Year 10 Higher: Curriculum Implementation Plan

Mathematics – Year 10 Higher – Overview				
Knowledge and Skills – Students will be taught to…	Reading, Oracy, Literacy	Formative Assessment	Summative Assessment	Link to GCSE Content
Please see individual units below.	• Reading worded questions to understand the context and decide how to approach a problem • Paired discussion of problems • Writing responses to worded questions such as "Explain why…" • Expanding vocabulary of key mathematical terms • Giving verbal responses in class question-and-answer	• Questioning in class • Self-assessment • Peer-assessment • Starter and homework questions • Mini-tests • Show of hands and other forms of whole-class feedback • Review of student work during lessons • Mini-whiteboards	Whole-class assessments towards the end of each term, based on work completed during the year to date. Full GCSE mock examination in the summer term, in preparation for Year 11.	Please see individual units below.

Mathematics – Unit 1 – Algebra 1	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Expand with more than 2 terms in a bracket e.g. $(x+3)(x^2+3x-5)$ (REVISION) • Expand the product of three binomials • Know the difference between an equation and an identity (REVISION) • Create a mathematical argument to show that two expressions are equivalent (to prove an identity) • Change the subject of a formula that involves powers or roots • Change the subject of a formula when the required subject appears twice	Expand product of two binomials **Expand products of more than two binomials** Rearrange formulae to change the subject, including cases where a reciprocal of the subject appears Rearrange formulae to change the subject in cases where the subject appears twice Use algebra to support and construct arguments Argue mathematically to show algebraic expressions are equivalent Use algebra to construct arguments Show algebraic expressions are equivalent **Use algebra to construct proofs and arguments**
Mathematics – Unit 2 – Trigonometry 1	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Label the sides of a right-angled triangle 'hypotenuse', 'adjacent', 'opposite' • Appreciate that the ratio of corresponding sides in similar triangles is constant • Know the trigonometric ratios, sinθ = o/h, cosθ = a/h, tanθ = o/a • Understand the meaning of sin, cos, tan as functions of angles • Use a calculator to find the sine, cosine and tangent of an angle • Choose an appropriate trigonometric ratio that can be used in a given situation • Set up and solve a trig. equation to find a missing side • Set up and solve a trig. equation when the unknown is in a denominator • Set up and solve a trig. equation to find a missing angle	Link trigonometric ratios to similar triangles Apply trigonometric ratios to find angles and lengths in right-angled triangles in 2D Recall and use the trigonometric identities for right-angled triangles Know and apply the trigonometric ratios, sin θ, cos θ and tan θ and apply them to find angles and lengths in right-angled triangles in 2D figures
Mathematics – Unit 3 – Powers & Roots	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Estimate squares of decimal numbers up to 10 • Estimate cubes of decimal numbers up to 5 • Estimate square roots of numbers up to 150 and cube roots of numbers up to 20 • Know and use the fact that $a^{1/n} = \sqrt[n]{a}$	**Calculate with fractional indices** **Use fractional indices to represent roots and combinations of powers and roots** **Calculate fractional powers** **Estimate powers and roots e.g. $\sqrt{51}$ to the nearest whole number**

• Know and use the fact that $a^{n/m} = (\sqrt[m]{a})^n$ to evaluate expressions • Calculate with standard form with and without a calculator (REVISION) • Practise GCSE-style problems involving standard form in context • Know the definition of a surd and a rational/irrational number • Add and subtract simple expressions involving surds e.g. $5\sqrt{3} + 2\sqrt{3} - \sqrt{3}$ • Understand and use multiplication of simple surds e.g. $\sqrt{5} \times \sqrt{7}$ • Simplify a surd e.g. $3\sqrt{50} = 3 \times \sqrt{25}\sqrt{2} = 15\sqrt{2}$ • Expand a single or double bracket involving surds • Understand and use division of simple surds e.g. $\frac{2\sqrt{50}}{\sqrt{10}} = 2\sqrt{5}$ • Rationalise a fraction where the denominator is a single term e.g. $2\sqrt{7}$ • Apply Pythagoras' theorem to problems involving surds	Calculate with roots Calculate with numbers in standard form **Estimate powers and roots of any given positive number** **Calculate exactly surds** **Simplify surd expressions involving squares e.g. $\sqrt{12}$** **Rationalise denominators of surds** **Estimate powers and roots e.g. $\sqrt{51}$ to the nearest whole number** **Use surds in exact calculations without a calculator** **Simplify expressions with surds, including rationalising denominators**
Mathematics – Unit 4 – Linear Inequalities	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Understand the situations in which an inequality is reversed • Extend solving linear inequalities to negative terms of the unknown e.g $20 - 3x < 8$ • Represent the solution of a linear inequality using set notation • Find the set of integers that are solutions to an inequality, including using set notation • Continue to solve problems by constructing and solving linear inequalities in one variable • Solve a simple three-part inequality e.g. $10 < 3x + 9 < 40$	Solve linear inequalities in one variable, representing the solution set on a number line **Represent the solution to an inequality using set notation** **Express solutions to inequalities in set notation e.g. { x: x < 3 }** Solve linear inequalities in one variable, expressing solutions on a number line using the conventional notation Understand and use the symbols <, ≤, > and ≥
Mathematics – Unit 5 – Transformation	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Identify and describe a single transformation, given two congruent 2D shapes (i.e. rotation, reflection, or translation) • Know that rotation, reflection and translation produce a congruent image, whereas enlargement produces a similar image • Enlarge a 2D shape using a negative scale factor and a centre of enlargement • Identify the scale factor and centre of an enlargement with a negative scale factor	**Describe the changes and invariance achieved by combinations of rotations, reflections and translations** Describe translations as 2D vectors Use x- and y-coordinates in plane geometry problems, including transformations of simple shapes Perform a specified translation using a column vector Identify the mirror line of a reflection from a shape and its image

• Perform a sequence of two or more transformations on a 2D shape and fully describe the single transformation that would be the equivalent • Identify points/lines that are invariant under a given transformation • Practise a variety of higher-tier GCSE transformation questions • Solve more complex problems involving similarity, linked to enlargement • Understand the implications of enlargement on area and volume • Move freely between scale factors for length, area and volume • Solve practical problems involving length, area and volume in similar figures	Use a column vector to describe a translation Identify a mirror line x=a, y=b, y=x or y=-x from a simple shape and its image under reflection Identify the centre, angle and direction of a rotation from a simple shape and its image under rotation **Perform a sequence of isometric transformations (reflections, rotations or translations), on a simple shape; describe the resulting transformation and the changes and invariance achieved**
Mathematics – Unit 6 – Quadratics 1	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Identify and interpret roots, intercepts and turning points of quadratic functions from their graphs • Find approximate solutions to equations of the form $ax^2 + bx + c = 0$ (roots) using a graph • Find approximate solutions to equations of the form $ax^2 + bx + c = k$ using a graph • Find approximate solutions to equations of the form $ax^2 + bx + c = dx + e$ using the point of intersection of a line and a curve on a graph • Factorise a quadratic expression of the form $ax^2 + bx + c$ • Factorise a difference of two squares of the form $ax^2 – c$ • Solve a quadratic of the form $ax^2 + bx + c = 0$ by factorising, including rearranging first • Hence identify the roots and sketch a graph of a quadratic function • Solve a quadratic of the form $x^2 + bx + c = 0$ by factorising (REVISION) • Solve problems in context by forming and solving a quadratic equation • Simplify an algebraic fraction that involves factorisation (linear and quadratic expressions)	Simplify and manipulate algebraic expressions by factorising quadratic expressions of the form $x^2 + bx + c$, including a difference of two squares **Factorise quadratic expressions of the form $ax^2 + bx + c$** **Simplify and manipulate algebraic fractions by factorising quadratic expressions of the forms $x^2 + bx + c$ and $ax^2 + bx + c$, including a difference of two squares** **Factorise quadratic expressions of the form ax^2+bx+c** **Solve quadratic equations, including those that require rearranging, by factorising** Find the roots of a quadratic equation algebraically Interpret solutions to equations in context Identify and interpret roots, intercepts and turning points of quadratic functions graphically Find approximate solutions to a quadratic equation using a graph Use graphs to find approximate roots of quadratic equations Identify intercepts and, using symmetry, the turning point of graphs of quadratic functions
Mathematics – Unit 7 – Proportion 1	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)

• Recognise tables and graphs showing direct and inverse proportion (REVISION) • Construct and use simple formulae describing direct and inverse proportion e.g. $a = kb$ (REVISION) • Construct and use formulae for direct and inverse proportion involving powers and roots e.g. $a = k\sqrt{b}$ • Solve more complex GCSE-style direct/inverse proportion problems in a range of contexts • Combine ratios in simple cases e.g. find A:B given A:C and B:C (REVISION) • Solve more complex problems involving the combining of ratios • Solve complex problems combining understanding of fractions, percentages and/or ratio • Express ratios in the form 1:n or m:1 (REVISION) • Use ratios in the form 1:n to compare proportions • Relate ratios to formulae e.g. 2y=3x, what is x:y?	Recognise and interpret graphs that illustrate direct and inverse proportion Interpret equations that describe direct and inverse proportion **Construct (and interpret) equations that describe direct and inverse proportion** Recognise and interpret graphs that illustrate direct and inverse proportion Recognise that if y=k/x then y is inversely proportional to x **Formulate equations and solve problems involving a quantity in inverse proportion to a power or root of another quantity** Identify and work with fractions in ratio problems Find the ratio of quantities in the form 1 : n Understand the relationship between ratio and linear functions
Mathematics – Unit 8 – Data 1	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Plot points on a scatter diagram, identifying correlation and interpreting the relationship shown (REVISION) • Construct a line of best fit and using it to make predictions (REVISION) • Identify outliers; distinguish these from anomalies (REVISION) • Understand the lack of reliability of making predictions outside the range of the original data (extrapolating) • Estimate a % using a scatter diagram e.g. 'What percentage passed Maths and English?' • Understand that correlation does not necessarily indicate causation • Use a sample to infer properties of a population • Understand the limitations of sampling • Know what is meant by simple random sampling • Find the quartiles for discrete data sets, and understand the meaning of these • Calculate and interpret the interquartile range • Understand why the IQR is generally a more reliable measure of spread than the range • Construct and interpret a box plot for discrete data • Use box plots to compare distributions	Use and interpret scatter graphs of bivariate data Recognise correlation and know that it does not indicate causation Draw estimated lines of best fit on a scatter graph and use them to make predictions Interpolate and extrapolate apparent trends from a scatter graph, whilst knowing the dangers of so doing Plot and interpret scatter diagrams for bivariate data; recognise correlation Interpret correlation within the context of the variables Draw a line of best fit by eye, and use it to make predictions Interpolate and extrapolate from data, and be aware of the limitations of these techniques Appreciate there may be errors in data from values (outliers) that do not 'fit' Recognise outliers on a scatter graph Appreciate the distinction between correlation and causation Describe a population using statistics

• Continue to compare data given in more than one form	**Interpret, analyse and compare the distributions of data sets from univariate empirical distributions using quartiles and the inter-quartile range**
Mathematics – Unit 9 – Algebra 2	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Solve problems in context by deriving and solving two linear simultaneous equations by elimination, including where one or both equations need to be multiplied (REVISION) • Solve two linear simultaneous equations with fraction/decimal coefficients • Draw a line / lines and shade a region to show an inequality such as $x > 3$, $y < -2$, $4 < x < 6$ • Draw a line and shade a region to show a linear inequality stated explicitly e.g. $y \leq 2x + 3$ • Draw a line and shade a region to show a linear inequality stated implicitly e.g. $2x + y < 12$ • Draw lines and shade a region for multiple linear inequalities in two variables • State the inequality/inequalities satisfied by a shaded region on a given graph • Find the set of integer coordinates that are solutions to a set of inequalities in two variables, including representing these using set notation • Find numerical and algebraic outputs from functions defined using a function machine, expression or equation • Use this context to practise arithmetic with large integers, decimals, fractions and negatives	Solve two linear simultaneous equations Set up and solve two linear simultaneous equations in two variables algebraically **Solve linear inequalities in two variables, representing the solution set on a graph** **Represent the solution to an inequality using set notation** **Solve (several) linear inequalities in two variables, representing the solution set on a graph** **Identify the solution sets of linear inequalities in two variables, using the convention of dashed and solid lines** **Express solutions to inequalities in set notation e.g. { x: x < 3 }**
Mathematics – Unit 10 – Geometric Reasoning	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)

• Solve problems involving angles on parallel lines, identifying alternate, corresponding and co-interior angles (REVISION) • Know and use the conditions for triangles to be congruent (SSS, SAS, RHS, ASA) • Prove that two given triangles are congruent • Deduce one or more Circle Theorems by investigation • Know the following Circle Theorems, including the wording, and apply them: - The angle at the centre is double the angle at the circumference - Angles in the same segment are equal - The angle in a semicircle is a right angle - Opposite angles in a cyclic quadrilateral add up to 180 - Two tangents from an external point are the same length - A radius and a tangent meet at 90° - The perpendicular bisector of a chord is a radius - The Alternate Segment Theorem • Use the fact that base angles of an isosceles triangle are equal • Create a geometrical proof, including applying circle theorems	Know and use alternate angles or corresponding angles on parallel lines are equal **Apply the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results** **Know and apply the sine rule and cosine rule to find unknown lengths and angles** Apply angle facts to find angles in rectilinear figures, and to justify results in simple proofs. e.g. 'The sum of the interior angles of a triangle is 180°' Use the basic properties of isosceles, equilateral and right-angled triangles to find lengths and angles in rectilinear figures and in simple proofs Apply congruent triangles in calculations and simple proofs. e.g. The base angles of an isosceles triangle are equal **Apply angle properties in more formal proofs of geometrical results** **Apply the standard circle theorems** Prove that two triangles are congruent using the cases SSS, ASA, SAS, RHS
Mathematics – Unit 11 – Data 2	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Construct a cumulative frequency curve • Use a cumulative frequency curve to estimate values, including percentages • Use a cumulative frequency curve to estimate the median, quartiles and IQR • Use a cumulative frequency curve to construct a box plot • Understand why a bar chart can be misleading if the class widths are different • Construct a histogram for grouped data with unequal class intervals	**Construct and interpret diagrams for grouped discrete data and continuous data,** including **cumulative frequency graphs and histograms with equal and unequal class intervals, and know their appropriate uses** **Interpret, analyse and compare the distributions of data sets from univariate empirical distributions using box plots** **Interpret and construct diagrams for grouped data as appropriate,** including **cumulative frequency graphs and histograms (with either equal or unequal class intervals)** **Draw and interpret box plots**
Mathematics – Unit 12 – Number	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)

• Find the HCF/LCM of two numbers using prime factor form (REVISION) • Solve practical problems involving HCF or LCM • Solve GCSE-style problems where numbers are given in prime factor form • Practise using the FACT function on a scientific calculator • Identify bounds and error intervals (inequalities) for both discrete and continuous quantities which have been rounded or truncated to the nearest integer, 10, 100, 5, 20 etc., or to a given number of significant figures (REVISION) • Identify bounds for discrete/integer quantities (REVISION) • Truncate a decimal number to a given number of decimal places • Write an error interval for a value that has been truncated • Solve simple problems involving one truncated quantity • Solve a bounds problem involving more than one rounded measurement • Convert a recurring decimal of the form $0.\dot{x}$, $0.\dot{x}\dot{y}$, or $0.\dot{x}y\dot{z}$ to a fraction • Convert a recurring decimal of the form $0.0\dot{x}$ or $0.0\dot{x}\dot{y}$, to a fraction • Check the result by using division to convert back to a decimal, without a calculator where appropriate	Identify prime numbers Use power notation in expressing a whole number as a product of its prime factors Find the HCF and LCM of two whole numbers from their prime factorisations Use inequality notation to write down an error interval for a number or measurement rounded to a given degree of accuracy Apply and interpret limits of accuracy **Calculate the upper and lower bounds of a calculation using numbers rounded to a known degree of accuracy** **Understand the difference between bounds of discrete and continuous quantities** Apply and interpret limits of accuracy when rounding and truncating **Change recurring decimals into their corresponding fractions** **Convert a recurring decimal to an exact fraction**
Mathematics – Unit 13 – Quadratics 2	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Complete the square for a quadratic expression (a = 1) • Use a completed-square form to identify, for a quadratic function: • the turning point (vertex) • the minimum value, and the value of x for which it occurs • the equation of the line of symmetry of the graph • Solve a quadratic equation by completing the square (a=1) • Know and apply the Quadratic Formula to solve any quadratic equation • Solve equations involving fractions that can be rearranged into the form $ax^2 + bx + c = 0$ • Continue to solve a range of problems that generate a quadratic equation	**Deduce the turning points of quadratic functions by completing the square** **Complete the square on a quadratic expression** **Solve quadratic equations by factorising, completing the square and by using the quadratic formula** **Recall and use the quadratic formula** **Rearrange and solve quadratic equations by factorising, completing the square or using the quadratic formula** Find the roots of a quadratic equation algebraically
Mathematics – Unit 14 – Proportion 2	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)

• Solve complex problems involving speed and converting between units of speed (REVISION) • Solve more complex problems involving density • Solve simple and complex problems involving pressure • Understand units for pressure e.g. N/m^2 or Pascals (Pa) • Solve problems involving rates of pay, population density and unit pricing • Solve problems involving other rates of change • Calculate the result of a repeated percentage change, profit or loss (including compound interest), and finding the percentage of a given increase, decrease, profit or loss (REVISION) • Compare investments earning simple interest with those earning compound interest (REVISION) • Determine the number of increases or decreases by a percentage needed to obtain or exceed a given value, showing sufficient calculations to justify the result • Practise a selection of GCSE-style questions on this topic • Find the result of a single fractional increase or decrease (REVISION) • Calculate the original quantity, given the result of a single fractional increase or decrease • Find the result of a repeated fractional increase or decrease • Identify the overall fraction or percentage of a repeated fractional change	Convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts Use and convert simple compound units (e.g. for speed, rates of pay, unit pricing) Know and apply in simple cases: speed = dist ÷ time Know and apply: density = mass ÷ volume Use and convert other compound units (e.g. density, pressure) Set up, solve and interpret the answers in growth and decay problems, including compound interest Calculate simple interest, including in financial contexts Solve problems step-by-step involving multipliers over a given interval, for example compound interest, depreciation, etc. Calculate with fractions greater than 1 Calculate exactly with fractions Use fractions in exact calculations without a calculator Carry out more complex calculations, including the use of improper fractions Express one quantity as a fraction of another
Mathematics – Unit 15 – Probability	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Extend applying the 'product rule for counting' to increasingly complex contexts • Use this as a context to practice multiplying large integers • Know and use the addition law of probability ('OR') • Understand that the addition law only applies to mutually exclusive events • Know and use the multiplication law of probability ('AND') • Understand that the multiplication law only applies to independent events • Use this context to practise skills with fractions and decimals • Draw tree diagrams to show the outcomes of two or three combined events • Label tree diagrams with probabilities for independent/dependent events	Use the addition law for mutually exclusive events Use a two-circle Venn diagram to enumerate sets, and use this to calculate related probabilities Calculate probabilities of simple combined events, for example rolling two dice and looking at the totals Calculate probabilities, expressed as fractions or decimals, in simple experiments with equally likely outcomes e.g. flipping coins, rolling dice **Use the product rule for counting** Construct a Venn diagram to classify outcomes and calculate probabilities

• Use a probability tree diagram to solve a range of problems involving dependent and independent combined events • Extend using two-way tables for calculating probabilities to GCSE-style problems • Extend using Venn diagrams for calculating probabilities to GCSE-style problems, including where the intersection needs to be deduced	Use tree diagrams and other representations to calculate the probability of independent and dependent combined events **Use the product rule for counting numbers of outcomes of combined events**
Mathematics – Unit 16 – Loci & Vectors	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Construct the bisector of an angle (REVISION) • Construct the perpendicular bisector of a line segment (REVISION) • Extend previous work on loci to more complex problems involving shading regions satisfied by multiple criteria • Understand that a vector quantity represents both magnitude (size) and direction, whereas a scalar quantity has only magnitude • Draw a column vector as 'arrow' on a grid, or write a column vector for a given 'arrow' • Add and subtract column vectors, understanding this as a resultant of two vectors • Multiply a column vector by a scalar (constant) • Work with combinations of 'letter' vectors shown as arrows on a grid • Solve simple geometrical problems involving vectors	Construct the perpendicular bisector and midpoint of a line segment Construct the bisector of an angle formed from two lines Understand the term 'equidistant' Apply ruler and compass constructions to construct figures and identify the loci of points, to include real-world problems Describe translations as 2D vectors Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors Understand addition, subtraction and scalar multiplication of vectors Represent a 2-dimensional vector as a column vector, and draw column vectors on a square or coordinate grid
Mathematics – Unit 17 – Trigonometry 2	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Use basic trigonometry to solve problems in context • Practise giving answers to an 'appropriate degree of accuracy' in this context • Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60° and 90° • Know the exact values of tan θ for θ = 0°, 30°, 45° and 60° • Use the Sine Rule to find a missing side or angle in a non-right-angled triangle • Know and use the Cosine Rule to find a missing side or angle in a non-right-angled triangle	Apply trigonometric ratios to find angles and lengths in right-angled triangles in 2D Know the exact values of sin θ and cos θ for θ=0, 30, 45, 60, 90°; know the exact value of tan θ for θ=0, 30, 45, 60° Recall and use the trigonometric identities for right-angled triangles Know and apply the trigonometric ratios, sin θ, cos θ and tan θ and apply them to find angles and lengths in right-angled triangles in 2D figures Know the exact values of sin θ and cos θ for θ = 0°, 30°, 45°, 60° and 90°; know the exact value of tan θ for θ = 0°, 30°, 45° and 60° **Know and apply the sine rule and cosine rule to find lengths and angles**

Mathematics – Unit 18 – Sequences	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Find the nth term of a quadratic sequence, of the form $ax^2 + b$ • Find the nth term of a quadratic sequence, of the form $ax^2 + bx + c$ • Recognise and use simple geometric sequences, r^n or ar^n, when r is positive and rational • Recognise and use geometric sequences, ar^n, when r is a surd • Find the next three terms, or a given term, in a geometric sequence • Find a formula for the nth term of a simple geometric sequence • Solve problems involving geometric sequences • Find the nth term of a sequence of fractions • Decide whether a sequence is linear, arithmetic, geometric, quadratic or none of these	Recognise and use quadratic sequences and simple geometric progressions (r^n where n is an integer and r is positive and rational) **Recognise and use geometric progressions of the form r^n where n is an integer and r is a surd** **Deduce expressions to calculate the nth term of quadratic sequences** **Recognise and use other sequences** Recognise quadratic sequences, and simple geometric progressions (r^n where n is an integer and r is a positive rational number) **Find a formula for the nth term of a quadratic sequence** **Generate and find nth terms of other sequences**
Mathematics – Unit 19 – Graphs	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Identify the gradient of a line using a line which is perpendicular to it • Identify the equation of a line using a line which is perpendicular to it • Show that two lines are perpendicular (using $m_1 \times m_2 = -1$) • Identify the equation of a circle from its graph • Identify the equation of a circle from a description of its centre and radius/diameter • Use the equation of a circle to sketch or describe its graph • Find the equation of a tangent to a circle at a given point • Interpret the gradient at a point on a curve as the instantaneous rate of change • Interpret the gradient of a chord as an average rate of change • Solve problems involving the gradients of graphs in context • Calculate an estimate for the area under a curve • Solve problems involving the area under graphs in context • Find the acceleration and distance from a piecewise-linear speed-time graph • Find the instantaneous acceleration from a curved speed-time graph • Find the average acceleration for a section of a speed-time graph • Estimate the distance travelled from a curved speed-time graph	Plot and interpret graphs, including reciprocal graphs and graphs to non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration Identify and interpret roots, intercepts and turning points of quadratic functions graphically Find approximate solutions to a quadratic equation using a graph **Use the form $y = mx + c$ to identify perpendicular lines** **Deduce turning points of quadratic functions by completing the square** **Recognise and use the equation of a circle with the centre at the origin** **Find the equation of the tangent to a circle at a given point** **Calculate or estimate gradients of graphs and areas under graphs, including quadratic and other non-linear graphs** **Interpret the gradient of a graph, or area under a graph, in cases such as distance-time graphs, velocity-time graphs and financial graphs** **Interpret the gradient at a point on a curve as the instantaneous rate of change**

	Apply the concepts of instantaneous and average rates of change (gradients of tangents and chords) in numerical, algebraic and graphical contexts Use graphs to find approximate roots of quadratic equations Identify intercepts and, using symmetry, the turning point of graphs of quadratic functions **Calculate or estimate gradients of graphs, and interpret in contexts such as distance-time graphs, velocity-time graphs and financial graphs** **Apply the concepts of average and instantaneous rate of change (gradients of chords or tangents) in numerical, algebraic and graphical contexts** **Calculate or estimate areas under graphs, and interpret in contexts such as distance-time graphs, velocity-time graphs and financial graphs** **Sketch graphs of quadratic functions, identifying the turning point by completing the square** **Identify and find equations of perpendicular lines** **Recognise and use the equation of a circle with centre at the origin** **Calculate the equation of a tangent to a circle at a given point**
Mathematics – Unit 20 – Solids	
Knowledge and Skills – Students will be taught to…	Links to KS4 National Curriculum (red) & Exam board specification (blue/black)
• Find the surface area of a cylinder (REVISION) • Find the volume of spheres, cones, frustums and pyramids, including in terms of π • Find the surface area of spheres, cones, and pyramids, including in terms of π • Use Pythagoras' theorem, when needed, to find a length in a pyramid or cone • Find the volume or surface area of a composite solid, including in the context of density and in terms of π • Continue to solve practical problems involving the volume and surface area of solids	Use multiples of π in exact calculations without a calculator Calculate surface areas and volumes of spheres, pyramids, cones and composite solids Calculate the surface area and volume of spheres, cones and simple composite solids (formulae will be given) Calculate the surface area and volume of a pyramid (the formula will be given) Recall and use Pythagoras' theorem