Year 12
Core Mathematics

Students have 8 lessons per fortnight
Homework is set a minimum 4 times a fortnight to be found on Firefly.

	Topic and approximate duration	Key Learning Areas	Independent study to be completed by student	Consolidation Tasks
Autumn First Half Term	**Surds.**	Students will: be able to perform essential algebraic manipulations, such as expanding brackets, collecting like terms, factorising etc; understand and be able to use the laws of indices for all rational exponents; be able to use and manipulate surds, including rationalising the denominator.	1. Essential GCSE practice 2. Surds exam questions 3. Quadratics 4. Chapter 1 end of chapter test A 5. Basic algebra and polynomials 6. Chapter 1 end of chapter test B 7. Basic algebra and coordinates	Indices, surds and simultaneous equations.
	Simultaneous equations & Inequalities.	Students will: Be able to solve linear simultaneous equations using elimination and substitution; be able to use substitution to solve simultaneous equations where one equation is linear and the other quadratic; be able to solve linear and quadratic inequalities; know how to express solutions through correct use of set notation; be able to interpret linear and quadratic inequalities graphically; be able to represent linear and quadratic inequalities graphically.		
	Equations of line and circle	Students will: Understand and use the equation of a straight line; know and be able to apply the gradient conditions for two straight lines to be parallel or perpendicular; be able to find lengths and areas using equations of straight lines; be able to use straight-line graphs in modelling; be able to find the midpoint of a line segment; understand and use the equation of a circle; to be able to find the equation of a circle given points or values; be able to find points of intersection between a circle and a line; calculate the tangent to a circle; know and be able to use the properties of chords and tangents.		Straight lines
	Complete the square & discriminant	Students will: Be able to solve a quadratic equation by factorising; be able to complete the square; be able to solve quadratic equations, including in a function of the unknown; be able to work with quadratic functions and their graphs; know and be able to use the discriminant of a quadratic function, including the conditions for real and repeated roots.		Quadratics
	Proof	Students will: Be able to use methods of proof, including proof by deduction; be able to use methods of proof by exhaustion and disproof by counter-example.		

	Algebraic division & factor theorem **Sketching graphs**	Students will: Be able to use algebraic division; be able to use algebraic division with 0 coefficients; know and be able to apply the factor theorem; be able to fully factorise a cubic expression; Students will: Sketching the equations of cubics and Quartics; sketch reciprocal and exponential graphs; understand the effect of simple transformations on the graph of y=f(x); sketch the result of a simple transformation given the graph of any function y=f(x)		Further Algebra
	Nature of Landmark Assessment	Two 40 minute landmark tests.		

	Topic and approximate duration	Key Learning Areas	Independent study to be completed by student	Essential Homework Additional homework will be set by class teacher.
Autumn Second Half Term	**Vectors** **Differentiation** **Binomials** **Trigonometry**	Students will: calculate the magnitude and direction of a vector; add vectors diagrammatically; algebraic operations of vector addition and multiplication by scalars; Know what a position vectors is; calculate the distance between two points represented by position vectors; Use the ratio theorem to find the position vector of a point C dividing AB in a given ratio; solve problems in pure mathematics and in context, (including forces). Students will: Be able to differentiate polynomials with whole number powers; Know differentiation gives gradient of curve and tangent at that point; Be able to differentiate polynomials rational powers; differentiate from first principles for small positive integer powers of x; be able to find second derivatives; be able to sketch the gradient function for a given curve. Students will be taught: binomial expansion of (a + bx)n for positive integer n using Pascal; find an unknown coefficient of a binomial expansion; binomial expansion of (a + bx)n for positive integer n; using Combinations; estimate using binomials. Students will be taught: Sketch the graph of all 3 trig ratios and graphs including transformations; to use the sine and cosine rules; to use the area of a triangle in the form 1/2 ab sin C; complete questions set around bearing of object; to solve trigonometric equations within a given interval; solve trig equations where the domain is transformed; to use trigonometric identities to solve equations.	1. Basic algebra and coordinates 2. chapter 2 end of chapter test A 3. chapter 6 end of chapter test A 4. chapter 2 end of chapter test B. 5. chapter 3 end of chapter test A 6. chapter 6 end of chapter test B 7. chapter 3 end of chapter test B	Equations of a circle Basic Differentiation Binomial expansions Trigonometry
	Nature of Landmark Assessment	Two 40 minute landmark tests.		

	Topic and approximate duration	Key Learning Areas	Independent study to be completed by student	Essential Homework Additional homework will be set by class teacher.
Spring First Half Term	**Differentiation** **Integration** **Logarithms Exponentials**	Students will be taught: Using differentiation to find gradient; equation of tangent and normal; finding the stationary points; finding the second differential; nature of stationary points; identify when a function is increasing or decreasing; sketch gradient function of a curve. Students will: know and be able to use the Fundamental Theorem of Calculus for positive powers; determine particular solutions; be able to integrate x^n (excluding n = −1), and related sums; differences and constant multiples; be able to evaluate definite integrals; be able to use a definite integral to find the area under a curve. Students will: know and be able to use the definition of loga x as the inverse of a^x, where a is positive and x≥0 ; develop laws of logs; understand and use the laws of logarithms; be able to solve equations of the form a^x=b graphically; be able to solve equations of the form a^x=b; be able to use logarithmic graphs to estimate parameters in relationships of the form y=ax^n and y=kb^x, given data for x and y; know and be able to use ln x as the inverse function of e^x ; know and be able to use the function ln x and its graph; be able to use exponential growth and decay in modelling, giving consideration to limitations and refinements of exponential models.	1. Mixed Exercise Chapter 9 2. chapter 2 end of chapter test B 3. chapter 4 end of chapter test A 4. chapter 5 end of chapter test A 5. chapter 9 end of chapter test A	Applying differentiation Integration Laws of logs Exponentials
	Nature of Landmark Assessment	Two 40 minute landmark tests		

	Topic and approximate duration	Key Learning Areas	Independent study to be completed by student	Essential Homework Additional homework will be set by class teacher.
Spring Second Half Term	**Data presentation** **Probability** **Kinematics** **Newton's 1st law**	Students will: Use the terms 'population' and 'sample'; use samples to make informal inferences about the population; use sampling techniques; critique sampling techniques in the context of solving a statistical problem; calculate measures of location, mean, median and mode; be able to calculate, standard deviation, variance; be able to calculate standard deviation, variance; interpret and draw inferences from summary statistics; calculate IQR; calculate interpercentile range; use linear coding to find statistics of connected data sets; know how to interpret diagrams for single variable data; calculate mean and standard deviation from a histogram; interpret scatter diagrams and regression lines for bivariate data; be able to make predictions using the regression line and understand its limitations; recognise and interpret possible outliers in data sets and statistical diagrams. Students will: Calculating probability using diagrams; understand and be able to use mutually exclusive and independent events when calculating probabilities. Students will: be able to draw and interpret distance/ displacement time graph, knowing the significance of their gradients and the areas underneath; know the difference between position, displacement and distance; understand the concept of a mathematical model; understand the particle model; be able to draw and interpret velocity time graph, knowing the significance of their gradients and the areas underneath; know the difference between velocity and speed; understand that units behave in the same way as algebraic quantities, e.g. meters per second is m/s = m × 1/s = ms-1; recognise when it is appropriate to use the suvat formulae for constant acceleration; be able to solve kinematics problems using constant acceleration formulae; be able to solve problems involving vertical motion under gravity; be aware that g is not a universal constant but depends on location, but is assumed at this level; use quantities and units: velocity, acceleration, be familiar with commonly-made assumptions when using these models. Students will: Understand the concept of a force; understand and use Newton's first law in vertical motion; understand that there are different types of forces. know the difference between mass and weight (including gravity); Know forces can be given in i - j form or as column vectors; solve problems involving I and J; forces can have I and J components; solve problems with non perpendicular forces expressed as I and J only; understand and be able to use Newton's second law for motion in a	1. chapter 7 end of chapter test A 2. chapter 4 end of chapter test B 3. chapter 5 end of chapter test B 4. chapter 7 end of chapter test B 5. chapter 10 end of chapter test A	Averages and range Probability Kinematic graphs SUVAT

		straight line; resolving horizontally; understand and be able to use Newton's second law for motion in two perpendicular directions or simple cases of forces given as 2D (i, j) vectors.);		
	Nature of Landmark Assessment	Two 40 minute landmark tests		

	Topic and approximate duration	Key Learning Areas	Independent study to be completed by student	Essential Homework Additional homework will be set by class teacher.
Summer first Half Term	**Binomial** **Hypothesis test** **Newtons 3rd law** **Variable acceleration**	Students will: Calculate single probability using the formula; know the conditions use of binomial distribution; calculate single and cumulative probabilities using tables and calculator; to be able to switch order of success when probability is over 0.5 so that tables can still be used. Students will: Understand and be able to apply the language of statistical hypothesis testing, developed through a binomial model; be able to conduct a statistical hypothesis test for the proportion in the binomial distribution and interpret the results in context; know sample is being used to make an inference about the population; the significance level is the probability of incorrectly rejecting the null hypothesis. Students will: Introduce Newton's 3rd law in vertical plane; solve problems in the vertical plane; solve truck and trailer problems in horizontal plane; solve pulley problems where all particles move in vertical plane; solve pulley problems where particles move in horizontal and vertical plane. Students will: Use calculus in kinematics to model motion in a straight line for a particle moving with variable acceleration; know how to find max and min velocities by considering zero gradients and understand how this links with the actual motion; calculate velocity and acceleration from displacement; use calculus in kinematics to model motion in a straight line for a particle moving under the action of a variable force; know how to use initial conditions to calculate the constant of integration and refer back to the problem.	1. chapter 8 end of chapter test A 2. chapter 11 end of chapter test A	Binomial distribution Hypothesis tests Newton's laws Variable acceleration
	Nature of Landmark Assessment	Two 40 minute landmark tests		