Year 12 AS/Year 1 Curriculum Overview:
Further Mathematics (Edexcel)
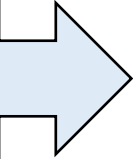
Topics / Content Outline	Powerful Knowledge (key concepts, skills)	What will you be assessed on?	How can you help at home?
Autumn Term 1) **Matrices** 2) **Complex Numbers** 3) **Series** 4) **Mechanics – Momentum** 5) **Discrete - Algorithms**	• Add, subtract and multiply matrices • Linear transformations • Inverse matrices • Linear simultaneous equations • Solve quadratic and cubic equations with real coefficients • Four operations in complex numbers • Argand Diagrams • Modulus – argument form • Loci • Sums of series • Momentum and impulse of two sphere colliding directly • Algorithms, sorting and order • Graphs – Eulerian, semi eulerian – which type of graph?	Baseline assessment in September to highlight areas from GCSE which need focus. Formal assessments at the end of half term 1 and 2. One will be skills based and the other will be problem solving.	Encourage students to become independent learners. We will provide a skills breakdown following each assessment. Students are required to select their own weak areas and dedicate independent learning time to improve these skills. At this point they should be working through the exercises and mixed exercises from the textbook or integral.
Spring Term 6) **Proof** 7) **Algebra and Functions** 8) **Vectors** 9) **Calculus** 10) **Mechanics – Work Energy Power** 11) **Discrete – Algorithms on graphs** 12) **Discrete – Linear Programming**	• Proof by induction • Roots of polynomials • Equation of a straight line in cartesian and vector form • Equation of a plane in cartesian and vector form • Scalar product and angles between lines and planes • Points of intersections • Volumes of revolution • Work – energy principle • Minimum spanning tree • Dijkstra's algorithm • Route inspection • Formulation of linear programming problems • Graphical solutions of linear programming problems	Two further formals towards the end of each half term. Each assessment will include a skills check and problem solving.	Encourage independent study. Students find the application of skills learnt to problem solving the most challenging part of the course. Working through a range of questions, without using a mark scheme as a prompt, is beneficial. When stuck, encourage students to come to maths support where we can talk through the thought process required.
Summer Term 6) **Mechanics – Collisions** 7) **Discrete – Critical Path Analysis**	• Direct impact of elastic spheres • Newtons law of restitution • Successive direct impacts • Activity network • Precedence tables • Lower and upper bounds for number of workers • Earliest and latest finish time • Identification of critical paths • Calculate float	External AS examinations are sat in May for those students not wanting to continue with Further Maths to A Level. Summer assessments will assess the full content of the AS course. These will be set using past exam questions.	Encourage independent study. Students should be working through past exam papers and using the mark schemes after they have completed questions seeking help from maths support to help develop understanding and problem-solving skills. Where students are finding a topic challenging, we would recommend returning to the exercise in the textbook before attempting exam questions again.

Year 13 A2 Curriculum Overview:
Further Mathematics (OCR)

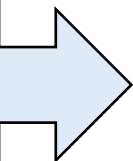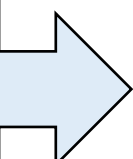|	Topics / Content Outline	Powerful Knowledge (key concepts, skills)	What will you be assessed on?	How can you help at home?
Autumn Term	1) Sums of Series 2) Further Vectors 3) Further Complex Numbers 4) Polar Coordinates 5) Further Matrices 6) Mechanics – Centres of mass 7) Discrete – Graphs and Algorithms 8) Discrete – Critical paths analysis	• Standard series and the method of differences • De Moivre's Theorem • Roots of complex numbers and roots of unity • Powers of trigonometric functions • Trigonometric series • Lines and Planes • Curves and areas in polar coordinates • Systems of Linear simultaneous equations • Centres of mass of rods with variable density, solids of revolution and uniform laminas • Inclusion-exclusion principle, colouring algorithm • Hamiltonian and planar graphs • Critical Path Analysis - Scheduling	Assessment at the start of the year to build on AS content and highlight areas of AS which still require development. Formal assessment in half term 2 made up of skills check and problem-solving questions including topics from year 12.	Encourage students to become independent learners. We will provide a skills breakdown following their AS year. It is essential that any topics found challenging from AS are addressed as soon as possible. Students are required to select their own weak areas and dedicate independent learning time to improve these skills. Working through textbook exercises, integral and AS past papers should form part of their independent study.
Spring Term	9) Hyperbolic Functions 10) Differential equations 11) Mechanics – Work, Energy, Power 12) Mechanics - Circular Motion 13) Mechanics - Collisions 14) Discrete – Simplex Algorithm 15) Discrete – Game Theory 16) Discrete – Linear Programming	• Hyperbolic Functions and their inverses • Integrating factor • Homogeneous and non-homogeneous second order differential equations • Simple harmonic motion • Linear systems • Work done by a variable force and Hooke's law • Momentum and impulse including oblique impacts • Radial and tangential components of acceleration • Slack Variables • Branch and Bound • Simplex algorithm and the geometric representation, link to game theory. • Nash Equilibrium	Mocks will be set up to replicate the final exams with all content taught through AS and up to January of year 13 on the papers. Students will sit three papers: Paper 1: Core Pure Paper 2: Mechanics Paper 3: Discrete	Encourage independent study. Students find the application of skills learnt to problem solving the most challenging part of the course. Working through a range of questions, without using a mark scheme as a prompt, is beneficial. When stuck, encourage students to come to maths support where we can talk through the thought process required.
Summer Term	17) Further Calculus 18) Mechanics – Further dynamics and kinematics 19) Discrete - Algorithms	• Differentiating and integrating trig and hyperbolics • Maclaurin Series • Mean Value of a function • Volumes of revolution • Knapsack problem • Hierarchy of orders • Problem solving • Exam Technique	External are sat in May and June. We have four papers. Paper 1: Core Pure Mathematics Paper 2: Core Pure Mathematics Paper 3: Mechanics Paper 4: Discrete Any topic from year 12 and 13 can be assessed with the core pure content coming up in any of the first two papers.	Encourage independent study. Students should be working through past exam papers and using the mark schemes after they have completed questions seeking help from maths support to help develop understanding and problem-solving skills. Where students are finding a topic challenging, we would recommend returning to the exercise in the textbook before returning to exam papers.