



Deepcar St. John's C.E. Junior School

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Vision

Our goal is to cultivate an environment where every child has a clear opportunity to succeed and takes pleasure from learning maths. Its relevance to the wider world should be emphasized as children recognize the value of skills beyond the pages of their maths books. Achievement is celebrated in all its forms.

All children will become secure with the fundamentals of maths, building-on and making connections between these to extend the limits of their own understanding.

Teaching at St. John's should instill a risk-taking outlook into children who are encouraged to explore (by means of comparison, experimentation, analysis and discussion), all in the process of forming their own conclusions and building links in their own minds. Instead of 'telling' children the knowledge and skills, the teacher is the 'facilitator' who, through expert questioning, guides the children to uncover their own learning-discoveries.

Children are not allowed to fall behind as interventions happen daily and, through expert teacher formative assessment, gaps in learning are identified and addressed in a timely manner. As a result, teachers, working with the subject lead, are able to map each child's flight-path through school enabling them to become the best mathematician they themselves can be.

Intent

The aim of teaching and learning of calculations throughout school is always towards **procedural fluency** (using efficient and reliable methods for calculations) while ensuring children have conceptual understanding (being able to grasp and explain what they are doing on a practical level).

Maths is a subject where children continually make links between their different areas understanding, building on their existing knowledge to further the limits of what they can do. As they approach a range of **reasoning problems**, children are encouraged to explore, experimenting with different approaches to come up with their own conclusions. Children select (reason) from their skills toolkits to use the most suitable methods for each challenge, evaluating their success as they do so and thinking about how they could adapt their practice in future. The end goal is always for children to become fluent with the standard methods of each operation, with complete conceptual understanding and be able to apply these to different real-life situations.

Key Concepts

Our key concepts for maths, which run through school, are based on the requirements of the National Curriculum. These are as follows:

- Number: place value
- Number: addition, subtraction, multiplication and division
- Number: fractions, decimals and percentages
- Ratio and proportion (Y6)
- Measurement
- Geometry: properties of shapes
- Geometry: position and direction (Y4 onwards)
- Algebra (Y6)

Implementation

Our teaching of maths involves encouraging **rich discussion** and **debate**, where children **compare and refine approaches**. A **risk-taking environment** is encouraged where children become articulate at **explaining their methods** and where the process is more important than the 'answer'. Indeed, children are encouraged to **explore** (by means of **comparison, experimentation, analysis and discussion**), all in the process of **forming their own conclusions** and **building links** in their own minds. Instead of 'telling' children the knowledge and skills, the teacher is the '**facilitator**' who, through expert **questioning**, guides the children to uncover their own learning-discoveries.

In all of this, children increase their **mathematical fluency** by improving **efficiency with procedures** (such as multiplying) while being able to **explain** what they are doing using appropriate **mathematical language**.

Fluency work consists of short activities designed to promote the development of key skills. Informed by the medium term plan, explicit teaching of these skills ensures **appropriate progression** of fluency skills across the key stage. This is interactive work to develop fluency and efficiency of key skills (x tables, operations, number bonds, use of inverses etc...). **On-going practice** of these skills is provided in the '**Number Ninjas**' sessions, usually at the start of a maths lesson.

Main whole class teaching, broadly resourced by the White Rose Maths schemes, is linked to the learning intention and context of the lesson. Topic work is an ongoing learning journey and so starts with what the children already know and, through exploration, discussion and practice, enables children to **make their own connections**, building on their understanding. The vast majority of activity is performed by the class with the teacher directing.

Teachers aim to provide as many **different representations of a concept** as possible; for example, not just $3 \times 4 = 12$ but also:

$4 \times 3 = 12$; $12 = 4 \times 3$; $12 = 3 \times 4$; $12 \div 3 = 4$; $12 \div 4 = 3$; $(2+2) \times 3 = 12$ etc...

...not to mention all the related place value permutations and rich variety of word questions that could be posed and compared!

Manipulatives are made available in every class, right up to year 6, in order to support the learning of all children (particularly the visual / kinaesthetic learners). In many cases children choose their own resources, thereby becoming more independent and making their own links to that with which they themselves are already familiar.

It is important that children finding a concept difficult are allowed time to consolidate and fully grasp an idea before moving on.

Each lesson includes at least 3 levels of challenge, to which children are given the freedom to select, encouraging a **growth-mindset, self evaluation** and **greater ownership**. If a child - by their own or an adult's judgement - needs more work, then this is given during the lesson and/or at a later time.

Problem solving is a daily aspect of our lesson structure. Those not requiring further consolidation are given a rich variety of appropriately challenging problems (which we call 3 chilli challenges) to allow them to 'go deeper' with their learning. Calculations are taught in the context of word problems from the start to develop understanding. The emphasis is on problem solving where children can **explain** their reasoning throughout.

All lessons include an opportunity to **discuss or explain strategies**, vocabulary etc. 'Talk partners' are planned for to allow pupils to work out a solution together or explain a procedure etc. All lessons follow the structure 'review, teach, practice, use and apply and assess'. They cater for visual, auditory and kinaesthetic learners and include demonstrating and modelling. Ensuring the learning is put into context is particularly important to ensure pupils use and apply their knowledge and skills.

In addition, hands-on Measures days are scheduled through the year to ensure a range of measures related contextual activity.

Impact

It is important that subjects are not taught and then quickly forgotten. To this end, lessons regularly include **quick revision activities** (in the Numer Ninjas segment) to practise a wide range of skills as well as those which have been recently taught.

Children become **secure with the fundamentals** of maths, building-on and making connections between these, extending the limits of their own understanding.

Children are not allowed to fall behind as interventions happen daily and, through expert teacher formative assessment, gaps in learning are identified and addressed in a timely manner. As a result, teachers, working with the subject lead, are able to cater for each child's flight-path through school, enabling them to become the best mathematician they themselves can be.

All teachers know where their children are through the use of **concise assessment**, prior learning and maths talk. They also understand where their children need to be through a secure understanding of the year group expectations and/or pre-key stage expectations (as well as adhering to the guidance of the post-covid 'ready to progress' materials).

Children's progress is assessed using the White Rose Hub unit and termly assessments, which allow teaching and learning to be planned according to need. Additional assessments are also carried out for baseline and end of year data, which will also take into account teacher assessments. The impact of teaching and learning in maths is assessed in many different ways, including discussions with children (pupil voice), book scrutinies, formal observations and drop-ins.

National Curriculum

Overview of learning

	Autumn 1		Autumn 2		Spring 1		Spring 2		Summer 1		Summer 2	
Year 3	Number: place value	Number: addition and subtraction	Number: multiplication and division		Measurement: money	Statistics	Measurement: length and perimeter	Number: Fractions	Measurement: time		Geometry: properties of shape	Measurement: mass and capacity
Year 4	Number: place value	Number: addition and subtraction	Measurement: length and perimeter	Number: multiplication and division	Measurement: area	Number: Fractions	Number: decimals	Measurement: money	Measurement: time	Statistics	Geometry: properties of shape	Geometry: position and direction
Year 5	Number: addition and subtraction	Number: addition and subtraction	Statistics	Number: multiplication and division	Measurement: area & perimeter	Number: Fractions	Number: decimals and percentages	Number: decimals	Geometry: properties of shape	Geometry: position and direction	Statistics	Measurement: converting units & volume
Year 6	Number: addition and subtraction, multiplication, division	Number: addition and subtraction, multiplication, division	Number: fractions	Geometry: position and direction	Number: decimals	Number: algebra	Number: decimals and percentages	Measurement: perimeter, area, volume	Number: ratio	Statistics	Geometry: properties of shape	consolidation

Subject progression

	Year 3	Year 4	Year 5	Year 6
Counting	<ul style="list-style-type: none"> count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number 	<ul style="list-style-type: none"> count in multiples of 6, 7, 9, 25 and 1000 count backwards through zero to include negative numbers 	<ul style="list-style-type: none"> count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 count forwards and backwards with positive and negative whole numbers, including through zero 	

Place Value	<ul style="list-style-type: none"> identify, represent and estimate numbers using different representations read and write numbers up to 1000 in numerals and in words 	<ul style="list-style-type: none"> identify, represent and estimate numbers using different representation. read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of zero and place value 	<ul style="list-style-type: none"> read, write, (order and compare) numbers to at least 1 000 000 and determine the value of each digit read Roman numerals to 1000 (M) and recognise years written in Roman numerals 	<ul style="list-style-type: none"> read, write, (order and compare) numbers to at least 1 000 000 and determine the value of each digit read Roman numerals to 1000 (M) and recognise years written in Roman numerals r read, write, (order and compare) numbers up to 10 000 000 and determine the value of each digit
	<ul style="list-style-type: none"> recognise the place value of each digit in a three-digit number (hundreds, tens, ones) compare and order numbers up to 1000 	<ul style="list-style-type: none"> find 1000 more or less than a given number recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) order and compare numbers beyond 1000 	<ul style="list-style-type: none"> (read, write) order and compare numbers to at least 1 000 000 and determine the value of each digit 	<ul style="list-style-type: none"> (read, write), order and compare numbers up to 10 000 000 and determine the value of each digit
	<ul style="list-style-type: none"> solve number problems and practical problems involving these ideas 	<ul style="list-style-type: none"> round any number to the nearest 10, 100 or 1000 solve number and practical problems that involve all of the above and with increasingly large positive numbers 	<ul style="list-style-type: none"> interpret negative numbers in context round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000 solve number problems and practical problems that involve all of the above 	<ul style="list-style-type: none"> round any whole number to a required degree of accuracy use negative numbers in context, and calculate intervals across zero solve number and practical problems that involve all of the above
Number: addition & subtraction	<ul style="list-style-type: none"> add and subtract numbers mentally, including: <ul style="list-style-type: none"> - a three-digit number and ones - a three-digit number and tens - a three-digit number and hundreds add and subtract numbers with up to three digits, using formal written methods of columnar addition and subtraction 	<ul style="list-style-type: none"> add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate 	<ul style="list-style-type: none"> add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction) add and subtract numbers mentally with increasingly large numbers 	<ul style="list-style-type: none"> perform mental calculations, including with mixed operations and large numbers use their knowledge of the order of operations to carry out calculations involving the four operations
	<ul style="list-style-type: none"> solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction 	<ul style="list-style-type: none"> solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why 	<ul style="list-style-type: none"> solve addition and subtraction multistep problems in contexts, deciding which operations and methods to use and why solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign 	<ul style="list-style-type: none"> solve addition and subtraction multistep problems in contexts, deciding which operations and methods to use and why

Number: Multiplication and division

<ul style="list-style-type: none"> recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables 	<ul style="list-style-type: none"> recall multiplication and division facts for multiplication tables up to 12×12 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 recognise and use factor pairs and commutativity in mental calculations 	<ul style="list-style-type: none"> identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers know and use the vocabulary of prime numbers, prime factors and composite (nonprime) numbers establish whether a number up to 100 is prime and recall prime numbers up to 19 recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3) 	<ul style="list-style-type: none"> identify common factors, common multiples and prime numbers use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy
<ul style="list-style-type: none"> write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for twodigit numbers times one-digit numbers, using mental and progressing to formal written methods 	<ul style="list-style-type: none"> multiply two-digit and three-digit numbers by a one digit number using formal written layout 	<ul style="list-style-type: none"> multiply numbers up to 4 digits by a one- or two digit number using a formal written method, including 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 1000 	<ul style="list-style-type: none"> multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication 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 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
<ul style="list-style-type: none"> solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects 	<ul style="list-style-type: none"> solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> solve problems involving addition, subtraction, multiplication and division use their knowledge of the order of operations to carry out calculations involving the four operations

Fractions, decimals, percentages

<ul style="list-style-type: none"> 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 recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators 	<ul style="list-style-type: none"> count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten. 	<p>identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths</p> <ul style="list-style-type: none"> recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number 	
<p>recognise and show, using diagrams, equivalent fractions with small denominators</p> <ul style="list-style-type: none"> compare and order unit fractions, and fractions with the same denominators 	<ul style="list-style-type: none"> recognise and show, using diagrams, families of common equivalent fractions 	<ul style="list-style-type: none"> compare and order fractions whose denominators are all multiples of the same number 	<ul style="list-style-type: none"> use common factors to simplify fractions; use common multiples to express fractions in the same denomination compare and order fractions, including fractions > 1
<p>add and subtract fractions with the same denominator within one whole</p>	<ul style="list-style-type: none"> add and subtract fractions with the same denominator 	<ul style="list-style-type: none"> add and subtract fractions with the same denominator and denominators that are multiples of the same number multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams 	<ul style="list-style-type: none"> add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions multiply simple pairs of proper fractions, writing the answer in its simplest form divide proper fractions by whole numbers
<ul style="list-style-type: none"> solve problems that involve all of the above 	<ul style="list-style-type: none"> 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 		

		<ul style="list-style-type: none"> • recognise and write decimal equivalents of any number of tenths or hundredths • recognise and write decimal equivalents to $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ • 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 	<ul style="list-style-type: none"> • read and write decimal numbers as fractions • 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 	<ul style="list-style-type: none"> • identify the value of each digit in numbers given to three decimal places
		<ul style="list-style-type: none"> • solve simple measure and money problems involving fractions and decimals to two decimal places 	<ul style="list-style-type: none"> • recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred', and write percentages as a fraction with denominator 100, and as a decimal • solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{2}{5}$, $\frac{4}{5}$ and those fractions with a denominator of a multiple of 10 or 25 	<ul style="list-style-type: none"> • associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, $\frac{3}{8}$] • recall and use equivalences between simple fractions, decimals and percentages, including in different contexts
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Ratio, proportion, algebra</p>				<ul style="list-style-type: none"> • solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts • solve problems involving the calculation/use of percentages for comparison • solve problems involving similar shapes where the scale factor is known or can be found • solve problems involving unequal sharing and grouping using knowledge of fractions and multiples

	<ul style="list-style-type: none"> • solve problems, including missing number problems 			<ul style="list-style-type: none"> • 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
Measures	<p>measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)</p>	<ul style="list-style-type: none"> • Convert between different units of measure [for example, kilometre to metre; hour to minute] • estimate, compare and calculate different measures 	<ul style="list-style-type: none"> • convert between different units of metric measure • 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 	<ul style="list-style-type: none"> • solve problems involving the calculation and conversion of units of measure, using decimal notation up to 3 d.p. 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 3 d.p. • convert between miles and kilometres
	<p>add and subtract amounts of money to give change, using both £ and p in practical contexts</p>	<ul style="list-style-type: none"> • estimate, compare and calculate different measures, including money in pounds and pence 	<ul style="list-style-type: none"> • use all four operations to solve problems involving measure [for example, money] 	

	<p>tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks</p> <ul style="list-style-type: none"> 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 o'clock, a.m./p.m., morning, afternoon, noon and midnight know the number of seconds in a minute and the number of days in each month, year and leap year compare durations of events [for example to calculate the time taken by particular events or tasks] 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> solve problems involving converting between units of time 	<ul style="list-style-type: none"> use, read, write and convert between standard units, converting measurements of time from a smaller unit of measure to a larger unit, and vice versa
	<p>measure the perimeter of simple 2-D shapes</p>	<ul style="list-style-type: none"> measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres find the area of rectilinear shapes by counting squares 	<ul style="list-style-type: none"> measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres calculate and compare the area of rectangles (including squares) and including using standard units, square centimetres (cm²) and square metres (m²) and estimate the area of irregular shapes estimate volume [for example, using blocks to build cuboids] and capacity [for example, using water] 	<ul style="list-style-type: none"> recognise that shapes with the same areas can have different perimeters and vice versa recognise when it is possible to use formulae for area and volume of shapes calculate the area of parallelograms and triangles calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm³) and cubic metres (m³), and extending to other units
Geometry	<p>draw 2-D shapes</p>	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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

	make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them		<ul style="list-style-type: none"> identify 3-D shapes, including cubes and other cuboids, from 2-D representations 	<ul style="list-style-type: none"> recognise, describe and build simple 3-D shapes, including making nets
	<p>recognise angles as a property of shape or a description of a turn</p> <ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles draw given angles, and measure them in degrees identify: <ul style="list-style-type: none"> angles at a point and one whole turn (total 360°) angles at a point on a straight line and ! 	<ul style="list-style-type: none"> 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
		<p>describe positions on a 2-D grid as coordinates in the first quadrant</p> <ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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
Statistics	interpret and present data using bar charts, pictograms and tables	<ul style="list-style-type: none"> interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs 	<ul style="list-style-type: none"> complete, read and interpret information in tables, including timetables 	<ul style="list-style-type: none"> interpret and construct pie charts and line graphs and use these to solve problems
	solve one-step and two-step questions [for example, 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables	<ul style="list-style-type: none"> solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs 	<ul style="list-style-type: none"> solve comparison, sum and difference problems using information presented in a line graph 	<ul style="list-style-type: none"> calculate and interpret the mean as an average