

KS5 Mathematics

The Maths department follows the Edexcel A2 Level curriculum at Key Stage 5. Students can be entered for AS Level exams in the summer of year 12 and we hope all students continue to complete the A2 Level exams in the summer of year 13. The course is split between Pure and Applied Mathematics

Qualification at a glance

Content and assessment overview

The Pearson Edexcel Level 3 Advanced GCE in Mathematics consists of three externally-examined papers.

Students must complete all assessment in May/June in any single year.

Paper 1: Pure Mathematics 1 (*Paper code: 9MA0/01)

Paper 2: Pure Mathematics 2 (*Paper code: 9MA0/02)

Each paper is:

2-hour written examination

33.33% of the qualification

100 marks

Content overview

- Topic 1 – Proof
- Topic 2 – Algebra and functions
- Topic 3 – Coordinate geometry in the (x, y) plane
- Topic 4 – Sequences and series
- Topic 5 – Trigonometry
- Topic 6 – Exponentials and logarithms
- Topic 7 – Differentiation
- Topic 8 – Integration
- Topic 9 – Numerical methods
- Topic 10 – Vectors

Assessment overview

- Paper 1 and Paper 2 may contain questions on any topics from the Pure Mathematics content.
- Students must answer all questions.
- Calculators can be used in the assessment.

Paper 3: Statistics and Mechanics (*Paper code: 9MA0/03)

2-hour written examination

33.33% of the qualification

100 marks

Content overview

Section A: Statistics

- Topic 1 – Statistical sampling
- Topic 2 – Data presentation and interpretation
- Topic 3 – Probability
- Topic 4 – Statistical distributions
- Topic 5 – Statistical hypothesis testing

Section B: Mechanics

- Topic 6 – Quantities and units in mechanics
- Topic 7 – Kinematics
- Topic 8 – Forces and Newton's laws
- Topic 9 – Moments

Assessment overview

- Paper 3 will contain questions on topics from the Statistics content in Section A and Mechanics content in Section B.
- Students must answer all questions.
- Calculators can be used in the assessment.

Year 12 Pure Mathematics

- Algebraic Expressions – expanding brackets, factorising expressions, laws of indices and surds
- Quadratic functions – solve quadratic functions, sketch graphs, use the discriminant
- Equations and Inequalities – solve linear and simultaneous equations, solve linear and quadratic inequalities
- Graphs and Transformations – sketch curves, understand and recognise functions, understand the effect of different transformations on graphs
- Straight Line Graphs – equation of straight lines, parallel and perpendicular lines, coordinate geometry in the 2D plane
- Circles – midpoint of line segment, equation of circles, chords and tangents
- Algebraic methods – algebraic long division, use the factor theorem, factorise cubic expressions, use proof
- The Binomial Expansion – use and understand the binomial expansion

- Trigonometric Ratios – use sine and cosine rules, find the area of a triangle, solve problems in 2D and 3D
- Trigonometric Identities – use identities to solve trigonometric equations
- Vectors – use vectors in 2 dimensions, calculate the magnitude of a vector, understand and visualise position vectors, calculate the distance between two points using position vectors
- Differentiation – understand derivatives as the gradient of the tangent of a curve, differentiation from first principles, find the equation of tangents and normals, understand the second derivative.
- Integration – evaluate definite integrals and understand the integral to be the area under a curve
- Exponentials and Logs – graphs and functions, laws of logs, solve equations using logs and exponentials,
- Algebraic Methods – simplify rational expressions, decompose into partial fractions,

Year 12 Applied Mathematics

- Data Collection – populations and samples, sampling techniques, critique different sampling methods
- Measures of Spread – mean median and mode, calculate standard deviation, variance and interpercentile range, understand and use coding
- Representation of data – recognise outliers, draw and interpret cumulative frequency diagrams, box plots and histograms
- Correlation – interpret scatter diagrams, regression lines for bivariate data, make predictions using regression lines,
- Probability – understand and use language and symbols associated with set theory, draw and interpret Venn diagrams, mutually exclusive and independent events, draw and calculate using Tree diagrams
- Distributions – discrete and uniform distributions, calculate probabilities using binomial distribution
- Hypothesis Testing – 1 tail test, 2 tail test, critical value, critical region, p value and acceptance of regions
- Modelling Mechanics – understand common assumptions used to model mechanics, vector and scalar quantities
- Constant Acceleration – understand graphs of kinematics (displacement against time, velocity against time and interpret gradients and area under the graph
- Forces and Motion – draw force diagrams, resultant forces using vectors, Newton's Laws

- Understand weight and motion in a straight line under gravity, equilibrium of forces, application for problems involving pulleys and connected particles
- Variable Acceleration – understand displacement, velocity and acceleration as a function of time.
- Use calculus to determine the rates of change for kinematic problems
- Use calculus to solve problems involving maxima and minima
- Use integration for kinematic problems
- Radians – convert between degrees and radians, know exact values of angles measured in radians, work with radian measure for arc length and sectors of circles,

Year 13 Pure Mathematics

- Algebraic Methods - split into partial fractions, use polynomial long division to split an improper fraction into partial fractions
- Functions and Graphs - use the modulus of a linear function, use composite and inverse functions and understand their graphs, understand the effect of simple transformations on the graph of $y = f(x)$ and use a combination of transformations.
- Sequences and Series - work with increasing and decreasing sequences, find the sum of a sequence, work with both arithmetic and geometric sequences and find the sum to infinity of a convergent sequence. Use sequences and series in modelling.
- Binomial Expansion - understand and use the binomial expansion of $(a + bx)^n$ and use the binomial expansion to give approximations,
- Radians - work with radian measure including arc length and area of a sector
- Trigonometric Functions - know and use exact values of sin and cos, understand and use sec, cosec and cot functions and know relationships with arcsin, arccos and arctan, understand the graphs of these functions along with their range and domain, use trigonometric functions and identities to solve problems in context.
- Parametric Functions - understand the difference between cartesian and parametric systems, convert between cartesian and parametric forms, sketch and plot graphs of parametric functions,
- Differentiation - differentiate from first principles including trigonometric functions, use second derivatives as the rate of change of a gradient, differentiate using the product rule, the quotient rule and the chain rule, differentiate implicit and parametric functions, construct differential equations
- Numerical Methods - locate roots by considering changes of sign in an interval of x , solve equations using iteration methods,
- Integration - use trigonometric identities to integrate functions, use a definite integral to find the area under a curve and the area between two curves, use

integration by substitution and by parts, integrate using partial fractions, solve differential equations using integration

- Vectors - extend work on vectors into 3 dimensions using i , j and k notations, calculate the magnitude of a 3D vector, understand and use position vectors and calculate the distance between two 3D points.

Year 13 Applied Mathematics

- Regression, correlation and hypothesis testing - change the variable in a regression, estimate values in a regression line, understand the coefficient correlation, calculate the PMCC,
- Conditional Probability - understand and use the probability formula using set notation, use tree diagrams, Venn-diagrams and two way tables, critique assumptions made and the likely effect of more realistic assumptions
- The Normal Distribution - find probabilities using the Normal distribution, know the position of the points of inflection of a normal distribution, find the mean and variance of a Binomial distribution, understand and apply a continuity correction, use the Normal distribution as an approximation to the Binomial distribution.
- Moments - realise that a force can produce a turning effect, understand that the force and distance must be perpendicular to each other, draw mathematical models to represent horizontal rod problems, understand how a system can remain in equilibrium, solve problems when a bar is on the point of tipping
- Forces and Friction - represent forces on a force diagram, find the resultant force by vector addition, resolve a force into components and select suitable directions for resolution,
- Projectiles - find the time of flight of a projectile, find the range and maximum height of a projectile, derive formulae to find the greatest height, time of flight and horizontal range, know how to modify projectile equations to take account of the height of its release
- Application of Forces - understand equilibrium, vectors representing forces in equilibrium form a closed polygon, solve problems involving equilibrium of a particle under coplanar forces, solve static problems, know and understand Newton's second law,
- Further Kinematics - write positions, velocities and accelerations in vector form, find the magnitude and direction of a vector, use velocity triangles to solve problems, use suvat formula for constant acceleration,