

Year 13 Further Mathematics

Timing	Unit Title	Key Question	Knowledge	Assessing Understanding
Autumn	CP1 FM1 FP1	What type of numbers are needed to deal with $\sqrt{-1}$? How do you solve an equation which does not factorise? Do you know how to manipulate matrices? How do we sum a series? What is proof by induction? Can you extend your mechanics knowledge to deal with further mechanics content?	For the full Further Mathematics A level 4 units are taught: - Core Pure 1 (CP1) - Core Pure 2 (CP2) - Further Mechanics 1 (FM1) - Further Pure 1 (FP1) For Further Mathematics AS level the following units are taught: - CP1 (50%) - FM1 (25%) - FP1 (25%) Classes contain both A level and AS level students. The order of teaching of the topics will vary depending on the split of teachers. We start by teaching CP1 and FM1 then progress to CP2 and FP1. Introduction to complex numbers, real, imaginary (CP1) Argand diagram and modulus /argument form (CP1) Matrices - order, inverse, determinant, and solve simultaneous equations (CP1) Linear transformations – using matrices (CP1) Series - use of sum of squares and cubes (CP1) Proof by induction (CP1) Roots of polynomials (CP1)	How understanding is assessed - Through applying the theory to a range of questions and increasingly more complex situations. - Discussion in lessons, sample problems. - Homework and tests involving past paper questions. Skills - In addition to the understanding of the concepts, significant algebraic skills are required. Mathematical modelling for FM1. Assessment Point information - Timed questions on both CP1 and FM1 topics.

			Vectors – equations of lines & planes, scalar product & angles, intersection & perpendiculars (CP1) Volumes of revolution around the x and y axes (CP1) Momentum and impulse (FM1) Work, energy and power (FM1) Elastic strings and springs - applying Hooke's Law to force and energy situations (FM1) Further inequalities (FP1) The t – formulae – solving trig equations (FP1) Numerical methods – Simpson's rule (FP1)	
Spring	CP2 FM1 FP1	Can you extend your pure knowledge to deal with CP2 & FP1	Extend complex numbers to trig and exponential form, de Moivre's theorem, series & nth roots (CP2) Vectors – vector product, areas (FP1) Higher derivatives, Maclaurin series (CP2) Further calculus – inverse trig functions (CP2) The coordinate geometry of the conic sections – hyperbola, parabola & ellipse (FP1) Introduction to hyperbolic functions sinh, cosh and tanh with their related reciprocal and inverse functions (CP2) First and second order differential equations (CP2)	How understanding is assessed • See above Skills • In addition to the understanding of the concepts significant algebraic skills are required. Advanced calculus skills. Assessment Point information • Timed questions on both the Pure and Mechanics topics. • Mock examination (CP1/FP1 AS topics) • Spring test on FM1

			Polar coordinates - finding tangents, normals and areas (CP2) Volumes of revolution – including parametrics (CP2) Elastic collisions in one dimension (FM1) Elastic collisions in two dimensions – oblique impact (FM1) Modelling with differential equations (CP2) Taylor series (FP1)	
Summer			Further calculus methods (FP1) Reducible differential equations (FP1) Completion of the Further Mathematics units as outlined above.	How understanding is assessed • See above Skills • See above Assessment Point information • Timed questions on both the Pure and Mechanics topics. • Informal mocks on Core Pure topics