Streethay Primary School

Year 4 Calculation Policy

Main Principles

Scan QR codes to be directed to the MNP website with further information and videos.

What is maths mastery?

Teaching maths for mastery is a transformational approach to maths teaching which stems from high performing Asian nations such as Singapore. When taught to master maths, children develop their mathematical fluency without resorting to rote learning and are able to solve non-routine maths problems without having to memorise procedures.

Concrete, pictorial, abstract (CPA)

Concrete, pictorial, abstract (CPA) is a highly effective approach to teaching that develops a deep and sustainable understanding of maths. Developed by American psychologist, Jerome Bruner, the CPA approach is essential to maths teaching in Singapore.

Number bonds

Number bonds are a way of showing how numbers can be combined or split up. They are used to reflect the 'part-part-whole' relationship of numbers.

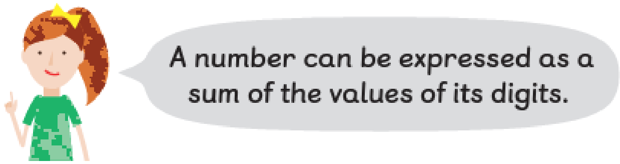
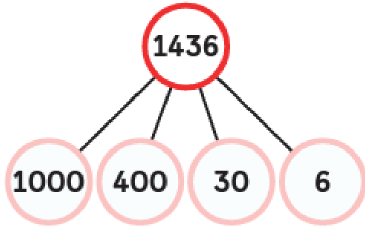
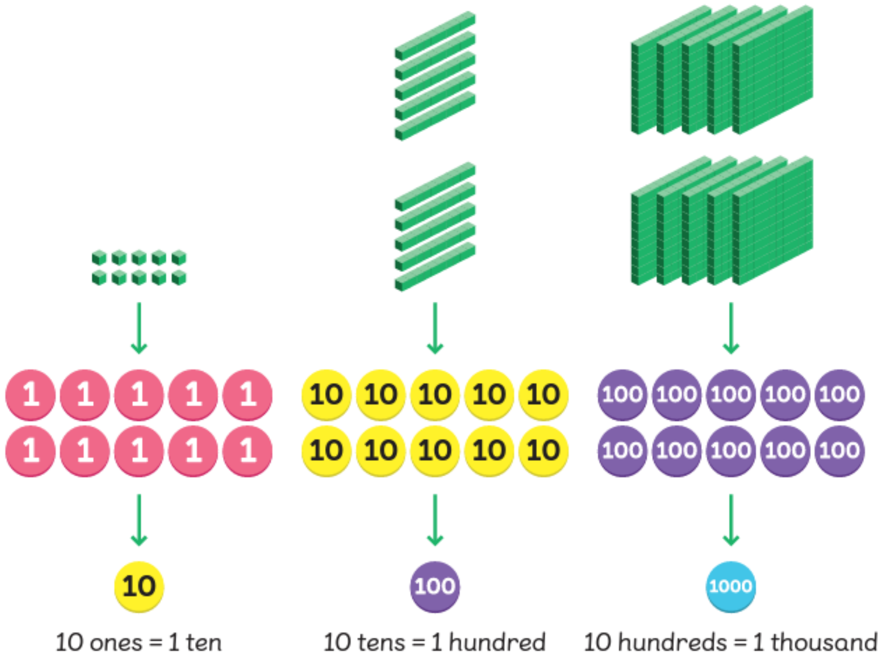
Bar modelling

The bar model method is a strategy used by children to visualise mathematical concepts and solve problems. The method is a way to represent a situation in a word problem, usually using rectangles.

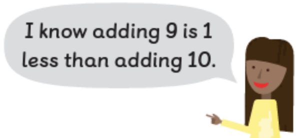
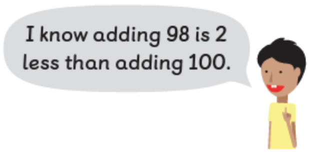
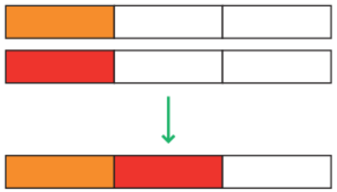
Fractions

In Singapore, the understanding of fractions is rooted in the Concrete, Pictorial, Abstract (CPA) model, where children use paper squares and strips to learn the link between the concrete and the abstract. At the heart of understanding fractions is the ability to understand that we're giving an equal part a name.

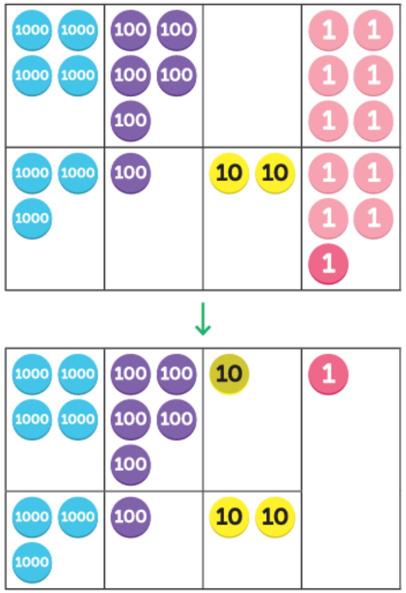
Progression in Addition—Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Part-part-whole	 $1436 = 1000 + 400 + 30 + 6$ 	This is a mathematical structure that underpins all addition situations. Numbers can be understood in terms of their parts; understanding that the parts are part of a larger collection. The bar model is used as a representation of a problem that can be related to a part–whole addition situation. Pupils develop an understanding of the parts and the whole within an equation.
4	Base 10 blocks		The use of base 10 blocks provides a representation of the place value of 3-digit numbers. This representation is related to the formal written method but also encourages pupils to use their understanding of adding the same noun. In Year 4, a transition between base 10 blocks and place–value counters takes place.

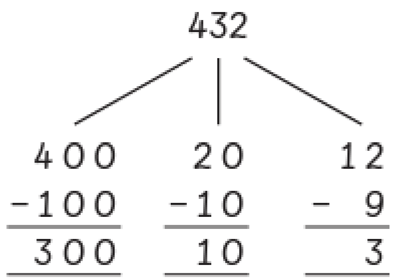
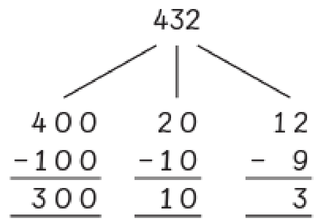
Progression in Addition—Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Estimating the sum	Start by estimating. $4188 \approx 4200$ $3245 \approx 3200$ $4200 + 3200 = 7400$ 	Estimation is introduced as an approach to start a calculation. Estimation is a skill that helps develop number sense. Pupils are expected to be able to decide if an answer is reasonable. Beginning a calculation with estimation is developed during the addition chapter.
4	Making 10 and making 100	make 10 $4072 + 8 = \boxed{}$ $4072 + 8 = 4070 + 10$ $4072 + 8 = 4080$ make 100 $97 + 5213 = \boxed{}$ $97 + 5213 = 100 + 5210$ $= 5310$	A mental method that involves renaming numbers to make 10 or 100 before finding the sum. Pupils develop their number sense by recognising numbers close to a ten or close to a hundred and renaming a number in the equation to bring a number to the nearest 10 or nearest 100 without having to compensate the sum.
4	Adding using compensation	1 Lulu used this method to find the sum of 3067 and 9. $3067 + 10 = 3077$ 1 less $3067 + 9 = 3076$  2 Ravi used this method to find the sum of 98 and 5262. $100 + 5262 = 5362$ 2 less $98 + 5262 = 5360$ 	A mental method that uses a similar equation in which a number in the original calculation is shown to the nearest 10 or 100 before carrying out the calculation. This calculation is used to help find the sum of the original equation.
4	Adding fractions	 $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$	Pupils use their understanding of adding the same noun when adding fractions with the same denominator. The adding of fractions uses equations and is supported through pictorial representation. Pupils use their understanding of equivalence to ensure denominators are the same before carrying out the addition.

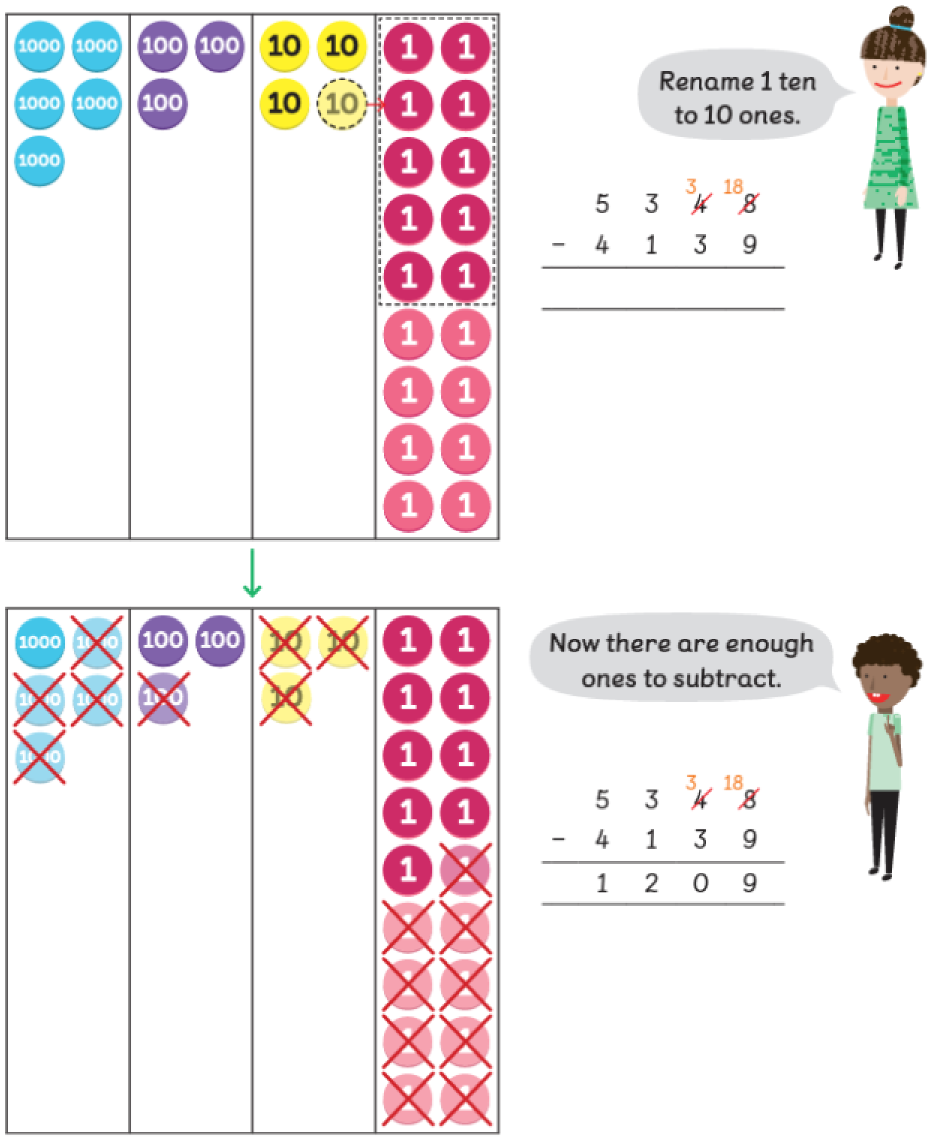
Progression in Addition—Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Place value counters	4506 + 3125 = Step 1 Add the ones. 6 ones and 5 ones = 11 ones Rename the ones. 11 ones = 1 ten and 1 one  $\begin{array}{rrrrr} & 4 & 5 & {}^{1}0 & 6 \\ + & 3 & 1 & 2 & 5 \\ \hline & & & & 1 \\ \hline \end{array}$	Place–value counters are used to represent addition situations. This transition relies on pupils understanding the value of each counter without being able to count its physical attributes. Pupils will have the opportunity to rename 10 counters of the same value to 1 counter with a value 10 times greater and vice versa. The idea of composing and decomposing at a rate of 10 should be well understood at this stage.
4	Formal written method	4188 + 3245 = $\begin{array}{rrrrrl} & 4 & 1 & 8 & 8 & \\ + & 3 & 2 & 4 & 5 & \\ \hline & & & 1 & 3 & \text{Add the ones.} \\ & & 1 & 2 & 0 & \text{Add the tens.} \\ & & 3 & 0 & 0 & \text{Add the hundreds.} \\ + & 7 & 0 & 0 & 0 & \text{Add the thousands.} \\ \hline & 7 & 4 & 3 & 3 & \\ \hline \end{array}$ $\begin{array}{rrrrr} & 2 & 6 & 1 & 2 \\ + & 4 & 2 & 6 & 4 \\ \hline & 6 & 8 & 7 & 6 \\ \hline \end{array}$	Pupils will have the opportunity to use a long and short version of this procedural method. In the long representation, the sum of adding each place is shown in its entirety before being added to find the final sum. In the short representation, the sum of each place is shown as part of the total sum and as a small number added to an existing place when a ten of one place is made. The procedure remains unchanged from Year 2

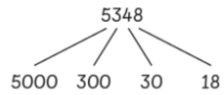
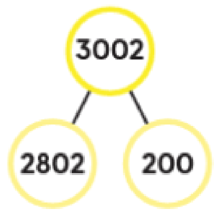
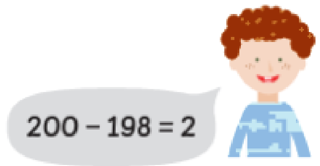
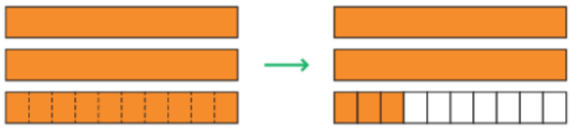
Progression in Subtraction —Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Part-part-whole		This is a mathematical structure that underpins all addition situations. Numbers can be understood in terms of their parts; understanding that the parts are part of a larger collection. The bar model is used as a representation of a problem that can be related to a part–whole addition situation. Pupils develop an understanding of the parts and the whole within an equation.
4	Place value counters	What is the difference between 432 and 119?  	Place–value counters are used to represent subtraction situations. This transition from base 10 blocks relies on pupils understanding the value of each counter without being able to count its physical attributes. Pupils will have the opportunity to rename 1 counter to 10 counters with a value 10 times smaller in order to carry out a formal written method. The idea of decomposing at a rate of 10 should be well understood at this stage.

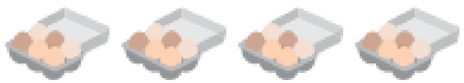
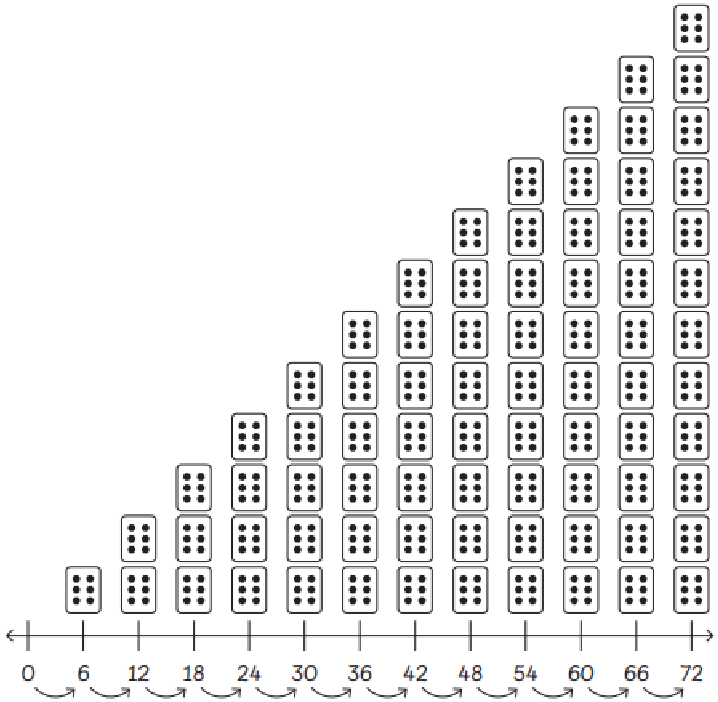
Progression in Subtraction —Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Formal written method		Pupils will use the formal written method initially without renaming, and then move to subtraction that requires renaming. The procedure remains the same as learned in Year 3 but the numbers increase to include 4-digit numbers being subtracted from 4-digit numbers.

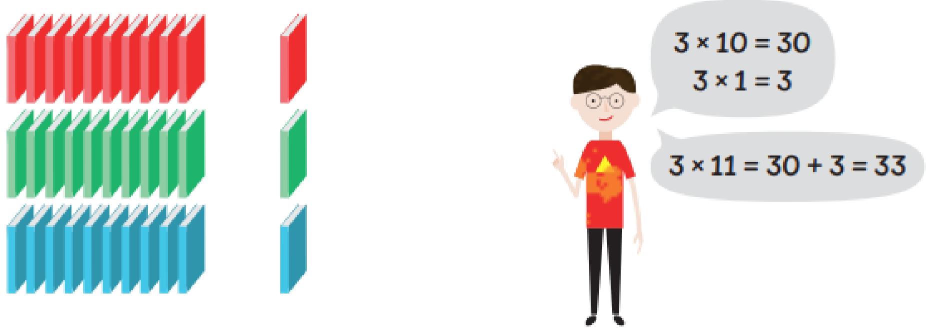
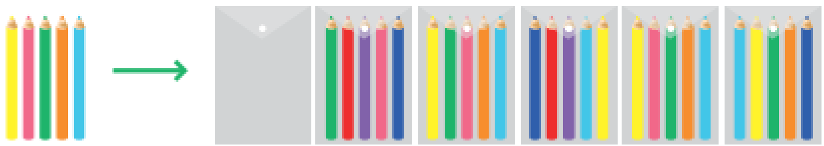
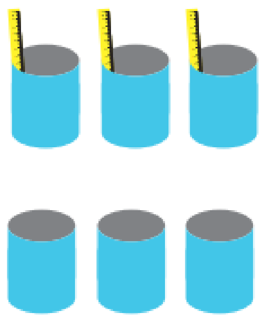
Progression in Subtraction —Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Using addition to check subtraction	 $\begin{array}{r} 5\;3\;\overset{3}{\cancel{4}}\;\overset{18}{\cancel{8}} \\ -\;4\;1\;3\;9 \\ \hline 1\;2\;0\;9 \\ \hline \end{array}$ Step 1 Subtract the ones. 18 ones − 9 ones = 9 ones Step 2 Subtract the tens. 3 tens − 3 tens = 0 tens Step 3 Subtract the hundreds. 3 hundreds − 1 hundred = 2 hundreds Step 4 Subtract the thousands. 5 thousands − 4 thousands = 1 thousand 5348 − 4139 = 1209  	Pupils are encouraged to check subtraction calculations by adding the parts (the subtrahend and the difference) to ensure the sum is equal to the whole (the minuend).
4	Mental method	3002 − 198 = 2804  3002 − 198 = 2802 + 2  	Mental subtraction methods include partitioning the minuend to simplify the subtraction calculation. The approach shown is supported by an understanding of number bonds to 10 and to 100.
	Subtracting fractions	 $3 - \frac{7}{10} = 2\frac{10}{10} - \frac{7}{10}$ 2 1 $= 2\frac{3}{10}$  	Pupils use their understanding of subtracting the same nouns when subtracting fractions with the same denominator. The subtraction of fractions or finding the difference between fractions is supported through pictorial representation. Pupils use their understanding of equivalence to ensure denominators are the same before carrying out the subtractions.

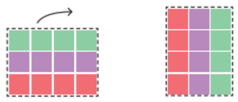
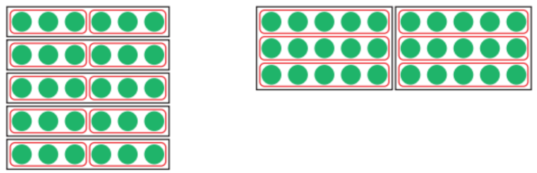
Progression in Multiplication—Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Counting in 6s, 7s and 9s	Count on in sixes. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	When pupils know that the size of a group is 6, 7 and 9 and the group size remains consistent, they can count in multiples of 6, 7 and 9 to find the product. Counting in multiples is supported by representation on a number line using intervals of 6, 7 and 9.
4	Equal groups	 4 boxes of 6 4 × 6 = 24	Multiplication by 6, 7 and 9 is shown initially using equal groups. Specific language is used to support these examples, in this case '4 groups of 6', and this is immediately followed by the equation 4 × 6. This forms the basis of using known facts to find unknown facts.
4	Number line		Counting in multiples is shown on a number line. Multiples of 6, 7 and 9 are used as the intervals on a number line to support skip counting using these multiples. A growing pattern in multiples of 6, 7 and 9 is also shown to support pupils' understanding

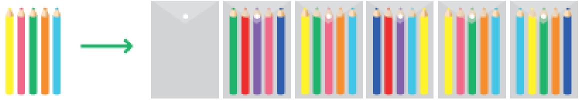
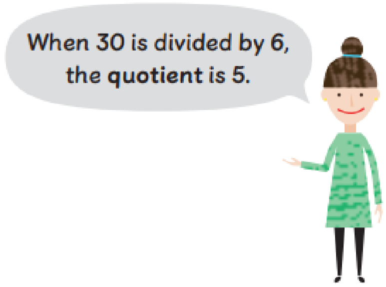
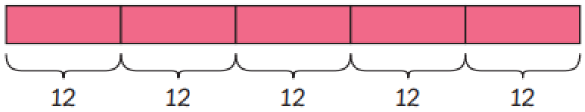
Progression in Multiplication —Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Multiplying by 11 and 12 using associated facts	 10 + 10 + 10 = 30 1 + 1 + 1 = 3	Learning to multiply by 11 and 12 is supported by partitioning 11 and 12 and using the 10 times table as the basis for initial understanding, building towards immediate recall.
4	Fact families	 30 ÷ 6 = 5 6 × 5 = 30	Fact families are used in the introduction of division, represented using arrays to show the relationship between factors and a product. Pupils relate 6 × 11 = 66 to 66 ÷ 6 = 11. They understand that multiplication can be used in division calculations.
4	Multiplying by 0 and 1	 3 pots of 1 ruler 3 × 1 = 3 3 empty pots 3 × 0 = 0	Pupils initially use their understanding of 'groups of' to understand multiplying by zero. For example, 0 × 4 is read as 'There are zero groups of 4'. Pupils' understanding then moves to read 0 × 4 as zero multiplied 4 times. The language is an extension of what they have already learned about multiplication.

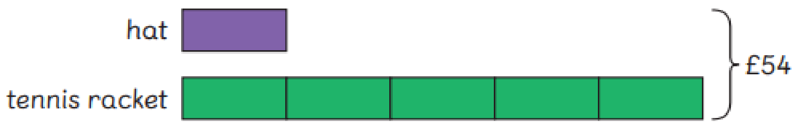
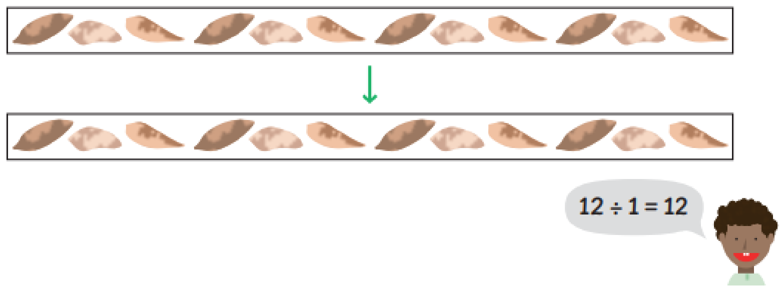
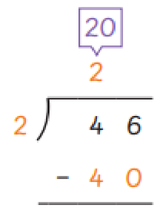
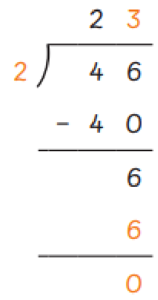
Progression in Multiplication —Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Commutativity	 3 × 4 4 × 3 3 × 4 = 4 × 3 3 × 4 is equal to 4 × 3. 5 × 2 × 3 = 2 × 3 × 5 = 	Arrays are used to support the understanding of commutativity. Pupils learn the pattern of a × b = b × a. Regardless of the order in which the factors are multiplied, the product remains the same. The commutative property is further developed through the multiplication of 3 numbers. 3 factors are multiplied in different orders and the product remains the same.
4	Multiplying multiples of 10	30 is equal to 3 tens. 5 × 3 = 15 5 × 3 tens = 15 tens = 150  5 × 30 = 150	Pupils learn to scale a product by a factor of 10 when multiplying a multiple of 10. For example, we know 3 × 4 = 12, therefore the product of 30 × 4 is 10 times greater: 30 × 4 = 120. Naming the place value of the digit supports this approach and pupils relate a known fact to multiplying multiples of 10. For example, we can read 30 × 4 as 3 tens × 4. So, 3 tens × 4 = 12 tens or 120. We would expect pupils to generalise and see that 30 × 4 = 3 × 4 × 10. While this isn't formalised, this forms the basis of the distributive property of multiplication x`
4	Formal written method	$\begin{array}{cccc} & 2 & 1 & 8 \\ \times & & & 4 \\ \hline & & 3 & 2 \\ & & 4 & 0 \\ + & 8 & 0 & 0 \\ \hline & 8 & 7 & 2 \\ \hline \end{array}$ → 8 × 4 = 32 → 10 × 4 = 40 → 200 × 4 = 800 → 218 × 4 = 872	Pupils use formal written methods, short and long, to multiply a 2-digit number by a 1-digit number. Initially the long method is used, showing the product of the multiplication of the ones, tens and hundreds, before adding the products to find the total. Pupils are shown the corresponding short formal written method so can make the links between the two procedures. Multiplication then moves from a 2-digit number by a 1-digit number to a 3-digit number by a 1-digit number. Pupils should be aware that even though the number of digits in one number increases, the procedure remains the same.

Progression in Division—Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Dividing by 6, 7 and 9	 $30 \div 6 = 5$ $6 \times 5 = 30$ Each packet can hold 5 pencils.  	Pupils are given division word problems and immediately relate the division used to solve the problem to the multiplication fact they have previously learned. The language associated with division is given, with pupils understanding that when the number is divided, the outcome is called the quotient
4	Dividing by 11 and 12	 $5 \times 12 = \square$ $\square \div 12 = \square$ $12 \times 5 = \square$ $\square \div 5 = \square$	Arrays and bar models are used to show the relationship between multiplication and division when learning to multiply and divide by 11 and 12, building on the relationship already learned when dividing by 6, 7 and 9.
4	Dividing with remainders	There are 13 flowers.  $13 \div 3 = 4$ with 1 left over The quotient is 4. The remainder is 1.	Pupils learn that when dividing into equal groups, we can be left with a number of items less than the group size. This is introduced as the remainder. Initially, the remainder is shown as a whole number.

Progression in Division —Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Word problems involving division	 6 units → £54 1 unit → £54 ÷ 6 = £9	Division word problems are supported by the use of arrays and bar models, reinforcing the idea of equal groups. Pupils relate the representations of the problems to the equations given. Comparison division models are also used to determine amounts when two separate amounts are compared.
4	Dividing by 1		Pupils look for a pattern and generalise about dividing by 1. They systematically work through dividing a single amount by 4, 3, 2 and finally 1 to make observations about the number of groups and the size of each group.
4	Dividing 2-digit numbers	Step 1 Divide 4 tens by 2.  4 tens ÷ 2 = 2 tens 40 ÷ 2 = 20  Step 2 Divide 6 ones by 2.  6 ones ÷ 2 = 3 ones 6 ÷ 2 = 3 46 ÷ 2 = 23 	Pupils initially use place–value counters to support the division of 2-digit numbers, then move on to use a long formal written method. The long written method shows the systematic division of parts of the dividend resulting in the quotient.

Progression in Division —Year 4

Year Group	Topic/Strand	Representation	Key Idea
4	Dividing 3-digit numbers	$306 \div 3 = \boxed{}$ 	The same procedure used for dividing 2-digit numbers is used for dividing 3-digit numbers. Place– value counters are used to represent the problem before moving on to use the long formal written method.