

Timing	Unit Title	Key Question	Knowledge	Assessing Understanding
Autumn	<p>Pure <i>The first 3 pure topics will have partly been taught in Y12.</i></p> <ul style="list-style-type: none"> Algebraic methods & proof Radians Sequences & series Functions and Graphs 	<p>Can you split an expression into partial fractions? Can you prove something is true by contradiction?</p> <p>Can you convert between degrees & radians?</p> <p>What is the difference between a geometric and arithmetic sequence?</p> <p>Can you model real-life situations with sequences and series?</p> <p>Can you solve problems involving modulus functions both algebraically and graphically?</p>	<p>One teacher will teach Pure and Mechanics, the other Pure and Statistics.</p> <ul style="list-style-type: none"> Simplify algebraic fractions Split expressions into partial fractions Use of proof by contradiction Converting between degrees & radians Problem solving with sectors & segments using radians Using small angle approximations nth term Sum of a series Sum to infinity Sigma notation Recurrence relations Understand modulus and function notation and language Find composite functions Find inverse functions Sketch functions Apply transformations to functions 	<p>How understanding is assessed Students will be assessed on their ability to:</p> <ul style="list-style-type: none"> Carry out mathematical techniques. Problem solve using the knowledge and techniques they have gained. <p>Skills</p> <ul style="list-style-type: none"> Numerical Algebraic particularly solving equations and carrying out simple proofs. Sketching graphs <p>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.</p>

	<ul style="list-style-type: none"> • Trigonometric functions • Trigonometry and modelling • Differentiation • Integration (1) <p>Mechanics</p> <ul style="list-style-type: none"> • Forces & friction & Application of Forces (1) 	<p>Do you know the graphs of $y = \sec x$, $y = \operatorname{cosec} x$ and $y = \cot x$?</p> <p>Can you solve equations involving \sec, cosec and \cot?</p> <p>Can you use trigonometric functions to model real-life situations?</p> <p>Can you recognise which differentiation techniques to apply to a variety of different problems? Can you differentiate functions involving 2 variables?</p> <p>Can you recognise with integration technique is required to solve a problem?</p> <p>Can you work out the maximum force required to overcome friction? What forces are applied to a pulley?</p>	<ul style="list-style-type: none"> • Recognise and use \sec, cosec and \cot functions including their graphs • Know and use the identities: <ul style="list-style-type: none"> $\sec^2 \theta \equiv 1 + \tan^2 \theta$ $\operatorname{cosec}^2 \theta \equiv 1 + \cot^2 \theta$ • Prove and use the addition formulae • Understand and use the double angle formulae • $R - \alpha$ method • Know and be able to use the chain rule, product rule and quotient rule • Know how to differentiate trig functions • Use implicit differentiation • Know and be able to use the reverse chain rule and partial fractions • Use trig identities in integration • Find areas under a curve • Resolve forces and find resultants • Solve problems involving $F \leq \mu R$ • Solve problems involving motion on rough or smooth inclined planes, pulleys and connected particles 	
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Curriculum Outline 2023-24

Department: Mathematics

	<ul style="list-style-type: none"> Projectiles <p>Statistics</p> <ul style="list-style-type: none"> Probability 	<p>Can you derive the formulae for time of flight, range and greatest height, and the equation of the path of a projectile?</p> <p>Can you identify the appropriate method to solve a variety of conditional probability questions?</p>	<ul style="list-style-type: none"> Solve projectile problems by considering both the horizontal and vertical components Apply SUVAT to projectile problems Understand and use set notation Solve problems involving conditional probability Probability formulae 	
Spring	<p>Pure</p> <ul style="list-style-type: none"> Binomial expansion Integration (2) Parametrics Vectors 	<p>How do you expand a bracket in the form $(ax + b)^n$ when n is not a positive integer?</p> <p>Can you recognise with integration technique is required to solve a problem?</p> <p>What are parametric equations?</p> <p>Can you use parametric equations in a variety of contexts?</p> <p>Can you use vectors to solve 3D geometrical problems?</p>	<ul style="list-style-type: none"> Expand brackets in the form $(ax + b)^n$ where n is any rational constant Use partial fractions to expand expressions Integration by substitution and integration by parts Trapezium rule and limit of a sum Convert between parametric and Cartesian equations Sketch the curves of parametric equations Solve coordinate geometry problems involving parametrics Parametric differentiation and integration Work with vectors in 3D 	<p>How understanding is assessed Students will be assessed on their ability to:</p> <ul style="list-style-type: none"> Carry out mathematical techniques. Problem solve using the knowledge and techniques they have gained. <p>Skills</p> <ul style="list-style-type: none"> Numerical Algebraic particularly solving equations and carrying out simple proofs. Sketching graphs <p>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.</p>

	<ul style="list-style-type: none"> ● Calculus ● Numerical methods <p>Mechanics</p> <ul style="list-style-type: none"> ● Moments ● Application of forces (2) ● Further kinematics 	<p>Can you model real-life situations with a differential equation and then solve it?</p> <p>What methods can you use to locate the root of an equation?</p> <p>What effect does distance have on a turning force?</p> <p>Can you draw an effective diagram to model a problem indicating all appropriate forces?</p> <p>What is meant by limiting equilibrium?</p> <p>How does calculus link displacement, velocity and acceleration with respect to time?</p>	<ul style="list-style-type: none"> ● Using second derivatives ● Linking rates of change ● Solving differential equations ● Approximate solutions to equations by considering sign changes, iteration and the Newton-Raphson method ● Use numerical methods to solve problems in a context ● Calculate a turning force ● Find a resultant moment ● Solve uniform and non-uniform problems ● Solve problems involving forces in equilibrium ● Solve statics problems involving weight & tension ● Solve problems in limiting equilibrium ● Solve connected particles, ladder and rod problems ● Differentiate and integrate vectors with respect to time ● Use calculus with harder functions of time involving variable acceleration. 	
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	<p>Statistics</p> <ul style="list-style-type: none"> • The normal distribution • Regression, correlation and hypothesis testing 	<p>Can you select appropriate distributions and solve real-life problems in context?</p>	<ul style="list-style-type: none"> • Know the properties of the normal distribution curve • Find values use a standard curve • Approximate a binomial distribution using a normal distribution • Hypothesis testing • Understand and use exponential models • Understand and calculate product moment correlation coefficient • Carry out a hypothesis test for zero correlation 	
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