Year 12 Spring Term Overview
AS Mathematics

Subject: Pure Mathematics	
Skills	**OT1 Mathematical Argument, Language and Proof** Construct and present mathematical arguments through appropriate use of diagrams using correct symbols and language, including set notation. **OT2 Mathematical Problem Solving** Understand the concept of a mathematical problem-solving cycle and be able to solve problems presented in an unstructured form, clearly communicating solutions in the context of the original problem. **OT3 Mathematical Modelling** Translate a situation in context into a mathematical model whilst using appropriate modelling assumptions.
Knowledge	**Pure 10 – Trigonometric Identities and Equations** Angles in all four quadrants, exact values, trigonometric identities, trigonometric equations **Pure 11 – Exponentials and Logarithms** Exponential functions, exponential modelling, logarithms, laws of logarithms, natural logarithms, solving equations using logs, non-linear data
Rationale	With their knowledge of trigonometric ratios, learners now have the knowledge to be able to solve trigonometric equations and understand how trigonometric identities are used. Learners are taught how the angles in all four quadrants are related using a CAST diagrams which is used to deepen their understanding of where the trigonometric identities come from and why they are multiple solutions to trigonometric equations. This method can also support learners when resolving forces in the later mechanics topics. Using their knowledge of indices from the autumn term learners can be introduced to exponentials and logarithms. Exponentials and logarithms are naturally occurring functions which are used to model and understand real-world patterns and problems. With the knowledge and applications learners gain from this topic, they are able to access a number of Year 13 topics.

Year 12 Spring Term Overview
AS Mathematics

Subject: Pure and Statistics	
Skills	**OT1 Mathematical Argument, Language and Proof** Construct and present mathematical arguments through appropriate use of diagrams, graphs and logical deductions using correct symbols and language. **OT2 Mathematical Problem Solving** Understand the concept of a mathematical problem-solving cycle and be able to solve problems presented in an unstructured form, clearly communicating solutions in the context of the original problem. **OT3 Mathematical Modelling** Translate a situation in context into a mathematical model whilst using appropriate modelling assumptions.
Knowledge	**Pure 06: Circles** Midpoints, perpendicular bisectors, equation of a circle, intersections of straight lines and circles, tangents, chords **Applied 05: Probability** Calculating probabilities, Venn diagrams, mutually exclusive events, independent events **Applied 06: Statistical Distributions** Probability distributions, binomial distribution, cumulative probabilities **Applied 07: Hypothesis Testing** Binomial hypothesis testing, critical values, one-tailed tests, two-tailed tests **Pure 08: Binomial Expansion** Pascal's triangle, factorial notation, binomial expansion, binomial estimation
Rationale	Learners begin the spring term with Circles which builds on ideas developed during earlier topics such as straight-line graphs, and equations and inequalities. It is taught at the start of the spring term in order to provide essential knowledge which learners will need for Differentiation which is taught slightly later in the term. The statistics element of the course resumes with studying the use of simple, discrete probability distributions (calculation of mean and variance of discrete random variables is excluded), including the binomial distribution, as a model leading to calculating probabilities using the binomial distribution. Later in the Spring, learners build on the probability skills they have learned previously and are introduced to the process of conducting a statistical hypothesis test for proportions in the binomial distribution and interpreting the results in context. This process will lead them to understand that a sample is being used to infer the population and appreciate that the significance level is the probability of incorrectly rejecting the null hypothesis. Binomial Expansion is taught at the end of the syllabus as a stand-alone topic as it is not a prerequisite to any applied or other pure topics. The concepts introduced in these topics are developed early on in Year 13.

Year 12 Spring Term Overview
AS Mathematics

Subject: Pure and Mechanics	
Skills	**OT1 Mathematical Argument, Language and Proof** Construct and present mathematical arguments through appropriate use of diagrams using correct symbols and language, including set notation. Comprehend and critique mathematical arguments, proofs and justifications of methods and formulae, including those relating to applications of mathematics. **OT2 Mathematical Problem Solving** Understand the concept of a mathematical problem-solving cycle and be able to solve problems presented in an unstructured form, clearly communicating solutions in the context of the original problem. Understand, interpret and extract information from diagrams to solve problems. **OT3 Mathematical Modelling** Translate a situation in context into a mathematical model whilst using appropriate modelling assumptions.
Knowledge	**Pure 07: Algebraic Methods** Algebraic fractions, dividing polynomials, factor theorem, mathematical proof, methods of proof **Pure 12: Differentiation** Gradients of curves, the derivative, differentiating polynomials, tangents and normal, increasing and decreasing functions, second order derivatives, stationary points, gradient functions **Pure 13: Integration** Integrating polynomials, indefinite integrals, definite integrals, areas under curves, areas between curves and lines **Applied 11: Variable Acceleration** Functions of time, using differentiation and integration, maxima and minima problems, using integration, constant acceleration formulae
Rationale	Learners revisit algebra where they develop and apply skills they acquired earlier in the course in Algebraic Expressions and Quadratics such as factorisation and solving quadratics. The proof element of this topic also relies heavily on learners' previously acquired algebra skills. Learners are then introduced to calculus which forms an essential part of the A-Level course, particularly in the remaining mechanics topics and a number of pure Year 13 topics. Differentiation is taught first where learners link their new learning to their knowledge of tangents and normal from Straight-Line Graphs and Circles. Integration is taught after this, so that it can be introduced and understood as the reverse process of differentiation. Having studied differentiation and integration, learners now have the pure skills to move on to Variable Acceleration. Learners apply their calculus skills to a number of mechanics problems which also link with their learning on constant acceleration in the autumn term.