# Year 7 to 11 Mathematics Curriculum Overview

**Mathematics Department Vision:**

*A mathematician at Bournville is not defined through prior attainment. At Bournville they are someone who through practice and application deepens their conceptual understanding to solve routine and non – routine problems. Through not over-valuing short term performance, addressing students' individual needs and inspiring students' creativity, it is our aim for every student to leave Bournville recognising themselves as a mathematician.*

| Time | Year 7 | Topic | Year 8 | Year 9 | Year 10 | Year 11 |
|---|---|---|---|---|---|---|
| Autumn Term | **Unit 1 – Place Value**<br>- Read and write whole numbers in figures and words<br>- Multiply, and divide, any whole number by 10, 100, 1000, or 10 000<br>- Round whole numbers to the nearest 1000, 100 or 10<br><br>**Unit 2 & 3 – Addition and Subtraction**<br>- Use mental strategies<br>- Add and subtract using formal algorithms<br>- Calculate and work with **perimeters**<br>- Model solve word problems<br><br>**Unit 4 - Addition and subtraction of decimals**<br>- Understand decimal notation and place value<br>- Read and write decimals in figures and words<br>- Convert between decimals and fractions where the denominator is a factor of 10 or 100<br>- Use the number line to display decimals and round decimals | Unit 1: Place Value | **1.1 Be able to use approximation through rounding to estimate answers**<br>- By rounding to 1 significant figure<br>- Use of knowledge of place value to make calculations easier.<br><br>**1.2 Be able to write numbers in standard form**<br>- Interpret numbers greater than 1 in standard form<br>- Interpret numbers less than 1 in standard form.<br>- Convert between normal and standard form.<br><br>**1.3 Be able to order numbers written in standard form**<br>- Interpret numbers greater than 1 in standard form<br>- Interpret numbers less than 1 in standard form | **1.4 Be able to apply limits of accuracy including upper and lower bounds**<br>- Rounding to degrees of accuracy<br>- Truncating to a certain degree<br>- Using error intervals<br><br>**1.5 Be able to calculate with numbers in standard form**<br>- Multiplication<br>- Division<br>- Powers | **1.14 Be able to calculate with numbers in standard form**<br>- Addition/ Subtraction<br>- Order of operations<br><br>**1.15 Be able to find the upper and lowers bounds of a calculation**<br>- Addition/Multiplication<br>- Subtraction/Division<br>- Order of operations | **Unit 1: Place Value**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps.<br><br>**Unit 2: Calculations**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps.<br><br>**Unit 3: Types of Number**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | to the nearest whole number, to 1 or 2 decimal places<br>- Use correctly the symbols <, >, etc. and the associated language to order a set of decimals<br>- Multiply and divide decimals by 10, 100, 1000, or 10 000<br>- Solve word problems involving the addition and subtraction of money in decimal notation<br>- Use written methods in column format for addition and subtraction of decimals<br>- Extend existing mental calculation to include decimals<br>- Calculate the perimeter of rectangles, squares and rectilinear figures<br><br>**Unit 5,6,7 & 8 – Addition and Subtraction of decimals**<br>- Use multiplication facts to solve mental calculations<br>- Use the terms 'product', 'multiple' and 'LCM'<br>- Understand and use the column method to multiply integers and decimals<br>- Divide whole numbers and decimals by whole numbers<br>- Use the terms 'quotient', 'remainder', 'factor', 'HCF'<br>- Represent multiplication word problems using bar models | Unit 2: Calculations | **2.5 Be able to add and subtract any number**<br>- Decimal numbers through place value<br>- Rational numbers through conversion to decimals<br>- Rational numbers with a common denominator<br>- Rational numbers with a different denominator<br><br>**2.6 Be able to multiply and divide any number**<br>- Decimal numbers through place value<br>- Rational numbers through conversion to decimals<br>- Rational numbers with a common denominator<br>- Rational numbers with a different denominator<br>- Interpret fractions and percentages as operators<br><br>**2.7 Be able to use integer powers and associated real roots**<br>- Approximate roots of numbers and compare with exact representations of roots<br>- Approximate cube roots of numbers and compare with exact representations of roots | **2.8 Be able to calculate with roots and indices**<br>- Calculations with the same base number<br>- Calculations with a different base number<br>- Fractional indices<br><br>**2.9 Be able to add and subtract fractions**<br>- Same denominator<br>- Different denominator<br>- Improper fractions<br>- Mixed numbers<br><br>**2.10 Be able multiply and divide fractions**<br>- Same denominator<br>- Different denominator<br>- Improper fractions<br>- Mixed numbers<br><br>**2.11 Be able to use the order of operations with fractions**<br>- Same denominator<br>- Different denominator<br>- Improper fractions<br>- Mixed numbers | **2.12 Be able to reason mathematically and use calculations to solve functional problems** | **Unit 4: Ratio and Proportion**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps.<br><br>**Unit 5: Fractions, Decimals and Percentages**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps.<br><br>**Unit 6: Manipulating Algebra**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps.<br><br>**Unit 7: Geometry**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | - Find the area of a rectangle and triangle<br>- Solve problems involving length, perimeter and area<br>- Estimate answers in calculations and check that results are reasonable<br>- Measure time, calculate with time and solve time word problems<br>- Find the mean average, interpreting average as "total amount ÷ number of items" and solve word problems involving average | Unit 3: Types of Number | **3.4 Be able to write a number as a product of its prime factors**<br>- Using the product notation<br>- Using the unique factorisation property<br><br>**3.5 Be able to identify the highest common factor of numbers**<br>- Identify through listing<br>- Identify through prime factorisation<br>- Identify coprime numbers<br><br>**3.6 Be able to find the lowest common multiple of numbers**<br>- Identify through listing<br>-Identify through prime factorisation<br>- Establish that the product of 2 numbers is equal to the HCF x LCM | **3.7 Be able to recognise and simplify surds**<br>- Recognise simplified surds through listing squares<br>- Simplify surds with a square prime numbers through prime factorisation<br>- Simplify surds with any square number through prime factorisation<br><br>**3.8 Be able to simplify expressions involving surds**<br>- Addition/Subtraction<br>- Multiplication/Division<br>- Order of operations<br>- Expanding single brackets<br>- Expanding double brackets | **3.10 Be able to rationalise the denominator**<br>- Surd only on the denominator<br>- Surd with addition/subtraction of integer through difference of 2 squares<br>- Surd with fractional surd<br><br>**3.11 Be able to apply systematic listing strategies**<br>- Use of the product rule<br>- Combinations<br>- Permutations | **Unit 8: Solving Equations**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps.<br><br>**Unit 9: Data Value**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps. |
| | | Unit 4: Ratio and Proportion | **4.6 Be able to understand that a multiplicative relation between two quantities can be expressed as a ratio or a fraction**<br><br>**4.7 Be able to use direct proportion**<br>- Best buys<br>- Exchange rates<br>- Speed<br>- Density<br><br>**4.8 Be able to use inverse proportion**<br>**-** Understand X is inversely proportion to Y is equivalent to X is directly proportional to 1/y | **4.9 Be able to construct and interpret equations that describe direct and inverse proportion**<br>- Proportional reasoning<br><br>**4.10 Be able to use ratio notation and scale factors with similarity**<br>- Compare lengths<br>- Compare areas<br>- Compare volumes<br><br>**4.11 Be able to convert between related compound units**<br>- Speed<br>- Rates of pay<br>- Prices<br>- Density<br>- Pressure | **4.12 Be able to recognise and interpret graphs that illustrate direct and inverse proportion**<br><br>**4.13 Be able to set up, solve and interpret growth and decay problems**<br>- Compound interest<br>- Iterative processes | **Unit 10: Sequences**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps.<br><br>**Unit 11: Probability**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Unit 5: Fractions, Decimals and Percentages | **5.7 Be able to order fractions, decimals and percentages**<br>- Terminating decimals<br>- Recurring decimals<br>- Irrational numbers<br><br>**5.8 Be able to interpret percentage change as a fraction or a decimal**<br>- Using proportional reasoning<br><br>**5.9 Be able to express one quantity as a percentage of another**<br>- Using proportional reasoning<br><br>**5.10 Be able to calculate a percentage increase/decrease**<br>- Using proportional reasoning | **5.11 Be able to convert recurring decimals to fractions**<br><br>**5.12 Be able to calculate reverse percentages**<br>- Proportional reasoning<br><br>**5.13 Be able to simplify simple algebraic fractions**<br>- Highest common factor<br>- Laws of indices | **5.14 Be able to multiply and divide algebraic fractions**<br>- Highest common factor<br>- Quadratic expressions<br>- Laws of indices<br><br>**5.15 Be able to add and subtract algebraic fractions**<br>- Highest common factor<br>- Quadratic expressions<br>- Laws of indices | **Unit 12: Graphs**<br>Review following year 10 mock and analysis of QLA data to fill subject knowledge gaps.<br><br>**Autumn Mock Revision** |
| Spring Term | **Unit 9 – Working with Units**<br>- Record and order measurements using decimal notation<br>- Estimate and/or measure:<br>o length in kilometres (km) /metres (m)/ centimetres (cm)/ millimetres (mm)<br>o mass in kilograms (kg) /grams (g)<br>- volume of liquid in litres (l) / millilitres (ml) | Unit 6: Manipulating Algebra | **6.5 Be able to simplify and manipulate algebraic expressions by collecting like terms**<br><br>**6.6 Be able to multiply a single term over a bracket**<br>- Numerical<br>- Algebraic<br>- Powers<br><br>**6.7 Be able to manipulate an algebraic expressions by taking out common factors**<br>- Numerical | **6.9 Be able to use the laws of indices to simplify algebraic expressions**<br><br>**6.10 Be able rearrange formula**<br>- Variable on one side<br>- Variable on both sides<br>- Variable as the denominator<br><br>**6.11 Be able to factorise quadratic expressions**<br>- no coefficient<br>- with a coefficient | **6.13 Be able to complete the square**<br>- no coefficient<br>- with a coefficient<br>- recognise minimum values<br><br>**6.14 Be able to find the sums or multiples of different functions**<br><br>**6.15 Be able to construct mathematical proofs**<br>- odd/even/consecutive etc. | **Unit 1: Place Value**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps.<br><br>**Unit 2: Calculations**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps.<br><br>**Unit 3: Types of Number**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Unit 10 – Angles**<br>- Draw and measure acute and obtuse angles reliably to the nearest degree<br>- Estimate the size of any given angle<br>- Recognize acute, right, obtuse and reflex angles<br>- Know and use the fact that the angles round a point total 360°, that angles on a straight line total 180°, and that vertically opposite angles are equal<br><br>**Unit 11 & 12 – Triangles and Quadrilaterals**<br><br>**Unit 13 - Symmetry and tessellation**<br>- Identify lines of symmetry in any shape<br>- Identify the order of rotational symmetry in any shape<br>- Create shapes given details of their symmetries<br>- Investigate and create tessellations<br><br>**Unit 14 – Understand and use fractions**<br>- Represent fractions using area diagrams, bar models and number lines<br>- Recognize and name equivalent fractions<br>- Convert fractions to decimals<br>- Convert terminating decimals to fractions in their simplest form | | - Algebraic<br>- Powers<br><br>**6.8 Be able to expand products of two or more binomials**<br>- Two brackets no coefficient grid method<br>- Two brackets grid method<br>- Multiple brackets repeated grid method | **6.12 Be able to use function notation**<br>- interpret simple expressions as functions with inputs and outputs<br>- Interpret the reverse process as the 'inverse function'<br>- Interpret the succession of functions as a 'composite function' | - factorising to find multiples or differences between expressions | **Unit 4: Ratio and Proportion**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps. |
| | | Unit 7: Geometry | **7.6 Be able to derive and use standard ruler and compass constructions**<br>- Perpendicular bisector of a line segment<br>- Constructing a perpendicular to a given line from/at a given point<br>- Bisecting a given angle<br>- Recognise and use the perpendicular distance from a point to a line as the shortest distance to the line<br><br>**7.7 Be able to calculate the area and circumference of circles**<br>- circles<br>- semi-circles<br>- sectors<br><br>**7.8 Be able to identify properties of and describe the results of transformations applied to given figures**<br>- translations<br>- rotations<br>- reflections<br>- enlargements | **7.11 Be able to construct and interpret plans and elevations of 3D shapes**<br><br>**7.12 Be able to interpret and use bearings**<br>- measure<br>- use of parallel lines<br><br>**7.13 Be able to use Pythagoras' theorem**<br>- missing hypotenuse<br>- any missing length<br>- diagonals<br>- compound shapes<br>- 3D<br><br>**7.14 Be able to calculate surface areas and volumes of 3D shapes**<br>- Pyramids<br>- Cones<br>- Spheres<br>- Composite solids<br><br>**7.15 Be able to use standard geometrical formula to solve problems**<br>- density, mass and volume<br>- pressure, force and area | **7.16 Be able to use trigonometry**<br>- Missing angles<br>- Missing lengths<br>- Known triangles for exact values<br>- Compound shapes<br><br>**7.17 Be able to use the sine and cosine rule**<br>- Use of trigonometry and introducing a perpendicular height<br>- Use of known formulae<br><br>**7.18 Be able to use trigonometry to find the area of a non-right angled triangle**<br><br>**7.19 Be able to solve problems involving vectors**<br>- Describe translations as 2D vectors<br>- Addition and subtraction of vectors<br>- Multiplication of vectors by a scalar<br>- Diagrammatic and column representations of vectors | **Unit 5: Fractions, Decimals and Percentages**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps.<br>**Unit 6: Manipulating Algebra**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps.<br>**Unit 7: Geometry**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps.<br>**Unit 8: Solving Equations**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps.<br>**Unit 9: Data**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps.<br>**Unit 10: Sequences**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps. |

| | | | | | | |
|---|---|---|---|---|---|---|
| | - Convert between mixed numbers and improper fractions<br>- Compare and order numbers<br>- Convert simple fractions and decimals to percentages<br>- Express one quantity as a fraction of another<br><br>**Unit 15 – Fractions of amounts**<br>- Find a fraction of a set of objects or quantity<br>- Find the whole given a fraction<br><br>**Unit 16 – Multiplying and dividing decimals**<br>- Multiply a whole number or fraction by a whole number or fraction<br>- Multiply a mixed number and a whole number<br>- Divide a whole number or proper fraction by a whole number or proper fraction | | **7.9 Be able to calculate missing angles in parallel lines**<br>- alternate<br>- corresponding<br>- co-interior<br><br>**7. 10 Be able to use criteria for similarity and congruence of triangles**<br>**-** recognise similarity through same angles<br>- construct similar shapes on a grid<br>- construct congruent shapes on a grid<br>- recognise criteria for congruence (ASA, SAS, SSS, RHS) | | - Construct arguments and proofs<br><br>**7.20 Be able to apply and prove standard circle theorems concerning angles, radii, tangents and chords** | **Unit 11: Probability**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps. |
| | | Unit 8: Solving Equations | **8.2 Be able to use algebraic methods to solve linear equations**<br>**-** Brackets<br>- Fractions<br>- Negatives<br><br>**8.3 Be able to understand and use standard mathematical formulae**<br><br>**8.4 Be able to rearrange standard formulae to change the subject**<br>- Linear, unknowns on one side | **8.4 Be able to solve linear simultaneous equations**<br>**-** Common coefficient on one variable<br>- Different coefficients<br><br>**8.5 Be able to solve quadratic equations by factorising.**<br>- No coefficient<br>- With a coefficient | **8.6 Be able to solve quadratic equations by completing the square.**<br>- No coefficient<br>- With a coefficient<br><br>**8.7 Be able to solve equations arising from algebraic fractions.**<br><br>**8.8 Be able to solve quadratic simultaneous equations.** | **Unit 12: Graphs**<br>Review following Autumn mock and analysis of QLA data to fill subject knowledge gaps.<br><br>**Spring Mock Revision** |

| | | | | | | |
|---|---|---|---|---|---|---|
| Summer Term | **Unit 17 – Order of Operations**<br>- Carry out calculations involving all four operations<br>- Understand and use brackets<br>- Use simple index notation<br><br>**Unit 18 – Introduction to algebra**<br>- Recognize and continue sequences<br>- Represent an unknown number using a letter<br>- Write and understand simple algebraic expressions<br>- Substitute numerical values into formulae and expressions<br>- Collect like terms and simplify expressions<br>- Multiply out brackets, identify and take out common factors to factorise<br>- Recognize that different-looking expressions may be identical and prove simple algebraic identities<br><br>**Unit 19 – Algebraic generalisation project**<br><br>**Unit 20 – Percentages**<br>- Understand percentage as a fractional operator with denominator of 100<br>- Express a part of a whole as a percentage<br>- Convert between fractions, decimals and percentages<br>- Find fractions and percentages of given quantities | Unit 9: Data | **9.5 Be able to construct and interpret scatter graphs**<br>- Describe simple mathematical relationships<br>- Use correlation<br>- Recognise extrapolation and interpolation<br><br>**9.6 Be able to construct and interpret pie charts**<br><br>**9.7 Be able to construct and interpret frequency polygons**<br><br>**9.8 Be able to calculate the mode, median, mean and range**<br>- From frequency polygons<br>- From continuous data tables | **9.9 Be able to construct and interpret cumulative frequency graphs**<br>- Use of a table<br>- Finding the median and interquartile range<br><br>**9.10 Be able to construct and identify boxplots including identifying outliers**<br>- From given averages and ranges<br>- From a frequency table<br>- From a cumulative frequency graph<br><br>**9.11 Be able to use sampling**<br>- random<br>- stratified<br>- infer properties of populations and distributions from a sample, whilst knowing the limitations | **9.12 Be able to interpret and construct tables and line graphs for time series data**<br><br>**9.13 Be able to construct and interpret histograms**<br>- equal class intervals<br>- unequal class intervals<br>- use a histogram to fill in a frequency table<br><br>**9.14 Be able to apply statistics to describe a population** | **Review and revision** |
| | | Unit 10: Sequences | **10.4 Be able to find the nth term of a linear/arithmetic sequence**<br>- Recognise constant different relates to a times table<br><br>**10.5 Be able to generate a sequence given an nth term rule**<br>- Recognition of times tables<br>- Using substitution<br><br>**10.6 Be able to find the nth term of a geometric sequence** | **10.7 Be able to identify whether a given number is in a sequence**<br>- Linear/ Arithmetic<br>- Geometric<br>- Fibonacci style<br>- Square numbers/ Quadratic<br>- Triangle numbers<br><br>**10.8 Be able to generate a quadratic sequence**<br>- Use of square numbers<br>- Use of standard quadratic expression | **10.9 Be able to find the nth term of a quadratic sequence**<br>- Use of square numbers<br>- Use of standard quadratic expression<br><br>**10.10 Be able to use iteration with simple converging sequences**<br>- Generate a sequence | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | - Find the whole given a part and the percentage<br>- Increasing and decreasing by a percentage<br><br>**Unit 21 – Handling data**<br>- Understand the difference between types of data<br>- Construct and interpret<br>o Tables (including tally and two way)<br>o Bar charts (including comparative and composite)<br>o Pictograms<br>o Line graphs<br>- Read and interpret pie charts<br>- Draw pie charts from raw data<br>- Explore misleading graphical representations | Unit 11: Probability | **11.4 Be able to calculate the expectation of an event happening**<br>- Fractions<br>- Decimals<br><br>**11.5 Be able to draw and use sample space diagrams to calculate probabilities**<br>- equally likely, mutually exclusive outcomes | **11.6 Be able to use two way tables sort out information and calculate probabilities**<br><br>**11.7 Be able to use Venn diagrams to sort out information and calculate probabilities** | **11.8 Be able to use tree diagrams to calculate probabilities of independent and conditional events.**<br>- independent<br>-dependent<br><br>**11.9 Be able to use the and/or rules to calculate probabilities** | |
| | | Unit 12: Graphs | **12.3 Be able to solve equations graphically**<br>- Given x or y coordinate<br>- Linear link to proportional reasoning<br><br>**12.4 Be able to draw the graphs of quadratic functions of one variable**<br>- Given a table of values<br>- Using equations in the x and y plane<br>- Given an appropriate axis<br>- Drawing an appropriate axis<br>- Recognise x and y-intercepts<br>- Recognise turning points<br><br>**12.5 Be able to find the equation of the line**<br>- Recognise through a drawn line on a graph<br>- Recognise parallel lines<br>- Recognise perpendicular lines<br>- Through two given points<br>- Through one point with a given gradient | **12.6 Be able to produce graphs of;**<br>- Simple cubic functions with a table of values<br>- Simple cubic functions with an equation in the x and y plane<br>- Reciprocal functions with a table of values<br>- Reciprocal functions with an equation in the x and y plane<br>- Exponential function<br><br>**12.7 Be able to transform and describe transformation of shapes on a coordinate grid**<br>- Rotation<br>- Reflection<br>- Translation<br>- Enlargement (positive, fractional and negative)<br><br>**12.8 Be able to draw and interpret;**<br>- distance-time graphs (gradients and area under graphs)<br>- velocity- time graphs (gradients and area under graphs<br>- financial context<br>- | **12.9 Be able to represent inequalities on a coordinate graphs and find the region**<br>- one variable<br>- two variables<br>- quadratic inequalities in one variable<br><br>**12.10 Be able to find the equation of perpendicular lines**<br><br>**12.11 Be able to sketch translations and reflection of a graph of a given function**<br><br>**12.12 Be able to estimate the area under a curve**<br>- rectangles<br>- trapeziums<br><br>**12.13 Be able to recognise and use the equation of a circle**<br>- centre at the origin<br>- centre anywhere<br>- gradient of the radius given a point on the circumference of the circle<br>- length of the radius given a point on the circumference of the circle<br>- tangent to a circle given a point on the circumference of the circle | |