Mathematics @ Caedmon

National curriculum for Mathematics: Purpose of study

Mathematics is a creative and highly interconnected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject

Aims of the National curriculum for Mathematics

The national curriculum for mathematics aims to ensure that all students:

- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that students develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Mathematics is an interconnected subject in which students need to be able to move fluently between representations of mathematical ideas. The programme of study for key stage 3 is organised into apparently distinct domains, but students should build on key stage 2 and connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge in science, geography, computing and other subjects.

Decisions about progression should be based on the security of students' understanding and their readiness to progress to the next stage. Students who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content in preparation for key stage 4. Those who are not sufficiently fluent should consolidate their understanding, including through additional practice, before moving on.

Aims of our Caedmon curriculum for Mathematics

The maths department has developed a curriculum to make mathematicians of all of our students. The main aim of this curriculum is to help promote an understanding of Mathematics in our students by increasing the coherence between topics. We promote resilience and independent thinking at every opportunity. In turn, this will develop a love of learning and encourage our students to be the best they can be.

Foundation learning – what the National Curriculum expects students to have studied in Mathematics by the end of KS3

Number

Students should be taught to:

- understand and use place value for decimals, measures and integers of any size
- order 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 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
- use the four 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
- 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
- interpret and compare numbers in standard form A x 10^n, 1≤A10
- work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and 2 7 or 0.375 and 8 3)
- 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
- use standard units of mass, length, time, money and other measures, including with decimal quantities
- 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
- use a calculator and other technologies to calculate results accurately and then interpret them appropriately
- appreciate the infinite nature of the sets of integers, real and rational numbers.

Algebra

Students should be taught to:

- use and interpret algebraic notation, including:
    - ab in place of a × b
    - 3y in place of y + y + y and 3 × y
    - a^2 in place of a × a,
    - a^3 in place of a × a × a;
    - a^2b in place of a × a × b
    - $\frac{a}{b}$ in place of a ÷ 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)
- 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
- 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.

Ratio, proportion and rates of change

Students should be taught to:

- 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.

Geometry and measures

Students should be taught to:

- 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
- 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
- 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
- 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
- use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles
- use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D
- interpret mathematical relationships both algebraically and geometrically.

Probability

Students should be taught to:

- 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
- 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.

Statistics

Students should be taught to:

- 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.

Year 7 Mathematics @ Caedmon

Our aim is to instill a passion and a love for the subject in each student. We will model a range of methods so that each student can develop their mathematical thinking in a way that works for them. During key stage 3 you will study five main topic areas; Number, Algebra, Geometry, Ratio & proportion and Statistics. We will use all the skills you have picked up from Primary and apply them to new ideas to extend your knowledge further. We design our lessons to be engaging and enjoyable for all through using a variety of teaching resources, puzzles and games.

	Topics, themes and skills covered	Assessment
Autumn 1	Sequences Understand and use algebraic notation Equality and equivalence	Each block of knowledge is divided into a series of small learning steps. These small related chunks of mathematical knowledge are designed to cover the curriculum content over the course of 5 years. At the end of each block there will be an end of block assessment and feedback lesson in order to ensure that any mistakes and misconceptions are addressed effectively. At the end of each term students will complete an assessment to cover all blocks. Year 7s can also expect a baseline assessment in the first half term, although this is nothing to be worried about as it involves no preparation, it just helps us to inform our planning for the year and to help improve any gaps in learning.
Autumn 2	Place value and ordering integers and decimals Fraction, decimal and percentage equivalence	
Spring 1	Solving problems with addition and subtraction Solving problems with multiplication and addition Fractions and percentages of amounts	
Spring 2	Operations and equations with directed numbers Addition and subtraction of fractions	
Summer 1	Constructing, measuring and using geometric notation Developing geometric reasoning	
Summer 2	Developing number sense Set and probability Prime numbers and proof	

Year 8 Mathematics @ Caedmon

Our aim in Year 8 is to help promote an understanding of Mathematics in our students. Each unit of work aims to build on previously taught knowledge and introduces new concepts to solve problems, so that students can understand Maths to be a coherent subject full of linked ideas and structures, and not isolated facts to be memorised.

	Topics, themes and skills covered	Assessment
Autumn 1	Ratio and scale	End of block mini assessment
	Multiplicative change	End of block mini assessment
	Multiplying and dividing fractions	End of block mini assessment
Autumn 2	Working in the Cartesian plane	End of block mini assessment
	Representing data	End of block mini assessment
	Tables and probability	End of block mini assessment + End of term assessment
Spring 1	Brackets, equations and inequalities	End of block mini assessment
	Sequences	End of block mini assessment
	Indices	End of block mini assessment
Spring 2	Fractions and percentages	End of block mini assessment
	Standard index form	End of block mini assessment
	Number sense	End of block mini assessment + End of term assessment
Summer 1	Angles in parallel lines and polygons	End of block mini assessment
	Area of trapezia and circles	End of block mini assessment
	Line symmetry and reflection	End of block mini assessment
Summer 2	The data handling cycles	End of block mini assessment
	Measures of location	End of block mini assessment + End of term assessment

Year 9 Mathematics @ Caedmon

Our aim in Year 9 is to help promote an understanding of Mathematics in our students. Each unit of work aims to build on previously taught knowledge to solve new problems, so that students can understand Maths to be a coherent subject full of linked ideas and structures, and not isolated facts to be memorised.

	Topics, themes and skills covered	Assessment
Autumn 1	Straight Line Graphs	End of block mini assessment
	Forming and solving equations	End of block mini assessment
	Testing conjectures	End of block mini assessment
Autumn 2	3D shapes	End of block mini assessment
	Constructions and congruency	End of block mini assessment + End of term assessment
Spring 1	Numbers	End of block mini assessment
	Using percentages	End of block mini assessment
	Maths and money	End of block mini assessment
Spring 2	Deductions	End of block mini assessment
	Rotation and translation	End of block mini assessment
	Pythagoras' Theorem	End of block mini assessment + End of term assessment
Summer 1	Enlargement and similarity	End of block mini assessment
	Solving ratio and proportion problems	End of block mini assessment
	Rates	End of block mini assessment
Summer 2	Probability	End of block mini assessment
	Algebraic representation	End of block mini assessment + End of term assessment

Year 10 Mathematics @ Caedmon

Our aim in Year 10 is to extend the knowledge built up in KS3 and start to use the fundamentals of Mathematics in new topics in order to begin preparing students for GCSE.

	Topics, themes and skills covered	Assessment
Autumn 1	Congruence, similarity and enlargement Trigonometry	End of block mini assessment End of block mini assessment
Autumn 2	Representing solutions of equations and inequalities Simultaneous equations	End of block mini assessment End of block mini assessment + End of term assessment
Spring 1	Angles and bearings Working with circles Vectors	End of block mini assessment End of block mini assessment End of block mini assessment
Spring 2	Ratios and fractions Percentages and interest Probability	End of block mini assessment End of block mini assessment End of block mini assessment + End of term assessment
Summer 1	Collecting, representing and interpreting data Non calculator methods	End of block mini assessment End of block mini assessment
Summer 2	Types of number and sequences Indices and roots Manipulating expressions	End of block mini assessment End of block mini assessment End of block mini assessment + End of term assessment/GCSE trial paper

Year 11 Mathematics @ Caedmon

Our aim in Year 11 is to tackle the most advanced topics in details, before moving on to exam practice to help develop students independent learning skills - learning to prepare revision, plan a study timetable and organise workload are key life skills which we support our students with whilst revising for Maths. Tackling the most advanced GCSE topics in this year also allows us to develop retention of the skills that were learnt previously and are required in solving problems mathematically.
This scheme of work is for our Year 11 and the 'units' refer to Edexcel units which can be found here
H Higher Paper
F Foundation

	Topics, themes and skills covered	Assessment
Autumn 1	**Unit 18: Vectors and Geometric Proof (H)** **Unit 18: Fractions, Indices and Standard Form (F)** **Unit 19: Congruence, Similarity and Vectors(F)**	Preparing for the GCSE with use of exam papers during lesson time. GCSE style check in. No specific revision required as it is diagnostic - we want to see where everyone is at and to inform individual revision plans for students. Trial exams, GCSE style paper with revision list released in advance.
Autumn 2	**Unit 19: Proportion and Graphs (H)** **Unit 20: More Algebra**	
Spring 1	**Revision**	Trial exams. GCSE style paper but no topic list released (as would happen in the real exam in Summer). Instead, a range of revision resources will be released to help guide students to prepare in advance. Preparing for the GCSE with use of exam papers during lesson time.
Spring 2	**Revision**	
Summer 1	**Revision**	Preparing for the GCSE with use of exam papers during lesson time.
Summer 2	**Revision**	