

Year 12 Route 1

Timing	Unit Title	Key Question	Knowledge	Assessing Understanding
Autumn 1	Pure Algebra and functions Straight line graphs Algebraic methods	Can you solve, linear, quadratic and simultaneous equations and inequalities? Can you simplify surds and indices? What does the discriminant tell us? Can you represent inequalities on a graph? Can you confidently sketch straight line graphs? How do you find the equation of a straight line? Can you simplify algebraic fractions? Can you use long division in algebra? How do we use the factor theorem? Can you construct a well-reasoned proof?	- Extending the algebra covered at GCSE with particular reference to indices, factorising and surds. - Solving of quadratic equations – from a variety of starting points. - Straight line graph problem solving - Be able to find the length of a line segment, midpoint of a line, area of a triangle - Add, subtract, multiply, divide and simplify algebraic fractions - Factorise cubics using the factor theorem and algebraic long division. - Carry out simple algebraic proofs – deduction, exhaustion and counter example.	How understanding is assessed Students will be assessed on their ability to: - Carry out mathematical techniques. - Problem solving using the knowledge and techniques they have gained. Skills - Numerical - Algebraic, particularly solving equations and carrying out simple proofs. - Sketching graphs Assessment point information The pure, mechanics and statistics lessons run side by side and all assessment is by using Exam standard questions on the topics studied either as homework or tests.

	Graph transformations	Can you confidently sketch quadratic, cubic, quartic and reciprocal graphs? How are curve transformations applied to a range of functions?	- Sketching quadratic, cubic, quartic and reciprocal graphs - Understanding the effects of graph transformations	
Autumn 2	Statistics Measures of locations and spread Representations of data Correlation	Can you make interpretations about data based on measures of location and spread? Can you apply coding techniques? Can you compare sets of data using a variety of statistical techniques? What is meant by an outlier? Can you interpret scatter diagrams and regression lines?	- Build on GCSE knowledge of measures of locations and spread - Calculate variance and standard deviation - Understand and use coding techniques - Identify outliers - Be able to draw and interpret box plots, cumulative frequency diagrams and histograms - Recognise explanatory and response variables. - Interpretation of correlation and regression. - Be able to clean data – deal with missing data, errors and outliers.	How understanding is assessed Students will be assessed on their ability to: - Carry out mathematical techniques. - Problem solving using the knowledge and techniques they have gained. Skills - Numerical - Algebraic particularly solving equations and carrying out simple proofs. - Sketching graphs Assessment point information The pure, mechanics and statistics lessons run side by side and all assessment is by using Exam standard questions on the topics studied either as homework or tests.

	Mechanics Modelling in mechanics Constant acceleration	Can you interpret a model? Can you apply SUVAT equations?	- Correct mechanics terminology. - Modelling of simple real-life situations. - Learn and apply the SUVAT equations. - Draw and/or interpret speed/time graphs. - Solve problems involving vertical motion under gravity	
Spring 1	Pure Differentiation Exponentials and logarithms Vectors	What is differentiation used for? Can you apply the rules of differentiation? Can you sketch the a^x, e^x and log functions? Do you know how to apply the rules of logs? Do you know the definition of a vector? Can you +,- and carry out scalar multiplications. Can you solve geometric problems using vectors?	- The basic differentiation rules - Use differentiation to find the equation of tangents, normals and locate stationary points. - Find and use the second derivative. - Know the graphs of a variety of exponential and log/ln functions. - Be able to solve equations which contain these type of functions. - Use exponentials to model real life situations such as compound interest and radioactive decay. - Position vectors, calculate a vector that runs between two given points. Find the distance between two points. - Use ratios to find the position vector of a point which divides a line in a given ratio.	How understanding is assessed Students will be assessed on their ability to: - Carry out mathematical techniques. - Problem solving using the knowledge and techniques they have gained. Skills - Numerical - Algebraic particularly solving equations and carrying out simple proofs. - Sketching graphs Assessment point information The pure, mechanics and statistics lessons run side by side and all assessment is by using Exam standard questions on the topics studied either as homework or tests.

	Mechanics Forces & motion 1 Statistics Probability	Can you draw a force diagram? Do you understand Newton's 3 laws and how they can be applied to a simple set of forces acting on a particle? Can you use a Venn Diagram or a Tree Diagram to solve a probability problem?	• Apply theory to a variety of geometric problems. • Force diagrams, equilibrium, including vector notation. • Find a resultant force • $F=ma$ • Know how Venn diagrams and Tree diagrams are used and which is the best method to use for different types of questions. • Understand the terms mutually exclusive and independent	
Spring 2	Pure The binomial expansion Integration	Can you carry out a binomial expansion? Do you understand how differentiation and integration are linked? Can you apply the rule of integration to find an area? What is the difference between a definite and indefinite integral?	• Familiarisation with Pascal's Triangle and nCr notation. • Binomial expansion for positive integer powers. • Using the fundamental rules for integrating functions such as x^n. • Using dy/dx and $f'(x)$ notation. • Integrating a gradient function to find the original function. • Using integration to find the area under a curve.	How understanding is assessed Students will be assessed on their ability to: • Carry out mathematical techniques. • Problem solving using the knowledge and techniques they have gained. Skills • Numerical • Algebraic particularly solving equations and carrying out simple proofs. • Sketching graphs Assessment point information

	Trigonometric equations and identities	Can you find all of the solutions to a trig equation?	- Solve trig equations using the quadrant diagram - Exact trig ratios $\sin^2\theta + \cos^2\theta = 1$ $\tan\theta = \frac{\sin\theta}{\cos\theta}$ - Solve trig equations involving identities	The pure, mechanics and statistics lessons run side by side and all assessment is by using: Exam standard questions on the topics studied either as homework or test
	Mechanics Forces & motion 2	Can you apply Newton's Laws to increasingly complex problems?	Solve problems involving connected particles, pulley systems.	
	Statistics Statistical distributions	Can you calculate probabilities from a discrete uniform distribution and from a binomial distribution?	- Deal with discrete distributions finding probabilities, mean and variance. With particular reference to the binomial distribution. - Be able to carry out a statistical hypothesis test for the proportion in a binomial distribution.	
	Hypothesis testing	Do you know the terminology used in hypothesis testing? How do we carry out one and two tailed tests?	- Understand that a sample is being used to make an inference about a population. - Appreciate what is meant by significance level.	
	Data Collection	Why is sampling used and what are the different methods?	- Understand how each sampling method works and be able to compare them. - Use and interpret samples from the large exam data set.	

Summer	Pure Circles Trigonometry Mechanics Variable acceleration	Can you find the equation of a circle? Can you use tangent and chord properties to solve geometrical problems? What is the 'special case' of the sine rule? Can you sketch all trig functions and apply transformations to them? How is calculus used to deal with variable acceleration?	- Equation of a circle - Find midpoints, perpendicular bisectors, points of intersection - Solve triangle problems using the sine and cosine rules - Graphs and transformations of trig functions - Solve kinematics problems using differentiation and integration.	How understanding is assessed Students will be assessed on their ability to: - Carry out mathematical techniques. - Problem solving using the knowledge and techniques they have gained. Skills - Numerical - Algebraic particularly solving equations and carrying out simple proofs. - Sketching graphs Assessment point information The pure, mechanics and statistics lessons run side by side and all assessment is by using Exam standard questions on the topics studied either as homework or tests.

We start to teach Year 2 pure topics after the end of year exams (e.g. Algebraic methods, Radians, Sequences and series)