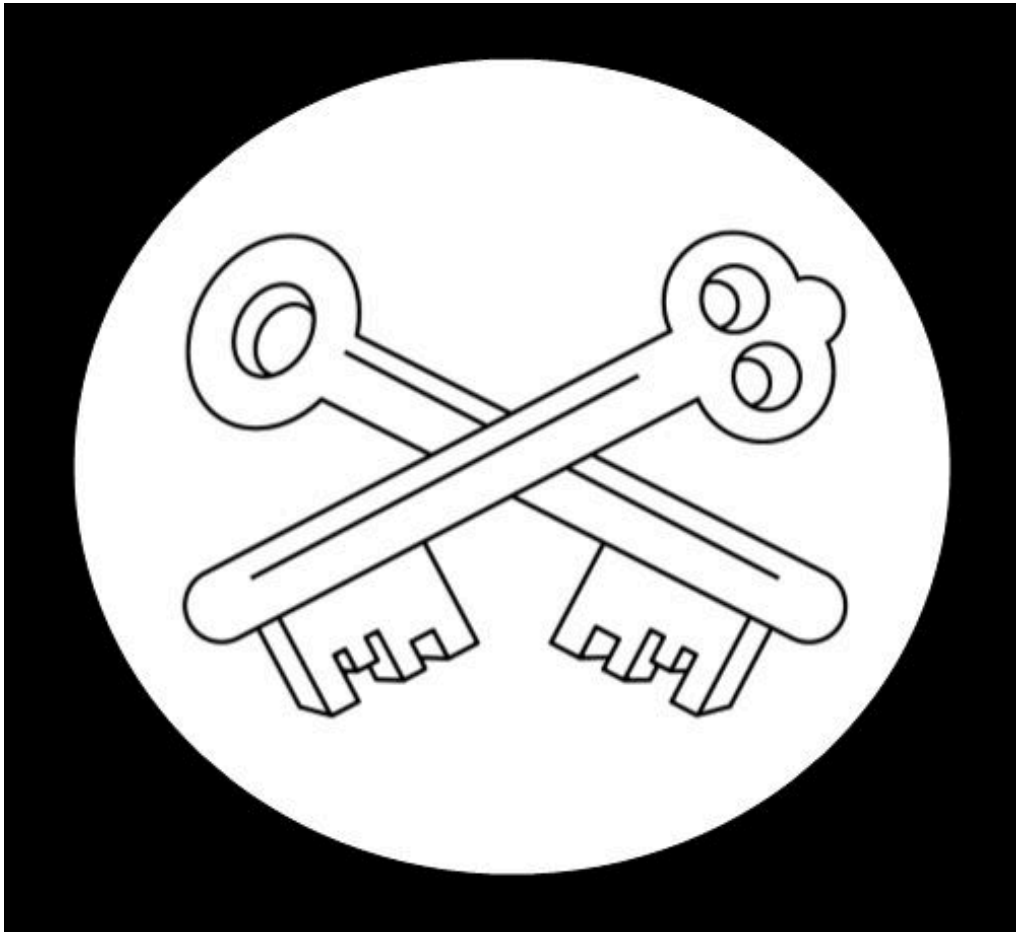
St Peter's CofE Junior School



Maths Curriculum

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Purpose and Rationale

At St. Peter's, we believe every child has the capacity to become an able mathematician. Our primary aim is to inspire an enjoyment of mathematics and create a sense of curiosity, allowing our pupils to develop an in-depth understanding of the application of mathematical knowledge and skills.
We aspire to create 'real mathematicians', recognising that mathematics is a fundamental life-skill as it provides the tools for understanding science, engineering, technology and economics. It is essential in decision-making and for participation in society. Mathematics equips pupils with powerful ways to describe, analyze and change the world.

We foster 'can do' attitudes. We believe that all children can achieve in mathematics, and teach for secure and deep understanding of mathematical concepts. We use mistakes and misconceptions as an essential part of the learning and provide challenges through rich and sophisticated problems as well as encouraging pupils to extend and deepen their understanding before accelerating through new content.

As children progress through school, their prior knowledge is activated through teaching, and new information is linked to prior learning helping to develop pupil's recall in the key areas and securing this information in the long term memory. Our Mathematics curriculum provides pupils with an opportunity to meet the aims of the National Curriculum where they build up their fluency, reasoning and problem solving skills. Mastery is our chosen approach to growing our mathematicians. Our children are taught together to master their own year group's objectives and deepen their understanding.

Our lessons follow a consistent approach where new content is taught and modelled explicitly and pupils are provided with a series of fluency questions that are linked directly to their learning objectives. Pupils are then encouraged to reason mathematically by following a line of enquiry and develop and present a justification, argument or proof using mathematical language. To support this, our learners are exposed to rich and specific vocabulary. The learning is secured through depth of understanding whereby pupils apply the skills and knowledge learnt to a variety of problems with increasing sophistication, including in unfamiliar contexts and model real-life scenarios.

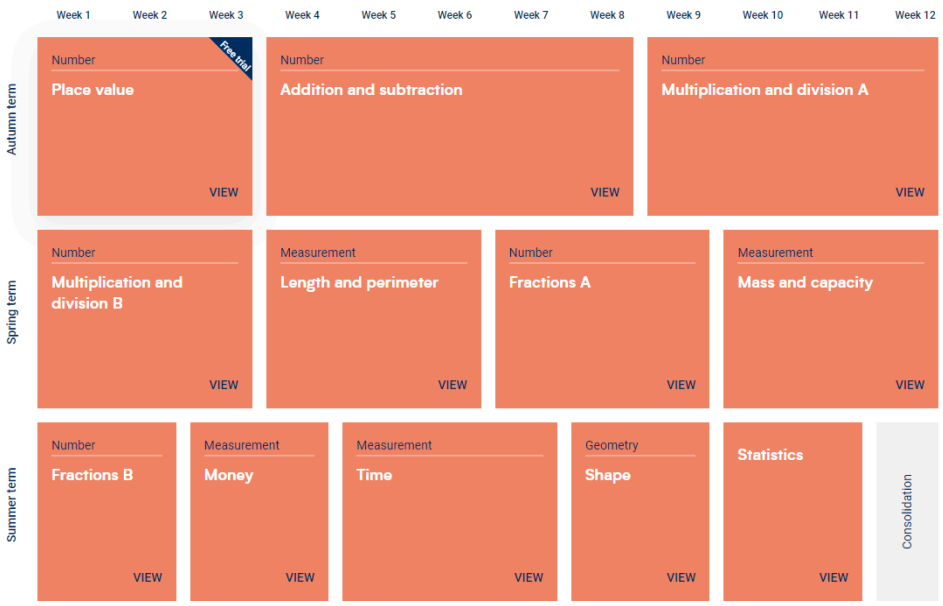
Why this? Why here?

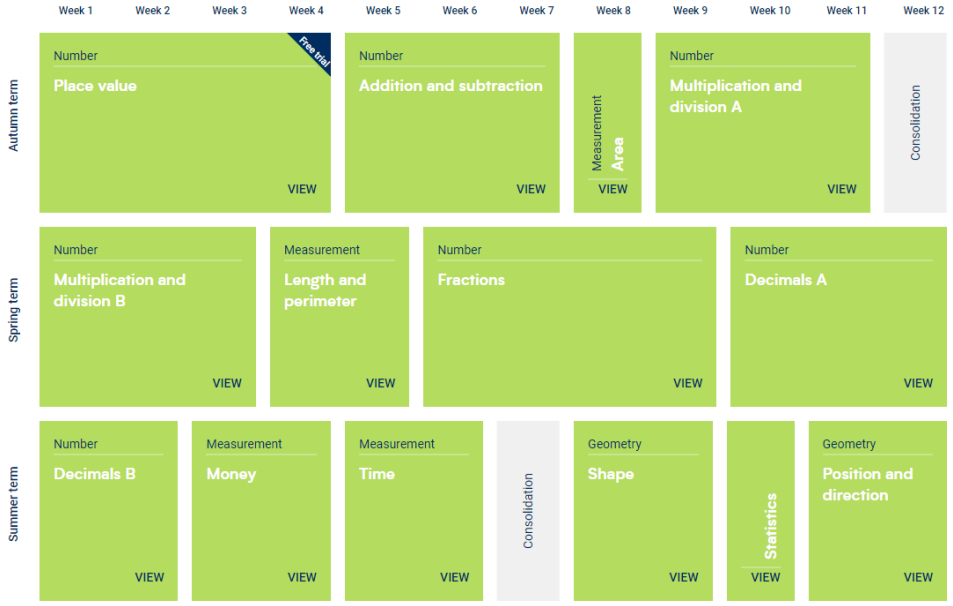
At St Peter's we have chosen to follow the White Rose Maths scheme. We made this decision because we are confident that White Rose Maths has a clear rationale for the sequence of the topics. Importantly, it is designed to support pupils on their journey to mastery, knowing that to master addition, for example, requires developing children's skills over many years - from single digit numbers, to multi-digit numbers, then decimals, then fractions, then negatives, addition in different units (such as time calculations). It would take several years to master addition, arguably one of the most basic concepts in mathematics, therefore White Rose breaks the journey down into small steps, which benefits the children in many ways:

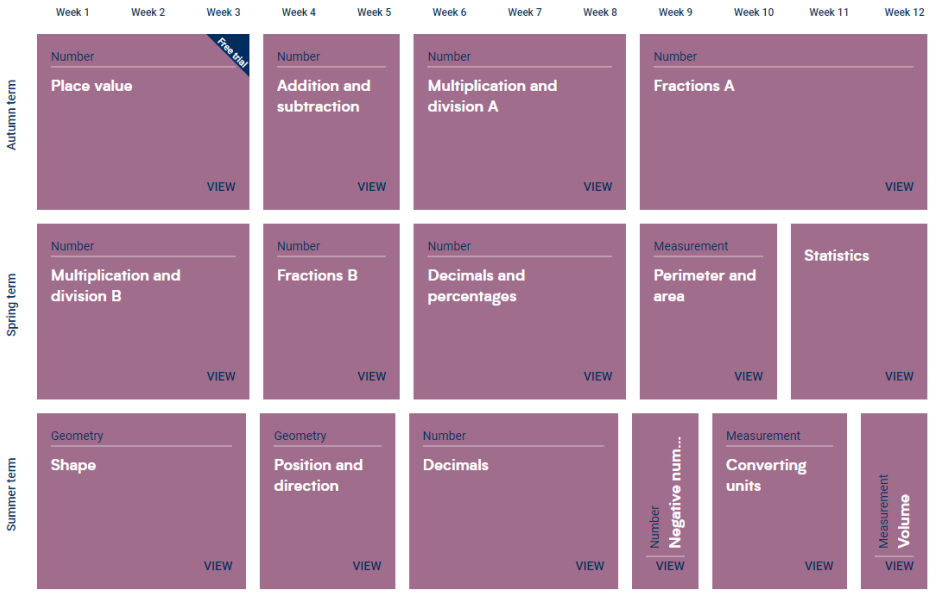
- It allows for deeper learning of content
- No child is left behind, everyone progresses together, teachers have higher expectations
- Built for long-term retention
- Confidence is gained and perceptions of Maths are changed
- Cognitive overload does not occur

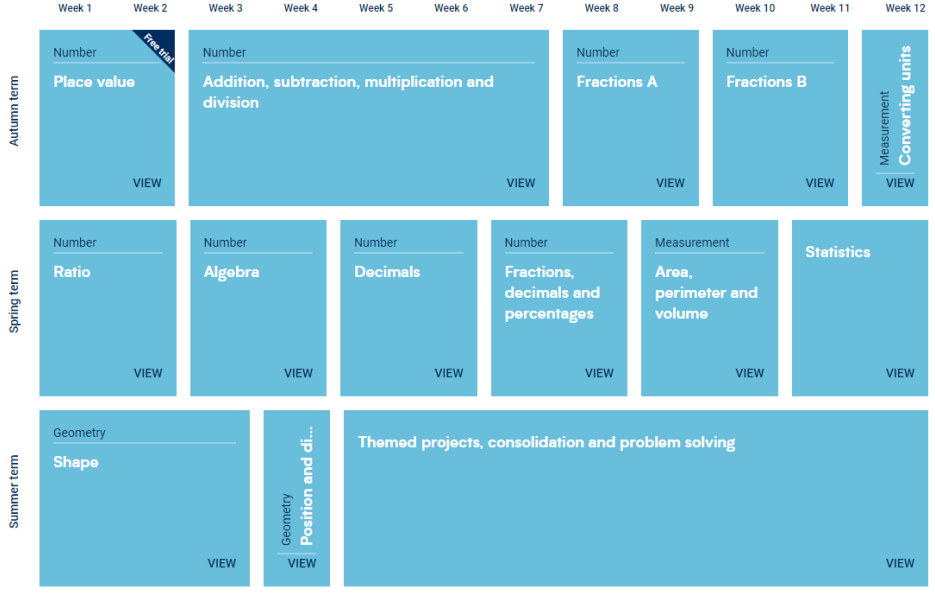
A further benefit to using White Rose is that as a Junior School we can see the starting points of our pupils through Key Stage 1, which supports us in designing and delivering a curriculum that ensures progress. Furthermore, it allows us to identify gaps in early maths and address these quickly and effectively through our teaching and learning.

Maths Curriculum Overview









How our curriculum supports gaps in our pupil's knowledge and skills

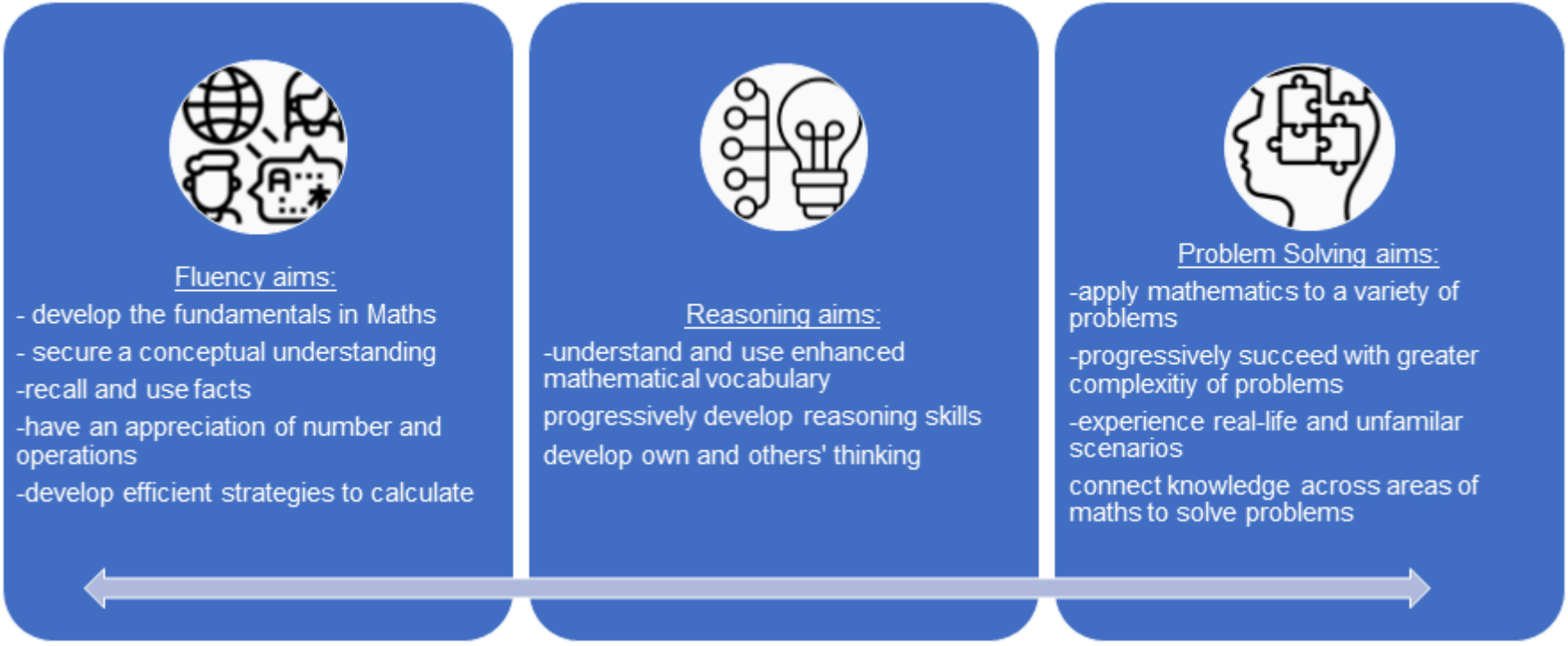
Context and demographics	Implications for St Peter's Maths curriculum
A considerable number of our pupils join us with significantly higher than average levels of prior attainment.	The Maths curriculum is designed around the concept of mastery which encourages children to dive deeper, think critically and reason effectively. We aim to instill a growth mindset and have high expectations in order to challenge pupils and stretch them beyond their comfort zone.
Despite the above, there are pockets of deprivation in the catchment (with some pupils coming to the school from one of the 10% most deprived neighbourhoods in the UK) and we have an increasing amount of Disadvantaged Pupils with us.	By following the White Rose scheme, all children are exposed to the Maths curriculum using a small steps approach to reduce gaps and support mastery for all. Our three big ideas (fluency, reasoning and problem solving) also ensure all children are given the opportunity to experience maths in a range of contexts, thus recognise the real-life importance of maths within society and future careers. Reviews are in place to start lessons, and 're-remembering' stickers are used for same day interventions where needed.
95% of the local population is white with very few residents born outside of the UK.	We are working towards exposing our pupils to diversity within maths by introducing a maths experience day across school, where mathematicians from minority backgrounds and contributions of different cultures are acknowledged and assumptions are challenged.

Big Ideas and Concepts of Maths

Key Mathematical Concepts are:

- Number: place value; addition and subtraction; multiplication and division; fractions; percentages; decimals;
- Measurement: read; measure; compare; calculate; convert; estimate;
- Geometry – draw; recognise; identify; compare; classify; describe; plot;
- Statistics – present; draw; interpret;
- Ratio and Proportion – recognise; solve;
- Algebra – use; generate; describe; express; enumerate.

At St. Peter's, to support the teaching for mastery in Maths, we focus on three **Big Ideas**: Fluency, Reasoning and Problem Solving.



Fluency: Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and presentations in mathematics. During fluency practice, children should be able to demonstrate their knowledge and skills using appropriately chosen methods. Where mistakes are made and knowledge is not secure, misconceptions are addressed and immediate intervention is taken to ensure children have a strong grasp of the mathematical concept before moving deeper.

Reasoning: Applying the learnt knowledge and skills to a context which requires noticing, questioning, analysing and arguing. Children are expected to use mathematical vocabulary to explain, convince, justify or show how and why they know something to be true or false, deepening their understanding beyond a simple calculation.

Problem Solving: Experiencing the mathematical concept within a range of increasingly complex, real-life scenarios. For these tasks, children are also expected to investigate and consider various possibilities, using a flexible mindset to solve the more open-ended tasks.

Mastery in Maths

Subject leaders have completed the NCETM 'Mastery in Maths' training. The NCETM website defines mastering maths as:

"Mastering maths means pupils of all ages acquiring a deep, long-term, secure and adaptable understanding of the subject. The phrase 'teaching for mastery' describes the elements of classroom practice and school organisation that combine to give pupils the best chances of mastering maths. Achieving mastery means acquiring a solid enough understanding of the maths that's been taught to enable pupils to move on to more advanced material."

As a school we aim to utilise this approach challenging children to cement their understanding and go 'deeper' into their learning rather than being pushed onto new concepts.

Spirituality @ St Peter's

At St Peter's, we consider our pupils spiritual development to be a central part of the school's curriculum. At our school, we use the following definition when thinking about Spirituality…

"Spirituality is the concept of exploring the purpose and meaning of life, to develop a sense of awe and wonder at the world we live in, to question our place within it and to work to care for our body, mind and soul. Spirituality is not dependent on religious belief or a particular faith."

Here are some examples of how we promote Spirituality across this curriculum area:

Spirituality across Maths	
Our maths curriculum supports children's spiritual development by exposing them to opportunities to problem solve and reason, both verbally and in written form, encouraging them to think deeply: when connections between pupils' numeracy skills and real life are made. Maths lessons at St Peter's aim to encourage children to be curious and to open their minds to various possibilities. Spirituality can be seen in maths when children are asked to consider pattern, order, symmetry and scale (both man made and in the natural world) and when appreciating the beauty of shape and space.	
Year 3	Collecting and representing data in using representations Recognise, describe and make 3D shapes Solving problems with time
Year 4	Making shapes with specific areas Correspondence problems - how many possibilities? Find missing lengths Solve problems with money
Year 5	Solve problems with multiplication and division Symmetry Estimate with measurements
Year 6	Solve problems with two unknowns Scale drawing, proportion problems and recipes The Fibonacci sequence - 'Beautiful Maths' enrichment unit in Summer term Hexaflexagons

END POINTS

By the end of KS2, we expect that all pupils will :

- Have a clear understanding of the number system and place value working confidently with larger integers
- Have developed connections between multiplication and division with fractions, decimals, percentages and ratio
- Be fluent in written methods for all 4 operations, including long multiplication and division
- Be able to solve a wide range of problems, including increasingly complex properties of numbers and arithmetic
- Be able to solve problems demanding efficient written and mental methods of calculation
- Be able to use the language of algebra as a means for solving a variety of problems
- Be able to classify shapes with increasingly complex geometric properties
- Be able to apply the vocabulary they need to describe complex shapes.

Progression in Maths

Place value

Year 3	Year 4	Year 5	Year 6
count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number compare and order numbers up to 1 000 identify, represent and estimate numbers using different representations read and write numbers up to 1 000 in numerals and in words recognise the place value of each digit in a three-digit number (hundreds, tens, ones)	count in multiples of 6, 7, 9, 25 and 1 000 find 1 000 more or less than a given number order and compare numbers beyond 1 000 identify, represent and estimate numbers using different representations 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 recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones) round any number to the nearest 10, 100 or 1 000	count forwards or backwards in steps of powers of 10 for any given number up to 1 000 000 read, write, order and compare numbers to at least 1 000 000 and determine the value of each digit read Roman numerals to 1 000 (M) and recognise years written in Roman numerals. round any number up to 1 000 000 to the nearest 10, 100, 1 000, 10 000 and 100 000	read, write, order and compare numbers up to 10 000 000 and determine the value of each digit round any whole number to a required degree of accuracy

Addition and Subtraction

Year 3	Year 4	Year 5	Year 6
add and subtract numbers mentally, including: * 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 4 digits using the formal written methods of column addition and subtraction where appropriate estimate and use inverse operations	add and subtract numbers mentally with increasingly large numbers add and subtract whole numbers with more than 4 digits, including using formal written methods (column addition and subtraction)	perform mental calculations, including with mixed operations and large numbers use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy.

add and subtract numbers with up to three digits, using formal written methods of column addition and subtraction estimate the answer to a calculation and use inverse operations to check answers solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction	solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why	use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why	solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why

Multiplication and Division

Year 3	Year 4	Year 5	Year 6
count from 0 in multiples of 4, 8, 50 and 100 recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables 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 *estimate and use inverse operations to check answers to a calculation* solve problems, including missing number problems, involving multiplication and	*count in multiples of 6, 7, 9, 25 and 1 000* 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 multiply two-digit and three-digit numbers by a one-digit number (moving to) using formal written layout	*count forwards or backwards in steps of powers of 10 for any given number up to* *1 000 000* multiply and divide numbers mentally drawing upon known facts multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 multiply numbers up to 4 digits by a one- or two-digit number (moving to) using a formal written method, including long multiplication for two-digit numbers – 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 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 (non-prime) numbers establish whether a number up to 100 is prime and recall prime numbers up to 19	perform mental calculations, including with mixed operations and large numbers 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 short division where appropriate for the context 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 identify common factors, common multiples and prime numbers

division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects	*estimate and use inverse operations to check answers to a calculation* 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	recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}) solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates	use their knowledge of the order of operations to carry out calculations involving the four operations use estimation to check answers to calculations and determine, in the context of a problem, levels of accuracy solve problems involving addition, subtraction, multiplication and division

Fractions (including percentages and decimals)

Year 3	Year 4	Year 5	Year 6
count up and down in tenths recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators recognise that tenths arise from dividing an object into 10 equal parts and in dividing one – digit numbers or quantities by 10 recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators	count up and down in hundredths recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten compare numbers with the same number of decimal places up to two decimal places round decimals with one decimal place to the nearest whole number recognise and show, using diagrams, families of common equivalent fractions recognise and write decimal equivalents of any number of tenths or hundredths recognise and write decimal equivalents to $^1/_4$; $^1/_2$; $^3/_4$	recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents compare and order fractions whose denominators are all multiples of the same number read, write, order and compare numbers with up to three decimal places round decimals with two decimal places to the nearest whole number and to one decimal place identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths read and write decimal numbers as fractions (e.g. 0.71 = $^{71}/_{100}$) recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents recognise the per cent symbol (%) and understand that per cent relates to “number of parts per	compare and order fractions, including fractions >1 identify the value of each digit in numbers given to three decimal places solve problems which require answers to be rounded to specified degrees of accuracy use common factors to simplify fractions; use common multiples to express fractions in the same denomination associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $^3/_8$) recall and use equivalences between simple fractions, decimals and percentages, including in different contexts 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 (e.g. $^1/_4 \times {}^1/_2 = {}^1/_8$) multiply one-digit numbers with up to two decimal places

compare and order unit fractions, and fractions with the same denominators recognise and show, using diagrams, equivalent fractions with small denominators add and subtract fractions with the same denominator within one whole (e.g. $^5/_7 + ^1/_7 = ^6/_7$) solve problems that involve all of the above	add and subtract fractions with the same denominator 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 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 solve simple measure and money problems involving fractions and decimals to two decimal places	hundred", and write percentages as a fraction with denominator 100 as a decimal fraction add and subtract fractions with the same denominator and multiples of the same number recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number (e.g. $^2/_5 + ^4/_5 = ^6/_5 = 1^1/_5$) multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams solve problems involving numbers up to three decimal places solve problems which require knowing percentage and decimal equivalents of $^1/_2$, $^1/_4$, $^1/_5$, $^2/_5$, $^4/_5$ and those with a denominator of a multiple of 10 or 25	by whole numbers divide proper fractions by whole numbers (e.g. $^1/_3 \div 2 = ^1/_6$) multiply one-digit numbers with up to two decimal places by whole numbers multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places identify the value of each digit to three decimal places and multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places associate a fraction with division and calculate decimal fraction equivalents (e.g. 0.375) for a simple fraction (e.g. $^3/_8$) use written division methods in cases where the answer has up to two decimal places

Ratio and Proportion

Year 3	Year 4	Year 5	Year 6
			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 of percentages [for example, of measures, and such as 15% of 360] and the 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.

Measurement			
Year 3	**Year 4**	**Year 5**	**Year 6**
compare durations of events, for example to calculate the time taken by particular events or tasks estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes, hours and o'clock; use vocabulary such as a.m./p.m., morning, afternoon, noon and midnight measure, compare, add and subtract: **lengths** (m/cm/mm); **mass** (kg/g); **volume/capacity** (l/ml) measure the **perimeter** of simple 2-D shapes 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 know the number of seconds in a minute and the number of days in each month, year and leap year	estimate, compare and calculate **different measures,** including **money in pounds and pence** measure and calculate the **perimeter** of a rectilinear figure (including squares) in centimetres and metres find the area of rectilinear shapes by counting squares 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	calculate and compare the area of squares and rectangles including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes (also included in measuring) estimate volume (e.g. using 1 cm^3 blocks to build cubes and cuboids) and capacity (e.g. using water) use all four operations to solve problems involving measure (e.g. **length, mass, volume, money**) using decimal notation including scaling measure and calculate the **perimeter** of composite rectilinear shapes in centimetres and metres calculate and compare the area of squares and rectangles including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes solve problems involving converting between units of time convert between different units of metric measure (e.g. kilometre and metre;	calculate, estimate and compare volume of cubes and cuboids using standard units, including centimetre cubed (cm^3) and cubic metres (m^3), and extending to other units such as mm^3 and km^3 solve problems involving the calculation and conversion of **units of measure**, using decimal notation up to three decimal places where appropriate recognise that shapes with the same areas can have different **perimeters** and vice versa calculate the area of parallelograms and triangles calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [e.g. mm^3 and km^3] recognise when it is possible to use formulae for area and volume of shapes 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

		centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre) understand and use equivalences between metric units and common imperial units such as inches, pounds and pints	solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate convert between miles and kilometres

Geometry

Year 3	Year 4	Year 5	Year 6
draw 2-D shapes and 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	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 compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes identify acute and obtuse angles and compare and order angles up to two right angles by size 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	identify 3-D shapes, including cubes and other cuboids, from 2-D representations draw given angles, and measure them in degrees (°) use the properties of rectangles to deduce related facts and find missing lengths and angles distinguish between regular and irregular polygons based on reasoning about equal sides and angles know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles identify: * angles at a point and one whole turn (total 360°) * angles at a point on a straight line and ½ a turn (total 180°) * 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	recognise, describe and build simple 3-D shapes, including making nets illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius draw 2-D shapes using given dimensions and angles recognise, describe and build simple 3-D shapes, including making nets compare and classify geometric shapes based on their properties and sizes and 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

Statistics

Year 3	Year 4	Year 5	Year 6
interpret and present data using bar charts, pictograms and tables solve one-step and two-step questions [e.g. 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables	interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs	complete, read and interpret information in tables, including timetables solve comparison, sum and difference problems using information presented in a line graph	interpret and construct pie charts and line graphs and use these to solve problems calculate and interpret the mean as an average

Algebra

Year 3	Year 4	Year 5	Year 6
solve problems, *including* ***missing number*** *problems, using number facts, place value, and more complex addition and subtraction.* (copied from Addition and Subtraction) *solve problems, including* ***missing number*** *problems, involving multiplication and division, including integer scaling* (copied from Multiplication and Division)		*use the properties of rectangles to deduce related facts and find* ***missing lengths and angles*** (copied from Geometry)	express missing number problems algebraically find pairs of numbers that satisfy number sentences involving two unknowns enumerate all possibilities of combinations of two variables use simple formulae *recognise when it is possible to use* ***formulae*** *for area and volume of shapes* (copied from Measurement) generate and describe linear number sequences

Progression in Maths Vocabulary

Mike Askew explains the role of talk in mathematics (http://mikeaskew.net/page3/page5/files/Privatetalkpublicconverse.pdf) as:

"It is not simply that children are talking about mathematics, but that they are talking mathematics. There is truth to the adage that mathematics is a language and just as there is a difference between talking about Italian and talking Italian, so the vocabulary to talk mathematics becomes part of the classroom discourse – it's not a list of words that you select from to talk about and describe something else, it's becoming immersed in the mathematics talk. The skill of the teaching of talking mathematics is giving children something mathematically worthwhile to talk about, accepting what children say, and then supporting them in crafting the talk."

The list of vocabulary (from Andrew Jeffrey) is 'new vocabulary' that is not included in the National Numeracy Strategy list:
https://webarchive.nationalarchives.gov.uk/20110203115237/https://nationalstrategies.standards.dcsf.gov.uk/node/84996

The lists are intended as a guide as to what pupils should know, and are not exhaustive. Of course, key terms may be introduced earlier as a challenge for our learners.

Maths vocabulary linked to Year 1 curriculum						
Number and place value	**Addition and subtraction**	**Multiplication and division**	**Measure**	**Geometry (position and direction)**	**Geometry (properties of shape)**	**Fractions**
Number Numbers to 20 and beyond Count on/up/to/from/down Before, after More, less, many, few, fewer, least, smallest, greatest Equal to, the same	Number bonds, number line Add, more, plus, make, sum, total, altogether Inverse Double, near double Half, halve Equals, is the same as Difference between	Odd, even Count in twos, threes and fives Count in tens (forwards from/backwards from) How many times? Lots of, groups of One, twice, three	Full, half full, empty, container Weigh, weighs, balances, scales Heavy, heavier, heaviest, light, lighter, lightest Time Days of the week Seasons Day of the week, month, year, weekend	Position Over, under, underneath, above, below, top, bottom, side On, in, outside, inside Around, in front, behind Front, back	Group, sort Cube, cuboid, pyramid, sphere, square, cone, circle, triangle, cylinder Shape Flat, curved, straight, round Hollow, solid Face, side, edge	Whole Equal parts, four equal parts One half, two halves A quarter, two quarters

as Odd, even Pair Units, tens Ten more/less Digit Numeral Compare Order Value Between, halfway between Above, below	How many more to make…? How many more is...than…? How much more is…? Subtract, take away, minus How many fewer is...than…? How much less is…?	times, five times Multiple of, times, multiply, multiply by Repeated addition Array, row, column Double, halve Share, share equally Equal groups of Divide, divided by, left, left over	Morning, afternoon, evening Night, midnight Today, yesterday, tomorrow Before, after Next, last Quick, quickest, slow, slowest Old, oldest, new, newest, newer Takes longer, takes less time Hour, o'clock, half past Clock, watch, hands How long ago? How often? How long will it take? Always, never, often, sometimes, usually Once, twice, first, second, third Estimate, close to, about the same Length, width, height, depth Near, far, close Metre, ruler Money, coin, penny, pence, pound, price, cost, spent, pay, change, cheaper, less than How much? How many? Total	Before, after Beside, next to, opposite Apart Between, middle, edge, centre Corner Direction, left, right, down, forwards, backwards, sideways Close, far, near Turn, half turn, whole turn	Make, build, draw	

New maths vocabulary for year 2						
Number and place value	**Measure**	**Geometry (position and direction)**	**Geometry (properties of shape)**	**Fractions**	**Data/statistics**	**General/problem solving**
Numbers to one hundred Hundreds Partition Hundred more/less	Quarter past/to m/km, g/kg. l/ml Temperature (degrees)	Rotation Clockwise, anti-clockwise Straight line Ninety degree turn, right angle	Size Bigger, larger, smaller Symmetrical, line of symmetry Fold Match Mirror line/reflection Pattern, repeating pattern	Three quarters, one third, a third Equivalence, equivalent	Count, tally, sort Vote Graph, block graph, pictogram Represent Group, set, list, table Label, title Most popular, most common, least common	Predict Describe the pattern, describe the rule Find, find all, find different Investigate

New maths vocabulary for year 3						
Number and place value	**Addition and subtraction**	**Multiplication and division**	**Measure**	**Geometry (position and direction)**	**Fractions**	**Data/statistics**
Numbers to one thousand	Column addition and subtraction	Product Multiples of four, eights, fifty and one hundred Scale up	Leap year Twelve hour/twenty four hour clock Roman numerals I to XIII	Horizontal, perpendicular and parallel lines	Numerator, denominator Unit fraction, non-unit fraction Compare and order Tenths	Chart, bar chart, frequency table, Carroll diagram, Venn diagram Axis, axes Diagram

New maths vocabulary for year 4						
Number and place value	**Multiplication and division**	**Measure**	**Geometry (position and direction)**	**Geometry (properties of shape)**	**Fractions**	**Data/statistics**
Tenths, Hundredths, Decimal (places) Round (to nearest) Thousand more/less than, Negative Integers Count through zero Roman numerals (I to C)	Multiplication facts (up to 12 x 12) Division facts Inverse Derive	Convert	Coordinates Translation Quadrant x-axis, y-axis Perimeter and area	Quadrilaterals Triangles Right angle, acute angle and obtuse angle	Equivalent decimals and fractions	Continuous data Line graph

New maths vocabulary for year 5						
Number and place value	**Addition and subtraction**	**Multiplication and division**	**Measure**	**Geometry (position and direction)**	**Geometry (property of shape)**	**Fractions, decimals and percentages**
Powers of 10	Efficient written method	Factor pairs, common factor, common multiples Composite numbers, prime numbers, square number, cubed number Formal written method	Volume Imperial units, metric units	Reflect angle Dimensions	Regular and irregular polygons	Proper fractions, improper fractions, mixed numbers Percentages Half, quarter, fifth, two fifths, four fifths Ratio, proportion

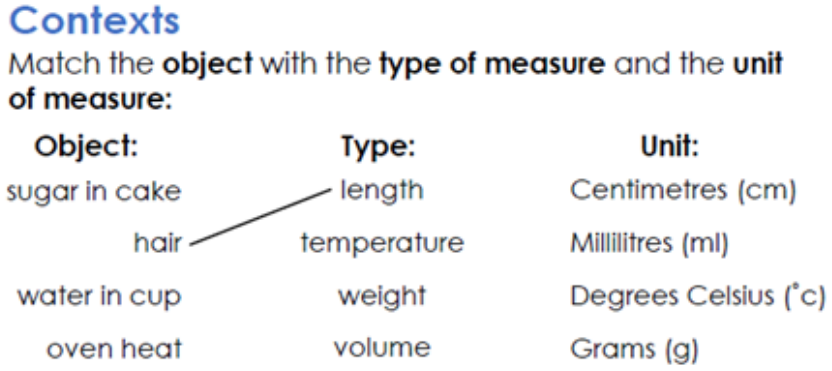
New maths vocabulary for year 6							
Number and place value	**Addition and subtraction**	**Multiplication and division**	**Geometry (position and direction)**	**Geometry (properties of shape)**	**Fractions, decimals and percentages**	**Algebra**	**Data/statistics**
Numbers to ten million	Order of operations	Order of operations	Four quadrants	Vertically opposite angles Circumference, radius, diameter	Degree of accuracy Simplify	Linear number sequence Substitute Variable Symbol Know values	Mean Pie chart Construct

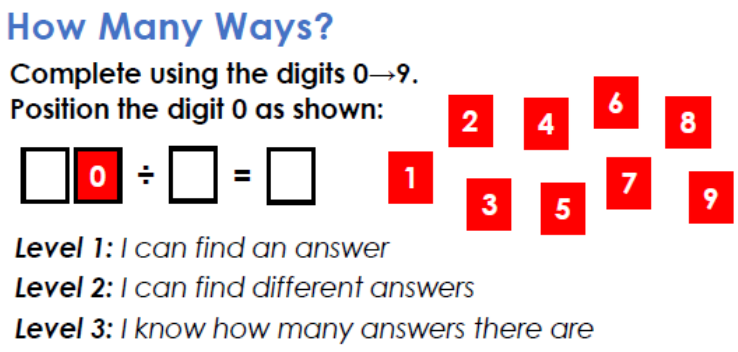
Useful Strategies, Prompts and Questions

Strategies and example to support reasoning and problem solving:

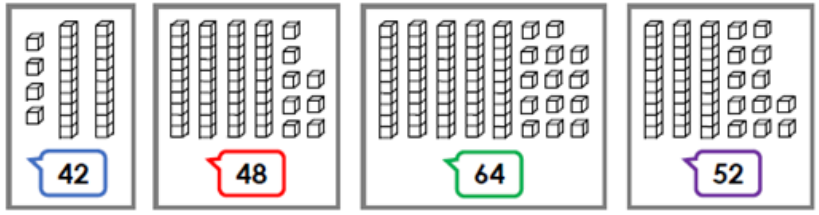
- Prove it
- Convince me
- Explain
- Explain the Mistakes
- Rank by Difficulty
- How Many Ways?
- Contexts
- Read the Pictures
- Which Answer? Agree or Disagree? Correct or Incorrect
- Estimate
- Part-complete examples
- Small difference questions
- Odd one out
- True or False

Examples taken from 'I See Reasoning', White Rose Maths or Classroom Secret resources, these are the sources we expect class teachers to use to support their planning and delivery of lessons.





Agree or Disagree? ✓ or ✘



For the incorrect answers, explain the mistakes.

Explain the Mistakes 42 × 6

Mistake A:

	40	2
6	24	12

$$\begin{array}{r} 24 \\ +\,12 \\ \hline 36 \end{array}$$

Mistake B:

	40	2
6	240	12

$$\begin{array}{r} 240 \\ +\,12 \\ \hline 360 \end{array}$$

Odd One Out

Which is the odd one out?
Explain your answer.

True or False?

Five tenths is $\frac{2}{10}$ smaller than 7 tenths.

Five tenths is $\frac{2}{10}$ larger than three tenths.

Do you agree?

Explain why.

Fill in the Blanks

$\frac{1}{3}$ of 60 = $\frac{1}{4}$ of $\square$

$\frac{1}{\square}$ of 50 = $\frac{1}{5}$ of 25

1a. Add any two amounts shown below, together to make a total less than £4.

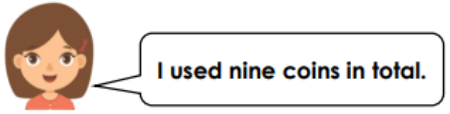
£__ and __p + £__ and __p = £3 and __p

D **Find three possibilities.**

PS

5a. Fiona has made £6 and 65p below by adding two amounts of money together.

£3 and 70p + 295p = £6 and 65p



Help Fiona find two other ways of making £6 and 65p by adding two amounts together, using six coins in total.

E

PS

9a. Xander has used this bar model to represent an addition.

Eight £1 coins Seven 1p coins Fifteen 20p coins	
£3 and 73p	754p

He thinks he has lost three coins which all have the same value.
Do you agree? Explain your reasoning.

GD

R

Questions and Prompts

"*Questions which are less definite offer the possibility of pursuing your own directions, based on your interests and on what you discover*." (Mason et al; 2010:122)

- **Odd one out**
- **True or false?**
- **Always, sometimes, never**
- **What if…?**
- **What comes next?**
- **Make up an example**
- **Working backwards**
- **What do you notice?**
- **What else do you know?**
- **How many different ways can you…?**
- **Can you group these ..... in some way?**
- **Describe the pattern.**
- **How can this pattern help you find an answer?**
- **What do think comes next? Why?**
- **Is there a way to record what you've found that might help us see more patterns?**
- **What would happen if....?**
- **What have you discovered?**
- **How did you find that out?**
- **Why do you think that?**
- **What made you decide to do it that way?**
- **How do you know you have found all possibilities?**
- **How could you do/show it differently?**

Questions to get started - Ask children who are getting started with a piece of work:	**Questions to check progress -** Make positive interventions to check progress while children are working, by asking:	**Questions when children are stuck -** Ask children who are stuck:	**Questions at the end of the lesson -** During the plenary session of a lesson ask:
How are you going to tackle this? What information do you have? What do you need to find out or do? What operation/s are you going to use? Will you do it mentally, with pencil and paper, using a number line, with a calculator…? Why? What method are you going to use? Why? What equipment will you need? What questions will you need to ask? How are you going to record what you are doing? What do you think the answer or result will be? Can you estimate or predict?	Can you explain what you have done so far? What else is there to do? Why did you decide to use this method or do it this way? Can you think of another method that might have worked? Could there be a quicker way of doing this? What do you mean by…? What did you notice when…? Why did you decide to organise your results like that? Are you beginning to see a pattern or a rule? Do you think that this would work with other numbers? Have you thought of all the possibilities? How can you be sure?	What do you know? Is there something that you already know that might help? How did you get this far? What did you do? Can you describe the problem in your own words? What did you do last time? What is different this time? Could you try it with simpler numbers… fewer numbers… using a number line…? What about putting things in order? Would a table help, or a picture/diagram/graph? Why not make a guess and check if it works? Have you compared your workings out with anyone else's?	How did you get your answer? Can you describe your method/pattern/rule to us all? Can you explain why it works? What could you try next? Would it work with different numbers? What if you had started with… rather than? What if you could only use…? Is it a reasonable answer/result? What makes you say so? How did you check it? What have you learned or found out today? If you were doing it again, what would you do differently? Having done this, when could you use this method/information/idea again? Did you use any new words today? What do they mean? How do you spell them? What are the key points or ideas that you need to remember for the next lesson?

References

Five Big Ideas in Teaching for Mastery | NCETM
Key-Curriculum-Maths-Vocabulary.pdf (goldsworthprimary.co.uk)
Year 4 Count in 1000s Lesson - Classroom Secrets | Classroom Secrets
Primary SOL | White Rose Maths | Primary Schemes of Learning

Askew M (2011) *Private Talk, Public Conversation*. King's College London

www.mikeaskew.net/page3/page5/.html

Barmby P, Bilsborough L, Harries T & Higgins S (2009) *Primary Mathematics: Teaching for Understanding*. Open University Press

Hattie J (2012) *Visible Learning for Teachers: Maximising Impact on Learning*. Routledge, London & New York

Jeffrey A (2019) Greater Depth in Primary Mathematics. Amazon Fulfillment

Mason J, Burton L, Stacey K (2010) *Thinking Mathematically*. Prentice Hall

Mason J, Graham A, & Johnston Wilder S (2005) *Developing Thinking in Algebra*, London: Paul Chapman Publishing

Monaghan F (2010) *Thinking Aloud Means Talking Allowed: Group Work in the Primary Schools Mathematics Classroom* from *Issues in Teaching Numeracy in Primary Schools*. Open University Press

Ollerton M (2010) *Issues In Teaching Numeracy in Primary School: Using Problem Solving Approaches to Learning Mathematics. Open University Press*

O'Sullivan L, Harris A, Sangster M, Wild J, Donald G, Bottle G (2005) *Reflective Reader: Primary Mathematics*. Exeter. Learning Matters

Ryan J, & Williams J (2007) *Children's Mathematics 4-15: Learning From Errors & Misconceptions*. Open University Press

Williams Sir P (2008) *Independent Review of Mathematics Teaching in Early Years Settings & Primary School*. DCSF