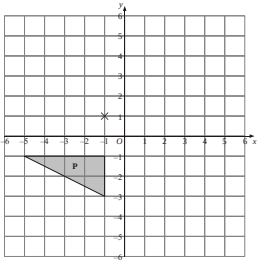
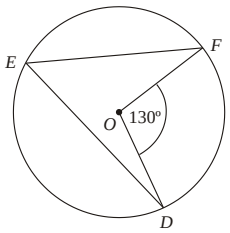
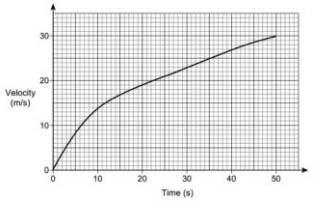
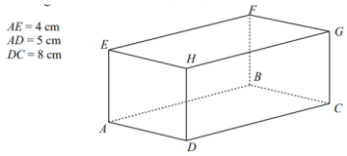
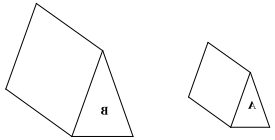
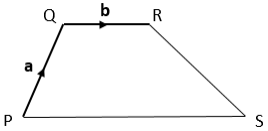
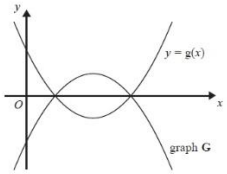
Curriculum Map: Mathematics Year 11 Higher Tier

In addition to Foundation tier content, Higher tier learners should also be able to ….

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Content Declarative knowledge 'I Know'	Sequences Linear sequences Quadratic sequences Special sequences Straight Line Graphs Gradients Real-World Graphs Graphs of real-world contexts Areas under graphs	Direct and Inverse Proportion Equivalent ratios Dividing quantities in a given ratio Ratios and fractions Direct proportion Inverse proportion Trigonometry Exact trigonometric ratios Area of a triangle Sine rule Cosine rule Algebraic Solution of Equations Quadratic equations	Transformations Combinations of transformations Similar Figures Enlargement Similar shapes Functions Inverse functions Composite functions	Circle Theorems Circle nomenclature Angles subtended at centre and circumference Angle in a semicircle Angles in the same segment Angle between radius and chord Angle between radius and tangent The alternate segment theorem Cyclic quadrilaterals Vectors Vector arithmetic and column vectors Non-Linear Graphs Trigonometric functions Equations of circles Parallel and perpendicular lines Polynomial and Exponential functions	Transformations of Graphs Translations and reflections Inequalities Inequalities in one variable Inequalities in two variables	Public exams
Skills Procedural Knowledge 'I know how to'	Sequences Generate a sequence from a formula for the *n*th term. Find a formula for the *n*th term of an arithmetic sequence. Use subscript notation for position-to-term and term-to-term rules. Find a formula for the *nth* term of a simple quadratic sequence. Recognise sequences of triangular, square and cube numbers and simple arithmetic progressions.	Direct and Inverse Proportion Use the proportionality symbol and constant. Investigate contexts that lead to direct or inverse proportion, including those that involve a power or root. Formulate equations and solve problems involving a quantity in direct or inverse proportion to a power or root of another quantity. Trigonometry Know the exact values of sin θ and cos θ for θ=0, 30, 45, 60 and 90 degrees.	Transformations Perform a sequence of isometric transformations (reflections, rotations or translations) on a simple shape. Describe the sequence of isometric transformations (reflections, rotations or translations) needed to transform an object to its image and the changes and invariance achieved.	Circle Theorems Recognise isosceles triangles drawn within circles. Apply and prove that - the angle subtended by an arc at the centre is twice the angle at the circumference, - the angle on the circumference subtended by a diameter is a right angle, - two angles in the same segment are equal, - a radius or diameter bisects a chord if and only if it is perpendicular to the chord, - for a point P on the circumference, the radius or diameter through P is perpendicular to the tangent at P, - for a point P on the circumference, the angle between the tangent and a chord through P equals the angle subtended by the chord in the opposite segment, - the opposite angles of a cyclic quadrilateral are supplementary.	Transformations of Graphs Identify and sketch simple translations of a given graph. Identify and sketch translations and reflections of the graph, given its equation. Inequalities Solve quadratic inequalities in one variable.	

	Recognise Fibonacci and quadratic sequences and simple geometric progressions. Generate and find nth terms of other sequences. **Straight Line Graphs** Find gradient from graph using $\frac{change\ in\ y}{change\ in\ x}$. Interpret straight line gradients as rates of change. Velocity as the gradient of a displacement-time graph Calculate or estimate gradients of graphs and interpret in kinematic contexts using 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. **Real-World Graphs** Recognise and interpret graphs that illustrate direct and inverse proportion. Construct graphs in real-world contexts, such as distance-time, money conversion and temperature conversion Calculate or estimate areas under graphs. Interpret in the context of distance-time graphs and velocity-time graphs.	Know the exact values of tan θ for θ=0, 30, 45 and 60 degrees. Manipulate Pythagoras' Theorem and trigonometric formulae, using algebraic expressions or exact trigonometry ratios to solve 3D problems. Use 2D representations of 3D solids to identify right angles and hence solve problems by Pythagoras' Theorem and Trigonometry. Know and apply the general sine formula to find the area for any triangle. Know and apply the sine rule and the cosine rules to find lengths and angles. **Algebraic Solution of Equations** Rearrange and solve quadratic equations by completing the square and by using the quadratic formula. Set up and solve quadratic equations, include manipulation of algebraic fractions.	**Similar Figures** Prove that two triangles are congruent using the cases: 3 sides (SSS), 2 sides and the included angle, 2 angles and the included side (ASA), right angle, hypotenuse, side (RHS). Apply congruent triangles in calculations and simple proofs, for instance proving that the base angles of an isosceles triangle are equal. Prove that two triangles are similar. Use similarity and ratios to determine missing sides or scale factors. Identify the centre and positive integer or fractional scale factor of an enlargement of a simple shape. Perform such an enlargement on a simple shape. Perform and recognise enlargements with negative scale factors. **Functions** Recap function machines with inputs and outputs. Interpret the reverse process as the 'inverse function'. Interpret the succession of two functions as a 'composite function'.	**Vectors** Define different routes between stated vertices, including involving scalars and parallel vectors. Use vectors to solve geometric proof in quadrilaterals and where vectors are given as simple scalar multiples. Use vectors to solve geometric proof with vector defined in ratios. **Non-Linear Graphs** Identify intercepts and, using symmetry, the turning point of graphs of quadratic functions. Find the roots of a quadratic equation algebraically. Sketch graphs of quadratic functions, identifying the turning point by completing the square. Recognise and sketch graphs of exponential functions in the form $y = k^x$ for positive k. Use a table of values to plot other polynomial graphs and reciprocals. Use a table of values or a formula to plot exponential graphs. Recognise and sketch graphs of simple polynomial and reciprocal graphs. Recognise and sketch the graphs of trig functions y=sin θ, y= cos θ and y=tan θ. Recognise and use the equation of a circle with centre at the origin. Calculate the equation of a line representing a radius or diameter at a point on the circumference of a circle. Calculate the equation of a tangent to a circle at a given point.	Solve (several) linear inequalities in two variables, representing the solution set on a graph. Set up and solve (several) linear inequalities in two variables from context, 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.	

Strategies Conditional Knowledge 'I know when to'	Sequences Link geometric progression to compound interest and depreciation. Straight Line Graphs Present chain of reasoning to achieve a given gradient result. Translate problems from kinematic or financial contexts into graphical form and interpret gradients to solve problems. Real-World Graphs Present chain of reasoning to achieve a given area result. Translate problems for kinematic or financial contexts into graphical form and interpret areas under graphs to solve problems	Direct and Inverse Proportion Solve proportionality problems set in a variety of context where direct or inverse proportionality must be implied. Trigonometry Construct chain of reasoning to achieve given result from information provided from diagrammatic representation of 3D frameworks in order to find missing lengths and angles of elevation. Understand and apply appropriate trigonometry formulae in range of contexts Algebraic Solution of Equations Set up and solve quadratic equations	Transformations Construct a chain of reasoning to describe the transformations from object to image using concise mathematical language. Determine a single transformation that will successfully map an object to its image, as previously defined by a series of transformations. Similar Figures Construct chain of reasoning to change between ratios of surface area and volume of similar solids. Link to flow rate and time to fill similar container type problems. Functions Define rules with function machines to generate results.	Circle Theorems Make deductions from mathematical information provided in a diagram and construct chain of reasoning to achieve a given result. Vectors Use vectors in complex geometric arguments and proofs Non-Linear Graphs Make deductions from equations to determine coordinates that will or will not feature on a graph	Transformations of Graphs Clearly present a valid argument to determine a pattern that links a series of related equations or graphs. Make links to lines of reflection, simple rotations (about the origin) and translations to define transformations of simple quadratic graphs. Inequalities Draw conclusions from graphs of linear and quadratic functions, e.g. identify coordinates which satisfy a set of linear inequalities.	
Examples of Key Questions	1) Find a formula for the nth term of the sequence 5,11,19,29,41…. 2) Find the nth term of a) 1, √2, 2, 2√2… b) $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$…	1) x is inversely proportional to the square root of y. When $x = 12$ and $y = 9$ Find the value of x when $y = 81$. 2) Find the height of a square based pyramid with edges of length 6cm. Leave your answer in surd form.	1) a) Rotate triangle P 180° about the point (–1, 1).  b) Translate triangle P by the vector $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$.	1) D, E and F are points on the circumference of a circle, centre O.  Angle $DOF = 130°$. Work out the size of angle DEF. Give a reason for your answer.	1) Solve the inequality $x^2 + 5x > 6$	

	3) Here is the velocity-time graph of a car for 50 seconds.  Work out the average acceleration during the 50 seconds.	3) Solve $2x^2 = 3x + 5$ $\frac{2}{x} - \frac{2}{x+1} = 1$ 4) The diagram shows a cuboid ABCDEFGH.  Calculate the size of angle ECA. Give your answer correct to 3 significant figures. 5) Sketch the graph of $f(x) = x^2 - 5x + 10$, showing the coordinates of the turning point and the coordinates of any intercepts with the coordinate axes.	2) Two prisms, A and B, are mathematically similar. The volume of prism A is 12 000 cm³. The volume of prism B is 49 152 cm³. The total surface area of prism B is 9728 cm².  Calculate the total surface area of prism A. 3) $f(x) = 2x^2$ and $g(x) = 4x + 3$. Calculate $gf(x)$.	2) This diagram shows a trapezium PQRS $\overrightarrow{PQ}$ = **a** and $\overrightarrow{QR}$ = **b** PS is twice the length of QR.  Find in terms of **a** and **b**, expressions for: a) $\overrightarrow{QP}$ b) $\overrightarrow{PR}$ c) $\overrightarrow{PS}$ 3) By completing the square, sketch the graph of the quadratic $y = x^2 + 2x + 4$	2) The graph of $y = g(x)$ is shown below.  The graph **G** is the reflection of $y = g(x)$ in the x-axis. Write down an equation of graph **G**.	
Assessment topics	Mini assessment of each topic studied	PPE (all topics studied thus far)	PPE feedback Mini assessment of each topic studied	PPE (all topics)	Completing the PPE feedback	
Cross curricular links/ Character Education	**Music** – links between mathematical sequences and rhythm patterns Use of graphs in **ICT**, **Geography** and **Science**	Direct and Inverse proportion used to derive **scientific** formulae **Design Technology** – use Computer Aided Design techniques for 3D modelling	Transformations are used in **Art** through cubism and tessellations of Escher **Design Technology** uses similarity and scale in planning ideas	**Science** – vectors linked to resultant force	**Art** – the transformations of reflection, rotation and translation are used to create repeated patterns such as Escher drawings	