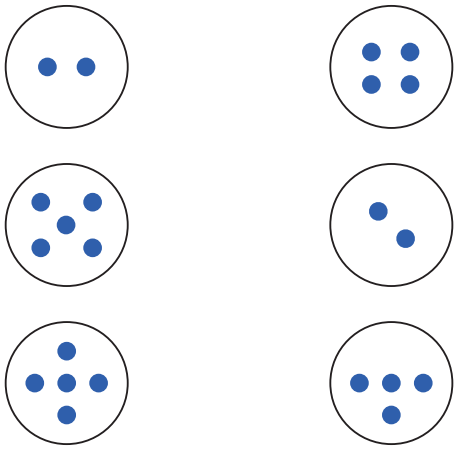
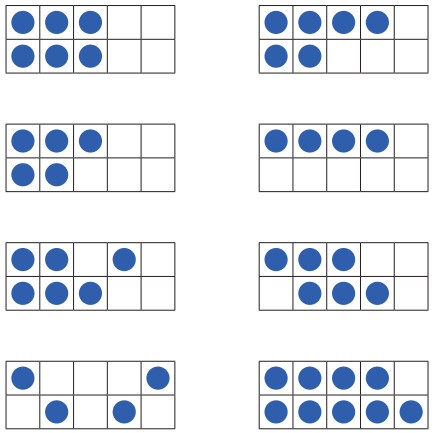
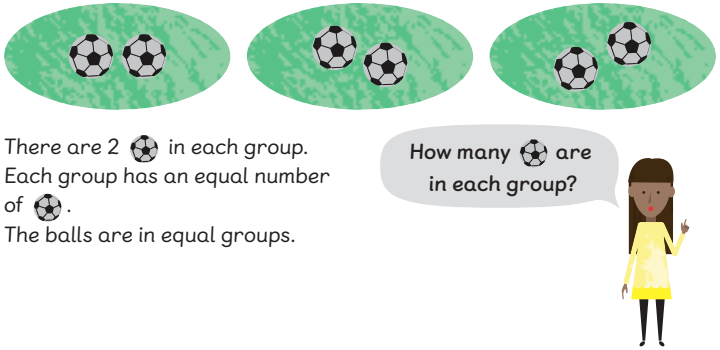
Multiplication Calculation Policy

Reception

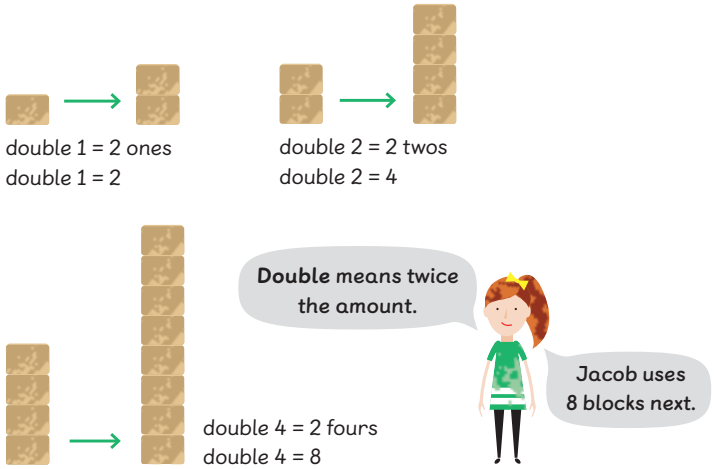
Year	Topic/Strand	Representation	Key Idea
Reception	**Equal Groups**		Pupils learn to recognise groups that are equal in quantity, initially using like items and then progressing to different items. Pupils understand that equal groups can be represented by concrete items, diagrams and written numbers. Pupils need to be secure in the abstraction principle of counting the quantity of items, regardless of the properties or characteristics of the items, in order to recognise equal groups in a range of situations.
Reception	**Addition**		Addition and equal groups are concepts that underpin multiplication. During Reception, pupils make equal groups and use equal groups when doubling numbers.

Multiplication Calculation Policy

Year 1

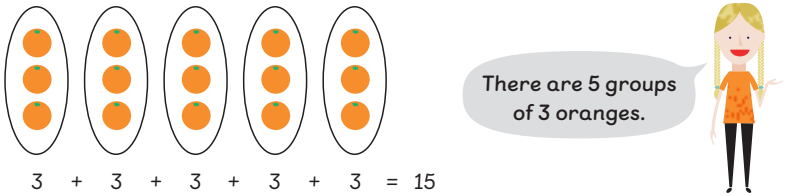
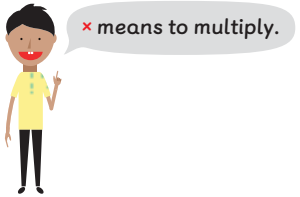
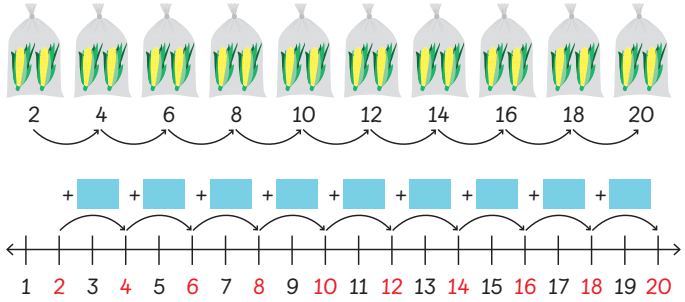
Year	Topic/Strand	Representation	Key Idea
Year 1	**Equal Groups**		Pupils learn to recognise groups that are equal in quantity, initially using like items and then progressing to different items. Pupils understand that equal groups can be represented by concrete items, diagrams and written numbers. Pupils need to be secure in the abstraction principle of counting the quantity of items, regardless of the properties or characteristics of the items, in order to recognise equal groups in a range of situations.
Year 1	**Repeated Addition**		Initially, multiplication is shown as the addition of equal groups. The key idea of adding like nouns still applies in multiplication. A group of 3 bananas and 3 apples does not result in 6 bananas or 6 apples. In order to add, the nouns must be the same, in this case 6 pieces of fruit. This is also true of multiplication: 2 groups of 3 pieces of fruit makes 6 pieces of fruit.

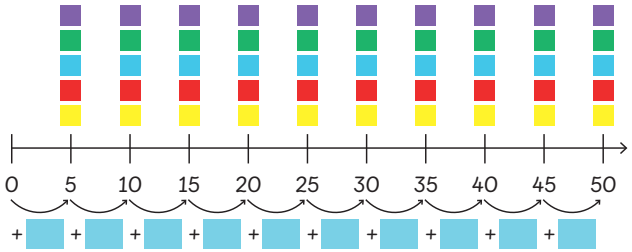
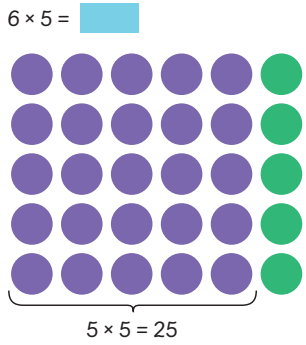
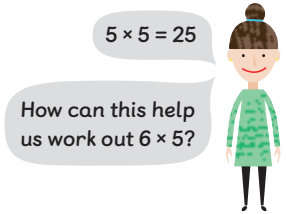
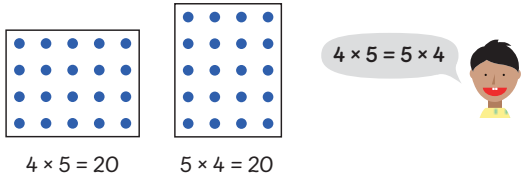
Year	Topic/Strand	Representation	Key Idea
Year 1	**Counting in 2s, 5s and 10s**	There are 3 groups of 2  .  2 2 2 3 groups of 2 = 6 3 twos = 6 There are 6  . 	Pupils start to count in multiples of 2 and multiples of 10, then progress to counting in multiples of 2, 5 and 10 supported by discrete, countable representations.
Year 1	**Arrays**	 3 rows of 5 3 fives = 15 There are 15 children altogether. 1 row of 5 = 5 2 rows of 5 = 10 3 rows of 5 =  	Multiplication is represented by arrays, beginning with making equal rows and further developing the language associated with arrays. For example: 'There are 3 rows of 5. There are 15 altogether.'

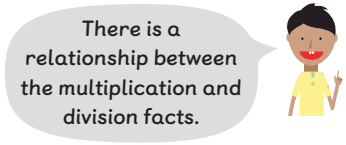
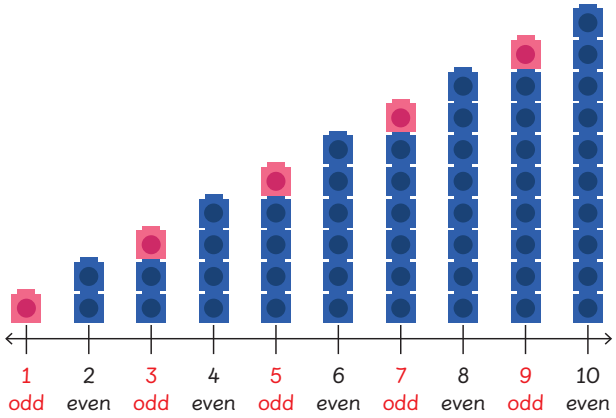
Year	Topic/Strand	Representation	Key Idea
Year 1	Doubles		The diagrams used to support learning how to double numbers, not only show equal groups of 2 being added each time, but also show the pattern scaling up and each 'tower' being twice the height of the tower just before it. Pupils can develop the language associated with multiplication by describing the growing block pattern. This also provides the basis for understanding halving, in which the representation scales down.

Multiplication Calculation Policy

Year 2

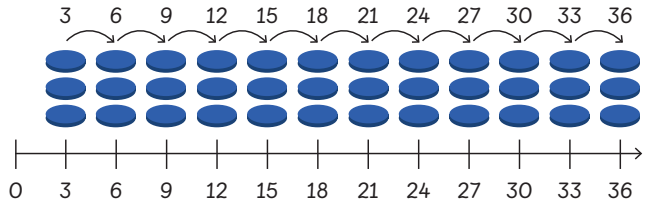
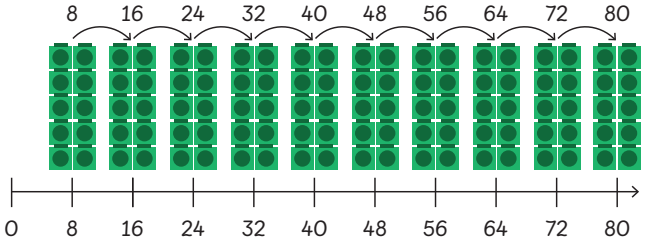
Year	Topic/Strand	Representation	Key Idea
Year 2	Equal Groups	 *There are 15 oranges in total.* 5 threes = 15 5 groups of 3 = 15 5 × 3 = 15 5 times 3 equals 15 *We read 5 × 3 = 15 as 5 times 3 equals 15.* 	Pupils learn to recognise groups that are equal in quantity, initially using like items and then progressing to different items. Pupils understand that equal groups can be represented by concrete items, diagrams and written numbers. In Year 2, the progression to multiplication from repeated addition is shown as 3 + 3 + 3 + 3 + 3 being equal to 5 groups of 3 and 5 groups of 3 being equal to 5 × 3. Pupils read 5 × 3 as 5 groups of 3.
Year 2	Counting in 2s, 5s and 10s		When a pupil knows that the size of a group is 2, 5 or 10 and the group size remains consistent, they can count in multiples of 2, 5 and 10 to find the product. Counting in multiples is supported by representation on a number line.

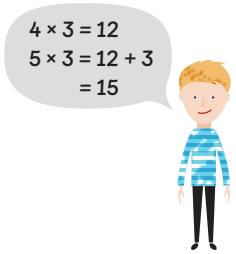
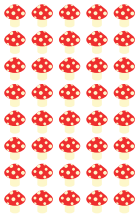
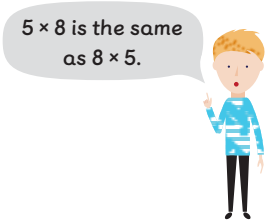
Year	Topic/Strand	Representation	Key Idea
Year 2	Number Line		Counting in multiples is shown on a number line. The increasingly abstract nature of the number line is shown as intervals change from 1 to 2, 5 and 10.
Year 2	Associated Facts	6 × 5 =   6 × 5 = 25 + 5 = 30	As pupils become more fluent and their understanding of their times tables increases, they are expected to use this knowledge to calculate associated facts. A pupil should be able to relate 10 × 5 to 9 × 5, knowing that the latter expression is 1 group of 5 less. So, 9 × 5 = 50 – 5.
Year 2	Commutativity		Pupils learn that the order of the factors in an equation does not affect the product. This is supported pictorially through the use of arrays.

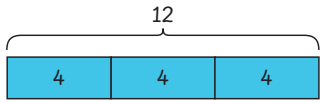
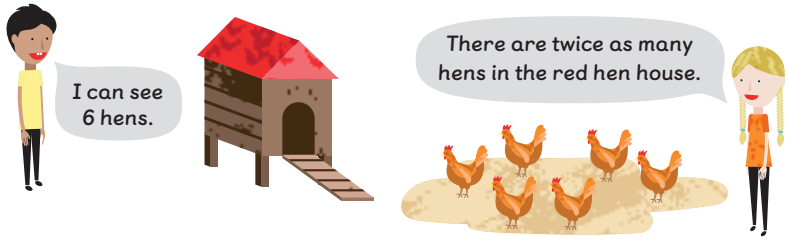
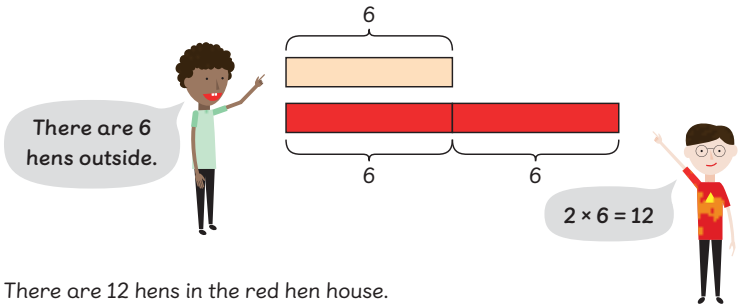
Year	Topic/Strand	Representation	Key Idea
Year 2	Fact Families	$10 \times 2 = 20$ $\quad 20 \div 2 = 10$ $2 \times 10 = 20$ $\quad 20 \div 10 = 2$ 	Pupils relate multiplication and division and see the connection between them when completing fact families. Pupils develop an understanding that factor × factor = product and product ÷ factor = factor. Once the understanding of this is secure, pupils can relate this to both multiplication and division situations.
Year 2	Odd and Even Numbers		Pupils develop an understanding that even numbers can be put into groups of 2 exactly but when odd numbers are grouped in twos, there is always 1 remaining.

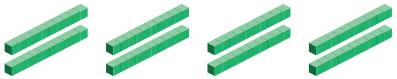
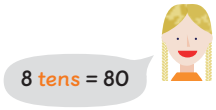
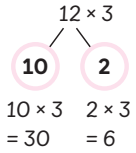
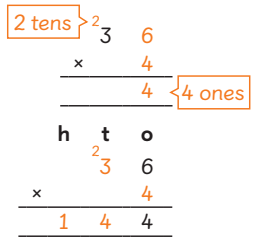
Multiplication Calculation Policy

Year 3

Year	Topic/Strand	Representation	Key Idea
Year 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.
Year 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.
Year 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.

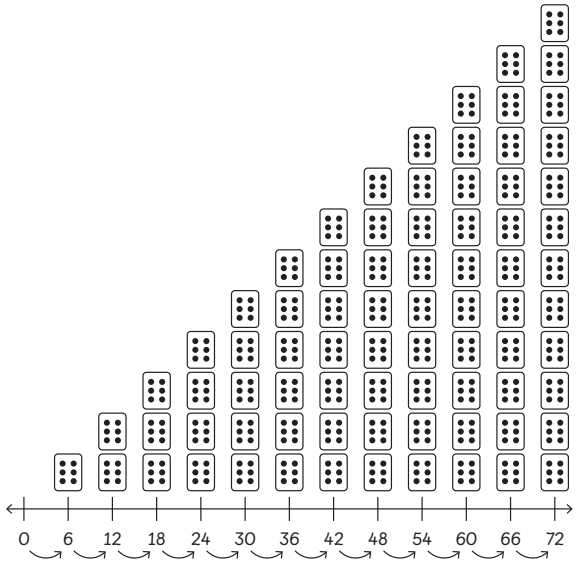
Year	Topic/Strand	Representation	Key Idea
Year 3	Associated Facts	 	Once the understanding of multiplication as the adding of equal groups is secure, this knowledge can be used to find unknown facts. For example, if a pupil knows 5 × 3 as 5 groups of 3, they can understand that 6 × 3 is simply 1 more 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.
Year 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.
Year 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.

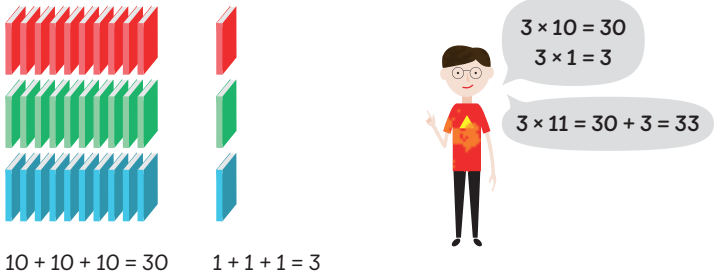
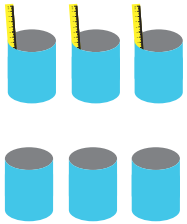
Year	Topic/Strand	Representation	Key Idea
Year 3	Fact Families	$12 \div 3 = 4$ $4 \times 3 = 12$ 	The relationship between multiplication and division is shown using fact families. The product is a result of multiplying factors and dividing the product by a factor will equal the factor used during multiplication.
Year 3	Multiplication Using Bar Models	 *How many hens are in the red hen house?*  *There are 12 hens in the red hen house.*	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.

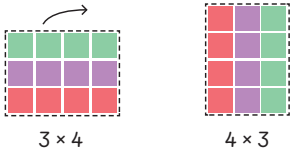
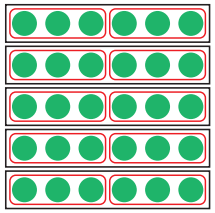
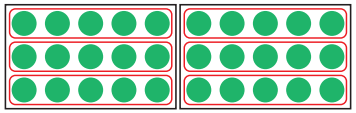
Year	Topic/Strand	Representation	Key Idea
Year 3	Base 10 Blocks	Multiply 2 tens by 4.  4 × 2 tens = 8 tens 4 × 20 = 80  	Base 10 blocks are used to support the understanding of multiplication of 2-digit numbers. Language and understanding is developed through the representation of 3 × 20 as 3 × 2 tens = 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.
Year 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.
Year 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 place in the multiplication.

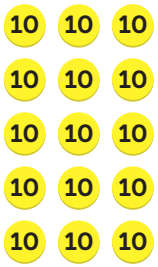
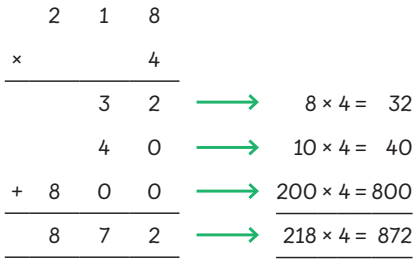
Multiplication Calculation Policy

Year 4

Year	Topic/Strand	Representation	Key Idea
Year 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.
Year 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.
Year 4	**Number Line**	 0 6 12 18 24 30 36 42 48 54 60 66 72	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.

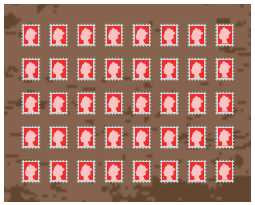
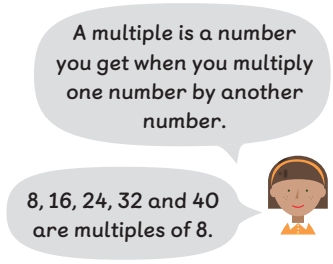
Year	Topic/Strand	Representation	Key Idea
Year 4	Multiplying by 11 and 12 Using Associated Facts	 10 + 10 + 10 = 30 1 + 1 + 1 = 3	Learning to multiply by 11 and 12 is supported by partitioning 11 and 12 and using the 10 times table as the basis for initial understanding, building towards immediate recall.
Year 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.
Year 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.

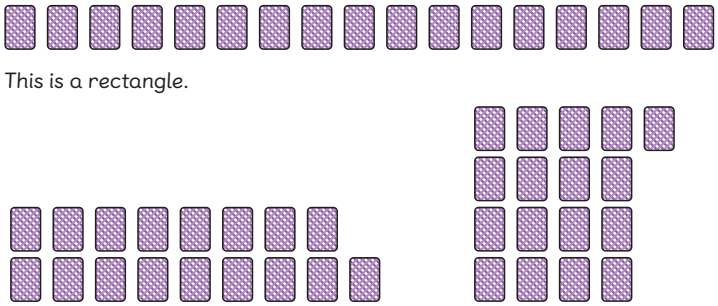
Year	Topic/Strand	Representation	Key Idea
Year 4	Commutativity	 3 × 4 = 4 × 3 3 × 4 is equal to 4 × 3. 5 × 2 × 3 = ☐  2 × 3 × 5 = ☐ 	Arrays are used to support the understanding of commutativity. Pupils learn the pattern of a × b = b × a. Regardless of the order in which the factors are multiplied, the 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.

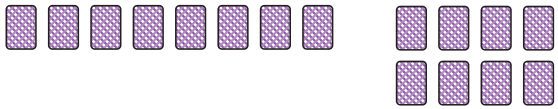
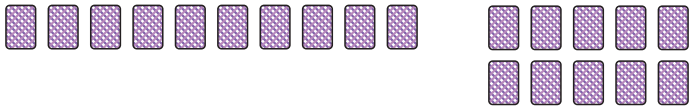
Year	Topic/Strand	Representation	Key Idea
Year 4	**Multiplying Multiples of 10**	30 is equal to 3 tens. 5 × 3 = 15 5 × 3 tens = 15 tens = 150  5 × 30 = 150	Pupils learn to scale a product by a factor of 10 when multiplying a multiple of 10. For example, we know 3 × 4 = 12, therefore the product of 30 × 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.
Year 4	**Formal Written Method**	 	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.

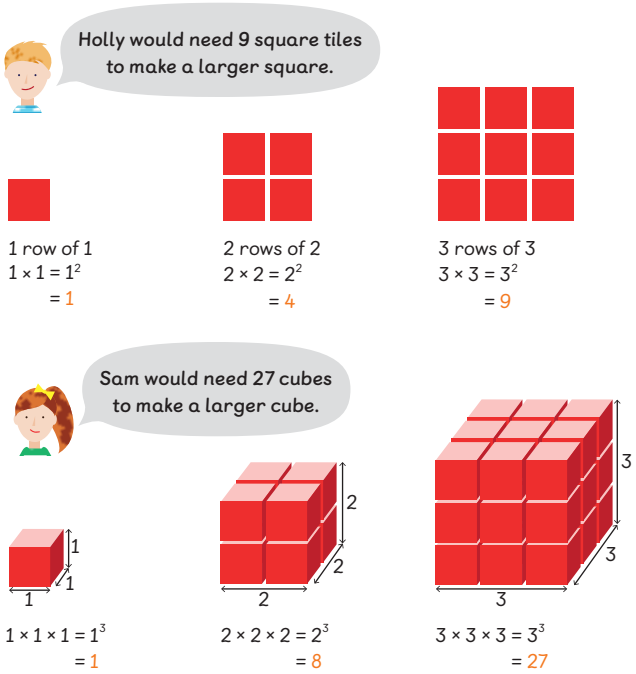
Multiplication Calculation Policy

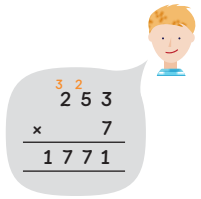
Year 5

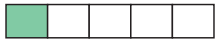
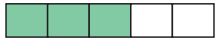
Year	Topic/Strand	Representation	Key Idea
Year 5	Multiples	 1 row of 8 stamps. 1 × 8 = 8  2 rows of 8 stamps. 2 × 8 = 16  3 rows of 8 stamps. 3 × 8 = 24  4 rows of 8 stamps. 4 × 8 = 32  5 rows of 8 stamps. 5 × 8 = 40 *Sam has 40 stamps altogether.* 	Finding multiples is initially related to skip counting. 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.

Year	Topic/Strand	Representation	Key Idea
Year 5	**Finding Factors**	 2 rows of 12 tiles 2 × 12 = 24 **2 and 12 are factors of 24.** **Factors are the numbers we multiply together to make another number. 2 and 12 are factors of 24 because 2 × 12 = 24.**	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.
Year 5	**Prime Numbers**	 *This is a rectangle.* *These are not rectangles.* *There is only one way to arrange 17 cards.* 17 = 1 × 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.

Year	Topic/Strand	Representation	Key Idea
Year 5	**Composite Numbers**	 6 = 1 × 6 6 = 2 × 3  8 = 1 × 8 8 = 2 × 4  10 = 1 × 10 10 = 2 × 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.

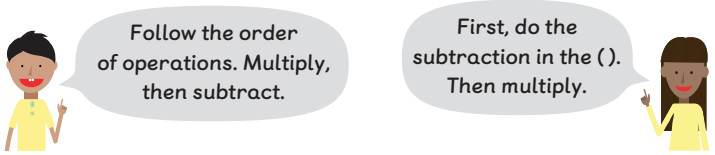
Year	Topic/Strand	Representation	Key Idea
Year 5	Square and Cube Numbers		Pupils are introduced to both square and cube numbers by the physical representation described by their names. These representations lead to abstraction, with pupils understanding that square numbers are the product of a number multiplied by itself and a cube number is the product made by multiplying a number twice by itself.
Year 5	Multiplying by 10, 100 and 1000	5 × 1000 = ▭ 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.

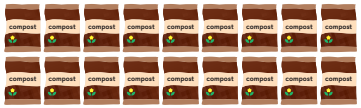
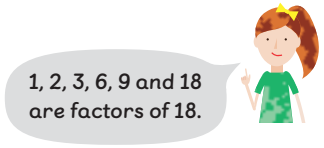
Year	Topic/Strand	Representation	Key Idea
Year 5	**Formal Written Method**	Multiply 253 by 17. 253 × 17 1771 + 2530 4301 	Pupils use formal written methods, short and long, to multiply a 3-digit number by a 1-digit number; then move on to multiply a 4-digit number by a 1-digit number. Initially the long 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.

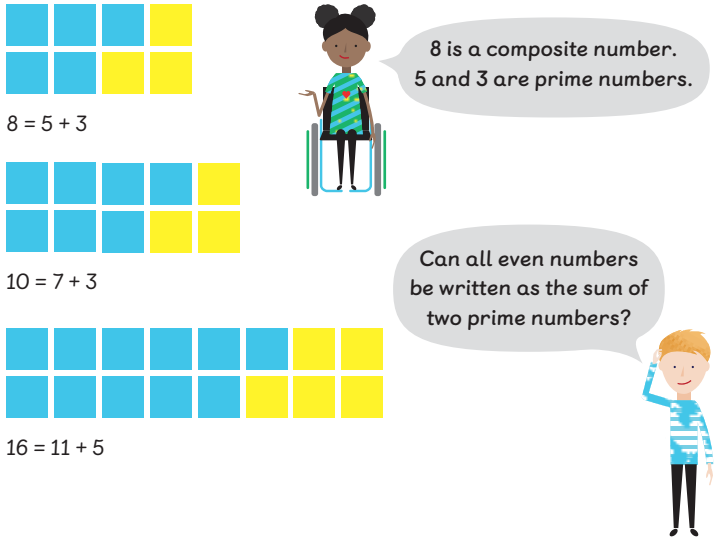
Year	Topic/Strand	Representation	Key Idea
Year 5	**Multiplying Fractions**	$\frac{1}{5}$  $3 \times \frac{1}{5} = \frac{3}{5}$ 	Multiplying a fraction by a whole number is underpinned by the early idea of adding equal groups. Pupils understand that we need to add and multiply items that have the same noun. We read $\frac{1}{5} \times 3$ 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.

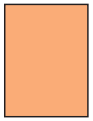
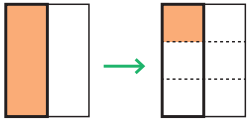
Multiplication Calculation Policy

Year 6

Year	Topic/Strand	Representation	Key Idea
Year 6	Order of Operations	First, carry out all the operations in ( ). Next, perform all the multiplication and division. Then, calculate all the addition and subtraction. $15 - 4 \times 3 = 15 - 12 = 3$ $(15 - 4) \times 3 = 11 \times 3 = 33$ 	Pupils use the multiplication skills they have learned in previous years within expressions and equations that use multiple operations. Pupils learn to multiply within brackets first, then left to right in expressions and equations that use multiplication. The procedures to multiply remain the same throughout.
Year 6	Multiplying by 2-Digit Numbers	£1229 × 28 = ☐ $\begin{array}{rrrrrl} & {\scriptstyle 1}1 & {\scriptstyle 2}2 & {\scriptstyle 1}2 & 9 & \\ \times & & & 2 & 8 & \\ \hline & 9 & 8 & 3 & 2 & \rightarrow 1229 \times 8 = 9832 \\ + & 2 & 4 & 5 & 8 & 0 \rightarrow 1229 \times 20 = 24\,580 \\ \hline & 3 & 4 & 4 & 1 & 2 \rightarrow 1229 \times 28 = 34\,412 \end{array}$	Pupils revisit the formal written method, multiplying up to 4-digit numbers by 2-digit numbers.

Year	Topic/Strand	Representation	Key Idea
Year 6	Common Factors	 1 row of 18 bags 1 × 18 = 18  2 rows of 9 bags 2 × 9 = 18  3 rows of 6 bags 3 × 6 = 18 	Prior learning is expanded on by finding common factors within more challenging word problems. Pupils are encouraged to partition larger numbers into known multiples to determine if the given number is a factor.
Year 6	Common Multiples	**Multiples of 4**: 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48 **Multiples of 6**: 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72 **Multiples of 8**: 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96 24 and 48 are common multiples of 4, 6 and 8.	Pupils are introduced to common multiples with the understanding that they are a multiple of 2 or more numbers.

Year	Topic/Strand	Representation	Key Idea
Year 6	Prime Numbers		Pupils' understanding of prime numbers is expanded through the use of Goldbach's conjecture, that all even numbers greater than 2 can be expressed as the sum of two prime numbers.

Year	Topic/Strand	Representation	Key Idea
Year 6	**Multiplying Fractions**	$\frac{1}{3} \times \frac{1}{2}$ l =   = 1 l of juice  $\frac{1}{2}$ l $\frac{1}{3} \times \frac{1}{2}$ l $\frac{1}{3}$ of $\frac{1}{2}$ l is $\frac{1}{6}$ l.	Pupils learn to multiply proper fractions by proper fractions. They read fractions to support multiplication, so $\frac{1}{3} \times \frac{1}{5}$ is read as 'What is $\frac{1}{3}$ of $\frac{1}{5}$?' Bar models are used to represent these problems pictorially. Pupils progress to realise that the numerators can be multiplied and the denominators can be multiplied, but before this procedure can be embedded, pupils must have a deep understanding of what the equation means.
Year 6	**Multiplying Decimals**	$^{1}7 . ^{1}2\ 3$ $\times \quad 6$ $4\ 3 . 3\ 8$	Pupils use the same formal written method procedure as they have previously. Pupils need to pay special attention to the places of the digits in the multiplication. It is important that they do not see the decimal point as a place but rather as a symbol used to separate the whole parts from the decimal parts of a mixed number.