

KS5 Curriculum Overview: Y12 Further Maths

Rationale: In year 12 students cover key topics in the following areas, Algebra, Complex numbers, Algorithms and Mechanics. Students use skills covered to help them solve modelling problems.

Term / Length of Unit		Outline	Assessment	Home Learning	Resources	Knowledge/Skills End Points	Reading
Autumn 1	Core Pure	C1 Complex numbers C2 Argand diagrams	Test: Chapters 1 & 2	Set after every lesson. Assessed set every 2 weeks.	Textbooks, Dr Frost powerpoints, bank of assessed HL Qs.	1.1 Imaginary and complex numbers 1.2 Multiplying complex numbers 1.3 Complex conjugate 1.4 Roots of quadratic equations 1.5 Solving cubic and quartic equations 2.1 Argand diagrams 2.2 Modulus and argument 2.3 Modulus and argument form of complex numbers 2.4 Loci in the Argand diagram 2.5 Regions in the Argand diagram	<p>Reading strategy: Go through key words and annotate worded problems.</p> <p>Books: Chalkdust Magazine: Complex numbers and Algebra: https://chalkdustmagazine.com/blog/complex-numbers-and-algebra/</p> <p>Chalkdust magazine: Pretty pictures in the complex plain: https://chalkdustmagazine.com/features/pretty-pictures-complex-plane/</p> <p>Plus Magazine: Roots of Complex Numbers https://plus.maths.org/content/maths-minute-choosing-square-roots</p> <p>Etymology: Cartesian, Argand, Loci, cubic, quartic, quadratic, Modulus</p> <p>Key words: Argument, Imaginary, quartic, Trigonometry</p>
	Decision	C1 Algorithms C2 Graphs and networks C3 Algorithms on graphs		Set after every lesson. Assessed set every 2 weeks.	Textbooks, bank of assessed HL Qs.	1.1 Using and understanding algorithms 1.2 Flow charts 1.3 Bubble sort 1.4 Quick sort 1.5 Bin- packing algorithms 1.6 Order of an algorithm 2.1 Modelling with graphs 2.2 Graph theory 2.3 Special types of graph 2.4 Representing graphs and networks using matrices 3.1 Kruskal's algorithm 3.2 Prim's algorithm	<p>Books: Algorithms Unlocked by T Corman</p> <p>Etymology: algorithm, Eulerian</p> <p>Key words: Kruskal, Dijkstra</p>

		C4 Route inspection	Test: Chapters 1, 2 & 3			3.3 Applying Prim's algorithm to a distance matrix 3.4 Using Dijkstra's algorithm to find the shortest path 4.1 Eulerian graphs 4.2 The route inspection algorithm	
Autumn 2	Core Pure	C3 Series C4 Roots of polynomials C6 Matrices	Test: Chapter 3 Test: Chapter 4	Set after every lesson. Assessed set every 2 weeks.	Textbooks, Dr Frost powerpoints, bank of assessed HL Qs.	3.1 Sums of natural numbers 3.2 Sums of squares and cubes 4.1 Roots of quadratic equations 4.2 Roots of cubic equations 4.3 Roots of quartic equations 4.4 Expressions relating to the roots of polynomials 4.5 Linear transformations of roots 6.1 Introduction to matrices 6.2 Matrix multiplication 6.3 Determinants 6.4 Inverting 2x2 matrices 6.5 Inverting 3x3 matrices 6.6 Solving systems of equations using matrices 6.7 Consistency of linear equations	Reading strategy: Go through key words and annotate worded problems. Chalkdust magazine: Switching sides on a matrix equation https://chalkdustmagazine.com/blog/switching-sides-matrix-equation/ Etymology: Cubic, quartic, quadratic, Sigma symbol Key words: Polynomial, Matrix, Determinant
	Decision	C6 Linear programming C8 Critical path analysis	Test: Chapters 4 & 6 Test: Chapter 8	Set after every lesson. Assessed set every 2 weeks.	Textbooks, bank of assessed HL Qs.	6.1 Linear programming problems 6.2 Graphical methods 6.3 Locating the optimal point 6.4 Solutions with integer values 8.1 Modelling a project 8.2 Dummy activities 8.3 Early and late event times 8.4 Critical activities 8.5 The float of an activity 8.6 Gantt charts	Etymology: Float, Dummy Key words: Integer, Gantt
Spring 1	Core Pure	C7 Linear transformations	Test: Chapters 6 & 7	Set after every lesson. Assessed set every 2 weeks.	Textbooks, Dr Frost powerpoints, bank of assessed HL Qs.	7.1 Linear transformations 7.2 Reflections and rotations 7.3 Enlargements and stretches 7.4 Successive transformations 7.5 Linear transformations in three dimensions 7.6 The inverse of a linear transformation	Reading strategy: Go through key words and annotate worded problems. Chalkdust magazine: Switching sides on a matrix equation https://chalkdustmagazine.com/blog/switching-sides-matrix-equation/

		C8 Proof by induction				8.1 Proof by mathematical induction 8.2 Proving divisibility results 8.3 Proving statements involving matrices	Etymology: Transformations, use of the letter n Key words: Induction
	Further Mechanics 1	Preliminary lessons on constant acceleration formulae, required to teach C1 C1 Momentum and impulse Preliminary lessons on forces, required to teach C2	Test: Chapter 1	Set after every lesson. Assessed set every 2 weeks.	Textbooks, Dr Frost powerpoints, bank of assessed HL Qs.	Suvat formulae Motion under gravity 1.1 Momentum in one direction 1.2 Conservation of momentum Resolving forces Forces in equilibrium Friction Friction on an inclined plane $F = ma$ $F = ma$ on an inclined plane	Etymology: Friction, Equilibrium Key words: Gravity, Equilibrium, acceleration, Momentum
Spring 2	Core Pure	C9 Vectors C5 Volumes of revolution	Test: Chapter 5	Set after every lesson. Assessed set every 2 weeks.	Textbooks, Dr Frost powerpoints, bank of assessed HL Qs.	9.1 Equation of a line in three dimensions 9.2 Equation of a plane in three dimensions 9.3 Scalar product 9.4 Calculating angles between lines and planes 9.5 Points of intersection 9.6 Finding perpendiculars 5.1 Volumes of revolution around the x- axis 5.2 Volumes of revolution around the y- axis 5.3 Adding and subtracting volumes 5.4 Modelling with volumes of revolution	Reading strategy: Go through key words and annotate worded problems. Etymology: Revolution, Perpendicular, Parallel Key words: Integration
	Further Mechanics 1	C2 Work, energy and power	Test: Chapter 2	Set after every lesson. Assessed set every 2 weeks.	Textbooks, Dr Frost powerpoints, bank of assessed HL Qs.	2.1 Work done 2.2 Kinetic and potential energy 2.3 Conservation of mechanical energy and the work- energy principle 2.4 Power Sum to infinity (Year 2 A Level Maths, Chapter 3)	In Pursuit of the Unknown: 17 Equations That Changed the World by Ian Stewart Etymology: Restitution, Kinetic

		Preliminary lesson on sum to infinity, required to teach C4 C4 Elastic collisions in one dimension	Test: Chapter 4			4.1 Direct impact and Newton's law of restitution 4.2 Direct collision with a smooth plane 4.3 Loss of kinetic energy 4.4 Successive direct impacts	
Summer 1	Core Pure	Revision	Maths Dept PPEs (full papers)	Set after every lesson. Assessed set every 2 weeks.	Textbooks, Dr Frost powerpoints, bank of assessed HL Qs, past papers		Reading strategy: Go through key words and annotate worded problems. Books: Professor Stewart's Cabinet of Mathematical Curiosities by Ian Stewart The Simpsons and their Mathematical Secrets by Simon Singh
	Decision and Further Mechanics 1	Revision	Maths Dept PPEs (full papers)	Set after every lesson. Assessed set every 2 weeks.	Textbooks, Dr Frost powerpoints, bank of assessed HL Qs, past papers		Books: Bridging the gap to university Mathematics by M Gould
Summer 2		<u>Year 2 Pure</u> C9 Differentiation (excluding differentiating parametric differentiation) C11 Integration (excluding differential equations)	Test: Chapters 9 & 11 (Sept)	Set after every lesson. Assessed set every 2 weeks.	Textbooks, Dr Frost powerpoints, bank of assessed HL Qs.	9.1 Differentiating $\sin x$ and $\cos x$ 9.2 Differentiating exponentials and logarithms 9.3 The chain rule 9.4 The product rule 9.5 The quotient rule 9.6 Differentiating trig functions 9.8 Implicit differentiation 9.9 Using second derivatives 9.10 Rates of change 11.1 Integrating standard functions 11.2 Integrating $f(ax + b)$ 11.3 Using trigonometric identities 11.4 Reverse chain rule 11.5 Integration by substitution 11.6 Integration by parts 11.7 Partial fractions 11.8 Finding areas 11.9 The trapezium rule	Reading strategy: Go through key words and annotate worded problems. Books: Chalkdust magazine issue 3: Fractional calculus https://chalkdustmagazine.com/features/fractional-calculus/ Etymology: Trigonometric, Implicit, Product, Exponential Key words: Differentiation, Integration, Logarithm

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