Mathematics Key Stage 5 Learning Journey

Year 13

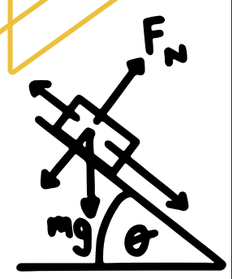
Mechanics: Application of Forces
- Static particles
- Static rigid bodies
- Dynamic and inclined planes
- Connected particles

Pure: More Differentiation & Integration
- Chain, product & quotient rule
- Implicit differentiation
- Integration by substitution & parts

$$\frac{d}{dx}(ax) = a$$

Statistics: Correlation & Distribution
- Measuring correlation
- Normal distribution
- Finding σ and μ
- Hypothesis testing

Mechanics: Moments, Projectiles & Further Kinematics
- Horizontal & vertical components
- Projection motion formula
- Vectors in kinematics



Year 13 Overview

Year 2 introduces advanced mathematical concepts and complex calculus methods. The applied modules elevate statistical analysis to include the Normal distribution, while mechanics expands into projectile motion and rotational forces.

Pure: More Binomial Expansion
- Expanding $(1 + x)^n$
- Expanding $(a + bx)^n$
- Using partial fractions

Pure: Parametric Equations
- Parametric equations
- Using tigonometric identities
- Curve sketching and points of intersection

Pure: More Vectors
- 3D coordinates
- Vectors in 3D
- Solving geometric problems
- Application to mechanics

Mechanics: Forces & Friction
- Resolving forces
- Inclined planes
- Friction

Pure: Sequences & Series
- Arithmetic sequences and series
- Geometric sequences and series
- Sum to infinity & sigma

$$(x + a)^n = \sum_{k=0}^{n} \binom{n}{k} x^k a^{n-k}$$

Statistics: Data Handling
- Data collection
- Measures of location & spread
- Variance & standard deviation

Pure: Radians & Trigonometric Functions
- Radians
- Sec, cosec and cot
- Trig identities & equations
- Addition formulae

Pure: Functions & Graphs
- Modulus function
- Functions and mappings
- Composite and inverse functions

$$\sin^2\theta + \cos^2\theta = 1$$



Year 12

Pure: Exponentials & Logarithms
- Exponential functions & modelling
- $y = e^x$
- Laws of logarithms
- Natural logarithms

Mechanics: Forces & Motion
- Force diagrams
- Forces as vectors
- Motion in two directions
- Connected particles
- Pulleys

Pure: Vectors
- Representing vectors
- Magnitude & direction
- Position vectors
- Modelling with vectors

Pure: Differentiation & Integration
- Differentiating to find gradient and stationary points
- Indefinite & definite integrals
- Areas unders curves

Pure: Trigonometry
- Non-right angle trigonometry
- Graphs of trig functions
- Trigonomatric identities & equations

$$a^{\log_a x} = x$$

Year 12 Overview

Year 1 bridges the gap from GCSE by expanding algebraic fluency into advanced topics like calculus, coordinate geometry, and trigonometric identities. In the applied section, students learn how to analyze real-world data distributions, conduct basic statistical hypothesis tests, and mathematically model the behavior of moving objects.

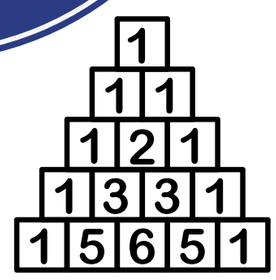
Pure: Binomial Expansion
- Pascal's triangle
- Factorial Notation
- Binomial expansion & estimations

Statistics: Discrete & Binomial Distributions
- Probability distributions
- Binomial distributions
- Cumulative probabilities

Mechanics: Modelling in Mechanics
- Constructing a model
- Modelling assumptions
- Quantities and units
- Working with vectors

Mechanics: Constant & Variable Acceleration
- Displacement-time & velocity-time graphs
- Constant acceleration
- Gravity

$$F = ma$$



Pure: Algebraic Methods
- Fractions
- Dividing polynomials
- Factor theorem
- Mathematical proof

Pure: Cirlces
- Equation of a circle
- Bisectors & intersections
- Tangent & Chords
- Circles & triangles

Pure: Straight Line Graphs
- Equations of straight line graphs
- Parallel & perpendicular
- Length & Area
- Modelling

Pure: Graphs & Transformations
- Cubic, Quartic & Reciprocal graphs
- Points of intersection
- Graph transformations

Statistics: Probability
- Calculating using Venn & tree diagrams
- Mutually exclusive & independent events

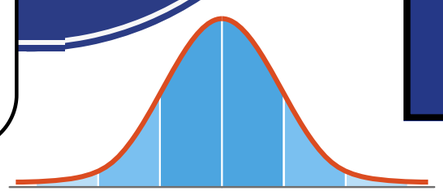
$$y = ax^2 + bx + c$$

Year 12

Pure: Algebraic Expressions
- Algebraic manipulation
- Surds
- Indices

Pure: Quadratics
- Solving equations
- Completitng the square
- Functions & graphs
- Discriminant

Pure: Equations & Inequalities
- Simultaneous equations
- Inequalities
- In graph form



"Pure mathematics is, in its way, the poetry of logical ideas."

Albert Einstien