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|  | **AUT 1** | **AUT 2** | **SPR 1** | **SPR 2** | **SUM 1** | **SUM 2** |
| **YEAR 7**Number is at the heart of our Year 7 curriculum as this enables students to be successful in all other strands of Mathematics at KS4 and KS5. In Year 7 the curriculum is strongly linked to the KS2 curriculum to enable students to build on their prior learning and connect their prior knowledge to new concepts. Algebraic thinking is introduced early in Year 7 to help students generalise throughout the curriculum and see how algebraic thinking can be used as a tool to solve problems in many other concepts.  Calculator use is encouraged throughout Year 7 following limited practice with calculators within KS2 experience.  | **ALGEBRAIC THINKING** **Exploring Sequences** * Work with linear and non- linear sequences
* Term to term rules of numerical sequences in words

**Understanding & using algebraic notation** * Working with function machines
* Use algebraic conventions
* Substitution into expressions
* Generating sequences given an algebraic rule
* Representing functions graphically

**Equality and equivalence** * Solve one step linear equations
* Collect like terms
 | **PLACE VALUE AND PROPORTION****Place value & ordering numbers** * Working with large numbers
* Rounding
* Estimation
* Ordering integers & decimals
* Median & Range
* Using standard form to write large and small numbers

**FDP Equivalence** * Equivalent fractions
* Simplify fractions
* Convert between decimals and fractions
* Understanding percentages
* Use & interpret pie charts
* Convert between FDP
 | **APPLICATIONS OF NUMBER** **Addition & Subtraction** * Strategies for addition and subtraction
* Formal methods inc. with standard form
* Perimeter
* Financial Problems
* Frequency Trees
* Bar Charts and Line Charts

**Multiplication & Division*** Factors and Multiples
* HCF & LCM
* Review multiplying & dividing by powers of 10
* Formal methods of multiplication & division
* Order of operations
* Area of rectangles, triangles, parallelograms & trapezia
* Calculating the mean
 | **DIRECTED NUMBER** **& FRACTIONAL THINKING****Operations with Directed Number** * Understand and use representations of directed number
* Add, subtract, multiply and divide with directed number
* Order of operation with directed numbers
* Using a calculator with directed number
* Collecting like terms with directed numbers
* Substitution with directed numbers
* Collecting like terms with directed numbers
* Solve two step equations

**Fractional Thinking** * Convert between mixed numbers and improper fractions
* Express one quantity as a fraction of another
* Add and subtract fractions including improper and mixed numbers
* Add and subtract fractions and decimals
* Add and subtract simple algebraic fractions
 | **LINES & ANGLES** **Constructing, measuring & using geometric notation** * Understand and use geometric notation for angles & lines
* Use of a protractor
* Draw and interpret pie charts
* Identify types of triangles, quadrilaterals and polygons
* Construct SSS, SAS and ASA triangles
* Construct polygons

**Developing Geometric Reasoning** * Find angles on a straight line, around a point, vertically opposite, in triangles and quadrilaterals
* Understand and use angles in parallel lines
 | **REASONING WITH NUMBER** **Sets & Probability** * Interpret & create Venn diagrams
* Understand & use the intersection, union & complement of sets
* Expressing probability in numbers
* Probability of single events

**Prime numbers and proof** * Recognise prime, square and triangular numbers
* Write a number as a product of prime factors
* Use Venn diagram to find HCF & LCM

  |
|  | Guided Reading: Algebra Common representations & structures: algebra tiles for forming and simplifying algebraic expressions and solving equations | Guided Reading: Standard Form Common representations & structures: number line for ordering values, Gattegno chart and place value table for multiplying and dividing by powers of 10, 100 square for FDP, bar model for equivalent fractions  | Guided Reading: Directed Number Common representations & structures: place value counters for column addition and subtraction, Gattegno chart and place value table for multiplying and dividing by powers of 10, grid multiplication linking to area  | Guided Reading: Directed Number Common representations & structures:double sided counters & number line for arithmetic with negative numbers, algebra tiles, for forming and simplifying algebraic expressions, number line, bar model for fraction arithmetic  | Guided Reading: Angles Common representations & structures:N/A | Guided Reading: Prime Numbers Common representations & structures: prime factor tiles for prime factor decomposition, HCF & LCM |

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| **YEAR 8**In Year 8 students build on their knowledge and skills gained from Year 7 and KS2 through learning about how to use bar models to understand proportional relationships. Many more algebraic concepts are introduced to enable links to be established between geometry and algebraic manipulation.  | **PROPORTIONAL REASONING****Ratio** * Understand & use ratio notation
* Simplifying ratio including 1: n
* Divide in a given ratio
* Working with maps and scales
* Understand pi as a ratio

**Multiplicative Reasoning** * Solve direct proportion problems
* Use exchange rates & conversion graphs
* Similar Shapes & enlargement
 | **MATHEMATICAL REPRESENTATIONS** **Working in the Cartesian Plane** * Work with coordinates in all four quadrants
* Find the midpoint of a line segment
* Identify and draw lines that are parallel to the axes
* Plot linear graphs
* Find the gradient of a line segment
* Work out the y and x intercepts of a graph in the form y = mx + c

**Representing Data*** Plot scatter graphs
* Understand & describe correlation
* Draw & use line of best fit
* Reading Frequency Tables
* Drawing two-way tables

**Tables & Probability** * Construct and interpret sample spaces including two-way tables
* Work out single event probabilities from Venn Diagrams
* Use sample space diagrams to show all possible outcomes
* Use the product rule to find the total number of possible outcomes
 | **ALGEBRAIC TECHNIQUES****Brackets, equations and inequalities** * Forming Expressions
* Substitution into formula
* Expand single & double brackets
* Factorise into single brackets
* Form and solve equations and inequalities including with unknown on both sides

**Sequences** * Generate sequences using words and algebraic rules
* Find the nth term of linear sequence
* Form and solve equations using the nth term of a linear sequence
* Fibonacci sequences and algebra

**Indices** * Simplify expressions involving indices
* Understand & use addition and subtraction laws
* Understand & use power of powers law
 | **DEVELOPING NUMBER****Multiplying and Dividing Fractions** * Multiply a fraction by an integer
* Find the product of any pair of fractions
* Divide an integer by a fraction
* Understand reciprocals
* Divide any pair of fractions
* Multiply and divide mixed numbers

**Working with fractions and percentages** * Find percentages of amounts with and without a calculator
* Find percentage increase and decrease
* Percentage multipliers
* Repeated percentage change
* Reverse percentages
 | **DEVELOPING GEOMETRY** **Angles in Polygons** * Understand and use the sum of exterior and interior angles in any polygon.
* Construct polygons

**Area & Circumference of Circles** * Know the parts of a circle
* Construct bisectors
* Calculate the circumference of a circle with and without a calculator
* Calculate the area of a circle with and without a calculator
* Find the area and perimeter of compound shapes

**Symmetry and Reflection** * Reflect shapes in vertical, horizontal and diagonal lines
* Recognise line symmetry
* Recognise rotational symmetry
 | **REASONING WITH DATA****The data handling cycle** * Design and criticise questionnaires
* Draw and interpret pictograms, bar charts & pie charts

**Measures of Location** * Work out and interpret the range
* Understand and use the mean, median and mode
* Choose the most appropriate average
* Find averages from ungrouped and grouped frequency tables
* Identify outliers
* Compare distributions using averages & range
 |
|  | Guided Reading: RatioCommon representations & structures: bar model, double number lines, ratio table  | Guided Reading: Correlation Common representations & structures: bar model for substitution when generating coordinates  | Guided Reading: Fibonacci Common representations & structures: bar model for substitution, algebra tiles for forming, simplifying expression and solving equations. Area model for expanding and factorising.  | Guided Reading: Percentages Common representations & structures: Grid for multiplying and dividing with fractions  | Guided Reading: Area & perimeter Common representations & structures: N/A  | Guided Reading: Averages Common representations & structures: ratio tables when working with Pie charts, number line with range  |

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| **YEAR 9**In Year 9 students are introduced to additional algebraic manipulation to enable students to solve coordinate geometry and further 2D/3D geometric problems. Further percentage work is developed to develop student understanding and knowledge of real-life money issues. Surds and Pythagoras Theorem are taught within the same half term so students can work with better precision with geometrical problems. Additional sample space diagrams are introduced following previous learning about Venn diagrams in Year 8.  | **COORDINATE GEOMETRY** **Graphs & algebra** * Substitution into formulae & equations
* Rearranging formula
* Identify and draw lines parallel to the coordinate axes
* Plot linear graphs
* Calculate the gradient of a line segment
* Understand and use y = mx +c
* Interpret gradient & intercepts of real-life graphs
* Explore parallel & perpendicular lines
* Solving simultaneous linear equations graphically
* Drawing quadratic graphs

**Speed, distance & time** * Draw & interpret distance-time graphs
* Calculate speed with and without a calculator
* Solve speed problems
 | **CONSTRUCTING WITH 2D & 3D SHAPES****2D representations of 3D shapes** * Name 2D & 3D shapes
* Isometric drawing
* Draw accurate nets of cuboids & other 3D shapes
* Understand and use plans & elevations

**Surface area & Volume** * Surface area of cubes and cuboids
* Surface area of triangular prisms
* Surface area of a cylinder
* Volume of cubes and cuboids
* Volume of other 3-D shapes - prisms and cylinders
* Explore volumes of cone, pyramids and spheres
* Solve problems with density, mass and volume
* Solve flow problems and their graphs
* Rates of change and their units
* Convert compound units
 | **MONEY MATTERS****Managing money** * Understand & interpret bills and bank statements
* Calculate wages and taxes
* Solve problems with Tax & National Insurance

**Money & percentages** * Calculate simple interest
* Calculate compound interest
* Solve problems with repeated percentage change
* Solve 'reverse' percentage problems
* Solve VAT problems

**Money & further proportional reasoning** * Understand unit pricing
* Determine value for money & solve best buy problems
* Work with exchange rates
* Understand & use conversion graphs
* Solve problems with direct proportion using algebra
* Solve problems with inverse proportion using algebra
* Graphs of inverse relationships
 | **FURTHER ANGLES & TRANSFORMATIONS****Angles & Bearings** * Angles problems with algebra
* Angles in parallel lines
* Solving angles problems using chains of reasoning
* Understand and draw bearings
* Solve bearings problems

**Rotation & Translation** * Identify the order of rotational symmetry of a shape
* Understand congruence
* Identify congruent triangles
* Rotate a shape about a point on a shape and a point not on a shape
* Describe a rotations
* Compare rotation and reflection of shapes
* Translate points and shapes by a given vector
* Vector arithmetic

**Similar Shapes** * Recognise enlargement and similarity
* Work out missing sides and angles in a pair of given similar shapes
* Solve problems with similar triangles
* Explore ratios in right-angled triangles
* Enlarge a shape by all types of scale factpr using a centre of enlargement

  | **SURDS & PYTHAGORAS THEOREM** **Surds** * Introducing surds
* Manipulate surds
* Simplify surds
* Adding & subtracting surds
* Expand brackets with surds
* Rationalise surdic expressions

**Pythagoras Theorem** * Squares & roots
* Determine whether a triangle is right angled
* Calculate the hypotenuse of a right-angled triangle
* Calculate missing sides in right-angled triangles
* Explore proofs of Pythagoras' theorem
* Use Pythagoras' theroem on coordinate axes
* Use Pythagoras' theroem in 3-D shapes
 | **PROBABILITY & SAMPLE SPACE DIAGRAMS** **Probability & Relative Frequency** * Calculate a single event probability
* Understand Relative frequency, including convergence
* Calculate expected outcomes from an experiment

**Tree Diagrams** * Construct tree diagrams
* Use tree diagrams to solve 'without replacement' problems
* Use tree diagrams to work out probabilities

**Venn Diagrams** * Work out single event probabilities from Venn Diagrams
* Understand & use set notation
 |
|  | Guided Reading: Gradient Common representations & structures: Algebra tiles for substitution & rearranging formula Ratio tables for working with speed  | Guided Reading: Density Common representations & structures: Ratio tables for density and converting units  | Guided Reading: Money matters Common representations & structures: Bar model for percentages, ratio table for percentages & further proportional reasoning  | Guided Reading: Bearings Common representations & structures: Algebra tiles for forming & solving linear equations, ratio tables when working with similar shapes and scale factors  | Guided Reading: Pythagoras Theorem Common representations & structures: Prime factor tiles for simplifying surds, algebra tiles for expanding brackets, area model for Pythagoras theorem  | Guided Reading: What is the chance? Common representations & structures: Ratio tables when working out expected outcomes from an experiment  |

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| **YEAR 10***Following previous work on multiplicative reasoning learners across all groups are ready to learn how trigonometry can be used to find missing angles and lengths in triangles.* *Algebraic manipulation is further developed by introducing all learners to how to solve a quadratic equation.* *Angle knowledge is consolidated and extended to introduce all of the circle theorems to higher tier students.* *There is ample opportunity to review probability concepts introduced in Year 9 and develop the fluency within this concept.* *Statistical representations are further explored following KS3 learning with averages linked to bar charts, histograms and cumulative frequency.*  | **SIMILARITY & TRIGONOMETRY** **Similarity & Enlargement** * Enlarge shapes by positive and fractional scale factors
* Enlarge shapes by negative scale factors (H)
* Identify similar shapes
* Work with similar triangles
* Explore similar areas and volumes (H)

 **Trigonometry** * Review Pythagoras Theorem
* Use Trigonometry to find missing lengths and angles in right-angled triangles
* Work with exact trigonometric values (H)
* Understand and use Sine & Cosine rule to calculate missing lengths and angles (H)
* Solve problems with bearings & trigonometry (H)
* Use the formula 0.5absinC to find the area of a triangle (H)
 | **LINEAR & QUADRATIC EQUATIONS****Simultaneous Equations** * Review forming expressions and solving linear equations
* Solve simultaneous equations by elimination.
* Forn and solve simultaneous equations from contexts
* Plot and solve linear simultaneous equations graphically
* Solve linear simultaneous equations by substitution.

**Working with Quadratics** * Expand single and double brackets
* Expand triple brackets (H)
* Factorise monic quadratics and relate to the graph
* Solve quadratic equations by factorising, including difference of two squares
* Factorise and solve non-monic quadratics (H)
* Complete the square and relate to the graph (H)
* Complete the square to solve a quadratic (H)
* Use the quadratic formula to solve a quadratic (H)
* Solve non-linear simultaneous equations (H)
* Solve quadratic inequalities (H)
 | **CIRCLES** **Working with Circles** * Review parts of a circle, area & circumference
* Calculate arc length without & without a calculator
* Calculate sector area without & without a calculator
* Review volume and surface area of a cylinder
* Review volume of spheres & cones
* Use Pythagoras Theorem to calculate the volume of a cone
* Calculate the surface area of a sphere and cone

**Angles & Circles** * Review & use angle facts
* Review angles & polygons
* Review angles & parallel lines
* Understand, use and prove Circle Theorems (H)

**Graphs & Circles** * Understand and use the equation of a circle with centre (0,0) (H)
* Find the equation of the tangent to a circle with centre (0,0) (H)
 | **PROBABILITY & COMBINATIONS** **Probability & Combinations** * Review how to add, subtract and multiply decimals
* List all possible outcomes
* Understand use product rule
* Review finding probabilities from two-way tables, Venn diagrams and Frequency Trees.
* Review working with Venn diagrams and set notation
* Review working with Tree diagrams
* Construct & interpret conditional probabilities with tree diagrams
* Construct & interpret conditional probabilities with Venn diagrams (H)
* Use algebra to solve probability problems
 | **DELVING INTO DATA****Averages & Range** * Review how to calculate mean, mode and median
* Review choosing the most appropriate average
* Review how to find averages from ungrouped and grouped frequency tables

**Representing data** * Identify the different types of data
* Construct a stratified sample (H)
* Review how to construct and interpret pie charts
* Understand and draw time series graphs
* Criticise charts and graphs
* Calculate quartiles from a data set
* Construct & interpret cumulative frequency graphs (H)
* Construct & interpret Boxplots (H)
* Construct & interpret Histograms (H)
 | **SEQUENCES, INDICES & SURDS** **Primes, factors & multiples*** Review factors & multiples
* Review how to write a number as a product of its prime factors
* Find the HCF & LCM using prime factorisation

**Sequences** * Describe and continue different types of sequences
* Generate sequences using the nth term
* Find and use the nth term of a linear sequence
* Find and use the nth term of a quadratic sequence (H)
* Describe and continue sequences with surds (H)

**Indices & Surds** * Calculate and estimate powers & roots
* Review powers of ten and standard form
* Review laws of indices
* Understand and use the power of zero & negative indices
* Understand and use fractional indices (H)
* Solve equations involving indices (H)
 |
|  | Common representations & structures: Ratio tables when working with similar shapes and scale factors  | Common representations & structures: Algebra tiles when forming and solving one variable linear equations and completing the square. Bar model when solving simultaneous equations.  | Common representations & structures: area model with Pythagoras Theorem | Common representations & structures: bar model for addition and subtraction of fractions, area model for multiplication of fractions.  | Common representations & structures: ratio table for pie charts | Common representations & structures: prime factor tiles for decomposition, HCF & LCM, Gattengo chart and place value table for multiplying and dividing by powers of 10.  |

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| **YEAR 11** *HIGHER* | **FURTHER GEOMETRY****Congruence & Similarity** * Use the basic congruence criteria for triangles
* Apply angle facts, triangle congruence, similarity and properties of quadrilaterals.
* Apply and use the concepts of congruence and similarity, including the relationships between lengths, areas and volumes in similar figures

**Transformations of 2D shapes** * Review how to perform & describe transformations
* Perform & describe combined transformations
* Understand invariant points

**Vector Geometry** * Arithmetic with column vectors
* Explore vector journeys in shapes
* Explore quadrilaterals with vectors
* Understand parallel vectors
* Understand collinear points using vectors
* Use vectors to construct geometric arguments & proof
 | **FURTHER ALGEBRA** **Changing the subject*** Simplify and manipulate algebraic expressions involving algebraic fractions
* Change the subject of complex formulae
* Change the subject where the subject appears more than once
* Rearrange iterative formula to solve equations

**Functions** * Understand and use complex formula machines
* Understand and use function notation
* Work out the inverse of a function
* Work with composite functions
* Sketch translations & reflections of functions

**Proof** * Understand the difference between an equation and an identity
* Compare coefficients to solve identity problems
* Argue mathematically to show algebraic expressions are equivalent including recurring decimals to fractions
* Construct proofs
 | **FURTHER GRAPHS & ESTIMATION****Types of Graphs** * Recognise, sketch and interpret linear, quadratic, cubic, reciprocal and exponential functions.
* Estimate solutions to equations using graphs
* Solve inequalities graphically
* Recognise, sketch and interpret trigonometric functions.
* Solve trigonometric equations using graphs
* Calculate or estimate gradients and areas under graphs including distance-time and velocity-time graphs

**Estimation** * Use inequality notation to specify simple error intervals due to truncation or rounding
* Apply and interpret limits of accuracy including upper and lower bounds
 | **REVISION** | **REVISION** | **REVISION**  |
| **YEAR 11***CROSSOVER* *This is a suggested sequence for Higher/Foundation classes that are aiming for grades 4-6. This sequence has been developed from considering the highest frequency & tariff concepts.* **Please also use QLA data from end of Year 10 mock to inform plans**  | **GEOMETRY REVISION** Understand and apply angle facts including parallel lines, polygons & bearingsReview of perimeter and area of 2D shapes including circles, arcs and sectors Review surface area and volume of 3D shapes including cylinders, spheres and pyramids Convert units of measurement including metric units, time calculations and compound measures Solve problems involving speed and density  | **NUMBER REVISION**Work with ratio including reduction to simplest form, 1: n and division problems Convert fluently between fractions, decimals, percentage and ratio Understand solve percentage problems including percentage change, compound interest and calculating the original amountUnderstand direct & inverse proportion including forming and solving algebraic equations (H)Rounding and estimation including interpretation of limits of accuracy and bound problems  | **ALGEBRA REVISION**Form and solve linear equations including simultaneous equations Form and solve linear inequalities and understand representation on number linesReview Index Laws including negative and fractional powers (H)Expanding, factorising & solving quadratics linking to quadratic graphs Understand and use the equation of a straight line (y=mx + c)Recognise the different types of sequences and find the nth term of a linear and quadratic sequence (H) | **DATA & PROBABILITY REVISION**Construct and interpret Venn diagrams including use of notation Construct and use tree diagrams to calculate probability of successive events Calculate averages, range and quartiles from data sets including frequency tables Construct and interpret cumulative frequency graphs & boxplots (H)Construct and interpret histograms with unequal class widths (H) | **REVISION**  | **REVISION**  |
|  | **AUT 1** | **AUT 2** | **SPR 1** | **SPR 2** | **SUM 1** | **SUM 2** |
| **YEAR 11** *FOUNDATION: Emergency plan!* *This sequence is created from AQA to support learners that have demonstrated that they are not likely to pass their GCSE at a grade 4/5 from end of year 10 data. All concepts in this sequence have been taught previously so the pace through this sequence should be swift Iapprox one week per concept) however learners should not be moved on until they have grasped at least the basics of each revision topic.*  | * **Order of operations**
* **Convert between fractions, decimals & percentages**
* **Simplify & share with ratio**
* **Arithmetic with negative numbers**
* **Prime factor decomposition**
* **Work with sequences including nth term**
 | * **Angle rules & triangles**
* **Transforming 2D shapes**
* **Area & circumference of a circle**
* **Pythagoras Theorem**
* **Area and volume of rectilinear shapes**
* **Collecting like terms & solving equations**
 | * **Averages & Range**
* **Bar charts & Pie Charts**
* **Trigonometry**
* **Measuring angles & bearings**
* **Inequalities on a number line**
* **Congruent and similar shapes**
 | * **Surface area of 3D shapes**
* **Standard Form**
* **Loci & Constructions**
* **Speed & Distance Time Graphs**
* **Scatter Graphs**
* **Probability & Venn Diagrams**
 | * **Systematic listing**
* **Percentages including simple & compound interest**
* **Expanding and factorising**
 | **REVISION**  |

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| **Level 2 FURTHER MATHS** KS4 students are given the opportunity to study Further Mathematics GCSE to help the transition for further learning of Mathematics beyond Year 11. A minimum of 30 guided hours is required to teach the additional concepts beyond GCSE Higher. This suggested sequence has been planned to enable this to be taught alongside the Year 10 programme of study as some classes are mixed Y11/10 in one year.  | **MATRICES & FUNCTIONS** * Matrices
* Limiting value of a sequence
* Drawing piece-wise functions
* Domain and Range of a Function
 | **BRACKETS & CALCULUS*** **Expanding brackets using Pascals triangle**
* **Using factor theorem to factorise cubic expressions**
* **Differentiation**
* **Equations of tangents & normals**
* **Increasing & decreasing functions**
* **Stationary points and classification**
* **Sketching & interpreting curves using calculus**
 | **FURTHER SIMULTANEOUS EQUATIONS & CIRCLES*** Solving linear equations in three unknowns
* Equation of a Circle with centre (a, b)
* Geometric Proof
 | **TRIGONOMETRY*** Using Trigonometric identities to solve trigonometric equations in given intervals
* Using trigonometric identities to simplify expressions and prove further identities
 | REVISION | REVISION |