Avonbourne Boys' & Girls' Academies
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Subject Mathematics

Curriculum vision

At Avonbourne Academies 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, students will leave us confident in tackling life without the maths anxiety so many adults feel. We see maths as a hierarchical subject that continually develops and builds on the foundational powerful knowledge. Our curriculum is designed so that students are continually adding to their maths 'toolkit', not just gaining new knowledge, skills and methods but also understanding how these fit within the whole. Through regular retrieval and practice, students can develop their confidence and flourish with this exciting and extensive subject.

The sequencing of our curriculum supports students to always feel confident and prepared with the base knowledge needed to tackle new problems, we have also sequenced the topics in such a way to avoid misconceptions developing. 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. 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 foundational knowledge is revisited and refreshed to give students that feeling of confidence and success in beginning to work with new ideas. We believe this will give students the resilience and confidence to tackle problems independently.

We know that success in anything helps breed confidence and enjoyment. This is our approach Maths at Avonbourne Academies. 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.

Curriculum Overview

Term 1	Autumn 1	Why this? Why now?	Autumn 2	Why this? Why now?
Year 7	- Place value and Number sense - Addition and Subtraction - Perimeter - Rounding & Estimation (in real life situations)	To consolidate knowledge of addition and subtraction, and applying this to calculating perimeter.	- Multiplication and Division - Factors and Multiples - Area of rectangles, triangles and parallelograms	Knowledge of multiplication and division is consolidated, followed by application to calculating area. Factors and multiples build on earlier understanding of multiplication from primary school.

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Year 8	• Indices • Prime Factorisation • Rounding • Fractions Negative Numbers	Prime factorisation builds on knowledge and understanding of indices Key skill of fractions ready for application to other areas later on in the curriculum.	• Linear Equations • Coordinates and Basic Graphs	Students develop key skills and method of solving equations Understanding of coordinates supports further application in graph and algebra work later on.
Year 9	• Place value and number properties • Decimals • Rounding and Estimation • Indices, powers and roots • Factors, multiples and primes • Ratio	Builds on study from Year 8, by revisiting and extending this knowledge. Key concept of ratio and link to fractions topic.	• Fractions, decimals and percentages • Fractions • Percentages • Proportion	Develops understanding of different representations of same values, this is structured by a closer focus on each area following overview.
Year 10	• Rearrange formulae • Linear Graphs • Compound measures	Rearranging formulae is a key skill when extending algebra topic, which is fundamental when studying Maths at a higher level. This also links to science where formulae are continually used. Linear graphs and gradients prepares students for next level, this 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.	• Quadratic Graphs • Linear simultaneous equations • Further graphs • Expanding and Factorising	Simultaneous equations introduced as a key problem solving method. Quadratics introduced as next order of equation that can be solved. Expanding and factorising links to key values on 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 builds on algebra rules and methods such as substitution. Quadratic equations extended and solved using different methods which is a key problem solving concept.	• Transformations • Congruence • Circle Theorems • Further Trigonometry	Knowledge of circle geometry is built on in this unit. Trigonometry is further extended to applications for any triangle and links to work with bearings.
Year 12 Maths	• Algebra and Functions • Coordinate Geometry • Statistical Sampling	Students consolidate higher GCSE knowledge, extending understanding to more complex examples. Students also are introduced to the sampling element of statistics.	• Trigonometry • Data Presentation • Kinematics	Consolidates higher GCSE knowledge, extending understanding to more complex examples. Introduces new course area of mechanics, where problem solving is linked with algebra and functions work of pure maths.
Year 12 Further Maths	• 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, where problem solving is linked with algebra and functions work of pure maths.

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Year 13 Maths	• Differentiation • Functions • Moments • Forces at any angle	Students extend their knowledge of differentiation work from Year 12. This gives knowledge of additional methods to differentiate and wider range of functions. Knowledge of functions from KS4 is extended in the 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	Students continue to build understanding of trigonometry from Year 12. This increases their 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 Further Maths	• Integration • Linear Transformations • Proof by Induction • Discrete Random Variables • Poisson Distribution • Geometric and Negative Binomial Distributions	Students extend their knowledge of integration from A Level course. More proof methods and more formal mathematical proof are introduced. Statistical distributions introduced for discrete variables. Knowledge of discrete data is extended from A Level Maths study.	• 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	• Fractions as part of a whole • Fractions as an operation	Key knowledge of fractions is developed and applied to other areas.	• Order of operations • Basic rules of algebra • Expand and factorise • Substitution	Algebra rules follow same order of operations. Understanding of 'language' of algebra to lead into substitution and generalisation of problems. Leads into later work with equations.
Year 8	• Units of Measurement • Angles • Circumference	This unit introduces pi as circle ratio Knowledge of angles is developed as a key skill for later geometry work in parallel lines and circles.	• Proportional reasoning • Fractions, decimals and percentages • Ratio	Students develop their ability to recognise different representations of same values. Linking fractions as part of a whole to ratio as part to part of whole.
Year 9	• Notation • Simplifying and index laws • Expanding and Factorising • Expressions and substitution	Students understanding of indices is extended into the index laws. Further application to algebraic expressions is continued.	• Linear Equations • Linear inequalities • Perimeter and Area • Pythagoras	Students build their knowledge from Year 8 equations work, where they revisit and extends this key area.
Year 10	• Probability • Standard Form • Proportion	Probability covered in depth by students. Key statistical method for predicting and modelling is looked at. Proportion builds on previous numerical work and links with algebra and equations.	• Simple interest • Ratio • Growth and decay • Recurring Decimals	Students build on knowledge of ratio and percentages. Percentages builds onto calculator methods.
Year 11	• Statistics • Vectors • Similar Shapes • Constructions and Loci	Further work in done to develop 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	Knowledge of gradients and straight-line graph work is extended and applied 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 of this topic area, which is then applied in a variation of problem-solving contexts. Probability revisits the topic from GCSE, consolidating knowledge of this area.	• Vectors • Sequences and Series	The vector topic builds on GCSE knowledge of this area. 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 Further Maths	• 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, consolidating knowledge of this area.	• Kinematics 2 • Partial Fractions • Binomial Expansion • Sequences and Series	Partial fractions and binomial expansion builds on the knowledge of algebra, giving students further tools to apply to problem solving questions in other areas. Sequences builds on knowledge from 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 topic.	• Numerical Methods • Parametric Equations • Projectiles • Further Kinematics	Numerical methods draws on knowledge of rearranging formulae and differentiation from previous study, to allow estimates of solutions to equations to be found that would otherwise not be solvable.
Year 13 Further Maths	• 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 extends integration topic area into 3 dimensions. Further knowledge of statistical distributions gained through this unit.	• Differential Equations • Elastic strings and springs • Elastic collisions in one and two dimensions • Probability Generating Functions • Quality of Tests	Students 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	• Angles • Polygons • Symmetry and reflection • Coordinates	Key area of angles introduced which forms the basis for much of geometry subject area.	• Mean • Two-way tables & Venn diagrams	Venn diagram understanding is developed by students, in preparation for prime factorisation and probability
Year 8	• Area of circles and trapezia • Presenting and interpreting data • Averages	Knowledge of circumference work and use of pi is extended.	• 3D visualisation • Volume	Students develop their understanding of 3D shapes leading into volume topic.
Year 9	• Properties of Shapes • Angle facts • Parallel Lines • Circles • Volume	Students build on shape work of Y7 and Y8. Extends angle facts and parallel lines work from Y8 as well as revisiting this area. Introduces more circle geometry in preparation for circle theorems and equations at GCSE.	• Surface Area • Basic vectors • Sequences • Plans and Elevations	Students build on area work and links to 3D shape and volume. Plans and elevations extends understanding of 3D visualisation.
Year 10	• Statistics • Surds • Bounds	Statistics work looks at representing data in variety of ways and shows the most appropriate for different data sets. Surds are introduced as important concept in working with exact values and avoiding rounding errors.	• Right angled trigonometry • Similar shapes • Quadratic sequences	Introduces important area of trigonometry. This builds a foundational knowledge 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	Statistics 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 Further Maths	• Functions and Modelling • Trigonometry • Differentiation • Moments	Functions builds on GCSE knowledge of this topic area, 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 studied builds on existing statistical knowledge, introducing first continuous distribution.

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Year 13	A Level revision programme – developed to suit the requirements of individual students and classes
Year 13 Further Maths	A Level revision programme – developed to suit the requirements of individual students and classes

Wider reading

Extracurricular Opportunities (competitions, associations and clubs)	Revision Guides
• Maths Challenge Club – opportunity to work through extension problems and enter the UKMT Maths Challenge competitions • Coding Club (*coming September 2022*) for those who enjoy Maths and want to apply their skills in a new way through a computing context.	CGP revision guides and workbooks for Mathematics GCSE found here: GCSE Maths | CGP Books

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 found at: Talks \| Ben Sparks
Youtube: Numberphiles found at: Numberphile - YouTube
University of Cambridge NRICH website found at: Secondary Students (maths.org)