PROGRESSION THROUGH CALCULATIONS FOR MULTIPLICATION

By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.
Children should not be made to go onto the next stage if:
1) they are not ready.
2) they are not confident.
Children should be encouraged to approximate their answers before calculating. Children should be encouraged to check their answers after calculation using an appropriate strategy. Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

MENTAL CALCULATIONS (ongoing)
These are a selection of mental calculation strategies:
Doubling and halving   Applying the knowledge of doubles and halves to known facts.   e.g. 8 x 4 is double 4 x 4

Using multiplication and division facts. Tables should be practised everyday from Year 1 onwards.
Year 1 begin to learn 2 times table and 10 times table

Year 2 2 times table
5 times table
10 times table
begin to learn 4 times table and 8 times table

Year 3 2 times table
3 times table
4 times table
5 times table
6 times table
8 times table
10 times table
begin to learn 7 times table and 9 times table

Year 4 recall all multiplication facts up to 12 x 12

Using and applying division facts

Children should be able to utilise their tables knowledge to derive other facts.   e.g. If I know 3 x 7 = 21, what else do I know?
30 x 7 = 210, 300 x 7 = 2100, 3000 x 7 = 21 000, 0.3 x 7 = 2.1 etc

Multiplying by 10 or 100 Knowing that the effect of multiplying by 10 is a shift in the digits one place to the left – please note that we don't "just put a zero on the end" ! Knowing that the effect of multiplying by 100 is a shift in the digits two places to the left.

Use closely related facts already known

$$13 \times 11 = (13 \times 10) + (13 \times 1)$$
$$= 130 + 13$$
$$= 143$$

Partitioning 23×4 $= (20 \times 4) + (3 \times 4)$
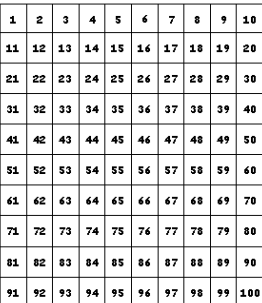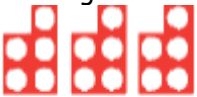$$= 80 + 12$$
$$= 102$$
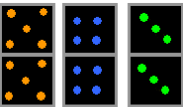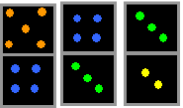
Use of factors $8 \times 12 = 8 \times 4 \times 3$

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

Multiplication Methods:

KEY VOCABULARY FOR MULTIPLICATION: lots of, groups, times, multiply, multiple, product, array & repeated addition.

Foundation	Year 1	Year 2
• Start to solve problems involving doubling.	• 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.	• 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 (x) and equals (=) signs. • Show that multiplication of two numbers can be done in any order (commutative). • Solve problems involving multiplication using materials, arrays, repeated addition, mental methods and multiplication and including problems in contexts.
Counting in ones, twos, tens. Odd and even numbers. Matching pairs eg socks. Noahs ark. Songs and rhymes. Finding doubles in dominoes. Repeated addition in practical contexts. Groups of objects with the same number, counting how many in each group, and finding how many altogether.	Children will experience equal groups of objects and will count in 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups, using pictorial representations, concrete objects and arrays. Counting in twos, fives and tens. Knowing doubles of numbers to 10. Dice and domino games with doubles. Finding patterns of numbers using 100 square and make connections with arrays.	Children develop their understanding of multiplication and use jottings to support calculation: Repeated addition 3 times 5 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x 3 Model using Numicon: $5 + 5 + 5 = 15$ Counting in 3s. Doubles of all numbers up to 10 and doubles of multiples of 10 to 100. Recognise odd and even numbers, supported by Numicon:
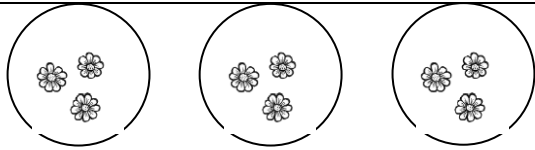
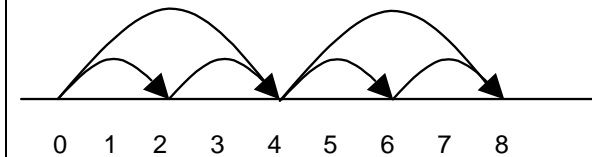|		
	Repeated addition of sets of objects, teacher modelling 3+3+3= 9 Use coins for repeated addition. Model using Numicon: 5 + 5 + 5 = 15	Odd. Even. Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method. ● ● ● ● 4 x 2 or 4 + 4 ● ● ● ● 2 x 4 or 2 + 2 + 2 + 2 Commutatively – children should know that 7x2 has the same answer as 2x7. This can also be shown on the number line. 0 1 2 3 4 5 6 7 8 x = signs and missing numbers 7 x 2 = ☐ ☐ = 2 x 7 7 x ☐ = 14 14 = ☐ x 7 ☐ x 2 = 14 14 = 2 x ☐ ☐ x ▽ = 14 14 = ☐ x ▽

Year 3	Year 4	Year 5	Year 6
• 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 two digit numbers times one digit numbers, using mental and progressing to formal written methods of short multiplication. • Solve problems, including missing number problems, involving multiplication, including positive integer scaling problems and correspondence problems in which n objects are connected to m objects.	• Recall multiplication and division facts for multiplication tables up to 12 x 12. • Use place value, known and derived facts to multiply mentally, including: multiplying by 0 and 1 and multiplying together 3 numbers. • Recognise and use factor pairs and commutativity in mental calculations. • Multiply two digit and three digit numbers by one digit numbers using formal written layout. • Solve problems involving multiplying including using the distributive law to multiply two digit numbers by one digit, integer scaling problems in which n objects are connected to m objects.	• Identify multiples and factors, including finding all factor pairs of a number and common factors of two numbers. • 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 numbers mentally drawing upon known facts, including multiplying whole numbers and those involving decimals by 10, 100 and 1000. • Recognise and use square numbers and cube numbers, write the notation for both squared and cubed and solve problems involving multiplication using the knowledge of factors and multiple, squares and cubes. • Solve problems involving scaling by simple fractions. • Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.	• Multiply multi-digit numbers up to four digits by two digit whole numbers using the formal written method of long multiplication. • Multiply one digit numbers with up to two decimal places by whole numbers. • Perform mental calculations, including with mixed operations and large numbers. • Multiply simple pairs of proper fractions. • Identify common factors, common multiples and prime numbers.
Doubling multiples of 5 up to 50. 15 x 2 = 30 10 + 5 ↓ ↓ 20 + 10 = 30 Know that division is the inverse of	Children use known facts to multiply larger multiples of ten (and corresponding division facts) e.g. 2 x 3 = 6 200 x 3 = 600 600 ÷ 3 = 200	Children will continue to use the grid method to consolidate their understanding of multiplying large numbers. They will apply this understanding to use of formal written methods for short and long	Using similar methods to the above (Year 5), they will be able to multiply decimals with up to two decimal places by a single digit number and then two digit numbers, approximating

multiplication and that multiplication is the inverse of addition.

Understand multiplication as repeated addition by using an ENL to solve 5 x 4

| 0 | 5 | 10 | 15 | 20 |
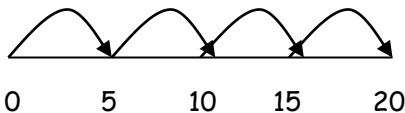
Continue to use arrays - Children should be able to model a multiplication calculation using an array. This knowledge
will support with the development of the grid method.

```
* * * * * * *
* * * * * * *
* * * * * * *
```

Introduce the grid method to solve e.g 35 x 2

x	30	5
2	60	10

Progress towards formal short multiplication.
24 × 6 becomes

```
    2  4
×      6
 1  4  4
    2
```

Once secure with the grid method, which they will continue to use, children will be introduced to formal written method for short multiplication (multiply two digits and three digit numbers by one digit)

Use the grid method.
234 x 7 =

x	200	30	4	
7	1400	210	28	= 1638

Extend use of formal short multiplication.
342 x 7 becomes:

```
   3  4  2
×         7
 2  3  9  4
   2  1
```

Use methods within problem solving contexts such as money and measures. E.G. Apply scaling to problems such as recipes and ingredients.

multiplication for large numbers.

Grid method HTU X TU, approximate first.

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

=7440
=1488
8928

Use the grid method to solve 6.24 x 8 (approximately 6 x 8 = 48)

X	6	0.2	0.04
8	48	1.6	0.32

= 49.92

Missing number problems _ x _ = 7 x 4, by using knowledge of factors to make 28.

Multiply decimals and integers by 10, 100 and 1000.

Use formal long multiplication for up to 4 digit x 2 digit.
124 × 26 becomes

```
     1  2  4
×       2  6
   7  4  4
 2  4  8  0
 3  2  2  4
   1  1
```

Multiply proper fractions:

first. They should know that the decimal points line up under each other.

Use formal long multiplication for up to 4 digits x 2 digits.
E.G. 1354 X 24 =

```
    12
    1
   1354
X    24
  27080
   5416
  32496
    1
```

Use the grid method to solve 6.24 x 8 (approximately 6 x 8 = 48)

X	6	0.2	0.04
8	48	1.6	0.32

= 49.92

Multiply simple pairs of proper fractions.

$$\frac{2}{3} \times \frac{2}{5} = \frac{4}{15}$$