Long Term Plan

The Level 2 Certificate in Further Maths allows students to extend their knowledge of trigonometry, quadratics and GCSE Maths into more complex problems as well as learning new topics such as calculus and matrices.

Year 11: Level 2 Further Maths

	Learning Cycle	Key Concepts and Themes	Vocabulary
HT1	Basic number	• Consolidation of ratio and proportion • Use of standard form • Product rule for counting	Product
	Basic algebra	• Expanding brackets • Simplifying expressions • Expanding $(ax + b)^n$ for positive integers n using Pascal's Triangle • Factorising techniques including harder difference of two squares	Expand, Binomial, Coefficient, Difference of two squares, Factorise
	Basic geometry	• Finding area of standard and compound shapes • Finding volumes and surface areas of 3D shapes • Angles: parallel lines and circle theorems including writing rigorous proofs.	Cone, Sphere, Frustum, Rectilinear, Alternate, Supplementary, Corresponding, Tangent, Segment
	Linear and Quadratic Equations	• Complete the square for quadratic expressions with integer coefficients • Solve equations by use of completing the square • Solve linear equations • Solve quadratic equations by factorisation, graphically or by use of the quadratic formula	Linear, quadratic, completing the square, roots, factorise, coefficient
HT2	Introductory coordinate geometry	• Consolidation of straight line geometry: equations of lines, parallel and perpendicular lines. • Distances between points • Midpoints • Splitting lines using a given ratio	Gradient, intercept, parallel, perpendicular, midpoint
	Functions	• Understand and use function notation • Solving equations given in function notation • Domains and ranges of functions • Composite functions • Inverse functions	Domain, range, composite, inverse
	Algebraic fractions	• Simplifying algebraic fractions • Solving equations involving algebraic fractions	Factorise
	Introductory calculus	• Differentiation of polynomials, including ones which require simplification • Use differentiation to find the value of the gradient of a curve at a given point • Find the equation of a tangent to a polynomial at a point	Differentiate, coefficient, power, gradient, tangent
	Sketching functions and inequalities	• Draw or sketch linear, quadratic and exponential functions, including piecewise functions • Solve linear and quadratic inequalities	Exponential, linear, quadratic, inequality
HT3	Manipulation and proof	• Changing the subject of a formula where the subject appears on one or both sides of the formula. • Identities and equating coefficients	Subject, formula, term, coefficient
	Surds	• Simplify expression by manipulating surds • Expand brackets which contains surds • Rationalise the denominator including denominators in the form $a\sqrt{b} + c\sqrt{d}$	Surd, rationalise
	Indices	• Simplify expressions involving negative and fractional indices • Solve equations involving fractional and negative indices; including n^{th} roots • Solve more complex equations involving ones which lead to hidden quadratics	Index, root, reciprocal,
	Equations of Straight lines and circles	• Work out the equation of a straight line • Draw graphs of straight line equations • Recognise and state the equation of general circle $(x - a)^2 + (y - b)^2 = r^2$ • Find equations of tangents to circles.	Gradient, intercept, chord, tangent, radius, perpendicular

HT4	Simultaneous equations	• Solve two linear simultaneous equations • Solve simultaneous equations where one is linear and one is second order using substitution or any other valid method • Solve three linear simultaneous equations using any valid algebraic method	Elimination, substitution, non-linear
	Matrix calculations	• Carry out addition and scalar multiplication of matrices • Know the properties of the identity matrix I • Carry out matrix multiplication of 2 x 2 matrices with a 2 x 2 or 2 x 1 matrix	Matrix, row, column, dimension, square matrix, identity, commutative, associative
	Trigonometry and Pythagoras	• Finding unknown sides of triangles using right angled trigonometry and the sine and cosine rules • Finding unknown angles using trigonometry, including the ambiguous case for sine • Carry out 3D trigonometry and Pythagoras • Solve problems involving bearings • Solve problems using exact trigonometric values	Hypotenuse, adjacent, plane, face, bearing
	Further trigonometry	• Solving trigonometric equations • Manipulating trigonometric identities • Solving trigonometric equations requiring use of identities	Identity, periodic, inverse
HT5	Sequences	• Limiting values of sequences • n^{th} term of linear and quadratic sequences	Limit, infinity
	Factor Theorem	• Use factor theorem to factorise polynomials • Roots of polynomials	Factor, divisor, quotient, root, polynomial
	Matrix Transformations	• Transformations of the unit square • Matrix representations of standard transformations • Matrices for combined transformations	Transformation, stretch, reflection, rotation, unit square,
	Calculus applications	• Equation of tangents and normals to curves • Stationary points • Increasing and decreasing functions • Maxima and minima of functions • Optimisation of geometric problems • Sketch functions using calculus	Tangent, normal, stationary point, increasing/decreasing function, maximum, minimum, optimisation, turning point, vertex
HT6	Revision and external assessments		

Skill Development	• Make and test conjectures about the generalisations that underlie patterns and relationships; look for proofs or counter examples; develop further their use of algebra to support and construct arguments. • Accurately interpret statistical and geometrical representations, and express arguments formally. • Assess the validity of an argument and the accuracy of a given way of presenting information. • Justify their reasoning in an articulate way using formal mathematical language. • Develop mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems, financial contexts and worded scenarios. • Make and use connections between different parts of mathematics to solve problems. • Select appropriate concepts, methods and techniques to apply to unfamiliar and nonroutine problems; interpret solutions in the context of the given problem