SUBJECT: Mathematics A-Level

NESTON HIGH SCHOOL

KS5 Knowledge and key skills

YEAR 12	AUTUMN 1	AUTUMN 2	SPRING 1	SPRING 2	SUMMER 1	SUMMER 2
TOPICS	Algebra & Functions Further Algebra Data Collection & Sampling Quantities and Units Kinematics	Coordinate Geometry, Differentiation, Measures of location and spread, Representation of data, Forces and Newton's laws	Integration, Trigonometry, Correlation and Regression, Probability, Statistical distributions, Kinematics 2	Exponentials & Logs, Hypothesis Testing	Vectors, Prep for AS	AS Exam, Algebra & Partial Fractions (A2), Functions (A2), Regression and Correlation (A2), Moments (A2)
Knowledge	Laws of indices, Law of surds, discriminant of a quadratic function, Complete the square, Factor Theorem, Graph shape produced by different equation types.	Proportional relationships and their graphs, The equation of a straight line, Gradient conditions for two straight lines to be parallel or perpendicular Use the equation of a circle, The angle in a semicircle is a right angle, the perpendicular from the centre to a chord bisects the chord.	Fundamental Theorem of Calculus, Integrate to find the area under a curve, definitions of sine, cosine and tangent, the sine and cosine rules; the area of a triangle in the form 0.5absinC Sine, cosine and tangent functions and graphs	Know and use the function a^x and its graph, where a is positive Know and use the function e^x and its graph, Know that the gradient of e^{kx} is equal to ke^{kx} and hence understand why the exponential model is suitable in many applications Know and use the definition of $\log_a x$ as the inverse of a^x.	Calculate the magnitude and direction of a vector. Understand vectors given in vector form and component form.	Know that an algebraic fraction can be written as the sum of two or more fractions with denominators equal to the algebraic factors of the original fraction.
Skills	Solve quadratic simultaneous equations, identify conditions for roots of quadratics, solve quadratic inequalities. Improve algebraic competency though skills such as sketching, expanding, factorising, cancelling & simplifying. Rationalise the denominator of a surd. Identify graph transformations.	Use all available knowledge of Co-ordinate geometry to solve problems involving missing lengths, angles or points. Complete the square to find the centre and radius of a circle	Integrate ax^n, Evaluate definite integrals, Solve simple trigonometric equations in a given interval, including quadratic equations in sin, cos and tan and equations involving multiples of the unknown angle	Solve equations to find unknown exponentials. Use logarithmic graphs to estimate parameters in relationships of the form $y=ax^n$ and $y=kb^x$, given data for x and y. Understand and use exponential growth and decay; use in modelling	Convert between component form and magnitude/direction form, Add vectors diagrammatically and perform the algebraic operations of vector addition and multiplication by scalars, and understand their geometrical interpretations	Decompose rational functions into partial fractions, utilising substitution or equating variables. Simplify algebraic fractions by factorising and cancelling common factors in the numerator and denominator.
Key Vocab	Expression, function, constant, variable, term, unknown, coefficient, index, linear, identity, simultaneous, elimination, substitution, factorise, completing the square, intersection, change the subject, cross-multiply, power, exponent, base, rational, irrational, reciprocal, root, standard form, surd, rationalise, exact, manipulate, sketch, plot, quadratic, maximum, minimum, turning point, transformation, translation, polynomial, discriminant, real roots, repeated roots, factor theorem, quotient, intercepts, inequality, asymptote .	Equation, bisect, centre, chord, circle, circumcircle, coefficient, constant, diameter, gradient, hypotenuse, intercept, isosceles, linear, midpoint, parallel, perpendicular, proportion, Pythagoras, radius, right angle, segment, semicircle, simultaneous, tangent.	Calculus, differentiate, integrate, reverse, indefinite, definite, constant, evaluate, intersection.	Exponential, exponent, power, logarithm, base, initial, rate of change, compound interest	Vector, scalar, magnitude, direction, component, parallel, perpendicular, modulus, dimension, ratio, collinear, scalar product, position vectors.	Polynomial, numerator, denominator, factor, difference of two squares, quadratic, power, index, coefficient, degree, squared, coefficients, improper, identity, algebraic fraction, partial fraction, rational.

Key Knowledge Transfer

YEAR 13	SUMMER 2	SUMMER 1	SPRING 2	SPRING 1	AUTUMN 2	AUTUMN 1
TOPIC	Study Leave	Exam Prep, Sequences and Series, Binomial Theorem	Integration, Numerical Methods	Vectors, Differentiation	Basic Parametrics, Trigonometry	Functions, Proof, Algebra and partial Fractions
Knowledge		Understand and use the second formula for binomial expansion. Know the formula for linear & geometric sequences and series (sums). Know the sum to infinity formula.	Integrate exponentials, logs and all trig functions.	Understand and use the second derivative as the rate of change of gradient; connection to convex and concave sections of curves and points of inflection. Chain Rule, Product rule, differentiate exponentials and logs.	Sec, Cot, Cosec. Graphs and identities. Angle addition formulae. Proof of double angle formulae. Rcos(x+a). Parametrics in all previous content	Know that an algebraic fraction can be written as the sum of two or more fractions with denominators equal to the algebraic factors of the original fraction. Proof that root 2 is irrational. Proof of infinite primes.

Skills		Be able to perform Binomial expansions with negative and fractional indices. Use those expansions to approximate roots.	Solve problems involving integration, including as an area. Problems may involve all previous content, including trig identities and partial fractions.	Construct simple differential equations in pure mathematics and in context, (contexts may include kinematics, population growth and modelling the relationship between price and demand). Solve Differential Equations.	Use all trigonometric identities to prove further identities. Solve all trigonometric equations of various forms, including double angles, angle additions and 'new' functions. Convert between parametric and cartesian form.	Decompose rational functions into partial fractions, utilising substitution or equating variables. Simplify algebraic fractions by factorising and cancelling common factors in the numerator and denominator.
Key Vocab		Sequence, series, finite, infinite, summation notation, Σ(sigma)	Integral, inverse, differential, coefficient, index, power,	Derivative, tangent, normal, turning point, stationary point,	Pythagoras, Pythagorean triple, right-angled triangle, opposite,	Function, mapping, domain, range, modulus, transformation,