Timing	Unit Title	Key Question	Knowledge	Assessing understanding
Autumn 1	**Pure**			**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 developed:** ● Numerical ● Algebraic particularly solving equations and carrying out simple proofs ● Sketching graphs **Assessment points:** 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.
	Quadratics	**Can you solve quadratic equations using factorisation, completing the square, and the quadratic formula?** **Can you use the discriminant to determine the nature of roots?**	● The key forms of a quadratic: factorised, standard, and completed square form. ● Use the discriminant to determine the nature of roots.	
	Equations and inequalities	**Can you solve linear and quadratic inequalities and represent solutions on a number line?** **Can you solve simultaneous equations where one equation is quadratic?**	● Solve simultaneous equations algebraically and graphically, including one linear and one quadratic. ● Solve linear and quadratic inequalities and represent solutions using set notation and on a number line.	
	Graphs and transformations	**Can you sketch and interpret graphs of key functions?** **Can you apply and describe transformations (translations, stretches, reflections) to graphs using correct function notation?**	● Recognise and sketch key functions including cubics, quartics, and reciprocals. ● Apply and describe transformations of graphs using function notation: translations, stretches, and reflections.	
	Straight line graphs	**Can you find and interpret the equation of a straight line including parallel and perpendicular lines?** **Can you use straight line models to solve problems in context?**	● The equation of a straight line in multiple forms, including $y = mx + c$ and $ax + by + c = 0$. ● Find equations of parallel and perpendicular lines. ● Use straight line graphs to model real-world data and interpret gradients and intercepts in context.	

Timing	Unit Title	Key Question	Knowledge	Assessing understanding
Autumn 1	**Circles**	**Can you find the equation of a circle and identify its centre and radius?** **Can you solve geometric problems involving tangents, chords, and intersections with lines?**	• The general and expanded equation of a circle. • Use circle theorems alongside coordinate geometry to solve geometric problems involving tangents and chords.	**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 developed:** • Numerical • Algebraic particularly solving equations and carrying out simple proofs • Sketching graphs **Assessment points:** 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.
	Factor theorem	**Can you use the factor theorem to identify factors of a polynomial and fully factorise it?** **Can you perform polynomial division?**	• Use the factor theorem to identify factors of a polynomial and factorise fully. • Perform polynomial long division.	
	Differentiation	**Can you differentiate polynomials from first principles and using the power rule?** **Can you find and interpret gradients, tangents, normals, and stationary points on a curve?**	• The basic differentiation rules. • Use differentiation to find the equation of tangents, normals, and locate stationary points. • Find and use the second derivative.	
Autumn 2	**Pure**			
	Differentiation	**Can you use differentiation to find and classify stationary points?** **Can you apply differentiation to solve optimisation problems in context?**	• Use differentiation to find and classify stationary points as maxima, minima, or points of inflection. • Apply differentiation to solve optimisation problems in context.	
	Trigonometric ratios	**Can you use the sine and cosine rules to solve problems in non-right-angled triangles?** **Can you find areas of triangles and solve problems using trigonometry in both degrees and radians?**	• The sine and cosine rules and the formula for the area of a triangle. • Work with trigonometric graphs and exact values for key angles in both degrees and radians.	

Timing	Unit Title	Key Question	Knowledge	Assessing understanding
Autumn 2	**Trigonometric identities and equations**	**Can you use the identities $\sin^2\theta + \cos^2\theta = 1$ and $\tan\theta = \sin\theta/\cos\theta$ to simplify expressions and solve equations?** **Can you solve trigonometric equations over a given interval, finding all solutions?**	• The identities $\sin^2\theta + \cos^2\theta = 1$ and $\tan\theta = \sin\theta/\cos\theta$ and how to use them to simplify expressions. • Solve trigonometric equations over a given interval, finding all solutions using the unit circle or CAST diagram.	**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 developed:** • Numerical • Algebraic particularly solving equations and carrying out simple proofs • Sketching graphs **Assessment points:** 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.
	Vectors	**Can you perform vector arithmetic and find the magnitude and direction of a vector?** **Can you use vectors to solve geometric problems, including proving points are collinear or finding ratios of line segments?**	• Vector arithmetic including addition, subtraction, and multiplication by a scalar, and finding the magnitude of a vector. • Use vectors to describe and solve geometric problems, including proving collinearity and finding midpoints.	
	Statistics			
	Measures of location and spread	**Can you calculate and interpret measures of central tendency (mean, median, mode) and spread (variance, standard deviation, IQR) for both grouped and ungrouped data?** **Can you compare two distributions using appropriate statistical measures?**	• Calculate and interpret measures of central tendency (mean, median, mode) and spread (variance, standard deviation, IQR) for grouped and ungrouped data. • Compare two distributions using appropriate statistical measures and comment on the context.	
	Representations of data	**Can you draw and interpret statistical diagrams including histograms, box plots, and cumulative frequency graphs?** **Can you identify skewness and outliers from a data set or diagram?**	• Draw and interpret statistical diagrams including histograms, box plots, and cumulative frequency graphs. • Identify and calculate outliers and understand the effect of cleaning data.	

Curriculum Information - Year 12

Department: Mathematics

Timing	Unit Title	Key Question	Knowledge	Assessing understanding
Autumn 2	**Correlation**	**Can you calculate and interpret Pearson's product moment correlation coefficient?** **Can you distinguish between correlation and causation and understand the role of a regression line in context?**	• Interpret Pearson's product moment correlation coefficient as a measure of linear correlation. • Use and interpret a regression line in context, and understand the distinction between correlation and causation.	**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 developed:** • Numerical • Algebraic particularly solving equations and carrying out simple proofs • Sketching graphs **Assessment points:** 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			
	Constant acceleration	**Can you apply the SUVAT equations to solve problems involving constant acceleration in one dimension?** **Can you interpret and analyse motion using displacement-time and velocity-time graphs, including calculating distances and accelerations?** **Can you solve problems involving vertical motion under gravity?**	• The five SUVAT equations and the conditions required to use them. • Interpret and analyse motion using displacement-time and velocity-time graphs, including calculating distances and accelerations. • Apply SUVAT to vertical motion under gravity, understanding the significance of sign convention.	
Spring 1	**Statistics**			
	Probability	**Can you calculate probabilities using Venn diagrams, two-way tables, and tree diagrams?** **Can you apply the addition and multiplication rules for probability?**	• Calculate probabilities using Venn diagrams, two-way tables, and tree diagrams. • Apply the addition rule $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ and the multiplication rule for independent events.	

Timing	Unit Title	Key Question	Knowledge	Assessing understanding
Spring 1	**Conditional probability**	**Can you calculate conditional probabilities and understand what they mean in context?** **Can you determine whether two events are independent and justify your reasoning?**	• Understand and calculate conditional probability using $P(A \mid B) = P(A \cap B)/P(B)$. • Use conditional probability to determine whether two events are independent and justify reasoning in context.	**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 developed:** • Numerical • Algebraic particularly solving equations and carrying out simple proofs • Sketching graphs **Assessment points:** 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.
	Statistical distributions	**Can you model real-world situations using the binomial distribution and calculate probabilities from it?** **Can you identify whether a binomial distribution is an appropriate model and justify the conditions required?**	• The conditions required for a binomial distribution B(n,p) and how to calculate probabilities from it. • Use the binomial distribution to model real-world situations and assess its suitability as a model.	
	Mechanics			
	Forces and motion	**Can you apply Newton's laws of motion to solve problems involving forces, including friction and normal reaction?** **Can you resolve forces and apply F = ma to particles on inclined planes and in connected particle problems?**	• Newton's three laws of motion and how to apply them to particles in equilibrium and non-equilibrium situations. • Resolve forces on particles on inclined planes, including the role of friction and the normal reaction force. • Set up and solve equations of motion for connected particle problems, including pulleys and tow bars.	

Timing	Unit Title	Key Question	Knowledge	Assessing understanding
Spring 2	**Pure**			**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 developed:** ● Numerical ● Algebraic particularly solving equations and carrying out simple proofs ● Sketching graphs **Assessment points:** 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.
	Introduction to proof	**Can you construct and write a rigorous mathematical proof, including proof by deduction and proof by counter-example?** **Can you identify flaws or errors in a given mathematical argument?**	● Understand the structure of a mathematical proof and the difference between a demonstration and a proof. ● Use proof by deduction and proof by counter-example to prove or disprove mathematical statements.	
	Integration	**Can you integrate polynomials using the power rule and find both definite and indefinite integrals?** **Can you find the area under a curve or between two curves using integration?**	● Understand integration as the reverse of differentiation and use the power rule to find indefinite integrals, including the constant of integration. ● Evaluate definite integrals and use them to find areas under curves and between two curves.	
	Exponentials and logarithms	**Can you sketch and interpret graphs of exponential and logarithmic functions, including $y = e^x$ and $y = \ln x$?** **Can you use the laws of logarithms to solve exponential and logarithmic equations, including in modelling contexts?**	● The properties and graphs of exponential and logarithmic functions, including $y = e^x$ and $y = \ln x$ as inverse functions. ● Use the laws of logarithms to solve exponential and logarithmic equations. ● Use exponential functions to model real-world growth and decay problems, including linearising data using logarithms.	

Timing	Unit Title	Key Question	Knowledge	Assessing understanding
Spring 2	**Radians**	**Can you convert between degrees and radians and use radians to calculate arc lengths and areas of sectors?** **Can you solve trigonometric equations and find exact values of trig functions using radians?** **Can you apply small angle approximations to simplify trigonometric expressions?**	• Convert between degrees and radians and use radians to calculate arc lengths and areas of sectors and segments. • Use radians when solving trigonometric equations and working with small angle approximations.	**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 developed:** • Numerical • Algebraic particularly solving equations and carrying out simple proofs • Sketching graphs **Assessment points:** 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.
	Statistics			
	Hypothesis testing	**Can you carry out a hypothesis test for the proportion in a binomial distribution, stating hypotheses, significance level, and conclusion clearly?** **Can you find and interpret critical regions and understand the difference between one-tailed and two-tailed tests?**	• Understand the language and structure of a hypothesis test: null and alternative hypotheses, significance level, test statistic, and conclusion. • Carry out a one-tailed and two-tailed hypothesis test for the proportion in a binomial distribution. • Find and interpret critical regions and understand the concept of actual significance level.	
	Mechanics			
	Variable acceleration	**Can you use differentiation and integration to move between displacement, velocity, and acceleration functions?** **Can you solve problems involving variable acceleration using calculus, including finding when a particle is at rest or changes direction?**	• Use differentiation to move from a displacement function to velocity and acceleration, and integration to reverse the process. • Apply calculus to solve problems involving variable acceleration, including using initial conditions to find constants of integration.	

Timing	Unit Title	Key Question	Knowledge	Assessing understanding
Summer 1	**Pure**			**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 developed:** ● Numerical ● Algebraic particularly solving equations and carrying out simple proofs ● Sketching graphs **Assessment points:** 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.
	Binomial expansion	**Can you expand expressions of the form $(a + bx)^n$ using the binomial expansion for positive integer n?** **Can you use the binomial expansion to find approximations and identify the range of validity?**	● The binomial expansion of $(a + bx)^n$ for positive integer n using Pascal's triangle or the binomial coefficient formula. ● Use the binomial expansion to find individual terms and apply it to approximation problems.	
	Trigonometric functions	**Can you sketch and interpret the graphs of sec, cosec, and cot, including their domains and ranges?** **Can you use inverse trigonometric functions and apply them to solve equations?**	● The definitions of sec, cosec, and cot as reciprocals of cos, sin, and tan respectively, and their graphs, domains, and ranges. ● Use the identities $1 + \tan^2\theta = \sec^2\theta$ and $1 + \cot^2\theta = \operatorname{cosec}^2\theta$ to simplify expressions and solve equations. ● Understand and use inverse trigonometric functions arcsin, arccos, and arctan, including their restricted domains and ranges.	
Summer 2	**Pure**			
	Partial fractions	**Can you decompose algebraic fractions into partial fractions, including cases with repeated and improper factors?** **Can you use partial fractions to simplify integration or binomial expansion problems?**	● Decompose algebraic fractions into partial fractions, including cases with distinct linear factors, repeated linear factors, and improper fractions. ● Use partial fractions as a tool to simplify integration and binomial expansion problems.	

Timing	Unit Title	Key Question	Knowledge	Assessing understanding
Summer 2	**Binomial expansion**	**Can you expand expressions of the form $(1 + x)^n$ for any rational n and state the range of validity?** **Can you use partial fractions alongside the binomial expansion to expand more complex expressions?**	• Expand expressions of the form $(1 + x)^n$ and $(a + bx)^n$ for any rational n and state the range of values of x for which the expansion is valid. • Use partial fractions in conjunction with the binomial expansion to expand more complex rational expressions.	**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 developed:** • Numerical • Algebraic particularly solving equations and carrying out simple proofs • Sketching graphs **Assessment points:** 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.
	Sequences and series	**Can you identify and work with arithmetic and geometric sequences, finding general terms and sums?** **Can you determine whether a geometric series converges and find its sum to infinity?** **Can you use sigma notation and apply sequences in modelling contexts?**	• The general term and sum formulae for arithmetic and geometric sequences and series. • Determine whether a geometric series converges and find its sum to infinity. • Use sigma notation and apply sequences and series to modelling problems in context.	
	Trigonometry and modelling	**Can you derive and apply the addition formulae, double angle formulae, and R addition form (R sin/cos)?** **Can you use trigonometric identities to solve equations and prove results?** **Can you apply trigonometric functions to model real-world periodic phenomena?**	• Derive and apply the addition formulae and double angle formulae for sin, cos, and tan. • Express a sin θ + b cos θ in the form R sin(θ + α) or R cos(θ + α) and use it to solve equations and find maximum and minimum values. • Apply trigonometric functions and identities to model and solve real-world problems.	