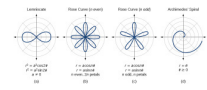


Further Maths Curriculum Map



- 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



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

LINKS TO A LEVEL MATHS
Integration; Differentiation

Core Further Pure
Mock 1

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

LINKS TO A LEVEL MATHS
Normal Distribution

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

Further Statistics
Core Further Pure

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

LINKS TO A LEVEL MATHS
Integration; Differentiation; Trigonometric Identities

Additional Further Pure
Core Further Pure

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

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

Additional Further Pure
Core Further Pure

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

LINKS TO A LEVEL MATHS
Sequences and Series

Chi-Squared Tests
Contingency Table; Yates Correction

LINKS TO A LEVEL MATHS
Sequences and Series

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

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

LINKS TO A LEVEL MATHS
Discrete Random variables

Core Further Pure
Further Statistics

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

LINKS TO A LEVEL MATHS
Correlation and Regression

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

Groups
Isomorphism & Structure of groups

Revision and consolidation
Additional Further Pure

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

LINKS TO A LEVEL MATHS
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

Core Further Pure
Mock 1

Further Statistics
Core Further Pure

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

Core Further Pure
Further Statistics

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

Additional Further Pure
Core Further Pure

Vectors
Vector Product; Properties of Vector Product; $a \times b = 0$; Areas of Triangles and Parallelograms;

LINKS TO A LEVEL MATHS
Vectors

Additional Further Pure
Core Further Pure

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

LINKS TO A LEVEL MATHS
Differentiation

Additional Further Pure
Core Further Pure

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

LINKS TO A LEVEL MATHS
Sequences and Series

Core Further Pure
Further Statistics

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

LINKS TO A LEVEL MATHS
Discrete Random variables

Core Further Pure
Further Statistics

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

LINKS TO A LEVEL MATHS
Correlation and Regression

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

Additional Further Pure
Core Further Pure

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

LINKS TO A LEVEL MATHS
Integration; Differentiation; Trigonometric Identities

Core Further Pure
Mock 2

Further Statistics
Core Further Pure

Further Calculus
Reduction Formula; Arc lengths; Surfaces of revolution

LINKS TO A LEVEL MATHS
Normal Distribution

Core Further Pure
Further Statistics

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

LINKS TO A LEVEL MATHS
Normal Distribution

Core Further Pure
Further Statistics

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

LINKS TO A LEVEL MATHS
Normal Distribution

Additional Further Pure
Core Further Pure

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

LINKS TO A LEVEL MATHS
Normal Distribution

Additional Further Pure
Core Further Pure

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

LINKS TO A LEVEL MATHS
Polynomials and Quadratics

Further Statistics
Core Further Pure

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

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

Core Further Pure
Further Statistics

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

LINKS TO A LEVEL MATHS
Discrete Random variables

Core Further Pure
Further Statistics

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

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Additional Further Pure
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LINKS TO A LEVEL MATHS
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Core Further Pure
Mock 2

Further Statistics
Core Further Pure

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Correlation and Regression

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

Additional Further Pure
Core Further Pure

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

LINKS TO A LEVEL MATHS
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Core Further Pure
Mock 2

Further Statistics
Core Further Pure

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Correlation and Regression

$\sin^2 x + \cos^2 x = 1$	$\csc^2 x = \sec^2 x$
$\sin^2 x - \cos^2 x = -\cos 2x$	$\csc^2 x - \sec^2 x = \tan^2 x$
$\sin^2 x + \cos^2 x = 1$	$\csc^2 x = \sec^2 x$
$\sin^2 x - \cos^2 x = -\cos 2x$	$\csc^2 x - \sec^2 x = \tan^2 x$

$$\sum_{n=1}^n c = cn$$

$$\sum_{n=1}^n n^2 = \frac{n(n+1)(2n+1)}{6}$$

$$\sum_{n=1}^n n^3 = \frac{n^2(n+1)^2}{4}$$

$$\sum_{n=1}^n 1 = \frac{n(n+1)}{2}$$

"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