

# NKS Maths Curriculum Map 2022-2023

## The purpose of studying Maths at NKS is...

Maths is a valued academic discipline at NKS. We aim to equip our students over the course of their time at NKS with excellent numeracy skills that will be of value to them in their chosen route after school, whether this is further education or employment.

We work with students to develop mathematical problem-solving skills because problem solving requires students to approach problems in a structured, logical manner. We also encourage students to be resilient and flexible in their approach – if they can't solve a problem with one method, how else could they solve the problem? What other methods could they use? Problem solving in mathematics is a key component in our curriculum.

We follow a three-year GCSE curriculum because we believe this allows our students to develop their mathematical understanding of the curriculum to a greater depth. We challenge students' depth of understanding using a mathematics mastery approach to our KS3 curriculum. Although our students join NKS in year 7 with highly skilled mathematical processes, often those processes are created through rote memorisation rather than mathematical reasoning. Our teachers challenge students to think of reasons 'why' mathematics concepts take place which allows students to broaden their understanding. This scheme of learning further enhances their mathematical reasoning and problem-solving skills.

We are a selective school, and our academic expectations of our students are high. We allow our most able KS4 students to undertake an additional Further Maths qualification as this develops their algebra skills and prepares them for A Level mathematics. This selective course bridges the gap between GCSE and A Level mathematics while providing stretch and challenge for our most able learners.

Students who join us for A Level mathematics follow a rigorous and challenging curriculum plan. Like those in KS4, our most able and ambitious students in KS5 can take part in the Further Maths A Level qualification alongside the A Level mathematics course.

We aim to support our students to enable them to achieve by conducting a stimulating learning environment for maths. This includes a mixed ability setting for all key stages. We provide regular feedback to our students on their progress after topic tests conducted at all key stages. Students' understanding is tested frequently providing staff and students with benchmarks to gauge understanding. We expect our students to achieve more than students with similar starting points nationally.

# Year 7

Prior to joining NKS students will have studied the national KS2 Maths Curriculum. We have approximately 50 feeder primary schools that range from large four-form entry schools to small village schools.

NKS uses a mastery-based curriculum in years 7 and 8. A mastery curriculum develops understanding in small steps, using representations where possible to ensure understanding of new concepts or concepts being further developed since primary school. Because NKS accepts students from so many primary schools, and most primary schools nationally partake in mathematics mastery, we have found that mathematics mastery in secondary school bridges the gap between primary and secondary education nicely.

|   | <b>Term 1</b>   | <b>Term 2</b>  | <b>Term 3</b>  | <b>Term 4</b>  | <b>Term 5</b>   | <b>Term 6</b>  |
|---|---|--|--|--|---|--|
| <p><b>Content – Knowledge and Understanding</b></p> <p><b>Skills and concepts</b></p> | <p><b>Unit 1: Algebraic Thinking</b></p> <ol style="list-style-type: none"> <li>1. Generating sequences</li> <li>2. Inverse operations</li> <li>3. Generalising operations</li> <li>4. Function machines</li> <li>5. Substitution</li> <li>6. Solving equations</li> <li>7. Simplifying expressions</li> </ol> <p><b>Unit 2: Place Value</b></p> <ol style="list-style-type: none"> <li>1. Comparing values</li> <li>2. Median and Range</li> <li>3. Rounding</li> <li>4. Standard form</li> <li>5. Fractions and decimals</li> <li>6. Equivalent fractions</li> <li>7. Converting fractions, decimals and percentages</li> </ol> | <p><b>Unit 3: Addition and Subtraction</b></p> <ol style="list-style-type: none"> <li>1. Formal methods for addition and subtraction of integers and decimals</li> <li>2. Solve problems in the context of perimeter</li> <li>3. Solve problems with tables and timetables</li> <li>4. Add and subtract values in standard form</li> </ol> <p><b>Unit 4: Multiplication and Division</b></p> <ol style="list-style-type: none"> <li>1. Understand and use factors and multiples</li> <li>2. Multiply and divide integers and decimals by powers of 10, including negative powers of 10</li> <li>3. Convert metric units</li> <li>4. Use formal methods to multiply and divide integers and decimals</li> <li>5. Understand and use the order of operations</li> </ol> <p><b>Unit 5: Areas, fractions and percentages</b></p> <ol style="list-style-type: none"> <li>1. Solve problems using the area of 2D shapes (rectangles, parallelograms, triangles and trapezia)</li> <li>2. Solve problems using the mean</li> <li>3. Explore multiplication and division in algebraic expressions</li> </ol> | <p><b>Unit 6: Directed Number</b></p> <ol style="list-style-type: none"> <li>1. Understand and use representations of directed number</li> <li>2. Perform calculations that cross zero</li> <li>3. Add and subtract directed numbers</li> <li>4. Multiply and divide directed numbers</li> <li>5. Evaluate algebraic expressions with directed number</li> <li>6. Solve two-step equations</li> <li>7. Use order of operations with directed numbers</li> <li>8. Use a calculator for directed number calculations</li> </ol> <p><b>Unit 7: Addition and Subtraction of Fractions</b></p> <ol style="list-style-type: none"> <li>1. Add and subtract unit fractions with the same and different denominators</li> <li>2. Understand and use equivalent fractions</li> <li>3. Add and subtract improper fractions and mixed numbers</li> <li>4. Use fractions in algebraic contexts</li> <li>5. Add and subtract simple algebraic fractions</li> </ol> <p><b>Unit 8: Number Sense, Sets and Probability</b></p> | <p><b>Unit 9: Constructing and Measuring</b></p> <ol style="list-style-type: none"> <li>1. Classify angles</li> <li>2. Measure and draw angles less than 180</li> <li>3. Measure and draw angles between 180 and 360</li> <li>4. Identify perpendicular and parallel lines</li> <li>5. Recognise types of triangles and quadrilaterals</li> <li>6. Identify polygons up to a decagon</li> <li>7. Construct triangles using various congruency methods</li> <li>8. Construct more complex polygons</li> <li>9. Interpret simple pie charts using proportions and protractors.</li> <li>10. Draw pie charts</li> </ol> <p><b>Unit 10: Geometric Reasoning</b></p> <ol style="list-style-type: none"> <li>1. Understand and use sum of angles at a point and on a straight line</li> <li>2. Understand and use the equality of vertically opposite angles</li> <li>3. Know and apply the sum of angles in a triangle and in a quadrilateral</li> <li>4. Find and use the angle sum of any polygon</li> <li>5. Investigate angles in parallel lines</li> </ol> | <p><b>Unit 12: Ratio and scale</b></p> <ol style="list-style-type: none"> <li>1. Represent and use ratio</li> <li>2. Solve ratio problems</li> <li>3. Divide into a ratio</li> <li>4. Simplifying ratios</li> <li>5. Ratio in context</li> </ol> <p><b>Unit 13: Multiplicative change</b></p> <ol style="list-style-type: none"> <li>1. Solve direct proportion problems</li> <li>2. Currency conversion</li> <li>3. Direct proportion graphs</li> <li>4. Similar shapes</li> <li>5. Scale factors</li> <li>6. Scale factors in context</li> </ol> <p><b>Unit 14: Multiplying and dividing fractions</b></p> <ol style="list-style-type: none"> <li>1. Multiplying with fractions</li> <li>2. Multiplying fractions</li> <li>3. Dividing with fractions</li> <li>4. Dividing fractions</li> <li>5. Algebraic fractions</li> </ol> | <p><b>Unit 15: Working in the Cartesian Plane</b></p> <ol style="list-style-type: none"> <li>1. Identify straight line graphs</li> <li>2. Gradient of straight lines</li> <li>3. Further gradients of straight lines</li> <li>4. Equation of straight lines</li> <li>5. Non-linear graphs</li> <li>6. Finding the midpoint</li> </ol> <p><b>Unit 16: Representing data and probability</b></p> <ol style="list-style-type: none"> <li>1. Scatter graphs</li> <li>2. Line of best fit</li> <li>3. Frequency tables</li> <li>4. Grouping data</li> <li>5. Two-way tables</li> <li>6. Sample space diagrams</li> <li>7. Probabilities from diagrams</li> <li>8. Product rule</li> </ol> |

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|---------------------------------|-------------------------|---|--|--|-------------------------|---|
|                                 |                         | <ol style="list-style-type: none"> <li>4. Find fraction of a given amount</li> <li>5. Find a percentage of a given amount with and without a calculator</li> <li>6. Solve problems with fractions greater than 1 and percentages greater than 100%</li> </ol> | <ol style="list-style-type: none"> <li>1. Know and use mental mathematical operations strategies</li> <li>2. Use known number and algebraic facts to derive other facts</li> <li>3. Identify and represent sets, including those in Venn diagrams</li> <li>4. Understand and use the intersection and union of sets</li> <li>5. Understand and use the complement of a set</li> <li>6. Know and use the probability of a single event</li> </ol> | <b>Unit 11: Prime Numbers and Proof</b> <ol style="list-style-type: none"> <li>1. Factors and multiples</li> <li>2. Identify prime numbers, square numbers and triangular numbers</li> <li>3. Find the highest common factor and least common multiple of a pair of values</li> <li>4. Write a number as a product of its prime factors</li> <li>5. Make and test conjectures</li> <li>6. Use counter examples to disprove a conjecture</li> </ol> |                         |   |
| <b>Assessment</b>               | End of Unit assessments | End of Unit assessments   | End of Unit assessments  | End of Unit assessments  | End of Unit assessments | End of Unit assessments<br>EOY assessment |
| <b>Enrichment and extension</b> | UKMT                    |   |  |  |                         |   |

# Year 8

Our year 8 curriculum builds on and extends the work done in Y7. This year, NKS is piloting its new mathematics mastery scheme of work for year 8 students. These students have already participated in mathematics mastery in year 7.

|  | <b>Term 1</b>  | <b>Term 2</b>   | <b>Term 3</b>   | <b>Term 4</b>  | <b>Term 5</b>   | <b>Term 6</b>   |
|--|--|---|---|--|---|---|
| <b>Content – Knowledge and Understanding</b> | <p><b>Unit 17: Brackets, Equations and Inequalities</b></p> <ol style="list-style-type: none"> <li>Multiply out a single bracket; factorise into a single bracket</li> <li>Expand multiple single brackets and simplify</li> <li>Expand a pair of binomials</li> <li>Form and solve equations, including with brackets</li> <li>Understand, form and solve simple inequalities</li> <li>Solve equations and inequalities with unknowns on both sides</li> <li>Form and solve inequalities with unknowns on both sides; identify and use formulae, expressions, identities and equations</li> </ol> | <p><b>Unit 20: Standard Form</b></p> <ol style="list-style-type: none"> <li>Investigate positive powers of 10; work with numbers greater than 1 in standard form</li> <li>Investigate negative powers of 10; work with numbers between 0 and 1 in standard form</li> <li>Compare and order numbers in standard form; mentally calculate with numbers in standard form</li> <li>Add and subtract numbers in standard form</li> <li>Multiply and divide numbers in standard form</li> <li>Use a calculator to work with numbers in standard form</li> <li>Understand and use negative indices</li> <li>Understand and use fractional indices</li> </ol> | <p><b>Unit 23: Area and Symmetry</b></p> <ol style="list-style-type: none"> <li>Calculate the area of triangles, rectangles and parallelograms; calculate the area of a trapezium</li> <li>Calculate the perimeter and area of compound shapes</li> <li>Investigate the area of a circle</li> <li>Calculate the area of a circle and parts of a circle with and without a calculator</li> <li>Calculate the perimeter and area of compound shapes including those with circles and parts of circles</li> <li>Recognise line symmetry; reflect a shape in a horizontal or vertical line</li> <li>Reflect a shape in a diagonal line</li> </ol> | <p><b>Unit 26: Straight Line Graphs</b></p> <ol style="list-style-type: none"> <li>Lines parallel to the axes, <math>y = x</math> and <math>y = -x</math>; using tables of values</li> <li>Compare gradients; compare intercepts</li> <li>Understand and use <math>y = mx + c</math>; write an equation in the form <math>y = mx + c</math></li> <li>Find the equation of a line from a graph</li> <li>Interpret gradient and intercepts of real-life graphs</li> <li>Model real-life graphs involving inverse proportion</li> <li>Explore perpendicular lines</li> </ol>    | <p><b>Unit 29: Rotation and Translation</b></p> <ol style="list-style-type: none"> <li>Identify the order of rotational symmetry of a shape; compare and contrast rotational symmetry with lines of symmetry</li> <li>Rotate a shape about a point on and off a shape</li> <li>Translate points and shapes by a given vector</li> <li>Compare rotation and reflection of shapes; find the result of a series of transformations</li> </ol>  | <p><b>Unit 32: Ratio and Proportion</b></p> <ol style="list-style-type: none"> <li>Solve problems with direct proportion</li> <li>Direct proportion and conversion graphs</li> <li>Solve problems with inverse proportion</li> <li>Graphs of inverse relationships</li> <li>Solve ratio problems given the whole or a part</li> <li>Solve 'best buy' problems</li> <li>Solve problems with ratio and algebra</li> <li>Solve speed, distance and time problems with and without a calculator</li> <li>Use distance-time graphs</li> <li>Solve problems with density, mass and volume</li> <li>Rates of change and their units</li> <li>Convert compound units</li> </ol> |
| <b>Skills and concepts</b>                   | <p><b>Unit 18: Sequences and Indices</b></p> <ol style="list-style-type: none"> <li>Generate sequences given a rule in words</li> <li>Generate sequences given a simple algebraic rule; generate sequences given a complex algebraic rule</li> <li>Find the rule for nth term of a linear sequence</li> <li>Simplifying algebraic expressions by multiplying and dividing indices</li> <li>Add and subtract expressions with indices</li> <li>Use the addition and subtraction laws for indices; exploring powers of powers</li> </ol>   | <p><b>Unit 21: Number Sense</b></p> <ol style="list-style-type: none"> <li>Round numbers to powers of 10 and 1 significant figure; round numbers to a given number of decimal places</li> <li>Estimate the answer to a calculation; understand and use error interval notation</li> <li>Calculate using the order of operations</li> <li>Calculate with money</li> <li>Convert metric measures of lengths; convert metric</li> </ol>  | <p><b>Unit 24: Data Handling</b></p> <ol style="list-style-type: none"> <li>Set up a statistical enquiry; design and criticise questionnaires</li> <li>Draw and interpret pictograms, bar charts and vertical line charts</li> <li>Draw and interpret pie charts</li> <li>Draw and interpret line graphs</li> <li>Choose the most appropriate diagram for a given set of data</li> <li>Represent and interpret grouped quantitative data</li> </ol>   | <p><b>Unit 27: Three-Dimensional Shapes</b></p> <ol style="list-style-type: none"> <li>Know names of 2D and 3D shapes; recognise prisms (including language of edges and vertices)</li> <li>Accurate nets of cuboids and other 3D shapes; sketch and recognise nets of cuboids and other 3D shapes</li> <li>Plans and elevations</li> <li>Find area of 2D shapes; surface area of cubes and cuboids; surface area of triangular prisms</li> <li>Surface area of a cylinder</li> <li>Volumes of cubes and cuboids; volume of other 3D shapes, prisms and cylinders</li> </ol> | <p><b>Unit 30: Pythagoras' Theorem</b></p> <ol style="list-style-type: none"> <li>Squares and square roots; identify the hypotenuse of a right-angled triangle</li> <li>Determine whether a triangle is right-angled</li> <li>Calculate the hypotenuse of a right-angled triangle; calculate missing sides of a right-angled triangle</li> <li>Use Pythagoras's Theorem on coordinate axes</li> <li>Explore proofs of Pythagoras's Theorem</li> <li>Use Pythagoras's Theorem in 3D shapes</li> </ol> <p><b>Unit 31: Enlargement and Similarity</b></p> <ol style="list-style-type: none"> <li>Recognise enlargement and similarity</li> <li>Enlarge a shape by a positive integer scale factor; enlarge a shape by</li> </ol> | <p><b>Unit 33: Probability</b></p> <ol style="list-style-type: none"> <li>Single event probability and relative frequency</li> <li>Expected outcomes; independent events</li> <li>Tree diagrams with and without replacement</li> <li>Use diagrams to work out probabilities</li> </ol>   |



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| <b>Enrichment<br/>and<br/>extension</b> | UKMT |
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# Year 9

**Our year 9 curriculum is the start of our student's GCSE mathematics course. Students have been equipped with foundational mathematical knowledge from KS3 which has been developed through mastery techniques enabling them to commence the course with confidence.**

Our GCSE curriculum is based on a Collins scheme of work that has been modified in places to enable a smoother progression of maths skills development.

|   | <b>Term 1</b>   | <b>Term 2</b>  | <b>Term 3</b>   | <b>Term 4</b>   | <b>Term 5</b>  | <b>Term 6</b>   |
|---|---|--|---|---|--|---|
| <p><b>Content – Knowledge and Understanding</b></p> <p><b>Skills and concepts</b></p> | <p><b>Unit 1: Basic number</b></p> <ul style="list-style-type: none"> <li>Solve problems set in a real-life context.</li> <li>Multiply or divide a decimal number by another decimal number.</li> <li>Round to a given number of significant figures including for estimation.</li> <li>Find multiples and factors.</li> <li>Identify prime numbers, square and triangular numbers.</li> <li>Find square roots.</li> <li>Identify cubes and cube roots.</li> <li>Identify prime factors.</li> <li>Identify the least common multiple of two numbers.</li> <li>Identify the highest common factor of two multiples.</li> <li>Calculate with positive and negative numbers.</li> </ul> <p><b>Unit 2: Powers, roots and standard form</b></p> <ul style="list-style-type: none"> <li>Multiply and divide by powers of 10.</li> <li>Use rules for multiplying and dividing powers.</li> <li>Change a number into standard form.</li> <li>Calculate using numbers in standard form.</li> </ul> | <p><b>Unit 4: Basic algebra</b></p> <ul style="list-style-type: none"> <li>Recognise expressions, equations, formulae and identities.</li> <li>Substitute into, manipulate and simplify algebraic expressions.</li> <li>Factorise an algebraic expression.</li> <li>Solve equations in which the variable appears as part of the numerator of a fraction.</li> <li>Solve equations with brackets</li> <li>Solve equations where the variable appears on both sides of the equals sign.</li> <li>Set up equations from given information and solve them.</li> <li>Change the subject of a formula.</li> </ul> <p><b>Unit 5: Percentages</b></p> <ul style="list-style-type: none"> <li>Increase and decrease quantities by a percentage</li> <li>Work out percentage change.</li> <li>Express one quantity as a percentage of another.</li> <li>Calculate compound interest.</li> <li>Solve problems involving repeated percentage change.</li> </ul> | <p><b>Unit 7: Angles</b></p> <ul style="list-style-type: none"> <li>Know the sum of the angles on a straight line, around a point, in a triangle and in a quadrilateral.</li> <li>Solve missing angle problems in triangles.</li> <li>Work out the sum of the interior angles in a polygon.</li> <li>Calculate the size of the interior and exterior angles of any regular polygon.</li> <li>Solve problems involving alternate, corresponding, allied and opposite angles.</li> <li>Calculate the size of angles in special quadrilaterals using their geometric properties.</li> </ul> <p><b>Unit 8: Number and sequences</b></p> <ul style="list-style-type: none"> <li>Recognise patterns in number sequences.</li> <li>Generate sequences, given the <math>n^{\text{th}}</math> term.</li> <li>Find the <math>n^{\text{th}}</math> term of a linear sequence.</li> </ul> <p><b>Unit 9: Linear graphs</b></p> <ul style="list-style-type: none"> <li>Draw linear graphs by finding points.</li> </ul> | <p><b>Unit 10: Transformations</b></p> <ul style="list-style-type: none"> <li>Demonstrate that two triangles are congruent</li> <li>Find the order of rotational symmetry for a 2D shape</li> <li>Recognise shapes with rotational symmetry.</li> <li>Translate, reflect, rotate and enlarge a 2D shape.</li> <li>Combine transformations</li> </ul> <p><b>Unit 11: Area in 2-D</b></p> <ul style="list-style-type: none"> <li>Calculate the circumference and area of a circle.</li> <li>Calculate the area of a parallelogram.</li> <li>Calculate the area of a trapezium.</li> <li>Calculate the length of an arc and the area and angle of a sector.</li> <li>Find the error interval or limits of accuracy of numbers that have been rounded to different degrees of accuracy.</li> <li>Combine limits of two or more variables together to solve problems.</li> </ul> | <p><b>Unit 12: Pythagoras' Theorem</b></p> <ul style="list-style-type: none"> <li>Calculate the length of the hypotenuse in a right-angled triangle.</li> <li>Calculate the length of a shorter side in a right-angled triangle.</li> <li>Solve practical problems involving Pythagoras' theorem.</li> <li>Use Pythagoras' Theorem and isosceles triangles</li> </ul> <p><b>Unit 13: Statistical diagrams and averages</b></p> <ul style="list-style-type: none"> <li>Draw and interpret bar charts and pie charts.</li> <li>Draw and interpret line graphs.</li> <li>Use averages to solve more complex problems.</li> <li>Identify the advantages and disadvantages of each type of average and learn which one to use in different situations.</li> <li>Work out and use the range of a set of data.</li> <li>Calculate the mode, the median and the mean from a frequency table.</li> <li>Identify the modal group.</li> <li>Estimate the mean from a grouped frequency table.</li> <li>Draw, interpret and use scatter diagrams.</li> </ul> | <p><b>Unit 14: Exploring and applying probability</b></p> <ul style="list-style-type: none"> <li>Calculate experimental probabilities and relative frequencies.</li> <li>Estimate probabilities from experiments.</li> <li>Use different methods to estimate probabilities.</li> <li>Recognise mutually exclusive, complementary and exhaustive events.</li> <li>Predict the likely number of successful events, given the number of trials and the probability of any one outcome.</li> <li>Read two-way tables and use them to work out probabilities.</li> <li>Use Venn diagrams to solve probability questions.</li> </ul> <p><b>Unit 15: Constructions and loci</b></p> <ul style="list-style-type: none"> <li>To be able to make a scale drawing to a given scale.</li> <li>To be able to convert measurements to calculate actual distances.</li> <li>To be able to read, interpret and draw bearings diagrams.</li> <li>To use the geometrical properties of a diagram to calculate a bearing.</li> </ul> |

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|---------------------------------|--|--|--|-------------------------|--|---|
|                                 | <ul style="list-style-type: none"> <li>How to estimate powers and roots of any given positive number.</li> <li>Apply the rules of powers to negative and fractional powers</li> <li>Find and use the relationship between negative powers and roots</li> <li>Simplify surds.</li> </ul> <p><b>Unit 3: Fractions</b></p> <ul style="list-style-type: none"> <li>Write one quantity as a fraction of another</li> <li>Add and subtract fractions with different denominators.</li> <li>Multiply and divide proper fractions and mixed numbers.</li> <li>Use a calculator to accurately solve problems involving fractions.</li> <li>Recognise rational numbers, reciprocals, terminating decimals and recurring decimals</li> <li>Convert between terminal decimals and fractions</li> <li>Find reciprocals of numbers or fractions</li> </ul> | <ul style="list-style-type: none"> <li>Calculate the original amount after a known percentage change.</li> </ul> <p><b>Unit 6: Ratio and proportion</b></p> <ul style="list-style-type: none"> <li>Simplify a ratio.</li> <li>Express a ratio as a fraction.</li> <li>Divide amounts in given ratios.</li> <li>Complete calculations from a given ratio.</li> <li>Recognise and solve problems using direct proportion.</li> <li>Find either the cost per unit weight or the weight per unit cost and use to identify the cheapest product.</li> <li>Recognise and solve problems involving the compound measures of rates of pay, speed, density and pressure.</li> </ul> | <ul style="list-style-type: none"> <li>Find the gradient of a straight line.</li> <li>Draw a line with a certain gradient.</li> <li>Find the gradient, length and midpoint of a line joining two points</li> <li>Draw graphs using the gradient-intercept method.</li> <li>Draw graphs using the cover-up method.</li> <li>Find the equation of a line, using its gradient and intercept.</li> <li>Find the equation of a line given two points on the line.</li> <li>Convert from one unit to another unit by using a conversion graph.</li> <li>Use straight-line graphs to find formulae.</li> <li>Draw linear graphs parallel or perpendicular to other lines and passing through a specific point.</li> </ul> |                         | <ul style="list-style-type: none"> <li>Draw and use a line of best fit.</li> </ul> | <ul style="list-style-type: none"> <li>Construct the bisectors of lines and angles</li> <li>Construct angles of <math>60^\circ</math> and <math>90^\circ</math>.</li> <li>Draw a locus for a given rule</li> <li>Solve practical problems using loci</li> <li>Construct and interpret plans and elevations of 3D shapes.</li> </ul> |
| <b>Assessment</b>               | End of Unit assessments  | End of Unit assessments  | End of Unit assessments  | End of Unit assessments | End of Unit assessments<br><b>Revision and EOY exams</b>                           | End of Unit assessments   |
| <b>Enrichment and extension</b> | UKMT   |  |  |                         |  |   |



# Year 10

Our year 10 curriculum builds on and extends the work done in year 9 by developing mathematical skills whilst following our GCSE curriculum. At the start of year 10, students are selected to be part of the 'fast set' in order to complete the GCSE course earlier in year 11. This gives time for teaching content related to the further maths qualification. Some topics that are appropriate to be taught in year 10 for the further maths qualification are noted with \*.

|   | <b>Term 1</b>   | <b>Term 2</b>  | <b>Term 3</b>  | <b>Term 4</b>  | <b>Term 5</b>  | <b>Term 6</b>   |
|---|---|--|--|--|--|---|
| <p><b>Content – Knowledge and Understanding</b></p> <p><b>Skills and concepts</b></p> | <p><b>Unit 16: Non-linear sequences</b></p> <ul style="list-style-type: none"> <li>Recognise and continue some special number sequences such as square numbers.</li> <li>Find the <math>n^{\text{th}}</math> term of a sequence from a diagram or practical problem.</li> <li>Generate the terms of a quadratic sequence from the <math>n^{\text{th}}</math> term.</li> <li>Work out the <math>n^{\text{th}}</math> term of a quadratic sequence.</li> </ul> <p><b>AM Use and apply recurrence relationships*</b></p> <p><b>Unit 17: Further algebraic manipulation</b></p> <ul style="list-style-type: none"> <li>Expand the square of a binomial.</li> <li>Expand more than two binomials.</li> <li>Factorise a quadratic expression of the form <math>x^2 + ax + b</math> into two linear brackets.</li> <li>Factorise a quadratic expression of the form <math>ax^2 + bx + c</math> into two linear brackets.</li> </ul> <p><b>AM Polynomials*</b></p> <ul style="list-style-type: none"> <li>Add and subtract polynomials</li> <li>Multiply polynomials</li> <li>Divide polynomials</li> </ul> | <p><b>Unit 19: Further surds</b></p> <ul style="list-style-type: none"> <li>Calculate and manipulate surds, including rationalising a denominator.</li> </ul> <p><b>Unit 20: Similarity</b></p> <ul style="list-style-type: none"> <li>Show two triangles are similar.</li> <li>Work out the scale factor between similar triangles.</li> <li>Solve problems involving the area and volume of similar shapes.</li> </ul> <p><b>Unit 21: Trigonometry</b></p> <ul style="list-style-type: none"> <li>Use the three trigonometric ratios.</li> <li>Use the trigonometric ratios to calculate an angle.</li> <li>Find lengths of sides and angles in right-angled triangles using the sine and cosine functions.</li> <li>Find lengths of sides and angles in right-angled triangles using the tangent function.</li> <li>Decide which trigonometric ratio to use in a right-angled triangle.</li> <li>Solve practical problems using trigonometry.</li> <li>Solve problems using an angle of elevation or an angle of depression.</li> </ul> | <p><b>Unit 22: Simultaneous equations</b></p> <ul style="list-style-type: none"> <li>Solve simultaneous linear equations using graphs.</li> <li>Solve simultaneous linear equations in two variables using the elimination method.</li> <li>Solve simultaneous linear equations in two variables using the substitution method.</li> <li>Solve simultaneous linear equations by balancing coefficients.</li> <li>Solve problems using simultaneous linear equations.</li> </ul> <p><b>Unit 23: Sampling and more complex diagrams</b></p> <ul style="list-style-type: none"> <li>Understand sampling.</li> <li>Collect unbiased reliable data for a sample.</li> <li>Draw and interpret frequency polygons.</li> <li>Draw and interpret cumulative frequency graphs.</li> <li>Draw and interpret box plots.</li> <li>Draw and interpret histograms where the bars are of equal width.</li> <li>Draw and interpret histograms where the bars are of unequal width.</li> </ul> | <p><b>Unit 25: Quadratic equations and functions</b></p> <ul style="list-style-type: none"> <li>Draw and read values from quadratic graphs.</li> <li>Solve a quadratic equation by factorisation.</li> <li>Rearrange a quadratic equation so that it can be factorised.</li> <li>Solve a quadratic equation by using the quadratic formula.</li> <li>Recognise why some quadratic equations cannot be solved.</li> <li>Solve a quadratic equation by completing the square.</li> </ul> <p>Identify the significant points of a quadratic function graphically.</p> <p>Identify the roots of a quadratic function by solving a quadratic equation.</p> <p>Identify the turning point of a quadratic function by using symmetry or completing the square.</p> <p><b>AM Functions and equations*</b></p> <ul style="list-style-type: none"> <li>Factor theorem</li> <li>Applications of linear, quadratic and cubic equations</li> </ul> <p><b>Unit 26: Properties of circles</b></p> | <p><b>Unit 27: Graphical solutions and equations</b></p> <ul style="list-style-type: none"> <li>Solve a pair of simultaneous equations where one is linear and one is non-linear, using graphs.</li> <li>Solve equations by the method of intersecting graphs.</li> <li>Solve simultaneous equations where one equation is linear and the other is non-linear.</li> <li>Simultaneous equations</li> <li>Solve quadratic inequalities.</li> </ul> | <p><b>Unit 28: Variation</b></p> <ul style="list-style-type: none"> <li>Solve problems where two variables have a directly proportional relationship</li> <li>Work out the constant of proportionality</li> <li>Solve problems where two variables have an inversely proportional relationship</li> </ul> <p><b>Unit 29: Combined events</b></p> <ul style="list-style-type: none"> <li>Work out the number of choices, arrangements or outcomes when choosing from lists or sets</li> <li>Work out the probability of different outcomes of combined events</li> <li>Work out the probability of two outcomes or events occurring at the same time</li> <li>Use tree diagrams to work out the probability of combined events</li> <li>Use connectors 'and' and 'or' to work out the probabilities for combined events including their notation</li> <li>Use the product rule for counting numbers of outcomes of combined events.</li> <li>Enumerate the number of ways of obtaining an</li> </ul> |

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|---------------------------------|--|-------------------------|---|--|-------------------------------------|---|
|                                 | <p><b>Unit 18: Area and volume</b></p> <ul style="list-style-type: none"> <li>• Calculate the volume of a prism.</li> <li>• Calculate the volume and surface area of a cylinder.</li> <li>• Calculate the volume of a pyramid.</li> <li>• Calculate the volume and surface area of a cone.</li> <li>• Calculate the volume and surface area of a sphere.</li> <li>• Use Pythagoras' theorem to solve problems involving three dimensions.</li> </ul> |                         | <ul style="list-style-type: none"> <li>• Calculate the median, quartiles and interquartile range from a histogram.</li> </ul> <p><b>Unit 24: Linear inequalities</b></p> <ul style="list-style-type: none"> <li>• Solve a simple linear inequality and represent it on a number line.</li> <li>• Show a graphical inequality.</li> <li>• Find regions that satisfy more than one graphical inequality.</li> </ul> <p><b>AM Linear programming*</b></p> <ul style="list-style-type: none"> <li>• Express real situations in terms of linear inequalities.</li> <li>• Use graphs of linear inequalities to solve 2-dimensional maximisation and minimisation problems.</li> <li>• Know the definition of objective function and be able to find it in 2-dimensional cases.</li> </ul> | <ul style="list-style-type: none"> <li>• Work out the size of angles in circles.</li> <li>• Find the size of angles in cyclic quadrilaterals.</li> <li>• Use tangents and chords to find the size of angles in circles.</li> <li>• Use the alternate segment theorem to find the size of angles in circles.</li> </ul> |                                     | <p>ordered linear subset (permutation) of r elements from a set of n distinct objects.</p> <ul style="list-style-type: none"> <li>• Enumerate an unordered subset (combination) of r elements from a set of n distinct objects.</li> <li>• Solve problems about outcomes, including problems in the context of probability.</li> <li>• Including <math>P(A B) = \frac{P(A \cap B)}{P(B)}</math> and <math>P(A \cup B) = P(A) + P(B) - P(A \cap B)</math></li> </ul> |
| <b>Assessment</b>               | End of Unit assessments  | End of Unit assessments | End of Unit assessments   | End of Unit assessments  | End of Unit assessment Year 10 PPEs | End of Unit assessments   |
| <b>Enrichment and extension</b> | UKMT, OCR Additional Maths FSMQ (Level 3) for most able students   |                         |   |  |                                     |   |

# Year 11

Our year 11 curriculum builds on and extends the work done in year 10 by developing mathematical skills whilst following our GCSE curriculum. The GCSE course will finish being taught at the start of term 3. This allows teachers to revisit any content for which students still have gaps. It also allows for valuable exam practice and structured rehearsal of problem-solving skills. The advanced mathematics curriculum content is noted with \*.

|   | <b>Term 1</b>  | <b>Term 2</b>   | <b>Term 3</b>   | <b>Term 4</b>   | <b>Term 5</b>  | <b>Term 6</b> |
|---|--|---|---|---|--|---------------|
| <p><b>Content – Knowledge and Understanding</b></p> <p><b>Skills and concepts</b></p> | <p><b>Unit 30: Further trigonometry</b></p> <ul style="list-style-type: none"> <li>Use trigonometric ratios and Pythagoras' theorem to solve more complex two-dimensional problems.</li> <li>Use trigonometric ratios and Pythagoras' theorem to solve more complex three-dimensional problems</li> <li>Find the sine, cosine and tangent of any angle from <math>0^\circ</math> to <math>360^\circ</math>.</li> <li>Plot the graphs of trigonometric functions</li> <li>Use the properties of the graphs of trigonometric functions to solve trigonometric equations</li> <li>Use the sine rule and the cosine rule to find sides and angles in any triangle.</li> <li>Know the sine and cosine rules and be able to apply them, including the ambiguous case for sine.</li> <li>Apply Pythagoras' Theorem and trigonometry to 2- and 3-dimensional problems.</li> <li>Work out the area of a triangle if you know two sides and the included angle.</li> <li>AM Trigonometric identities*</li> </ul> | <p><b>Unit 33: Vector Geometry</b></p> <ul style="list-style-type: none"> <li>Add and subtract vectors.</li> <li>Use vectors to solve geometric problems</li> </ul> <p><b>Unit 34: Curves of Graphs and Special Graphs</b></p> <ul style="list-style-type: none"> <li>Use areas of rectangles, triangles and trapeziums to estimate the area under a curve.</li> <li>Interpret the meaning of the area under a curve.</li> <li>Draw a tangent at a point on a curve and use it to work out the gradient at a point on a curve</li> <li>Interpret the gradient at a point on a curve.</li> <li>Find the equation of a tangent to a circle.</li> <li>Find and use the equation of a circle</li> <li>Recognise and plot cubic, exponential and reciprocal graphs.</li> <li>Sketch &amp; plot a graph of a polynomial of order 3 or higher.</li> <li>Sketch &amp; plot an exponential graph</li> <li>Transform a graph.</li> <li>Algebraic fractions and functions</li> <li>Simplify algebraic fractions</li> </ul> | <p>All content noted below is part of the additional maths qualification.</p> <p><b>AM The Binomial Distribution</b></p> <ul style="list-style-type: none"> <li>Understand and be able to apply the binomial expansion of <math>(a + b)^n</math> where <math>n</math> is a positive integer.</li> <li>Construct and use the binomial distribution to enumerate outcomes.</li> </ul> <p><b>AM Exponentials and logarithms</b></p> <ul style="list-style-type: none"> <li>Know and use the function <math>ka^x</math> and its graph, where <math>a</math> is positive.</li> <li>Know and use the definition of <math>\log_a x</math> as the inverse of <math>a^x</math>.</li> <li>Convert equations of the form <math>y = ka^x</math> and <math>y = kx^n</math> to a linear form using logarithms.</li> <li>Estimate values of <math>k</math> and <math>a</math> or <math>k</math> and <math>n</math> from graphs.</li> <li>Solve equations of the form <math>a^x = b</math> for <math>a &gt; 0</math>.</li> <li>Use exponentials and logarithms in problems involving exponential growth and decay.</li> </ul> <p><b>AM Numerical methods</b></p> <ul style="list-style-type: none"> <li>Solve equations approximately by</li> </ul> | <p>All content noted below is part of the additional maths qualification.</p> <p><b>AM Differentiation</b></p> <ul style="list-style-type: none"> <li>Differentiate <math>kx^n</math> where <math>n</math> is a positive integer or 0, and the sum of such functions.</li> <li>Know that the gradient function gives the gradient of the curve and measures the rate of change of <math>y</math> with <math>x</math>.</li> <li>Know that the gradient of the function is the gradient of the tangent at that point.</li> <li>Find the equation of a tangent and normal at any point on a curve.</li> <li>Use differentiation to find stationary points on a curve.</li> <li>Determine the nature of a stationary point.</li> <li>Sketch a curve with known stationary points.</li> </ul> <p><b>AM Integration</b></p> <ul style="list-style-type: none"> <li>Integrate <math>kx^n</math> where <math>n</math> is a positive integer or 0, and the sum of such functions.</li> <li>Be aware that integration is the reverse of differentiation.</li> </ul> | <p>Some will study Additional maths (OCR L3)</p> <p>Remainder will review and revise for their GCSE exams.</p> |               |

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|  | <ul style="list-style-type: none"> <li>• Know and use the identity <math>\tan \theta \equiv \frac{\sin \theta}{\cos \theta}</math> *</li> <li>• Know and use the identity <math>\sin^2 \theta + \cos^2 \theta \equiv 1</math> *</li> </ul> <p><b>Unit 31: Graphs</b></p> <ul style="list-style-type: none"> <li>• Interpret distance–time graphs</li> <li>• Draw a graph of the depth of liquid as a container is filled.</li> <li>• Read information from a velocity–time graph.</li> <li>• Work out the distance travelled from a velocity–time graph.</li> <li>• Work out the acceleration from a velocity–time graph.</li> </ul> <p><b>Unit 32: Algebraic fractions and functions</b></p> <ul style="list-style-type: none"> <li>• Solve equations containing algebraic fractions.</li> <li>• Change the subject of a formula where the subject occurs more than once.</li> <li>• Find the output of a function.</li> <li>• Find the inverse function.</li> <li>• Find the composite of two functions.</li> <li>• Estimate the answer to an equation that does not have an exact solution using trial and improvement.</li> <li>• Find an approximate solution for an equation using the process of iteration.</li> <li>• Use a simple iterative method to solve equations approximately</li> </ul> |  | <p>considering the change of sign.</p> <ul style="list-style-type: none"> <li>• Recognise when these numerical methods may fail.</li> <li>• Use a chord to estimate gradient of a tangent to a curve at a point.</li> <li>• Recognise how to improve an estimate for the gradient of a curve at a point.</li> <li>• Use rectangular strips to estimate the area between a curve and the x-axis.</li> <li>• Use trapezium rule to estimate the area between a curve and the x-axis. Recognise whether an estimate would be an over or underestimate and understand how to calculate an improved estimate.</li> <li>• Apply numerical methods in context where appropriate.</li> </ul> <p><b>Remainder will review and revise for their GCSE exams</b></p> | <ul style="list-style-type: none"> <li>• Know what is meant by an indefinite and a definite integral.</li> <li>• Evaluate definite integrals.</li> <li>• Find the area between a curve, two ordinates and the x-axis.</li> <li>• Find the area between two curves.</li> </ul> <p><b>AM Application of kinematics</b></p> <ul style="list-style-type: none"> <li>• Recognise the special case where the use of constant acceleration formulae is appropriate.</li> <li>• Use differentiation and integration with respect to time to solve simple problems involving variable acceleration.</li> </ul> <p><b>Remainder will review and revise for their GCSE exams</b></p> |  |  |
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|   |  |  |  |  |  |  |
| <b>Assessment</b>                       | End of Unit assessments  | End of Unit assessments<br>Year 11 PPE |  |  |  |  |
| <b>Enrichment<br/>and<br/>extension</b> | UKMT, OCR Additional Maths FSMQ (Level 3) for most able students |  |  |  |  |  |

# Year 12

Prior to commencing A Level students will have studied GCSE mathematics. Some students may have participated in an additional mathematics qualification, such as OCR Level 3 FMQ or AQA Level 2 Qualification, but this is not a requirement for beginning the A Level course. Students should not be disadvantaged if they have not participated in an additional mathematics qualification. However, all students are required to have been awarded a grade 7 or above in their GCSE qualification.

An understanding of students' starting points is achieved by baseline testing completed at the start of year 12. For internal candidates, two baseline assessments are completed: one after their GCSEs and one at the start of year 12. This allows teachers to gauge work ethic of these students as well as any forgotten learning from over the summer break. It also allows teachers a starting point as to which topic areas are strengths and which topic areas will need more attention.

To benefit from strong content and subject knowledge of teaching staff, the curriculum is broken down into three aspects: pure mathematics, statistics and mechanics. One teacher is responsible for each aspect of the course, and curriculum time is allocated to mirror the A Level assessment (60% pure mathematics, 20% statistics, 20% mechanics).

Most of the year 12 course focuses on the AS Mathematics qualification content. Although students do not sit the AS exam at the end of year 12, these assessments are used for internal data. Where one aspect of the course relies on another, teachers may include content from the year 13 syllabus to not miss out on valuable curriculum time. This allows teachers to provide stretch and challenge as well.

|  | <b>Term 1</b>   | <b>Term 2</b>  | <b>Term 3</b>   | <b>Term 4</b>  | <b>Term 5</b>   | <b>Term 6</b>   |
|--|---|--|---|--|---|---|
| <b>Content – Knowledge and Understanding</b> | Algebraic expressions   | Straight line graphs   | Trigonometric ratios  | Differentiation  | Integration   | Algebraic methods   |
| <b>Skills and concepts</b>                   | <ul style="list-style-type: none"> <li>• Index Laws</li> <li>• Expanding brackets</li> <li>• Factorising</li> <li>• Negative and fractional indices</li> <li>• Surds</li> <li>• Rationalising denominators</li> </ul>             | <ul style="list-style-type: none"> <li>• <math>Y = mx + c</math></li> <li>• Equations of straight lines</li> <li>• Parallel and perpendicular lines</li> <li>• Length and area</li> <li>• Modelling with straight lines</li> </ul>                           | <ul style="list-style-type: none"> <li>• The cosine rule</li> <li>• The sine rule</li> <li>• Areas of triangles</li> <li>• Solving triangle problems</li> <li>• Graphs of sine, cosine and tangent</li> <li>• Transforming trig graphs</li> </ul> | <ul style="list-style-type: none"> <li>• Gradients of curves</li> <li>• Finding the derivative</li> <li>• Differentiating <math>x^n</math></li> <li>• Differentiating with quadratics</li> <li>• Gradients, tangents and normal</li> <li>• Increasing and decreasing functions</li> <li>• Second order derivatives</li> <li>• Stationary points</li> <li>• Sketching gradient functions</li> <li>• Modelling with differentiation</li> </ul> | <ul style="list-style-type: none"> <li>• Integrating <math>x^n</math></li> <li>• Indefinite integrals</li> <li>• Finding functions</li> <li>• Definite integrals</li> <li>• Areas under curves</li> <li>• Areas under the x-axis</li> <li>• Areas between curves and lines</li> </ul>   | <ul style="list-style-type: none"> <li>• Use proof by contradiction.</li> <li>• Multiply and divide two or more algebraic fractions</li> <li>• Add or subtract two or more algebraic fractions</li> <li>• Convert an expression with linear factors or repeated linear factors into partial fractions</li> <li>• Divide algebraic expressions</li> <li>• Convert improper fractions into partial fraction form</li> </ul> |
|  | Quadratics  | Circles  | Trigonometric identities and equations  | Statistical distribution   | Exponentials and logarithms   | Functions and graphs  |
|  | <ul style="list-style-type: none"> <li>• Solving quadratic equations</li> <li>• Completing the square</li> <li>• Functions</li> <li>• Quadratic graphs</li> <li>• The discriminant</li> <li>• Modelling with particles</li> </ul> | <ul style="list-style-type: none"> <li>• Midpoints and perpendicular bisector</li> <li>• Equation of a circle</li> <li>• Intersections of straight lines and circles</li> <li>• Use tangent and chord properties</li> <li>• Circles and triangles</li> </ul> | <ul style="list-style-type: none"> <li>• Angles in all four quadrants</li> <li>• Exact values of trig ratios</li> <li>• Trig identities</li> <li>• Trig equations</li> <li>• Equations and identities</li> </ul>                                  | <ul style="list-style-type: none"> <li>• Probability distributions</li> <li>• The binomial distribution</li> <li>• Cumulative probabilities</li> </ul>   | <ul style="list-style-type: none"> <li>• Exponential functions</li> <li>• <math>Y = e^{\lambda x}</math></li> <li>• Exponential modelling</li> <li>• Logarithms</li> <li>• Laws of logarithms</li> <li>• Solving equations using logarithms</li> <li>• Working with natural logarithms</li> <li>• Logarithms and non-linear data</li> </ul> | <ul style="list-style-type: none"> <li>• Understand and use modulus notation</li> <li>• Understand mappings and functions, use domain and range</li> </ul>  |
|  | Equations and inequalities  | Algebraic methods  | Vectors   | Moments  | Hypothesis testing  |   |
|  | <ul style="list-style-type: none"> <li>• Linear simultaneous equations</li> <li>• Quadratic simultaneous equations</li> </ul>   | <ul style="list-style-type: none"> <li>• Algebraic fractions</li> <li>• Dividing polynomials</li> <li>• The factor theorem</li> <li>• Mathematical proof</li> </ul>  | <ul style="list-style-type: none"> <li>• Vectors</li> <li>• Representing vectors</li> </ul>   |  | <ul style="list-style-type: none"> <li>• Hypothesis testing</li> <li>• Finding critical values</li> </ul>   |   |

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|                   | <ul style="list-style-type: none"> <li>• Simultaneous equations on graphs</li> <li>• Linear inequalities</li> <li>• Quadratic inequalities</li> <li>• Inequalities on graphs</li> </ul> <p>Graphs and transformations</p> <ul style="list-style-type: none"> <li>• Cubic graphs</li> <li>• Quartic graphs</li> <li>• Reciprocal graphs</li> <li>• Points of intersection</li> <li>• Translating graphs</li> <li>• Sketching graphs</li> <li>• Transforming functions</li> </ul> <p>Data Collection</p> <ul style="list-style-type: none"> <li>• Populations and samples</li> <li>• Sampling</li> <li>• Non-random sampling</li> <li>• Types of data</li> <li>• The large data set</li> </ul> <p>Measures of location and spread</p> <ul style="list-style-type: none"> <li>• Measures of central tendency</li> <li>• Other measures of location</li> <li>• Measures of spread</li> <li>• Variance and standard deviation</li> <li>• Coding</li> </ul> <p>Modelling in mechanics</p> <ul style="list-style-type: none"> <li>• Constructing a model</li> <li>• Modelling assumptions</li> <li>• Quantities and units</li> <li>• Working with vectors</li> </ul> | <ul style="list-style-type: none"> <li>• Methods of proof</li> </ul> <p>Binomial expansion</p> <ul style="list-style-type: none"> <li>• Pascal's triangle</li> <li>• Factorial notation</li> <li>• The binomial expansion</li> <li>• Solving binomial problems</li> <li>• Binomial estimation</li> </ul> <p>Representations of data</p> <ul style="list-style-type: none"> <li>• Outliers</li> <li>• Box plots</li> <li>• Cumulative frequency</li> <li>• Histograms</li> <li>• Comparing data</li> </ul> <p>Correlation</p> <ul style="list-style-type: none"> <li>• Correlation</li> <li>• Linear regression</li> </ul> <p>Probability</p> <ul style="list-style-type: none"> <li>• Calculating probabilities</li> <li>• Venn diagrams</li> <li>• Mutually exclusive and independent events</li> <li>• Tree diagrams</li> </ul> <p>Constant acceleration</p> <ul style="list-style-type: none"> <li>• Displacement-time graphs</li> <li>• Velocity-time graphs</li> <li>• Constant acceleration formulae</li> <li>• Vertical motion under gravity</li> </ul> | <ul style="list-style-type: none"> <li>• Magnitude and direction</li> <li>• Position vectors</li> <li>• Solving geometric problems</li> <li>• Modelling with vectors</li> </ul> <p>Forces and motion</p> <ul style="list-style-type: none"> <li>• Force diagrams</li> <li>• Forces as vectors</li> <li>• Forces and acceleration</li> <li>• Motion in 2 dimensions</li> <li>• Connected particles</li> <li>• Pulleys</li> </ul> | <ul style="list-style-type: none"> <li>• Moments</li> <li>• Resultant moments</li> <li>• Equilibrium</li> <li>• Centre of mass</li> <li>• Tilting</li> </ul> | <ul style="list-style-type: none"> <li>• One-tailed tests</li> <li>• Two-tailed tests</li> </ul> <p>Forces and friction</p> <ul style="list-style-type: none"> <li>• Resolving forces</li> <li>• Inclined planes</li> <li>• Friction</li> </ul> | <ul style="list-style-type: none"> <li>• Combine two or more functions to make a composite function</li> <li>• Know how to find the inverse of a function graphically or algebraically</li> <li>• Sketch the graphs of modulus functions</li> <li>• Transform the modulus function</li> </ul> <p>Correlation &amp; regression</p> <ul style="list-style-type: none"> <li>• Regression, correlation and hypothesis testing</li> <li>• Exponential models</li> <li>• Measuring correlation</li> <li>• Hypothesis testing for zero correlation</li> </ul> <p>Variable acceleration</p> <ul style="list-style-type: none"> <li>• Functions of time</li> <li>• Using differentiation</li> <li>• Maxima and minima problems</li> <li>• Using integration</li> <li>• Constant acceleration formulae</li> </ul> |
| <b>Assessment</b> | End of Unit assessments   | End of Unit assessments  | End of Unit assessments   | End of Unit assessments  | End of Unit assessments<br>Y12 PPEs   | End of Unit assessments   |

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| <b>Enrichment<br/>and<br/>extension</b> | <b>Advanced Maths Support Programme enrichment (AMSP)</b><br><br>UKMT |
|---|---|



# Year 13

Our year 13 curriculum builds on and extends the work done in year 12 by revisiting and challenge course content covered in year 12. Many of the course components in year 13 build off the content covered in year 12, so it is vital that teachers are frequently assessing students' understanding.

Like the year 12 course, the course components are broken into three sections taught by three teachers: pure mathematics, statistics and mechanics. Curriculum time is allocated similarly to that of year 12, but the pure content is weighted more heavily than the applied content. There are times in which all teachers may have to provide instruction for the pure mathematics aspect of the course.

As with our year 11 scheme of learning, the A Level instruction finishes early to allow for revisiting previous topics. However, as students have become more independent and are studying fewer courses, the course ends much closer to the start of the exam season.

|   | <b>Term 1</b>   | <b>Term 2</b>  | <b>Term 3</b>  | <b>Term 4</b>   | <b>Term 5</b>                           | <b>Term 6</b> |
|---|---|--|--|---|---|---------------|
| <p><b>Content – Knowledge and Understanding</b></p> <p><b>Skills and concepts</b></p> | <p>Sequences and series</p> <ul style="list-style-type: none"> <li>Find the nth term of an arithmetic sequence</li> <li>Prove and use the formula for the sum of the first n terms of an arithmetic series</li> <li>Find the nth term of a geometric sequence</li> <li>Prove and use the formula for the sum of the first n terms of a geometric series</li> <li>Prove and use the formula for the sum to infinity for a convergent series</li> <li>Generate sequences from recurrence relations</li> <li>Model real-life situations</li> </ul> <p>Binomial expansion</p> <ul style="list-style-type: none"> <li>Expand <math>(1 + x)^n</math> and determine the range of values of x for which the expansion is valid</li> <li>Expand <math>(a + bx)^n</math> and determine the range of values of x for which the expansion is valid</li> </ul> | <p>Trigonometric functions</p> <ul style="list-style-type: none"> <li>Understand the definition of secant, cosecant and cotangent</li> <li>Understand the graphs of secant, cosecant and cotangent</li> <li>Simplify expressions, prove simple identities involving secant, cosecant and cotangent</li> <li>Prove and use <math>\sec^2 x = 1 + \tan^2 x</math> and <math>\operatorname{cosec}^2 x = 1 + \cot^2 x</math></li> <li>Understand and use inverse trig functions and their domains and ranges</li> </ul> <p>Trigonometry and modelling</p> <ul style="list-style-type: none"> <li>Prove and use the Addition formulae</li> <li>Understand and use the double angle formulae</li> <li>Solve trig equations using the double angle and addition formulae</li> <li>Write expressions of the form <math>a \cos x \pm b \sin x</math> in the forms</li> </ul> | <p>Parametric equations</p> <ul style="list-style-type: none"> <li>Convert parametric equations into Cartesian form by substitution or using trig identities</li> <li>Understand and use parametric equations of curves and sketch parametric curves</li> <li>Solve coordinate geometry problems involving parametric equations</li> <li>Use parametric equations in modelling a variety of contexts</li> </ul> <p>Differentiation</p> <ul style="list-style-type: none"> <li>Differentiate trigonometric functions</li> <li>Differentiate exponentials and logs</li> <li>Use the Chain, Product and Quotient rules</li> <li>Differentiate parametric equations</li> <li>Use the second derivative</li> <li>Solve problems involving connected rates of change</li> </ul> <p>Numerical methods</p> | <p>Integration</p> <ul style="list-style-type: none"> <li>Integrate standard functions including trig and exponential functions and use the reverse of the Chain rule</li> <li>Use trig identities in integration</li> <li>Integrate using a substitution, by parts or using partial fractions</li> <li>Find the area under a curve</li> <li>Use the trapezium rule</li> <li>Solve simple differential equations</li> </ul> <p>Vectors</p> <ul style="list-style-type: none"> <li>Understand 3D Cartesian coordinates</li> <li>Use vectors in three dimensions</li> <li>Use vectors to solve geometric problems</li> <li>Model 3D motion in mechanics with vectors</li> </ul> <p>Further kinematics</p> <ul style="list-style-type: none"> <li>Vectors in kinematics</li> <li>Vector methods and projectiles</li> </ul> | <p>Revision and past paper practice</p> |               |

|                   |  |  |   |  |  |  |
|-------------------|--|--|---|--|--|--|
|                   | <ul style="list-style-type: none"> <li>Use partial fractions to expand fractional expressions</li> </ul> <p>Radians</p> <ul style="list-style-type: none"> <li>Convert between degrees and radians and apply this to trig graphs and their transformations</li> <li>Know exact values of angles measured in radians</li> <li>Find arc length using radians</li> <li>Find areas of sectors and segments using radians</li> <li>Solve trig equations in radians</li> <li>Use approx. trig values when theta is small</li> </ul> <p>Conditional probability</p> <ul style="list-style-type: none"> <li>Set notation</li> <li>Conditional probability</li> <li>Conditional probabilities in Venn diagrams</li> <li>Probability formulae</li> <li>Tree diagrams</li> </ul> <p>Projectiles</p> <ul style="list-style-type: none"> <li>Horizontal projection</li> <li>Horizontal and vertical components</li> <li>Projection at an angle</li> <li>Projectile motion formulae</li> </ul> | <p><math>R\cos(x+\alpha)</math> or <math>R\sin(x+\alpha)</math></p> <ul style="list-style-type: none"> <li>Use trigonometric functions to model real-life situations</li> </ul> <p>The normal distribution</p> <ul style="list-style-type: none"> <li>The normal distribution</li> <li>Finding probabilities from normal distributions</li> <li>The inverse normal distribution</li> <li>The standard normal distribution</li> <li>Finding <math>\mu</math> and <math>\sigma</math></li> <li>Approximating a binomial distribution</li> <li>Hypothesis testing with the normal distribution</li> </ul> <p>Applications of forces</p> <ul style="list-style-type: none"> <li>Static particles</li> <li>Modelling with Statics</li> <li>Friction and static particles</li> </ul> | <ul style="list-style-type: none"> <li>Locate roots of <math>f(x) = 0</math> by considering changes of sign</li> <li>Use iteration to find an approximation</li> <li>Use the Newton-Raphson procedure</li> <li>Solve problems in context</li> </ul> <p>Applications of forces</p> <ul style="list-style-type: none"> <li>Static rigid bodies</li> <li>Dynamics and inclined planes</li> <li>Connected particle</li> </ul> | <ul style="list-style-type: none"> <li>Variable acceleration in one dimension</li> <li>Differentiating vectors</li> <li>Integrating vectors</li> </ul> |  |  |
| <b>Assessment</b> | End of Unit assessments  | End of Unit assessments  | End of Unit assessments<br>Y13 PPEs   | End of Unit assessments  |  |  |

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| <b>Enrichment<br/>and<br/>extension</b> | <b>Advanced Maths Support Programme enrichment (AMSP)</b><br><br>UKMT |
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# Year 12 – Further Maths A Level

Our most able year 12 mathematicians will also take part in the Further Maths A Level alongside the Maths A Level course. These students will have more curriculum time to cover all of the content listed above (in years 12 and 13), but also the course content involved in the Further Maths course. Some of the content listed below will be from the Mathematics A Level (denoted with a \*) while some will be specific to the Further Maths A Level.

This course is also flexible depending on the interests of the cohorts. While all Further Maths students need to study Core 1 and Core 2 mathematics, students then have an option between further pure maths, further mechanics, further statistics. This year's year 13 cohort has decided to take part in further mechanics, so this curriculum map reflects those timings.

|  | Term 1   | Term 2  | Term 3  | Term 4  | Term 5   | Term 6   |
|--|--|---|---|---|--|--|
| <b>Content – Knowledge and Understanding</b> | Algebraic expressions* <ul style="list-style-type: none"> <li>Index Laws</li> <li>Expanding brackets</li> <li>Factorising</li> <li>Negative and fractional indices</li> </ul>  | Exponentials and logarithms* <ul style="list-style-type: none"> <li>Exponential functions</li> <li><math>Y = e^x</math></li> <li>Exponential modelling</li> <li>Logarithms</li> <li>Laws of logarithms</li> <li>Solving equations using logarithms</li> <li>Working with natural logarithms</li> <li>Logarithms and non-linear data</li> </ul>  | Sequences and series* <ul style="list-style-type: none"> <li>Find the nth term of an arithmetic sequence</li> <li>Prove and use the formula for the sum of the first n terms of an arithmetic series</li> <li>Find the nth term of a geometric sequence</li> <li>Prove and use the formula for the sum of the first n terms of a geometric series</li> <li>Prove and use the formula for the sum to infinity for a convergent series</li> <li>Generate sequences from recurrence relations</li> <li>Model real-life situations</li> </ul> | Integration* <ul style="list-style-type: none"> <li>Integrate standard functions including trig and exponential functions and use the reverse of the Chain rule</li> <li>Use trig identities in integration</li> <li>Integrate using a substitution, by parts or using partial fractions</li> <li>Find the area under a curve</li> <li>Use the trapezium rule</li> <li>Solve simple differential equations</li> </ul> | Series <ul style="list-style-type: none"> <li>Sums of natural numbers</li> <li>Sums of squares and cubes</li> </ul>  | Matrices <ul style="list-style-type: none"> <li>Introduction to matrices</li> <li>Matrix multiplication</li> <li>Determinants</li> <li>Inverting a 2 x 2 matrix</li> <li>Inverting a 3 x 3 matrix</li> <li>Solving systems of equations using matrices</li> </ul>  |
| <b>Skills and concepts</b>                   | Quadratics* <ul style="list-style-type: none"> <li>Solving quadratic equations</li> <li>Completing the square</li> <li>Functions</li> <li>Quadratic graphs</li> <li>The discriminant</li> <li>Modelling with particles</li> </ul>  | Algebraic methods* <ul style="list-style-type: none"> <li>Algebraic fractions</li> <li>Dividing polynomials</li> <li>The factor theorem</li> <li>Mathematical proof</li> <li>Methods of proof</li> </ul>  | Binomial expansion* <ul style="list-style-type: none"> <li>Expand <math>(1 + x)^n</math> and determine the range of values of x for which the expansion is valid</li> <li>Expand <math>(a + bx)^n</math> and determine the range of values of x for which the expansion is valid</li> <li>Use partial fractions to expand fractional expressions</li> </ul>   | Numerical methods* <ul style="list-style-type: none"> <li>Locate roots of <math>f(x) = 0</math> by considering changes of sign</li> <li>Use iteration to find an approximation</li> <li>Use the Newton-Raphson procedure</li> <li>Solve problems in context</li> </ul>  | Roots of polynomials <ul style="list-style-type: none"> <li>Roots of a quadratic equation</li> <li>Roots of a cubic equation</li> <li>Roots of a quartic equation</li> <li>Expressions relating to the roots of a polynomial</li> <li>Linear transformations of roots</li> </ul> | Linear transformations <ul style="list-style-type: none"> <li>Linear transformations in two dimensions</li> <li>Reflections and rotations</li> <li>Enlargements and stretches</li> <li>Successive transformations</li> <li>Linear transformations in three dimensions</li> <li>The inverse of a linear transformation</li> </ul> |
|  | Equations and inequalities* <ul style="list-style-type: none"> <li>Linear simultaneous equations</li> <li>Quadratic simultaneous equations</li> <li>Simultaneous equations on graphs</li> <li>Linear inequalities</li> <li>Quadratic inequalities</li> <li>Inequalities on graphs</li> </ul> | Differentiation* <ul style="list-style-type: none"> <li>Gradients of curves</li> <li>Finding the derivative</li> <li>Differentiating <math>x^n</math></li> <li>Differentiating with quadratics</li> <li>Gradients, tangents and normal</li> <li>Increasing and decreasing functions</li> <li>Second order derivatives</li> <li>Stationary points</li> <li>Sketching gradient functions</li> </ul> |   | Vectors* <ul style="list-style-type: none"> <li>Understand 3D Cartesian coordinates</li> <li>Use vectors in three dimensions</li> </ul>   | Complex numbers <ul style="list-style-type: none"> <li>Imaginary and complex numbers</li> <li>Multiplying complex numbers</li> <li>Complex conjugation</li> <li>Roots of quadratic equations</li> <li>Solving cubic and quartic equations</li> </ul>                             | Proof by induction <ul style="list-style-type: none"> <li>Proof by mathematical induction</li> <li>Proving divisibility results</li> <li>Proving statements involving matrices</li> </ul>  |
|  | Graphs and transformations* <ul style="list-style-type: none"> <li>Cubic graphs</li> <li>Quartic graphs</li> </ul>   |   |   |   | Argand diagrams <ul style="list-style-type: none"> <li>Argand diagrams</li> <li>Modulus and argument</li> </ul>  | Volumes of revolution <ul style="list-style-type: none"> <li>Volumes of revolution around the x-axis</li> </ul>  |

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|  | <ul style="list-style-type: none"> <li>Reciprocal graphs</li> <li>Points of intersection</li> <li>Translating graphs</li> <li>Sketching graphs</li> <li>Transforming functions</li> </ul> <p>Straight line graphs*</p> <ul style="list-style-type: none"> <li><math>Y = mx + c</math></li> <li>Equations of straight lines</li> <li>Parallel and perpendicular lines</li> <li>Length and area</li> <li>Modelling with straight lines</li> </ul> <p>Circles*</p> <ul style="list-style-type: none"> <li>Midpoints and perpendicular bisector</li> <li>Equation of a circle</li> <li>Intersections of straight lines and circles</li> <li>Use tangent and chord properties</li> <li>Circles and triangles</li> </ul> <p>Binomial expansion*</p> <ul style="list-style-type: none"> <li>Pascal's triangle</li> <li>Factorial notation</li> <li>The binomial expansion</li> <li>Solving binomial problems</li> <li>Binomial estimation</li> </ul> <p>Trigonometric ratios*</p> <ul style="list-style-type: none"> <li>The cosine rule</li> <li>The sine rule</li> <li>Areas of triangles</li> <li>Solving triangle problems</li> <li>Graphs of sine, cosine and tangent</li> <li>Transforming trig graphs</li> </ul> | <ul style="list-style-type: none"> <li>Modelling with differentiation</li> </ul> <p>Integration*</p> <ul style="list-style-type: none"> <li>Integrating <math>x^n</math></li> <li>Indefinite integrals</li> <li>Finding functions</li> <li>Definite integrals</li> <li>Areas under curves</li> <li>Areas under the x-axis</li> <li>Areas between curves and lines</li> </ul> <p>Algebraic methods*</p> <ul style="list-style-type: none"> <li>Use proof by contradiction.</li> <li>Multiply and divide two or more algebraic fractions</li> <li>Add or subtract two or more algebraic fractions</li> <li>Convert an expression with linear factors or repeated linear factors into partial fractions</li> <li>Divide algebraic expressions</li> <li>Convert improper fractions into partial fraction form</li> </ul> <p>Functions and graphs*</p> <ul style="list-style-type: none"> <li>Understand and use modulus notation</li> <li>Understand mappings and functions, use domain and range</li> <li>Combine two or more functions to make a composite function</li> <li>Know how to find the inverse of a function graphically or algebraically</li> <li>Sketch the graphs of modulus functions</li> </ul> | <p>Differentiation*</p> <ul style="list-style-type: none"> <li>Differentiate trigonometric functions</li> <li>Differentiate exponentials and logs</li> <li>Use the Chain, Product and Quotient rules</li> <li>Differentiate parametric equations</li> <li>Use the second derivative</li> <li>Solve problems involving connected rates of change</li> </ul> <p>Trigonometric functions*</p> <ul style="list-style-type: none"> <li>Understand the definition of secant, cosecant and cotangent</li> <li>Understand the graphs of secant, cosecant and cotangent</li> <li>Simplify expressions, prove simple identities involving secant, cosecant and cotangent</li> <li>Prove and use <math>\sec^2 x = 1 + \tan^2 x</math> and <math>\operatorname{cosec}^2 x = 1 + \cot^2 x</math></li> <li>Understand and use inverse trig functions and their domains and ranges</li> </ul> <p>Trigonometry and modelling*</p> <ul style="list-style-type: none"> <li>Prove and use the Addition formulae</li> <li>Understand and use the double angle formulae</li> <li>Solve trig equations using the double angle and addition formulae</li> <li>Write expressions of the form <math>a \cos x \pm b \sin</math></li> </ul> | <ul style="list-style-type: none"> <li>Use vectors to solve geometric problems</li> <li>Model 3D motion in mechanics with vectors</li> </ul> <p>Variable acceleration*</p> <ul style="list-style-type: none"> <li>Functions of time</li> <li>Using differentiation</li> <li>Maxima and minima problems</li> <li>Using integration</li> <li>Constant acceleration formulae</li> </ul> <p>Statistical distribution*</p> <ul style="list-style-type: none"> <li>Probability distributions</li> <li>The binomial distribution</li> <li>Cumulative probabilities</li> </ul> | <ul style="list-style-type: none"> <li>Modulus-argument form of complex numbers</li> <li>Loci in the Argand diagram</li> <li>Regions in the Argand diagram</li> </ul> <p>Vectors*</p> <ul style="list-style-type: none"> <li>Understand 3D Cartesian coordinates</li> <li>Use vectors in three dimensions</li> <li>Use vectors to solve geometric problems</li> <li>Model 3D motion in mechanics with vectors</li> </ul> <p>Hypothesis testing*</p> <ul style="list-style-type: none"> <li>Hypothesis testing</li> <li>Finding critical values</li> <li>One-tailed tests</li> <li>Two-tailed tests</li> </ul> <p>Variable acceleration*</p> <ul style="list-style-type: none"> <li>Functions of time</li> <li>Using differentiation</li> <li>Maxima and minima problems</li> <li>Using integration</li> <li>Constant acceleration formulae</li> </ul> <p>Moments*</p> <ul style="list-style-type: none"> <li>Moments</li> <li>Resultant moments</li> <li>Equilibrium</li> <li>Centre of mass</li> <li>Tilting</li> </ul> | <ul style="list-style-type: none"> <li>Volumes of revolution around the y-axis</li> <li>Adding and subtracting volumes</li> <li>Modelling with volumes of revolution</li> </ul> <p>Vectors</p> <ul style="list-style-type: none"> <li>Equation of a line in three dimensions</li> <li>Equation of a plane in three dimensions</li> <li>Scalar product</li> <li>Calculating angles between lines and planes</li> <li>Points of intersection</li> <li>Finding perpendiculars</li> </ul> <p>Forces and friction*</p> <ul style="list-style-type: none"> <li>Resolving forces</li> <li>Inclined planes</li> <li>Friction</li> </ul> <p>Correlation &amp; regression*</p> <ul style="list-style-type: none"> <li>Regression, correlation and hypothesis testing</li> <li>Exponential models</li> <li>Measuring correlation</li> <li>Hypothesis testing for zero correlation</li> </ul> <p>Conditional probability*</p> <ul style="list-style-type: none"> <li>Set notation</li> <li>Conditional probability</li> <li>Conditional probabilities in Venn diagrams</li> <li>Probability formulae</li> <li>Tree diagrams</li> </ul> <p>The normal distribution*</p> <ul style="list-style-type: none"> <li>The normal distribution</li> <li>Finding probabilities from normal distributions</li> </ul> |
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|  | <p>Trigonometric identities and equations*</p> <ul style="list-style-type: none"> <li>• Angles in all four quadrants</li> <li>• Exact values of trig ratios</li> <li>• Trig identities</li> <li>• Trig equations</li> <li>• Equations and identities</li> </ul> <p>Data Collection*</p> <ul style="list-style-type: none"> <li>• Populations and samples</li> <li>• Sampling</li> <li>• Non-random sampling</li> <li>• Types of data</li> <li>• The large data set</li> </ul> <p>Modelling in mechanics*</p> <ul style="list-style-type: none"> <li>• Constructing a model</li> <li>• Modelling assumptions</li> <li>• Quantities and units</li> <li>• Working with vectors</li> </ul> <p>The Large Data Set*</p> | <ul style="list-style-type: none"> <li>• Transform the modulus function</li> </ul> <p>Radians*</p> <ul style="list-style-type: none"> <li>• Convert between degrees and radians and apply this to trig graphs and their transformations</li> <li>• Know exact values of angles measured in radians</li> <li>• Find arc length using radians</li> <li>• Find areas of sectors and segments using radians</li> <li>• Solve trig equations in radians</li> <li>• Use approx. trig values when theta is small</li> </ul> <p>Constant acceleration*</p> <ul style="list-style-type: none"> <li>• Displacement-time graphs</li> <li>• Velocity-time graphs</li> <li>• Constant acceleration formulae</li> <li>• Vertical motion under gravity</li> </ul> <p>Measures of location and spread*</p> <ul style="list-style-type: none"> <li>• Measures of central tendency</li> <li>• Other measures of location</li> <li>• Measures of spread</li> <li>• Variance and standard deviation</li> <li>• Coding</li> </ul> <p>Representations of data*</p> <ul style="list-style-type: none"> <li>• Outliers</li> <li>• Box plots</li> <li>• Cumulative frequency</li> <li>• Histograms</li> </ul> | <p>x in the forms <math>R\cos(x+\alpha)</math> or <math>R\sin(x+\alpha)</math></p> <ul style="list-style-type: none"> <li>• Use trigonometric functions to model real-life situations</li> </ul> <p>Parametric equations</p> <ul style="list-style-type: none"> <li>• Convert parametric equations into Cartesian form by substitution or using trig identities</li> <li>• Understand and use parametric equations of curves and sketch parametric curves</li> <li>• Solve coordinate geometry problems involving parametric equations</li> <li>• Use parametric equations in modelling a variety of contexts</li> </ul> <p>Forces and motion*</p> <ul style="list-style-type: none"> <li>• Force diagrams</li> <li>• Forces as vectors</li> <li>• Forces and acceleration</li> <li>• Motion in 2 dimensions</li> <li>• Connected particles</li> <li>• Pulleys</li> </ul> <p>Correlation*</p> <ul style="list-style-type: none"> <li>• Correlation</li> <li>• Linear regression</li> </ul> <p>Probability*</p> <ul style="list-style-type: none"> <li>• Calculating probabilities</li> <li>• Venn diagrams</li> <li>• Mutually exclusive and independent events</li> <li>• Tree diagrams</li> </ul> |  |  | <ul style="list-style-type: none"> <li>• The inverse normal distribution</li> <li>• The standard normal distribution</li> <li>• Finding mu and sigma</li> <li>• Approximating a binomial distribution</li> <li>• Hypothesis testing with the normal distribution</li> </ul> |
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|                                 |  |  |                         |                         |   |  |
|---------------------------------|--|--|-------------------------|-------------------------|---|--|
|                                 |  | <ul style="list-style-type: none"> <li>Comparing data</li> </ul> |                         |                         |   |  |
| <b>Assessment</b>               | End of Unit assessments  | End of Unit assessments  | End of Unit assessments | End of Unit assessments | End of Unit assessments<br>Year 12 PPEs |  |
| <b>Enrichment and extension</b> | <b>Advanced Maths Support Programme enrichment (AMSP)</b><br><br><b>UKMT</b> |  |                         |                         |   |  |

# Year 13 – Further Maths A Level

Our year 13 curriculum builds on and extends the work done in year 12 by revisiting and challenge course content covered in year 12. Many of the course components in year 13 build off the content covered in year 12, so it is vital that teachers are frequently assessing students' understanding.

As with our year 11 scheme of learning, the A Level instruction finishes early to allow for revisiting previous topics. However, as students have become more independent and are studying fewer courses, the course ends much closer to the start of the exam season.

This map reflects the choices of the current year 13 students in choosing core maths 1 and 2, further mechanics 1 and further pure maths 1.

|   | <b>Term 1</b>  | <b>Term 2</b>   | <b>Term 3</b>   | <b>Term 4</b>  | <b>Term 5</b>                           | <b>Term 6</b> |
|---|--|---|---|--|---|---------------|
| <p><b>Content –</b><br/>Knowledge and Understanding</p> <p><b>Skills and concepts</b></p> | <p>Methods in calculus</p> <ul style="list-style-type: none"> <li>Improper integrals</li> <li>The mean value of a function</li> <li>Differentiating inverse trigonometric functions</li> <li>Integrating with inverse trigonometric functions</li> <li>Integrating using partial fractions</li> </ul> <p>Complex numbers</p> <ul style="list-style-type: none"> <li>Exponential form of complex numbers</li> <li>Multiplying and dividing complex numbers</li> <li>De Moivre's theorem</li> <li>Trigonometric identities</li> <li>Sums of series</li> <li>Nth roots of a complex number</li> <li>Solving geometric problems</li> </ul> <p>Series</p> <ul style="list-style-type: none"> <li>The method of differences</li> <li>Higher derivatives</li> <li>Maclaurin series</li> <li>Series expansions of compound functions</li> </ul> <p>Volumes of revolutions</p> <ul style="list-style-type: none"> <li>Volumes of revolutions around the x-axis</li> </ul> | <p>Elastic collisions in one dimension</p> <ul style="list-style-type: none"> <li>Direct impact and Newton's law of restitution</li> <li>Direct collision with a smooth plane</li> <li>Loss of kinetic energy</li> <li>Successive direct impacts</li> </ul> <p>Elastic collisions in two dimensions</p> <ul style="list-style-type: none"> <li>Oblique impact with a fixed surface</li> <li>Successive oblique impacts</li> <li>Oblique impact of smooth spheres</li> </ul> <p>Conic sections 1</p> <ul style="list-style-type: none"> <li>Ellipses</li> <li>Hyperbolas</li> <li>Eccentricity</li> <li>Tangents and normal to an ellipse</li> <li>Tangents and normal to a hyperbola</li> <li>Loci</li> </ul> <p>Methods in differential equations</p> <ul style="list-style-type: none"> <li>First-order differential equations</li> </ul> | <p>Conic sections 2</p> <ul style="list-style-type: none"> <li>Ellipses</li> <li>Hyperbolas</li> <li>Eccentricity</li> <li>Tangents and normal to an ellipse</li> <li>Tangents and normal to a hyperbola</li> <li>Loci</li> </ul> <p>Inequalities</p> <ul style="list-style-type: none"> <li>Algebraic methods</li> <li>Using graphs to solve inequalities</li> <li>Modulus inequalities</li> </ul> <p>Numerical methods</p> <ul style="list-style-type: none"> <li>Solving first-order differential equations</li> <li>Solving second-order differential equations</li> <li>Simpson's rule</li> </ul> <p>Vectors</p> <ul style="list-style-type: none"> <li>Vector product</li> <li>Finding areas</li> <li>Scalar triple product</li> <li>Straight lines</li> <li>Solving geometrical problems</li> </ul> <p>The t-formulae</p> <ul style="list-style-type: none"> <li>The t-formulae</li> </ul> | <p>Reducible differential equations</p> <ul style="list-style-type: none"> <li>First-order differential equations</li> <li>Second-order differential equations</li> <li>Modelling with differential equations</li> </ul> <p>Taylor series</p> <ul style="list-style-type: none"> <li>Taylor series</li> <li>Finding limits</li> <li>Series solutions of differential equations</li> </ul> <p>Methods in calculus</p> <ul style="list-style-type: none"> <li>Leibnitz's theorem and nth derivatives</li> <li>L'Hospital's rule</li> <li>The Weierstrass substitution</li> </ul> <p>Revision and past paper practice</p> | <p>Revision and past paper practice</p> |               |



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|--|--|--|---|--|--|--|
|  | <ul style="list-style-type: none"> <li>• Volumes of revolutions around the y-axis</li> <li>• Volumes of revolution of parametrically defined curves</li> <li>• Modelling with volumes of revolution</li> </ul> <p>Polar coordinates</p> <ul style="list-style-type: none"> <li>• Polar coordinates and equations</li> <li>• Sketching curves</li> <li>• Area enclosed by a polar curve</li> <li>• Tangents to polar curves</li> </ul> <p>Hyperbolic functions</p> <ul style="list-style-type: none"> <li>• Introduction to hyperbolic functions</li> <li>• Inverse hyperbolic functions</li> <li>• Identities and equations</li> <li>• Differentiating hyperbolic functions</li> <li>• Integrating hyperbolic functions</li> </ul> <p>Momentum and impulse</p> <ul style="list-style-type: none"> <li>• Momentum in one direction</li> <li>• Conservation of momentum</li> <li>• Momentum as a vector</li> </ul> <p>Work, energy and power</p> <ul style="list-style-type: none"> <li>• Work done</li> <li>• Kinetic and potential energy</li> <li>• Conservation of mechanical energy and the work-energy principle</li> <li>• Power</li> </ul> <p>Elastic strings and springs</p> <ul style="list-style-type: none"> <li>• Hooke's law and equilibrium problems</li> </ul> | <ul style="list-style-type: none"> <li>• Second-order homogeneous differential equations</li> <li>• Second-order non-homogeneous differential equations</li> <li>• Using boundary conditions</li> </ul> <p>Modelling with differential equations</p> <ul style="list-style-type: none"> <li>• Modelling with first-order differential equations</li> <li>• Simple harmonic motion</li> <li>• Damped and forced harmonic motion</li> <li>• Coupled first-order simultaneous differential equations</li> </ul> | <ul style="list-style-type: none"> <li>• Applying the t-formulae to trigonometric identities</li> <li>• Solving trigonometric equations</li> <li>• Modelling with trigonometry</li> </ul> |  |  |  |
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|---------------------------------|---|-------------------------|-------------------------------------|-------------------------|--|--|
|                                 | <ul style="list-style-type: none"> <li>• Hooke's law and dynamics problem</li> <li>• Elastic energy</li> <li>• Problems involving elastic energy</li> </ul> |                         |                                     |                         |  |  |
| <b>Assessment</b>               | End of Unit assessments   | End of Unit assessments | End of Unit assessments<br>Y13 PPEs | End of Unit assessments |  |  |
| <b>Enrichment and extension</b> | <b>Advanced Maths Support Programme enrichment (AMSP)</b><br><br><b>UKMT</b>  |                         |                                     |                         |  |  |