On – Line Programme of Learning for Year 12

Autumn (1st term)	Autumn (2nd term)	Spring (1st term)	Spring (2nd term)	Summer (1st term)	Summer (2nd term)
From: September To: October	From: November To: December	From: January To: February	From: February To: March	From: April To: May	From: To:
Topic/Key Questions/ **Pure:** Algebraic expressions; Quadratics; Equations and Inequalities. **Applied Maths**: Mechanics- Modelling in Mechanics Constant Acceleration **Learning Outcomes:** By the end of the sub-unit, students will be able to perform all the skills highlighted below.	Topic/Key Questions/ **Pure:** Graphs and Transformations; Coordinate Geometry – straight lines; Circles Algebraic Methods **Applied Maths** Forces and Motion **Learning Outcomes:** By the end of the sub-unit, students will be able to perform all the skills highlighted below.	Topic/Key Questions/ **Pure:** Binomial Expansion Trigonometric ratios. Trigonometric Identities and Equations. Differentiation **Applied Maths** Statistics: Data Collection Measures of Location and Spreads Representation of Data **Learning Outcomes:** By the end of the sub-unit, students will be able to perform all the skills highlighted below.	Topic/Key Questions/ **Pure:** Integration, Vector, Exponential and logarithms **Applied Maths** Statistics: Correlation Probability Mechanic: Variable acceleration **Learning Outcomes:** By the end of the sub-unit, students will be able to perform all the skills highlighted below.	Topic/Key Questions/ **Pure:** Revision, Review and Re-teach, Examination preparation **Applied Maths** Statistics: Statistical Distributions Hypothesis Testing **Learning Outcomes:** By the end of the sub-unit, students will be able to perform all the skills highlighted below.	Topic/Key Questions/ Pure: YEAR 2 Algebraic Methods Functions and Graphs Sequences and Series Applied Maths: Statistics (Yr. 2): Regression, correlation and Hypothesis Testing **Learning Outcomes:** By the end of the sub-unit, students will be able to perform all the skills highlighted below.

Skills (students should be able to do): Solve linear, quadratic and simultaneous equations and inequalities. Simplify surds and indices. Understand what the discriminant tells us. Represent inequalities on a graph. Sketch straight line graphs. Find the equation of a straight line and the equation of a perpendicular bisector of a line. Find the point of intersection of two lines. Distinguish between vector and scalar quantities. Make neat, clear diagrams using given information. Apply SUVAT equations Draw a force diagram. Understand Newton's 3 laws and how they can be applied to a simple set of forces acting on a particle. Solve problems involving connected particles, lifts and pulley systems	**Skills** (students should be able to do): Sketch quadratic, cubic, quartic, reciprocal and trigonometric graphs. Apply transformations to curves for a range of functions. Find the equation of a circle. Use tangent and chord properties to solve geometric problems. Manipulate polynomials algebraically, including expanding brackets and collecting like terms, factorisation and simple algebraic division; Simplify algebraic fractions. Use long division in algebra. Use factor theorem. Understand and use the structure of mathematical proof, proceeding from given assumptions through a series of logical steps to a conclusion; use methods of proof, including proof by deduction, proof by exhaustion, disproof by counter-example	**Skills** (students should be able to do): Understand and use the binomial expansion of $(a+bx)^n$ for positive integer n; the notations $n!$ and nCr link to binomial probabilities Solve problems involving sine and cosine rule. Understand the ambiguous case for the sine rule. Know the exact trigonometric ratios. Find all the solutions to trigonometric equations. Solve trigonometric equations involving identities. Understand what differentiation is used for. Differentiate from first principles. Apply the rules of differentiation. Understand how to find and use the gradient function. Use differentiation to solve problems involving gradients, tangents and normal to curves.	**Skills** (students should be able to do): Understand how differentiation and integration are linked. Know and use the Fundamental Theorem of Calculus Integrate related to sums, differences and constant multiples Find the area under a curve. Know the difference between a definite and indefinite integral. Use the correct notation when integrating. Find the original function if given the gradient function 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	**Skills** (students should be able to do): Understand and be able to use simple, discrete probability distributions, including the binomial distribution. Identify the discrete uniform distribution. Calculate probabilities using the binomial distribution. Carry out a hypothesis test for zero correlation	**Skills** (students should be able to do): Use partial fractions to expand fractional expressions Understand and use the modulus function. Understand mappings and functions and use domain and range. Combine two or more functions to make a composite function. Know how to find the inverse of a function graphically and algebraically. Sketch the graphs of modulus functions. Apply a combination of two (or more) transformations to the same curve. Transform the modulus function Know the difference between an arithmetic and geometric sequence. Know the difference between a sequence and series. Recall and use the formulae for the nth term

End of year assessment to cover: At the beginning of Spring 1, pupils will be sitting their first Mock examination on the following topic: **Pure:** In addition to the GCSE grade 9 topics, Algebraic expressions; Quadratics; Equations and Inequalities; Graphs and Transformations; Coordinate Geometry – straight lines; Circles, Algebraic Methods. **Applied Maths**: Mechanics- Modelling in Mechanics Constant Acceleration- Forces and Motion		**End of year assessment to cover:** A final mock examination of all content will be administered in April (Summer 1).		**End of year assessment to cover:** Pupils will be sitting the end of year exams which will be covering all the AS content and the following: Pure: Algebraic Methods Functions and Graphs Sequences and Series Applied Maths: Statistics (Yr. 2): Regression, correlation and Hypothesis Testing	
Building understanding: Rationale / breakdown for your sequence of lessons: This POS is based upon a one-year delivery model for AS level Mathematics. It is broken up into units and sub-units, so that there is greater flexibility for moving topics around to meet planning needs as well as to ensure that all the prior knowledge contents that are linked to other topics are done with a greater level of efficacy allowing for the pupils to	**Building understanding: Rationale / breakdown for your sequence of lessons:** The next mechanic topic to be taught is forces and motion. This will follow through easily as it continues from the previous half term. Doing it at this instance will allow for a better appreciation of year 1 Mechanics. The continuation of the Pure part of the specification will follow easily as it lends itself to	**Building understanding: Rationale / breakdown for your sequence of lessons:** Doing Binomial expressions at this instance will allow the learners to further develop and or apply a good understanding of the laws of indices when expanding binomial expressions, so teaching this topic having done all the algebraic topics ahead of it lends itself to a greater appreciation and applicability of the same.	**Building understanding: Rationale / breakdown for your sequence of lessons:** In terms of Integration, a visual approach for much of this work is vital to the learners understanding. There are clearly two key points to focus on here, one is that of finding the original function from the gradient and the second is in finding the area under the curve. In terms of applications the latter tends to be the more prominent. Its application	**Building understanding: Rationale / breakdown for your sequence of lessons:** Prior to working on statistical distributions, it highly recommended that the learners have a firm understanding of the rules of probability (building upon GCSE and the content from section) and they should have experience of creating basic probability distributions from known probability situations. This should be a core	**Building understanding: Rationale / breakdown for your sequence of lessons:** Having completed all the contents for year 1, the first two to three chapters of A2 Pure and Statistics will be taught. This will allow for a more effective use of the time, giving a greater advantage to the pupils as they will have had a jump-start at the seconds years content. A greater link will be seen and appreciated by the pupils of the continuity in doing hypothesis testing concurrently.

make a meaningful and continuous learning. The pure mathematics content that is covered this term forms the foundation of knowledge that the rest of A level mathematics builds upon. This content revisits key algebra and geometry topics from GCSE to ensure students have secure knowledge and fluency in algebra. Modelling questions challenge and extend student knowledge and the modelling questions covered this term link directly into the skills required for AS Mechanics. For the applied module, students start with Mechanics – this supports the further mathematicians who will begin AS Further Mechanics in the Spring. Modelling in mechanics can be taught any time after the Pure Quadratics module and Kinematics 1 can be taught after Coordinate geometry – straight line graphs.	continuous learning for all pupils.	Many learners fail to make connections between what they are learning and how that knowledge will be used. They struggle to understand the concepts in mathematics unless they can see the relevance to their everyday lives. Differentiation and its applications will give the pupils the insight to make this true. This will open up real application of maths as it will lead to them understanding how to optimise. Doing Differentiation at this point will eliminate the abstractness of Variable acceleration that will be taught in the next half term. They will then be able to appreciate the meaningful relationship between abstract ideas and practical applications in the real world. This in turn, will lead to greater motivation, enjoyment through discovery, improved confidence, independent thinking and better retention of skills. The topic on trigonometric ratios covered this term will be taken to the extent that's prescribed by the	in mechanics, in variable acceleration, particularly in finding the distance travelled as the area under the graph is perhaps the most common usage for learners. In the statistics component it is used to find the probability as the area under a probability density function. Although this calculation is now done on a calculator it is worthwhile pointing out to learners what it is they are doing and the understanding of probability as the area under the normal curve is part of the content. Integration – learners need a good understanding of partial fractions to be able to integrate functions using partial fractions. The work on exponential functions can be linked to population models and the rates of growth of populations or linked to any of a number of other similar ideas like radioactive decay or the spread of disease.	component of the initial approach. As such the pupils will be able to use Venn diagrams, tree diagrams and table of outcomes to solve probability problems. Knowledge of statistical measures and their interpretation and the ability to calculate these, including the variance and standard deviation of a data set would also be beneficial to the understanding of the statistical distributions and their applications, hence teaching the distribution at this point is apt as all the prerequisites would have been done prior to this point. Coupling to the above, the pupils will also benefit from having a good understanding of the binomial expansion and its uses.	Proof by deduction can be practised in contexts such as: properties of graphs; trigonometric identities; logarithms; differentiation from first principles; vector results; probability results and series formulae. It is then fitting to be introducing proof at this instance. Generally, in mathematics proof by exhaustion one will need to use to establish results some probabilities or binomial coefficients, and having seen these concepts prior to this instance makes it very apt and useful to all pupils. The different types of proof allow for application and practice of contents that all pupils would have seen at this point. Many results in Statistics and Mechanics are useful for practising proof, particularly the latter. Simply asking students to show given results, or to justify their working, is enough to develop many

		examination board so as to ensure that all pupils are adequately prepared to do an examination at the end of the year. This will allow for the pupils to make vital connections with year 2 content when we are there. This is so, as it will be needed as a prerequisite to be built on in year 2. The calculus (differentiation and integration) is taught in the spring term, as opposed to the order suggested by textbooks. The rationale for this is that all the necessary algebra has been covered in the first term and the further mathematicians need strong differentiation skills in order to tackle FP1 topics such as Conic Sections. Integration is also required before Kinematics 2 can be taught. In addition, FP1 Covers t-formulae, meaning that trigonometric identities need to be covered this term.	The work on indices lays the foundation to the work on logarithms and if this first topic is not clearly understood then understanding of logarithms will not hold together particularly well. Therefore, doing it at this point would have given the pupils ample time to have reached mastery. In applying the concept to real life situations, the link will be made to Straight lines – this forms the foundation of reduction to linear form wherein is made the use of logarithms to reduce functions to straight line form.		of the ideas and techniques. Proof is developed in Further Mathematics, both within the mandatory pure content and in aspects of the optional content.

Calendared Centrally Planned Extended Home – Learning Tasks:	Calendared Centrally Planned Extended Home – Learning Tasks:	Calendared Centrally Planned Extended Home – Learning Tasks:	Calendared Centrally Planned Extended Home – Learning Tasks:	Calendared Centrally Planned Extended Home – Learning Tasks:	Calendared Centrally Planned Extended Home – Learning Tasks:
Entry examination in September based on transition home learning task (GCSE content only) Centralised online homework as well as regular written homework will be given. In collaboration with all teachers, end of Topic tests will be centralised and will be supervised under exams conditions.	Centralised online homework as well as regular written homework will be given. In collaboration with all teachers, end of Topic tests will be centralised and will be supervised under exams conditions.	Centralised online homework as well as regular written homework will be given. In collaboration with all teachers, end of Topic tests will be centralised and will be supervised under exams conditions.	Centralised online homework as well as regular written homework will be given. In collaboration with all teachers, end of Topic tests will be centralised and will be supervised under exams conditions.	Centralised online homework as well as regular written homework will be given. In collaboration with all teachers, end of Topic tests will be centralised and will be supervised under exams conditions.	Centralised online homework as well as regular written homework will be given. In collaboration with all teachers, end of Topic tests will be centralised and will be supervised under exams conditions.

Reading / literacy / Oracy:
For reading in mathematics, see the links under enrichment. For literacy, students will learn how to break down long worded problems to extract the mathematics involved. This will be modelled in the classroom. Students should get used to reading all parts of the textbook / exam questions and challenging words they don't understand.

Numeracy
Students should be numerate in terms of knowing what a sensible answer looks like for any question they answer and not simply relying on the calculator.

Students will participate in the UKMT senior maths challenge: all students are given the opportunity to partake in the individual challenge. Students will be selected to enter the team maths challenge. This provides students to compete in a nationally recognised mathematics competition.

Students are provided with a variety of internet resources (see links to several resources below) to develop their cultural capital in mathematics and provide them for opportunities for enrichment within the subject.
https://undergroundmathematics.org/
https://www.cimt.org.uk/projects/mepres/alevel/alevel.htm
https://www.stem.org.uk/resources/search
https://www.stem.org.uk/secondary/resources/collections/maths/a-level-maths