Further Maths Curriculum Map

Key
- Required links between parts of the Further Maths Course
- Where on time line to expect to be taught the topic
- Required links between parts of the A level Maths Course

Vectors
Volumes of tetrahedral and Parallelepipeds; Triple scalar product

Vectors
Equation of a Plane; Intersection of a line & a plane; Angles between lines & planes; distances between points, lines and planes; linear simultaneous equations; intersections of planes

Number theory
Simultaneous linear Congruences; Quadratic Residues; Fermat's little Theorem; The order of modulo p; Binomial theorem

Groups
Isomorphism & Structure of groups

Differential Equations
Definitions; First Order: Integrating Factor Method; Second Order: Homogeneous and Non-Homogeneous Differential Equations

YEAR 13 Term 3

Revision and consolidation | Additional Further Pure | Additional Further Pure | Core Further Pure | Mock 2 | Additional Further Pure

Surfaces and partial differentiation
Find stationary points and describe them in 3D; Equation of Tangent plane in 3D

Applications of Differential Equations
Forming Differential Equations; Simple Harmonic Motion; Damping & Damped Oscillations; Linear Systems

LINKS TO A LEVEL MATHS
Integration; Differentiation; Trigonometric Identities

Powers & Roots of Complex Numbers
De Moivre's Theorem; Complex Exponents; Roots of a Complex Number; Roots of Unity; Factorising; Geometry of Complex Numbers

LINKS TO A LEVEL MATHS
Trigonometric Identities

Complex Numbers & Trigonometry
Multiple Angle Formulae; Applications to polynomial equations; Powers of trigonometric functions; Trigonometric Series

Polar Co-ordinates
Curves in Polar Co-ordinates; Converting between Polar & Cartesian Co-ordinates; Area enclosed by a polar curve; Area between two polar curves

Applications of Calculus
Maclaurin Series; Improper Integrals; Volumes of Revolution; Mean Value of a Function

LINKS TO A LEVEL MATHS
Integration; Differentiation;

YEAR 13 Term 2

Core Further Pure | Mock 1 | Core Further Pure | Further Statistics | Core Further Pure | Further Statistics

Sequences and Series
Solving Second Order Recurrence Relationships

Combining Random Variables
Adding Independent random variables; Expectation & variance of sample mean; Unbiased estimate of mean & variance; Linear combinations of Normal variables; Distributions of means of large samples = CENTRAL LIMIT THEOREM

LINKS TO A LEVEL MATHS
Normal Distribution

Further Calculus
Reduction Formula; Arc lengths; Surfaces of revolution

LINKS TO A LEVEL MATHS
Integration; Differentiation; Trigonometric Identities

Series & Induction
Recap Proof by Induction; Induction & Series; Using Standard series; Method of Difference

Non-Parametric Tests
Single Sample Sign Test; Single=sample Wilcoxon signed-rank test; Matched pairs tests; Wilcoxon rank-sum test; Normal approximations

LINKS TO A LEVEL MATHS
Normal Distribution

Hypothesis Tests and Confidence Intervals
Hypothesis Test on Mean of a large sample; Confidence Intervals

LINKS TO A LEVEL MATHS
Normal Distribution
Hypothesis Tests

YEAR 13 Term 1

Core Further Pure | Further Statistics | Core Further Pure | Further Statistics | Further Statistics | End of Year 12 Assessment

Further calculus Techniques
Differentiation of inverse trigonometric and hyperbolic functions; Integration with inverse Trigonometric and hyperbolic functions; Use of partial fractions

LINKS TO A LEVEL MATHS
Integration; Differentiation; Trigonometric Identities; Partial Fractions

Hyperbolic Functions
Definition and graphs of Hyperbolic Functions and their inverses; Hyperbolic Identities; Hyperbolic Equations; Differentiation; Integration;

LINKS TO A LEVEL MATHS
Integration; Differentiation; Trigonometric Identities

Continuous Random Variables
Probability Density Function; Expectation; Variance; Median; Mode; Piecewise PDF; Cumulative Distribution Function; Exponential Distribution; Functions of Continuous random Variables; Goodness of Fit for Continuous random variables

Continuous Random Variables
Probability Density Function; Expectation; Variance; Median; Mode;

LINKS TO A LEVEL MATHS
Normal Distribution

YEAR 12 Term 3

Additional Further Pure | Additional Further Pure | Additional Further Pure | Revision and consolidation | Core Further Pure

Groups
Binary Operations; Definition of a group; Modular Arithmetic; Sub-groups; Lagrange's Theorem; Cyclic Groups

Vectors
Vector Product; Properties of Vector Product; a x b = 0; Areas of Triangles and Parallelograms;

Surfaces and partial differentiation
Functions of two variables; Sketching sections and contours; First and second partial derivatives

LINKS TO A LEVEL MATHS
Differentiation

Vectors
Vector equation of a line in 3D; Cartesian equation of a line in 3D; Intersection of lines; Angles and scalar Product; Vector Product

LINKS TO A LEVEL MATHS
Vectors

LINKS TO A LEVEL MATHS
Polynomials and Quadratics

YEAR 12 Term 2

Additional Further Pure | Additional Further Pure | Further Statistics | Core Further Pure | Further Statistics | Core Further Pure

LINKS TO A LEVEL MATHS
Probability

Number theory
Number Bases; Divisibility Tests; The division algorithm; finite modular arithmetic; linear congruences; prime numbers; Euclid's Lemma

Sequences and Series
Recurrence Relations; Properties of sequences; Fibonnaci and Lucas Numbers; Solving First Order Recurrence Relationships

LINKS TO A LEVEL MATHS
Sequences and Series

Chi-Squared Tests
Goodness of Fit Test for Discrete Distributions and Population proportions

Roots of Polynomials
Roots for polynomials of order 2,3 & 4. Transformation of equations.

Discrete Random Variables
Uniform Distribution; Binomial Distribution; Geometric Distribution; Poisson Distribution

Permutations & Combinations
The counting Principle; Permutations; Combinations; Arrangements; Probability

Chi-Squared Tests
Contingency Table; Yates Correction

LINKS TO A LEVEL MATHS
Discrete Random variables; Binomial distribution and probability

YEAR 12 Term 1

Further Statistics | Core Further Pure | Further Statistics | Further Statistics | Core Further Pure | Further Statistics | Core Further Pure

More Matrices:
Applications to simultaneous equations; Matrices and Transformations in 2D & 3D. Invariant Lines

Discrete Random Variables
Definition of a Discrete Random Variable; Expectation & Variance;

Induction:
The principal of Induction; Induction & Matrices; Induction and divisibility; Induction & Inequalities

Matrices:
Matrix Arithmetic; Determinants and Inverses of 2x2 Matrices; Determinants and Inverses of 3x3 Matrices;

LINKS TO A LEVEL MATHS
Discrete Random variables

Correlation & regression:
Pearson's Product moment correlation Coefficient; Spearman's Rank Correlation Coefficient; Hypothesis testing of PPPMCC & Spearman's; Linear Regression

LINKS TO A LEVEL MATHS
Correlation and Regression

Complex Numbers:
Basic definitions of complex numbers; Complex conjugates; Geometrical representation; Modulus & Argument; Loci in a complex plane; Modulus-argument Form; Factorising complex polynomials; Complex Solutions to Polynomials

"Mathematics has beauty and romance. It's not a boring place to be, the mathematical world. It's an extraordinary place; it's worth spending time there." — **Marcus du Sautoy, British mathematician**