

YEAR 12 A-LEVEL MATHS CONTENT

Algebra and Functions (Y1 Ch 1) <ul style="list-style-type: none"> Expanding, factorising and simplifying expressions including quadratics 	Algebra and Functions <ul style="list-style-type: none"> Rules of indices (Y1 Ch 1)
Quadratic Functions (Y1 Ch 2) <ul style="list-style-type: none"> Plotting and solving by factorisation 	Algebra and Functions <ul style="list-style-type: none"> Use and manipulation of Surds Rationalising denominators (Y1 Ch 1)
Quadratic Functions (Y1 Ch 2) <ul style="list-style-type: none"> Completing the square Solving by completing the square 	Algebra <ul style="list-style-type: none"> algebraic fractions long division (Y1 Ch 7)
Quadratic Functions (Y1 Ch 2) <ul style="list-style-type: none"> Solving with formula . discriminant Sketching quadratics Modelling with quadratic funcs 	Algebra - factor theorem (Y1 Ch 7)
Equations and Inequalities (Y1 Ch 3) <ul style="list-style-type: none"> Linear inequalities Quadratic inequalities 	Co-ordinate Geometry <ul style="list-style-type: none"> Equation and gradient of a straight line (Y1 Ch 5)
Equations and Inequ (Y1 Ch3) <ul style="list-style-type: none"> simultaneous eqns by elimination/ substitution linear-quadratic similt eqns inequality regions 	Co-ordinate Geometry <ul style="list-style-type: none"> Using the form $y-y_1=m(x-x_1)$ Parallel and Perpendicular lines distance between points, mid-points (Y1 Ch 5)
Sine and Cosine Rule <ul style="list-style-type: none"> All aspects of GCSE Trig (Y1 Ch 9) 	Coordinate geometry - equation of a circle (Y1 Ch 6)
Radian Measure (Y2 Ch 6) <ul style="list-style-type: none"> Intro to Radians, Arc length 	Coordinate geometry - inresections of lines and circles Properties of chords and troangles in circles (Y1 Ch 6)
Radian Measure <ul style="list-style-type: none"> Area of segments (Y2 Ch 6) 	Binomial Expansion <ul style="list-style-type: none"> Pascal's triangle, binomial coefficients Expanding $(a+bx)^n$ (Y1 Ch 8)
Graphs of Trigonometric Functions <ul style="list-style-type: none"> Extend beyond 90°, Sin, Cos, Tan and simple transformations (Y1 Ch 9) 	Binomial Expansion <ul style="list-style-type: none"> Link to binomial probabilities (Y1 Ch 8)

<p>Trig Identities and simple equations</p> <ul style="list-style-type: none"> • Simple trig identities (Y1 Ch 10) 	<p>Binomial Theorem: fractional and negative index (Y2 Ch4 - not 4.4)</p>
<p>Solving trig equations: multiple solutions, ranges and use of identities (Y1 Ch 10)</p>	<p>Binomial Theorem: exam style questions (Y1 Ch 8, Y2 Ch 4)</p>
<p>Differentiation</p> <ul style="list-style-type: none"> • Intro – gradient of tangents etc.... • First-principles derivation for small powers of x (Y1 Ch 12) 	<p>Vectors: vector arithmetic (Y1 Ch 11)</p>
<p>Differentiation</p> <ul style="list-style-type: none"> • Formula for gradient of x^n (Y1 Ch 12) 	<p>Vectors: position vectors, basis vectors, Cartesian components (Y1 Ch 11)</p>
<p>Differentiation: simple functions, more complex functions, (including simplifying to make them easier to differentiate)</p> <ul style="list-style-type: none"> • Second order derivatives (Y1 Ch 12) 	<p>Vectors: Use vectors to solve problems in pure maths and in context (Y1 Ch 11)</p>
<p>Differentiation</p> <ul style="list-style-type: none"> • Rates of change • Equations of tangents and normals to a curve at a point (Y1 Ch 12) 	<p>Sketching Curves</p> <ul style="list-style-type: none"> • Sketching and interpreting graphs of cubic functions • Sketching reciprocal functions <p>horizontal/vertical asymptotes (Y1 Ch 4)</p>
<p>Differentiation - increasing/decreasing functions, stationary points (Y1 Ch 12)</p>	<p>Sketching Curves</p> <ul style="list-style-type: none"> • Link to the solution of equations <p>Understand and use proportional relationships (Y1 Ch 4)</p>
<p>Differentiation - max/min turning points, points of inflection. Solving problems (Y1 Ch 12)</p>	<p>Sketching Curves</p> <ul style="list-style-type: none"> • The effect of transformations $f(x+a)$, $f(x-a)$ and $f(x) + a$ • The effect of the transformations $f(ax)$ and $af(x)$ (Y1 Ch 4)
<p>Integration as the reverse of differentiation</p> <ul style="list-style-type: none"> • Integrating x^n • Integrating simple expressions and using the integral sign (Y1 Ch 13) 	<p>Exponentials and Logarithms -</p> <ul style="list-style-type: none"> • graphs of exponentials • natural exponential - gradient property (Y1 Ch 14)
<p>Integration</p> <ul style="list-style-type: none"> • Simplifying expressions before integrating • Finding the constant of integration (Y1 Ch 12) 	<p>Exponentials and Logarithms - introduction to logs, laws of logs, solving log and exp equations (Y1 Ch 14)</p>

Definite integration - areas under a curve Areas between curves (Y1 Ch 13)	Exponentials and Logarithms - solving exam style questions with logs/exps (Y1 Ch 14)
Sampling and populations: sampling techniques, using samples to make inferences about the population (STM Y1 Ch 1)	Logarithmic Graphs - use of log-log plots to identify power in power relations (Y1 Ch 14)
Measures of location: mean, mode, median; calculations from frequency tables (STM Y1 Ch 2)	Exponential growth modelling: e.g. compound interest, population growth etc) (Y1 Ch 14)
Measures of dispersion: range, quartiles, percentiles; standard deviation; (STM Y1 Ch 2)	Units: Understand and use fundamental units in SI system. • derived units (STM Y1 Ch 8)
Measures of dispersion: coding, exam type questions (STM Y1 Ch 2)	Kinematics: introduction to language of mechanics, speed/distance-time graphs (STM Y1 Ch 9)
Representing data: histograms, stem and leaf, box plots, outliers, skewness Clean data: dealing with missing data, outliers and errors. (STM Y1 Ch 3)	Kinematics: constant acceleration, suvat (STM Y1 Ch 9) suavt with vectors (M2 Ch 1)
Correlation/Regression: scatter graphs, correlation vs causation, connecting variables, interpreting coefficients (STM Y1 Ch 4)	Calculus in kinematics: time-varying acceleration, including vectors (STM Y1 Ch 11)
Probability: vocabulary, Venn diagrams, probability formulae Mutually exclusive/independent events (STM Y1 Ch 5)	Gravity: understand weight and calculate motion in straight line under gravity (vertical projectile) (STM Y1 Ch 9)
Probability: Conditional probability and tree diagrams (STM Y1 Ch 5, STM Y2 Ch 2)	Concept of forces, Newton's First Law Dynamics: Newton's Second Law, using $F=ma$ (STM Y1 Ch 9)
Probability: modelling with probability, critiquing assumptions made. (STM Y1 Ch 5)	Resolving forces into components (2D), forces given as vectors (STM Y1 Ch 10)
Sequences and Series • Introduction and nth terms • Recurrence Relationships • increasing and decreasing sequences (Y2 Ch 3)	Newton's Third Law, particles in equilibrium, connected particles and pulleys (STM Y1 Ch 10)

Sequences and Series <ul style="list-style-type: none"> • Sum of n terms of an arithmetic series • Using Sigma notation (Y2 Ch 3)	Mathematical proof: methods of proof including proof by deduction (Y1 Ch 7)
Geometric Sequences and Series <ul style="list-style-type: none"> • nth term, Sum and Sum to Infinity Modelling with sequences and series (Y2 Ch 3)	Mathematical proof: methods of proof including proof by exhaustion, disproof by counter example (Y1 Ch 7)

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Geometric Sequences and Series, general sequences (sigma notation) <ul style="list-style-type: none"> • Sum and Sum to Infinity (Y2 Ch 3)	Mathematical proof: methods of proof including proof by deduction, exhaustion, disproof by counter example (Y1 Ch 7)
Algebraic fractions: multiplying dividing, add/subtract/simplify (Y2 Ch 1)	Mathematical proof: methods of proof including proof by contradiction (Y2 Ch 1)
Dividing algebraic fractions (Y2 Ch 1)	Trigonometry: sec x, cosec x, cot x , arcsin x, arccos x, arctan x- graphs of functions (Y2 Ch 6)
Partial fractions: decompose rational functions into partial fractions. Binomial application - need more time (Y2 Ch 1)	Trigonometry: sec x, cosec x, cot x - simplifying, proving identities ($1+\tan^2x=\sec^2x$ and $1+\cot^2x=\operatorname{cosec}^2x$) and solving equations (Y2 Ch 6)
Discrete Random Variables: probability distributions, sum rules, <ul style="list-style-type: none"> • discrete uniform distribution (STM1 Ch 6)	Trigonometry: sum/difference formulae. Applications to expressions, proving identities/solving equations (Y2 Ch 7)
Binomial Distribution <ul style="list-style-type: none"> • conditions/properties of binomial distribution • pdf and cdf from calculators (STM1 Ch 6)	Trigonometry: double angle formulae. Applications to expressions, proving identities/solving equations. (Y2 Ch 7)
Hypothesis testing <ul style="list-style-type: none"> • concept • significance testing, one and two tail tests, critical values, null hypothesis, alternative hypothesis, p-value (STM1 Ch 7)	Trigonometry: write combinations as $R\sin(x+\theta)$, $R\cos(x+\theta)$, factor formulae. Problem Solving (Y2 Ch 7)
Hypothesis testing <ul style="list-style-type: none"> • hypothesis test with Binomial distribution (STM1 Ch 7)	Parametric Equations: parametric curves, converting to Cartesian (Y2 Ch 8)

Small angle approximations Exact Values (Y2 Ch 5.5)	Parametric Equations: modelling, problem solving (Y2 Ch 8)
First principles: differentiate $\sin x$ and $\cos x$ from first principles; Second derivatives: convex, concave and points of inflection. (Y2 Ch 9)	Vectors: Review Y12 work and extend to 3 dimensions (Y1 Ch11, Y2 Ch 12)
Differentiation: exponentials, logs, $\sin x$, $\cos x$, $\tan x$ (Y2 Ch 9) Integration: reverse of differentiation	Vectors: Review Y12 work and extend to 3 dimensions (Y1 Ch11, Y2 Ch 12)
Differentiation: Chain rule/product rule/quotient rule (Y2 Ch 9)	Newton's Third Law, particles in equilibrium, connected particles and pulleys (STM Y1 Ch 10)
Parametric Equations: differentiating parametric equations (Y2 Ch 9)	Dynamics: resolving forces, coefficient of friction (STM2 Ch 5)
Differentiation: implicit differentiation. (Y2 Ch 9)	Moments: moments of a force, sum of moments (STM2 Ch 4)
Differentiation: differential equations. Review differentiation methods. (Y2 Ch 9)	Rigid Bodies: moments of forces, problems of equilibrium (STM2 Ch4)
Integration: standard functions, trig functions., substitution - $ax+b$ rule (Y2 Ch 11)	Model motion under gravity in a vertical plane using vectors. Projectiles (STM2, Ch 6)
Integration: using identities and partial fractions (Y2 Ch 11)	Statics: particles on a slope, limiting equilibrium (STM2 Ch 7)
Integration: integration by parts (Y2 Ch 11)	Statics: rigid bodies, moments and forces (STM2 Ch 7.4)
Integration: further substitutions (Y2 Ch 11)	Dynamics and inclined planes, connected particles (pulleys) (STM2 Ch 7.5, 7.6)
Solving differential equations (Y2 Ch 11)	Functions: mappings. Domain, range and graphs. (Y2 Ch 2)
Integration: interpret solutions to differential equation. Definite integration between two curves (recap). Integration as limit of sum. (Y2 Ch 11)	Composite functions. Inverse functions (Y2 Ch 2)

Normal distribution function: shape, symmetry, calculator tables (STM2 Ch 3)	Transforming graphs: modulus function, solving equation with modulus. Transforming graphs: combinations of transformations (Y2 Ch 2)
Normal Distribution: solving problems, forwards, reverse and with simultaneous equations, Standard normal (STM2 Ch 3)	Functions in Modelling: trig functions, exponentials, reciprocal (inverse proportion) (Y2 Ch 2, Y1 Ch 14, Y1 Ch 2)
Normal Approximation - continuity correction - use as an approximation Select appropriate distribution (STM2 Ch 3)	Numerical methods: graphical (change of sign). Newton-Raphson method including understanding of failure. (Y2 Ch 10)
Correlation: pmcc/regression with logs. Formulate hypothesis test on correlation coefficient (STM2 Ch 1)	Numerical methods: algebraic methods (iteration) including understanding of convergence (Y2 Ch 10)
Hypothesis testing for a normal distribution with known variance. (STM2 Ch 3.7)	Trapezium Rule: Use numerical methods to solve problems in context including interpretation of numerical integration limits (Y2 Ch 11)

References in brackets are to Pearson Textbooks, Year 1 (Y1), Year 2 (Y2), Statistics and Mechanics Year 1 (STM1) and Statistics and Mechanics (STM2)