Streethay Primary School

Year 3 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.

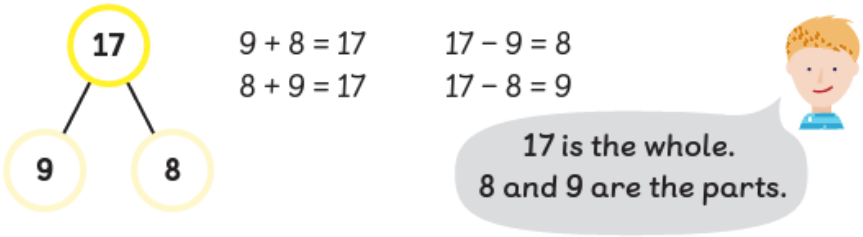
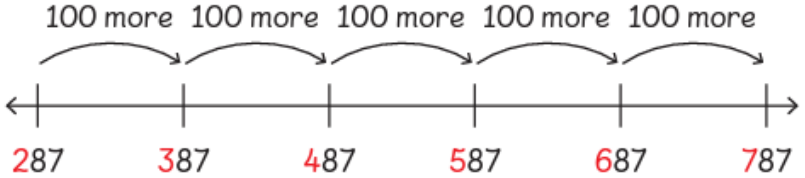
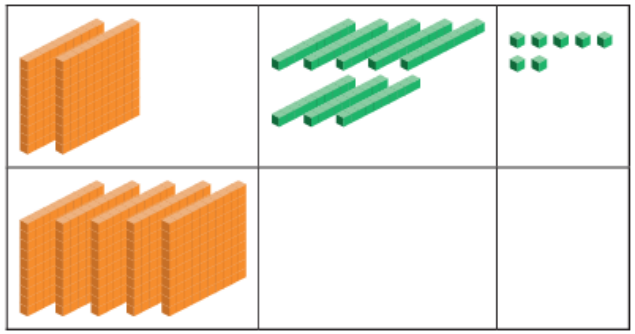
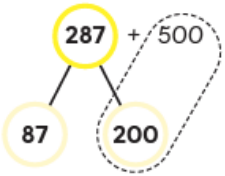
Bar modelling

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.

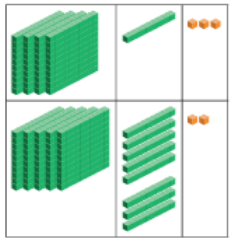
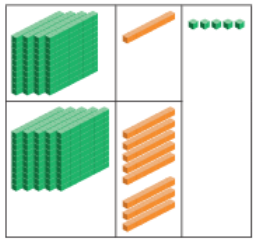
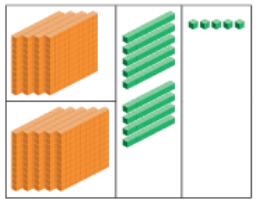
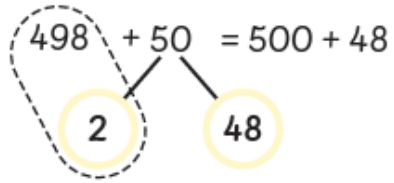
Fractions

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.

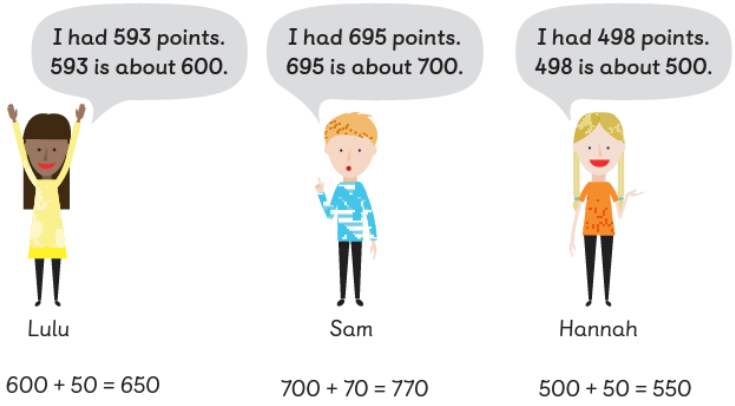
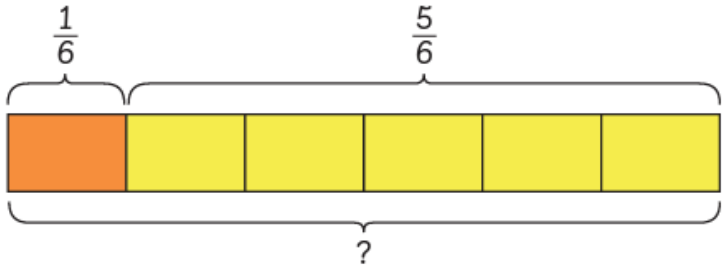
Progression in Addition—Year 3

Year Group	Topic/Strand	Representation	Key Idea
3	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. Pupils develop an understanding of the parts and the whole within an equation.
3	Counting on using a number line	 287 + 500 = 787	The use of the number line is further developed when counting starts from a given number, relying on pupils' ability to locate and count from a given number, including starting from a 3-digit number. Initially a 1-digit number is added to a 3-digit number, then this progresses to a number line shown with intervals of 1, then 10 and eventually to 100.
3	Base 10 blocks	 287 + 500 = 787 787 fans watched the game in total.  200 + 500 = 700 87 + 700 = 787 	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 to add 3-digit numbers. For example, 200 + 500 can be understood as 2 hundreds + 5 hundreds. The sum of these numbers is 700 or 7 hundreds. Progression is made by adding ones, then tens and finally hundreds before the addition of all 3 is undertaken. An understanding of place value will support addition as well as subtraction, multiplication and division.

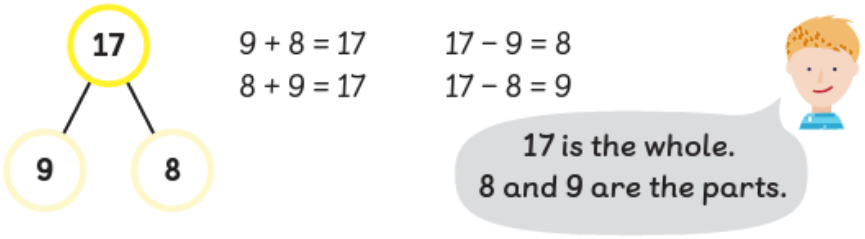
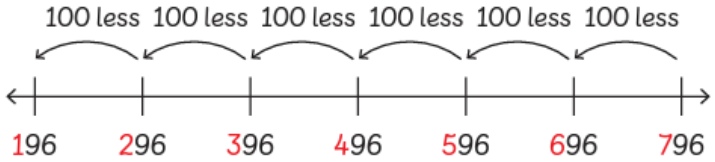
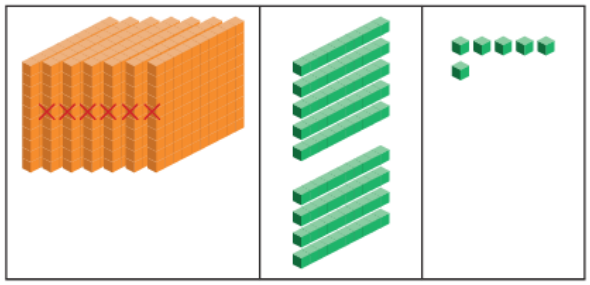
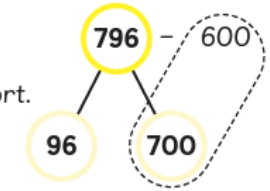
Progression in Addition—Year 3

Year Group	Topic/Strand	Representation	Key Idea
3	Formal written method	413 + 582 = ☐ Step 1 Add the ones. 3 ones + 2 ones = 5 ones  h t o 4 1 3 + 5 8 2 5 Step 2 Add the tens. 1 ten + 8 tens = 9 tens  h t o 4 1 3 + 5 8 2 9 5 Step 3 Add the hundreds. 4 hundreds + 5 hundreds = 9 hundreds  h t o 4 1 3 + 5 8 2 9 9 5 413 + 582 = 995	This procedural method progresses from the renaming of 10 ones into 1 ten to include the renaming of 10 tens to 1 hundred. The procedure remains unchanged from Year 2. Pupils understand that at this stage, they start with the addition of the ones, then the tens, then finally the hundreds. This method is supported with base 10 block representation. The formal written method is always accompanied by a written equation to ensure that the relationship between the representations is made.
3	Adding by making 100	498 + 50 = ☐  	Pupils are given the opportunity to further develop their number sense by using a ‘make 100’ strategy with numbers that are ‘near hundreds’. They use their part–whole understanding to rename a given number to make 100. For example, 498 + 50 can be renamed as 498 + 2 + 48. Pupils add 2 to 498 to make 500, then add the remaining 48.

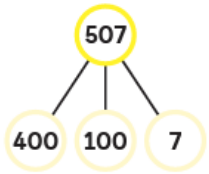
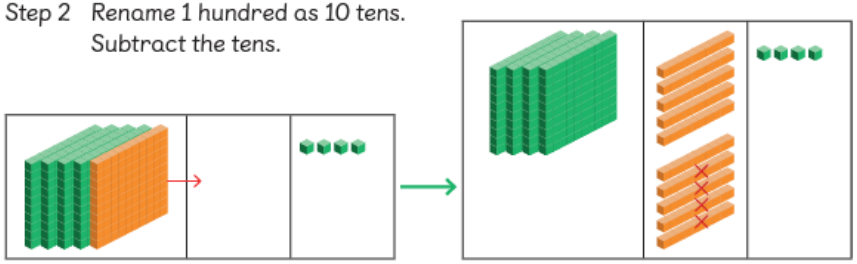
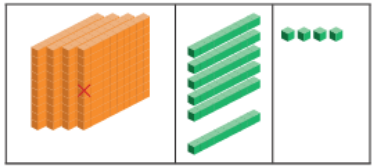
Progression in Addition—Year 3

Year Group	Topic/Strand	Representation	Key Idea
3	Estimating		Pupils use their number sense to recognise numbers close to a hundred and how estimation can help accuracy in completing a precise calculation.
3	Adding fractions	 1 sixth and 5 sixths make 6 sixths. $\frac{1}{6} + \frac{5}{6} = \frac{6}{6}$ $= 1$	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.

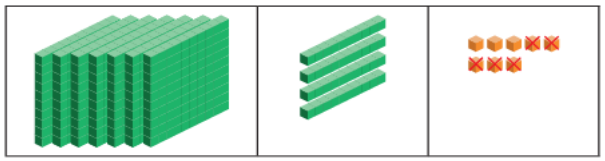
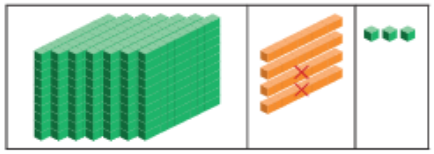
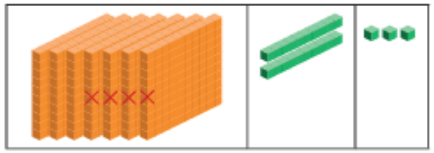
Progression in Subtraction —Year 3

Year Group	Topic/Strand	Representation	Key Idea
3	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. Pupils develop an understanding of the parts and the whole within an equation.
3	Counting back using a number line	 796 − 600 = 196	The use of the number line is further developed when counting back starts from a given number, relying on pupils' ability to locate and count back from a given number, including starting from a 3-digit number. Initially a 1-digit number is subtracted from a 3-digit number, then this progresses to a number line shown with intervals of 1, then 10 and then progressing to 100.
3	Base 10 blocks	 796 − 600 = 196 There were 196 people left at the airport.  700 − 600 = 100 96 + 100 = 196 h t o 7 9 6 − 6 0 0 1 9 6	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 subtracting the same noun to subtract from 3-digit numbers. For example, 700 – 400 can be understood as 7 hundreds – 4 hundreds. The difference between these numbers is 300 or 3 hundreds. Progression is made by subtracting ones, then tens and finally hundreds before the subtraction of all 3 places is undertaken. An understanding of place value will support subtraction as well as addition, multiplication and division.

Progression in Subtraction —Year 3

Year Group	Topic/Strand	Representation	Key Idea
3	Formal written method	507 − 143 = ☐ Step 1 Subtract the ones.  7 ones − 3 ones = 4 ones  h t o 5 0 7 − 1 4 3 4 Step 2 Rename 1 hundred as 10 tens. Subtract the tens.  10 tens − 4 tens = 6 tens h t o 4 10 5 Ø 7 − 1 4 3 6 4 Step 3 Subtract the hundreds.  4 hundreds − 1 hundred = 3 hundreds 507 − 143 = 364 h t o 4 10 5 Ø 7 − 1 4 3 3 6 4	This procedural method progresses from the renaming of 10 ones into 1 ten to include the renaming of 10 tens to 1 hundred when necessary. The procedure itself remains unchanged from Year 2. Pupils understand that at this stage, they start with the subtraction of the ones, then the tens, then finally the hundreds. This method is supported with base 10 block representation. The formal written method is always accompanied by a written equation to ensure that the relationship between the representations are made.

Progression in Subtraction —Year 3

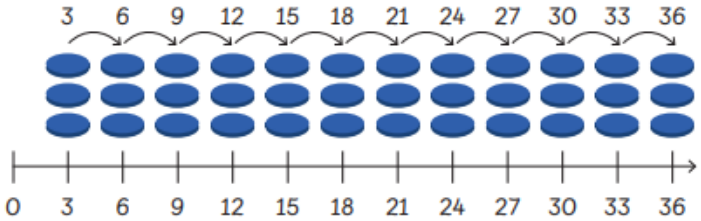
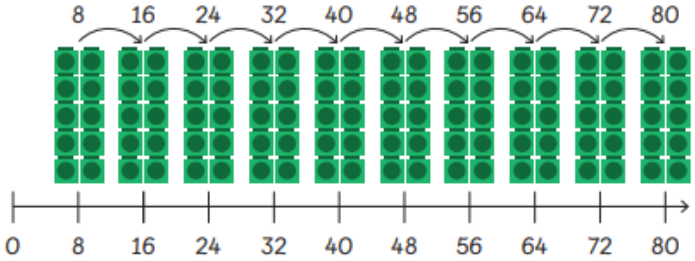
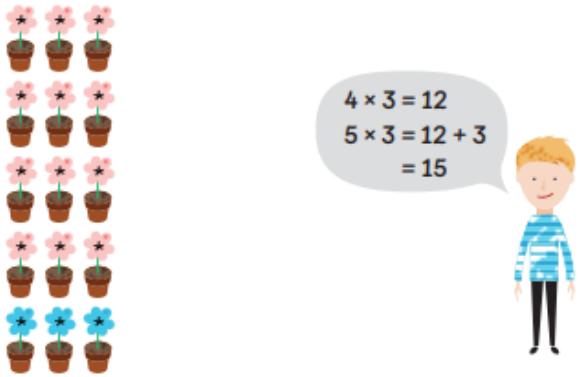
Year Group	Topic/Strand	Representation	Key Idea
3	Inverse operation	748 − 425 = ☐ Step 1 Subtract the ones. 8 ones − 5 ones = 3 ones  Step 2 Subtract the tens. 4 tens − 2 tens = 2 tens  Step 3 Subtract the hundreds. 7 hundreds − 4 hundreds = 3 hundreds  748 − 425 = 323 323 tomatoes are left. 	Pupils should understand that subtraction is the inverse operation of addition. They are encouraged to check completed subtraction calculations using addition.

	h	t	o
	7	4	8
−	4	2	5
			3

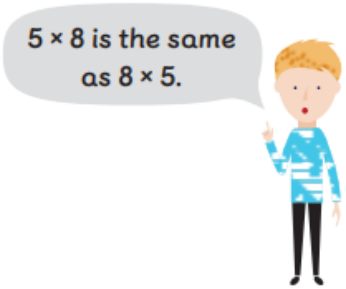
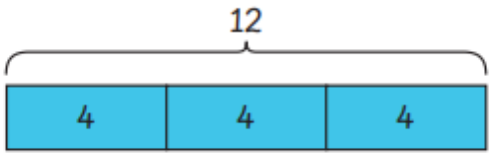
	h	t	o
	7	4	8
−	4	2	5
		2	3

	h	t	o
	7	4	8
−	4	2	5
	3	2	3

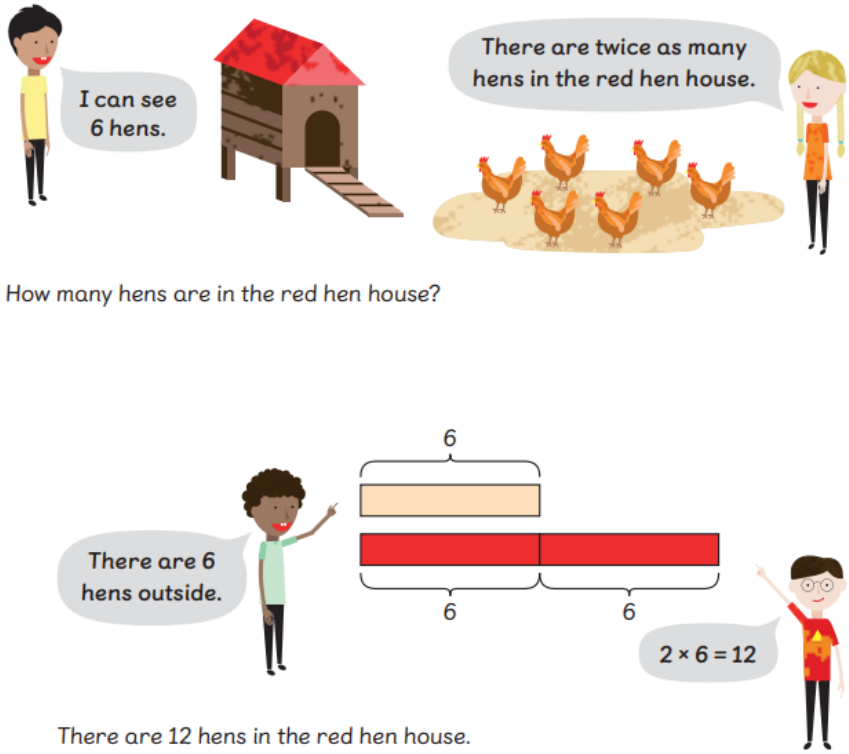
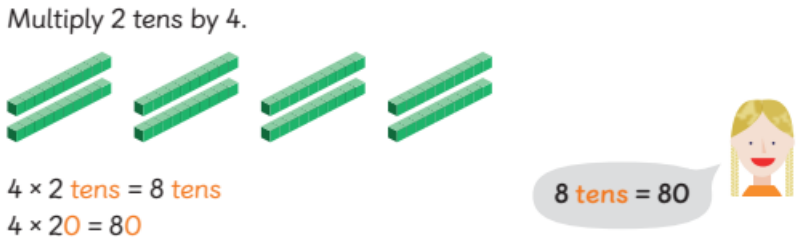
Progression in Multiplication —Year 3

Year Group	Topic/Strand	Representation	Key Idea
3	Counting in 3s, 4s and 8s		When a pupil knows that the size of a group is 3, 4 and 8 and the group size remains consistent, they can count in multiples of 3, 4 and 8 to find the product. Counting in multiples is supported by representation on a number line.
3	Equal groups		Multiplication by 3, 4 and 8 is shown initially using equal groups. Specific language is used to support these examples, in this case '4 groups of 3', and this is immediately followed by the equation 4 × 3. This forms the basis of using known facts to find unknown facts.
3	Number line		Counting in multiples is shown on a number line. Multiples of 3, 4 and 8 are used as the intervals on a number line to support skip counting using these multiples.
3	Associated facts		Once the understanding of multiplication as the adding of equal groups is secure, this knowledge can be used to find unknown facts. For example, if a pupil knows 5 × 3 as 5 groups of 3, they can understand that 6 × 3 is simply 1 more group of 3. So, 6 × 3 = 15 + 3; 4 × 3 is seen as 1 group fewer than 5 × 3; 4 × 3 = 15 – 3. This structure is used in all multiplication tables.

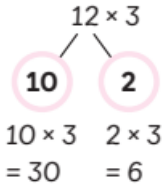
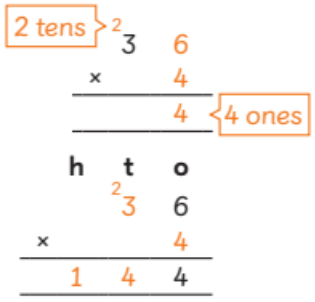
Progression in Multiplication —Year 3

Year Group	Topic/Strand	Representation	Key Idea
3	Number patterns		Pupils count in multiples of 3, 4 or 8 to identify missing multiples in a sequence. This reinforces the products found within the 3, 4 and 8 times tables.
3	Commutativity	 There are 5 rows of 8 mushrooms. 5 × 8 = 40  There are 8 rows of 5 mushrooms. 8 × 5 = 40 There are 40 mushrooms. 	The representation of multiplication as an array is used to further develop the understanding of commutativity. Having first understood multiplication as [ ] groups of [ ], pupils develop an understanding that 5 × 3 can also be read as 5 multiplied 3 times. Pupils should have a firm understanding that the order the factors are multiplied in does not change the product.
3	Fact families	12 ÷ 3 = 4 4 × 3 = 12 	The relationship between multiplication and division is shown using fact families. The product is a result of multiplying factors and dividing the product by a factor will equal the factor used during multiplication.

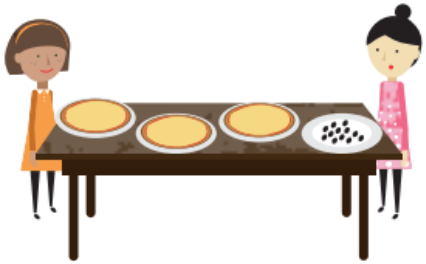
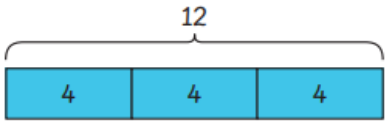
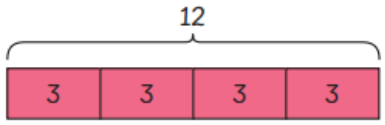
Progression in Multiplication —Year 3

Year Group	Topic/Strand	Representation	Key Idea
3	Multiplication using bar models		Bar models are used in multiplicative comparison problems. Pupils use multiplication skills to determine quantities in comparison to another quantity. Language such as 'twice as many', 'three times as many' and so on is developed in relation to multiplicative comparison problems.
3	Base 10 blocks		Base 10 blocks are used to support the understanding of multiplication of 2-digit numbers. Language and understanding is developed through the representation of 3 × 20 as 3 × 2 tens = 6 tens. Pupils use known multiplication tables to 10 together with the place–value names of the digits being used to carry out the multiplication.

Progression in Multiplication —Year 3

Year Group	Topic/Strand	Representation	Key Idea
3	Number bonds		Number bonds are used to show numbers partitioned into tens and ones before being multiplied. The examples being used move from a number bond relating to an equation to an equation and the formal written method.
3	Formal written method	Step 1 Multiply the ones. 6 ones × 4 = 24 ones 24 ones = 2 tens + 4 ones Step 2 Multiply the tens. 3 tens × 4 = 12 tens 12 tens + 2 tens = 14 tens 36 × 4 = 144 	This method is used to multiply a 2-digit number by a 1-digit number. Initially, the method shows the product of the multiplication of the ones, then the product of the multiplication of the tens, before adding the products to find the total. This method progresses to include renaming and finally moves to a shortened form of the written method. The method is finally shown as a version of the formal written method, in which the product of the multiplication of each place is shown as a single product, with any renaming added above each

Progression in Division —Year 3

Year Group	Topic/Strand	Representation	Key Idea
3	Dividing by 3, 4 and 8	Sam put 32 cobs of corn into 4 equal groups.  4 groups of 8 is 32. 4 × 8 = 32  32 ÷ 4 = 8 Each group has 8 cobs of corn.	Pupils are introduced to the division of numbers by 3, 4 and 8 using grouping initially. They make groups of 3, 4 and 8 and then move on to sharing a total.
3	Division with word problems	Amira and Ruby are making pizzas. They have 12 olives. They want to put 3 or 4 olives on each pizza. Can we make a family of multiplication and division equations to help them?   4 times 3 is 12, so 12 divided by 3 is 4. 12 divided into groups of 4 is equal to 3.  3 times 4 is 12, so 12 divided by 4 is 3. 12 shared between 4 is equal to 3.	Pupils extend their understanding of division by relating the division facts to multiplication facts, creating a multiplication and division fact family. Word problems get increasingly more complex and bar models are used to represent problems involving division.