

A Level Mathematics at FIC – Units of Work

The exact scheduling of topics is subject to change, as the small class sizes at FIC allow for the pace and ordering of teaching to be adjusted according to students' knowledge and progress.

Class – Term – Topic	Learning Content (Homework is an extension of classwork)
Year 12 – Autumn 1 st half	<ul style="list-style-type: none"> • Introduction to A level maths, syllabus, baseline test • Algebra, indices and surds – revision • Straight-line graphs • Midpoints and perpendicular bisectors • Quadratic functions • Simultaneous equations – linear and quadratic • Inequalities – linear and quadratic • Vectors (2D) • Position vectors and geometric problems • Vectors (3D)
Year 12 – Autumn 2 nd half	<ul style="list-style-type: none"> • Mechanics: Quantities and units • Mechanics: Kinematics 1 – constant acceleration • Mechanics: SUVAT, gravity • Mechanics: Forces & Newton's laws • Graphs – sketching • Transformations – transforming graphs • Algebraic Division, Factor Theorem
Year 12 – Spring 1 st half	<ul style="list-style-type: none"> • The Binomial Expansion (positive integer powers) • Circles (coordinate geometry) • Trigonometry ratios, graphs and geometry • Trigonometric identities and equations, pt 1 • Differentiation: Definition, polynomials, second derivatives • Differentiation: Gradients, tangents, normals, maxima & minima

Year 12 – Spring 2 nd half	<ul style="list-style-type: none"> • Integration, definite integrals and areas under curves • Mechanics: Kinematics 2 – variable acceleration, use of calculus • Statistics: Probability • Statistics: Probability (Y2) – set notation, conditional probability
Year 12 – Summer 1 st half	<ul style="list-style-type: none"> • Exponentials and logarithms • Statistics: Sampling, the large data set • Statistics: Data presentation and interpretation • Statistics: Graphs, correlation, regression, outliers etc
Year 12 – Summer 2 nd half	<ul style="list-style-type: none"> • Statistical distributions – discrete uniform, binomial • Statistics: Hypothesis testing, on binomial • Proof: Deduction, exhaustion, counter example • Proof: Contradiction
Year 13 – Autumn 1 st half	<ul style="list-style-type: none"> • Algebraic fractions • Partial fractions • The Binomial Expansion (any real powers) • Sequences and series – Arithmetic & geometric progressions, sums • Sequences and series – Sigma notation, recurrence and iterations • Functions and modelling – modulus function, composite and inverse functions • Transformations, modelling with functions • Trigonometry: Radians (exact values), arcs and sectors, small angle approximations
Year 13 – Autumn 2 nd half	<ul style="list-style-type: none"> • Trigonometry: Reciprocal and inverse trigonometrical functions • Trigonometry: Compound and double / half angle formulae • Trigonometry: R formulae – $R \cos(x \pm \alpha)$ or $R \sin(x \pm \alpha)$ • Proving trigonometric identities, solving problems in context • Differentiation: $\sin x$ and $\cos x$ from first principles • Differentiating exponentials and logarithms • Chain rule, product rule, quotient rule • Trigonometric functions • Second derivatives (rates of change of gradient, stationary points)

Year 13 – Spring 1 st half	<ul style="list-style-type: none"> • Mechanics: Moments – forces turning effect • Mechanics: Forces at any angle, resolving forces • Mechanics: Friction forces, coefficient of friction μ • Mechanics: Equilibrium, statics of a particle (inc. ladder problems) • Mechanics: Dynamics of a particle • Mechanics: Applications of kinematics – projectiles • Mechanics: Kinematics in 2D (vectors, constant acceleration) • Mechanics: Variable acceleration (use of calculus and vectors) • Numerical methods: location of roots • Solving by iterative methods ('staircase & cobweb' diagrams) • Numerical methods: Newton-Raphson method
Year 13 – Spring 2 nd half	<ul style="list-style-type: none"> • Parametric equations • Differentiation: Implicit and parametric functions • Differentiation: Rates of change problems • Integration: Including trigonometric, reverse chain rule • Integration: Use of partial fractions • Integration: By substitution • Integration: By parts • Integration: Areas under graphs (sigma notation) • Integration: The trapezium rule as an approximation • Differential equations and modelling
Year 13 – Summer	<ul style="list-style-type: none"> • Statistics: Regression and correlation, change of variable • Statistics: Correlation coefficients – zero correlation hypothesis testing • Statistics: The Normal distribution • Statistics: Normal distribution as approximation to binomial • Statistics: Hypothesis testing for the mean of the Normal distribution • Revision • Exams