

	Topic	Content
<b>Y12 Autumn Term</b>	Problem Solving/Proof	Understand and use the structure of mathematical proof, proceeding from given assumptions through a series of logical steps to a conclusion Understand and be able to use the logical connectives $\equiv, \Rightarrow \Leftrightarrow$
	Surds and Indices	Understand and use the laws of indices for all rational exponents Use and manipulate surds, including rationalising the denominator
	Coordinate Geometry	Understand and use the equation of a straight line; gradient conditions for two straight lines to be parallel or perpendicular. Be able to use straight line models in a variety of contexts. Understand and use the coordinate geometry of the circle including using the equation of a circle ; completing the square to find the centre and radius of a circle; use of the following properties: <ul style="list-style-type: none"> <li>• the angle in a semicircle is a right angle</li> <li>• the perpendicular from the centre to a chord bisects the chord</li> <li>• the radius of a circle at a given point on its circumference is perpendicular to the tangent to the circle at that point</li> </ul>
	Trigonometry	Understand and use the definitions of sine, cosine and tangent for all arguments; the sine and cosine rules; the area of a triangle Understand and use the sine, cosine and tangent functions; their graphs, symmetries and periodicity Understand and use some trigonometric identities Solve simple trigonometric equations in a given interval, including quadratic equations Work with radian measure, including use for arc length and area of sector. Know and use exact values of sin, cos and tan
	Quadratic Functions	Work with quadratic functions and their graphs; the discriminant of a quadratic function, including the conditions for real and repeated roots; completing the square; solution of quadratic equations including solving quadratic equations in a function of the unknown.
	Equations and Inequalities	Solve simultaneous equations in two variables by elimination and by substitution, including one linear and one quadratic equation. Solve linear and quadratic inequalities in a single variable and interpret such inequalities graphically, including inequalities with brackets and fractions Express solutions through correct use of ‘and’ and ‘or’, or through set notation Represent linear and quadratic inequalities graphically.
	Polynomials	Manipulate polynomials algebraically, including expanding brackets and collecting like terms, factorisation and simple algebraic division; use of the factor theorem.
	Vectors	Use vectors in two dimensions. Calculate the magnitude and direction of a vector and convert between component form and magnitude/direction form. Add vectors diagrammatically and perform the algebraic operations of vector addition and multiplication by scalars, and understand their geometrical interpretations. Understand and use position vectors; calculate the distance between two points represented by position vectors. Use vectors to solve problems in pure maths and in context, including forces.

**MATHEMATICS**
**A LEVEL OCR SPECIFICATION**

<b>Y12 Spring Term</b>	Data Collection	<p>Understand and use the terms 'population' and 'sample'</p> <p>Use samples to make informal inferences about the population</p> <p>Understand and use sampling techniques</p>
	Processing, presentation and interpretation	<p>Interpret diagrams for single-variable data</p> <p>Interpret scatter diagrams and regression lines for bivariate data</p> <p>Interpret measures of central tendency and variation, extending to standard deviation.</p> <p>Recognise and interpret possible outliers in data sets and statistical diagrams. Select or critique data presentation techniques in the context of a statistical problem.</p>
	Binomial expansion	<p>Understand and be able to use the binomial expansion for positive integer <math>n</math></p>
	Units and Kinematics	<p>Understand and use the language of kinematics: position; displacement; distance travelled; velocity; speed; acceleration.</p> <p>Understand, use and interpret graphs in kinematics for motion in a straight line: displacement against time and interpretation of gradient; velocity against time and interpretation of gradient and area under the graph.</p> <p>Understand, use and derive the formulae for constant acceleration for motion in a straight line.</p>
	Differentiation	<p>Understand and use the derivative of <math>f(x)</math> as the gradient of the tangent to the graph of <math>y = f(x)</math> at a general point <math>(x, y)</math>; the gradient of the tangent as a limit; interpretation as a rate of change; sketching the gradient function for a given curve; second derivatives; differentiation from first principles for small positive integer powers of <math>x</math>.</p> <p>Understand and use the second derivative as the rate of change of gradient.</p> <p>Differentiate <math>x^n</math>, for rational values of <math>n</math>, and related constant multiples, sums and differences.</p> <p>Apply differentiation to find gradients, tangents and normals, maxima and minima and stationary points. Identify where functions are increasing or decreasing.</p>
	Forces and Newton's Laws	<p>Understand the concept and vector nature of a force; understand and use Newton's first law.</p> <p>Understand and use Newton's second law for motion in a straight line (restricted to forces in two perpendicular directions or simple cases of forces given as 2-D vectors).</p> <p>Understand and use weight and motion in a straight line under gravity; gravitational acceleration, <math>g</math>, and its value in S.I. units to varying degrees of accuracy.</p> <p>Understand and use Newton's third law; understand and use the concept of a normal reaction force; equilibrium of forces on a particle and motion in a straight line (restricted to forces in two perpendicular directions or simple cases of forces given as 2-D vectors); application to problems involving smooth pulleys and connected particles.</p>
	Exponentials and Logs	<p>Understand and use the laws of logarithms</p> <p>Solve equations of the form <math>a^x = b</math></p> <p>Use logarithmic graphs to estimate parameters in relationships of the form <math>y = ax^n</math> and <math>y = kb^x</math>, given data for <math>x</math> and <math>y</math></p>

**MATHEMATICS**

**A LEVEL OCR SPECIFICATION**

		Understand and use exponential growth and decay; use in modelling; consideration of limitations and refinements of exponential models
	Probability	Be able to use appropriate diagrams to assist in the calculation of probabilities. Includes tree diagrams, sample space diagrams, Venn diagrams.
	Discrete Probability Distributions (Including Binomial)	Understand and use simple, discrete probability distributions, including the binomial distribution, as a model; calculate probabilities and expectation using the binomial distribution.
	Graphs and Transformations	Understand and use graphs of functions; sketch curves defined by simple equations including polynomials, $y = \frac{a}{x}$ and $y = \frac{a}{x^2}$ (including their vertical and horizontal asymptotes); interpret algebraic solution of equations graphically; use intersection points of graphs to solve equations. Understand and use proportional relationships and their graphs. Understand the effect of simple (single) transformations on the graph of $y = f(x)$ including sketching associated graphs: $y = af(x)$ , $y = f(x) + a$ , $y = f(x + a)$ , $y = f(ax)$
	Integration	Know and use the Fundamental Theorem of Calculus. Integrate $x^n$ (excluding $n = -1$ ), and related sums, differences and constant multiples Evaluate definite integrals; use a definite integral to find the area under a curve
	Variable Acceleration	Use calculus in kinematics for motion in a straight line: $v = \frac{dr}{dt}$ , $a = \frac{dv}{dt} = \frac{d^2r}{dt^2}$ , $r = \int v dt$ , $v = \int a dt$