## Mathematics Department Curriculum Map (Key Stage 3)

## Overall Curriculum Intent

The Brian Clarke Church of England Academy is a place where students, regardless of their background, can access a high quality and challenging mathematics curriculum. We believe that all students can learn and succeed in mathematics given the appropriate learning experiences in and beyond the classroom. Every student is entitled to have the opportunity to master the key mathematical content and as such we have one curriculum for all. The curriculum is sequenced to focus on depth over breadth. We aim to spend more time teaching fundamental concepts to avoid the need to 're-teach'. Students are challenged to deepen their understanding of a topic rather than being accelerated through content.

Our curriculum approach is based around four key principles: conceptual understanding, language \& communication, mathematical thinking and problem solving. We aim to develop a deep conceptual understanding through use of various representations (concrete, pictorial and abstract). Clear mathematical communication, verbally and written is essential for students to be able to use mathematical language and notation to express and clarify their thoughts with others. During their time at Brian Clarke, students will have the opportunity to develop habits of mind enabling them to think mathematically. In tandem with this we ensure pupils can develop procedural fluency with knowledge of key facts and techniques. With these key principles students will then be supported to use their learning accurately, efficiently and flexibly to reason mathematically and solve problems in familiar and unfamiliar contexts.

We believe that all students should leave school equipped with sufficient knowledge and the core mathematical skills they need for future learning. Through a detailed audit of the KS3 national curriculum and through the study of the principal strands (number, algebra, proportional reasoning, geometry \& measures, probability and statistics) we have designed and sequenced a 5 -year curriculum which allows students to link established ideas to learning of new concepts and supports them in understanding the coherent and connected nature of the subject. Our curriculum is cumulative so that concepts and skills learnt previously are applied and connected throughout the school year to consolidate learning; this continual recapping emphasises how each of the concepts interconnects with others in mathematics.

The curriculum at KS3 is designed to consolidate learning from the KS2 national curriculum whilst building on existing knowledge. Teaching methods consider the way learners have been taught prerequisite topics in the past and how we can successfully integrate these to enable a smooth transition between KS2 and KS3.

The purpose of our curriculum is to develop students into lifelong independent learners who can confidently analyse, deduce, and problem solve, not only within mathematics, but who can apply these skills across the curriculum and to the multifarious aspects of their wider lives. Our rewards program, extra-curricular and co-curricular enrichment opportunities will further encourage pupil's enthusiasm for mathematics.

|  | Half Term 1 | Half Term 2 | Half Term 3 | Half Term 4 | Half Term 5 | Half Term 6 |
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| Knowledge Introduced | Number 1.1 - Place Value <br> - Further place value of digits in integers, decimals and measures. <br> - Column headers in exponent and fractional form. <br> - Ordering and comparing integer and decimal numbers and measures using inequality notation. <br> - Representations of numbers including using the infinite nature of the number line. <br> - Rounding numbers to the nearest power of 10. <br> - Multiplying \& dividing integers and decimals by powers of 10 . <br> - Converting units of length and mass in context | Number 1.2 - Number <br> Properties <br> - Multiples and factors. <br> - Divisibility rules. <br> - Integer exponents and roots. <br> - Prime numbers. <br> - Writing integers as a product of prime factors. <br> - Using prime factors. <br> - Venn diagrams. <br> - Lowest Common Multiple and Highest Common Factor, including from prime factors. |  <br> Subtraction <br> - Using formal written methods to add and subtract integers \& decimals. <br> - Efficient mental addition and subtraction strategies for integers and decimals. <br> - Bar models and fact families for addition \& subtraction. <br> - Perimeter of rectilinear shapes. <br> - Perimeter problems with other polygons. <br> Number 2.2-Multiplication \& Division <br> - Understand and use the commutative and associative properties of multiplication. <br> - Using place value to calculate multiplication of integers and decimals. <br> - Area model of multiplication. <br> - Multiplying with decimal numbers. |  <br> Division <br> - Using place value and multiplication facts to calculate division of integers and decimals. <br> - Understand and use formal methods of division (short division algorithm). <br> - Dividing with decimal numbers. <br> - Dividing by decomposition. <br> - Using the distributive law for division. <br> - Method selection through money problems. | Number 2.3 - Order of Operations <br> - Applying the commutative law to efficiently and accurately reorder calculations involving the four operations. <br> - Order of operations with all four operations, brackets and exponents. <br> Number 2.4 - Directed Number <br> - Understanding negative numbers, number lines and applications. <br> - Ordering and comparing negative and positive numbers. <br> - Arithmetic procedures with negative numbers (using zero pairs and vectors on a number line). <br> - Order of operations involving negative numbers. | Algebra 1 - Expressions and Equations <br> - Using letters to represent generalised numbers. <br> - Using algebraic notation. <br> - Understand and recognise that a letter can be used to represent a specific unknown value or a variable. <br> - Understand that relationships can be generalised using algebraic statements. <br> - Substituting numeric values into algebraic expressions and evaluating <br> - Identify a variety of like terms in an expression, including products and indices. <br> - Simplify expressions by collecting like terms. <br> - Manipulate expressions through adding, subtracting and multiplying algebraic terms. |
| Key vocabulary/ concepts/ideas students must master | N1: Integer, exponent, power, in than, less than, unit of measure, factor, factor pair, lowest comm prime, prime factor decompositi square root, cube root, Venn dia <br> Command words: work out, eval | $x$, ascending, descending, greater gth, mass, convert, multiple, multiple, highest common factor, square number, cube number, m, set. <br> e, calculate, find, explain. | N2: recurring, associative, comm partition, distribute. <br> Command words: work out, evalu | ive, distributive, exchange, , calculate, find, explain. | N2: Sum, summand, difference, minuend, subtrahend, product, quotient, divisor, dividend, negative, vector, origin. | A1: term, expression, equation, variable, substitute/substitution, simplify, like terms, coefficient, constant. <br> Command words: work out, evaluate, calculate, find, explain. |
| Knowledge revisited | - Read, write and compare intege (KS2) <br> - Multiply and divide by 10, 100, <br> - Convert metric units of length a <br> - Round whole numbers (KS2) <br> - Use of < > = (KS2) <br> - Identify multiples and factors (K <br> - Identify common multiples and <br> - Squares, cubes and primes (KS2) <br> - Sorting diagrams (KS2) | and decimals up to 10 million $\begin{aligned} & 00 \text { (KS2) } \\ & \text { mass (KS2) } \end{aligned}$ <br> tors (KS2) | - Place value (N1) <br> - Formal written methods for add and division of integers (KS2) <br> - Multiply a decimal by a whole (K <br> - Divide with decimal answers (KS | , subtraction, multiplication | - Order of operations (KS2) <br> - Methods for addition, subtraction, multiplication and division (N2) <br> - Understand and use negative numbers in context (temperature) (KS2) | - Using order of operations (N1) <br> - Using simple formulae (KS2) <br> - Expressing missing number problems algebraically (KS2) <br> - Enumerate possible number combinations for two variables in an equation (KS2) |
| CEIAG Links/ Opportunities | Prime numbers - Applications to security (Gatsby Benchmark 4) | s in data encryption and cyber |  |  |  |  |


|  | Half Term 1 | Half Term 2 | Half Term 3 | Half Term 4 | Half Term 5 | Half Term 6 |
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| Knowledge Introduced | Algebra 2 - Distributive Law <br> - Use the distributive law to multiply out a bracket. <br> - Use the distributive law to factorise expressions with common factors. <br> Geometry 1-Area and Perimeter <br> - Properties of triangles and quadrilaterals. <br> - Perimeter problems with polygons and compound shapes. <br> - Area of rectangles, triangles, parallelograms, and trapezia. <br> - Area of composite shapes <br> - Algebra in perimeter and area problems. | Algebra 3-Coordinates <br> - Coordinates (including noninteger), in all four quadrants. <br> - Geometric problems involving coordinates. <br> - Mid-point of a line segment. <br> - Equations of vertical and horizontal lines. <br> - Graphs of $y=x$ and $y=-x$ <br> Number 3.1 - Fractions and Decimals <br> - Structure of fractions, improper fractions and mixed numbers. <br> - Conversion between fractions and decimals. <br> - Equivalent fractions and simplifying fractions. <br> - Order and compare fractions | Number 3.2-Arithmetic Procedures with Fractions <br> - Addition and subtraction of fractions and mixed numbers. <br> - Multiplication with fractions and mixed numbers. <br> - Reciprocals. <br> - Division with fractions and mixed numbers. <br> Number 4.1 - Ratios and Multiplicative Relationships <br> - Scaling and calculating multipliers. <br> - Connecting fractions and ratios. <br> - Simplifying ratios. <br> - Double number lines and ratio table representations. | Number 4.2 - Fractions <br> - Fractions of an amount. <br> - Writing one number as a fraction of another. <br> Number 4.3 - Applying Ratios <br> - Dividing into a ratio. <br> - Working with ratios and quantities. <br> - Connecting ratios and rates (e.g. conversions). <br> Geometry 2 - Transformations <br> - Translations. <br> - Introduction to congruence. <br> - Reflections. <br> - Rotations. <br> - Enlargements. | Number 5-Estimating and Rounding <br> - Rounding to a given number of decimals places. <br> - Significant figures and rounding to significant figures. <br> - Estimate and check numerical calculations. <br> - Overestimates and underestimates. <br> - Calculate possible errors using inequality notation. | Algebra 4-Solving Linear <br> Equations <br> - Equations and understanding equality with numbers and algebraic terms. <br> - Solve a one-step linear equation with a single unknown on one side. <br> - Solve a two-step (or more) linear equation with a single unknown, including equations where the unknown appears on both sides. <br> - Solve a linear equation with a single unknown involving brackets in an efficient way. |
| Key vocabulary/ concepts/ideas students must master | A2: distributive law, multiply out, expand, factorise, factor, algebraic factor, simplify, collect like terms, fully factorised. <br> G1: Quadrilateral, isosceles, equilateral, scalene, right-angled triangle, square, rectangle, parallelogram, rhombus, kite, trapezium, perimeter, area, parallel, perpendicular, rectilinear, composite, diagonal, base, perpendicular height. | A3: Coordinate axes, $x$-axis, $y$ axis, coordinate pair, quadrant, origin, mid-point, line segment, vertical, horizontal, graphically, algebraically. <br> N3: Fraction, numerator, denominator, mixed number, improper fraction, proper fraction, terminating decimal, recurring decimal, equivalent fraction, simplify, simplest form. | N3: Common denominator, reciprocal. <br> N4: Additive relationship, multiplicative relationship, whole, quantity, multiplier, ratio table, simplify (a ratio), simplest form (of a ratio). | N4: Rate, per, conversion rate, proportional. <br> G2: Transformation, translate, column vector, reflect, mirror line, symmetry, rotate, clockwise, anti-clockwise, centre of rotation, enlarge, scale factor, centre of enlargement, vertex, invariant point. | N5: Rounding, decimal place, significant figure, overestimate, underestimate, estimate, approximation, rounding error, error interval. | A4: Solve, linear equation, unknown, balance, inverse operation. |
| Knowledge revisited | - Distributive law and numbers (N2) <br> - Letters as numbers (A1) <br> - Expressions \& Equations (A1) <br> - Convert units of length (N1) <br> - Addition, subtraction, multiplication and division strategies (N2) <br> - Perimeter of polygons (KS2) <br> - Area of rectangles, parallelograms, triangles (KS2) <br> - Use standard units of area (KS2) | - Describing positions on the full coordinate grid (KS2) <br> - Find missing vertices of polygons on a coordinate grid (KS2) <br> - Equivalent fractions and simplifying fractions (KS2) <br> - Convert between decimals and fractions (KS2) <br> - Mixed numbers and improper fractions (KS2) | - Place value (N1) <br> - HCF and LCM (N1) <br> - Compare and order integers and decimals (N1) <br> - Add and subtract fractions and mixed numbers (KS2) <br> - Multiply with fractions (KS2) <br> - Divide fraction by integer (KS2) <br> - Solve problems involving the relative sizes of two quantities using integer multiplication and division facts (KS2) | - Solve problems with unequal sharing and grouping using fractions and multiples (KS2) <br> - Solve problems with similar shapes using scale factors (KS2) <br> - Basic translations and reflections (KS2) <br> - Line symmetry (KS2) <br> - Rotation as turns and angles (KS2) | - Read, write, order and compare numbers and determine the value of each digit (KS2, N1) <br> - Round any whole number to a required degree of accuracy (KS2, N1) <br> - Place value and multiplying and dividing numbers by powers of 10 with answers up to three decimal places (KS2, N1) | - Express missing number problems algebraically (KS2) <br> - Understand and use the conventions and vocabulary of algebra including forming and interpreting algebraic expressions and equations (A1) <br> - Simplify algebraic expressions (A1) <br> - Manipulate algebraic expressions using the distributive law (A2) |
| CEIAG Links/ Opportunities | Area and perimeter - Use in inter (Gatsby Benchmark 4) | esign and decorating jobs | Ratio and proportion - Use in cat | ing (Gatsby Benchmark 4) |  |  |


|  | Half Term 1 | Half Term 2 | Half Term 3 | Half Term 4 | Half Term 5 | Half Term 6 |
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| Knowledge Introduced | Algebra 5-Sequences <br> - Numerical and pictorial sequences and patterns. <br> - Term-term rules. <br> - Position-to-term rule. <br> - Properties of arithmetic sequences. <br> - Nth term rules. <br> - Determine whether a number is a term in an arithmetic sequence. <br> Algebra 6-Graphical representations <br> - Express patterns and relationships between coordinates graphically and algebraically. <br> - Understand that there are two key elements to any linear relationship: rate of change and intercept point. <br> - Writing and using linear equations in the form $y=m x+c$. | Number 6-Percentages and <br> Proportion <br> - Graphs and scaling diagrams to represent multiplicative relationships. <br> - Describe one number as a percentage of another. <br> - Find a percentage of a quantity. <br> - Calculate percentage changes (increases and decreases). <br> - Recognise and use direct proportionality with numbers, algebra and in a range of contexts. <br> - Recognise and use inverse proportionality. <br> Geometry 3.1-Circles <br> - Circumference of a circle <br> - Area of a circle <br> - Find radius/diameter given circumference or area <br> - Perimeter and area of composite shapes including part or whole circles. | Geometry 3.2-3D Shapes <br> - Surface area of 3D shapes <br> - Prisms <br> - Volume and capacity of prisms <br> Geometry 4 - Properties of <br> Angles and Polygons <br> - Draw and measure angles, use standard angle vocabulary. <br> - Geometrical proof using properties of angles around a point, angles adjacent on a straight line, vertically opposite angles, interior angle sum of a triangle. <br> - Properties of special quadrilaterals and regular polygons. <br> - Properties of angles and parallel lines. <br> - Interior and exterior angles in polygons. | Statistics 1.1 - Discrete Data and Representations <br> - Types of data, collecting data and sampling. <br> - Frequency tables. <br> - Pictograms, line graphs and bar graphs. <br> - Representing data and reading data in pie charts. <br> - Choose appropriate statistical measures and representations. <br> - Compare data represented in charts. | Statistics 1.2 - Summary Statistics <br> - Measures of central tendency and spread from un-grouped discrete data - mean, median, mode, range. <br> - Using summary statistics to compare and analyse data. <br> - Calculate summary statistics from frequency tables. <br> - Calculating summary statistics when changes are made to the data. <br> Number 7 - Standard Form <br> - Be able to write any integer using powers of 10 . <br> - Writing large numbers in standard form. <br> - Writing large numbers in standard form. <br> - Recognising numbers written in standard form. <br> - Changing numbers that are almost in standard form. | Geometry 5-Constructions <br> - Circles as the locus of a point equidistant from a fixed point. <br> - Use intersecting circles to construct triangles and rhombuses from given lengths. <br> - Properties of a rhombus to help with constructions. <br> - Perpendicular bisector of a line segment. <br> - Perpendicular to a given line through a given point. <br> - Angle bisector. <br> Geometry 6 - Similarity, Congruence and Pythagoras' Theorem <br> - Properties of similar shapes. <br> - Properties of congruent shapes. <br> - Criteria for congruent triangles. <br> - Using Pythagoras' theorem to identify and find missing sides of right-angled triangles. <br> - Use and apply Pythagoras' theorem to solve problems in a range of contexts. |
| Key <br> vocabulary/ concepts/ideas students must master | A5: Sequence, term, nth-term, term-term rule, position-term rule, arithmetic, linear. <br> A6: Gradient, intercept, parallel, rate of change, graphical | N6: Percentage, percent, reverse percentage, increase, decrease, profit, loss, decimal multiplier, direct proportion, inverse proportion, constant of proportionality, compound measure. <br> G3: Circumference, diameter, radius, arc. | G3: sector, prism, cylinder, surface area, volume, capacity. <br> G4: Parallel, perpendicular, transversal, corresponding, alternate, supplementary, congruent, interior angle, exterior angle, regular polygon, irregular polygon. | S1: discrete, continuous, qualitative, quantitative, sample, population, class, frequency. | S1: mean, median, mode, range. <br> N7: Standard form, standard index form. | G5: Arc, bisector, construction line, line segment, locus, perpendicular, diagonal. <br> G6: Congruent, similar, Pythagoras' Theorem, hypotenuse, proportion, rotational symmetry. |
| Knowledge revisited | - Generate and describe linear number sequences (KS2) <br> - Use simple formulae (KS2) <br> - Algebraic expressions (A1) <br> - Expanding brackets (A1) <br> - Describe positions on the full coordinate grid (KS2, A2) <br> - Find pairs of numbers that satisfy an equation with two unknowns (KS2, A2) | - The percent symbol (\%) and definition (KS2) <br> - Write percentages as fractions and decimals (KS2) <br> - Measures and scaling (KS2, N1) <br> - Solve problems involving the calculation of and the use of percentages for comparison (KS2) <br> - Similar shapes and scale factors (KS2, G2) | - Estimate, calculate and compare volume and capacity of cubes/cuboids (KS2) <br> - Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles (KS2) <br> - Compare and classify geometric shapes based on their properties and sizes and | - Bar charts, pictograms, pie charts, line graphs (KS2) | - Mean average (KS2) <br> - Place values and multiplying/dividing by powers of 10 (KS2, N1) <br> - Exponents and roots (N1) <br> - Ordering and comparing integers and decimals (N1) | - Similar shapes and scale factors (G6) <br> - Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons (KS2) <br> - Compare and classify geometric shapes based on their properties and sizes and |


|  | - Use/recognise horizontal and vertical line graphs and $y=x, y=-x$ (A2) | - Perimeter (KS2, N2, G1) <br> - Area of rectangles, parallelograms, triangles and trapeziums (KS2, G1) <br> - Areas of composite shapes (G1) | find unknown angles in any triangles, quadrilaterals, and regular polygons (KS2) |  | find unknown angles in any triangles, quadrilaterals, and regular polygons (KS2) <br> - Solve problems involving similar shapes where the scale factor is known or can be found (KS2) <br> - Concept of congruence (G2) <br> - Enlargements and scale factors (G2) |
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| CEIAG Links/ Opportunities |  |  |  | Interpreting data - data analyst, ecologist, meteorologist, scientist (Gatsby Benchmark 4) | Loci - landscape gardener and construction jobs (Gatsby Benchmark 4) |

