Key Stage 5 (12 & 13)		
Course title: A-Level Mathematics		
Exam board: OCR		
Specification code: H240		
Autumn 1 (September-October)	**Teacher 1**	**Teacher 2**
	Indices and Surds • Manipulate surds • Rationalise a denominator • Simplify expressions with indices Extension of GCSE concepts	**Straight Lines** • Mid-points • Distance between two points Formalises GCSE concepts
	Quadratic Functions • Completing the square • Factorising • Quadratic formula Extension of GCSE concepts	**Straight Lines** • Equation of a line • Parallel and perpendicular lines Extension of GCSE concepts
	Quadratic Functions • Use of the discriminant • Curve sketching	**Binomial Expansion** • Link Pascal's triangle to binomial coefficients • Use of Binomial expansion formula
	Simultaneous Equations and Quadratic Inequalities • Solve simultaneous equations including one linear/ one quadratic and two curves. • Solve quadratic inequalities	**Differentiation** • Understand that the derivative is the gradient of the tangent to the curve • Use of correct notation • Differentiation from first principles

<table>
<tr><td rowspan="3"></td><td>Solving Equations Graphically and Graphical Inequalities
Use of points of intersection
Understand and use proportional graphs
Graph linear and quadratic inequalities</td><td rowspan="3">Rules of differentiation
Use of second derivative and notation
Tangents and normals
Stationary points
Increasing/ decreasing functions
Optimisation</td></tr>
<tr><td>Proof
Set and interval notation
Direct proof
Proof by exhaustion
Proof by counter example
Logical connectives</td></tr>
<tr><td>Polynomials
Factor theorem
Polynomial division
Comparing coefficients</td></tr>
<tr><td rowspan="2">Autumn 2 (October-December)</td><td>Transformations
Single transformations only in Year 12</td><td>Circles
Use of circle theorems and equation of a circle to solve problems</td></tr>
<tr><td>Exponential Functions
Graphs of exponential functions
Introduction to $e^x$and gradient
Introduction to logs</td><td>Integration
Integrate indefinite integrals
Integrate between limits
Find the area between a curve and the x-axis</td></tr>
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<tr><td rowspan="2"></td><td>Logarithms
Laws of logs
Logs to any base and logs to base e
Natural logs
Graphs of natural logs
Solving equations with exponentials
Reduction to linear form and modelling exponential functions</td><td></td></tr>
<tr><td>Disguised Quadratics
Solve a quadratic in another function</td><td rowspan="2">Vectors
Column and component notation
Magnitude and direction
Basic operations on vectors
Position vectors
Distance between points
Problem-solving – shapes in 3D</td></tr>
<tr><td rowspan="2">Spring 1 (January-February)</td><td><u>MECHANICS</u>
SI Units</td></tr>
<tr><td>Kinematics</td><td>Trigonometry
Sine and Cosine rules
Area of a triangle formula
Trigonometric curves
Trigonometric identities
Solving equations</td></tr>
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<tr><td rowspan="2"></td><td>Constant Acceleration</td><td></td></tr>
<tr><td>Non-uniform Acceleration</td><td><u>Statistics</u>
Single Variable Data
Stem-and-leaf
Cumulative frequency</td></tr>
<tr><td rowspan="2">Spring 2 (February-March)</td><td rowspan="2">Newton’s Laws
First Law
Second Law and with vectors
Weight
Third law, normal reaction</td><td>More Charts
Scatter diagrams and correlation
Histograms</td></tr>
<tr><td>Measures of Average and Spread
Mean and standard deviation
Outliers and cleaning data</td></tr>
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		Probability • Mutually exclusive and independent events • Venn diagrams • Sample space diagrams • Statistical sampling • Discrete random variables • Binomial distribution • Hypothesis testing • Critical Values
	Connected Particles • Smooth contact • Pulleys	

<table>
<tr><td rowspan="2">Summer 1
(April-May)</td><td><u>Year 2</u>
Trigonometry
• Radians
• Equations
• Arcs and sectors</td><td></td></tr>
<tr><td>Binomial Expansion
• Year 2 formula</td><td>Large Data Set</td></tr>
<tr><td rowspan="2">Summer 2
(May-July)</td><td>Integration as a limit of a sum</td><td rowspan="2"><u>Year 2</u>
Differentiation
• Chain rule
• Differentiation of ln
• Product Rule
• Quotient Rule
• Reciprocal trigonometric functions
• Differentiation of trigonometric functions
• Implicit differentiation
• Differentiation of parametric equations</td></tr>
<tr><td>Trapezium Rule</td></tr>
</table>

	Sequences and Series • Arithmetic sequences • Geometric sequences • Sigma notation and sum to infinity	
	Rational Functions • Partial Fractions	**Numerical methods** • Sign change rule • Iteration • Cobweb and staircase diagrams • Newton-Raphson • Limitations of iteration and Newton-Raphson
Autumn 1 (September-October)	**Functions** • Definitions • Vocabulary and notation • Domain and range • Composite and Inverse	

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- Transformation of functions
- Modulus functions and graphs

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Integration

- Integration of exponentials, 1/x, sin and cos
- Reverse chain rule
- Integration by substitution
- Integration by parts
- Finding the area between two curves or bounded by a curve and a line
- Integration with partial fractions
- Parametric integration
- Related rates of change
- Integration using trigonometric identities
- Differential Equations

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Trigonometry

- Addition formulae and double angles
- acos(x) + bsin(x) form
- Proof
- Year 2 Identities
- Small angle approximations
- Differentiating sin and cos from first principles

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<tr><td rowspan="3">Autumn 2 (October-December)</td><td>Proof
Recap Year 1
Proof by contradiction</td><td rowspan="3"></td></tr>
<tr><td>Vectors
Recap Year 1
3D notation</td></tr>
<tr><td>Points of Inflection
Recap increasing and decreasing functions
Concave and convex curves
Stationary and non-stationary points of inflection</td></tr>
<tr><td>Spring 1 (January-February) & Spring 2 (February-March)</td><td>Year 2 Mechanics:
Applications of Vectors
Describing motion in two dimensions
Constant acceleration equations
Calculus with vectors
Vectors in three dimensions
Solving geometrical problems
Projectiles
Modelling projectile motion
Trajectory
Forces
Resolving forces</td><td>Year 2 Statistics:
Conditional Probability
Set notation and Venn diagrams
Two-way tables
Tree diagrams
Modelling
The Normal Distribution
Introduction to normal probabilities
Inverse normal distribution
Finding unknown μ or σ
Modelling
Hypothesis Testing</td></tr>
</table>

	• Coefficient of friction • Motion on a slope • Equilibrium problems **Moments** • Turning effect of a force • Equilibrium • Non-uniform rods • Equilibrium problems	• Distribution of the sample mean • Hypothesis tests for a mean • Hypothesis tests for correlation coefficients
Summer 1 (April-May) & Summer 2 (May-July)	**Revision**	**Revision**