Subject: Mathematics

Curriculum vision

At Avonbourne, we have designed a Maths curriculum that will equip students to tackle the challenges they will face in later life. Through opportunities to be successful with maths, we hope students will leave us confident in tackling life without the maths anxiety so many adults feel.

We see maths as a holistic subject that continually develops and builds on the early knowledge that is learnt and not just a collection of individual topics. Our curriculum is designed so that students go through school adding to their maths 'toolkit', gaining new knowledge, skills and methods but understanding how these fit within the whole. Through regular retrieval and practice, students can develop their confidence and flourish with this exciting and endless subject.

Much thought has gone into the structure of our curriculum and how it is sequenced. This allows students to always feel confident and prepared with the base knowledge needed to tackle new ideas. Problem solving is a major part of maths. All maths questions are an opportunity to solve a problem, unpicking what needs to be done and which knowledge and parts of the toolkit need to be used. We look to develop this skill in students, giving them the resilience to persevere when correct answers are not immediately obtained. This we hope will contribute to equipping them for the challenges they may face in a wide variety careers. This reflects the school values that form such an important aspect of life at Avonbourne. Opportunities for independent practice allow students the time to master these skills and build their knowledge base ready to take on the next layer of the subject. As we add these new layers, the required base knowledge is revisited and refreshed to give students that feeling of confidence and success in beginning to work with new ideas. This we believe will give students the resilience and confidence to tackle problems independently, whilst also recognising that is acceptable to make mistakes and that these form an important learning opportunity.

By creating a supportive and safe environment in the classroom, students will have the confidence to try new ideas, learn new concepts and develop their knowledge and understanding of the subject.

We know that success in anything helps breed confidence and enjoyment. This is how we want to approach maths at Avonbourne. If the students have early success, they will continue to enjoy lessons and feel equipped to take on new challenges. This allows them to progress with maths and see what a fascinating and useful subject it is.

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Curriculum Overview

Term 1	Autumn 1	Why this? Why now?	Autumn 2	Why this? Why now?
Year 7	Numerical Skills Order of operations Introduction to Algebra	Understand and use place value for decimals. Calculations with negative numbers. Estimate calculations by rounding. Solve calculations requiring understanding of B-I-DM-AS (know that the inverse of squaring is 'square rooting') Introduce the concept of algebra, simplify expressions, manipulate expressions through simple one step rearranging, substitute positive and negative integers into expressions, solve simple one step equations. Substitute and solve.	Primes, Factors and Multiples Expanding and Factorising 1 Addition and Subtraction Perimeter	Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple. Simplify and manipulate algebraic expressions to maintain equivalence by multiplying a single term over a bracket or by taking out common factors. Use Addition and Subtraction, including formal written methods, applied to integers, decimals. Calculate and solve problems involving perimeters of rectangles and compound shapes (not circles). Converting metric units of length.
Year 8	Powers and Roots Prime Factorisation Rounding Fractions	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. Use the concepts and vocabulary of prime numbers, factors (or divisors), common factors, prime factorisation, including using product notation and the unique factorisation property (HCF and LCM with large numbers taught in 9.04) Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures] Multiply and divide fractions and mixed numbers	Solving Equations Coordinates and basic graphs Units of measurement	Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement). Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs Coordinates and developing algebraic relationships Use standard units of mass, length, time, money and other measures, including with decimal quantities
Year 9	Decimal Manipulation Estimation and Limits of accuracy Related Calculations HCF & LCM of large numbers Fraction Calculations	Apply all four operations using non calculator methods when working with decimals, this includes both dividing a decimal by an integer and dividing a number by a decimal. Use rounding in order to complete estimations (rounding to both one significant figure and applying sensible rounding), using inequality notation to write error	Algebraic Manipulation Index Laws Standard Form Expanding & Factorising	Collecting like terms and simplifying expressions involving all four operations, the identity symbol, adding fractions with algebraic numerators, multiplying and dividing simple algebraic fractions. Working with the laws of indices, this includes negative and fractional indices, using index notation for integer powers of 10, including negative powers.

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		intervals from both rounding and truncation.		Converting between ordinary numbers and standard form.
		Recognise and use relationships between operations in order to write down the answer to a related calculation from a given calculation.		Calculating with standard form including multiplication, division, addition and subtraction.
		Use prime factor decomposition and Venn diagrams in order to find the HCF and LCM of large values.		Expanding double brackets, factorising quadratics (where the coefficient of x^2 is 1), difference of two squares.
		Apply all four operations using non calculator methods when working fractions and mixed numbers involving different denominators, finding the fraction of an amount, writing one number as a fraction of another and to find the reciprocal of an integer, decimal or fraction.		
Year 10	Rearrange formulae Solving Equations Linear Graphs Linear simultaneous equations Volume	Rearranging formulae key skill extending algebra. Important knowledge to have as subject is taken to higher levels. Applications to science and using formulae. Simultaneous equations introduced as a key problem-solving method. Linear graphs and gradients prepares students for extending into real life graphs and their interpretation. Leads into gradients of curves and gradient function at A Level. This is important hierarchical knowledge; students need the base knowledge to be able to move on. Recap from KS3 finding volume of prisms including cylinders.	Compound measures Quadratic Graphs Quadratic Algebra Further graphs	Compound measures linked from science. Quadratics introduced as next order of equation that can be solved. Using factorisation and quadratic formulae to solve quadratic equations. Using calculator methods to plot graphs, apply substitution to plot graphs.
Year 11	Pythagoras Right angled trigonometry Bearings and scale drawings Algebraic Proof Quadratic equations Functions Iteration Quadratic Inequalities	Introduces formal proof, important for taking the subject beyond GCSE. Function work generalises further. Builds on algebra rules and methods such as substitution. Quadratic equations extended and solved using different methods, key problem-solving concept.	Transformations Congruence Circle Theorems Further Trigonometry	Builds on circle geometry Extends trigonometry to applications for any triangle and links to work with bearings.

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Year 12	Algebra and Functions Coordinate Geometry Statistical Sampling	Consolidates higher GCSE knowledge, extending understanding to more complex examples. Introduces sampling element of statistics	Trigonometry Data Presentation Kinematics	Consolidates higher GCSE knowledge, extending understanding to more complex examples. Introduces new course area of mechanics. Problem solving here links with algebra and functions work of pure maths.
Year 12 FM	Algebra and Functions Coordinate Geometry Trigonometry Statistical Sampling Data Representation	Consolidate higher GCSE knowledge, extending understanding with more complex examples.	Kinematics Complex Numbers Forces Further Algebra Differentiation	Introduces new course area of mechanics. Problem solving here links with algebra and functions work of pure maths. Work on gradient function introduced.
Year 13	Differentiation Functions Moments Forces at any angle	Extends differentiation work from Year 12. Gives knowledge of additional methods to differentiate and wider range of functions. Functions builds on GCSE knowledge of functions, extending understanding of composite and inverse functions. This also introduces knowledge of range and domain of functions. Moments introduces turning forces and the forces work extends to include forces applied at angles.	Trigonometry Integration	Continues to build understanding of trigonometry from Year 12. Increases knowledge base to include more complex trig functions and identities. Integration builds on foundation from Year 12, giving new methods to integrate increasingly more complex functions.
Year 13 FM	Integration Linear Transformations Proof by Induction Discrete Random Variables Poisson Distribution Geometric and Negative Binomial Distributions	Extend knowledge of integration from A Level course. Introduce more proof methods and more formal mathematical proof. Statistical distributions introduced for discrete variables. Knowledge of discrete data extending from A Level.	Complex Numbers Vectors Methods in Calculus Series Momentum and Impulse Work, energy and power	Knowledge of complex numbers extended from Y12 work. Further methods in calculus introduced giving knowledge of differentiating and integrating more complex functions.

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Term 2	Spring 1	Why this? Why now?	Spring 2	Why this? Why now?
Year 7	Mean Multiplication and Division Area of triangles and quadrilaterals	Describe, interpret and compare observed distributions of a single variable through the use of the mean. Use Multiplication and Division, including formal written methods, applied to integers, decimals. Derive and apply formulae to calculate and solve problems involving area of triangles and quadrilaterals. Converting metric units of area.	Fraction Manipulation Adding and Subtracting Fractions Comparing and Ordering Fractions Fractions of amounts	Express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1 Use addition and subtraction, including formal written methods, applied to proper and improper fractions, and mixed numbers. Compare and order fractions by creating common denominators. Interpret fractions as operators in equations.
Year 8	Angles in parallel lines Circumference Direct Proportion	Understand and use the relationship between parallel lines and alternate and corresponding angles Calculate and solve problems involving perimeters of 2-D shapes (including circles) and composite shapes Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction	Fractions, decimals and percentages Percentage Calculations Ratio	Converting between fractions, decimals and percentages. Solve problems involving percentage change (calc and non calc), including: percentage increase, decrease, original value problems and simple interest in financial mathematics. Using multipliers. Writing numbers as percentages of other numbers. 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
Year 9	Forming expressions & substitution Direct and Inverse Proportion Probability	Substitution into algebraic formulae, basic functions - inputs and outputs, use algebra to show expressions are equivalence, know the difference between an equation and an identity. Use proportion to answer problems involving exchange rates and best buys. Introduction to inverse proportion, interpret conversion graphs. Describe probability using the probability scale, calculate expected outcomes, mutually exclusive outcomes, experimental probabilities, probability from two way tables, sample spaces, samples, set notation and Venn diagrams. Product rule for counting.	Solving equations Inequalities Sequences	Solve linear equations which contain brackets, fractional coefficients, negativ signs, negative solutions. Solving linear equations in one unknown with unknowns on both sides, solving equations that require fraction manipulation. Solve linear inequalities in one variable, represent and interpret solutions sets on a number line, solve two inequalities in one variable and compare to see which value(s) satisfy both. Recognise and use the sequence of triangular, square and cube numbers. Generate terms of a term-to-term sequence. Find the nth term of a linear sequence, use the nth term of a linear sequence to determine whether a given number is in that sequence.

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Year 10	Probability Statistics	Probability covered in depth. Further work developing the knowledge of the statistical elements of the maths curriculum. Key statistical method for predicting and modelling. Proportion builds on previous numerical work and links with algebra and equations.	Ratio and Proportion Growth and decay Recurring Decimals	Builds on previous work on ratio and percentages. Proportion builds on previous numerical work and links with algebra and equations. Percentages builds on calculator methods.
Year 11	Statistics Vectors Similar Shapes Constructions and Loci	Further work developing the knowledge of the statistical elements of the maths curriculum. Introduction of vectors and their pure maths application. This area is developed further at A Level.	Gradients and areas under curves Kinematics Graphical transformations	Extends gradients and straight line graph work and applies to curves. Introduces beginning of gradient function seen at A Level.
Year 12	Further Algebra Differentiation Probability Forces	Algebra continues to build on previous knowledge. This will then be applied in problem solving contexts within exam questions. Probability revisits the topic from GCSE, covering much of the same content.	Vectors Sequences and Series	Vectors builds on GCSE knowledge of this topic. Sequences builds on GCSE by formalising notation and introducing the concept of series. This gives students the knowledge to work with a variety of sequences and calculate sums of series.
Year 12 FM	Statisical Distributions and Hypothesis Testing Integration Vectors 2D and 3D Exponentials and Logs Probability	Integration builds on foundation from Year 12, giving new methods to integrate increasingly more complex functions. Probability revisits the topic from GCSE, covering much of the same content.	Kinematics 2 Partial Fractions Binomial Expansion Sequences and Series	Partial fractions and binomial expansion build on the knowledge of algebra, giving students further tools to apply to problem solving questions in other areas. Sequences builds on GCSE by formalising notation and introducing the concept of series. This gives students the knowledge to work with a variety of sequences and calculate sums of series.
Year 13	Regression and Correlation Probability Normal Distribution	Regression and correlation formalises use of lines of best fit and how they can be used and applied with data. Normal distribution introduces our first continuous distribution.	Numerical Methods Parametric Equations Projectiles Further Kinematics	Numerical methods draws on knowledge of rearranging formulae and differentiation to allow estimates of solutions to equations to be found that would otherwise not be solvable.
Year 13 FM	Polar Coordinates Hyperbolic Functions Volumes of Revolution Hypothesis Testing Central Limit Theorem Chi squared tests	Polar coordinates introduced to give knowledge of alternative coordinate system. Volumes of revolution extend integration into 3 dimensions. Further knowledge of statistical distributions gained.	Differential Equations Elastic strings and springs Elastic collisions in one and two dimensions Probability Generating Functions Quality of Tests	Focus on statistics and mechanics. Statistics gives further understanding of how statistical tests can be interpreted.

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Term 3	Summer 1	Why this? Why now?	Summer 2	Why this? Why now?
Year 7	Polygons Angles Coordinates	Derive, describe and illustrate properties of triangles, quadrilaterals and other plane figures [for . Describe, sketch and draw regular polygons, and other polygons that are reflectively and rotationally symmetric example, equal lengths and angles] using appropriate language and technologies. Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles. Read and plot coordinates in all 4 quadrants. Coordinates and developing algebraic relationships. Find midpoints. Understand how coordinates link to basic graphs of y=a, x=a, y=x and y=-x	Time	Using clocks, converting between analogue and digital time, calculating with time, using timetabkes, using calendars, converting units of time.
Year 8	Area of circles and trapezia Statistics (presenting and interpreting data) Averages and Spread	Derive and apply formulae to calculate and solve problems involving area of circles (including part circles) and trapezia. Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, vertical line (or bar) charts and stem and leaf for ungrouped and grouped numerical data Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers).	3D visualisation Volume	Understanding of 3D shapes leading into volume topic.
Year 9	Pythagoras Interior and Exterior Angles Vectors 1 Transformations 1	Use Pythagoras' Theorem to find missing sides in a right-angled triangle and to find the distance between two points. Justify whether a triangle with three given sides in right-angled or not. To calculate interior and exterior angles of (regular) polygons, find the total angle sum of a given polygon. To use column vectors, addition and subtraction of column vectors and interpretation of diagrammatic vectors. To identify whether a pair of column vectors are equal or not. Reflection and rotational symmetry, understand all 4 Transformations - rotation, reflection, translation, enlargement (with a positive scale factor), identify the equation of a line of symmetry	Plans and Elevations Arcs and Sectors Surface Area	Construct plans and elevations of 3D shapes, draw sketches of 3D solids from plans and elevations. Define all parts of a circle and know key definitions including, tangent, arc, sector and segment. Use the formula for area and circumference of a circle to find the area of circle and sectors and calculate the circumference and arc lengths of circles. Sketch the nets of cuboids and prisms. Find the surface areas of cuboids, pyramids, spheres, cones and composite solids.

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Year 10	Statistics Surds Bounds	Statistics work looks at representing data in variety of ways and shows the most appropriate for different data sets. Introduces surds as important concept in working with exact values and avoiding rounding errors.	Right angled trigonometry Similar shapes Quadratic sequences	Introduces important area of trigonometry. Builds foundation of basics to allow further extension in Y11. Extends sequences work to introduce more complex number sequences.
Year 11	GCSE revision programme – developed to suit the requirements of individual students and classes			
Year 12	Statistical Distributions Hypothesis Testing Integration	Stats in this term starts to look at how distributions and models can be applied to data to make predictions. The hypothesis testing introduces how these can be interpreted and used.	Exponentials and Logarithms Partial Fractions Binomial Expansion	Knowledge of logarithms is introduced as the inverse of exponents. Laws here are linked to the knowledge students already have of the indices laws. Partial fractions and binomial expansion build on the knowledge of algebra, giving students further tools to apply to problem solving questions in other areas.
Year 12 FM	Functions and Modelling Trigonometry Differentiation Moments	Functions builds on GCSE knowledge of functions, extending understanding of composite and inverse functions. This also introduces knowledge of range and domain of functions. Moments introduces turning forces and the forces work extends to include forces applied at angles.	Forces Regression and Correlation Probability Normal Distribution Projectiles	Statistics work builds on existing statistical knowledge, introducing first continuous distribution.
Year 13	A Level revision programme – developed to suit the requirements of individual students and classes			
Year 13 FM	A Level revision programme – developed to suit the requirements of individual students and classes			

Extracurricular Opportunities (competitions, associations and clubs)	**Revision Guides**
Maths Challenge Club – opportunity to work through extension problems and enter the UKMT Maths Challenge competitions	CGP revision guides and workbooks

Academic Reading

Humble Pi by Matt Parker
The Hidden Maths of Sport by Rob Eastaway
The Simpsons and their mathematical secrets by Simon Singh
Ben Sparks talks
Youtube: Numberphiles
Nrich website