KS5 Mathematics Curriculum Sequence

Big idea / subject / theme.	Year 12			Year 13		
	Term 1	Term 2	Term 3	Term 1	Term 2	Term 3
Algebra	Algebraic expressions – basic algebraic manipulation, indices and surds Quadratic functions – factorising, solving, graphs and the discriminants Equations – quadratic/linear simultaneous Inequalities – linear and quadratic (including graphical solutions) Graphs – cubic, quartic and reciprocal Transformations – transforming graphs – f(x) notation Algebraic division, factor theorem and proof The binomial expansion			Proof: Examples including proof by deduction and proof by contradiction Simplifying algebraic fractions Partial fractions Modulus function Composite and inverse functions Transformations Modelling with functions Arithmetic and geometric progressions (proofs of 'sum formulae') Sigma notation Recurrence and iterations The binomial theorem Expanding (a + bx)n for rational n; knowledge of range of validity Expansion of functions by first using partial fractions		
Geometry and Numerical Methods	Straight-line graphs, parallel/perpendicular, length and area problems Circles – equation of a circle, geometric problems on a grid				Definition and converting between parametric and Cartesian forms Curve sketching and modelling Location of roots Solving by iterative methods (knowledge of 'staircase and cobweb' diagrams) Newton-Raphson method Problem solving	
Trigonometry		Trigonometric ratios and graphs Trigonometric identities and equations			Radians (exact values), arcs and sectors Small angles Secant, cosecant and cotangent (definitions, identities and graphs); Inverse trigonometrical functions; Inverse trigonometrical functions Compound and double (and half) angle formulae $R\cos(x \pm \alpha)$ or $R\sin(x \pm \alpha)$ Proving trigonometric identities Solving problems in context (e.g. mechanics)	

Differentiation and Integration		Definition, differentiating polynomials, second derivatives Gradients, tangents, normals, maxima and minima	Definition as opposite of differentiation, indefinite integrals of xn Definite integrals and areas under curves		Differentiating sin x and cos x from first principles Differentiating exponentials and logarithms Differentiating products, quotients, implicit and parametric functions. Second derivatives (rates of change of gradient, inflections) Rates of change problems (including growth and kinematics)	Using the reverse of differentiation, and using trigonometric identities to manipulate integrals Integration by substitution Integration by parts Use of partial fractions Areas under graphs or between two curves, including understanding the area is the limit of a sum (using sigma notation) The trapezium rule Differential equations (including knowledge of the family of solution curves)
Functions, Vectors and Exponentials/logarithms		Definitions, magnitude/direction, addition and scalar multiplication Position vectors, distance between two points, geometric problems	Exponential functions and natural logarithms			Use of vectors in three dimensions; knowledge of column vectors and i, j and k unit vectors
Statistics	Introduction to sampling terminology; Advantages and disadvantages of sampling Understand and use sampling techniques; Compare sampling techniques in context Calculation and interpretation of measures of location; Calculation and interpretation of measures of variation; Understand and use coding Interpret diagrams for single-variable data; Interpret scatter diagrams and regression lines; Recognise and interpret outliers; Draw simple conclusions from statistical problems Probability: Mutually exclusive events; Independent events	Statistical distributions: Use discrete distributions to model real-world situations; Identify the discrete uniform distribution; Calculate probabilities using the binomial distribution (calculator use expected) Language of hypothesis testing; Significance levels Carry out hypothesis tests involving the binomial distribution	Revision	Change of variable Correlation coefficients Statistical hypothesis testing for zero correlation Using set notation for probability Conditional probability Questioning assumptions in probability	Understand and use the Normal distribution Use the Normal distribution as an approximation to the binomial distribution Selecting the appropriate distribution Statistical hypothesis testing for the mean of the Normal distribution	Revision
Mechanics	Introduction to mathematical modelling and standard S.I. units of length, time and mass Definitions of force, velocity, speed, acceleration and weight and displacement; Vector and scalar quantities Graphical representation of velocity, acceleration and displacement Motion in a straight line under constant acceleration; suvat formulae for constant acceleration; Vertical motion under gravity	Newton's first law, force diagrams, equilibrium, introduction to i, j system Newton's second law, 'F = ma', connected particles (no resolving forces or use of F = μR); Newton's third law: equilibrium, problems involving smooth pulleys	Variable force; Calculus to determine rates of change for kinematics Use of integration for kinematics problems i.e. Integrating velocity with respect to time, and integrating acceleration with respect to time	Moments: Forces' turning effect Resolving forces Friction forces (including coefficient of friction μ)	Applications of kinematics: Projectiles Equilibrium and statics of a particle (including ladder problems) Dynamics of a particle	Constant acceleration (equations of motion in 2D; the i, j system) Variable acceleration (use of calculus and finding vectors $\dot{\mathbf{r}}$ and $\ddot{\mathbf{r}}$ at a given time)