

Stages in Multiplication

Multiplication – Early Stages (EYFS)

Children will engage in a wide variety of songs and rhymes, games and activities. In practical activities and through discussion they will begin to solve problems involving doubling.



'Three strawberries for you and three strawberries for me. How many strawberries altogether?'

Multiplication – Year One

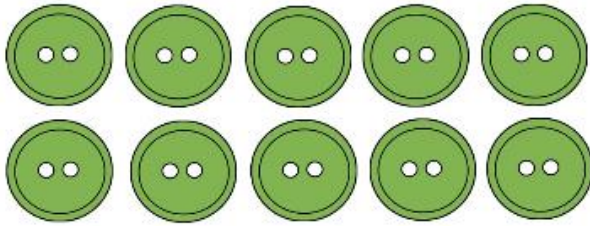
- Solve one-step problems involving multiplication by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.
- Count in multiples of twos, fives and tens (to the 10th multiple)

Children will count repeated groups of the same size in practical contexts. They will use the vocabulary associated with multiplication in practical contexts. They will solve **practical problems** that involve combining groups of 2, 5 or 10. e.g. socks, fingers and cubes.

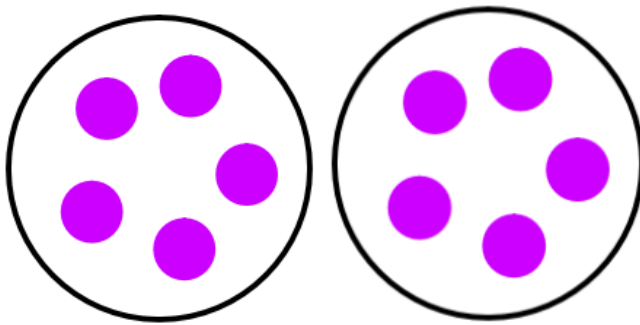


'Six pairs of socks.
How many socks altogether? 2, 4, 6, 8, 10, 12'

Use arrays to support early multiplication



'Five groups of two buttons. How many buttons altogether? 2, 4, 6, 8, 10'
Two groups of five buttons. How many buttons altogether? 5, 10'



'2 groups of 5'

'How many altogether?'

'5 + 5 = 10'

Double five is ten

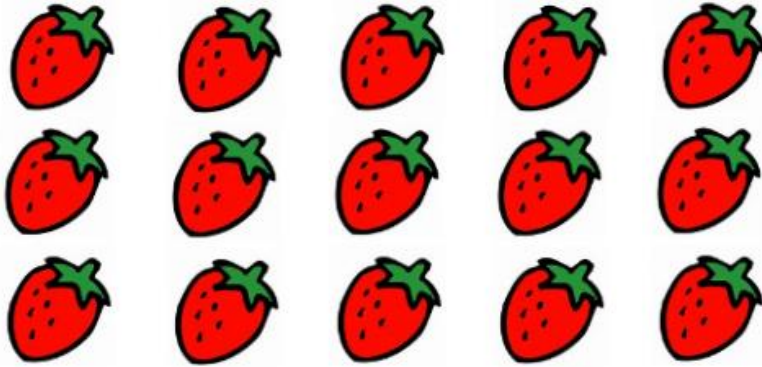
Continue to solve problems **in practical contexts** and develop the language of early multiplication, with appropriate resources, throughout Y1.

Multiplication - Year Two

- **Recall and use multiplication facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.**
- **Calculate mathematical statements for multiplication within the multiplication tables and write them using the multiplication (×) and equals (=) signs**
- **solve problems involving multiplication, using materials, arrays, repeated addition, mental methods, and multiplication facts, including problems in contexts**
- **show that multiplication is commutative (two numbers can be multiplied in any order).**

Statutory mental calculation expectations:

Recall and use multiplication facts for 2, 5 and 10 multiplication tables, including recognising odd and even numbers.

Combining Groups (repeated addition):

'5 groups of 3' '5 lots of 3' ' $3 + 3 + 3 + 3 + 3 = 15$ '

'5 times 3' '3 multiplied by 5' ' $5 \times 3 = 15$ ' ' $3 \times 5 = 15$ '

Using arrays to support multiplication:

$$4 \times 5 = 20$$

' $5 + 5 + 5 + 5 = 20$ '

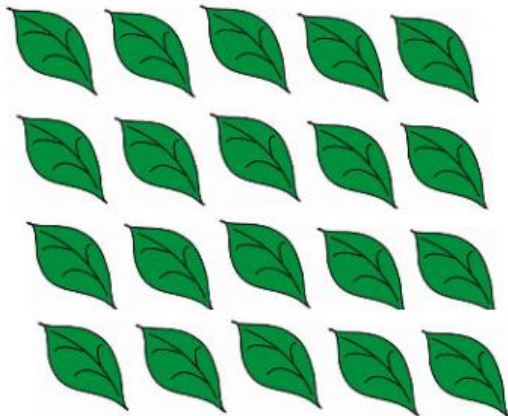
'4 rows of 5'

'4 groups of 5'

'5 groups of 4'

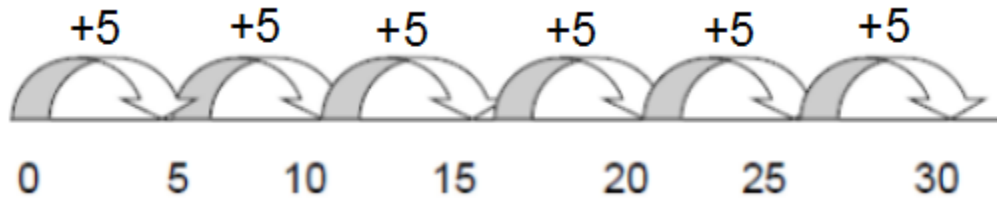
' $5 \times 4 = 20$ '

' $4 \times 5 = 20$ '



Using an empty number line:

$$6 \times 5 = 30$$



Make the link to repeated addition.

Mathematical vocabulary for multiplication KS1

Lots of	Groups of	Times	Multiply	Multiply by
Multiple of	Once	Twice	Three times	Four times
Five times	Ten times	Times as big	Times as long	Times as wide
Repeated addition	Array	Row	Column	Double

Multiplication – Year Three

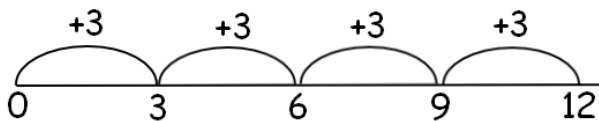
- Recall and use multiplication facts for the 3, 4 and 8 multiplication tables (continue to practise the 2, 5 and 10 multiplication tables)
- Write and calculate mathematical statements for multiplication using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to a formal written method.

Statutory mental calculation expectations:

Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.

Ensure the children are confident with the methods outlined in the previous year's guidance before moving on.
Continue to use number lines and arrays.

$$4 \times 3 = 12$$



Partitioning method for multiplication of a teen number by a one-digit number:

$$14 \times 3 = 42 \text{ (Partition 14 into } 10 + 4\text{)}$$

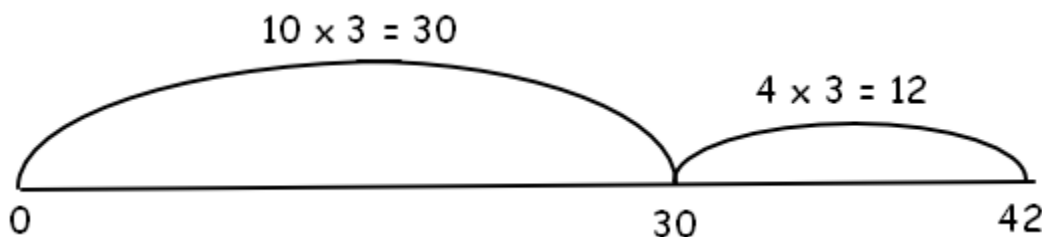
$$10 \times 3 = 30$$

$$4 \times 3 = 12$$

$$30 + 12 = 42$$

Demonstrate the partitioning method **using a number line**:

$$14 \times 3 = 42$$



Incorporate land-marking into your number line work so that jumps are relevant to the size of jump.

Grid method (teen number multiplied by a one-digit number):

$14 \times 8 = 112$

X	10	4
8	80	32

$80 + 32 = 112$

Partition 14 into $10 + 4$ then multiply each number by 8. Add the partial products (80 and 32) together.

This will lead into **expanded short multiplication:**

$14 \times 8 = 112$

	1	4			
x		8			
	3	2	(8 × 4)		
	8	0	(8 × 10)		
	1	1	2		

Model the same calculation using a number line, if necessary, to ensure understanding.

Formal short multiplication:

	1	4	
x		8	
	1	1	2
	3		

Ensure that the digit 'carried over' is written under the line in the correct column.
Use the language of place value to ensure understanding.

Continue to develop the formal written method of multiplication throughout year three using teen-numbers multiplied by a one-digit number.

If children are confident, progress to multiplying other two-digit numbers by a one digit number (Yr 4 guidance).

If, at any time, children are making significant errors, return to the previous stage in calculation.

Multiplication – Year Four

Recall multiplication facts for multiplication tables up to 12×12 .

Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.

**Statutory mental calculation expectations:
Recall multiplication and division facts for
multiplication tables up to 12×12**

Ensure children are confident with the methods outlined in the previous year's guidance before moving on.

Continue to use empty number lines as appropriate (yr 3).

Further develop the grid method for two-digit numbers multiplied by a one-digit number.

$$48 \times 4 = 192$$

X	40	8
4	160	32

$$160 + 32 = 192 \text{ (add the partial products)}$$

Expanded short multiplication (two-digit number by a one-digit number):

$$48 \times 4 = 192$$

		4	8				
		x		4			
			3	2	(4 × 8)		
	+	1	6	0	(4 × 40)		
		1	9	2			

This leads to **short multiplication (formal method)** of a two-digit number multiplied by a one-digit number:

$$48 \times 4 = 192$$

		4	8
		x	
			4
		1	9
		2	
		3	

Use the language of place value to ensure understanding. Ensure that the digit 'carried over' is written under the line in the correct column.

Continue to practise the formal method of short multiplication of a two-digit number by a one-digit number throughout Y4. If the children are confident, continue to develop short multiplication with three-digit numbers multiplied by a one-digit number.

If **necessary**, return to the grid method and/or expanded method first:

$$132 \times 7 = 924$$

X	100	30	2
7	700	210	14

$$700 + 210 + 14 = 924 \text{ (add the partial products)}$$

This leads to **expanded short multiplication**:

	1	3	2				
x			7				
		1	4	(7 × 2)			
	2	1	0	(7 × 30)			
	7	0	0	(7 × 100)			
	9	2	4				

This will lead into **short multiplication (formal method)**:

	1	3	2
x			7
	9	2	4
	2	1	

Use the language of place value to ensure understanding. Ensure that the digit 'carried over' is written under the line in the correct column.

Aim of year 4: to leave using the formal method for short multiplication (TU x U and HTU x U) confidently.

However, if at any time, children are making significant errors, return to the previous stage in calculation.

Multiplication – Year Five

Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.

**Statutory mental calculation expectations:
Multiply and divide numbers mentally
drawing upon known facts.**

Build on the work covered in Y4 with the **formal method of short multiplication** (two-digit number multiplied by a one-digit number).

When children are confident introduce multiplication by a two-digit number.

If necessary, return to the grid method and/or expanded method first.

Grid method (two-digit number multiplied by a teen-number):

$$24 \times 15 = 360$$

X	20	4
10	200	40
5	100	20

	2	4	0
+	1	2	0
<hr/>			
	3	6	0

Add the partial products $(200 + 40) + (100 + 20) = 360$

Children are encouraged to estimate by rounding before calculating.

Expanded long multiplication (two-digit numbers multiplied by a teen-number):

$$24 \times 15 = 360$$

	2	4		
x	1	5		
<hr/>				
	2	0	(5 × 4)	
1	0	0	(5 × 2 0)	
	4	0	(1 0 × 4)	
2	0	0	(1 0 × 2 0)	
<hr/>				
	3	6	0	

	2	4	
x	1	5	
<hr/>			
	2	0	
1	0	0	
	4	0	
2	0	0	
<hr/>			
	3	6	0

When teaching, ensure that the children understand where each number comes from by discussing the prompts in brackets. However, it is not necessary for the children to write this in their books if they are not needed.

This leads into the **Compact long multiplication (formal method)**:

$$24 \times 15 = 360$$

	2	4		
x	1	5		
<hr/>				
1	2	0	(5 × 2 4)	
2	4	0	(1 0 × 2 4)	
<hr/>				
	3	6	0	

	2	4	
x	1	5	
<hr/>			
1	2	0	
2	4	0	
<hr/>			
	3	6	0

Use the language of place value to ensure understanding.

Extend to larger two-digit numbers: return to the grid method if necessary to begin

$$36 \times 27 = 972$$

x	30	6	
20	600	120	720
7	210	42	252
			972

Add the partial products $(600 + 120) + (210 + 42) = 972$

Expanded long multiplication (two-digit numbers multiplied by two-digit numbers):

$$36 \times 27 = 972$$

		3	6				
x	2	7					
		4	2	(7 × 6)			
	2	1	0	(7 × 3 0)			
	1	2	0	(2 0 × 6)			
	6	0	0	(2 0 × 3 0)			
	9	7	2				

		3	6				
x	2	7					
		4	2				
	2	1	0				
	1	2	0				
	6	0	0				
	9	7	2				

This expanded method is linked to the grid method.

This leads into the **Compact long multiplication (formal method)**:

$$36 \times 27 = 972$$

		3	6				
x	2	7					
	2	5	2	(7 × 3 6)			
	7	2	0	(2 0 × 3 6)			
	9	7	2				

		3	6				
x	2	7					
	2	5	2				
	7	2	0				
	9	7	2				

Use the language of place value to ensure understanding. In this example, there are digits that have been 'carried' over in the partial products. Add the partial products.

When children are confident with long multiplication extend with three-digit numbers multiplied by a two-digit number. *Return to the grid method if necessary.*

$$126 \times 24 = 3024$$

		1	2	6				
x			2	4				
		5	0	4	(4 × 1 2 6)			
	2	5	2	0	(2 0 × 1 2 6)			
	3	0	2	4				

		1	2	6				
x			2	4				
		5	0	4				
	2	5	2	0				
	3	0	2	4				

Extend with short and long multiplication of decimal numbers (initially in the context of money and measures), returning to an expanded method first, if necessary (see Y6 guidance).

Aim of year 5: to leave using the formal method for compact long multiplication, with prompts in brackets omitted (TU x TU; HTU x TU)

Multiplication – Year Six

Multiply multi-digit numbers (including decimals) up to 4 digits by a two-digit whole number.

Continue to practise and develop the **formal short multiplication** method and **formal long multiplication** method with larger numbers and decimals throughout Y6. Return to an expanded form of calculation initially, if necessary.

Decimal number multiplied by a two-digit number: Grid method

X	50	3	0.2	
20	1000	60	4	1064.0
4	200	12	0.8	212.8
				1276.8

Encourage children to estimate by rounding before calculating.

The formal written method of long multiplication:

			5	3	.	2			
x			2	4	.	0			
			2	1	2	.	8		(5 3 . 2 × 4)
			1	0	6	4	.	0	(5 3 . 2 × 2 0)
			1	2	7	6	.	8	

Algebra – Year Six

Statutory:

Use simple formulae.

Generate and describe linear number sequences.

Express missing number problems algebraically.

Find pairs of numbers that satisfy an equation with 2 unknowns.

Enumerate possibilities of combinations of 2 variables.

Non-Statutory:

Pupils should be introduced to the use of symbols and letters to represent variables and unknowns in mathematical situations that they already understand, such as:

- missing numbers, lengths, coordinates and angles
- formulae in mathematics and science
- equivalent expressions (for example, $a + b = b + a$)
- generalisations of number patterns
- number puzzles (for example, what 2 numbers can add up to)

Algebra is all about solving puzzles with letters, numbers and symbols. It is about finding the unknown by using whatever information is given.

To begin with, ensure the children are used to representing numbers with letters and symbols.

For example:

$$a = 1, b = 2, c = 3$$

Following this, ask questions about this information.

- What is 'a' add 'b'?
- What is 'c' plus 'b'?
- What is the sum of 'a' and 'b' and 'c'?

These questions can then be written as a calculation with a question mark.

- $a + b = ?$
- $c + b = ?$
- $a + b + c = ?$

As the children become more confident, begin to explore multiplication by asking:

- What is $2b$?

This leads to explaining that writing $2b$, really means 2 times 'b' or $2 \times b$

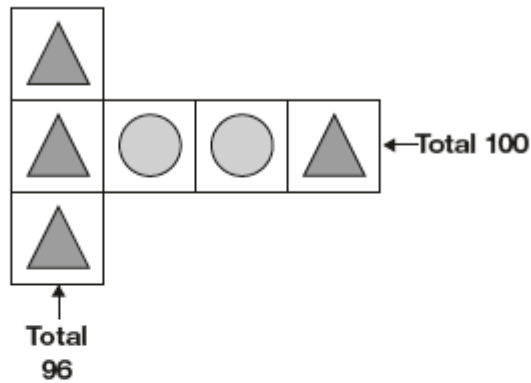
$$\text{So } 2b = 4 \quad \text{because} \quad 2 \times 2 = 4$$

Explain that a number next to a letter means that the number and the letter are multiplied.

Here are two example questions taken from the 2016 KS2 SATS paper:

4

Each shape stands for a number.



Work out the **value** of each shape.

$$\triangle = \underline{\hspace{2cm}}$$

1 mark

$$\circ = \underline{\hspace{2cm}}$$

1 mark

12

$$n = 22$$

What is $2n + 9$?

1 mark

$$2q + 4 = 100$$

Work out the value of q .

$$q = \underline{\hspace{2cm}}$$

1 mark