KS 3-4 Mathematics Curriculum

Curriculum statement

Our curriculum in Mathematics forms a backbone to our ethos statement. Examples of how our curriculum supports the ethos statement are by providing real stretch and challenge and opportunities for collaborative thinking, as well as space for independent thought and creative solutions. Students are explicitly taught strategies to solve problems and are encouraged by teacher modelling to be able to express themselves in Mathematical language. The school uses the National Curriculum as the basis for the teaching and learning of Mathematics.

Intent

We aim to create the very best Mathematicians. We encourage students to involve themselves in critical thinking, brainstorm new ideas and techniques. We do this by quality first teaching which ensures students understand underlying Mathematical principles and can apply them in a variety of familiar and unfamiliar contexts. We teach content in its totality and constantly refer to the 'why' techniques work, inspiring students to make connections between ideas and topics. We facilitate students to relate their learning with other subjects and familiarize themselves with cross curricular links of Mathematics.

Implementation

Our curriculum is focussed on embedding challenges, metacognition, memory techniques and enhancing maths learning, whilst also developing literacy skills. This is enabling us to define the core knowledge our students need to master. In Mathematics we also implement our curriculum through using a variety of teaching approaches and tasks such as treasure hunts, relay tasks, competitive game based activities and problem solving as well as more traditional skills practice and skill checkers. Key skills and knowledge are constantly revisited and key terminology is regularly embedded within lessons and in the written work that our students produce. Students are challenged to build on fundamental concepts by structured extension activities.

Impact

• To develop a passion for mathematics for students to continue throughout their school life and beyond, whilst building curiosity about the mathematics around us and asking about 'why' and 'how' concepts arise.

• To reason mathematically through lines of enquiry, conjecturing relationships and generalisations, developing arguments through justifications and proof using mathematical language.

• To become fluent with the fundamentals of mathematics, through varied, frequent practice and increasingly complex concepts over time, so that students can develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

• To be able to problem solve by applying mathematics to a variety of routine and non-routine problems, with increasing sophistication. Breaking down problems into a series of simpler steps and persevering in seeking solutions in order to promote independence, resilience and perseverance through rich-tasks.

• To build on the mathematics that has been taught previously to enable students to master key skills and make rapid progress.

• To be inclusive and meet all students' needs to ensure that all learners are able to access the curriculum and achieve, but also to challenge and engage the most able students, encouraging them to study Maths and related courses beyond GCSE and A Level, at University and through their career ambitions.

• To be able to be self-sufficient in managing their personal finances beyond secondary school.

• To foster a culture where the most able students act as mentors for younger students encouraging a real sense of a Maths community in school.

• To cultivate an enthusiasm for Maths, and develop application skills, through relevant and related trips and extra-curricular activities.

Mathematics Programme

Year 7

Number

- Write numbers in words and figures including decimal numbers
- Decimal notation and place value
- Arrange decimal numbers in order
- Multiply and divide decimals by 10, 100 and 1000
- Add and subtract using mental, written and calculator methods
- Use negative numbers in real life context
- Know how to use calculator to solve problems with mixed operations
- Use fractions to describe parts of a whole
- Find equivalent fractions
- Simplify fractions
- Adding, subtracting, multiplying and dividing fractions
- Convert between fractions, decimals & percentages
- Find fraction of a quantity
- Find percentages of amounts
- Round to whole numbers and to decimal places
- Use order of operations to carry out operations related to calculations involving mixed operations and indices
- Multiply and divide whole numbers without a calculator
- Use a calculator for complex calculations
- Performing all four operations involving integers and decimals
- Find factors and multiples of a number
- Find squares and square roots
- Recognise prime numbers
- Find Highest common factor and lowest common multiple of numbers
- Solving problems using mental maths and calculators
- Use mental methods to multiply and divide decimal numbers
- Use a standard method to multiply a decimal number
- Use a standard written method to divide a decimal number
- Use a calculator for calculations
- Interpret the answer given on a calculator

Geometry

- Measure lengths in cm and mm
- Convert between cm and mm
- Calculate perimeters
- Calculate areas of rectangles, triangles and parallelograms
- Recognise and name different types of angles
- Estimating the size of acute, obtuse and reflex angles
- Measure and draw angles to the nearest degree and lines to the nearest mm
- Estimating and calculating problems involving measuring
- Recognising parallel and perpendicular lines
- Use angle facts to work out unknown angles
- Calculating the sum of angles on a point, triangle and straight line
- Recognise and name different types of triangles
- Recognise and name different types of quadrilaterals
- Draw shapes accurately using a ruler and protractor
- Reflect shapes in a mirror line
- Rotate shapes about a point
- Recognise and describe line symmetry and rotational symmetry
- Recognise and describe translations
- Tessellate shapes
- Draw triangles and quadrilaterals accurately using a ruler and protractor
- Use and construct a scale drawing
- Know various 3D shapes and their names
- Count the vertices, faces and edges of a 3D shape
- Use isometric paper to draw 3D shapes
- Find the surface area and volume of 3D shapes
- Draw and identify nets of 3D shapes
- Using the correct geometrical terms
- Solving Geometrical problems using triangles, quadrilaterals and other polygons

ALGEBRA

- Using letters to represent numbers
- Simplifying expressions
- Use and write a formula
- Read and plot coordinates in four quadrants
- Use a formula to complete a table of values
- Plot points from the table of values
- Draw a graph and use it to estimate an unknown value
- Multiply and divide algebraic expressions
- Find the values needed to balance equations
- Solve an equation by adding or subtracting on both sides
- Solve an equation by multiplying or dividing on both sides
- Solve two step equations
- Continue a sequence
- Find a rule to describe a sequence of numbers
- Use a rule to find the terms in a sequence
- Generate sequences from patterns of shapes

Ratio and Proportion

- Write a proportion as a fraction or percentage
- Increase or decrease two quantities using direct proportion
- Use ratio to compare two quantities
- Solve problems involving ratio and proportion

Statistics

- Understand and draw different kinds of bar chart
- Understand pie charts
- Understand and draw line graphs
- Find averages and range from a list of data
- Collect data and recognize a good questionnaire
- Organise data using tally charts and frequency tables
- Compare data from lists or represented in diagrams

Probability

- Use words to describe different probabilities
- Know the meaning of the words trial, outcome and event
- Understanding probability terms such as likely, unlikely, impossible, probably
- Use the scale 0 to 1 for placing probabilities
- Use equally likely outcomes to find the theoretical probabilities
- Use an experiment to estimate experimental probabilities
- Estimating probability from a simple experiment
- Comparing probabilities
- Identify a set
- Complete and interpret a Venn diagram

Year 8

Number

- Order and compare decimals
- Add, subtract, multiply and divide integers
- Recognise and use multiples and factors
- Use divisibility tests
- Find the prime factor decomposition of a number
- Find the lowest common multiple and highest common factor of numbers
- Recognise and use cube and square numbers, cube and square roots
- Understand, compare and order decimals
- Convert between fractions, decimals and percentages
- Order fractions
- Add, subtract, multiply and divide fractions
- Find a fraction of a quantity
- Express one number as a fraction of another
- Calculate percentages of amounts
- Express one number as a percentage of another
- Round numbers
- Use a range of mental strategies for addition, subtraction, multiplication and division
- Multiply and divide a number by 10,100,1000 and 0.1 and 0.01
- Solve problems using mental strategies by breaking the problems down into smaller steps
- Develop standard written methods for addition, subtraction, multiplication and division
- Use the order of operations
- Solve problems using standard method of addition, subtraction, multiplication and division

Geometry

- Use appropriate units to measure length, mass and capacity
- Know rough metric equivalents to imperial units
- Read and interpret scales
- Calculate area and perimeter of rectangles and triangles
- Calculate area of parallelograms and trapeziums
- Work with angles at a point and on a line
- Work with angles in a triangle
- Work with angles on parallel and intersecting lines
- Recognise quadrilaterals and know their properties
- Know and use some properties of polygons
- Recognise congruent shapes
- Reflect, rotate and translate 2D shapes
- Transform 2D shapes using combinations of transformations
- Recognise reflection and rotation symmetry
- Enlarge a 2D shape
- Construct triangle and quadrilaterals accurately
- Construct angle bisectors, perpendicular bisectors and perpendicular lines
- Describe the locus of a point and draw it accurately
- Use bearings to specify directions
- Use scale drawings to represent real life objects
- Recognise and name 3D solids and recognise their nets
- Use isometric paper and draw plans and elevations of 3D shapes
- Calculate the surface area and volume of cuboids
- Calculate the volume of prisms

Algebra

- Using and interpreting algebraic notation
- Substitute into simple algebraic expressions
- Use indices to simplify expressions and simplify by collecting like terms
- Expand brackets
- Substitute into formulae
- Construct a formula for different situations
- Draw a straight line graph of a function

- Recognise the equations of sloping lines and lines parallel to the axes
- Interpret and draw real life graphs
- Construct and interpret simple line graphs for time series
- Solve simple, one step equations
- Solve multi step equations including with the unknown on the both sides
- Solve equations including with brackets
- Solve real life equations
- Find and use the term to term rule in a sequence
- Find and use the position to term rule in a sequence
- Use sequences in context and in real life
- Recognise and describe geometric sequences

Ratio and Proportion

- Simplify and use ratios
- Solve problems involving direct proportion
- Calculate a percentage of an amount
- Calculate a percentage increase or decrease
- Use fractions, decimals and percentages to compare simple proportions and solve problems

Statistics

- Identify and collect data
- Construct pie charts
- Construct bar charts and frequency diagrams
- Calculate statistics for sets of discrete and continuous data
- Construct scatter diagrams and understand correlation
- Draw and interpret stem and leaf diagrams

Probability

- Use diagrams and tables to record mutually exclusive outcomes
- Find probabilities based on equally likely outcomes
- Calculate the probability that an event does not occur from the probability that it does occur
- Estimate probabilities by collecting data from an experiment
- Compare experimental probabilities with theoretical probabilities
- Use the language of sets and use sets to calculate probabilities

Year 9

Number

Working with Integers

- Basic calculations
- Order pf operations
- Inverse operations

Properties of integers

- Types of numbers
- Prime factors
- Multiples and factors

Working with fractions

- Equivalent fractions
- Using the four operations with fractions
- Fractions of quantities

Working with decimals

- Review of decimals and fractions
- Calculating with decimals

Rounding and Estimation

- Approximate values
- Approximation and estimation
- Limits of accuracy

Percentages

- Review of percentages
- Percentage calculations
- Percentage change

Powers and roots

- Index notation
- The laws of indices

Standard form

- Expressing numbers in standard form

Geometry

Properties of polygons and 3D objects

- Types of shapes
- Symmetry
- Triangles
- Quadrilaterals
- Properties of 3D objects

Angles

- Angle facts
- Parallel lines and angles
- Angles in triangles
- Angles in polygons

Perimeter

- Perimeter of simple and composite shapes
- Circumference of a circle
- Problems involving perimeter and circumference

Area

- Area of polygons
- Area of circles and sectors
- Area of composite shapes
- 3D objects and their nets
- Drawing 3D objects

- Plan and elevation views

Congruence

- Congruent triangles
- Applying congruency

Similarity

- Similar polygons
- Similar triangles
- Enlargements

Pythagoras' theorem

- Finding the length of the hypotenuse
- Finding the length of any side
- Proving whether a triangle is right angled

Trigonometry

- Trigonometry in right angled triangles

Algebra

Basic Algebra

- Algebraic notation
- Simplifying expressions
- Expanding single brackets
- Factorising expressions
- Solving problems using Algebra

Further Algebra

- Multiplying two binomials

Equations

- Solving Linear Equations
- Simultaneous equations
- Using graphs to solve equations

Functions and Sequences

- Sequences and patterns
- Finding the nth term
- Functions
- Special sequences

Formulae

- Writing formulae
- Substituting values into formulae
- Changing the subject of the formula

Inequalities

- Expressing inequalities
- Number lines

- Solving inequalities

Graphs of linear functions

- Plotting graphs
- Gradient and intercepts of straight line graphs
- Working with straight line graphs

Interpreting Graphs

- Graphs of real world problems
- Gradients

Graphs of other functions and equations

- Review of linear graphs
- Quadratic functions
- Other polynomials and reciprocals
- Plotting, sketching and recognising graphs

Ratio and proportion

Ratio

- Introducing ratios

- Sharing a given ratio
- Comparing ratios

Proportion

- Direct proportion
- Algebraic and graphical representations
- Inverse proportion

Units and measure

- Standard units of measurement
- Compound units of measurement

Statistics

Collecting, interpreting and representing data

- Population and samples
- Tables and charts
- Pie charts
- Line graphs for time series data

Analysing data

- Averages and range
- Misleading graphs
- Scatter diagrams

Probability

Basic probability

- The probability scale
- Calculating Probability
- Experimental probability
- Mixed probability problems

Pupils embark upon their GCSE programme which focuses on the key strands for Mathematics. Pupils adopt a mastery approach as opposed to a spiral approach where they focus on a particular area for a much longer period then move to the next with regular revisiting taking place to ensure embedded knowledge.

Year 10 Foundation

Number

Rounding and estimation

- Limits of accuracy

Powers and roots

- Working with powers and roots

Standard form

- Calculators and standard from

- Working in standard form

Geometry

Area and Perimeter

- Area and perimeter of sectors

3D Objects

- 3D objects and their nets
- Drawing 3D objects
- Plan and elevation views

Units and measurement

- Standard units of measurement
- Compound units of measurement
- Maps, scale drawings and bearings

Volume and Surface Area

- Volume and Surface Area of prisms and cylinders
- Volume and surface area of cones and spheres
- Volume and surface area of Pyramids

Transformations in a plane

- Reflect, rotate, translate and enlarge shapes

Constructions and Loci

- Construct shapes using geometrical instruments
- Loci and applying skills using loci

Similarity

- Similar triangles and polygons

Congruence

- Congruent triangles and applying congruency

Pythagoras' theorem

- Finding the length of the hypotenuse using Pythagoras' theorem
- Finding the length of any side using Pythagoras' theorem
- Proving whether a triangle is right angled
- Using Pythagoras' theorem to solve problems

Trigonometry

- Trigonometry in right angles triangles
- Exact values of trigonometric ratios
- Solving problems using trigonometry

Algebra

Further Algebra

- Factorising quadratic expressions
- Solving word problems involving quadratic expressions

Equations

- Solving quadratic equations
- Solving Simultaneous equations
- Using graphs to solve equations

Functions and sequences

- Finding the nth term
- Special sequences

Formulae

- Writing formulae
- Substituting values into formulae
- Changing the subject of the formula
- Working with formulae

Inequalities

- Expressing Inequalities
- Number lines
- Solving linear inequalities
- Working with Inequalities

Graphs of linear functions

- Plotting Graphs
- Gradients and intercepts of straight line graphs
- Parallel lines
- Working with straight line graphs

Ratio and proportion

Ratio

- Introducing ratios
- Sharing a given ratio
- Comparing ratios

Proportion

- Direct proportion
- Inverse proportion
- Algebraic and graphical representations of direct and inverse proportion

Statistics

Analysing data

- Averages and range

Probability

Basic Probability

- Calculating probability
- Experimental Probability
- Mixed Probability problems

Year 10 Higher

Number

Working with decimals

- Converting recurring decimals to exact fractions

Rounding and estimation

- Limits of accuracy

Powers and roots

- Working with powers and roots

Standard form

- Calculators and standard from

- Working in standard form

Geometry

Area and Perimeter

- Area and perimeter of sectors

3D Objects

- 3D objects and their nets
- Drawing 3D objects
- Plan and elevation views

Units and measurement

- Standard units of measurement
- Compound units of measurement
- Maps, scale drawings and bearings

Volume and Surface Area

- Volume and Surface Area of prisms and cylinders
- Volume and surface area of cones and spheres
- Volume and surface area of Pyramids

Transformations in a plane

- Reflect, rotate, translate and enlarge shapes

Constructions and Loci

- Construct shapes using geometrical instruments
- Loci and applying skills using loci

Similarity

- Similar triangles and polygons

Congruence

- Congruent triangles and applying congruency

Pythagoras' theorem

- Finding the length of the hypotenuse using Pythagoras' theorem
- Finding the length of any side using Pythagoras' theorem
- Proving whether a triangle is right angled
- Using Pythagoras' theorem to solve problems
- Pythagoras' theorem in three dimensions
- Use Pythagoras' theorem to solve problems

Trigonometry

- Trigonometry in right angles triangles
- Exact values of trigonometric ratios
- Solving problems using trigonometry
- The sine, cosine and area rules
- Using trigonometry to solve problems

Algebra

Further Algebra

- Factorising quadratic expressions
- Solving word problems involving quadratic expressions
- Algebraic fractions
- Apply your skills

Equations

- Solving quadratic equations
- Solving Simultaneous equations
- Using graphs to solve equations

Functions and sequences

- Finding the nth term
- Special sequences

Formulae

- Writing formulae
- Substituting values into formulae
- Changing the subject of the formula
- Working with formulae

Inequalities

- Expressing Inequalities
- Number lines and set notation
- Working with Inequalities
- Solving Linear Inequalities
- Graphing Linear Inequalities

Graphs of linear functions

- Plotting Graphs
- Gradients and intercepts of straight line graphs
- Parallel lines
- Working with straight line graphs

Ratio and proportion

Ratio

- Introducing ratios
- Sharing a given ratio
- Comparing ratios

Proportion

- Direct proportion
- Inverse proportion
- Algebraic and graphical representations of direct and inverse proportion
- Directly proportional to the square, square root and other expressions
- Inversely proportional to the square, square root and other expressions

Statistics

Collecting interpreting and representing data

- Cumulative frequency graphs and histograms

Analysing data

- Averages and range

Probability

Basic Probability

- Calculating probability
- Experimental Probability
- Mixed Probability problems

Year 11 Foundation

Number

Working with numbers

- Apply systematic listing strategies including use of the product rule for counting

Growth and Decay

- Simple and compound growth
- Simple and compound decay

Geometry

Vector Geometry

- Vector notation and representation
- Vector arithmetic
- Mixed Practice

Algebra

Graphs of linear functions

- Plotting graphs

Interpreting Graphs

- Graphs of real world contexts
- Gradients

Graphs of other functions and equations

- Review of linear graphs
- Quadratic functions
- Other polynomials and reciprocals
- Plotting, sketching and recognising graphs

Probability

Further Probability

- Combined events
- Theoretical probability of combined events

Year 11 Higher

Number

Working with numbers

- Apply systematic listing strategies including use of the product rule for counting

Growth and Decay

- Simple and compound growth
- Simple and compound decay

Surds

- Approximate and exact values
- Manipulating Surds
- Working with surds

Geometry

Circles

- Review of parts of a circle
- Circle theorems and proofs
- Applications of circle theorems

Vector Geometry

- Vector notation and representation

- Vector arithmetic
- Mixed Practice
- Using vectors in geometric proofs

Pythagoras' theorem

- Pythagoras' theorem in three dimensions
- Using Pythagoras' theorem to solve problems

Trigonometry

- The sine, cosine and area rules
- Using trigonometry to solve problems

Algebra

Further Algebra

- Algebraic fractions
- Apply your skills

Equations

- Finding approximate solutions by iteration
- Using equations and graphs to solve problems

Functions and sequences

- Finding the nth term
- Special sequences
- Functions
- Composite functions
- Inverse functions

Graphs of linear functions

- Plotting graphs
- Gradients and intercepts of straight line graphs
- Parallel lines

- Working with straight line graphs

Interpreting Graphs

- Graphs of real world contexts
- Gradients
- Areas under graphs

Graphs of other functions and equations

- Review of linear graphs
- Quadratic functions
- Other polynomials and reciprocals
- Plotting, sketching and recognising graphs
- Exponential and trigonometric functions
- Circles and their equations

Transformations of curves

- Quadratic functions and parabolas
- Trigonometric functions
- Other functions
- Translation and reflection problems

Statistics

Collecting, interpreting and representing data

- Cumulative frequency graphs and histograms
- Box plots

Probability

Further Probability

- Combined events
- Theoretical probability of combined events
- Conditional probability