

Curriculum overview: Maths (higher tier)

Key Stage 2

Number and Ratio

- To have a good understanding of place value and to be able to round whole numbers to appropriate degrees of accuracy.
- To have a good understanding of negative numbers.
- To use mental and written methods for all four operations.
- To solve multi-step problems in contexts, deciding which operations and methods to use and why.
- To use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.
- To use their knowledge of the order of operations to carry out calculations involving the four operations.
- To identify common factors, common multiples and prime numbers and to apply this knowledge to simplify fractions.
- To add and subtract fractions with different denominators and mixed numbers.
- To multiply simple pairs of proper fractions and to divide proper fractions by whole numbers.
- To compare and order fractions, including fractions > 1 .
- To multiply and divide numbers by a power of 10.
- To multiply one-digit numbers with up to two decimal places by whole numbers.
- To recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.
- To describe positions on the full coordinate grid (all four quadrants).
- To draw and translate simple shapes on the coordinate plane, and reflect them in the axes.
- To solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.
- To solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison.
- To solve problems involving similar shapes where the scale factor is known or can be found.
- To solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.

Algebra

- Simplify expressions by collecting like terms
- Substitute into a simple expression
- Recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3)
- Use simple formulae in words, and express missing number problems algebraically.
- Generate and describe linear number sequences.
- Find possible values in missing number problems and equations involving 1 or 2 unknowns.

Geometry

- To solve problems involving the calculation and conversion of units of measure.
- To use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places.
- To convert between miles and kilometres.
- To recognise that shapes with the same areas can have different perimeters and vice versa.
- To calculate the area of parallelograms and triangles.
- To calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [for example, mm^3 and km^3].
- To draw 2-D shapes using given dimensions and angles.
- To illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius.
- To recognise, describe and build simple 3-D shapes, including making nets.
- To compare and classify geometric shapes based on their properties and sizes.
- To find unknown angles in any triangles, quadrilaterals, and regular polygons.
- To recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.

Statistics and Probability

- To complete, read and interpret information in tables, including timetables
- To solve comparison, sum and difference problems using information presented in a line graph
- To interpret and construct pie charts and line graphs and use these to solve problems.
- To calculate and interpret the mean as an average.

Key skills/content requirements at GCSE			
Number and ratio	Algebra	Statistics and probability	Geometry
<ul style="list-style-type: none"> ▪ Fractions ▪ Percentages ▪ Ratio ▪ Proportion ▪ Fraction, decimal, percentage conversions ▪ Multiples, factors and prime factorisation ▪ Calculations involving currency ▪ Problem solving ▪ Standard Form ▪ Indices ▪ Surds 	<ul style="list-style-type: none"> ▪ Linear and non-linear graphs ▪ Expanding and simplifying ▪ Factorisation ▪ Forming and solving equations ▪ Inequalities ▪ Rearranging formulae ▪ Simultaneous equations ▪ Quadratic expressions and equations ▪ Algebraic proof ▪ Algebraic fractions ▪ Direct and inverse proportionality ▪ Functions ▪ Linear and quadratic sequences 	<ul style="list-style-type: none"> ▪ Theoretical and experimental probability ▪ Independent and dependent events ▪ Conditional probability ▪ Venn diagrams ▪ Sample space diagrams ▪ Scatter graphs ▪ Pie charts ▪ Tree diagrams ▪ Cumulative frequency graphs ▪ Box plots ▪ Histograms ▪ Averages from diagrams and tables ▪ Sampling 	<ul style="list-style-type: none"> ▪ Transformations ▪ Constructions ▪ Pythagoras' theorem ▪ Trigonometry ▪ Congruence and similarity ▪ Angle facts and geometrical reasoning ▪ Vectors ▪ Circle theorems ▪ Perimeter ▪ Area of triangles and quadrilaterals ▪ Circles, sectors and segments ▪ Estimating the area under a curve ▪ Volume and Surface area ▪ Trigonometric graphs ▪ Conversions ▪ Maps and scales

Curriculum Overview/Rationale

Each year students will study topics from each of the strands of the curriculum. The curriculum in year 7, 8 and 9 is skills-based where students will learn about each objective with emphasis on the skill rather than the application to a problem. Throughout the course students will review and build upon the knowledge they had studied in previous terms. Although students encounter topics from each strand only key knowledge is covered by all students in years 7 and 8. Year 9 is an intermediary year where content is still skills based but more advanced content from each strand is introduced and taken further. Only in year 10 and 11 students will begin to apply the knowledge they had learnt previously by encountering more problem-solving content.

	Term 1	Term 2	Term 3	Portable knowledge	Key terms	
Year 7	<p>Number</p> <ul style="list-style-type: none"> ▪ Place value and ordering numbers ▪ Multiplying and dividing numbers by powers of 10 ▪ Calculations with integers, decimals and negatives ▪ Rounding and estimation ▪ Recalling and calculations with prime numbers, square numbers, cube numbers and roots ▪ Using the order of operations to make calculations ▪ Identify common factors, common multiples and prime numbers ▪ To find highest common factor and lowest common multiples by listing and other methods 	<p>Ratio and Proportion</p> <ul style="list-style-type: none"> ▪ Finding fractions of an amount, increasing and decreasing by a fraction and finding the original amount after being increased or decreased by a fraction ▪ Finding percentages, percentage increases and decreases with and without a calculator ▪ Writing and simplifying ratio ▪ Dividing in a given ratio <p>Algebra</p> <ul style="list-style-type: none"> ▪ Expanding single brackets 	<p>Algebra</p> <ul style="list-style-type: none"> ▪ Linear sequences <p>Geometry</p> <ul style="list-style-type: none"> ▪ Time and timetables ▪ Transformations (reflection, rotation and translation) ▪ Reflective and rotational symmetry ▪ Surface area ▪ Angle rules (eg. point, line, triangle, quadrilateral) ▪ Distance-time graphs <p>Statistics and probability</p> <ul style="list-style-type: none"> ▪ Averages and stem and leaf diagrams ▪ Introduction to probability ▪ Representing data using graphs (bar charts, line 	Times tables Written calculations Order of operations Negative numbers Rounding Estimation Types of number HCF LCM Angle facts Time Area Fraction manipulation Fraction operations Metric units	Acute angle Algebra Angle Area Average Axis Brackets Calculate Centilitre (cl) Centimetre (cm) Cube number Cuboid Decagon Decimal Decrease Denominator Difference Distance Equal Equation	Multiple Negative Nonagon Numerator Obtuse angle Octagon Odd number Operation Order Parallel Parallelogram Pentagon Perimeter Perpendicular Polygon Positive number Power Prime Prism Probability

	<ul style="list-style-type: none"> ▪ Writing numbers as a product of its prime factors ▪ Fractions, Decimal, Percentage conversions ▪ Manipulating fractions ▪ Calculations with fractions using all four operations <p>Ratio and Proportion</p> <ul style="list-style-type: none"> ▪ Expressing an amount as a percentage of another <p>Algebra</p> <ul style="list-style-type: none"> ▪ Writing and simplifying expressions ▪ Substitution into expressions and formulae 	<ul style="list-style-type: none"> ▪ Factorising linear expressions with numerical coefficients ▪ Solving linear equations ▪ To use inequality symbols, to represent inequalities on a number line and to write an inequality from a number line ▪ To solve basic inequalities <p>Geometry</p> <ul style="list-style-type: none"> ▪ Naming 2D shapes and its properties using geometrical language ▪ Identifying the most appropriate metric and imperial units and estimating using metric units ▪ Metric conversions ▪ Plotting axes, coordinates and midpoints ▪ Perimeter and area of triangles, quadrilaterals and composite shapes 	<p>graphs, pictograms and scatter graphs)</p>		<p>Equilateral triangle Estimate Even number Expand Expression Factor Factorise Figures Frequency Gram (g) HCF Heptagon Hexagon Increase Integer Kilogram (Kg) Kilometre (Km) LCM Litre (l) Mean Median Metre (m) Millilitre (ml) Millimetre (mm) Mode</p>	<p>Product Quadrilateral Range Ratio Reflex angle Regular Remainder Right angle Rotation Round Scale factor Sequence Share Significant figure Simplify Solve Square number Sum Tally Term Trapezium Triangle Units Value</p>
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<p>Year 8</p>	<p>Number</p> <ul style="list-style-type: none"> ▪ Index laws ▪ Product of primes and finding HCF and LCM from venn diagrams ▪ Using a calculator effectively ▪ Finding the upper and lower bound of integers ▪ To know what the term 'surd' means ▪ Calculations with fractions using all four operations ▪ Converting between mixed and improper fractions ▪ Calculations with mixed numbers using all four operations ▪ Recurring decimals <p>Ratio and proportion</p> <ul style="list-style-type: none"> ▪ Writing and simplifying ratio ▪ Dividing in a given ratio ▪ Direct proportion (including best buys and recipes) ▪ Expressing an amount as a percentage of another ▪ Percentage change ▪ Reverse percentages ▪ Direct and inverse proportion ▪ Currency conversion ▪ Compound measures (S, D, T) <p>Algebra</p> <ul style="list-style-type: none"> ▪ Solving equations ▪ Changing the subject 	<p>Algebra</p> <ul style="list-style-type: none"> ▪ Forming and solving equations ▪ Inequalities ▪ Expanding single and double brackets ▪ Factorising linear expressions with numerical and algebraic coefficients ▪ Plotting graphs of form ($y = a$, $x = a$, $y = x$ and $y = -x$) ▪ To identify gradient and y-intercept from an equation ▪ Plotting linear graphs using a table of values <p>Geometry</p> <ul style="list-style-type: none"> ▪ Angle rules ▪ Angles along parallel lines ▪ Angles in polygons ▪ Enlargement ▪ Describing transformations ▪ Pythagoras' theorem <p>Statistics and probability</p> <ul style="list-style-type: none"> ▪ Probability including expected results and relative frequency ▪ Frequency trees ▪ Probability trees ▪ Venn diagrams ▪ Set notation 	<p>Ratio and proportion</p> <ul style="list-style-type: none"> ▪ Simple proof ▪ Introduction to function notation <p>Geometry</p> <ul style="list-style-type: none"> ▪ Circle terminology ▪ Area and circumference of circles ▪ Nets and 3D drawings ▪ Plans and elevations ▪ Scale drawings ▪ Volume ▪ Similarity and congruence ▪ Introduction to vectors <p>Statistics and probability</p> <ul style="list-style-type: none"> ▪ Two way tables ▪ Pie charts ▪ Types of data ▪ Tally charts and frequency tables ▪ Averages from frequency tables 	<p>Volume Substitution Simplifying expressions Expanding brackets Solving equations FDP conversions Percentages Sequences Frequency tables</p>	<p>Adjacent Circumference Coefficient Congruent Cross section Diameter Formula Gradient Hypotenuse Indices Pi (π) Radius Recurring Segment Solid Speed Symmetrical Transformation Translation Tree diagram Variable Volume X-Axis Y-Axis Y-Intercept</p>
<p>Year 9</p>	<p>Number</p> <ul style="list-style-type: none"> ▪ Calculations with integers and decimals ▪ Powers and roots ▪ Rounding and estimation ▪ Index laws ▪ HCF & LCM ▪ Product of primes and finding HCF and LCM from venn diagrams ▪ Order of operations ▪ Standard form <p>Ratio and proportion</p>	<p>Number</p> <ul style="list-style-type: none"> ▪ Negative and fractional indices ▪ Fractions of an amount and finding original amount ▪ Fractions, Decimal, Percentage conversions ▪ Recurring decimals ▪ Calculations with fractions and mixed numbers <p>Ratio and proportion</p>	<p>Ratio and proportion</p> <ul style="list-style-type: none"> ▪ Percentage increase and decrease (and repeated) ▪ Ratio ▪ Proportion, best buys <p>Algebra</p> <ul style="list-style-type: none"> ▪ Solving quadratics by factorising ▪ Straight line graphs <p>Geometry</p> <ul style="list-style-type: none"> ▪ Area, Perimeter, volume ▪ All transformations 	<p>Indices Pythagoras' theorem Surd Graphs Factorising expressions</p>	<p>Approximate Constant Credit Debit Irrational Modal Natural number Rational Reciprocal Surface area Triangular number</p>

	<ul style="list-style-type: none"> ▪ Writing and simplifying ratio ▪ Dividing in a given ratio ▪ Working with ratio (one part and differences) ▪ Combining ratio ▪ Three-part ratios <p>Algebra</p> <ul style="list-style-type: none"> ▪ Simplifying expressions ▪ Substitution ▪ Expanding and factorising linear & quadratic expressions ▪ Solving linear equations ▪ Forming and solving equations <p>Geometry</p> <ul style="list-style-type: none"> ▪ Vectors ▪ Pythagoras' theorem <p>Statistics and probability</p> <ul style="list-style-type: none"> ▪ Averages ▪ Reverse mean 	<ul style="list-style-type: none"> ▪ Finding percentages, percentage increases and decreases with and without a calculator ▪ Reverse percentages <p>Algebra</p> <ul style="list-style-type: none"> ▪ Plotting linear graphs using a table of values ▪ Simultaneous equations ▪ Linear sequences ▪ Changing the subject ▪ Algebraic proof <p>Geometry</p> <ul style="list-style-type: none"> ▪ Angles ▪ Angles along parallel lines ▪ Trigonometry <p>Statistics and probability</p> <ul style="list-style-type: none"> ▪ Two-way tables ▪ Statistical diagrams ▪ Averages from frequency tables 	<ul style="list-style-type: none"> ▪ Angles in polygons <p>Statistics and probability</p> <ul style="list-style-type: none"> ▪ Scatter graphs ▪ Histograms 		
Year 10	<p>Number</p> <ul style="list-style-type: none"> ▪ Bounds and error intervals <p>Ratio and proportion</p> <ul style="list-style-type: none"> ▪ Percentages ▪ Speed, distance and time <p>Algebra</p> <ul style="list-style-type: none"> ▪ Plotting linear and non-linear functions ▪ Factorising and solving quadratics ▪ Completing the square ▪ Quadratic graphs, roots and turning points ▪ Inequalities <p>Geometry</p> <ul style="list-style-type: none"> ▪ Conversion graphs ▪ Distance-time graphs ▪ Circles, arcs and sectors ▪ Volume and surface area of cylinders, spheres, pyramids and cones ▪ Equation of a line 	<p>Ratio and proportion</p> <ul style="list-style-type: none"> ▪ Simplifying and writing ratio ▪ Dividing in a given ratio ▪ Proportion ▪ Compound measures <p>Algebra</p> <ul style="list-style-type: none"> ▪ Circle graphs ▪ Recognising different types of graphs ▪ Quadratic formula ▪ Simultaneous Equations ▪ Inequalities ▪ Functions ▪ Algebraic fractions <p>Geometry</p> <ul style="list-style-type: none"> ▪ Reflection, rotation and translation ▪ Exact trigonometric values ▪ Graphs of trigonometric functions ▪ Pyramids and cones 	<p>Number</p> <ul style="list-style-type: none"> ▪ Surds <p>Ratio and proportion</p> <p>Algebra</p> <ul style="list-style-type: none"> ▪ Expanding triple brackets ▪ Changing the subject <p>Geometry</p> <ul style="list-style-type: none"> ▪ Enlargement ▪ Describing transformations ▪ Advanced trigonometry ▪ 3D Pythagoras ▪ 3D Trigonometry ▪ Length, Area and Volume scale factors ▪ Bearings ▪ Scale drawings ▪ Constructions <p>Statistics and probability</p> <ul style="list-style-type: none"> ▪ Probability ▪ Probability tree diagrams 	<p>Trigonometry</p> <p>Averages</p> <p>Interquartile range</p>	<p>Bearing</p> <p>Bisect</p> <p>Bound</p> <p>Cumulative frequency</p> <p>Distribution</p> <p>Error interval</p> <p>Frequency density</p> <p>Histogram</p> <p>Inter-quartile range (IQR)</p> <p>Justify</p> <p>Loci</p> <p>Locus</p> <p>Quadratic equation</p> <p>Random sampling</p>

	<ul style="list-style-type: none"> Trigonometry <p>Statistics and probability</p> <ul style="list-style-type: none"> Cumulative frequency Box Plots Statistical diagrams 	<p>Statistics and probability</p> <ul style="list-style-type: none"> Histograms Stratifies sampling Capture/Recapture 	<ul style="list-style-type: none"> Set notation Venn diagrams Product rule for counting 		
Year 11	<p>Number</p> <ul style="list-style-type: none"> Surds <p>Algebra</p> <ul style="list-style-type: none"> Graphs of simultaneous equations Simultaneous equations Inequalities Functions Algebraic fractions Iteration <p>Geometry</p> <ul style="list-style-type: none"> Circle theorems Angle problems Coordinate geometry Circle geometry Types of graphs Advanced Trigonometry <p>Statistics and probability</p> <ul style="list-style-type: none"> Sampling Capture/Recapture Cumulative frequency Box Plots Histograms 	<p>Algebra</p> <ul style="list-style-type: none"> Exponential growth and decay Graph transformations Gradient and area under a curve' Algebraic proof <p>Geometry</p> <ul style="list-style-type: none"> Vectors Geometric proof Similarity and Congruence Constructions and Loci 3D Trigonometry & Pythagoras 	<p>Bespoke revision plan of content based on each individual class</p>		<p>Arc Chord Tangent Theorem</p>

GCSE External assessment:

All content is assessed at the end of Year 11. The written examinations are made up of 3 examination papers, two calculator and one non-calculator. Each paper is equally weighted. Each lasts 1 hour 30 minutes and is marked out of 80. Students are awarded grades based on the 9-1 grading system (with 9 being the best grade).

Each examination is available at two tiers. Teachers will use internal class assessments to decide which tier is most appropriate for each student.

Tier	Available Grades
Higher	9-4
Foundation	1-5

SMSC in the mathematics

Through various projects, mini investigations and activities built into lessons, SMSC (Spiritual, Moral, Social and Cultural) is being delivered in high quality lessons.

What we offer:

- A classroom environment which encourages problem solving, collaborative work and enjoyment of exploring real-life problems.

- Participation in extra-curricular activities such as the UK Schools Mathematics Challenges, Maths Enrichment Days, Mathematics Revision Sessions, and Maths Club for students who want to extend themselves and have fun in mathematics

Spiritual development in mathematics

We encourage pupils to see the awe and wonder that can be found within mathematics – from the symmetry of a snowflake or the number of seeds in a sunflower head to the design of galaxies and the coordinates of a newly discovered planet. Pupils are introduced to famous mathematicians, some of whom are also well-known as philosophers. There is a sense of wonder in the exactness of mathematics and students are able to gain a sense of personal achievement in solving problems.

Moral development in mathematics

We look at the use and interpretation of data, particularly the use of statistics and how people manipulate them to promote their own (biased) opinions. Pupils are encouraged to discuss the use and misuse of data in all issues, including those supporting moral arguments, and consider the use of questionnaires to conduct opinion surveys.

Social development in mathematics

Pupils are regularly asked to work in pairs or small groups during experimental or investigative work where they are able to develop both their problem solving and teamwork skills. They are given many opportunities to discuss their ideas and are encouraged to develop their mathematical reasoning through communication with others. Through the use of peer- assessment pupils are able to improve their use of language and better understand how to give constructive criticism.

Cultural development in mathematics

Students are able to explore the mathematics found and used in other cultures. They are introduced to symmetrical patterns, number systems and mathematical methods such as patterns found in Islamic art and Roman numerals. Students are introduced to the culturally and historically significant art of code-breaking and theorems devised by famous mathematicians.