Whimple Primary School

Maths Calculation Policy
Multiplication

Carole Shilston

2016

Stages in Multiplication

Early Stages (EYFS)
Children will engage in a variety of counting songs and rhymes and practical activities. They will begin to relate counting patterns to multiplication.

Counting in steps ('Clever' counting)
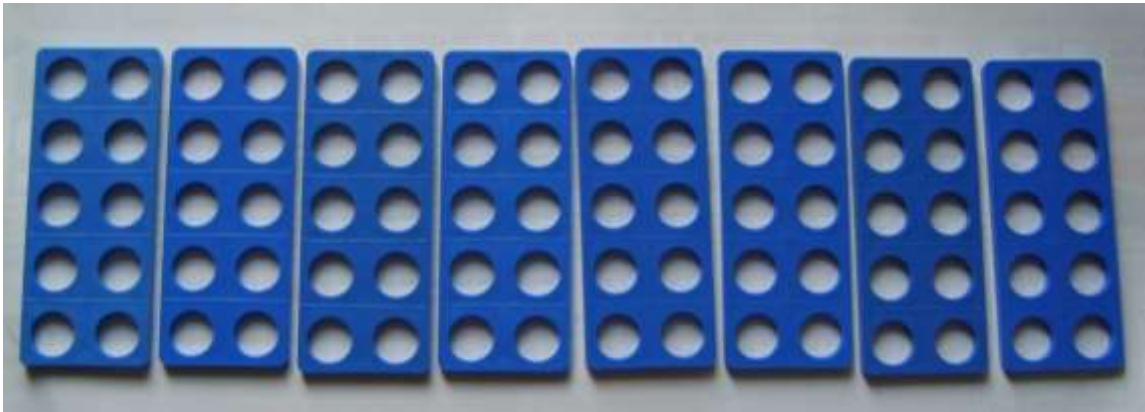❖ **Using objects or pictures:**

How many legs do 3 teddies have?

| 2 | + | 2 | + | 2 | = | 6 |

Counting – 2, 4, 6.

❖ **Using images of number: for example Numicon**

Counting – 10, 20, 30, 40, 50, 60, 70, 80.

❖ **Using money**

Stages in Multiplication

❖ **Using dice (especially doubles)**

❖ **Using cards**

Key vocabulary: groups of, lots of, altogether, multiply, count

Early Years Foundation Stage – Early Learning Goal:
  ➢ Solve problems, including doubling, halving and sharing.

Key skills for multiplication at Reception:
  • Count in multiples of 2 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.
 • Begin to understand doubling using concrete objects and pictorial representations.

Stages in Multiplication

Year 1

Children will experience equal groups of objects and will count in 2s, 10s and 5s. They will work on practical problem solving activities involving equal sets or groups. To solve these problems children will use concrete objects and pictorial representations. They will also make connections between arrays, number patterns, and counting in twos, fives and tens.
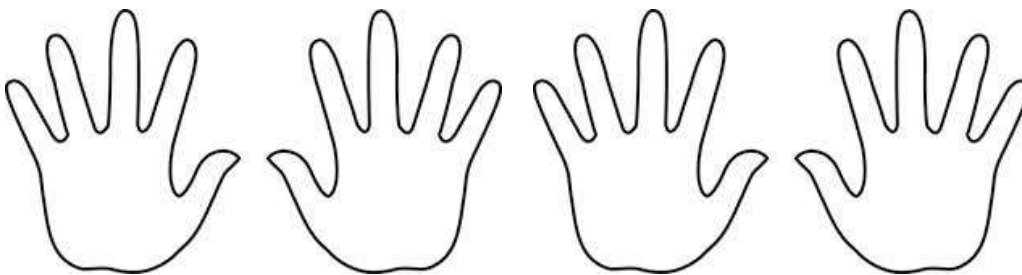
Counting in steps ('Clever' counting)

Count in steps of 2 and 10.
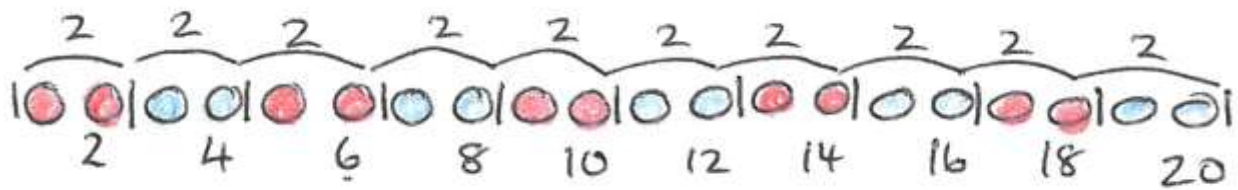
❖ **Using objects or pictures:**

How many fingers do 4 hands have?

5 + 5 + 5 + 5 = 20

Counting: 5, 10, 15, 20.

❖ **Using images of number: for example Cuisinaire**

Placed vertically to demonstrate that 10 twos makes 2 tens.

2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 = 20

Stages in Multiplication

Counting – 2, 4, 6, 8, 10, 12, 14, 16, 18, 20.

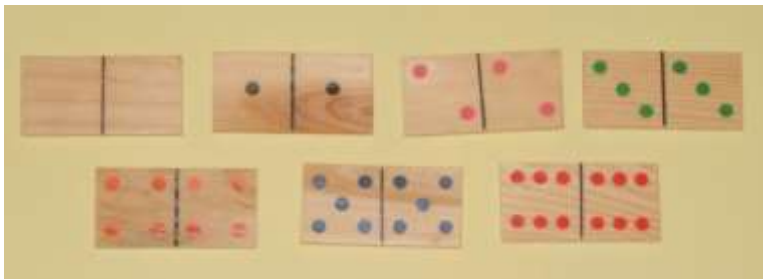❖ **Using money**

Doubling and Halving

Find doubles to double 6.

❖ **Using objects:**

5 + 5 = 10

❖ **Using dominoes:**
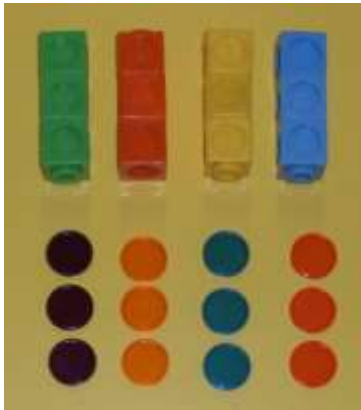

❖ **Using cards:**

3 + 3 = 6

Stages in Multiplication

Grouping

Begin to use visual and concrete arrays and 'sets of' objects to find the answers to '4 lots of 3' or '2 lots of 5', etc.

2 lots of 5
5 + 5 = 10

4 lots of 3
3 + 3 + 3 + 3 = 12

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

National Curriculum 2014 statements:
  ➢ 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.

Key skills for multiplication at Year 1:
  • 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.
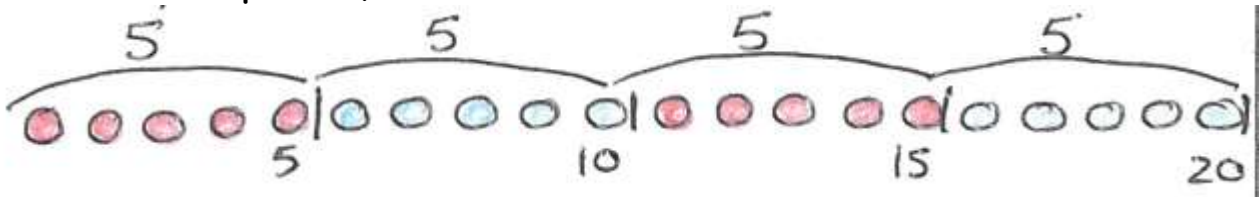

Stages in Multiplication

Year 2
Children will develop their understanding of multiplication and use jottings to support calculation. They will use repeated addition on a number line and develop their knowledge of arrays which will help them understand the commutative law of multiplication.

Counting in steps ('Clever' counting)
❖ **Count in steps of 2s, 5s and 10s.**
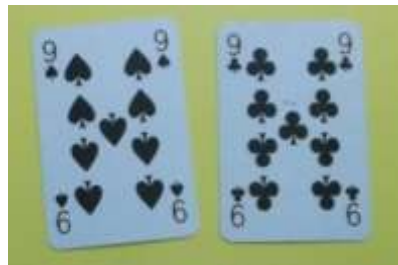

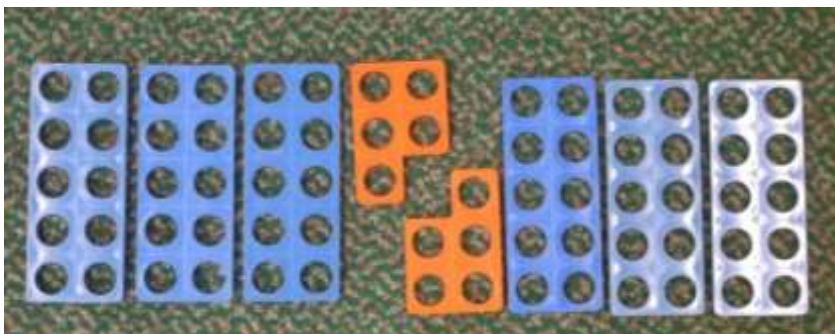❖ **Begin to count in 3s.**

Doubling and Halving
❖ **Begin to know doubles of multiples of 5 to 100.**
   e.g. double 35 is 70.

❖ **Using cards:**

     9 + 9 = 18

❖ **Using images of number: for example Numicon**
   Double 35 is 70   35 + 35 = 70

Stages in Multiplication

❖ **Using money:**

40 + 40 = 80

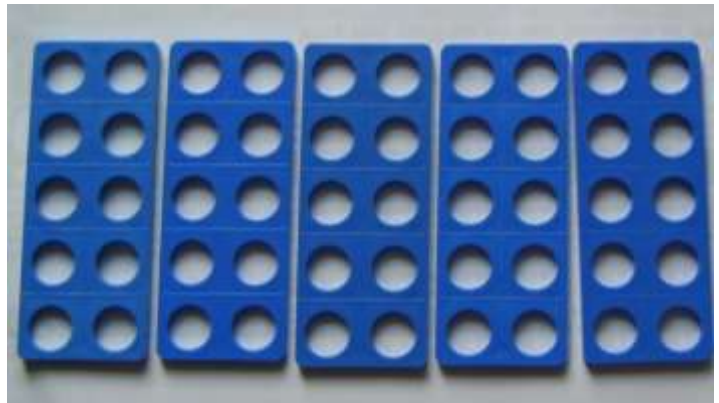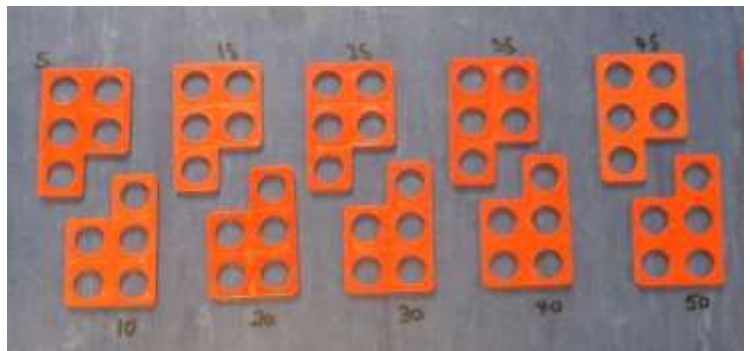## Using Number Facts

❖ **Know doubles to double 20.**

❖ **Start learning 2x, 5x, 10x tables and relating these to 'Clever counting' in 2s, 5s, and 10s.**

e.g. 10 x 5 = 50,
and 10, 20, 30, 40, 50
is five steps in the tens count.

e.g. 5 x 10 = 50,
and 5, 10, 15, 20, 25, 30, 35, 40, 45, 50
is ten steps in the fives count.

By Carole Shilston – Maths Subject Leader

Stages in Multiplication

Grouping
* ❖ **Repeated addition**:

3 times 5   is   5 + 5 + 5 = 15   or   3 lots of 5   or   5 x 3

Repeated addition can be shown easily on a number line:

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

| 5 | 5 | 5 |

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
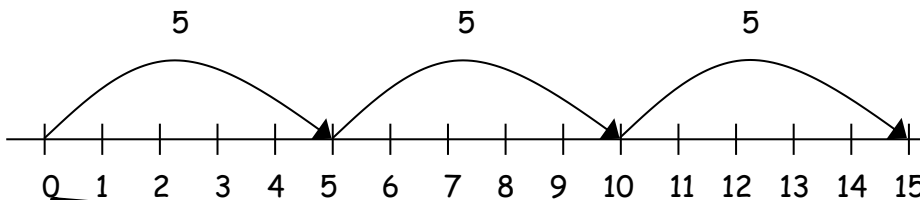
> Starting from zero, make equal jumps on a number line to work out multiplication facts and write multiplication statements using x and = signs.

* ❖ **and on a bead bar:**

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

| 5 | 5 | 5 |
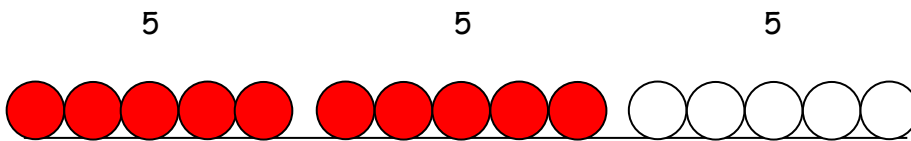
Commutativity
* ❖ **Children should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.**

| 5 | 5 | 5 |

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

3   3   3   3   3
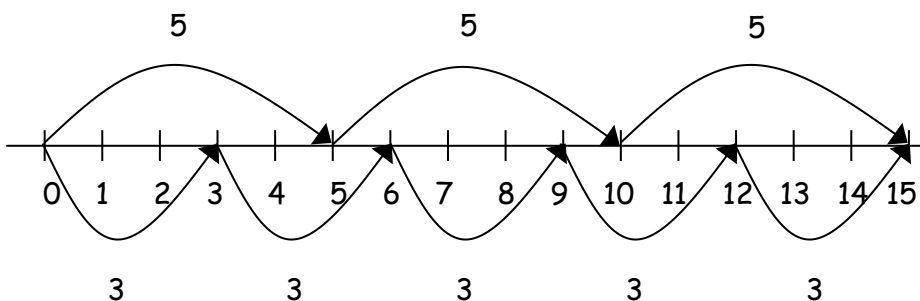
Stages in Multiplication

Arrays

❖ **Use arrays to find answers to multiplication and relate to 'clever' counting.**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.

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

$$5 \times 3 = 15$$

$$3 \times 5 = 15$$

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

Use arrays to help teach children to understand the commutative law of multiplication and give examples such as 3 x ☐ = 6.

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...

National Curriculum 2014 statements:
- ➢ 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.

Key skills for multiplication at Year 2:
- • 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.
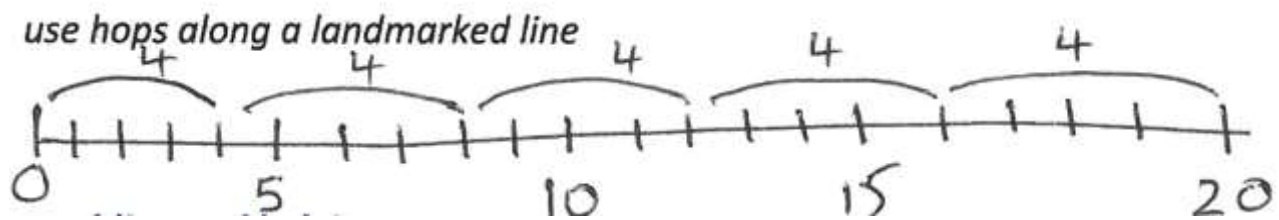
Stages in Multiplication

Year 3
Children continue to use repeated addition to solve problems. Alongside physically making arrays to represent a calculation, children are introduced to the 'grid method' for multiplying a 2-digit number by a single digit number.

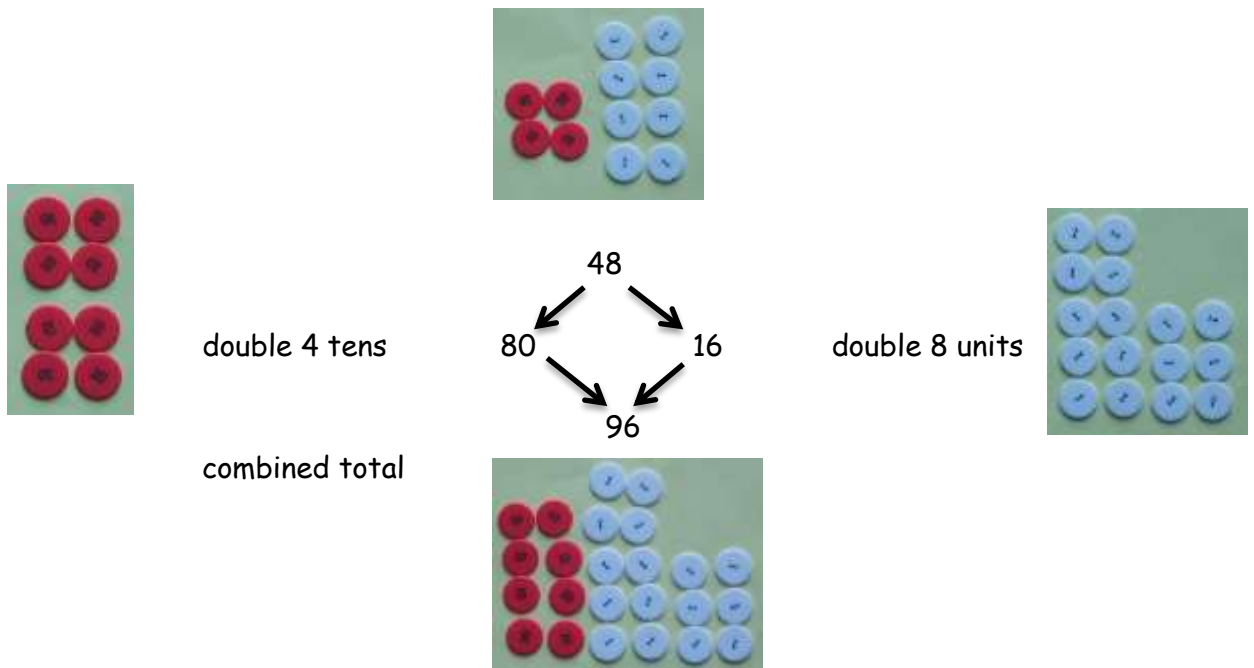### Counting in steps ('Clever' counting)
- ❖ Count in 10s, 5s, 2s, 4s, 8s, and 3s, e.g. colour the multiples on a 1-100 grid or use hops along a landmarked line.

Doubling and Halving
- ❖ Find doubles to double 50 using partitioning.

double 4 tens

48

80   16

96

double 8 units

combined total

- ❖ **Use doubling as a strategy in multiplying by 2.**
  e.g. 18 x 2 is double 18 (36)

Stages in Multiplication

Using Number Facts

❖ **Know doubles to 20 and doubles of multiples of 5 to 100.**

e.g. double 45 is 90, double 85 is 170.

❖ **Know 10x, 5x, 2x, 4x, 8x and 3x tables facts.**
By understanding the relationships between tables, e.g. that the products of the 8x table are double of the 4x table, children are more likely to develop a strong sense of number relationships, an important prerequisite for procedural fluency.

❖ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

e.g. □ x 5 = 20   3 x △ = 18   □ x O = 32

❖ **Number facts are also used for scaling.**

e.g. Find a ribbon that is 4 times as long as the blue ribbon
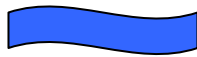
5 cm   20 cm

Grouping

❖ **Recognise that multiplication is commutative.**

e.g. 4 x 8 = 8 x 4
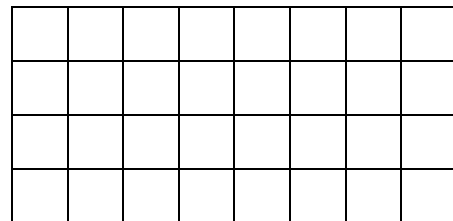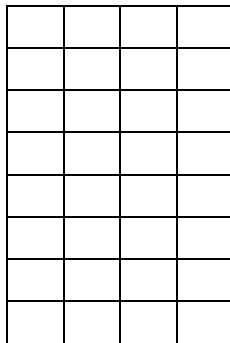
❖ **Multiply multiples of 10 by single digit numbers.** e.g. 30 x 8 = 240 (using 3 x 8 = 24)

❖ **Multiply friendly 2-digit numbers by single digit numbers**, e.g. 14 x 6

Link the layout of the grid to an array initially:
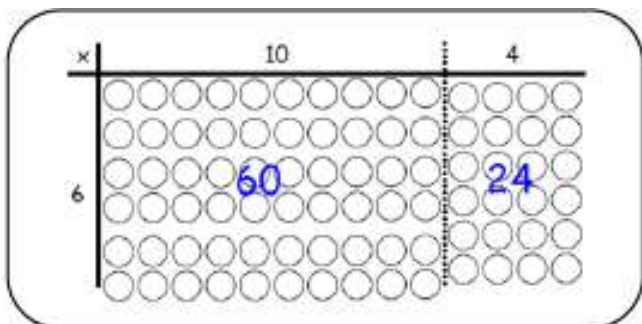
X	10	4
6	60	24

Partitioning:
14 x 6 = (6 x 10) + (6 x 4)
         =   60   +   24
         =   84

Stages in Multiplication

Introduce the grid method with children physically making an array to represent the calculation (e.g. make 6 lots of 14 with 10s and 1s place counters), then translate this to grid method format.

This enables children to see the link between their array and the written method known as grid multiplication.

To do this, children must be able to:

- Partition numbers into tens and units.
- Multiply multiples of ten by a single digit (e.g. 20 x 4) using their knowledge of multiplication facts and place value.
- Recall and work out multiplication facts in the 2, 3, 4, 5, 8 and 10 times tables.
- Work out multiplication facts not known by repeated addition or other taught mental strategies (e.g. commutative law, working out near multiples and adjusting, using doubling). Strategies to support this are repeated addition using a number line, bead bars and arrays.
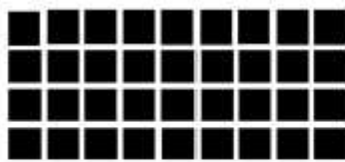
9 x 4 = 36
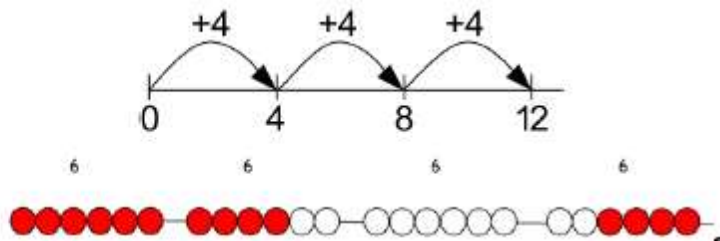
Key vocabulary: groups of, lots of, times, array, altogether, multiply, count, multiplied by, repeated addition, column, row, commutative, sets of, equal groups, times as big as, once, twice, three times..., partition, grid method, multiple, product, tens, units, value

National Curriculum 2014 statements:

- ➢ Recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables.
- ➢ Write and calculate mathematical statements for multiplication and division 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 and division, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.

Key skills for multiplication at Year 3:

- 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 x 12 x 5 = 4 x 5 x 12 = 20 x 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 × 12 × 5** = 4 × 5 × 12 **= 20 × 12** = 240) and for missing number problems ? x 5 = 20, 3 x ? = 18, ? x ?= 32

Stages in Multiplication

Year 4
Children will continue to use arrays where appropriate and write the corresponding grid multiplication. This is initially with a two-digit multiplied by a single digit moving on to multiplying 2 and 3-digit numbers by a single digit.

Counting in steps ('Clever' counting)
- ❖ **Count in steps of 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s, 10s, 11s, 12s, 25s, 50s, 100s and 1000s.**
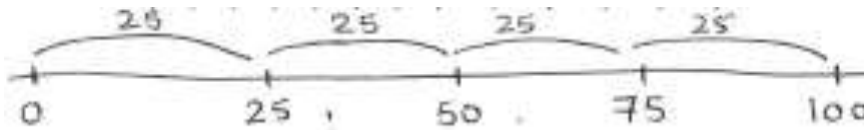
Doubling and Halving
- ❖ **Find doubles up to and including double 100 and beyond using partitioning.**

double 1 hundred   200   52   double 26

252
combined total
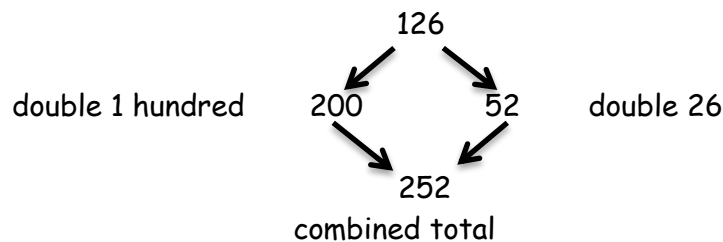
- ❖ **Begin to double amounts of money.** e.g. £3.50 doubled is £7.

- ❖ **Using doubling as a strategy in multiplying by 2, 4 and 8.**
e.g. 34 x 4 = double 34 (68) doubled again (136)

Using Number Facts
- ❖ **Know times tables up to 12 x 12**

Grouping
- ❖ **Use partitioning to multiply 2-digit numbers by single-digit numbers.**

- ❖ **Multiply multiples of 100 by single digit numbers using table facts.**
  e.g. 400 x 8 = 3200
- ❖ **Multiply using near multiples by rounding.**
  e.g. 24 x 19 as (24 x 20) - 24

Stages in Multiplication

Developing the grid method:
- ❖ **Use grid multiplication to multiply 3-digit by 1-digit numbers.**

e.g. 136 x 5 = 680

X	100	30	6
5	500	150	30

500
150
+ 30
680

Encourage column addition to add accurately.

Step 1: Calculate 5 lots of 100.

Step 2: Calculate 5 lots of 30. (Knowing 3 lots of 5 and multiplying by 10).

Step 3: Calculate 5 lots of 6.

Step 4: Write out the 3 answers to find their total which gives the answer to the multiplication.

- ❖ **Use vertical written algorithm (ladder) to multiply 3-digit numbers by 1-digit numbers.**

e.g. 253 x 6

X	200	50	3
6	1200	300	18

253
X   6
18
300
1800
1518

First, 6 lots of 3 is 18; then 6 times 50 and lastly 6 multiplied by 200. Finally add up all 3 answers to calculate the total.

Apply table facts knowledge and multiply by the correct factor of 10. (e.g. 6 x 2 times 100, 6 x 5 times 10).

Using this order will aid children to move towards short multiplication later.

- ❖ **Use grid multiplication to multiply 2-digit numbers by 2-digit numbers.** e.g 46 x 18

X	40	6
10	400	60
8	320	48

720   +   108   = 828

Step 3: Multiply the first units box by first tens box (6x10).

Step 4: Multiply both the units' boxes (6x8).

400 (Step 1)
320 (Step 2)
60 (Step 3)
+   48 (Step 4)
828
1

Step 1: Multiply the tens boxes (40x10).

Step 2: Multiply the tens box by units (40x8).

Stages in Multiplication

Children must understand the structure of the mathematics presented in the algorithms, with particular emphasis on place value. Base ten (or equivalent) apparatus is used to support the development of fluency and understanding.

Stepping stones to formal written methods:

$$23 \times 4 = ?$$

Approximate, Calculate, Check It Mate!

Children should be able to 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.

For example: 346 x 9 is approximately 350 x 10 = 3500.

Record an approximation to check the final answer against.

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, multiple, product, tens, units, value, inverse

National Curriculum 2014 statements:
- ➢ 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.

Key skills for multiplication at Year 4:
- 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 x 6 = 6 x 3, 2 x 6 x 5 = 10 x 6 , 39 x7 = 30 x 7 + 9 x 7.
- Solve problems with increasingly complex multiplication in a range of contexts.
- Count in multiples of 6, 7, 9, 25 and 1000
- Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens, and ones)

Stages in Multiplication

Year 5

Children continue to multiply a range of numbers up to 4-digits by a 1 or 2-digit number by using the grid method of multiplication. Children are introduced to short multiplication method for multiplying a number by a single-digit number. This is introduced by comparing a grid method calculation to a short multiplication method, to see how the steps are related, but notice there are less steps involved in the column method. Long multiplication is introduced in order to multiply by 2 digits.

Doubling and Halving

❖ **Double amounts of money using partitioning.**

e.g. £6.73 doubled is double £6 (£12) plus double 73p (£1.46).

£6 x 2

£6.73

73p x 2

£12 → £13.46 ← £1.46

£12 + £1.46
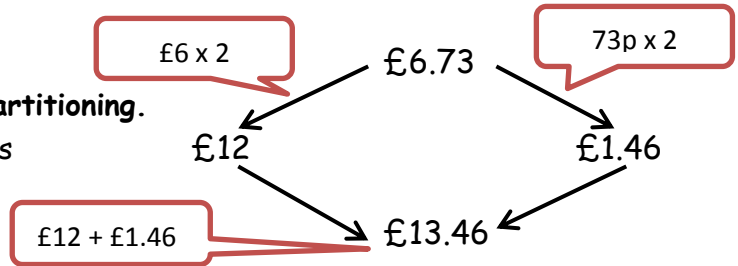
❖ **Using doubling and halving as a strategy in multiplying by 2, 4, 8, 5 and 20.**

e.g. 58 x 5 = ½ of 58 (29) x 10 (290) or 58 x 10 then half.

Using Number Facts

❖ **Use times tables facts up to 12 x 12 to multiply multiples of the multiplier.**

e.g. 4 x 6 = 24 so 4 x 60 = 240 and 4 x 600 = 2400.

❖ **Know square numbers and cubed numbers.**

A square number is a number obtained after multiplying an integer by itself, e.g. 9 (3 x 3 = 3^2), 49 (7 x 7 = 7^2).

A cubed number is a number that is multiplied by itself and then multiplied by itself again, e.g. 8 (2 x 2 x 2 = 2^3), 125 (5 x 5 x 5 = 5^3).

Grouping

❖ **Multiply decimals by 10, 100 and 1,000.**

e.g. 3.4 x 10 = 34; 3.4 x 100 = 340; 3.4 x 1000 = 3400

❖ **Use partitioning to multiply friendly 2-digit and 3-digit numbers by single-digit numbers.** e.g. 402 x 6 as 400 x 6 (2400), and 2 x 6 (12).

402

400 x 6

2 x 6

2400 → 2412 ← 12

2400 + 12
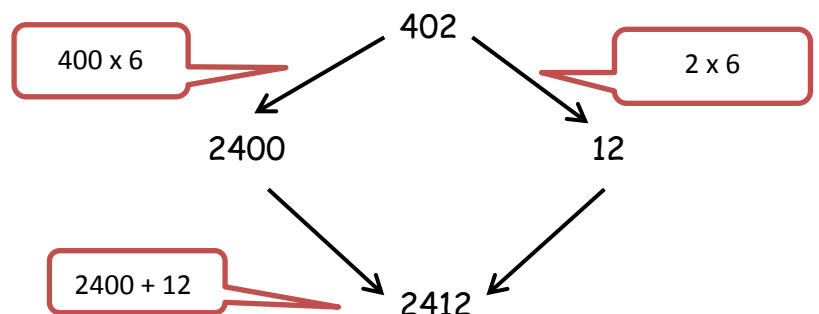
Stages in Multiplication

An alternative layout: 402 x 6 = ☐

Partitioned is: 400   2

400 x 6 = 2400
2 x 6 =   12   +
2412   so 402 x 6 = 2412

❖ **Use partitioning to multiply two friendly 2-digit numbers.**

e.g. 24 x 13 = ☐

24 x 13 = (24 x 10) + (24 x 3)
= (240) + (72)
= 312

❖ **Use multiplying by 20 or 100 and adjusting.**

e.g. 65 x 19 = ☐

65 x 20 = 65 x 10 x 2 = 650 x 2 = 1300
1300 – 65 =   (as multiplied by 20 only needed 19 so deduct 65)
= 1235

e.g. 78 x 21 = ☐

78 x 20 = 78 x 10 x 2 = 780 x 2 = 1560
1560 + 78 =   (as multiplied by 20 need 21 so add 78)
= 1638

e.g. 57 x 99 = ☐

57 x 100 = 5700
5700 – 57 =   (as multiplied by 100 only needed 99 so deduct 57)
= 5643

Written multiplication

❖ **Use a vertical written algorithm to multiply 1-digit number by a number with up to 4 digits** – known as a 'Number ladder':

```
                234
           X      7
(7 x 4)           28
(7 x 30)         210
(7 x 200)       1400
                1638
```

The calculation must be written out accurately using hundreds, tens and units columns. Multiply the units first, then the tens and lastly the hundreds. Then total the three parts.

Stages in Multiplication

❖ **Short Multiplication – leading on from the 'Number ladder'** (children must be secure in this method before moving onto short multiplication).

e.g 24 x 6 =
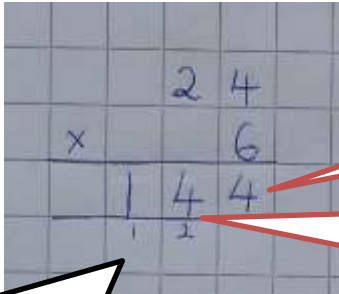
Step 1: Calculate 6 multiplied by 4 (24); write 4 in units column and carry the 20 as 2 tens under the tens column.

Step 2: Calculate 6 multiplied by 2 tens (12 tens); don't forget to add the 2 tens carried from the previous calculation (12 + 2 = 14 tens) and write 4 in the tens column and carry the 100 as 1 hundred under the hundreds column. Write the one hundred in the hundreds column.

The final carry can be placed directly into the hundreds column; it is good practice when starting short multiplication as it by emphasises the steps and the value of each number carried.
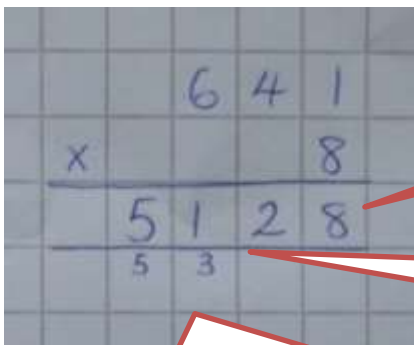
Step 1: Calculate 8 multiplied by 1 (8).

Step 2: Calculate 8 multiplied by 4 tens (32 tens, 320); and write 2 in the tens column and carry the 300 as 3 hundred under the hundreds column.

Step 3: Calculate 8 multiplied by 6 hundreds (48 hundreds, 4800); don't forget to add the 3 hundreds carried from the previous calculation (48 + 3 = 51 hundreds). Write 1 in the hundreds column and carry the 5000 as 5 thousand under the thousands column. Write the five thousand in the thousands column.

Unpicking calculations

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

x	300	20	7
4	1200	80	28

Stages in Multiplication

Approximate, Calculate, Check It Mate!
Children should be able to 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.
For example: 323 x 4 is approximately 300 x 5 which to approximate mentally you could calculate 300 x 10 = 3000 and then halve it, 1500.
Record an approximation to check the final answer against.

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, multiple, product, tens, units, value, inverse, square, factor, integer, decimal, short/long multiplication, 'carry'

National Curriculum 2014 statements:
  ➢ 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 (non-prime) numbers.
  ➢ Establish whether a number up to 100 is prime and recall prime numbers up to 19.
  ➢ 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.
  ➢ Multiply and divide numbers mentally drawing upon known facts.
  ➢ Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.
  ➢ 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.

Key skills for multiplication at Year 5:
  • 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.
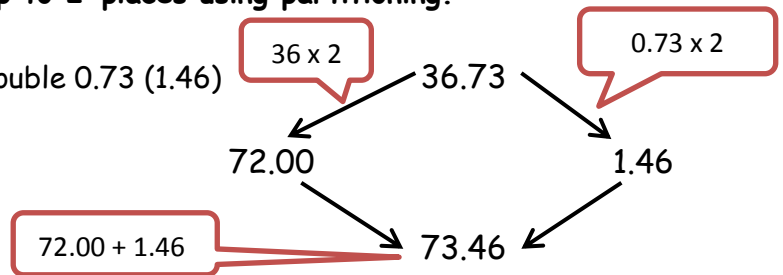
Stages in Multiplication

Year 6
Children continue using both short and long multiplication with a range of calculations. They also use short multiplication with decimal numbers and money.

Doubling and Halving
- ❖ **Double decimal numbers with up to 2-places using partitioning.**
  e.g. 36.73 doubled is
  double 36 (72) plus double 0.73 (1.46)

  [36 x 2] 36.73 [0.73 x 2]

  72.00   1.46

  [72.00 + 1.46] 73.46

- ❖ **Using doubling and halving as strategies in mental multiplication.**
  Including multiplying by 2, 4, 8, 5, 20, 50 and 25.
  e.g. 28 x 25 is ¼ of 28 x 100 = 700.

Using Number Facts
- ❖ **Use times tables facts up to 12 x 12 in mental multiplication of large numbers or numbers with up to two decimal places.**
  e.g. 6 x 4 = 24 so 0.06 x 4 = 0.24

Grouping
- ❖ **Use partitioning as a strategy in mental multiplication, as appropriate.**
  e.g. 3060 x 4 as (3000 x 4) + (60 x 4) = 12,240
  or 8.4 x 8 as 8 x 8 (64) and 0.4 x 8 (3.2)= 67.2

- ❖ **Use factors in mental multiplication.**
  e.g. 421 x 6 as 421 x 3 (1263) doubled (2526)
  or 3.42 x 5 as half of 3.42 x 10 (1.71 x 10).

- ❖ **Multiply decimal numbers using near multiples by rounding.**
  e.g. 4.3 x 19 as 4.3 x 20 – 4.3 (86 – 4.3)

Stages in Multiplication

Written Multiplication

❖ **Short multiplication of 2-digit, 3-digit and 4-digit numbers by 1-digit numbers.**
e.g. 342 x 7

Approximate first: 350 x 10 = 3,500 so 350 x 5 = 1,750. The answer will be midway between the two; (1750 + 500) 2250 to 3000 (3500 – 500)
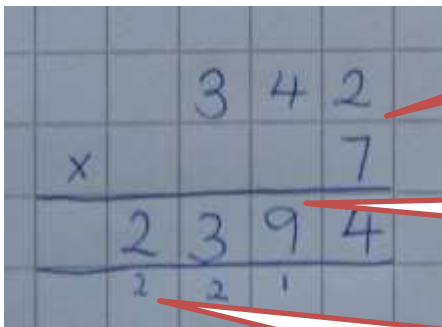
Grid method:

x	300	40	2
7	2100	280	14

```
    14
+  280
+ 2100
  2394
```

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

Short division:

Step 1: Calculate 2 multiplied by 7 (14). Carry one ten below the tens column.

Step 2: Calculate 4 multiplied by 7 (28). Don't forget to add the carried ten. Carry two hundreds below the hundreds column.

Step 3: Calculate 3 multiplied by 7 (21). Don't forget to add the carried hundreds. Carry two thousands below the thousands column or put straight in the thousands column to complete the multiplication.

e.g. 346 x 9
Children will approximate first
346 x 9 is approximately 350 x 10 = 3500

x	300	40	6
9	2700	360	54

```
      54                 346
+    360              X    9
+   2700              31 14
   31 14                4 5
    1 1
```

Stages in Multiplication

e.g. 4346 x 8

Children will approximate first: 4346 x 8 is approximately 4346 x 10 = 43460

x	4000	300	40	6
8	32000	2400	320	48

```
  4346
x    8
34768
  2 3 4
```

```
      48
+    320
+   2400
+  32000
   34768
```

❖ **Long multiplication of 2-digit, 3-digit and 4-digit numbers by 2-digit numbers**.
e.g. 72 x 38

Children will approximate first:
72 x 38 is approximately 70 x 40 = 2800

x	70	2
30	2100	60
8	560	16

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

```
     16
+    60
+   560
+  2100
   2736
     1
```
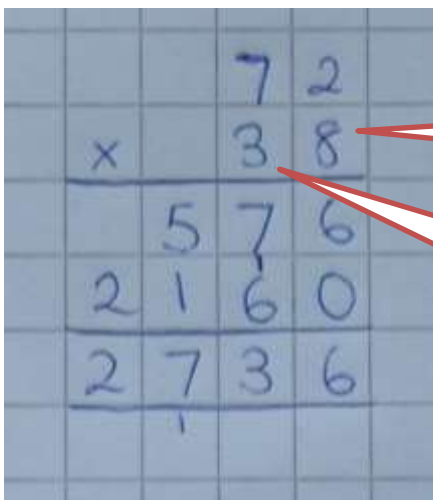

Step 1: Multiply by units first (8), so 72 x 8 broken into steps; 2 x 8 = 16 (ten carried) then 7 x 8 (really 70 x 8) is 56 tens, add the ten already carried, total 57 tens.

Step 2: Multiply by tens (3) next so remember to place a zero in units column, so 72 x 30 broken into steps; 2 x 3 = 6 tens then 7 x 3 (really 70 x 30) is 21 tens, 2100 written as 1 in hundreds column and 2 in thousands column.
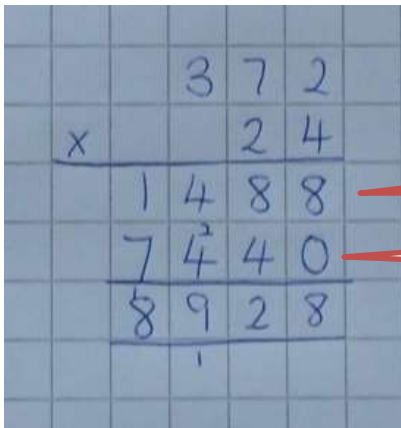
Stages in Multiplication

e.g. 372 x 24

Children will approximate first:
372 x 24 is approximately 400 x 25 = 10000 (calculate 400 x 100 divide by 4) or 400 x 10 then double

x	300	70	2
20	6000	1400	40
4	1200	280	8

```
        8
  +    40
  +   280
  +  1400
  +  1200
  +  6000
     8928
        1
```


(372 x 4)

(372 x 20)

❖ **Short multiplication of decimal numbers using x 100, and ÷ 100;**
e.g. 13.72 x 6 as 1372 x 6 ÷ 100

```
    1372
  x    6
    8232
    2 4 1
```
so then 8232 ÷ 100 = 82.32

Stages in Multiplication

❖ **Short multiplication of money**.

e.g. £13.72 x 6

×	10	3	0.7	0.02
6	60	18	4.2	0.12

```
        13.72
        X 6
        82.32
        2 4 1
```

```
     0.12
  +  4.20
  + 18.00
  + 60.00
    82.32
       1
```

> Ensure the multiplier, the 6 in this case, is written in the correct column compared to the number being multiplied. In this case the 6 should be in the units column.

❖ **Grid multiplication of numbers with up to 2 decimal places by single digit numbers.**

They should know that the decimal points line up under each other.
3.19 x 8

Children will approximate first
3.19 x 8 is approximately 3 x 8 = 24

×	3	0.1	0.09
8	24	0.8	0.72

```
      0.72
   +  0.8
   + 24.00
     25.52
        1
```

```
    3 · 1 9
  ×   8
    2 5 · 5 2
      1     7
```

> Children must have a concrete understanding of place value below one, i.e. tenths and hundredths, in order to multiply decimals.

Stages in Multiplication

❖ **Multiplying proper and improper fractions**, e.g ¾ x 2/3

Step 1:
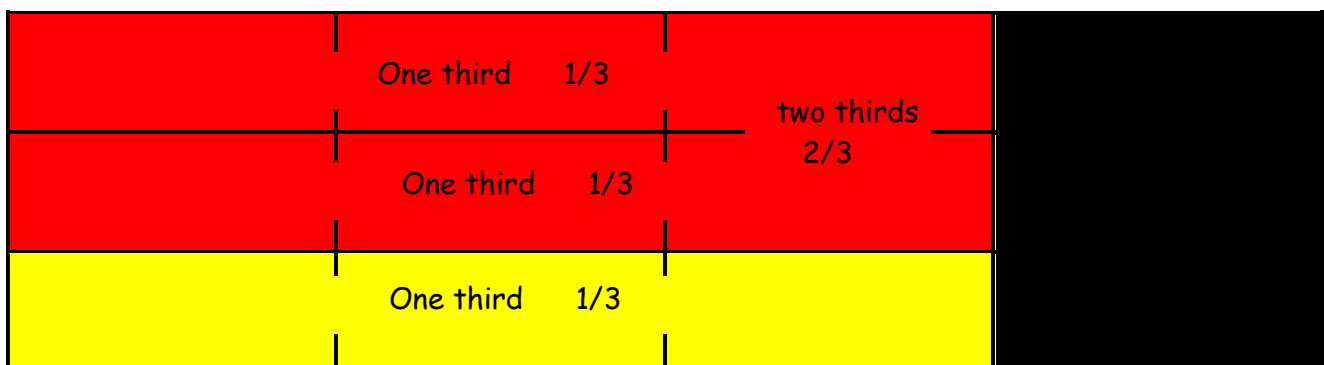Draw a rectangle and divide into quarters. Calculation only needs three quarters.

One quarter 1/4	One quarter 1/4	One quarter 1/4	One quarter 1/4
three quarters 3/4			
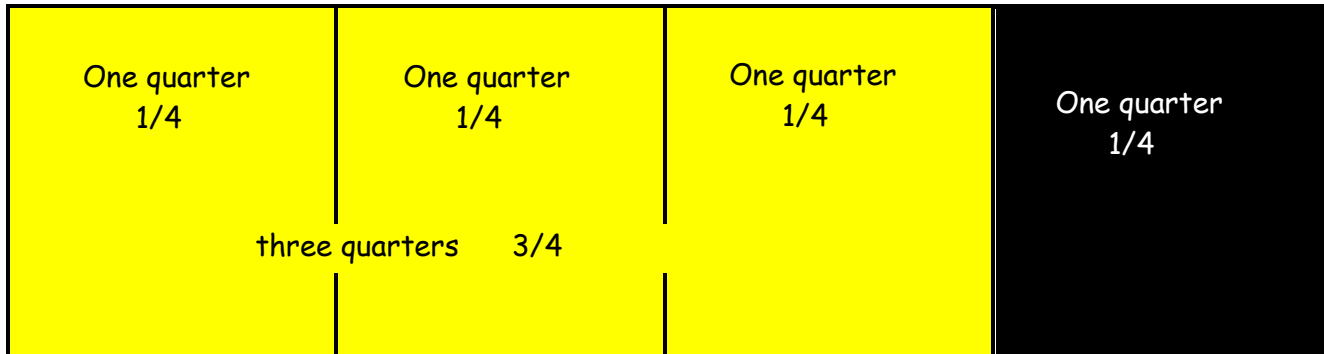
Step 2:
Calculation multiplies three quarters by two thirds; only two thirds of the three quarters are needed.

One third 1/3		two thirds 2/3	
One third 1/3			
One third 1/3			

Step 3: That leaves 6/12ths or one half so three quarters multiplied by two thirds (or two thirds of three quarters) in one half.

Remember ¾ x 2/3 is the same as asking for two-thirds of three-quarters.

$$\frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$$

Stages in Multiplication

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, multiple, product, tens, units, value, inverse, square, factor, integer, decimal, short/long multiplication, 'carry', tenths, hundredths, decimal

National Curriculum 2014 statements:
- ➢ 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.
- ➢ Use their knowledge of the order of operations to carry out calculations involving the four operations.
- ➢ Solve problems involving addition, subtraction, multiplication and division.
- ➢ Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.

Key skills for multiplication at Year 6:
- Recall multiplication facts for all times tables up to **12 x 12 (as Y4 and Y5).**
- Multiply multi-digit numbers, up to 4-digit x 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 round and approximation and determine levels of accuracy.
- Round any integer to a required degree of accuracy.