

## **St Michael's CE (VA) Junior School**

### **Mathematics Curriculum**



#### **CURRICULUM INTENT**

Our Mathematics curriculum fulfils the requirements of the National Curriculum and is fully inclusive to every child; it ensures the progressive development of knowledge and skills, promotes fluency, reasoning and problem solving and enables all children to experience success and enjoyment.

We want our children to develop resilience through appropriate challenge; irrespective of their personal starting points, our pupils will explore maths' concepts in depth and use a range of mathematical vocabulary to reason and explain. Children will persevere by building on previous knowledge and skills and apply these to a wide variety of contexts, both with maths and across the curriculum. They will appreciate the relevance of maths in real-life situations.

#### **CURRICULUM IMPLEMENTATION**

Teachers plan high quality lessons in year group teams; lessons are carefully planned for progression and depth, in accordance with White Rose Maths' small steps progression. Maths is taught in blocks; this allows children to master the skills and techniques that they are learning. Teachers use a range of high-quality differentiated resources, linked to the small steps progression, to ensure all children are able to achieve the learning objectives.

As part of their daily maths lesson, children complete arithmetic questions, which enables them to practise and consolidate their mental and calculation knowledge. The arithmetic tasks reinforce and consolidate previous learning, increase fluency, speed and accuracy and improve confidence. All children use Times Tables Rockstars within school to improve their multiplication and division knowledge.

#### **CURRICULUM IMPACT**

Ongoing formative assessment takes place within each maths lesson. This includes: teacher observations, questioning, discussions and marking and feedback. These outcomes are fed forward into timely teacher intervention and subsequent planning to ensure gaps in knowledge are closed and progress is not limited.

End of unit assessments from White Rose are used in Years 3 to 5 to support teacher assessments, and end of term assessments are used to track progress and to identify knowledge that has not been well retained. Outcomes from both end of unit and end of term assessments are used to identify gaps in knowledge and will inform future planning.

SLT analyse termly data (based on teacher assessments) and this forms the basis for conversations during pupil progress meetings, where teachers and leaders will identify precise actions and objectives for targeted focus children, including disadvantaged pupils and those pupils who are not making expected progress. Maths' attainment is reported to parents during the autumn and spring parent consultation evenings and is recorded on the child's annual end-of-year report to parents.

### National Curriculum Objectives for KS2 Mathematics

**The statutory requirements, as outlined in the National Curriculum, form the basis of this curriculum document. The statutory objectives have been broken down into year groups, so that there is complete curriculum coverage and progression of concepts.**

	Year 3	Year 4	Year 5	Year 6
<p><b>Place Value</b></p> <ul style="list-style-type: none"> <li>- <b>Counting</b></li> <li>- <b>Represent</b></li> <li>- <b>Use place value and compare</b></li> <li>- <b>Problems and rounding</b></li> </ul>	<p>Count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number.</p> <p>Identify, represent and estimate numbers using different representations.</p> <p>Read and write numbers up to 1,000 in numerals and words.</p> <p>Recognise the place value of each digit in a three-digit number (H, T, O).</p> <p>Compare and order numbers from 0 up to 1000; use <math>&gt;</math>, <math>&lt;</math> and <math>=</math> signs.</p> <p>Solve number problems and practical problems involving these ideas.</p>	<p>Count in multiples of 6, 7, 9, 25 and 1000.</p> <p>Count backwards through zero to include negative numbers.</p> <p>Identify, represent and estimate numbers using different representations.</p> <p>Read Roman numerals to 100.</p> <p>Find 1,000 more or less than a given number.</p> <p>Recognise the place value of each digit in a four-digit number (Th, H, T, O).</p> <p>Order and compare numbers beyond 1,000.</p> <p>Round any number to the nearest 10, 100 or 1,000.</p>	<p>Count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000.</p> <p>Count forwards and backwards with positive and negative whole numbers, including through zero.</p> <p>Read, write, (order and compare) numbers to at least 1,000,000 and determine the value of each digit.</p> <p>Read Roman numerals to 1,000 and recognise years written in Roman numerals.</p> <p>(Read, write,) order and compare numbers to at least 1,000,000 and determine the value of each digit.</p> <p>Interpret negative numbers in context.</p>	<p>Read, write, (order and compare) numbers up to 10,000,000 and determine the value of each digit.</p> <p>(Read, write,) order and compare numbers to at least 10,000,000 and determine the value of each digit.</p> <p>Round any number to a required degree of accuracy.</p> <p>Use negative numbers in context and calculate intervals across zero.</p> <p>Solve number and practical problems that involve all of the above.</p>

			<p>Round any number up to 1,000,000 to the nearest 10, 100, 1,000, 10,000 and 100,000.</p> <p>Solve number problems and practical problems that involve all of the above.</p>	
<p><b>Knowledge</b></p>	<p>Place value tells us the value of a digit, depending on its place in the number.</p> <p>The place value of a digit increases when it moves across the place value grid to the left.</p> <p>The place value of a digit decreases when it moves across the place value grid to the right.</p> <p>We use zero as a place holder to show that there is no value in that column.</p> <p>The decimal point in a place value grid never moves, the digits move.</p> <p>The equals sign means 'balance' (not 'and the answer is...') – the numbers or calculations on either side of the equals symbol (=) must be the same to achieve the balance.</p>			
<p><b>Addition and Subtraction</b></p> <ul style="list-style-type: none"> <li>- Recall, represent, use</li> <li>- Calculations</li> <li>- Solve problems</li> </ul>	<p>Estimate the answer to a calculation and use inverse operations to check answers.</p> <p>Add and subtract numbers mentally.</p> <p>Add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction.</p> <p>Solve problems including missing number problems, using number facts, place value, and more complex addition and subtraction.</p>	<p>Estimate and use inverse operations to check answers to a calculation.</p> <p>Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate.</p> <p>Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why.</p>	<p>Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.</p> <p>Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction).</p> <p>Add and subtract numbers mentally with increasingly large numbers.</p> <p>Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.</p>	<p>Perform mental calculations, including with mixed operations and large numbers.</p> <p>Use their knowledge of the order of operations to carry out calculations involving the four operations.</p> <p>Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.</p>

			Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign.	
<b>Knowledge</b>	<p>The difference is the result of subtracting one number from another.</p> <p>The sum/total is the result of adding two or more numbers together.</p> <p>The inverse operation is the operation that reverses the effect of another operation.</p>			
<b>Multiplication and Division</b> <ul style="list-style-type: none"> <li>- <b>Recall, represent, use</b></li> <li>- <b>Calculations</b></li> <li>- <b>Solve Problems</b></li> <li>- <b>Combined operations</b></li> </ul>	<p>Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.</p> <p>Write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods.</p> <p>Solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which <math>n</math> objects are connected to <math>m</math> objects.</p>	<p>Recall multiplication and division facts for multiplication tables up to <math>12 \times 12</math>.</p> <p>Use place value, known and derived facts to multiply and divide mentally, including multiplying by 0 and 1; dividing by 1; multiplying together three numbers.</p> <p>Recognise and use factor pairs and commutativity in mental calculations.</p> <p>Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.</p> <p>Solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by one</p>	<p>Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.</p> <p>Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.</p> <p>Establish whether a number up to 100 is prime and recall prime numbers up to 19.</p> <p>Recognise and use square numbers and cube numbers and the notation for squared (<math>^2</math>) and cubed (<math>^3</math>).</p> <p>Multiply numbers up to 4 digits by a one or two-digit number using a formal written method, including</p>	<p>Identify common factors, common multiples and prime numbers.</p> <p>Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.</p> <p>Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of multiplication.</p> <p>Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.</p>

digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

long multiplication for two-digit numbers.  
Multiply and divide numbers mentally, drawing upon known facts.  
Divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context.  
Multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000.  
Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes.  
Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.  
Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign.

Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context.  
Perform mental calculations, including with mixed operations and large numbers.  
Solve problems involving addition, subtraction, multiplication and division.  
Use their knowledge of the order of operations to carry out calculations involving the four operations.

Knowledge				
<p><b>Fractions</b></p> <ul style="list-style-type: none"> <li>- <b>Recognise and write</b></li> <li>- <b>Compare</b></li> <li>- <b>Calculations</b></li> <li>- <b>Solve problems</b></li> </ul>	<p>Count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10.</p> <p>Recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators.</p> <p>Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators.</p> <p>Recognise and show, using diagrams, equivalent fractions with small denominators.</p> <p>Compare and order unit fractions, and fractions with the same denominators.</p> <p>Add and subtract fractions with the same denominator within one whole (for example, <math>\frac{5}{7} + \frac{1}{7} = \frac{6}{7}</math>).</p> <p>Solve problems that involve all of the above.</p>	<p>Count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten.</p> <p>Recognise and show, using diagrams, families of common equivalent fractions.</p> <p>Add and subtract fractions with the same denominator.</p> <p>Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number.</p>	<p>Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths.</p> <p>Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements <math>&gt; 1</math> as a mixed number (for example, <math>\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1 \frac{1}{5}</math>).</p> <p>Compare and order fractions whose denominators are all multiples of the same number.</p> <p>Add and subtract fractions with the same denominator and denominators that are multiples of the same number.</p> <p>Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.</p>	<p>Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.</p> <p>Compare and order fractions, including fractions <math>&gt; 1</math>.</p> <p>Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.</p> <p>Multiply simple pairs of proper fractions, writing the answer in its simplest form (for example, <math>\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}</math>).</p> <p>Divide proper fractions by whole numbers (for example, <math>\frac{1}{3} \div 2 = \frac{1}{6}</math>).</p>

<p><b>Knowledge</b></p>	<p>A fraction is part of a whole.  The numerator is the top number in a fraction – it shows how many equal parts are being used.  The denominator is the bottom number in a fraction – it shows the number of equal parts that the whole has been divided into.  An improper fraction a fraction where the numerator is greater than the denominator e.g. <math>\frac{5}{3}</math>. It is greater than 1.  A mixed number is a number consisting of an integer (a whole number) and a proper fraction e.g. <math>5\frac{1}{2}</math>  Equivalent fractions have the same value for example <math>\frac{1}{2}</math> is equivalent to <math>\frac{3}{6}</math>  Fractions can be simplified by dividing the numerator and denominator by the lowest common factor.</p>			
<p><b>Decimals</b></p> <ul style="list-style-type: none"> <li>- Recognise and write</li> <li>- Compare</li> <li>- Calculations &amp; problems</li> </ul>		<p>Recognise and write decimal equivalents of any number of tenths or hundredths.  Recognise and write decimal equivalents to <math>\frac{1}{4}</math>, <math>\frac{1}{2}</math>, <math>\frac{3}{4}</math>.  Round decimals with one decimal place to the nearest whole number.  Compare numbers with the same number of decimal places up to two decimal places.  Find the effect of dividing a one or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths.</p>	<p>Read and write decimal numbers as fractions (for example, <math>0.71 = \frac{71}{100}</math> ).  Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.  Round decimals with two decimal places to the nearest whole number and to one decimal place.  Read, write, order and compare numbers with up to three decimal places.  Solve problems involving numbers with up to three decimal places.</p>	<p>Identify the value of each digit in numbers given to three decimal places.  Multiply and divide numbers by 10, 100 and 1,000 giving answers up to three decimal places.  Multiply one-digit numbers with up to two decimal places by whole numbers.  Use written division methods in cases where the answer has up to two decimal places.  Solve problems which require answers to be rounded to specified degrees of accuracy.</p>
		<p>Solve simple measure and money problems involving fractions and decimals to two decimal places.</p>	<p>Recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred' and write</p>	<p>Associate a fraction with division and calculate decimal fraction equivalents (for example 0.375) for a</p>

<b>Fractions, Decimals and Percentages</b>			<p>percentages as a fraction with denominator 100 and as a decimal.</p> <p>Solve problems which require knowing percentage and decimal equivalents of <math>\frac{1}{2}</math>, <math>\frac{1}{4}</math>, <math>\frac{1}{5}</math>, <math>\frac{2}{5}</math>, <math>\frac{4}{5}</math> and those fractions with a denominator of a multiple of 10 or 25.</p>	<p>simple fraction (for example, <math>\frac{3}{8}</math>).</p> <p>Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.</p>
<b>Knowledge</b>	'Per cent' means 'out of 100' – percentage can be expressed as a fraction (for example, 35% is equivalent to $\frac{35}{100}$ ).			
<b>Ratio and Proportion</b>				<p>Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.</p> <p>Solve problems involving the calculation of percentages (for example, of measures, and such as 15% of 360) and the use of percentages for comparison.</p> <p>Solve problems involving similar shapes where the scale factor is known or can be found.</p> <p>Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.</p>



<p style="text-align: center;"><b>Algebra</b></p>	<p>Solve problems, involving missing number problems.</p>	<p>Solve problems, involving missing number problems.</p>	<p>Solve problems, involving missing number problems.</p>	<p>Solve problems, involving missing number problems. Use simple formulae. Generate and describe linear number sequences. Express missing number problems algebraically. Find pairs of numbers that satisfy an equation with two unknowns. Enumerate possibilities of combinations of two variables.</p>
<p style="text-align: center;"><b>Measurement</b></p> <ul style="list-style-type: none"> <li>- <b>Using measures</b></li> <li>- <b>Money</b></li> <li>- <b>Time</b></li> <li>- <b>Perimeter, area &amp; volume</b></li> </ul>	<p>Measure, compare, add and subtract lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml).  Add and subtract amounts of money to give change, using both £ and p in practical contexts.  Tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks.  Estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as</p>	<p>Convert between different units of measure (for example, kilometre to metre; hour to minute).  Estimate, compare and calculate different measures. Estimate, compare and calculate different measures, including money in pounds and pence.  Read, write and convert time between analogue and digital 12- and 24-hour clocks.  Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.</p>	<p>Convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre).  Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints. Use all four operations to solve problems involving measure (for example, length, mass, volume, money) using decimal notation including scaling.</p>	<p>Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.  Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places.  Convert between miles and kilometres.  Use, read, write and convert between standard units,</p>

	<p>o'clock, am/pm, morning, afternoon, noon and midnight.</p> <p>Know the number of seconds in a minute and the number of days in each month, year and leap year.</p> <p>Compare durations of events (for example to calculate the time taken by particular events or tasks).</p> <p>Measure the perimeter of simple 2-D shapes.</p>	<p>Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres.</p> <p>Find the area of rectilinear shapes by counting squares.</p>	<p>Use all four operations to solve problems involving measure (for example, money).</p> <p>Solve problems involving converting between units of time.</p> <p>Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres.</p> <p>Calculate and compare the area of rectangles (including squares) and including using standard units, square centimetres (cm<sup>2</sup>) and square metres (m<sup>2</sup>) and estimate the area of irregular shapes.</p> <p>Estimate volume (for example, using 1cm<sup>3</sup> blocks to build cuboids, including cubes) and capacity (for example, using water).</p>	<p>converting measurements of time from a smaller unit of measure to a larger unit, and vice versa.</p> <p>Recognise that shapes with the same areas can have different perimeters and vice versa.</p> <p>Recognise when it is possible to use formulae for area and volume of shapes.</p> <p>Calculate the area of parallelograms and triangles.</p> <p>Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm<sup>3</sup>) and cubic metres (m<sup>3</sup>), and extending to other units (for example, mm<sup>3</sup> and km<sup>3</sup>).</p>
<p><b>Knowledge</b></p>	<p>1000 metres = 1 kilometre, 100 centimetres = 1metre, 10 millimetres = 1 centimetre.</p> <p>1000 millilitres = 1 litre.</p> <p>1000 grams = 1 kilogram.</p> <p>60 seconds = 1 hour, 24 hours = 1 day, 7 days = 1 week, 52 weeks = 1 year.</p> <p>The correct order of the months of the year, and how many days are in each.</p> <p>Capacity is the volume of a material (typically liquid or air) held in a vessel or container.</p> <p>Perimeter is the distance around the outside of a shape.</p> <p>Area is the measure of the inside of a shape – it is measured in square units (e.g. cm<sup>2</sup>)</p>			

<p><b>Geometry</b></p> <ul style="list-style-type: none"> <li>- <b>2-D shapes</b></li> <li>- <b>3-D shapes</b></li> <li>- <b>Angles and lines</b></li> <li>- <b>Position and direction</b></li> </ul>	<p>Volume is the measure of three-dimensional space. Usually measured in cubic units (for example, cubic centimetres (cm<sup>3</sup>)).</p>			
<p>Draw 2-D shapes.          Make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them.          Recognise angles as a property of shape or a description of a turn. Identify right angles, recognise that two right angles make a half-turn, three make three-quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle.          Identify horizontal and vertical lines and pairs of perpendicular and parallel lines.</p>	<p>Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes.          Identify lines of symmetry in 2-D shapes presented in different orientations.          Identify acute and obtuse angles and compare and order angles up to two right angles by size.          Identify lines of symmetry in 2-D shapes presented in different orientations.          Complete a simple symmetric figure with respect to a specific line of symmetry.          Describe positions on a 2-D grid as coordinates in the first quadrant.          Describe movements between positions as translations of a given unit to the left/right and up/down.          Plot specified points and draw sides to complete a given polygon.</p>	<p>Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.          Use the properties of rectangles to deduce related facts and find missing lengths and angles.          Identify 3-D shapes, including cubes and other cuboids, from 2-D representations.          Know angles are measured in degrees; estimate and compare acute, obtuse and reflex angles.          Draw given angles and measure them in degrees.          Identify angles at a point and one whole turn (total 360°), angles at a point on a straight line and <math>\frac{1}{2}</math> a turn (180°) and other multiples of 90°.          Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed.</p>	<p>Draw 2-D shapes using given dimensions and angles.          Compare and classify geometric shapes based on their properties and sizes.          Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius.          Recognise, describe and build simple 3-D shapes, including making nets.          Find unknown angles in any triangles, quadrilaterals and regular polygons.          Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.          Describe positions on the full coordinate grid (all four quadrants).          Draw and translate simple shapes on the coordinate plane and reflect them in the axes.</p>	

<p><b>Knowledge</b></p>	<p>A triangle has three sides and three interior angles that total <math>180^\circ</math>.  A quadrilateral has four sides and four interior angles that total <math>360^\circ</math>.  A pentagon has five sides and five interior angles, a hexagon has six sides and six interior angles, a heptagon has seven sides and seven interior angles, an octagon has eight sides and eight interior angles.  Regular shapes have equal sides and equal angles.  A 2-D (two-dimensional) shape lies on a plane – it is flat.  A 3-D (three-dimensional) shape takes up space – it has depth.  An acute angle is more than <math>0^\circ</math> but less than <math>90^\circ</math>  An obtuse angle is more than <math>90^\circ</math> but less than <math>180^\circ</math>  A right-angle measures <math>90^\circ</math>  The sum of the angles at a point on a straight line is <math>180^\circ</math>.  The complete angle all the way around a point is <math>360^\circ</math>.</p>			
<p><b>Statistics</b></p> <ul style="list-style-type: none"> <li>- <b>Present and interpret</b></li> <li>- <b>Solve problems</b></li> </ul>	<p>Interpret and present data using bar charts, pictograms and tables.</p> <p>Solve one-step and two-step questions using information presented in scaled bar charts, pictograms and tables.</p>	<p>Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs.</p> <p>Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.</p>	<p>Complete, read and interpret information in tables, including timetables.</p> <p>Solve comparison, sum and difference problems using information presented in a line graph.</p>	<p>Interpret and construct pie charts and line graphs and use these to solve problems.</p> <p>Calculate and interpret the mean as an average.</p>