

Multiplication

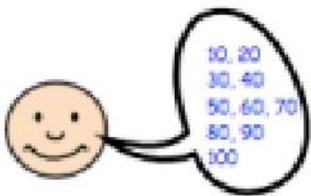
Foundation Children begin to record in the context of play or practical activities and problems.

Year 1 Multiply with concrete objects, arrays and pictorial representations.
(1c, 1b, 1a)

Real life contexts and use of practical equipment to count in repeated groups of the same size:

- Count in twos; fives; tens

Also chanting in 2s, 5s and 10s.

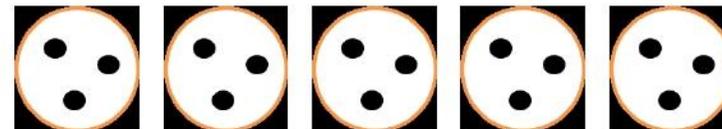


How many legs will 3 teddies have?



$$2+2+2=6$$

There are 3 sweets in one bag. How many sweets are in 5 bags altogether? $3+3+3+3+3 = 15$



Give children experience of counting equal groups of objects in 2s, 5s and 10s.
Present practical problem solving activities involving counting equal sets or groups.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count.

Key skills for multiplication at Y1:

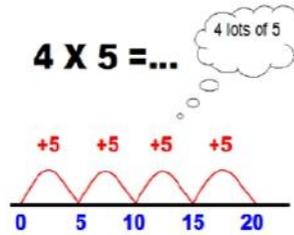
- Count in multiples of 2, 5 and 10.
- Solve one-step problems involving multiplication, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.
- Make connections between arrays, number patterns, and counting in twos, fives and tens. Begin to understand doubling using concrete objects and pictorial representations.

Multiplication

Year 2 Multiply using arrays and repeated addition using at least 2s, 5s and 10s (1a, 2c, 2b)

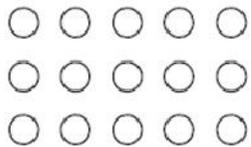
Use repeated addition on a number line.

Starting from zero, make equal jumps up on a number line to work out multiplication facts and write multiplication statements using x and = signs.



4 X 5 = 20

Use arrays



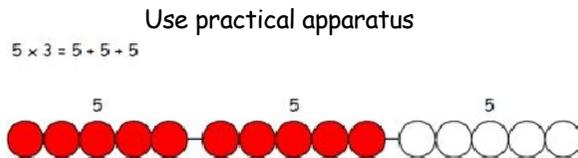
$5 \times 3 = 15$

$3 \times 5 = 15$

$5 \times 3 = 3 + 3 + 3 + 3 + 3 = 15$

$3 \times 5 = 5 + 5 + 5 = 15$

Use arrays to help teach children to understand the commutative law (swap integers around) of multiplication.



Use mental recall

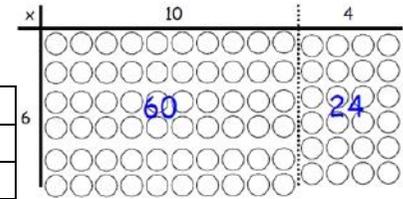
Children should begin to recall multiplication facts for 2, 5 and 10 times tables through practice in counting and understanding of the operation.

Year 3 Multiply 2-digits by a single digit number. (2b, 2a, 3c)

Introduce the grid method for multiplying 2-digits by a single-digit number

Eg. $23 \times 8 = 184$

X	8
20	160
3	24



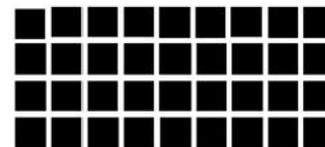
$160 + 24 = 184$

Link the layout of the grid to an array initially:

Introduce the grid method with children physically by making an array to represent the calculation (e.g. make 8 lots of 23 with 10s and 1s place value counters). Then translate this to grid method format.

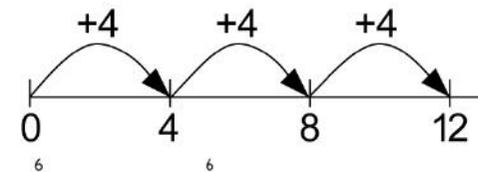
To do this, children must be able to

- o Partition numbers into tens and units
- o Multiply multiples of ten by a single digit (e.g. 20×4) using their knowledge of multiplication facts and place value
- o Recall and work out multiplication facts in the 2, 3, 4, 5, 8 and 10 times tables.
- o Work out multiplication facts not known by repeated addition or other taught mental strategies (e.g. by commutative law, working out near multiples and adjusting, using doubling etc.) Strategies to support this are repeated addition using a number line, bead bars and arrays.

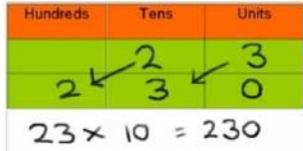


$9 \times 4 = 36$

6 6



Use place value and number facts to solve problems.
 Connect the 10 multiplication table to place value.
 Use place value to multiply by 10.



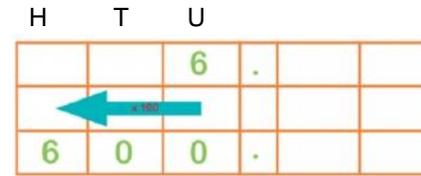
Say: Move every digit one place to the left.
Never say: Add a zero. (Or later: Move the decimal place).

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times...

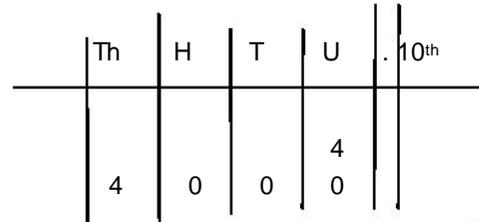
Key skills for multiplication at Y2:

- Count in steps of 2, 3 and 5 from zero, and in 10s from any number.
- Recall and use multiplication facts from the 2, 5 and 10 multiplication tables, including recognising odds and evens.
- Write and calculate number statements using the x and = signs.
- Show that multiplication can be done in any order (commutative).
- Solve a range of problems involving multiplication, using concrete objects, arrays, repeated addition, mental methods, and multiplication facts.
- Pupils use a variety of language to discuss and describe multiplication.

Become fluent in the order and place value of numbers to 1000.
 Use understanding of place value.



$$6 \times 100 = 600$$



$$4 \times 1000 = 4000$$

Say: Move every digit 2 places to the left.
Never say: Add 2 zeros. (Or later: Move the decimal place).

Say: Move every digit 3 places to the left.
Note the number of zeros - this gives you a clue as to how many places to move.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative law (swapping integers), sets of, equal groups, times, ...times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, units, value.

Key skills for multiplication at Y3

- Recall and use multiplication facts for the 2, 3, 4, 5, 8 and 10 multiplication tables, and multiply multiples of 10.
- Write and calculate number statements using the multiplication tables they know, including 2-digit x single-digit, drawing upon mental methods, and progressing to reliable written methods.
- Solve multiplication problems, including missing number problems.
- Develop mental strategies using commutativity (e.g. $4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$)
- Solve simple problems in contexts, deciding which operations and methods to use. Develop efficient mental methods to solve a range of problems e.g using commutativity ($4 \times 12 \times 5 = 4 \times 5 \times 12 = 20 \times 12 = 240$) and for missing number problems $\dots \times 5 = 20$, $3 \times \dots = 18$, $\dots \times \dots = 32$

Multiplication

Year 4 Multiply 2 and 3-digits by a single digit, using all multiplication tables up to 12×12 (3c, 3b, 3a)

Developing the grid method

Eg. $136 \times 5 = 680$

X	100	30	6
5	500	150	30

$$\begin{array}{r} 500 \\ 150 \\ + 30 \\ \hline 680 \end{array}$$

Encourage column addition to add accurately.

Move onto **short multiplication** (see Y5) if and when children are confident and successful when multiplying 2 and 3-digit numbers by a single digit this way and are already confident in 'carrying' for written addition.

Children should be able to:

- o Approximate before they calculate, and make this a regular part of their calculating, going back to the approximation to check the reasonableness of their answer. e.g. 346×9 is approximately $350 \times 10 = 3500$
- o Record an approximation to check the final answer against.

Approximate,
Calculate,
Check it mate!

- o Multiply multiples of ten and one hundred by a single-digit, using their multiplication table knowledge.
- o Recall all times tables up to 12×12

Year 5 Multiply up to 4-digits by 1 or 2 digits. (3a, 4c, 4b)

Introducing column multiplication

- o Introduce by comparing a grid method calculation to a short multiplication method to see how the steps are related, but notice how there are less steps involved in the column method.
- o Children need to be taught to approximate first, e.g. for 72×38 , they will use rounding: 72×38 is approximately $70 \times 40 = 2800$, and use the approximation to check the reasonableness of their answer against.

Short multiplication for multiplying by a single digit

x	300	20	7
4	1200	80	28

	3	2	7
x	4		
	1	2	8
	1	3	0
	1	3	0

Pupils could be asked to work out a given calculation using the grid and then compare it to their column method. What are the similarities and differences? Unpick the steps and show how it reduces them.

Introduce long multiplication for multiplying by 2 digits

	10	8
10	100	80
3	30	24

Step 1. The grid could be used to introduce long multiplication, as the relationship can be seen in the answers in each row.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, groups of, sets of, lots of, equal groups, times, multiply, times as big as, once, twice, three times... partition, grid method, total, multiple, product, sets of, **inverse**

Key skills for multiplication at Y4:

- Count in multiples of 6, 7, 9, 25 and 1000
- Recall multiplication facts for **all multiplication tables up to 12 x 12**.
- Recognise place value of digits in up to 4-digit numbers
- Use place value, known facts and derived facts to multiply mentally, e.g. multiply by 1, 10, 100, by 0, or to multiply 3 numbers.
- Use commutativity and other strategies mentally $3 \times 6 = 6 \times 3$, $2 \times 6 \times 5 = 10 \times 6$, $39 \times 7 = 30 \times 7 + 9 \times 7$.
- Solve problems with increasingly complex multiplication in a range of contexts.
- Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and units).

		1	8	
	×	1	3	
		5	4	
	1	8	0	
	2	3	4	

Step 2. 18×3 on the 1st row ($8 \times 3 = 24$, carrying the 2 for twenty, then „1“ $\times 3$). 18×10 on the 2nd row. Put a zero in units first, then say 8×1 , and 1×1 .

$$\begin{array}{r} 3652 \\ \times 2518 \\ \hline 29216 \end{array}$$

$$\begin{array}{r} 1234 \\ \times 286 \\ \hline 7404 \\ 98720 \\ \hline 106124 \end{array}$$

Make sure you cross out the numbers you have carried from your second row of multiplications before adding.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, ...times as big as, once, twice, three times..., partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short/long multiplication, 'carry'.

Key skills for multiplication at Y5:

- Identify multiples and factors using knowledge of multiplication tables to 12x12. Solve problems where larger numbers are decomposed into their factors.
- Multiply and divide integers and decimals by 10, 100 and 1000
- Recognise and use square and cube numbers and their notation.
- Solve problems involving combinations of operations, choosing and using calculations and methods appropriately.

Multiplication

Year 6 Short and long multiplication as in Y5 and multiply decimals with up to 2d.p by a single digit.
(4b, 4a, 5c)

Line up the decimal points in the question and the answer.

$$\begin{array}{r}
 3.19 \\
 \times 8 \\
 \hline
 25.52
 \end{array}$$

Remind children that the single digit belongs in the units

This works well for multiplying money (£.p) and other measures.

Children will be able to:

- o Use rounding and place value to make approximations before calculating and use these to check answers against.
- o Use short multiplication (see Y5) to multiply numbers with more than 4-digits by a single digit; to multiply money and measures and to multiply decimals with up to 2d.p. by a single digit.
- o Use long multiplication (see Y5) to multiply numbers with at least 4 digits by a 2-digit number.

Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, array, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times... partition, grid method, total, multiple, product, inverse, square, factor, integer, decimal, short / long multiplication, 'carry', **tenths, hundredths, decimal.**

Key skills for multiplication at Y6:

- Recall multiplication facts for all times tables up to 12×12 (as Y4 and Y5).
- Multiply multi-digit numbers, up to 4-digit \times 2-digit using long multiplication. □ Perform mental calculations with mixed operations and large numbers.
- Solve multi-step problems in a range of contexts, choosing appropriate combinations of operations and methods.
- Estimate answers using rounding and approximation. Determine levels of accuracy. Round any integer to a required degree of accuracy.

Beyond

Use written methods to support, record or explain

multiplication of:

- a three-digit number by a two-digit number
- a decimal with one or two decimal places by a single digit

Grid method

6.24×8 is approximately $6 \times 8 = 48$

x	6	0.2	0.04
8	48	1.6	0.32

= 49.92

Grid lines can become optional

Use partitioning

Partition either part of the product e.g. $7.3 \times 11 = (7.3 \times 10) + 7.3 = 80.3$