



**Key Stage 5 Further Maths
Programme of Study**



Year 12					
Term 1		Term 2		Term 3	
Half term 1	Half term 2	Half term 1	Half term 2	Half term 1	Half term 2
<p>Core Pure</p> <p>Complex Numbers</p> <ul style="list-style-type: none"> Imaginary and complex numbers Multiplying complex numbers Complex conjugation Roots of quadratic equations Solving cubic and quartic equations <p>Argand Diagrams</p> <ul style="list-style-type: none"> Argand diagrams Modulus and argument Modulus-argument form of complex numbers Loci in the argand diagram Regions in the argand diagram <p>Decision</p> <p>Algorithms</p> <ul style="list-style-type: none"> Using and understanding algorithms Flow charts Bubble sort Quick sort Bin-packing algorithm 	<p>Core Pure</p> <p>Series</p> <ul style="list-style-type: none"> Sums of natural numbers Sums of squares and cubes <p>Roots of polynomials</p> <ul style="list-style-type: none"> Roots of a quadratic equation Roots of a cubic equation Roots of a quartic equation Expressions relating to the roots of a polynomial Linear transformations of roots <p>Decision</p> <p>Graphs and Networks</p> <ul style="list-style-type: none"> Modelling with graphs Graph theory Special types of graphs Representing graphs and networks using matrices The planarity algorithm <p>Mechanics</p> <p>Forces and Motion</p> <ul style="list-style-type: none"> Force Diagrams Forces as Vectors 	<p>Core Pure</p> <p>Matrices</p> <ul style="list-style-type: none"> Introduction to matrices Matrix multiplication Determinants Inverting a 2x2 matrix Inverting a 3x3 matrix Solving systems of equations using a matrix <p>Linear Transformations</p> <ul style="list-style-type: none"> Linear transformations in 2 dimensions Reflections and rotations Enlargements and stretches Successive transformations Linear transformations in 3 dimensions The inverse of a linear transformation <p>Decision</p> <p>Algorithms on graphs</p> <ul style="list-style-type: none"> Kruskal's algorithm Prim's algorithm Applying Prim's algorithm to a distance matrix <p>Mechanics</p>	<p>Core Pure</p> <p>Proof by Induction</p> <ul style="list-style-type: none"> Proof by mathematical induction Proving divisibility results Proving statements involving matrices <p>Decision</p> <p>Algorithms on graphs</p> <ul style="list-style-type: none"> Using Dijkstra's algorithm to find the shortest path Floyd's algorithm <p>Mechanics</p> <p>Moments</p> <ul style="list-style-type: none"> Moments Resultant Moments Equilibrium Centres of Mass Tilting <p>Forces and Friction</p> <ul style="list-style-type: none"> Resolving Forces Inclined Planes Friction 	<p>Core Pure</p> <p>Vectors</p> <ul style="list-style-type: none"> Equation of a line in 3 dimensions Equation of a plane in 3 dimensions Scalar product Calculating angles between lines and planes Points of intersection Finding perpendiculars <p>Decision</p> <p>Route inspection</p> <ul style="list-style-type: none"> Eulerian graphs Using the route inspection algorithm Networks with more than four odd nodes <p>Mechanics</p> <p>Projectiles</p> <ul style="list-style-type: none"> Horizontal Projection Horizontal and Vertical Components Projection at any Angle Projectile Motion Formulae <p>Applications of Forces</p> <ul style="list-style-type: none"> Static Particles Modelling with Particles Friction and Static Particles Static 	<p>Core Pure</p> <p>Volumes of revolution</p> <ul style="list-style-type: none"> Volumes of revolution around the x-axis Volumes of revolution around the y-axis Adding and subtracting volumes Modelling with volumes of revolution <p>Exponentials and Logarithms</p> <ul style="list-style-type: none"> Exponential Functions $Y=e^x$ Exponential Modelling Logarithms Laws of Logs Solving Equations Using Logs Working with Natural Logs Logs and Non-Linear Data <p>Decision</p> <p>The Travelling Salesman Problem</p> <ul style="list-style-type: none"> The classical and practical travelling

<ul style="list-style-type: none"> Order of algorithm <p>Mechanics</p> <p>Modelling</p> <ul style="list-style-type: none"> Constructing a Model Modelling assumptions Quantities and Units Working with Vectors <p>Constant Acceleration</p> <ul style="list-style-type: none"> Displacement-Time Graphs Velocity-Time Graphs Constant Acceleration Formulae Vertical Motion 	<p>Forces and Acceleration</p> <ul style="list-style-type: none"> Motion in 2 Dimensions Connected Particles Pulleys 	<p>Variable Acceleration</p> <ul style="list-style-type: none"> Functions of Time Using Differentiation Maxima and Minima Problems <p>Variable Acceleration</p> <ul style="list-style-type: none"> Using Integration Constant Acceleration Formulae 		<ul style="list-style-type: none"> Rigid Bodies Dynamics and Inclined Planes Connected Particles 	<p>salesman problems</p> <ul style="list-style-type: none"> Using a minimum spanning tree method to find and upper bound Using a minimum spanning tree method to find a lower bound Using the nearest neighbour algorithm to find an upper bound <p>Mechanics</p> <p>Further Kinematics</p> <ul style="list-style-type: none"> Vectors in Kinematics Vector Methods with Projectiles Variable Acceleration in One Dimension Differentiating Vectors Integrating Vectors
	Senior Maths Challenge				
<p>Assessment:</p> <p>Graded KS5 assessment for all skills from this topic</p>	<p>Assessment:</p> <p>Graded KS5 assessment for all skills from this topic</p>	<p>Assessment:</p> <p>Graded KS5 assessment for all skills from this topic</p> <p>January Mock Examinations</p>	<p>Assessment:</p> <p>Graded KS5 assessment for all skills from this topic</p>	<p>Assessment:</p> <p>Graded KS5 assessment for all skills from this topic</p>	<p>Assessment:</p> <p>Graded KS5 assessment for all skills from this topic</p> <p>Summer Mock Examinations</p>
<p>Homework:</p> <p>Mymaths, research, worksheet or practise assessment questions</p>	<p>Homework:</p> <p>Mymaths, research, worksheet or practise assessment questions</p>	<p>Homework:</p> <p>Mymaths, research, worksheet or practise assessment questions</p>	<p>Homework:</p> <p>Mymaths, research, worksheet or practise assessment questions</p>	<p>Homework:</p> <p>Mymaths, research, worksheet or practise assessment questions</p>	<p>Homework:</p> <p>Mymaths, research, worksheet or practise assessment questions</p>

Year 13					
Term 1		Term 2		Term 3	
Half term 1	Half term 2	Half term 1	Half term 2	Half term 1	Half term 2
<p>Core Pure</p> <p>Complex Numbers</p> <ul style="list-style-type: none"> Exponential form of complex numbers Multiplying and dividing complex numbers De Moivre's theorem Trigonometric identities Sums of series n^{th} roots of a complex number solving geometric problems <p>Series</p> <ul style="list-style-type: none"> The method of two differences Higher derivatives Maclaurin series Series expansions of compound functions <p>Decision</p> <p>Linear programming</p> <ul style="list-style-type: none"> Linear programming problems Graphical methods Locating the optimal point Solutions with integer values <p>Mechanics</p> <p>Momentum and Pulse</p> <ul style="list-style-type: none"> Momentum in one direction Conservation of momentum 	<p>Core Pure</p> <p>Methods in Calculus</p> <ul style="list-style-type: none"> Improper integrals The mean value of a function Differentiating inverse trigonometric functions Integrating with inverse trigonometric functions Integrating using partial fractions <p>Volumes of Revolution</p> <ul style="list-style-type: none"> Volumes of revolution around the x-axis Volumes of revolution around the y-axis Volumes of revolution of parametrically defined curves Modelling with volumes of revolution <p>Decision</p> <p>The Simplex algorithm</p> <ul style="list-style-type: none"> Formulating linear programming problems The simplex method Problems requiring integer solutions 	<p>Core Pure</p> <p>Polar Coordinates</p> <ul style="list-style-type: none"> Polar coordinates and equations Sketching curves Area enclosed by a polar curve Tangents to polar curves <p>Hyperbolic Functions</p> <ul style="list-style-type: none"> Introduction to hyperbolic functions Inverse hyperbolic functions Identities and equations Differentiating hyperbolic functions Integrating hyperbolic functions <p>Decision</p> <p>The Simplex algorithm</p> <ul style="list-style-type: none"> Two stage simplex method The Big-M method <p>Mechanics</p> <p>Elastic Strings and Springs</p> <ul style="list-style-type: none"> Hooke's law and equilibrium problems Hooke's law and dynamics problems Elastic energy 	<p>Core Pure</p> <p>Methods in Differential equations</p> <ul style="list-style-type: none"> First-order differential equations Second-order homogeneous differential equations Second-order non-homogeneous differential equations Using boundary conditions <p>Decision</p> <p>Critical Path Analysis</p> <ul style="list-style-type: none"> Modelling a project Dummy activities Early and late event times Critical activities <p>Mechanics</p> <p>Elastic Collisions in one Dimension</p> <ul style="list-style-type: none"> Direct impact and Newton's law of restitution Direct collision with a smooth plane Loss of kinetic energy Successive direct impacts 	<p>Core Pure</p> <p>Modelling with Differential Equations</p> <ul style="list-style-type: none"> Modelling with first-order differential equations Simple harmonic motion Damped and forced harmonic motion Coupled first-order simultaneous differential equations <p>Decision</p> <p>Critical Path Analysis</p> <ul style="list-style-type: none"> The float of an activity Gantt charts Resource histograms Scheduling diagrams <p>Mechanics</p> <p>Elastic collisions in two dimensions</p> <ul style="list-style-type: none"> Oblique impact with a fixed surface Successive oblique impacts Oblique impact of smooth spheres 	<p>Core Pure</p> <p>Exam Preparation</p> <ul style="list-style-type: none"> Practice Exam papers Past Questions Exam Technique Examiners Reports Use of Mark Schemes <p>Decision</p> <p>Exam Preparation</p> <ul style="list-style-type: none"> Practice Exam papers Past Questions Exam Technique Examiners Reports Use of Mark Schemes <p>Mechanics</p> <p>Exam Preparation</p> <ul style="list-style-type: none"> Practice Exam papers Past Questions Exam Technique Examiners Reports Use of Mark Schemes

