Fremington Primary School

Maths Curriculum Overview

Maths

INTENT

Our curriculum at Fremington Primary School aims to develop the skills our children need to become creative, independent and empowered learners who are excited and curious about the challenge mathematics presents.

The teaching of mathematics at FPS centres around a mastery approach, encouraging the development of reasoning, problem solving and fluency skills through a 'small steps' approach where each lesson builds on the learning of the previous lesson. We use White Rose as a spine; it's ambitious and connected curriculum ensuring high quality coverage that is consistent throughout the school. Practical provision, mathematical experiments, and a personalised approach means that all children are challenged to exceed their potential through learning how to learn and develop their mathematical skills, knowledge, and understanding.

We also believe that it is important for children to realise how empowering mathematics can be and so our curriculum aims to give children 'real world' contexts, challenging them to consider different approaches and viewpoints; extending their learning beyond a surface level understanding. We want to nurture creativity in all aspects of their learning and so children will be taught to notice, reason, justify, generalise and communicate by applying their mathematics to the world around them. That might be using their mathematical skills to help plan our school vegetable garden; calculating how long it would take us to walk to the moon; or discovering how much lava the average volcano can hold.

At the heart of our maths curriculum is the belief that all children deserve the opportunity to explore, create, and be curious about the world around them in a nurturing environment that develops their interests and challenges their potential.

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IMPLEMENTATION

By using White Rose as our curriculum spine, it provides consistent representations across the school to ensure that children are secure in the underlying structure of maths. Our teaching follows the 'concrete, pictorial, abstract' approach throughout the school to help children understand the abstract nature of mathematics and the key concepts. The use of key manipulatives in Key Stage One develops a secure understanding of the mathematical concepts, while giving children in Key Stage Two ownership of their learning by using the manipulatives to hook back to previous learning when needed.

It is our belief that effective learning builds on the learning of the previous lesson, the previous unit, the previous year; by following the sequence of White Rose we are ensuring that our children are understanding the fundamentals before moving on to the more advanced. For example: place value needs to be understood before addition and subtraction, which needs to be understood before multiplication and division. By using small steps, not only within each unit but also through their mathematical learning journey across the school, children can feel empowered by their learning and confident in their abilities.

Variation is also at the heart of our mathematical teaching. It is our belief that children learn in different ways and we want to ensure that all children are targeted in our teaching. Through representing concepts in multiple ways, not only are critical aspects drawn attention to while developing a deep and holistic understanding, it is also ensuring that all children can be confident in their ability to access our curriculum. Variation also helps children learn to make connections, by encouraging them to question what is the same, what is different, and why, they are naturally making links between mathematical relationships and structures.

At FPS we use a range of stem sentences to give our children the building blocks to communicate their mathematical ideas and opinions; helping them find value in their voice and self-confidence in their abilities. Our curriculum emphasises the need for lots of opportunities for children to talk – to both adults and peers alike. Stem sentences provide children with a structure to help communicate concisely and efficiently, while also exploring their own thoughts and expanding their mathematical vocabulary.

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IMPACT

Here at FPS we want every child to have the confidence to be curious about everything that surrounds them and ask 'why?' as many times in the day as they can. Maths develops the problem solving, resilience, and critical thinking needed to find the answers to those questions. We do not want Maths to only apply to the arithmetic questions on a sheet of paper – rather we want to encourage the children through our teaching to think about Maths creatively in order to apply their learning to the world around them.

In following White Rose with its sequencing and small steps, the children can feel confident going into Year 2 and Year 6 SATs, as well as when they make the move up to secondary school. By giving the children the tools to progress they can feel empowered by their own capabilities as they encounter difficulties; whether they are in their primary journey or higher education.

We want our children to find independence through Maths and realise that they have the power to shape their own learning, their future, and their dreams. Whether they want to be a vet, an astronaut, or a fire fighter, children need to understand that Maths is everywhere in our world and we strive to show children all the possibilities this presents. A high-quality mathematics education provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject – this what we endeavour to provide for our children.

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	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
EYFS	Getting to know you Just like me!	It's me 1,2,3! Light and Dark	Alive in 5! Growing 6,7,8	Building 9&10 Consolidation	To 20 and beyond First, then, now	Find my pattern On the move
Year 1	Place Value (Within 10)	Addition and Subtraction (Within 10) Shape	Place Value (Within 20) Addition and Subtraction (Within 20)	Place Value (Within 50) Length and Height Mass and Volume	Multiplication and Division Fractions Position and Direction	Place Value (Within 100) Money Time
Year 2	Place Value Addition and Subtraction (begin)	Addition and Subtraction (complete) Shape	Money Multiplication and Division (begin)	Multiplication and Division (complete) Fractions	Four operations (revision 2 weeks) Time Length and height	Mass, capacity and temperature Statistics Position and Direction
Year 3	Place Value Addition and Subtraction	Addition and Subtraction Multiplication and Division A	Multiplication and Division B Length and Perimeter	Fractions A Mass and Capacity	Fractions B Money Time	Time Shape Statistics
Year 4	Place Value Addition and Subtraction	Area Multiplication and Division A	Multiplication and Division B Length and Perimeter Fractions	Fractions Decimals A	Decimals B Money Time	Shape Statistics Position and Direction

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Year 5	Place Value Addition and Subtraction	Multiplication and division A Fractions A	Multiplication and Division B Fractions B	Decimals and percentages Perimeter and Area Statistics	Shape Position and Direction Decimals	Negative Numbers Converting Units Volume
Year 6	Place Value Addition, subtraction, multiplication and division	Fractions A Fractions B Converting units	Ratio Algebra Decimals	Fractions, decimals and percentages Area, perimeter and volume Statistics	Shape Position and Direction	Themed projects, consolidation and problem solving

The Big Conceptual Picture

One of the strongest research summaries supporting the importance of conceptual understanding can be found in *How People Learn: Brain, Mind, Experience and School* (Bransford et al 2000), published by the National Academy of Sciences and the National Research Council:

Experts' knowledge if connected and organized around important concepts (e.g mathematical fluency). To develop competence in an area of maths, students much: a) have a deep foundation of factual knowledge & recall, b) understand facts and ideas in the context of a conceptual framework, and c) organise knowledge in ways that facilitate retrieval and application... ... organising information into a conceptual framework allows for greater transfer; that is, it allows the student to apply what was learned in new situations and to learn related information more quickly.

Anderson and Krathwohl's book (2001) updated Benjamin Bloom's Taxonomy of Educational Objectives (1956), and further supports the need to teach for deeper conceptual understanding. By separating factual knowledge from conceptual knowledge, not just for remembering isolated and small bits of factual knowledge (p.42). Students understand when they build conncetions between the "new" knowledge to be gained and their prior knowledge. More specifically, the incoming knowledge is integrated with existing schemas and cognitive frameworks. Since concepts are the building blocks for these schemas and frameworks, conceptual knowledge provides a basis for understanding.

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Five main 'big ideas' recur within the Primary Maths teaching and which are useful for teachers to keep revisiting explicitly as they enable deeper understanding to develop in their modelling:

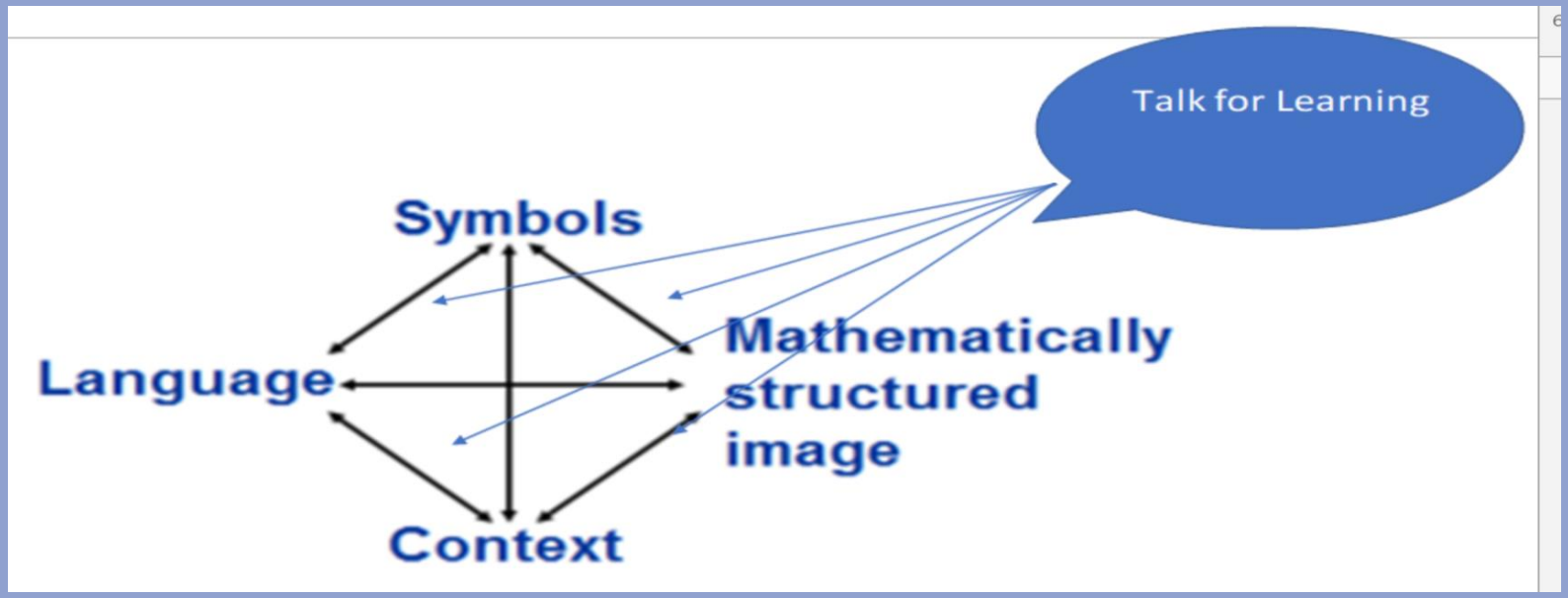
Five Big Ideas

Teacher 'Big Ideas'	
Coherence	Lessons are broken down into small, connected steps that gradually unfold the concept, providing access for all children and leading to a generalisation of the concept and the ability to apply the concept to a range of contexts
Structure and Representation (See Connective Model & CPA Models below)	Representations used in lessons expose the mathematical structure being taught, the aim being that students can do the maths without recourse to the representation
Mathematical Thinking and Reasoning	If taught ideas are to be understood deeply, they must not merely be passively received but must be worked on by the student: thought about, reasoned with and discussed with others
Fluency	Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics
Variation	Variation is twofold. It is firstly about how the teacher represents the concept being taught, often in more than one way, to draw attention to critical aspects, and to develop deep and holistic understanding. It is also about the sequencing of the episodes, activities and exercises used within a lesson and follow up practice, paying attention to what is kept the same and what changes, to connect the mathematics and draw attention to mathematical relationships and structure.

Connective Model

Understanding mathematical involves identifying and understanding connections between mathematical ideas. Haylock and Cockburn (1989) suggested that effective learning in mathematics takes place when the learner makes cognitive connections. Teaching and learning of mathematics, especially when modelling, should therefore focus on making such connections. The connective model helps to make explicit the connections between different mathematical representations: symbols, mathematically structures images, language and contexts.

The interconnections represented by the lines in this image is developed more fully through 'Talk for Learning' between pupils to extend their thinking.



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	Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Place Value: Counting			Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number Count numbers to 100 in numerals; count in multiples of 2s, 5s, and 10s Autumn 1 Autumn 4 Spring 2 Summer 4	Count in steps of 2, 3, and 5 from 0, and in 10s from any given number, forward and backward Autumn 1	Count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number Autumn 1 Autumn 3	Count in multiples of 6, 7, 9, 25 and 1000 Count backwards through zero to include negative numbers Autumn 1 Autumn 4	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 Autumn 1	

Place Value: Represent			Identify and represent numbers using objects and pictorial representations Read and write numbers to 100 in numerals Read and write numbers from 1 to 20 in numerals and words Autumn 1 Autumn 4 Spring 2 Summer 4	Read and write numbers to at least 100 in numerals and in words Identify, represent and estimate numbers using different representations, including the number line Autumn 1	Identify, represent and estimate numbers using different representations Read and write numbers up to 1000 in numerals and words Autumn 1	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 0 and place value Autumn 1	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 Autumn 1	Read, write (order and compare) numbers to 10,000,000 and determine the value of each digit Autumn 1
Place Value: Use Place Value and Compare			Given a number, identify one more and one less Autumn 1 Autumn 4 Spring 2 Summer 4	Recognise the place value of each digit in a two-digit number Compare and order numbers from 0 up to 100; use <,> and = signs Autumn 1	Recognise the place value of each digit in a three-digit number (hundreds, tens, ones) Compare and order numbers up to 1000 Autumn 1	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 Autumn 1	(Read, write) order and compare numbers to at least 1,000,000 and determine the value of each digit Autumn 1	(Read, write) order and compare numbers up to 10,000,000 and determine the value of each digit Autumn 1

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Place Value: Problems and Reasoning					Use place value and number fats to solve problems Autumn 1	Solve number problems and practical problems involving these ideas Autumn 1	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 Autumn 1	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 Autumn 1	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 Autumn 1
	Nursery	Reception	Year 1		Year 2	Year 3	Year 4	Year 5		Year 6

Addition and Subtraction: Recall, Represent, Use			Read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs Represent and use number bonds and related subtraction facts within 20 Autumn 2 Spring 1	Recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100 Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot Autumn 2	Estimate the answer to a calculation and use inverse operation to check answers Autumn 2	Estimate and use inverse operation to check answers to a calculation Autumn 2	Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy Autumn 2	

Addition and Subtraction: Calculations			Add and subtract one-digit and two-digit numbers to 20, including 0 Autumn 2 Spring 1	Add and subtract numbers using concrete objects, pictorial representations, and mentally, including: -a two-digit number and ones -a two-digit number and tens -two two-digit numbers Adding three one-digit numbers Autumn 2	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 three digits, using formal written methods of columnar addition and subtraction Autumn 2	Add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate Autumn 2	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 Autumn 2	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 Autumn 2

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Addition and Subtraction: Solve Problems			Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? – 9 Autumn 2 Spring 1	Solve problems with addition and subtraction: -using concrete objects and pictorial representations, including those involving numbers, quantities and measures -applying their increasing knowledge of mental and written methods Autumn 2	Solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction Autumn 2	Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why Autumn 2	Solve addition and subtraction multi-step 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 to the equals sign Autumn 2	Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why Autumn 2

	Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Multiplication and Division: Recall, Represent, Use				Recall and use multiplication and division facts for the 2, 5, and 10 multiplication tables, including recognising odd and even numbers Show that multiplication of two numbers can be done in any order (commutative) and division of	Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables Autumn 3	Recall multiplication and division facts for multiplication tables up to 12x12 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 Autumn 4 Spring 1	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 numbers	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

				one number by another number cannot Autumn 4 Spring 1			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 notion for squared and cubed Autumn 4	Autumn 2
Multiplication and Division: Calculations				Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication, division and equals signs Autumn 4 Spring 1	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 Autumn 3 Spring 1	Multiply two-digit and three-digit numbers by a one-digit number using formal written layout Spring 1	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	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,

							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 Autumn 4 Spring 1 Summer 1	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 Autumn 2

Multiplication and Division: Solve Problems			Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of a teacher Summer 1	Solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts Autumn 4 Spring 1	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 Spring 1	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 Spring 1	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 Autumn 4 Spring 1	Solve problems involving addition, subtraction, multiplication and division Autumn 2

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Multiplication and Division: Combined							Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign Spring 1	Use their knowledge of the order of operations to carry out calculations involving the four operations Autumn 2
	Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Fractions: Recognise and Write			Recognise, find and name a half as one of two equal parts of an object, shape or quantity Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity Summer 2	Recognise, find, name and write fractions 1/3, ¼, 2/4, and ¾ of a length, shape, set of objects or quantity Spring 4	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	Count up and down in hundredths; recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten Spring 3	Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1	

					Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators Spring 5		as a mixed number (for example 2/5 + 4/5 = 6/5 = 1 1/5) Spring 2	
Fractions: Compare				Recognise the equivalence of 2/4 and ½ Spring 4	Recognise and show, using diagrams, equivalent fractions with small denominators Compare and order unit fractions, fractions with the same denominators Summer 1	Recognise and show, using diagrams, families of common equivalent fractions Spring 3	Compare and order fractions whose denominators are all multiples of the same number Spring 2	Use common factors to simplify fractions; use common multiples to express fractions in the same denomination Compare and order fractions, including fractions > 1 Autumn 3

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Fractions: Calculations				Write simple fractions for example, ½ of 6 = 3 Spring 4	Add and subtract fractions with the same denominator within on whole (for example 5/7+1/7=6/7) Summer 1	Add and subtract fraction with the same denominator Spring 3	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 Spring 3	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 it's simplest form Divide proper fractions by whole numbers Autumn 3
Fractions: Solve Problems					Solve problems that involve all of the above Spring 5 Summer 1	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 Spring 3		

	Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6

Decimals: Recognise and						Recognise and write decimal equivalents of any number of tenths or hundredths Recognise and write decimal equivalents to ¼, 1/2, ¾ Spring 4 Summer 1	Read and write decimal numbers as fractions Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents Spring 3	Identify the value of each digit in numbers given to three decimal places Spring 1
Decimals: Compare						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 Summer 1	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 Spring 3	
Decimals: Calculations and Problems						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 Spring 4	Solve problems involving number up to three decimal places Summer 1	Multiply and divide numbers by 10, 100 and 1000 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 Spring 1

	Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Fractions, Decimals and Percentages						Solve simple measure and money problems involving fractions and decimals to two decimal places Spring 3 Spring 4 Summer 1	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 ½, ¼, 1/5, 2/5, 4/5 and those fractions with a denominator of a multiple of 10 or 25 Spring 3	Associate a fraction with division and calculate decimal fraction equivalents for a simple fraction Recall and use equivalences between simple fractions, decimals and percentages, including different contexts Spring 1 Spring 2

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	Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Ratio and Proportion								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 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 Spring 6

	Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Algebra			Solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as 7 = ? - 9	Recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems	Solve problems, including 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

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								Spring 3
	Nursery	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Measurement: Using Measures			Compare, describe and solve practical problems for: -lengths and heights -mass/weight -capacity and volume -time Measure and begin to record the following: -lengths and height -mass/weight -capacity and volume -time Spring 3 Spring 4 Summer 6	Choose and use appropriate standard units to estimate and measure length/height in any direction; mass; temperature; capacity to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels Compare and order lengths, mass, volume/capacity and record the results using >, < and =	Measure, compare, add and subtract: lengths, mass, volume/capacity Spring 4 Summer 4	Convert between different units of measure Estimate, compare and calculate different measures Autumn 3 Spring 2 Summer 3	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 using decimal notation, including scaling	Solve problems involving 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

				Spring 5 Summer 4			Summer 1 Summer 4 Summer 5	of measure to a larger unit, and vice versa using decimal notation to up to three decimal places Convert between miles and kilometres Spring 4
Measurement: Money								