St John's C of E Primary Calculation Policy

Reviewed: December 2024

Introduction

Our school has adopted the White Rose Hub's calculation document. We adapted the policy to match with our school's approach. This policy is a statement of the aims, principles and strategies for teaching and learning of calculation strategies in Mathematics. It is designed to help teachers and staff at St John's ensure that calculation is taught consistently across the school and to aid them in helping children who may need extra support or challenges. This policy is also designed to help parents and carers support children's learning by providing an explanation of the methods used in our school.

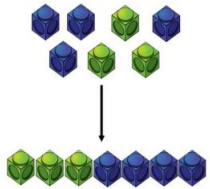
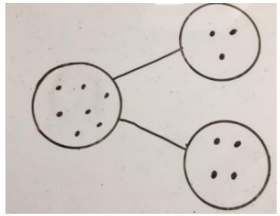
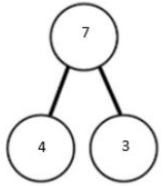
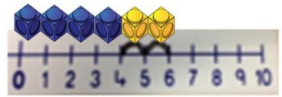
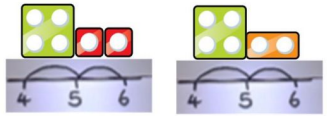
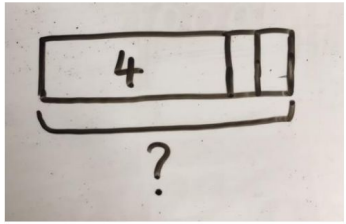
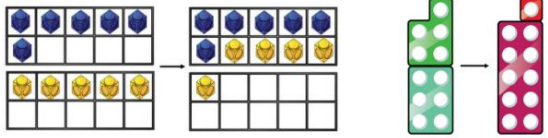
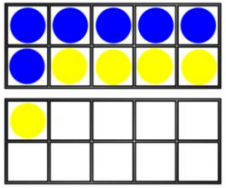
The policy is set out in subjects, addition, subtraction, multiplication and division. Within each specific area there is a progression of skills, knowledge and layout for written methods. The calculation strategies used reflect this ideology – moving from concrete to pictorial and then abstract recording leading to more formal written methods. Mental methods and strategies work in partnership with these methods; a variety of mental calculation methods are taught, and the recall of facts are recapped and monitored regularly. The progression of mental methods and expectations will comply with the National Curriculum (2014). At St John's, staff use correct mathematical language and encourage this from every pupil. This takes place in class discussions, as well as through oral and written feedback, next steps and target setting. The basis of our Calculation Policy is that: written methods are complementary to mental methods and should not be seen as separate from them, children should use mental methods when appropriate, but for calculations that they cannot do in their heads, they use an efficient written method accurately and with confidence.

This document identifies progression in calculation strategies rather than specifying which method should be taught in a particular year group. Eventually we aim to enable pupils to make informed choices about the methods they use both mental and written that are the most efficient and this includes recognised compact methods.

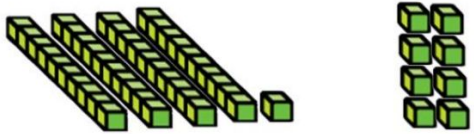
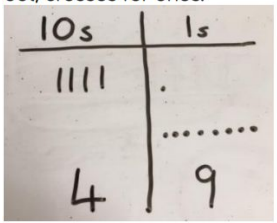
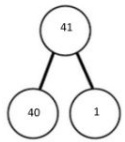
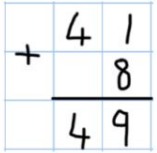
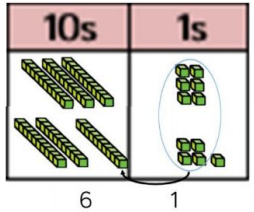
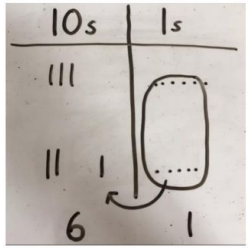
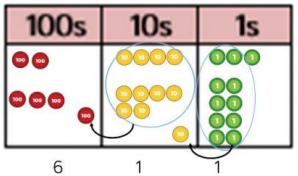
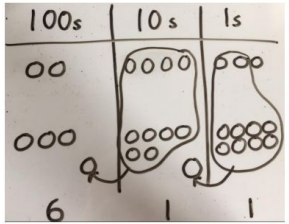
Developmental Aims:

- To ensure consistency and progression in our approach to calculation and enable a smooth transition between year groups.
- As children begin to understand the underlying ideas they develop ways of recording to support their thinking and calculation methods, use particular methods that apply to special cases.
- To enable children to learn to interpret and use the signs and symbols.
- As children acquire secure mental methods of calculation and one efficient written method of calculation for addition, subtraction, multiplication and division which they know they can rely on when mental methods are not appropriate.
- To ensure that children can use these methods accurately with confidence and understanding.
- At whatever stage in their learning, and whatever method is being used, children's methods of calculating will be underpinned by a secure and appropriate knowledge of number facts, along with the mental skills that are needed to carry out the process and judge if it was successful.
- To ensure that pupils are competent in fluency, reasoning and problem solving and can make informed and appropriate choices about the methods they wish to use (mental or written) to solve mathematical problems efficiently and effectively.

Addition Key Vocabulary: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'.

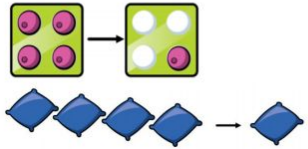
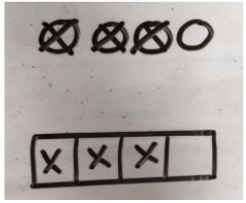
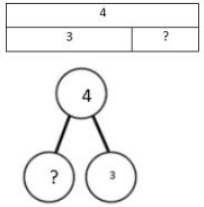
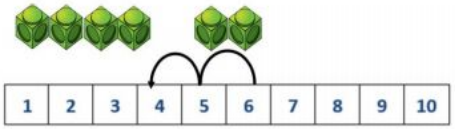
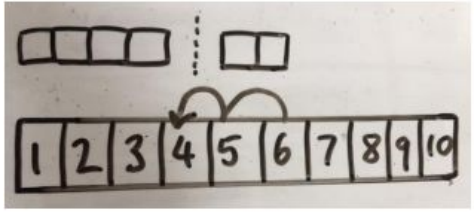
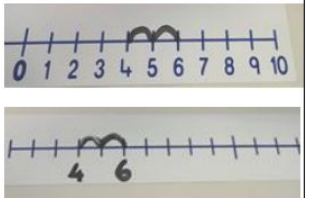
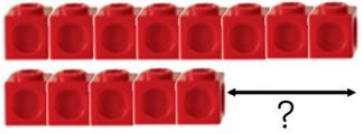
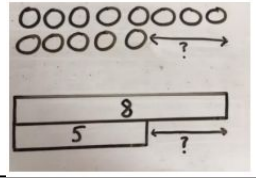
Strategies	Concrete	Pictorial	Abstract
Combining two parts to make a whole: part- whole model	**Combining two parts to make a whole** (use other resources too e.g. eggs, shells, teddy bears, cars). 	Children to represent the cubes using dots or crosses. They could put each part on a part whole model too. 	4 + 3 = 7 Four is a part, 3 is a part and the whole is seven. 
Starting at the bigger number and counting on	**Counting on using number lines** using cubes or Numicon.  	A bar model which encourages the children to count on, rather than count all. 	The abstract number line: What is 2 more than 4? What is the sum of 2 and 4? What is the total of 4 and 2? 4 + 2 
Regrouping to make 10.	**Regrouping to make 10;** using ten frames and counters/cubes or using Numicon. 6 + 5 	Children to draw the ten frame and counters/cubes. 	Children to develop an understanding of equality e.g. 6 + □ = 11 6 + 5 = 5 + □ 6 + 5 = □ + 4

Addition Key Vocabulary: sum, total, parts and wholes, plus, add, altogether, more, 'is equal to' 'is the same as'.

Strategies	Concrete	Pictorial	Abstract
Adding three single digits	**TO + O using base 10**. Continue to develop understanding of partitioning and place value. 41 + 8 	Children to represent the base 10 e.g. lines for tens and dot/crosses for ones. 	41 + 8  1 + 8 = 9 40 + 9 = 49 
Column method- no regrouping	**TO + TO using base 10.** Continue to develop understanding of partitioning and place value. 36 + 25 	Chidlren to represent the base 10 in a place value chart. 	Looking for ways to make 10. 36 + 25= 1 5 30 + 20 = 50 5 + 5 = 10 50 + 10 + 1 = 61 36 Formal method: +25 61 1
Column method regrouping	**Use of place value counters to add HTO + TO, HTO + HTO etc.** When there are 10 ones in the 1s column- we exchange for 1 ten, when there are 10 tens in the 10s column- we exchange for 1 hundred. 	Chidren to represent the counters in a place value chart, circling when they make an exchange. 	243 +368 611 1 1

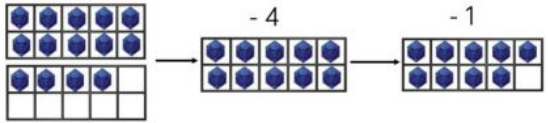
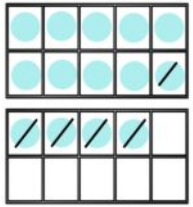
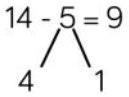
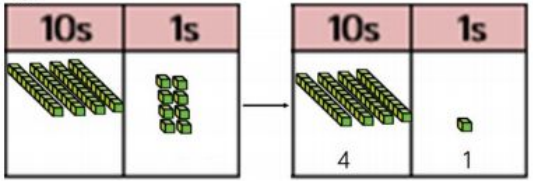
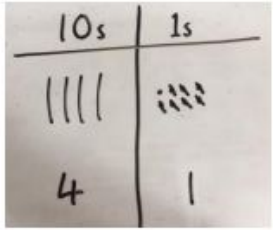
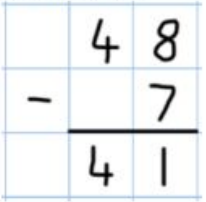
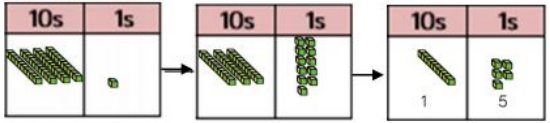
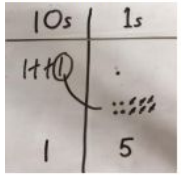
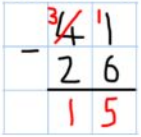
Subtraction

Key Vocabulary: take away, less than, the difference, subtract, minus, fewer, decrease.

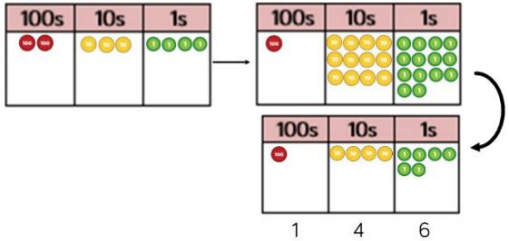
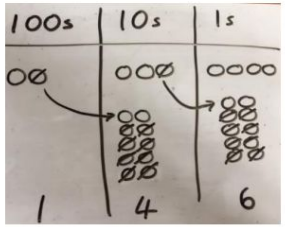
Strategies	Concrete	Pictorial	Abstract
Taking away ones	**Physically taking away and removing objects from a whole** (ten frames, Numicon, cubes and other items such as beanbags could be used). 4 - 3 = 1 	Children to draw the concrete resources they are using and cross out the correct amount. The bar model can also be used. 	4- 3 = □ = 4 - 3 
Counting back	**Counting back** (using number lines or number tracks) children start with 6 and count back 2. 6 - 2 = 4 	Children to represent what they see pictorially e.g. 	Children to represent the calculation on a number line or number track and show their jumps. Encourage children to use an empty number line 
Find the difference	**Finding the difference** (using cubes, Numicon or Cuisenaire rods, other objects can also be used). Calculate the difference between 8 and 5. 	Children to draw the cubes/other concrete objects which they have used or use the bar model to illustrate what they need to calculate. 	Find the difference between 8 and 5. 8 - 5, the difference is □ Children to explore why 9 - 6 = 8 - 5 = 7 - 4 have the same difference.

Subtraction

Key Vocabulary: take away, less than, the difference, subtract, minus, fewer, decrease.

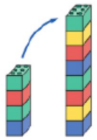
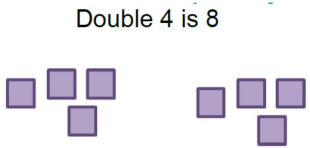
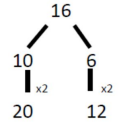
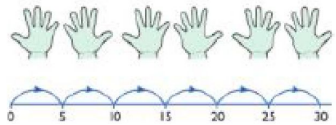
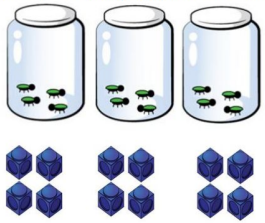
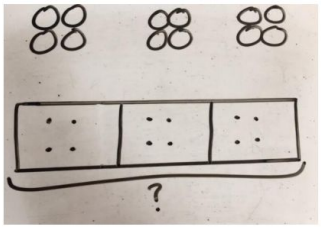
Strategies	Concrete	Pictorial	Abstract
Make 10	**Making 10** using ten frames. 14 – 5 	Children to present the ten frame pictorially and discuss what they did to make 10. 	Children to show how they can make 10 by partitioning the subtrahend.  14 – 4 = 10 10 – 1 = 9
Column method without regrouping	**Column method** using base 10. 48-7 	Children to represent the base 10 pictorially. 	Column method or children could count back 7. 
Column method - regrouping with base ten	**Column method** using base 10 and having to exchange. 41 – 26 	Represent the base 10 pictorially, remembering to show the exchange. 	Formal column method. Children must understand that when they have exchanged the 10 they still have 41 because 41 = 30 + 11. 

Subtraction

Strategies	Concrete	Pictorial	Abstract
Column method - regrouping with counters	**Column method** using place value counters. 234 – 88  	Represent the place value counters pictorially; remembering to show what has been exchanged.  	Formal colum method. Children must understand what has happened when they have crossed out digits. $\begin{array}{r} {}^{2}{}^{1} \\ 2\not{3}4 \\ -\ 88 \\ \hline 6 \end{array}$

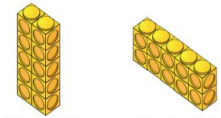
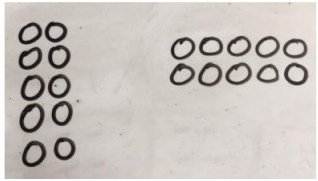
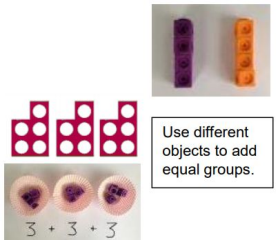
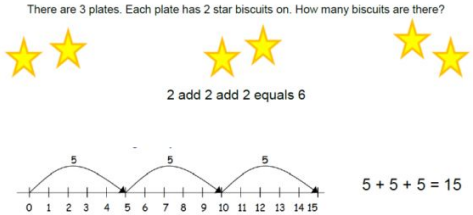
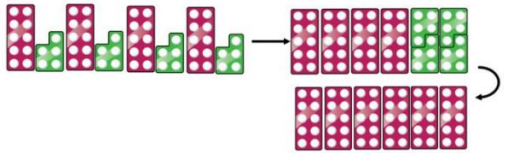
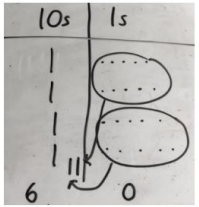
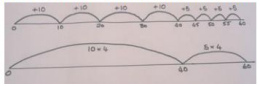
Multiplication

Key Vocabulary: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Strategies	Concrete	Pictorial	Abstract
Doubling	 Use practical activities to show how to double a number.	Draw pictures to show how to double a number. 	 Partition a number and then double each part before recombining it back together.
Counting in multiples	  Count in multiples supported by concrete objects in equal groups.	 Use a number line or pictures to continue support in counting in multiples.	Count in multiples of a number aloud. Write sequences with multiples of numbers. 2, 4, 6, 8, 10 5, 10, 15, 20, 25, 30
Repeated addition	Repeated grouping/repeated addition 3 × 4 4 + 4 + 4 There are 3 equal groups, with 4 in each group. 	Children to represent the practical resources in a picture and use a bar model. 	3 × 4 = 12 4 + 4 + 4 = 12

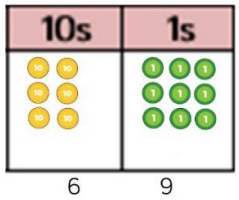
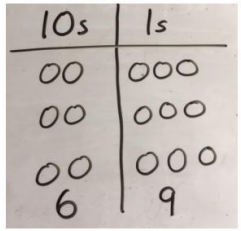
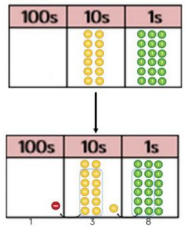
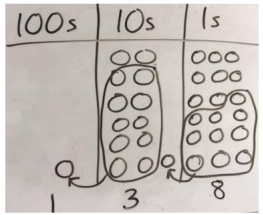
Multiplication

Key Vocabulary: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Strategies	Concrete	Pictorial	Abstract
Arrays- showing commutative multiplication	**Use arrays to illustrate commutativity** counters and other objects can also be used. $2 \times 5 = 5 \times 2$  2 lots of 5 5 lots of 2	Children to represent the arrays pictorially. 	Children to be able to use an array to write a range of calculations e.g. $10 = 2 \times 5$ $5 \times 2 = 10$ $2 + 2 + 2 + 2 + 2 = 10$ $10 = 5 + 5$
Number lines to show repeated groups	 Use different objects to add equal groups.	 	Write addition sentences to describe objects and pictures.  2 + 2 + 2 + 2 + 2 = 10
	Partition to multiply using Numicon, base 10 or Cuisenaire rods. 4×15 	Children to represent the concrete manipulatives pictorially.  	Children to be encouraged to show the steps they have taken. 4 x 15 10 5 10 x 4 = 40 5 x 4 = 20 40 + 20 = 60 A number line can also be used 

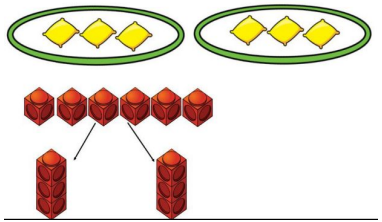
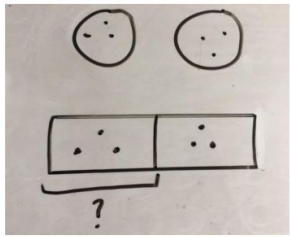
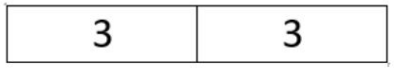
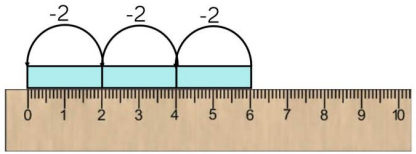
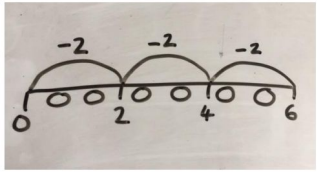
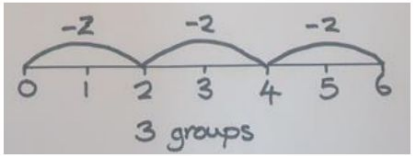
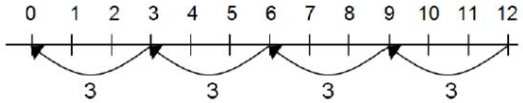
Multiplication

Key Vocabulary: double, times, multiplied by, the product of, groups of, lots of, equal groups.

Strategies	Concrete	Pictorial	Abstract
Formal column method with place value counters (base 10 can also be used.)	**Formal column method** with place value counters (base 10 can also be used.) 3 × 23  	Children to represent the counters pictorially.  	Children to record what it is they are doing to show understanding. 3 × 23 = 3 × 20 = 60 3 × 3 = 9 20 3 60 + 9 = 69 23 × 3 69
Formal column method with place value counters.	**Formal column method** with place value counters. 6 x 23  	Children to represent the counters/base 10, pictorially e.g. the image below.  	Formal written method 6 x 23 = 23 × 6 138 1 1
Formal column method with place value counters.	When children start to multiply 3d × 3d and 4d × 2d etc., they should be confident with the abstract: To get 744 children have solved 6 × 124. To get 2480 they have solved 20 × 124.		1 2 4 × 2 6 7 4 4 1 2 2 4 8 0 3 2 2 4 1 1 Answer: 3224

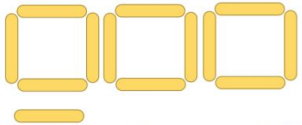
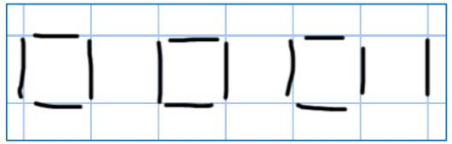
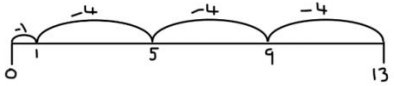
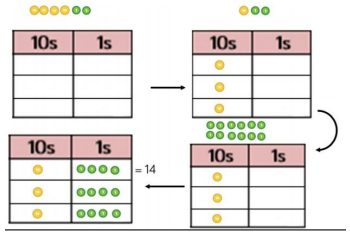
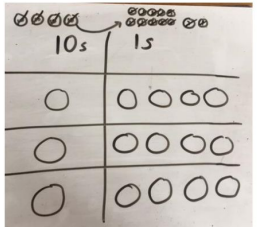
Division

Key Vocabulary: share, group, divide, divided by, half.

Strategies	Concrete	Pictorial	Abstract
Sharing objects into groups	**Sharing** using a range of objects. 6 ÷ 2 	Represent the sharing pictorially. 	6 ÷ 2 = 3  Children should also be encouraged to use their 2 times tables facts.
Repeated subtraction	**Repeated subtraction** using Cuisenaire rods above a ruler. 6 ÷ 2  3 groups of 2	Children to represent repeated subtraction pictorially. 	Abstract number line to represent the equal groups that have been subtracted. 
Division as grouping	Divide quantities into equal groups. Use cubes, counters, objects or place value counters to aid understanding. 	Use a number line to show jumps in groups. The number of jumps equals the number of groups. 	28 ÷ 7 = 4 Divide 28 into 7 groups. How many are in each group?

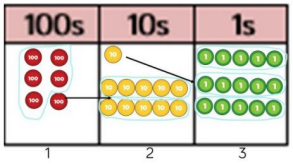
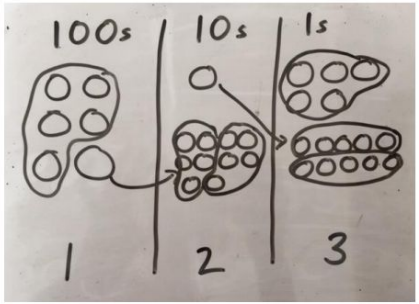
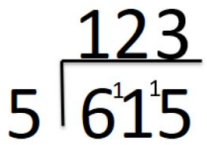
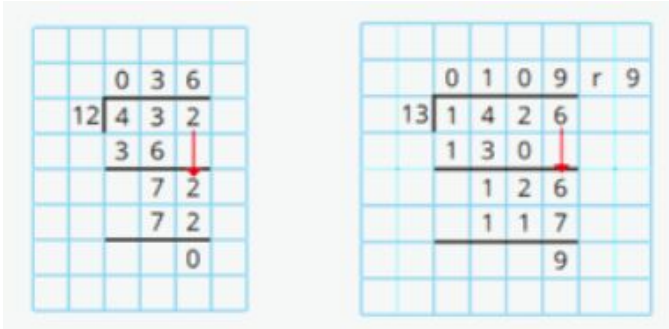
Division

Key Vocabulary: share, group, divide, divided by, half.

Strategies	Concrete	Pictorial	Abstract
Division with a remainder	**2d ÷ 1d with remainders** using lollipop sticks. Cuisenaire rods, above a ruler can also be used. 13 ÷ 4 Use of lollipop sticks to form wholes- squares are made because we are dividing by 4.  There are 3 whole squares, with 1 left over.	Children to represent the lollipop sticks pictorially.  There are 3 whole squares, with 1 left over.	13 ÷ 4 = 3 remainder 1 Children should be encouraged to use their times table facts; they could also represent repeated addition on a number line. '3 groups of 4, with 1 left over' 
Sharing using place value counters	Sharing using place value counters. 42 ÷ 3 = 14 	Children to represent the place value counters pictorially. 	Children to be able to make sense of the place value counters and write calculations to show the process. 42 ÷ 3 42 = 30 + 12 30 ÷ 3 = 10 12 ÷ 3 = 4 10 + 4 = 14

Division

Key Vocabulary: share, group, divide, divided by, half.

Strategies	Concrete	Pictorial	Abstract
Short division	**Short division** using place value counters to group. 615 ÷ 5  1. Make 615 with place value counters. 2. How many groups of 5 hundreds can you make with 6 hundred counters? 3. Exchange 1 hundred for 10 tens. 4. How many groups of 5 tens can you make with 11 ten counters? 5. Exchange 1 ten for 10 ones. 6. How many groups of 5 ones can you make with 15 ones?	Represent the place value counters pictorially.  	Children to the calculation using the short division scaffold. 
Long Division	The long division method is introduced for the first time. There are five long division steps: 1. Divide 2. Multiply 3. Subtract 4. Bring the next number down 5. Repeat	 	

References

This policy has been largely adapted from the White Rose Maths Hub Calculation Policy with further material added. It is a working document and will be revised and amended as necessary. White Rose Hub also released an updated Calculation Policy in September 2020, which further breaks down each developmental mathematical learning stage and reflects important representations.

Updated White Rose Hub - https://assets.whiteroseeducation.com/new-schemes/WRM%20calculation%20policy%202024%20All%20year%20groups.pdf

White Rose Hub - https://www.tes.com/teaching-resource/calculation-policy-11664888

Mapelwell Hall School - https://www.maplewell.leics.sch.uk/wp-content/uploads/Calculation-Policy-MHS.pdf

National curriculum in England: mathematics programmes of study - https://www.gov.uk/government/publications/national-curriculum-in-england-mathematics-programmes-of-study/national-curriculum-inengland-mathematics-programmes-of-study

NCETM Calculation Guidance for primary schools - https://www.ncetm.org.uk/media/k20boquz/ncetm-calculation-guidance-october-2015.pdf