Streethay Primary School

Progression in Addition

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.

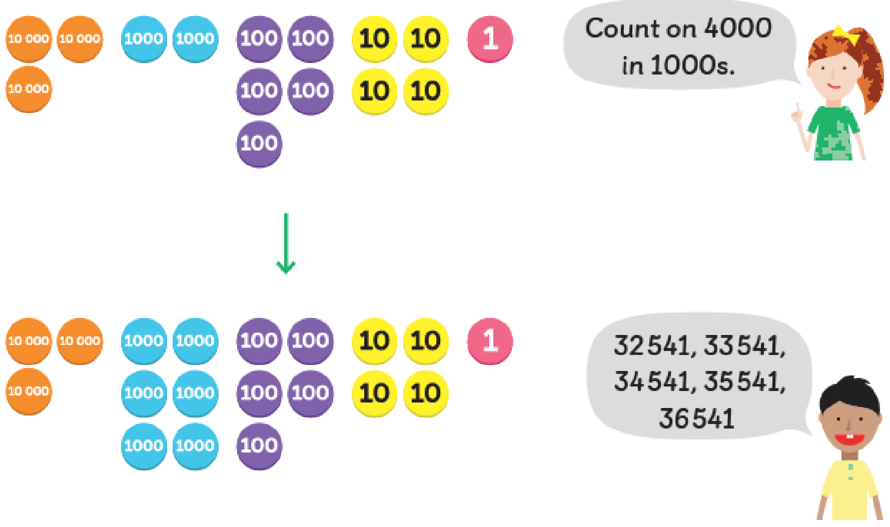
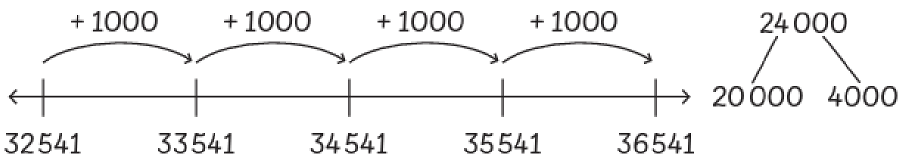
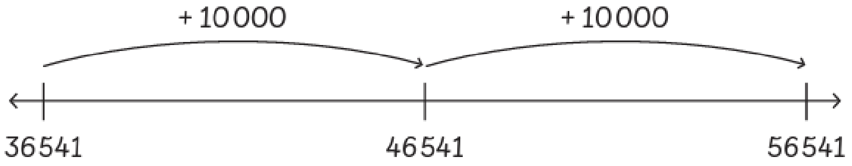
Bar modelling

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.

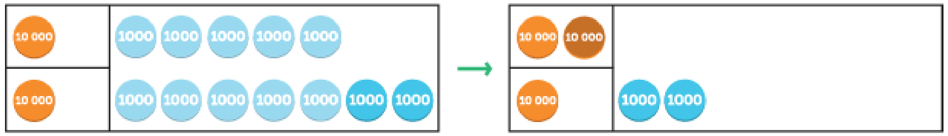
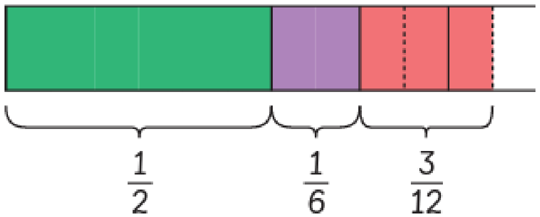
Fractions

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.

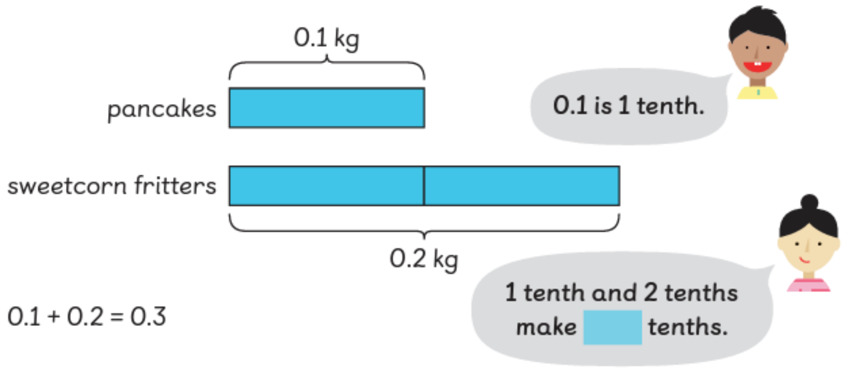
Progression in Addition—Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Counting on using place value counters	32 541 + 24 000 = 	Pupils use place–value counters to support counting on in thousands to find the sum.
5	Counting on using number lines	Count on 24 000 from 32 541.  32 541 + 4000 = 36 541  36 541 + 20 000 = 56 541 32 541 + 24 000 = 56 541	Pupils count in thousands and ten thousands, using a number line to show this counting on method

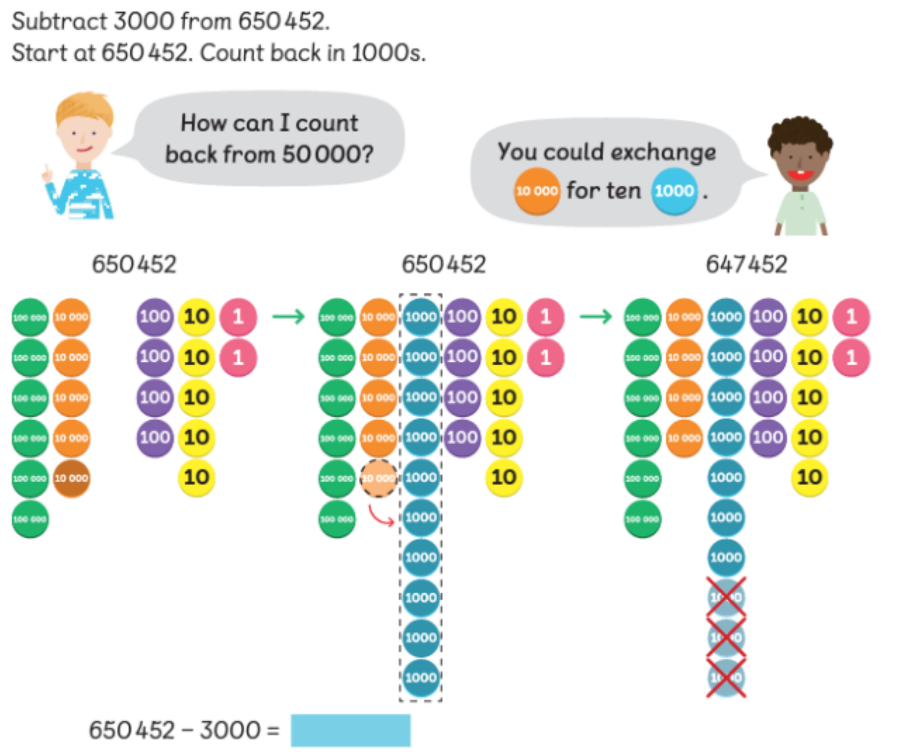
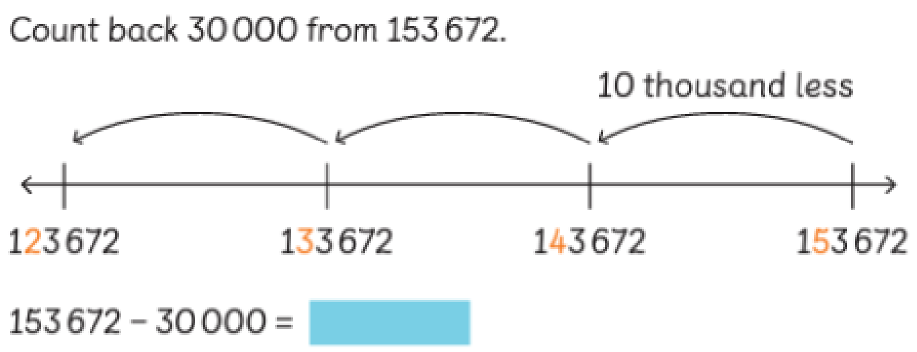
Progression in Addition—Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Formal written Method	 $\begin{array}{r} \scriptstyle 1 \\ 15\,000 \\ +\ 17\,000 \\ \hline 32\,000 \\ \hline \end{array}$ 5 thousands + 7 thousands = 12 thousands 12 thousands = 1 ten thousand + 2 thousands  $15\,000 + 17\,000 = 32\,000$	Place–value counters are used to represent the formal written method. The procedure remains unchanged from Year 2.
5	Adding fractions	Add $\frac{1}{2}$, $\frac{1}{6}$ and $\frac{3}{12}$.  $\frac{1}{2} + \frac{1}{6} + \frac{3}{12} = \frac{6}{12} + \frac{2}{12} + \frac{3}{12}$ $= \frac{11}{12}$	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

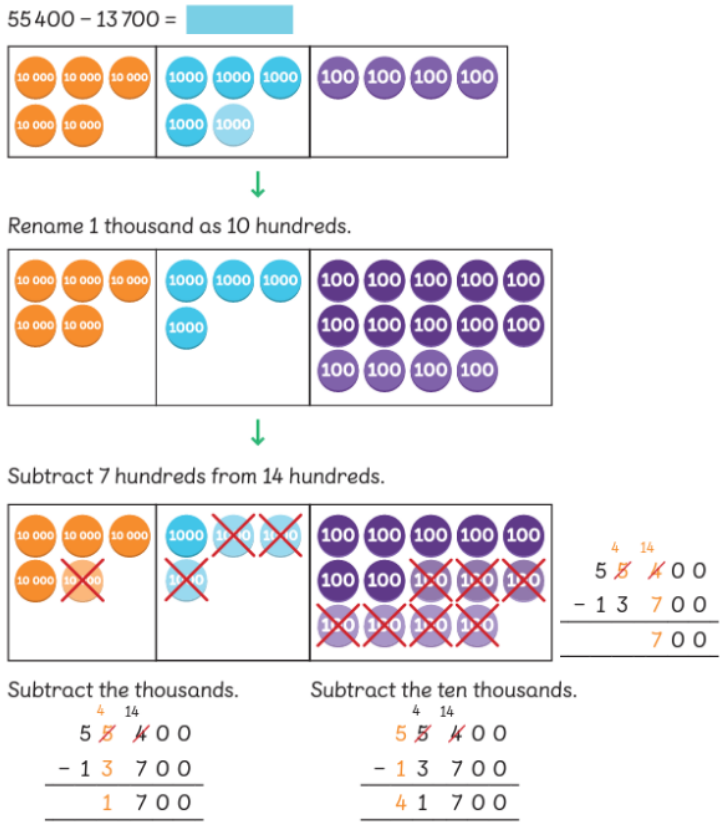
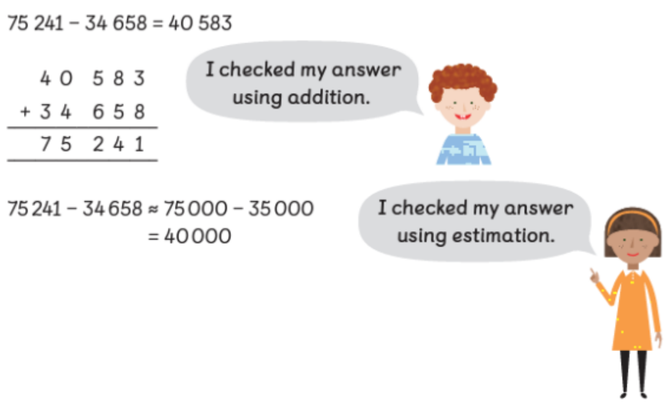
Progression in Addition—Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Adding decimals		Pupils use their understanding of adding the same nouns when adding tenths. Tenths are represented using bar models, written words and equations.
5	Adding decimals with a formal written method	$\begin{array}{r} £\,^{1}1\,.\,8\,0 \\ +\,£\,0\,.\,7\,0 \\ \hline £\,2\,.\,5\,0 \\ \hline \end{array}$	The procedure for adding decimals using a formal written method is the same as when adding whole numbers, but attention needs to be given to the decimal point. The decimal point does not represent a place but separates the whole from the fractional part of a number. Careful alignment is needed when adding decimal numbers using a formal written method.

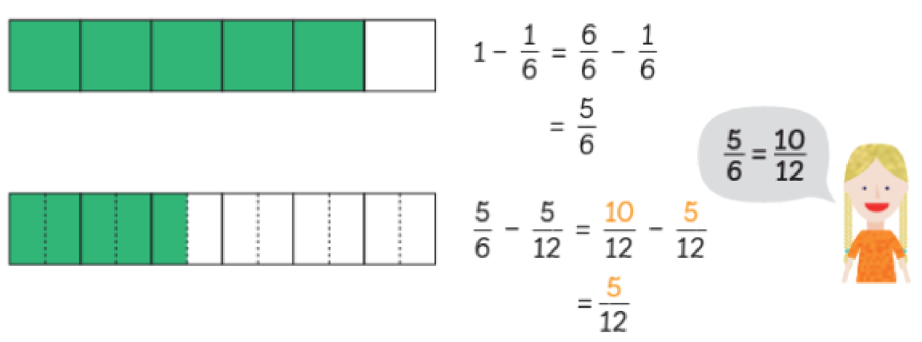
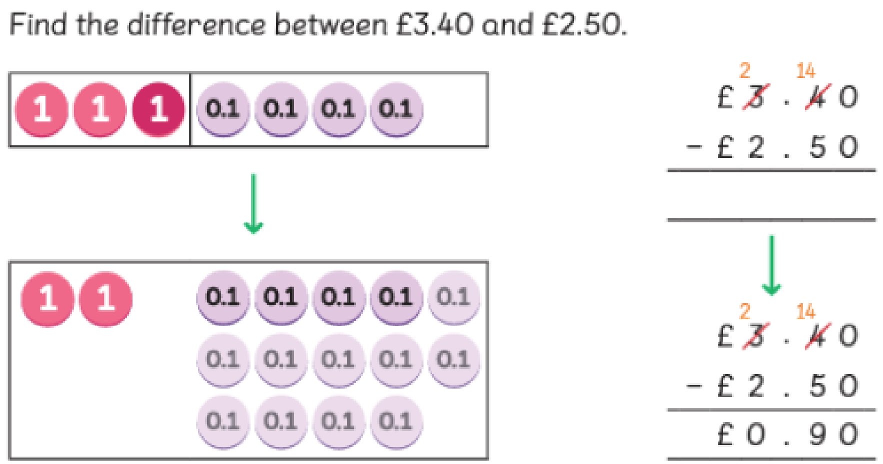
Progression in Subtraction —Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Counting back using place value counters		Pupils use place–value counters to support counting back in thousands to find the difference.
5	Counting back using number lines		Pupils count back in thousands and ten thousands, using a number line to show this counting back method.

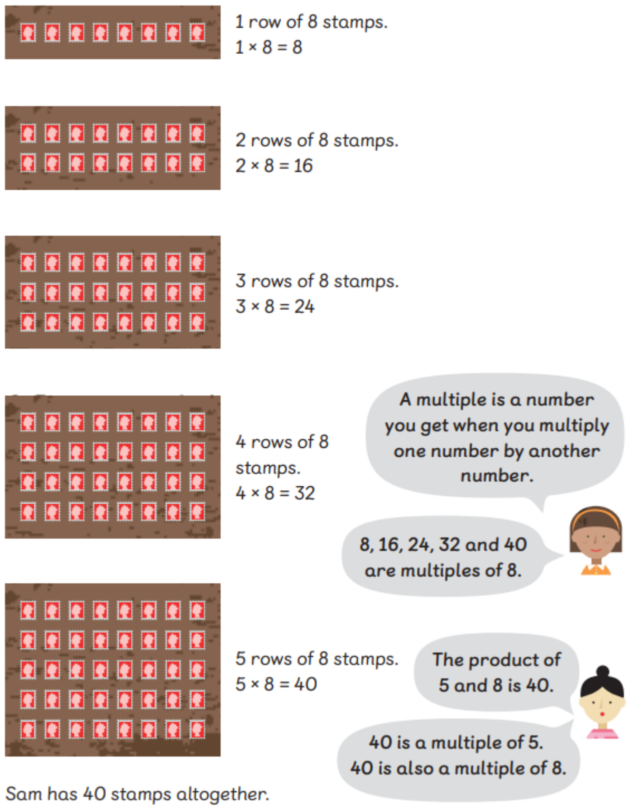
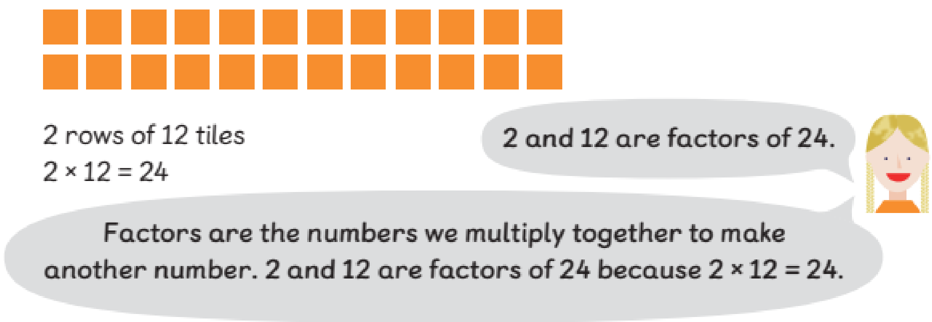
Progression in Subtraction —Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Formal written Method		Place–value counters are used to represent the formal written method. The procedure to subtract using numbers up to 6-digits using the formal written method remains the same as when it was first introduced. Pupils begin at the least value place and work to the left through the places to find the difference. Renaming takes place when a calculation in a place cannot be done. Again, this procedure is the same as when this was first learned and requires the renaming of the minuend. The renaming of the minuend is also represented using a number bond, providing the foundation for mental methods that require renaming
5	Check using estimation and addition		Pupils are encouraged to check the reasonableness of their answers by initially finding an estimated difference. When using estimation to check, pupils initially round to the nearest thousand before calculation. When using addition to check the difference, pupils add the difference and the subtrahend to check it is equal to the minuend

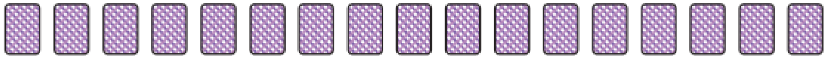
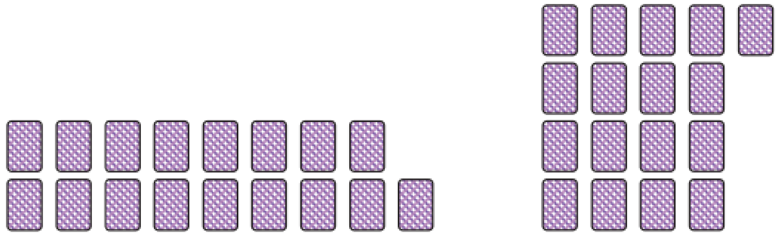
Progression in Subtraction —Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Subtracting fractions		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.
5	Subtracting decimals using a formal written method		The same procedure for subtracting decimals using a formal written method is the same as when subtracting whole numbers but attention needs to be given to the decimal point. The decimal point does not represent a place but separates the whole from the fractional part of a number. Careful alignment is needed when subtracting decimal numbers using a formal written method.
5	Subtracting fractions using equivalence		Pupils use their understanding of equivalence to subtract a decimal from a whole number. For example, when calculating 4 – 0.6 we can rename 4 as 40 tenths, so the calculation becomes 40 tenths – 6 tenths. Once the nouns are the same, the subtraction can be carried out. 40 tenths – 6 tenths = 34 tenths = 3.4

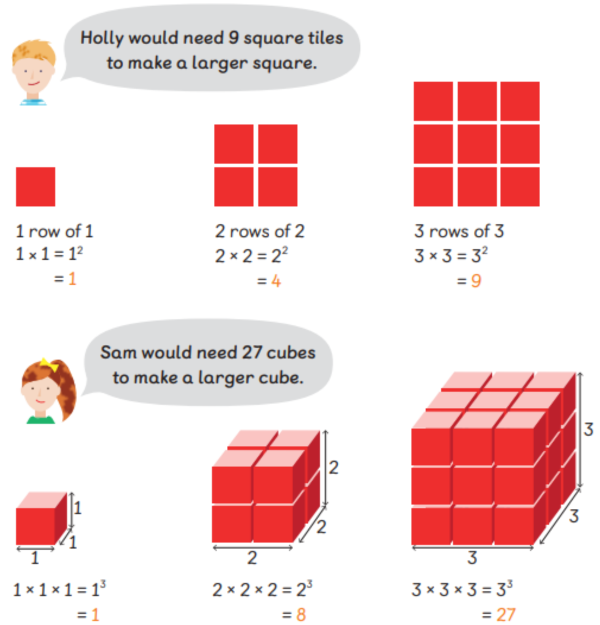
Progression in Multiplication —Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Multiples		Finding multiples is initially related to skip counting. Pupils develop an understanding that counting in 2s produces a series of multiples that are also a product when 2 is a factor. They develop an understanding that the product is the multiple of two numbers.
5	Finding factors		Pupils have already been working with factors for a significant amount of time but the term ‘factors’ is introduced in Year 5. The structure for introducing factors uses rectangular arrangements and identifies the number of rows and number of items in each row. Pupils’ understanding of factors is further developed when looking at common factors. They learn that different numbers can share some of the same factors. Pupils may go on to generalise about common factors. For example, all integers that end in 0 or 5 have 5 as a common factor.

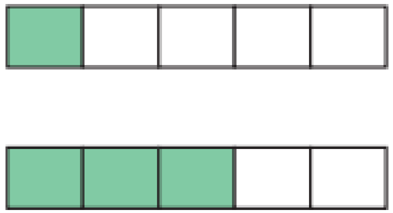
Progression in Multiplication—Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Prime numbers	 This is a rectangle.  These are not rectangles. There is only one way to arrange 17 cards. $17 = 1 \times 17$ 17 only has two factors, 1 and itself. 17 is a prime number.	Following on from finding factors, pupils use rectangular arrangements to identify a pattern presented by prime numbers. Pupils find that prime numbers can only be arranged in a single rectangular pattern. This leads them to see that certain numbers only have two factors. These numbers, integers greater than 1, are called prime numbers
5	Composite numbers	 $6 = 1 \times 6$ $6 = 2 \times 3$  $8 = 1 \times 8$ $8 = 2 \times 4$  $10 = 1 \times 10$ $10 = 2 \times 5$ 2 is the only even prime number. All other multiples of 2 have more than two factors.	Once pupils have a sound understanding of multiples, factors and prime numbers, the term ‘composite numbers’ is used to describe integers, greater than 1, that have more than two factors.

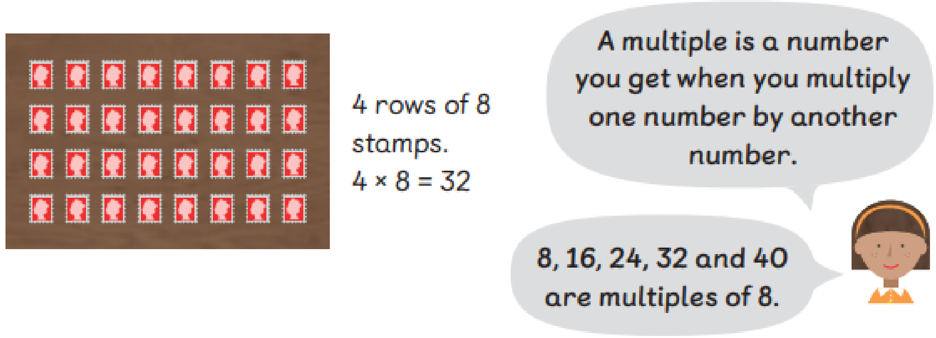
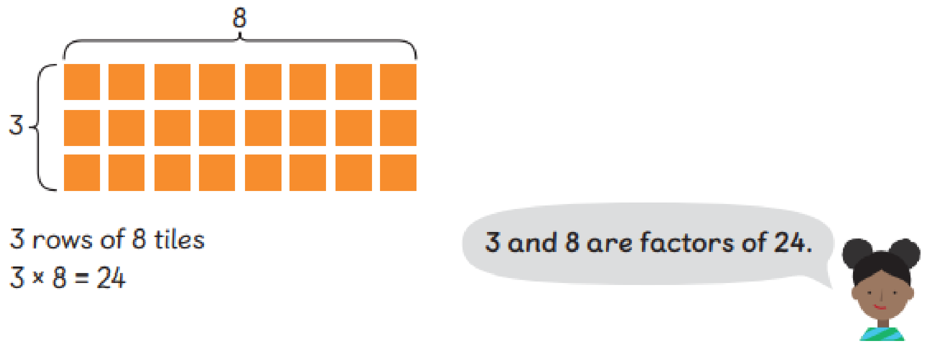
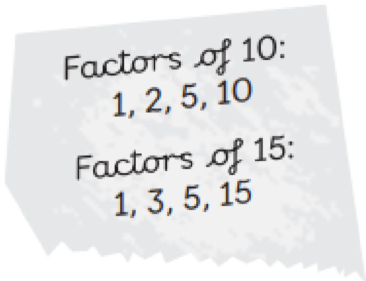
Progression in Multiplication —Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Square and cube numbers		Pupils are introduced to both square and cube numbers by the physical representation described by their names. These representations lead to abstraction, with pupils understanding that square numbers are the product of a number multiplied by itself and a cube number is the product made by multiplying a number twice by itself.
5	Multiplying by 10, 100 and 1000	5 × 1000 = $\boxed{}$ 5 × 1 thousand = 5 thousands 5 × 1000 = 5000	Pupils build on their understanding of multiplication by factors of 10. They see that when a factor is made 10 times greater, the product is 10 times greater. Pupils use their knowledge of times tables to underpin multiplying by 10, 100 and 1000, so 5 × 1000 is equal to 5 × 1 thousand = 5 thousands or 5000. This follows a pattern that has been introduced in previous years.
5	Formal written method	Multiply 253 by 17. $\begin{array}{rr} & 253 \\ \times & 17 \\ \hline & 1771 \\ + & 2530 \\ \hline & 4301 \\ \hline \end{array}$  $\begin{array}{rr} & {}^{3}2\,{}^{2}5\,3 \\ \times & 7 \\ \hline & 1771 \\ \hline \end{array}$	Pupils use formal written methods, short and long, to multiply a 3-digit number by a 1-digit number; then move on to multiply a 4-digit number by a 1-digit number. Initially the long method is used, showing the product as a result of multiplying each place. Pupils then progress to the short formal written method making a link between the two procedures. Next, pupils learn to multiply a 2-digit number by a 2-digit number, then a 3-digit number by a 2-digit number. Links are made to the formal written procedure that they know. Pupils work systematically through the procedure progressing from multiplying by ones to multiplying by tens and ones.

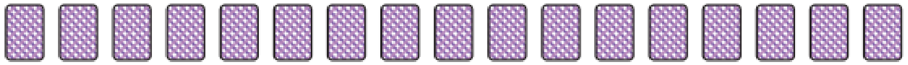
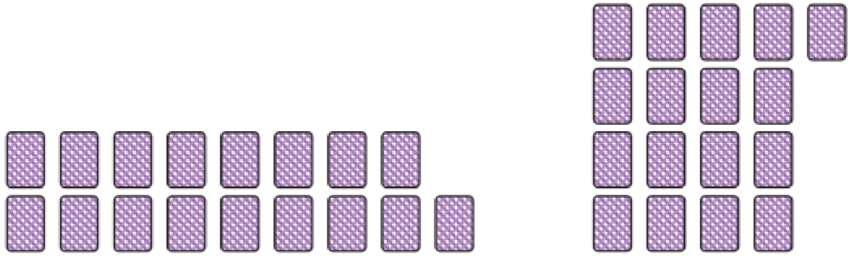
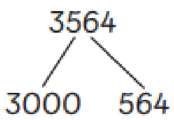
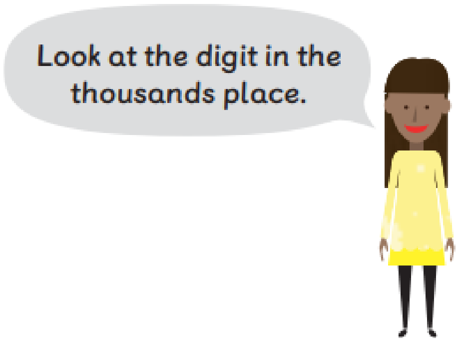
Progression in Multiplication —Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Multiplying fractions	$\frac{1}{5}$ $3 \times \frac{1}{5} = \frac{3}{5}$ 	Multiplying a fraction by a whole number is underpinned by the early idea of adding equal groups. Pupils understand that we need to add and multiply items that have the same noun. We read 1 5 × 3 as 1 fifth × 3 = 3 fifths, in the same was we would read 1 kg × 3 = 3 kg. Bar models are used as pictorial support to show the multiplication of fractions with the same denominator. Pupils progress to multiplying mixed numbers by whole numbers. The approach remains the same but uses partitioning, so pupils multiply the fraction and whole number separately and add the products.

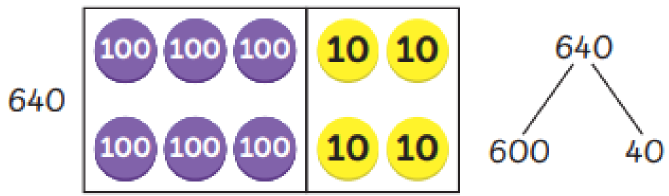
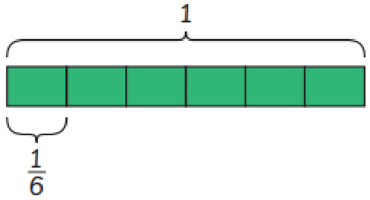
Progression in Division —Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Finding multiples		Pupils use arrays to recognise multiples as the total number once a number is multiplied by another number. Skip counting is related to multiples as it is shown on a number line. Pupils also look for patterns when identifying multiples on number squares
5	Finding factors		The same rectangular arrangement that was used to find multiples is used to identify factors. The pictorial representation leads to an understanding that factors are the numbers we multiply to produce a product.
5	Finding common factors		Pupils learn that when multiple numbers share the same factors, we can describe those factors as common factors. Pupils will begin to generalise about common factors. For example, all whole numbers ending in zero will have 5 as a multiple.

Progression in Division—Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Prime numbers and composite numbers	 This is a rectangle.  These are not rectangles. There is only one way to arrange 17 cards. $17 = 1 \times 17$ 17 only has two factors, 1 and itself. 17 is a prime number.	Pupils use their understanding of rectangular arrays to look for prime numbers. They learn that any number that can only be made into a single rectangular array is a prime number. In describing this array, they make the connection that prime numbers only ever have two factors, itself and 1. They also learn that numbers with two or more factors can be described as composite numbers
5	Dividing by 10, 100 and 1000	How many groups of 1000 can we make from 3564?   	Place–value counters and numbers bonds are initially used to represent division problems involving dividing by 10, 100 and 1000. Pupils use their understanding of place value to support the division calculations. For example, 35 hundreds ÷ 1 hundred = 35.

Progression in Division —Year 5

Year Group	Topic/Strand	Representation	Key Idea
5	Dividing without remainders		Pupils use place–value counters and number bond diagrams to support their understanding of the long formal written method for division. Pupils are shown how numbers can be partitioned into known multiples before carrying out the division.
5	Dividing with remain-ders	$\begin{array}{rrrrl} & & 7 & 8 & \text{remainder } 1 \\ 6 \enclose{longdiv}{} & 4 & 6 & 9 & \\ - & 4 & 2 & 0 & \rightarrow 420 \div 6 = 70 \\ & & 4 & 9 & \\ & & 4 & 8 & \rightarrow 48 \div 6 = 8 \\ & & & 1 & \end{array}$  $1 \div 6 = \frac{1}{6}$ $469 \div 6 = 78\frac{1}{6}$	The same procedure used for dividing without a remainder is used for dividing with a remainder but once pupils have made the maximum possible number of equal groups, they have a quantity remaining that is less than the equal group size. This is the remainder. Initially, the remainder is shown as a whole number. This progresses to showing the remainder as a fraction. This progression is supported pictorially with a bar model. Pupils should also start to become aware that the representation of the remainder will be determined by the context of the problem.