

Further Maths Curriculum Map

YEAR 12	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Content	<p>CORE PURE Complex numbers Complex numbers Argand Diagrams</p> <p>Discrete Random Variables Expected value of discrete random variables (DRV) Variance of DRV Expected value and variance of a function Solving problems involving random variables</p> <p>Poisson distributions The Poisson distribution Modelling Adding, mean and variance of the Poisson distribution Mean and variance of the binomial Using a Poisson distribution to approximate the binomial distribution</p>	<p>CORE PURE Series Natural numbers Squares and cubes</p> <p>CORE PURE Roots of Polynomials Quadratics Cubics Quartics Transformations</p> <p>CORE PURE Proof by Induction Mathematical Induction Divisibility results Matrices</p> <p>Geometric and negative binomial Distributions Geometric distribution Mean and variance Negative binomial distribution</p> <p>Hypothesis testing Testing for the mean of a poisson distribution Finding the critical regions</p>	<p>CORE PURE Matrices Matrix multiplication Determinants Inverting matrices Solving systems</p> <p>CORE PURE Linear Transformations Two dimensions Three dimensions The inverse</p> <p>CORE PURE Proof by Induction Mathematical Induction Divisibility results Matrices</p> <p>Central limit theorem The central limit theorem Applying the central limit theorem to other distributions Chi Squared Goodness of fit Degrees of freedom and the chi-squared Testing a hypothesis Contingency tables</p>	<p>CORE PURE Vectors Equation of lines and planes in 3D Scalar product Angles Perpendiculars Points of intersection</p> <p>PURE Trigonometry Formula Trig Identities Trig equations Parametric equations</p> <p>Probability generating functions Probability of generating and standard distributions Mean and variance of a distribution Quality of tests Type 1 and Type 2 errors Finding type 1 and type 2 errors using the normal distribution</p>	<p>PURE Trigonometry Parametric equations</p> <p>PURE Calculus Differentiation</p>	<p>PURE Calculus Integration</p> <p>CORE PURE Complex numbers Complex numbers De Moivre's theorem Geometric Problems</p>

Skills	AO1: Use and apply standard techniques. AO2: Reason, interpret and communicate mathematically AO3: Solve problems within mathematics and in other contexts	AO1: Use and apply standard techniques. AO2: Reason, interpret and communicate mathematically AO3: Solve problems within mathematics and in other contexts	AO1: Use and apply standard techniques. AO2: Reason, interpret and communicate mathematically AO3: Solve problems within mathematics and in other contexts	AO1: Use and apply standard techniques. AO2: Reason, interpret and communicate mathematically AO3: Solve problems within mathematics and in other contexts	AO1: Use and apply standard techniques. AO2: Reason, interpret and communicate mathematically AO3: Solve problems within mathematics and in other contexts	AO1: Use and apply standard techniques. AO2: Reason, interpret and communicate mathematically AO3: Solve problems within mathematics and in other contexts
Key Questions	Complex Numbers Argand Diagrams	Series (1) Series (2) Roots of Polynomials Volumes of Revolution	Matrices Linear Transformations	Proof by Induction Vectors		
Assessment	Baseline Test Topic Tests Consolidation exam questions at the end of every lesson	Topic Tests Consolidation exam questions at the end of every lesson	Topic Tests Consolidation exam questions at the end of every lesson	FS1 Practice Mock Topic Tests Consolidation exam questions at the end of every lesson	End of Year Mocks Topic Tests Consolidation exam questions at the end of every lesson	Topic Tests Consolidation exam questions at the end of every lesson
Literacy/numeracy/SMSC/Character	Further Reading <ul style="list-style-type: none"> • <i>The Code Book</i> – Simon Singh • <i>The Music of the Primes</i> – Marcus du Sautoy • <i>Thinking About Mathematics</i> – Stewart Shapiro • <i>Chaos, Making a New Science</i> – James Gleick • <i>Alex's Adventures in Numberland: Dispatches from the Wonderful World of Numbers</i> – Alex Bellos • <i>It Must be Beautiful: Great Equations of Modern Science</i> – 		Key Words <u>Core Pure</u> Ch1&2 - Conjugate, real part, imaginary part, complex conjugate, root, discriminant, Argand diagram, Cartesian coordinates, vector, magnitude, modulus, argument, principal argument, radians, modulus-argument form, polynomial, coefficient, quadratic, quartic, cubic, complex conjugate pair, locus, loci. Ch3 - Sigma notation, series, sum, arithmetic series, geometric series, binomial series, integer, natural numbers, Ch4 - Quadratic, cubic, quartic, polynomial, coefficient, degree, root, complex conjugate, degree, Vieta's formulas Ch5 - Rotation, solid of revolution, volume of revolution, bounded area, arc, cubic units, parameter, Cartesian equation. Ch6&7 - Array, dimension, rows, columns, elements, scalar, square matrices, commutative, associative, transformation, rotation, translation, reflection, enlargement, linear			

	<p>edited by Graham Farmelo</p> <ul style="list-style-type: none"> • <i>The Problems of Mathematics, Nature's Numbers, From Here to Infinity, Game, Set and Math and The Magical Maze</i> – Ian Stewart • <i>What is Mathematics?</i> – Courant and Robbins • <i>Mathematics: The Golden Age</i> – Devlin • <i>A Mathematician's Apology</i> – Hardy • <i>Makers of Mathematics</i> – Hollingdale 	<p>transformation, scale factor, vector, position vector, object, image, identity, determinant, inverse, transpose, symmetric, zero matrix, minor, cofactor, singular, non-singular, three-dimensional space, line, plane, parameter, vector equation, Cartesian equation, simultaneous equations, invariant point, invariant line, sheaf, prism,</p> <p>Ch8 - Mathematical induction, general statement, basis, assumption, inductive, conclusion, integer, summation, divisible, matrix.</p> <p>Ch9 - Vector, scalar, magnitude, modulus, direction, vector quantity, scalar quantity, displacement vector, zero vector, unit vector, base vector, component, equal vectors, localised vector, free vector, resultant, triangle law, parallelogram law, position vector, vector equation, Cartesian equation, scalar product, dot product, collinear, skew, concurrent, direction ratio, perpendicular, Pythagoras' Theorem.</p> <p><u>Further Statistics 1</u></p> <p>Ch1, 2 &3 – Discrete random variables, expected value, variance, Poisson and Binomial distributions, Lamda, mean, independent, negative binomial distribution, geometric distribution</p> <p>Ch4&5 – hypothesis testing, one tail, two tail, null and alternate hypothesis, critical region and critical value, significance level, sample mean, the central limit theorem</p> <p>Ch6&7 – Chi squared, goodness of fit, degrees of freedom, factorials, probability generating functions</p> <p>Ch8 – Quality of tests, type 1 and type 2 error, size of a test, power of a test and power of a function</p>	
<p>Enrichment opportunities and futures</p>	<p>Further Study Mathematics Degree Related Degree Subjects</p> <p>More information: https://www.mathscareers.org.uk/degree-courses-a-level-mathematics/</p>	<p>Career Paths STEM subjects Insurance and Risk Data Science Computing Natural and Life Sciences Business and Operations Humanities Banking/Finance Business Operations</p>	<p>Extracurricular at Haydon Webinars Maths Works Maths Modelling Challenge MC3 Shared podcasts Online uni events Senior UKMT</p>

YEAR 13	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1
Content	<p>CORE PURE Series Higher derivatives Maclaurin Series</p> <p>F MECHANICS Momentum and Impulse Conservation of Momentum</p> <p>F MECHANICS Work, energy and power Conservation of Mechanical Energy Work Energy Principal</p> <p>F MECHANICS Elastic Strings and Springs Hooke's Law Elastic Energy</p>	<p>CORE PURE Methods in calculus Improper Integrals Trig functions Partial fractions</p> <p>CORE PURE Volumes of revolution Volumes of revolution Parametric equations</p> <p>CORE PURE Polar coordinates Polar coordinates and equations Sketching Curves Tangents</p> <p>F MECHANICS Elastic Collisions Collision in one dimension Collision in two dimensions</p>	<p>CORE PURE Hyperbolic functions Hyperbolic functions Calculus Identities</p> <p>CORE PURE Differential equations Methods in Differential equations Modelling with differential equation</p>	Exam Preparation	
Skills	AO1: Use and apply standard techniques. AO2: Reason, interpret and communicate mathematically	AO1: Use and apply standard techniques. AO2: Reason, interpret and communicate mathematically AO3: Solve problems within mathematics and	AO1: Use and apply standard techniques. AO2: Reason, interpret and communicate mathematically AO3: Solve	AO1: Use and apply standard techniques. AO2: Reason, interpret and communicate mathematically AO3: Solve problems within mathematics and in other contexts	

	AO3: Solve problems within mathematics and in other contexts	in other contexts	problems within mathematics and in other contexts		
Key Questions	Series	Methods in Calculus Polar Coordinates	Hyperbolic Functions Methods in Differential Equations Modelling with Differential Equations		
Assessment	Baseline Pure Mock assessment Topic Tests Consolidation exam questions at the end of every lesson	<ul style="list-style-type: none"> • Topic Tests • Consolidation exam questions at the end of every lesson 	<ul style="list-style-type: none"> • Mock Exams • Topic Tests • Consolidation exam questions at the end of every lesson 	<ul style="list-style-type: none"> • Practice Core Pure Mock 	External Exams Two Papers in Core Pure One Paper in Decision One Paper in Further Mechanics
Literacy	Further Reading <ul style="list-style-type: none"> • <i>The Code Book</i> – Simon Singh • <i>The Music of the Primes</i> – Marcus du Sautoy • <i>Thinking About Mathematics</i> – Stewart Shapiro • <i>Chaos, Making a New Science</i> – James Gleick • <i>Alex's Adventures in Numberland: Dispatches from the Wonderful World of Numbers</i> – Alex Bellos • <i>It Must be Beautiful: Great Equations of Modern Science</i> – edited by Graham Farmelo • <i>The Problems of Mathematics, Nature's Numbers, From Here</i> 		Key Words <u>Core Pure</u> Ch1 - Conjugate, real part, imaginary part, complex conjugate, nth root, distinct root, discriminant, Argand diagram, Cartesian coordinates, vector, magnitude, modulus, argument, principal argument, radians, modulus-argument form, polynomial, coefficient, quadratic, quartic, cubic, de Moivre, unity, exponential, multiple angle. Ch2 - Series, sigma, differences, sum, term, general term, partial fraction, function, Maclaurin, range, power. Ch3&4 - Improper, undefined, continuous, mean, integrate, partial, fraction, radical, inverse. Ch5 - Polar, Cartesian, coordinates, convert, parallel, point, enclosed, area Ch6 - Hyperbolic, sinh, cosh, tanh, domain, range, exponential, function, radical. Ch7&8 - Integrating, factor, complementary, function, differential, equation, order, auxiliary, discriminant, general, particular. <u>Further Mechanics</u> Ch1 - Mass, velocity, speed, Ns , momentum, impulse, force, time, collisions, direct,		

	<p><i>to Infinity, Game, Set and Math and The Magical Maze – Ian Stewart</i></p> <ul style="list-style-type: none"> • <i>What is Mathematics? – Courant and Robbins</i> • <i>Mathematics: The Golden Age – Devlin</i> • <i>A Mathematician’s Apology – Hardy</i> • <i>Makers of Mathematics – Hollingdale</i> 	<p>smooth, body, sphere, coalesce, conservation, vector, i, j, unit vector, magnitude, string, light, inextensible, jerk, impulsive tension.</p> <p>Ch2 - Work, energy, power, joules, gravitational potential energy (GPE), kinetic energy (KE), energy change, resistance, force, distance, displacement, speed, velocity, conservation of mechanical energy, external force, work-energy principle, reaction, power, watts, KW, tractive (driving) force, acceleration, inclined plane, resistance, rate of working, rough/smooth surface, friction.</p> <p>Ch3 - String, spring, light, elasticity, modulus of elasticity (λ), extension, natural length, elastic potential energy (EPE), kinetic energy (KE), gravitational potential energy (GPE), joules (J), conservation of energy, equilibrium, work-energy principle, Newton’s 2nd law of motion, work done, joined or parallel strings/springs, friction, coefficient of friction, inclined plane.</p> <p>Ch4 - Mass, velocity, N s, momentum, impulse, force, collisions, direct, impact, smooth, sphere, elastic, conservation, coefficient of restitution (e), Newton’s (experimental) law of restitution, approach speed, separation speed, opposite direction, perfectly elastic, inelastic, plane, energy, kinetic energy, joules, ‘loss’ of mechanical energy.</p> <p>Ch5 - Impact, momentum, impulse, magnitude, direction, sphere, equal radii, collision, oblique, smooth, coefficient of restitution, Newton’s (experimental) law of restitution, rebound, conservation, perfectly elastic, inelastic, vector, component, parallel, perpendicular, normal, line of centres, deflection, scalar product, kinetic energy.</p>	
<p>Enrichment opportunities and futures</p>	<p>Further Study Mathematics Degree Related Degree Subjects</p> <p>More information: https://www.mathscareers.org.uk/degree-courses-a-level-mathematics/</p>	<p>Career Paths</p> <p>STEM subjects Insurance and Risk Data Science Computing Natural and Life Sciences Business and Operations Humanities Banking/Finance Business Operations</p>	<p>Extracurricular at Haydon</p> <p>Webinars Maths Works Maths Modelling Challenge MC3 Shared podcasts Online uni events Senior UKMT</p>