Curriculum Overview

Maths

KS3

	Year 7	Year 8	Year 9
Half term 1	**Numerical Skills** Rounding, Estimation, Comparing & Ordering numbers, Directed Numbers **Order of Operations** Division & Multiplication before Addition & Subtraction, Left to Right, Prioritising Indices & Roots, Prioritising Brackets, Prioritising Groups **Intro to Algebra** Simplifying Expressions, Collecting Like Terms, Substitution with positive & negative integers, Substitution into Formulae, Solving equations, One-step rearranging	**Powers & Roots** Powers, Roots, Calculations with powers and roots **Prime Factorisation** Properties of numbers, Prime Factor Decomposition **Rounding** Rounding Review, Significant Figures **Fractions** Multiplying, Dividing, Working with a calculator	**Decimals** Addition, Subtraction, Multiplication, Division, Order of Operations **Estimation** Estimation, Truncation, Limits of Accuracy **Related Calculations** Multiplication, Division, Inverse Operations **HCF & LCM** Prime Factor Decomposition, HCF & LCM using Venn diagrams **Fractions** Addition, Subtraction, Multiplication, Division, Fraction of an Amount
Half term 2	**Primes, Factors & Multiples** Prime Numbers, Factors, HCF, Multiples, LCM, Divisibility Tests **Expanding & Factorising**	**Solving Equations** Solving one-step equations, Solving two-step equations, Solving multi-step equations, forming and solving **Angles in parallel lines** Type of Angle, Multi-step problems	**Algebraic Manipulation** Simplifying expressions, Algebraic Fractions **Index Laws** Rules of Index Laws (integer, fractional, negative)

	Expanding a single bracket, expanding and simplifying, factorising expressions **Addition & Subtraction** Adding & subtracting integers, Advanced subtraction, adding and subtracting decimals, two-way tables **Perimeter** Counting squares, adding lengths (integers & decimals)	**Circumference** Circles, part circles	**Standard Form** Converting to and from Standard Form, Addition, Subtraction, Multiplication, Division, Standard Form using a Calculator **Expanding & Factorising** Expanding a single bracket, expanding double bracket, factorising quadratics
Half term 3	**ASSESSMENT 1** **Mean** Calculating mean, reverse mean **Multiplication & Division** Mental Methods, Long multiplication, short division, division with decimals **Area of Rectangles & Triangles** Area of Quadrilaterals, Area of Triangles, Area of Compound Shapes, Area with Mixed Units	**ASSESSMENT 1** **Direct Proportion** Multiplicative reasoning, Recipes and Best Buys **FDP** Fractions review, Fraction Decimal Percentage Conversion, Ordering Fractions, Decimals and Percentages **Percentages** Percentage of Amounts, Percentage Increase/Decrease	**ASSESSMENT 1** **Forming Expressions** Function Machines, Forming Expressions and Formulae **Substitution** Substitution into Expressions, Substitution into Formulae **Direct & Inverse Proportion** Unitary Method, Best buys, recipes, Exchange Rates, Inverse Proportion, Conversion Graphs **Probability** Probability Scale, Systematic Listing, Product Rule for Counting, Single Event Probability, Relative Frequency, Expected Outcomes, Frequency Trees, Sample Space, Venn Diagrams
Half term 4	**Fractions** Fractions from diagrams, equivalent fractions, Improper Fractions and Mixed Numbers, Adding and subtracting Fractions, Comparing	**Ratio** Writing and Simplifying Ratios, Sharing in a ratio, Combining ratios **Area of Circle**	**Solving Equations** One step, two step, subject in the denominator, negative unknown, multistep, brackets and fractions,

	and Ordering Fractions, Values between two Fractions, Fraction of Amounts	Circles, part circles, combining shapes, circumference and area	unknown on both sides, substituting and solving **Inequalities** Drawing an inequality on a number line, Writing an inequality on a number line, integer solutions to an inequality, solving inequalities, solving compound inequalities **Sequences** Unique sequences, term to term rule, finding terms, finding the nth term **Pythagoras** Finding the hypotenuse, Finding the shorter side, Is this triangle right angled, isosceles triangles, Pythagoras in context, multistep pythagoras
Half term 5	**Polygons** Properties of Polygons, Line Symmetry, Rotational Symmetry **Angles** Using a Protractor, Calculating missing angles, Multi-step problems **Coordinates** Reading and Plotting, Midpoints, Basic Graphs	**Statistics** Grouping Data, Pictograms, Bar Graphs, Line Graphs, Pie Charts **Averages and Spread** Mean, Median, Mode, Range	**Int & Ext Angles** Angles in triangles, Angles in quadrilaterals, Interior & Exterior Angles (numerical & algebraic), Tessellation **Vectors** Writing a vector from a line segment, adding & subtracting vectors, multiplying vectors, drawing resultant vectors, parallel vectors **Transformations** Reflection, Rotation, Translation, Enlargement, Combined
Half term 6	**Time** Analogue clocks, Digital Clocks, 12 & 24 Hour, Timetables	**3D Visualisation** Properties of 3D Shapes, Nets **Volume** Units of Volume and Capacity, Volume of Prisms, Volume of Other Solids	**Plans & Elevations** Typical 3D shapes, Irregular 3D shapes, sketching 3D shapes from plans and elevations **Arcs & Sectors**

	ASSESSMENT 2	**ASSESSMENT 2**	Circumference & arc length, compound perimeter, area of circles & sectors, compound area, problem solving **Surface Area** Cubes & Cuboids, Prisms, Cylinders, Cones, Spheres **ASSESSMENT 2**

Curriculum Overview

Maths

KS4

	Year 10	Year 11
Half term 1	**Re-arranging formulae** F/H - One-step, two-step, multistep **Linear Graphs** F/H - Plotting linear graphs, equation of a line, identifying gradient and y-intercept, midpoints, parallel lines H – Perpendicular Lines **Simultaneous Equations** F/H - Solving by elimination, solving by substitution, simultaneous equations in context **Volume** F/H - Cones, pyramid, frustums, spheres, units	**Algebra Review (F)** Substitution Simplify and manipulate algebraic expressions, Expanding and factorising (single bracket), Rearranging formulae, Solve linear equations in one unknown, Solve linear inequalities in one unknown, Deduce expressions to calculate the n^{th} term of linear sequences **Trigonometry (F)** Labelling sides, Sin Cos Tan, Finding missing sides, finding missing angles, isosceles triangles, combined triangles and polygons, exact values **Similar Shapes (F)** Intro to similarity, finding missing lengths, finding lengths using fractions, similar triangles involving ratio, area of similar shapes, volume of similar solids, solving length, area, volume problems **Recurring Decimals (H)** Identifying recurring or terminating decimals, recurring decimals to fractions, calculations with recurring decimals **Quadratic Sequences (H)** Finding terms, find the nth term, arithmetic and geometric sequences **Simultaneous Equations (H)** Solving linear and non-linear simultaneous equations
Half term 2	**Compound Measures** F/H - Distance, Speed, Time, Combined speeds, converting units of speed, distance-time graphs, density, mass, volume, pressure, force & area **Quadratics – Graph**	**ASSESSMENT 2** **Congruence (F)** Congruence rules **Constructions (F)** Perpendicular bisectors, angle bisectors, constructing angles, triangles and parallelograms, Loci, Loci Regions

	F/H - Plotting quadratic graphs, identifying features of a quadratic graphs, finding approximate solutions using the graph **Quadratics – Algebra** F/H - Factorising quadratic expressions, solving quadratic equations by factorising, sketching quadratics H - completing the square, finding turning points, quadratic formula, simplifying algebraic fractions, algebraic fractions (adding, subtracting, multiplying, dividing), solving algebraic fractions **Further Graphs** F/H - recognising and plotting cubic graphs, reciprocal graphs, direct & inverse proportion H - sketching cubics, exponential graphs, equation of a circle, Triple brackets	**Trigonometry (H)** Area of a triangle, Sine Rule, Cosine Rule, 3D Trigonometry, Trigonometric Graphs **Inequalities (H)** Graphing inequalities and shading regions, quadratic inequalities **Functions (H)** Intro to functions, Composite Functions, Inverse Functions, Function problems creating equations
Half term 3	**ASSESSMENT 1** **Probability** F/H - Increasing sample size, Tree Diagrams, Venn Diagrams, H - Conditional probability, probability of at least 1 **Statistics** Types of data, sampling and bias, problem solving mean, combined means, comparing and choosing averages, mean from a frequency table, time series, pie charts, scattergraphs **H - Cumulative Frequency & Box Plots** Quartiles, Box Plots, Cumulative Frequency	**Iteration (H)** Introducing to iteration, Using iteration to find a solution **Algebraic Proof (H)** Proof from equivalent statements, Proof from given terms, Proof from given statements **Circle Theorems (H)** Angle at the centre is twice the angle at the circumference, angles in a semi-circle, angles in the same segment are equal, opposite angles in a cyclic quadrilateral add up to 180, alternate segment theorem, tangent and radius meet at a right angle, two tangents froma point outside the circle are equal, perpendicular bisector of a chord, circle theorem proofs **Histograms (H)** Drawing Histograms, Completing and interpreting histograms
Half term 4	**Growth & Decay** F/H - Repeated percentage change, compound interest, comparing compound and simple interest, depreciation, exponential growth, exponential decay **Ratio**	**ASSESSMENT 2** **Vectors (H)** Geometry resultant vectors, midpoints, ratios, parallel vectors, collinear vectors, unknown scalar

	F/H - Simplifying, Ratio to fraction, sharing in a ratio, Combining ratios, splitting a ratio, change within a ratio, ratio to linear functions H - complex multistep ratio **H - Similar Shapes** Intro to similarity, finding missing lengths, finding lengths using fractions, similar triangles involving ratio, area of similar shapes, volume of similar solids, solving length, area, volume problems	**Gradients (H)** Equation of a tangent, interpreting and estimating gradients, finding acceleration, estimating the distance travelled **Graphical Transformations (H)** Translations of functions, reflections of functions **Congruence (H)** Congruence rules **Constructions (H)** Intro to similarity, finding missing lengths, finding lengths using fractions, similar triangles involving ratio, area of similar shapes, volume of similar solids, solving length, area, volume problems
Half term 5	**F – Pythagoras** Finding the hypotenuse, Finding the shorter side, Is this triangle right angled, isosceles triangles, Pythagoras in context, multistep pythagoras **F – Bearings** Measuring and Reading bearings, drawing bearings, bearings and angles **H – Proportion** Capture/Recapture, Direct Proportion (linear & non-linear), Inverse Proportion (linear & non-linear), proportion tables, algebraic proportion **H – Surds** Simplifying, addition, subtraction, multiplication, division, expand & simplify, rationalising, perimeter & area **H - Trigonometry** Labelling sides, Sin Cos Tan, Finding missing sides, finding missing angles, isosceles triangles, combined triangles and polygons, exact values	**Revision**
Half term 6	**F - Scale Drawings** Scale drawings **H – Bounds**	**FINAL EXAMS**

	Finding upper and lower bounds, calculations with bounds, suitable degree of accuracy **H – Bearings** Measuring and Reading bearings, drawing bearings, bearings and angles, bearings and trigonometry **H - Transformations** Enlargements (negative scale factors), combined transformations **ASSESSMENT 2**	

Curriculum Overview

Maths

KS5

	Year 12	Year 13

Half term 1	**<u>Pure</u>** **Algebraic Expressions** Index Laws, Expanding brackets, Factorising, Negative and Fractional Indices, Surds **Quadratics** Solving quadratics, completing the square, functions, quadratic graphs, the discriminant, modelling with quadratics **Inequalities** Simultaneous equations, inequalities, inequalities on graphs and regions **Straight Line graphs** $y = mx + c$, parallel and perpendicular lines, length and area, modelling with straight lines **<u>Statistics</u>** **Data Collection** Populations vs samples, Random Sampling, Non-Random Sampling, Types of data, Large Data Set **<u>Mechanics</u>** **Vectors** Working with vectors	**<u>Pure</u>** **Functions** The Modulus Function, Mappings vs Functions, Domain and Range, Composite Functions, Inverse Functions, Transformations **Radians** Find arc length and sector area, Solve trig equations in radians, Small angle approximations **<u>Statistics</u>** **Hypothesis Testing** Writing hypotheses, critical regions, one-tailed test, two tailed test **<u>Mechanics</u>** **Moments** Moments, resultant moments, equilibrium
Half term 2	**<u>Pure</u>** **Circles** Midpoints and perpendicular bisectors, equation of a circle, intersections of straight lines and circles, use tangent and chord properties, circles and triangles **Differentiation** Gradients of curves, finding derivative, differentiating x^n, differentiating quadratics, differentiating functions with two or more terms, tangents and normals, increasing and decreasing functions, second order derivatives, stationary	**ASSESSMENT 4** **<u>Pure</u>** **Trigonometry** Understanding sec, $cosec$, tan and draw their graphs, prove and solve trigonometric functions, Inverse trig functions, addition formulae, double angel formulae, trigonometric modelling **Differentiation** Differentiate trigonometric, exponential and log functions, Use chain, product and quotient rules, Implicit Differentiation, Rates of change **Numerical Methods**

	points, sketching gradient functions, modelling with differentiation **Integration** Integrating x^n, indefinite integrals, finding functions, definite integrals, area under the curve, area under the x-axis, area between curves and lines **Statistics** **Measures of Spread & Location** Mean, Median, Mode, Quartiles, Percentiles, Deciles, Variance & Standard Deviation, Coding **Mechanics** Constant acceleration Displacement-time graphs, velocity-time graphs, constant acceleration formulae, vertical motion under gravity **ASSESSMENT 1**	Locating Roots, Using iteration to approximate roots to $f(x) = 0$, Newton-Raphson Method **Statistics** **Normal Distribution** Characteristics of the Normal Distribution, Finding probabilities on a standard normal curve, Finding unknown means/standard deviations, Binomial → Normal Approximations, Hypothesis Testing **Mechanics** **Moments** Centre of mass, Tilting
Half term 3	**Pure** **Algebraic Methods** Algebraic Fractions, Dividing polynomials, Factor Theorem Proof **Binomial Expansion** Pascal's Triangle, Factorial Notation, Binomial Expansion, solving binomial problems, binomial estimation **Graphs & Transformations** Cubic, Quartic, Reciprocal, Points of intersection, Translating graphs, Stretching graphs, Transforming functions **Statistics** **Representations of Data** Box Plots, Cumulative Frequency, Histograms	**Pure** **Integration** Integration by standard result, Integration by reverse chain rule, Integration by substitution, Integration by parts, Integrating partial fractions, integration as a limit, Trapezium rule, differential equations **Parametrics** Converting from parametric to Cartesian form, Sketching parametric curves, Finding points of intersection, Modelling, Differentiating parametrics, Integrating parametrics **Vectors** Representing vectors, magnitude and direction, position vectors, solving geometric problems, modelling with vectors, Distance between two points, i, j, k notation for vectors, Magnitude of a 3D vector and using it to find angle between vector and a coordinate axis, Application to Mechanics

	Mechanics **Variable accelaration** Functions of time, using differentiation, maxima and minima problems, using integration, constant acceleration	**Statistics** **Regression & Correlation** Correlation, Regression, Exponential Models, Measuring Correlation (PMCC), Hypothesis Testing for no correlation **Mechanics** Projectiles Horizontal projection, Horizontal and Vertical components, projection at any angle, projectile motion formulae
Half term 4	**Pure** **Exponentials & Logs** Exponential functions, $y = e^x$, exponential modelling, logarithms, laws of logs, solving equations with logs, natural logs, logs and non-linear data **Trigonometry** Cosine rule, Sine rule, area of triangles, solving triangle problems, Trigonometric graphs, transforming trigonometric graphs, trigonometric identities, trigonometric equations **Statistics** **Probability** Basic Probability, Venn diagrams, Mutually Exclusive/Independent Events, Tree diagrams **Mechanics** **Forces & Motion** Force diagrams, forces as vectors, forces and acceleration, motion in 2D, connected particles, pulleys **ASSESSMENT 1**	**ASSESSMENT 5** **Revision**
Half term 5	**Pure** **Algebraic Methods** Algebraic Fractions, Partial Fractions	**Revision**

	Binomial Expansion Binomial Expansion for negative/fractional powers, Constant is not 1, Using Partial Fractions **Statistics** **Probability** Set Notation, Venn Diagrams, Formula for Conditional Probability, Tree Diagrams **Mechanics** **Forces & Friction** Resolving forces, inclined planes, friction	
Half term 6	**Pure** **Sequences & Series** Arithmetic Series, Geometric Series, Sigma Notation, Recurrence Relations, Modelling with sequences **Statistics** **Statistical Distributions** Probability Distributions, Binomial Distribution, Cumulative Binomial Probabilities **Mechanics** **Application of forces** Static particles, modelling with statics, friction and static particles, static rigid bodies, dynamics and inclined planes, connected particles **ASSESSMENT 3**	**FINAL EXAMS**

Curriculum Overview

Further Maths

KS5

	Year 12	Year 13
Half term 1	**Core** **Complex Numbers** Imaginary and Complex Numbers, Multiplying complex numbers, complex conjugation, roots of a quadratic equations, solving cubic and quartic equations, **Argand Diagrams** Argand diagrams, modulus and argument, loci, regions **Decision** **Algorithms** Trace table, flowcharts, bubble sort, quick sort, bin-packing, order of algorithms	**Core** **Method in Calculus** Improper integrals, the mean value of a function, differentiating inverse trigonometric functions, integrating inverse trigonometric functions, integrating partial fractions **Volumes of revolution** Volumes of revolution around the x axis, volumes of revolution around the y axis, volumes of revolution of parametrically defined curves, modelling with volumes of revolution **Further Mechanics***

	Graphs & Networks Modelling with graphs, Graph Theory, directed graphs, matrices, planar algorithm	**Momentum and Impulse** Momentum in one direction, conservation of momentum, momentum as a vector **Work, Energy and Power** Work done, Kinetic and potential energy, conservation of mechanical energy, and the work-energy principle, Power **<u>Further Statistics*</u>** **Discrete random Variables** Expected value of a discrete random variable, Variance of a discrete random variable, Expected Value and Variance of function of X, Solving Problems involving Random Variables **The Poisson Distribution** The Poisson distribution, Modelling with the Poisson distribution, Adding Poisson distributions, Mean and variance of the poisson distribution, Mean and variance of the binomial distribution, Using poisson distribution to approximate binomial distribution, Hypothesis testing **Chi Squared tests** Goodness of fit, Degrees of freedom and the chi-squared family of distributions, Testing a hypothesis, Testing the goodness of fit with discrete data, Using contingency tables, Apply goodness of fit tests to geometric distributions
Half term 2	**<u>Core</u>** **Series** Sum of natural numbers, sum of square and cubes **Roots of polynomials** Roots of a quadratic, cubic and quartic equation, expressions relating to the roots of a polynomial, linear transformations of roots **<u>Decision</u>**	**ASSESSMENT 4** **<u>Core</u>** **Polar Coordinates** Polar coordinates and equations, sketching curves, area enclosed by a polar curve, tangents to polar curves **Hyperbolic functions**

	Algorithms on graphs Kruskal's Algorithm, Prim's Algorithm, Dijkstra's Algorithm, Floyd's Algorithm **Route Inspection** Euler/Semi-Euler graphs, Route Inspection **ASSESSMENT 1**	Introduction to hyperbolic functions, inverse hyperbolic functions, identities and equations, differentiating hyperbolic functions, integrating hyperbolic functions **Further Mechanics*** **Elastic strings and springs** Hooke's law and equilibrium problems, Hooke's law and dynamics problems, Elastic energy, Problems involving elastic energy **Elastic collisions in one dimension** Direct impact and Newton's law of restitution, Direct collision with a smooth plane, Loss of kinetic energy, Successive direct impacts **Further Statistics*** **Geometric and Negative Binomial** The geometric distribution, Mean and variance of a geometric distribution, The negative binomial distribution, Mean and variance of the negative binomial distribution, Hypothesis Testing **Central Limit Theorem** The central limit theorem, Applying the central limit theorem to other distributions
Half term 3	**Core** **Matrices** Intro into Matrices, Matrix Multiplication, Determinants, Inverting a 2x2 matric, Inverting a 3x3 matrix, solving systems of equations using matrices **Linear Transformations** Linear transformation in 2D, Reflections and Rotations, Enlargements and Stretches, Successive transformations, Linear transformations in 3D, inverse of linear transformation **Decision** **Critical Path Analysis**	**Core** **Methods of differential equations** First order differential equations, second order homogeneous differential equations, second order non-homogeneous differential equations, using boundary conditions **Modelling differential equations** Modelling with first order differential equations, simple harmonic motion, damped and forced harmonic motion, coupled first order simultaneous differential equations **Further Mechanics*** **Elastic collisions in two dimension**

	Modelling a project, Activity Networks, Dummy Activities, Early and Late Event Times, Critical Activites, Float of an activity, Gnatt Charts, Resource Histograms, Resource Levelling, Scheduling Diagrams, Lower bounds	Oblique impact with a fixed surface, Successive oblique impacts, Oblique impact of smooth spheres **Further Statistics*** **Probability Generating Functions** Probability generating functions, Probability generating functions of standard distributions, Use probability generating functions to find the mean and variance of a distribution, Sums of independent random variables **Quality of Tests** Type 1 and Type 2 errors, Finding Type 1 and Type 2 errors using the normal distribution, Calculate the size and power of a test, The Power function
Half term 4	**Core** **Proof by Induction** Proof by mathematical induction, proving divisibility results, proving statements involving matrices **Vectors** Equation of a line in 3D, Equation of a plane in 3D, Scalar Product, calculating angles between lines and planes, points of intersection, finding perpendiculars **Decision** **Travelling Salesman** Upper Bound, Lower Bound, Nearest Neighbour Algorithm **Linear Programming** Formulating the problem, graphical methods, optimal solutions, vertex testing **ASSESSMENT 2**	**ASSESSMENT 5** **Revision**
Half term 5	**Core** **Volumes of revolution**	**Revision**

	Volumes of revolution around the x axis, volumes of revolution around the y axis, adding and subtracting volumes, modelling with volumes of revolution **Decision** **Simplex Algorithm** Simplex Algorithm, Two stage simplex algorithm, Big-M method	
Half term 6	**Core** **Complex Numbers** Exponential form, multiplying and dividing complex numbers, De Moivre's theorem, Trigonometric identities, Sum of series, nth roots of a complex number, solving geometric problems **Series** The method of differences, Higher derivatives, Maclaurin series, Series expansions of compound functions **ASSESSMENT 3**	**FINAL EXAMS**

***Students will study either Further Mechanics or Further Statistics in Year 13**