

Mathematics-Year 12 Curriculum Map

Content (Intent)	Links to prior learning	Skills and Assessment (Implementation)	Expected Learning Outcomes (Impact)
<p>Term 1 Pure</p> <p>Proof Algebra and Functions Co-ordinate Geometry</p>	<p>A4 Collecting like terms and factorising N8 Surds A19 Solving linear simultaneous equations A18 Solving quadratic equations (by factorising and completing the square) A22 Working with inequalities. Solving quadratic inequalities. A12 Functional notation and shapes of standard graphs (e.g. parabola, cubic, reciprocal) N7 Rules of indices</p> <p>Algebraic manipulation covered so far</p> <ul style="list-style-type: none"> • Simultaneous equations • Completing the square <p><u>GCSE (9-1) in Mathematics at Higher Tier</u></p> <p>A9 Equation of a line Parallel and perpendicular lines G20 Pythagoras A14 Conversion graphs R10 Calculating the proportionality constant k G10 Circle theorems</p> <p>Algebraic manipulation covered so far</p>	<p>Baseline Assessment</p> <p>Pure Assessment</p> <p>Marking Policy</p>	<ul style="list-style-type: none"> • be able to perform essential algebraic manipulations, such as expanding brackets, collecting like terms, factorising etc; • understand and be able to use the laws of indices for all rational exponents; • be able to use and manipulate surds, including rationalising the denominator. • be able to solve a quadratic equation by factorising; • be able to work with quadratic functions and their graphs; • know and be able to use the discriminant of a quadratic function, including the conditions for real and repeated roots; • be able to complete the square. e.g. $ax^2 + bx + c = a\left(x + \frac{b}{2a}\right)^2 + \left(c - \frac{b^2}{4a}\right);$ • be able to solve quadratic equations, including in a function of the unknown. • be able to solve linear simultaneous equations using elimination and substitution; • be able to use substitution to solve simultaneous equations where one equation is linear and the other quadratic. • be able to solve linear and quadratic inequalities;

	<ul style="list-style-type: none"> • Factorising quadratics • notation <p><u>GCSE (9-1) in Mathematics at Higher Tier</u></p> <p>A4 Expanding brackets</p> <p>A2 Substitution</p> <p>A6 Proof</p>		<ul style="list-style-type: none"> • know how to express solutions through correct use of ‘and’ and ‘or’ or through set notation; • be able to interpret linear and quadratic inequalities graphically; • be able to represent linear and quadratic inequalities graphically. • understand and use graphs of functions; • be able to sketch curves defined by simple equations including polynomials; • be able to use intersection points of graphs to solve equations. • understand the effect of simple transformations on the graph of $y = f(x)$; • be able to sketch the result of a simple transformation given the graph of any function $y = f(x)$. • understand and use the equation of a straight line; • know and be able to apply the gradient conditions for two straight lines to be parallel or perpendicular; • be able to find lengths and areas using equations of straight lines; • be able to use straight-line graphs in modelling. • be able to find the midpoint of a line segment; • understand and use the equation of a circle;
--	--	--	--

<p>Applied</p> <p>Statistical sampling</p> <p>Data presentation and interpretation</p> <p>Probability</p>	<p><u>GCSE (9–1) in Mathematics at Higher Tier</u></p> <p>S1 Infer properties of populations or distributions from a sample, while knowing the limitations of sampling</p> <p>S5 Apply statistics to describe a population</p> <p><u>GCSE (9–1) in Mathematics at Higher Tier</u></p> <p>S2 Interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data and know their appropriate use</p> <p>S3 Construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use</p> <p>S4 Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers), quartiles and inter-quartile range</p> <p>S6 Use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends while knowing the dangers of so doing</p> <p><u>GCSE (9–1) in Mathematics at Higher Tier</u></p> <p>P1 Record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees</p>		<ul style="list-style-type: none"> • be able to find points of intersection between a circle and a line; • know and be able to use the properties of chords and tangents. • understand and be able to use the terms ‘population’ and ‘sample’; • know how to use samples to make informal inferences about the population; • be able to describe advantages and disadvantages of sampling compared to census. • understand and be able to use sampling techniques; • be able to describe advantages and disadvantages of sampling techniques; • be able to select or critique sampling techniques in the context of solving a statistical problem; • understand that different samples can lead to different conclusions about the population. • be able to calculate measures of location, mean, median and mode; • be able to calculate measures of variation, standard deviation, variance, range and interpercentile range; • be able to interpret and draw inferences from summary statistics. • know how to interpret diagrams for single variable data; • know how to interpret scatter diagrams and regression lines for bivariate data;
---	--	--	--

	<p>P2 Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments</p> <p>P3 Relate relative expected frequencies to theoretical probability, using appropriate language and the 0–1 probability scale</p> <p>P4 Apply the property that the probabilities of an exhaustive set of outcomes sum to one; apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one</p> <p>P6 Enumerate sets and combinations of sets systematically, using tables, grids</p> <p>P7 Construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities</p> <p>P9 Tree diagrams and Venn diagrams</p>		<ul style="list-style-type: none"> • recognise the explanatory and response variables; • be able to make predictions using the regression line and understand its limitations; • understand informal interpretation of correlation; • understand that correlation does not imply causation; • recognise and interpret possible outliers in data sets and statistical diagrams; • be able to select or critique data presentation techniques in the context of a statistical problem; • be able to clean data, including dealing with missing data, errors and outliers. • understand and be able to use mutually exclusive and independent events when calculating probabilities; • be able to make links to discrete and continuous distributions.
<p>Term 2 Pure</p> <p>Algebraic Methods</p> <p>Binomial Expansion</p> <p>Trigonometric Ratios</p> <p>Trigonometry</p>	<p>Algebra covered so far</p> <ul style="list-style-type: none"> • Basic algebraic manipulation • Quadratics • Graph transformations <p><u>GCSE (9-1) in Mathematics at Higher Tier</u></p> <p>G20 Pythagoras' Theorem Trigonometry in right-angled triangles</p> <p>G22 The sine rule</p>	<p>Refer to Marking Policy</p>	<ul style="list-style-type: none"> • be able to use algebraic division; • know and be able to apply the factor theorem; • be able to fully factorise a cubic expression; • understand and be able to use the structure of mathematical proof, proceeding from given assumptions through a series of logical steps to a conclusion;

<p>Applied Statistical distributions</p> <p>Statistical hypothesis testing</p>	<p>The cosine rule</p> <p>G23 The area of a triangle</p> <p>G15 Bearings</p> <p><u>GCSE (9–1) in Mathematics at Higher Tier</u></p> <p>N1 Order positive and negative integers, decimals and fractions; use the symbols =, ≠, <, >, ≤, and ≥</p> <p>An understanding of how to calculate binomial probabilities and using samples from populations from previous units.</p>		<ul style="list-style-type: none"> • be able to use methods of proof, including proof by deduction, proof by exhaustion and disproof by counter-example. • understand and be able to use the binomial expansion of $(a + bx)^n$ for positive integer n; • be able to find an unknown coefficient of a binomial expansion. • understand and be able to use the definitions of sine, cosine and tangent for all arguments; • understand and be able to use the sine and cosine rules; • understand and be able to use the area of a triangle in the form $\frac{1}{2} ab \sin c$; • understand and be able to use the sine, cosine and tangent functions; their graphs, symmetries and periodicity. • be able to solve trigonometric equations within a given interval • understand and be able to use $\tan \theta = \frac{\cos \theta}{\sin \theta}$ • Understand and use $\sin^2 \theta + \cos^2 \theta = 1$ <ul style="list-style-type: none"> • understand and be able to use simple, discrete probability distributions, including the binomial distribution;
---	--	--	---

			<ul style="list-style-type: none"> • be able to identify the discrete uniform distribution; • be able to calculate probabilities using the binomial distribution. • understand and be able to apply the language of statistical hypothesis testing, developed through a binomial model. • be able to conduct a statistical hypothesis test for the proportion in the binomial distribution and interpret the results in context; • understand that a sample is being used to make an inference about the population; • appreciate that the significance level is the probability of incorrectly rejecting the null hypothesis.
<p>Term 3 Pure Vectors Differentiation</p>	<p>Covered so far</p> <ul style="list-style-type: none"> • Surds <p><u>GCSE (9-1) in Mathematics at Higher Tier</u></p> <p>G24 Vectors</p> <p>Covered so far</p> <ul style="list-style-type: none"> • Solving quadratics • Coordinate geometry • Proof • Function notation • Indices <p><u>GCSE (9-1) in Mathematics at Higher Tier</u></p> <p>N8 Fractions</p>	<p>Applied Assessment</p> <p>Marking Policy</p>	<ul style="list-style-type: none"> • be able to use vectors in two dimensions; • be able to calculate the magnitude and direction of a vector and convert between component form and magnitude/direction form; • be able to add vectors diagrammatically and perform the algebraic operations of vector addition and multiplication by scalars, and understand their geometrical interpretations. • understand and be able to use position vectors; • be able to calculate the distance between two points represented by position vectors; • be able to use vectors to solve problems in pure mathematics and in context, (including forces). • understand and be able to use the derivative of $f(x)$ as the gradient of the tangent to the graph

<p>Applied Quantities and units in mechanics</p> <p>Kinematics 1 (constant acceleration)</p>	<p>G16 Area of 2D shapes Volume and surface area of 3D shapes</p> <p>A5 Rearranging equations</p> <p><u>GCSE (9-1) in Mathematics at Higher Tier</u></p> <p>R1 Change freely between related standard units (e.g. time, length, area, volume/capacity, mass) and compound units (e.g. speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts</p> <p>R11 Use compound units such as speed, rates of pay, unit pricing, density and pressure</p>		<p>of $y = f(x)$ at a general point (x, y);</p> <ul style="list-style-type: none"> • understand the gradient of the tangent as a limit and its interpretation as a rate of change; • be able to sketch the gradient function for a given curve; • be able to find second derivatives; • understand differentiation from first principles for small positive integer powers of x; • be able to differentiate x^n, for rational values of n, and related constant multiples, sums and differences. • be able to apply differentiation to find gradients, tangents and normals, maxima and minima and stationary points; • be able to identify where functions are increasing or decreasing. <ul style="list-style-type: none"> • understand the concept of a mathematical model, and be able to abstract from a real-world situation to a mathematical description (model); • know the language used to describe simplifying assumptions; • understand the particle model; • be familiar with the basic terminology for mechanics; • be familiar with commonly-made assumptions when using these models; • be able to analyse the model appropriately, and interpret and communicate the implications of
---	---	--	--

<p>Forces & Newton's laws</p>	<p>A14 Plot and interpret graphs (including reciprocal graphs and exponential graphs) and graphs of non-standard functions in real contexts to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration</p> <p>A15 Calculate or estimate gradients of graphs and area under graphs (including quadratic and non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts</p> <p><u>GCSE (9-1) in Mathematics at Higher Tier</u></p> <p>R1 Change freely between related standard units (e.g. time, length, area, volume/capacity, mass) and compound units (e.g. speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts</p> <p>R11 Use compound units such as speed, rates of pay, unit pricing, density and pressure</p> <p>A2 Substitute numerical values into formulae and expressions, including scientific formulae</p> <p>A5 Understand and use standard mathematical formulae; rearrange formulae to change the subject</p> <p>A14 Plot and interpret graphs (including reciprocal graphs and exponential graphs) and graphs of non-standard functions in real contexts to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration</p> <p>A15 Calculate or estimate gradients of graphs and area under graphs (including quadratic and non-linear graphs), and interpret results in</p>		<p>the analysis in terms of the situation being modelled;</p> <ul style="list-style-type: none"> • understand and use fundamental quantities and units in the S.I. system: length, time and mass; • Understand that units behave in the same way as algebraic quantities, e.g. meters per second is $\text{m/s} = \text{m} \times 1/\text{s} = \text{ms}^{-1}$. • understand and use derived quantities and units: velocity, acceleration, force, weight; • know the difference between position, displacement and distance; • know the difference between velocity and speed, and between acceleration and magnitude of acceleration; • know the difference between mass and weight (including gravity); • understand that there are different types of forces. • recognise when it is appropriate to use the <i>suvat</i> formulae for constant acceleration; • be able to solve kinematics problems using constant acceleration formulae; • be able to solve problems involving vertical motion under gravity. • recognise when it is appropriate to use the <i>suvat</i> formulae for constant acceleration; • be able to solve kinematics problems using constant acceleration formulae;
--	--	--	--

	<p>cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts</p> <p>A17 Solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation)</p> <p>A18 Solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square and by using the quadratic formula</p> <p><u>AS Mathematics – Pure Mathematics content</u></p> <p>3.1 Gradient (See Unit 2a of the SoW)</p> <ul style="list-style-type: none"> • Modelling and definitions/assumptions from the introduction in Unit 6 <p><u>GCSE (9-1) in Mathematics at Higher Tier</u></p> <p>A19 Solve two simultaneous equations in two variables (linear/linear or linear/quadratic) algebraically; find approximate solutions using a graph</p> <p><u>AS Mathematics – Pure Mathematics content</u></p> <p>10.1 – 10.5 Vectors in 2D (See SoW Unit 5)</p>		<ul style="list-style-type: none"> • be able to solve problems involving vertical motion under gravity. • understand and be able to use Newton’s second law for motion in a straight line (restricted to forces in two perpendicular directions or simple cases of forces given as 2D (i, j) vectors.); • understand and use Newton’s third law; equilibrium of forces on a particle and motion in a straight line; application to problems involving smooth pulleys and connected particles.
<p>Term 4 Pure Integration Exponentials and logs</p>	<ul style="list-style-type: none"> • Algebraic manipulation • Differentiation <p>Covered so far</p> <ul style="list-style-type: none"> • Indices 	<p>Pure Assessment</p> <p>Marking Policy</p>	<ul style="list-style-type: none"> • know and be able to use the Fundamental Theorem of Calculus; • be able to integrate x^n (excluding $n = -1$), and related sums, differences and constant multiples. • be able to evaluate definite integrals;

<p>Applied</p> <p>Kinematics 2 (variable acceleration)</p>	<p><u>GCSE (9-1) in Mathematics at Higher Tier</u> R16 Compound interest</p> <p><u>GCSE (9-1) in Mathematics at Higher Tier</u> A11 Identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically and turning points by completing the square A14 Plot and interpret graphs (including reciprocal graphs and exponential graphs) and graphs of non-standard functions in real contexts to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration A15 Calculate or estimate gradients of graphs and area under graphs (including quadratic and non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts</p> <p><u>AS Mathematics – Pure Mathematics content</u> 7, 8 Differentiation and integration of polynomials (See Units 6 and 7 of the SoW)</p>		<ul style="list-style-type: none"> • be able to use a definite integral to find the area under a curve. • be able to use calculus (differentiation) in kinematics to model motion in a straight line for a particle moving with variable acceleration; • understand that gradients of the relevant graphs link to rates of change; • know how to find max and min velocities by considering zero gradients and understand how this links with the actual motion (i.e. acceleration = 0). • be able to use calculus (integration) in kinematics to model motion in a straight line for a particle moving under the action of a variable force; • understand that the area under a graph is the integral, which leads to a physical quantity; • know how to use initial conditions to calculate the constant of integration and refer back to the problem.
<p>Term 5</p> <p>Pure</p> <p>Exponential and Logs</p> <p>Past papers and practice</p>		<p>Marking Policy</p>	<ul style="list-style-type: none"> • know and be able to use the function a^x and its graph, where a is positive; • know and be able to 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;

<p>Applied Past Paper and practice</p>			<ul style="list-style-type: none"> • know and be able to use the definition of $\log_a x$ as the inverse of a^x, where a is positive and $x \geq 0$; • know and be able to use the function $\ln x$ and its graph; • know and be able to use $\ln x$ as the inverse function of e^x; • understand and use the laws of logarithms:
<p>Term 6 Exams week 1-2</p>	<p>END OF AS CONTENT A LEVEL CONTENT BEGINS</p>	<p>AS Level Mock Assessment Marking Policy</p>	

Additional Features

- **Student will complete the transition documents as they enter the AS Course. This will prepare students to “hit the ground running”.**
- **Students use the A level Casio Classwiz. The Maths Department feel has adequate power for the A Level Mathematics course. Only Further Maths students are recommended to purchase the Casio ClassPad.**

