

Year 12 Mathematics Curriculum Rationale

In the pure strand of the curriculum students build upon their GCSE studies with a particular focus on algebra skills. All students study statistics, developing probability and data handling topics covered in KS4 before being introduced to statistical models. In mechanics students learn about kinematics and forces, beginning to use their pure skills to solve mechanics problems. All A level students are expected to practise, be resilient and persevere when approaching all areas of Mathematics.

Unit	Core knowledge/skill development	Sequence	Assessment	Literacy, numeracy, PSHE, FBV, other links	ACP and VAA development	Home learning and enrichment
Surds and Indices	Simplify surds and indices and expressions involving them.	Students have learnt the skills and facts they need for this topic at GCSE. They will become more fluent at using these skills and in unfamiliar contexts.	Initial Assessment Integral online tests: S1, S2		Realising – Automaticity Hardworking - Practice	Review lesson notes Integral online tests / worksheets Questions from the textbook
Quadratic Equations	Draw and sketch quadratic graphs. Factorise quadratic equations, complete the square and use the quadratic formula to solve problems. Introduced to the discriminant.	Students have been introduced to these skills at GCSE. The focus here is on linking the ideas together and extending them to the discriminant.	Integral online tests: Q1, Q2 Topic Test: Algebraic Manipulation and Quadratic Equations		Linking - Connection finding	Review lesson notes Integral online tests / worksheets Questions from the textbook
Simultaneous Equations and Inequalities	Formulate and solve equations and inequalities to solve problems.	At GCSE students have studied the processes. The focus here is on using them as a tool to solve problems.	Integral online tests: E1, E2 Topic Test: Simultaneous Equations, Linear and Quadratic Inequalities		Analysing- Complex and multi-step problem solving	Review lesson notes Integral online tests / worksheets Questions from the textbook

Unit	Core knowledge/skill development	Sequence	Assessment	Literacy, numeracy, PSHE, FBV, other links	ACP and VAA development	Home learning and enrichment
Probability	Solve problems using tree diagrams, Venn diagrams and tables. Become confident with probability vocabulary. Find probabilities from probability distribution tables.	Builds on GCSE knowledge of probability.	Probability past exam questions written task Integral online tests: P1, P2	Vocabulary of probability	Linking - Imagination Empathetic - Collaborative (the ability to seek out and receive responses to your own work)	Integral online tests / worksheets Questions from the textbook Past exam questions written homework
Binomial Expansion	Explore and use the general rule for a binomial expansion. Use the binomial expansion to find approximations.	Students already know how to expand brackets term by term. This topic builds upon this.	Binomial Expansion exam questions written homework Integral online test: B1		Linking – generalisation	Integral online tests / worksheets Questions from the textbook Binomial Expansion exam questions written Homework <i>Enrichment:</i> <i>Permutations and combinations could be explored in greater depth.</i>
Binomial Distribution and Hypothesis Testing	Know the binomial distribution as a probability model. Find probabilities. Understand the vocabulary and	This is a new topic for students which builds on ideas in Probability.	Integral online tests: B1, H1, H2 Topic Test: Probability and Binomial Distribution	"Binomial" two possible outcomes. Focus on language of hypothesis testing	Linking – Abstraction Analysing – Critical or logical thinking Analysing –Precision	Integral interactive book introducing binomial distribution Integral online tests / worksheets

Unit:	Core knowledge/skill development:	Sequence:	Assessment:	Literacy, numeracy, PSHE, FBV, other links	ACP and VAA development:	Home learning and enrichment
	structure of hypothesis testing.		Topic Test: Hypothesis Testing			
Polynomials	Use terminology such as "order", "degree" and "coefficient". Explore polynomials of different orders. Know and apply the factor theorem.	Builds on the quadratic equations topic. Some students will know what cubic graphs look like from GCSE.	Integral online tests: P1, P2 Topic Test: Binomial Expansion and Polynomials		Linking – Connection finding Analysing - Precision	Review lesson notes Integral online tests / worksheets Questions from the textbook
Coordinate Geometry	Solve problems in coordinate geometry. Study intersections of lines and curves. Know and apply the equation of a circle.	Builds upon GCSE knowledge of straight lines but students will be expected to work in unfamiliar contexts. They will utilise skills studied in the quadratic equations and simultaneous equations and inequalities topics.	Integral online tests: C1, C2 Coordinate geometry past exam questions written task Topic Test: Coordinate geometry and Circles		Analysing - Critical or logical thinking. Linking - Imagination Agile - Risk taking –(the ability to demonstrate confidence speculate willingly and work in unfamiliar contexts)	Review lesson notes Integral online tests / worksheets Questions from the textbook <i>Enrichment: Points, Lines and Rectangles Geogebra Task</i>
Vectors	Calculate with vectors. Find unit vectors and identify parallel vectors.	Students learn about column vectors and adding and subtracting vectors at GCSE. This unit further develops these skills.	Integral online test: V1 Topic Test: Vectors		Creating – Flexible thinking	Integral online tests / worksheets Exercises from the textbook

Unit	Core knowledge/skill development	Sequence	Assessment	Literacy, numeracy, PSHE, FBV, other links	ACP and VAA development	Home learning and enrichment
Trigonometry	Solve problems involving sine rule, cosine rule and facts for right angled triangles. Review exact values Draw and use graphs of trigonometric functions. Identities and proof using trigonometric functions are introduced.	Students have studied trigonometry at GCSE. This unit builds confidence with these ideas and extends then further.	Topic Tests: Trigonometry 1,2 Integral online tests: T1 T2, T3		Creating – Intellectual playfulness Realising - Automaticity	Integral online tests / worksheets Textbook questions (sine and cosine rules) <i>Enrichment:</i> <i>Trigonometry Tasks from underground maths</i>
Graphs and Transformations	Recognise and sketch different types of curves such as polynomials, reciprocal functions, trigonometric graphs. Explore transformations. (Stretch, reflection, translation.) Link changes of graphs to the transformations they produce.	Builds upon GCSE curve sketching and the work covered in the quadratic equations, trigonometry and polynomials units of work.	Integral online tests: G1, G2 Topic Test: Graphs and Transformations		Metathinking - Metacognition	Use geogebra / desmos to explore the behaviour of curves Integral online tests / worksheets Review lesson notes
Calculus: Differentiation and Integration	Know and apply differentiation techniques for	This is a new topic to students which uses their algebra	Integral online tests: D1, D2, D3, I1, I2, I3		Linking – Big picture thinking	Introduction to differentiation technology task

Unit:	Core knowledge/skill development:	Sequence:	Assessment:	Literacy, numeracy, PSHE, FBV, other links	ACP and VAA development:	Home learning and enrichment
	gradients of curves. Stationary points, higher order derivatives, differentiation from first principles and increasing / decreasing functions are studied Solve optimisation problems using these techniques. Know and apply integration techniques and use the Fundamental Theorem of calculus, Find the area under a curve using integration.	skills and builds on ideas covered in coordinate geometry and graphs.	Topic Tests: Differentiation 1,2 and Integration Past exam questions written homework.		Linking - generalisation Linking – connection Finding Linking – Abstraction Analysing - Precision	Integral online tests/worksheets Exercises from the textbook Past exam questions written homework
Kinematics	Interpret graphs of motion. Know and apply constant acceleration equations.	Builds on knowledge of distance time-graphs and velocity-time graphs from GCSE.	Integral online tests: K1, K2, K3 Topic Test: Kinematics 1	Links to Physics	Linking - Connection finding Linking - Big picture thinking Analysing – Precision	Review lesson notes Integral online tests / worksheets Textbook questions
Forces and Newton's Laws of Motion	Understand and use Newton's Laws of Motion.	This unit builds on ideas covered in the kinematics topic.	Integral online tests: F1, F2, F3		Analysing – Critical or logical thinking	Review lesson notes

Unit:	Core knowledge/skill development:	Sequence:	Assessment:	Literacy, numeracy, PSHE, FBV, other links	ACP and VAA development:	Home learning and enrichment
	Draw force diagrams and make assumptions to solve problems.		Topic Tests: Forces 1,2		Creating – Flexible thinking	Integral online tests / worksheets Textbook questions
Exponential Functions	Sketch graphs of exponential functions. Learn and apply laws of logarithms. Model with curves by reducing relationships to a linear form.	Simple exponential growth and decay has been covered at GCSE. This unit builds on this with a more rigorous approach and much greater depth.	Integral online tests: L1, L2, L3 Topic Test: Exponentials and Logarithms 1,2	Link to population growth / decay in real world contexts such as Biology. Transforming graphs to look for relationships and model in scientific situations.	Linking - Generalisation Analysing – Precision Analysing – Complex and multistep problem solving	Review lesson notes Integral online tests / worksheets Textbook questions
Data Collection, Representation and Interpretation	Describe sampling techniques. Interpret averages, measures of spread and charts and diagrams. Calculate standard deviation. Analyse the Large Data Set.	This unit builds on data representation and interpretation studied at GCSE.	Integral online tests: D1, D2, D3 Topic Test: Statistical Sampling	Vocabulary of Sampling Links to Psychology and Biology in particular Students develop skills in Excel / Geogebra by	Analysing – Precision Linking – Big picture thinking	Integral interactive books on single variable / bivariate data Averages and measures of spread exam questions Large Data set task

Unit:	Core knowledge/skill development:	Sequence:	Assessment:	Literacy, numeracy, PSHE, FBV, other links	ACP and VAA development:	Home learning and enrichment
				studying the Large Data Set		
Variable Acceleration	Sketch graphs of motion where acceleration is not constant. Use calculus to solve problems involving variable acceleration.	This unit builds upon the ideas covered in Kinematics and Calculus: Differentiation and Integration.	Integral online test: V1 Topic Tests: Kinematics 2 Past exam questions written homework		Linking – Generalisation Analysing - Complex and multistep problem solving	Review lesson notes Integral online tests / worksheets Textbook questions Past exam questions written homework
Writing Mathematics and Proof	Use the words "necessary" and "sufficient" and associated notation. Use proof by deduction, exhaustion and counter example.	Students have covered the idea of proof at GCSE but this unit brings a more rigorous approach to the topic.	Integral online tests: PS1, PS2		Analysing - Precision	Review lesson notes Integral online tests / worksheets