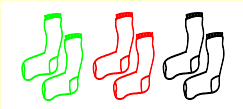
Progression of written methods for multiplication

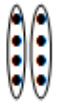
Practical experiences and mental images:

Children record calculation through mark making using pictures or tallies.

Grouping objects:
Children will use pictures to 'group' objects and then count how many there are all together.

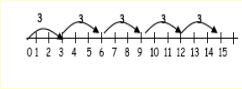


Repeated addition using arrays:
Children will develop their understanding of multiplication and *organise* their jottings to support their calculations.

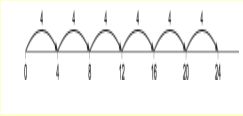


2 x 4

Repeated addition using a number line:
Marked number line:
Children will begin to use *numbered* lines to support counting forwards in equal groups.



Blank number line:
They will then move on to using blank number lines.



Partitioning using the grid method:
Children will use this method when dealing with larger numbers to break multiplication into more manageable chunks.

x	20	3
8	160	24

Expanded column method for short multiplication:

$$\begin{array}{r} 26 \\ \times\ 7 \\ \hline 42 \\ 140 \\ \hline 182 \end{array}$$

Formal method for short multiplication:

$$\begin{array}{r} 26 \\ \times\ 7 \\ \hline 182 \\ 4 \end{array}$$

EYFS - Multiplication

Knowledge and Understanding of Number	**Calculating**	**Using and Applying**
Observe number relationships and patterns in the environment and use these to derive facts.	Count repeated groups of the same size.	Sort objects, making choices and justifying decisions.

Method

Context: Real-life counting opportunities - e.g. we know how many children there are in the class, but do we know how many feet/hands are in the class? Have we got enough wellington boots for all those feet? Are there enough gloves for all those hands? How could we find out? Children could make their suggestions and have a go at their solutions. They may try: matching objects to children; counting in ones, matching their counting to feet; mark making using pictures or tallies or counting in twos for each child.

Share rhymes and songs that involve counting in twos, fives and tens forwards and backwards.

Encourage counting in groups of the same size during role-play. For example: we'll need enough for 6 of us. 2, 4, etc. If 2 can fit on each seat in the train, how many passengers can you take? 2, 4, etc. When organising groups, ask whether they can get into pairs to go to lunch. Have we got everyone? Let's see, that's 2, 4, etc.

Put up pictures, for example balloons, on an interactive whiteboard or felt board and numerals in multiples of 2, 5 or 10. The objects can be sorted into sets, numbered and counted.

Practice

Sort real objects and pictures into sets of equal number while counting aloud.
Use groups of children to count in pairs. For example: encourage children to share small outdoor equipment in pairs.
Move along an outdoor number line, for example jumping forward in twos.
Use washing lines for group activities or small number lines next to resources.
Use puppets to demonstrate counting along a number track or number line.

1	2	3	4	5	6	7	8	9	10

Use vocabulary associated with number e.g. zero, ten, twenty... one hundred, count, count (up) to count on (from, to) count back (from, to) count in ones, twos... tens..., how many times? pattern, estimate ,double, sort, equal, sets of

Pupil Profile

Profile Points

8. Uses developing mathematical ideas and methods to solve practical problems.

Year 1 - Multiplication

EYFS COULD

Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher.

Calculation method

Context: Real-life counting opportunities –
Children will experience equal groups of objects and will begin to count in 2s, 10s and 5s. They will work on practical problem solving activities involving equal sets or groups.

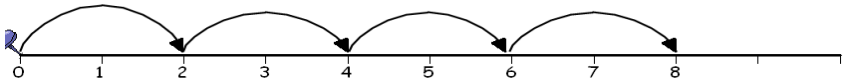
Count these pairs of socks.
How many pairs are there?
How many socks are there altogether?

Pictures
Count repeated groups of the same size.

3 groups of 2 = 6

Numicon: shapes can be arranged to count groups of a given number. The total number of holes can be counted to find the product.

Marked number line:
Teacher to initially model - use a fully marked number line to represent multiplication as repeated addition.
2+2+2+2=8



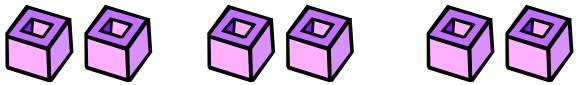
Practice

Count back and forth in 1s.
Count forward and backwards in 2s, 5s, 10s.
Start on a number other than 0.
Use counting stick, washing lines etc.
number sequences, zero, ten, twenty... one hundred, count (up) to ,count on (from, to), count in ones, twos... tens... ,
more, many, odd, even, how many times?
pattern, pair, multiple

Steps 2 Success

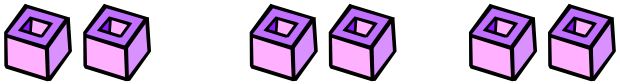
To count **group**s of objects:

- Count the number of objects in each group, making sure there are the same numbers of objects in each group.



2 2 2

- Count the objects altogether.



1 2 3 4 5 6

- 3 groups of 2 = 6

Year 2 - Multiplication

Year 1 COULD

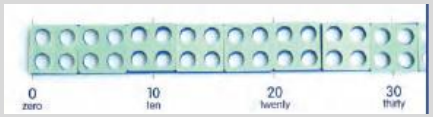
Recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers.

Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs. Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot.

solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts.

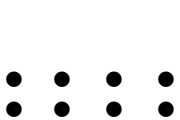
Calculation methods

Numicon: shapes can be arranged along a number line to find the product. Shapes can be used to show commutative facts.

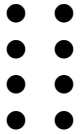


Children will develop their understanding of multiplication and use jottings to support their calculations:

Repeated addition using arrays:

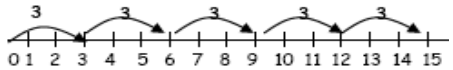


2 x 4 = 4 + 4 = 8 (2 rows of 4)

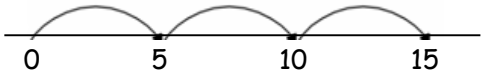


4 x 2 = 2 + 2 + 2 + 2 = 8 (4 rows of 2)

Repeated addition using a numbered line:
Repeated addition can be shown on a number line: 5 x 3 = 3+3+3+3+3



Repeated addition using a blank number line:
3 x 5 = 3 multiplied by 5, 3 times 5, 3 lots o 5,



Partition to double numbers: Double 15 = double 10 and double 5 e.g

10 5

20 10 = 30

Recognise and use symbols to stand for unknown numbers or signs:
e.g. 6 x 2 = ☐ 6 x △ = 12 12 = 6 x ☐

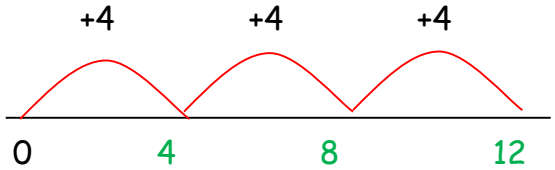
Steps 2 Success

To use a number line to count in steps:

- Read the number sentence e.g. 3 x 4
- Set the number line out like shown below:

0

- Look at the first number in the number sentence, this tells you how many jumps you need to make e.g. **3** x 4 (3 jumps).
- Look at the second number in the number sentence, this tells you to jump in multiples of this number e.g. 3 x **4** (jump 4 every time).



- Check your work.
- The last number you landed on is the answer.

Year 3 - Multiplication

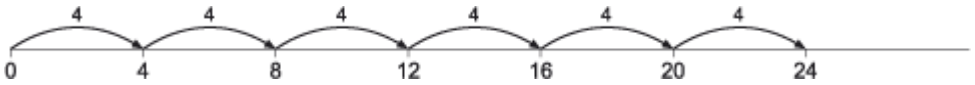
Year 2 COULD

Recall and use multiplication and division facts for the 3, 4 and 8 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 formal written methods.	Solve problems, including missing number problems, involving multiplication, including positive integer scaling problems & correspondence problems in which n objects are connected to m objects.

Calculation methods

Number line:

Review multiplication as repeated addition by counting jumps on a number line. For example, find 6 fours by making 6 hops of 4.



Expanded Column Method:

Short multiplication:

```
  2 6
X   7
  4 2
1 4 0
1 8 2
```

Efficient Formal Method:

```
  2 6
X   7
1 8 2
  4
```

Steps 2 Success

- Set the calculation out in a column with the **largest number at the top** e.g. 23 x 6

```
 T U
 2 3
X  6
```

- Start at the **right** to multiply numbers.
- Use **factors** to help you multiply by 10 and 100 e.g. to multiply by 20, first multiply by 2 and then 10. Line the digits up according to their **place value**.

```
 T U
 2 3
   6
  1 8    (6 x 3)
1 2 0    (6 x 20) or (6 x 2 x 10)
1 3 8
```

- Add the numbers together.

Year 4 – Multiplication

Year 3 COULD

Recall multiplication and division facts for multiplication tables up to 12 × 12; use place value, known and derived facts to multiply and divide mentally, including: multiplying by 0 and 1; dividing by 1; multiplying together three numbers; recognise and use factor pairs and commutativity in mental calculations.	Multiply two-digit and three-digit numbers by a one-digit number using formal written layout.	Solve problems involving multiplying and adding, including using the distributive law to multiply two digit numbers by one digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects.

Calculation methods

Expanded Column Method:

Short multiplication:

```
  2 6
X   7
  4 2
1 4 0
1 8 2
```

Efficient Formal Method:

```
  2 6
X   7
1 8 2
  4
```

Steps 2 Success

Formal Method:

- Set the calculation out in a column with the largest number at the top e.g. 26 x 7

```
  T U
  2 6
X 7
```

- Start at the right to multiply numbers.
- Use factors to help you multiply by 10 and 100 e.g. to multiply by 20, first multiply by 2 and then 10. Line the digits up according to their **place value**.
- Continue to multiply working from right to left and carry any digits that bridge under the line into the next column.

```
  2 6
X   7
1 8 2
  4
```

Year 5 - Multiplication

Year 4 COULD

Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers; know and use the vocabulary of prime numbers, prime factors and composite (nonprime) numbers; establish whether a number up to 100 is prime and recall prime numbers up to 19; multiply and divide numbers mentally drawing upon known facts; multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.

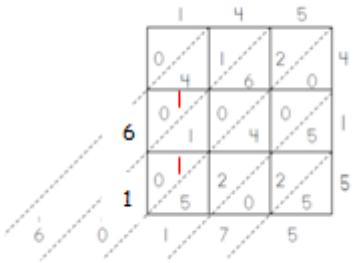
Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.

Recognise and use square numbers and cube numbers, and the notation for squared (2) and cubed (3).

Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes; solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign; solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.

Calculation methods

Lattice grid: to multiply HTU x HTU. e.g. 145x415:



Short Multiplication:

342 x 7

```
  3 4 2
X     7
-------
2 3 9 4
  2 1
```

Long Multiplication:

124 x 26 :

```
  1 2 4
X   2 6
-------
  7 4 4
  1 2
2 4 8 0
-------
3 2 2 4
1 1
```

Steps 2 Success

Formal Method Short Multiplication:

- Set the calculation out in a column with the largest number at the top e.g. 342 x 7

```
  H T U
  3 4 2
X     7
-------
```

- Start at the right to multiply numbers.
- Use factors to help you multiply by 10 and 100 e.g. to multiply by 20, first multiply by 2 and then 10. Line the digits up according to their **place value**.
- Continue to multiply working from right to left and carry any digits that bridge under the line into the next column.

```
  3 4 2
X     7
-------
2 3 9 4
  2 1
```

Year 6 – Multiplication

Year 5 COULD

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication; perform mental calculations, including with mixed operations and large numbers; identify common factors, common multiples and prime numbers.	Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication; Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.	Solve problems involving addition, subtraction, multiplication and division.

Calculation methods

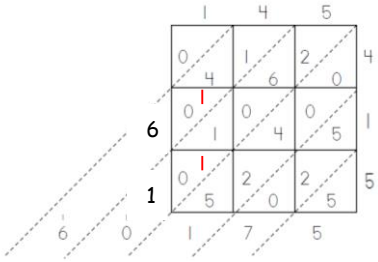
Short multiplication:

Compact efficient method

```
  26
X  7
182
 4
```

Lattice grid:

to multiply HTU x HTU.
e.g. 145x415



Long Multiplication:

124 x 26 :

```
  124
X  26
 744
 12
2480
3224
 11
```

Steps 2 Success

Long Multiplication:

- Set out the numbers according to their place value.

```
 H T U
 2 3 7
X  4 5
```

Largest number always on top.

- Multiply each digit of the top number by the digit in the **units** column of the bottom number, starting with the units (e.g. your first calculation would be 5 x 7 and so on).

```
  2 3 7
X   4 5
-------
  1 1 8 5
    1 3
```

Carry any digits which bridge underneath.

- Always add your place holder 0 first because you're now multiplying by ten. Now multiply each digit on the top by the tens number.

```
  2 3 7
X   4 5
-------
  1 1 8 5
    1 3
  9 4 8 0
  1 2
-------
1 0 6 6 5
  1
```

- Add together the two new numbers