Simplify and manipulate algebraic expressions by collecting like terms, multiply a single term over a bracket (integer coefficients), taking out common factors, dividing an expression by an integer or by another expression, expanding products of 2 or more binomials.
- Use simple formulae from mathematics and other subjects, substitute positive integers into simple linear expressions and formulae and, in simple cases, derive a formula.
- Identify the necessary information to solve a problem; represent problems mathematically, making correct use of symbols, words, diagrams and tables.
- Recognise, sketch and produce graphs of linear and quadratic functions of 1 variable with appropriate scaling, using equations in x and y and the Cartesian plane
- Use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations.
- Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs
- Interpret mathematical relationships both algebraically and geometrically

Graphing:

- Work with coordinates in all four quadrants
- Recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane
- Interpret mathematical relationships both algebraically and graphically
- Reduce a given linear equation in two variables to the standard form $y = mx + c$; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically



- Use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations
- Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs

Sequences:

- Generate terms of a sequence from either a term-to-term or a position-to-term rule
- Recognise arithmetic sequences and find the n th term
- Recognise geometric sequences and appreciate other sequences that arise
- Generate and describe simple integer sequences.
- Generate sequences from practical contexts and describe the general term in simple cases.
- Generate terms of a sequence either from a term-to-term or a position-to-term rule
- Recognise arithmetic sequences and find the n th term
- Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property
- Recognise the first few triangular numbers, squares of numbers to at least 12×12 , and the corresponding roots.
- Use the square root key.
- Generate terms of a simple sequence, given a rule (e.g. finding a term from the previous term, finding a term given its position in the sequence).
- Generate sequences from practical contexts and describe the general term in simple cases.
- Express simple functions in words, then using symbols; represent them in mappings.
- Generate coordinate pairs that satisfy a simple linear rule; plot the graphs of simple linear functions, where y is given explicitly in terms of x , on paper and using ICT; recognise straight-line graphs parallel to the x -axis or y -axis.
- Solve word problems and investigate in a range of contexts: number and algebra.
- Identify the necessary information to solve a problem; represent problems mathematically, making correct use of symbols, words, diagrams, tables and graphs.

Spring 2 Number (Focus: Fractions, decimals, percentages)

Curriculum Objectives

- Use fraction notation to describe parts of shapes and to express a smaller whole number as a fraction of a larger one; simplify fractions by cancelling all common factors and identify equivalent fractions; convert terminating decimals to fractions e.g. $0.23 = 23/100$; use a diagram to compare two or more simple fractions.
- Define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100% interpret fractions and percentages as operators
- Add and subtract fractions with like and unlike denominators; calculate fractions of quantities and measurements; multiply and divide fractions
- Understand percentage as the 'number of parts per 100'; recognise the equivalence of percentages, fractions and decimals; calculate simple percentage and use percentages to compare simple proportions.
- Interpret fractions and percentages as operators
- Consolidate and extend mental methods of calculation to include decimals, fractions and percentages, accompanied where appropriate by suitable jottings; solve simple word problems mentally.
- Check a result by considering whether it is of the right order of magnitude and by working the problem backwards.
- Break a complex calculation into simpler steps, choosing and using appropriate and efficient operations, methods and resources, including ICT.
- Present and interpret solutions in the context of the original problem; explain and justify methods and conclusions, orally and in writing.



Summer 1 – Ratio, proportion & rates of change

Curriculum Objectives

- Change freely between related standard units [for example time, length, area, volume/capacity, mass]
- Use scale factors, scale diagrams and maps; express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1
- Use ratio notation, including reduction to simplest form
- Divide a given quantity into two parts in a given part:part or part:whole ratio; express the division of a quantity into two parts as a ratio
- Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction
- Relate the language of ratios and the associated calculations to the arithmetic of fractions and to linear functions
- Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics
- Solve problems involving direct and inverse proportion, including graphical and algebraic representations
- Use compound units such as speed, unit pricing and density to solve problems.

Application:

- Check a result by considering whether it is of the right order of magnitude and by working the problem backwards.

Summer 2 - Measures

Curriculum Objectives

- Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)
- Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes
- Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D
- Calculate and solve problems involving: perimeters of 2-D shapes (including circles), areas of circles and composite shapes

Application:

- Interpret mathematical relationships both algebraically and geometrically
- Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms (including cylinders)
- Draw and measure line segments and angles in geometric figures, including interpreting scale drawings



Summer 3 - Statistics & Probability
(Focus: Handling data & probability)

Curriculum Objectives

Statistics:

- Calculate statistics for small sets of discrete data: find the mode, median and range, and the modal class for grouped data.
- Calculate the mean, including from a simple frequency table, using a calculator for a larger number of items.
- Interpret diagrams and graphs (including pie charts), and draw conclusions based on the shape of graphs and simple statistics for a single distribution.
- Describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)
- Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data
- Describe simple mathematical relationships between two variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs
- Solve word problems and investigate in a range of contexts: handling data.
- Given a problem that can be addressed by statistical methods, suggest possible answers.
- Decide which data would be relevant to an enquiry and possible sources.
- Plan how to collect and organise small sets of data; design a data collection sheet or questionnaire to use in a simple survey; construct frequency tables for discrete data, grouped where appropriate in equal class intervals.
- Write a short report of a statistical enquiry and illustrate with appropriate diagrams, graphs and charts, using ICT as appropriate; justify the choice of what is presented.
- Collect small sets of data from surveys and experiments, as planned.
- Construct, on paper and using ICT, graphs and diagrams to represent data, including:
 - bar-line graphs;
 - frequency diagrams for grouped discrete data; use ICT to generate pie charts.

Probability:

- Use vocabulary and ideas of probability, drawing on experience.
- Understand that the probabilities of all possible outcomes sum to 1
- Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams
- Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities
- Understand and use the probability scale from 0 to 1; find and justify probabilities based on equally likely outcomes in simple contexts; identify all the possible mutually exclusive outcomes of a single event.
- Collect data from a simple experiment and record in a frequency table; estimate probabilities based on this data.
- Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0-1 probability scale