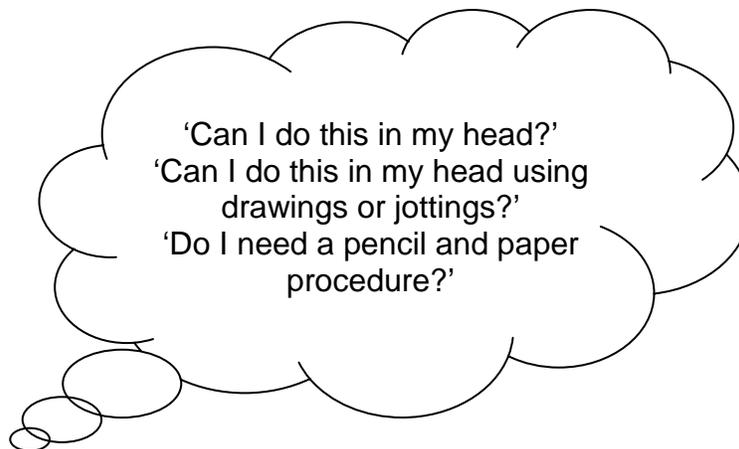# Progression in Multiplication

At Cobham Primary School, we have developed a consistent approach to the teaching of written calculation methods in order to establish continuity and progression through the school.
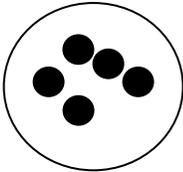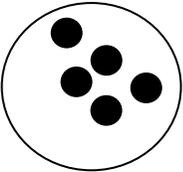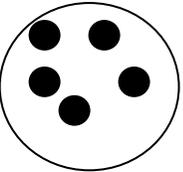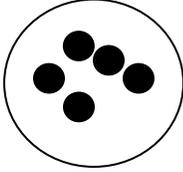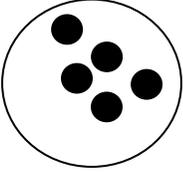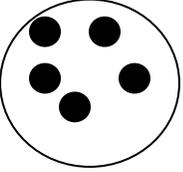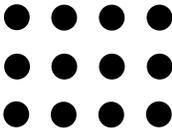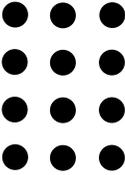
This calculation policy outlines the progression in mathematical strategies and skills from Foundation to Year 6, and the typical year group children will be in when they are first introduced to particular concepts. However, this calculation policy is to be used flexibly, as children in each year group may draw from year groups above and below their own, according to their ability. It is imperative that visual images and manipulates are used alongside the teaching of each stage.

It is essential that, in all year groups, multiplication is:
- taught alongside its inverse division, as these important links will assist children in mastering the operation.
- involved in situations with real life contexts, rich problem solving activities and word problems.

We aim for all children to be able to use a reliable and efficient written method for each operation with confidence and understanding by Upper Key Stage 2. Children will be encouraged to consider the calculation and the most efficient method to reach the answer.

'Can I do this in my head?'
'Can I do this in my head using drawings or jottings?'
'Do I need a pencil and paper procedure?'

Strategy	*Rationale*
## Adding groups by using equipment Multiplication is introduced through problems involving 'lots of' objects. **Example** 3 lots of 5 = □ **5** (6 7 8 9) **10** (11 12 13 14) **15** 	Children will physically make sets or groups, and then add them together by counting up from 1 (until all of the objects have been used).
## Adding groups The multiplication sign (x) will be introduced as a short way of saying 'lots of'. **Example** 5 x 3 = □ There are 5 buns on a plate. How many buns are on 3 plates? **5 + 10 + 15**	Please note that the number sentence '5x3' is read '3 lots of 5'. Dots are often drawn in groups. This shows how many 'lots of' there are. These groups are then added together
## Representing multiplication with arrays The product of two numbers will be shown using an array. In doing so the children will identify the commutatively of multiplication. **Example** 4 x 3 = ? A chew costs 4p. How much do 3 chews cost? or 4 x 3 = 12 and 3 x 4 = 12	Drawing sets gives the children an image of the answer. It also helps them to see that the numbers are reversible (commutative). Children creating these arrays and then physically turning it help to move towards recording this more abstractly. This stage begins to showcase how jottings are essential in mathematical problems.

Caring ┊ Proud ┊ Successful

Comparisons

Children will be given the opportunity to develop their ability to apply multiplication much more flexibly.

Example

←—5cm—→   ←———————20cm———————→

Children will see that the longer ribbon is four times the length of the shorter, rather than 15cm longer.

Hundred squares

Children will notice patterns in hundred squares, as they begin to count up in different amounts. They will begin to identify which number will come next in a sequence.

This is an introduction to more formal 'times tables'.

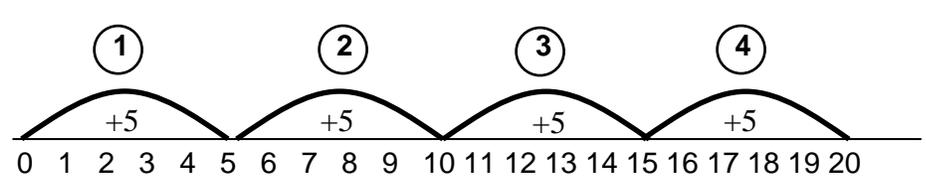They will begin to count in multiples of 2,5 and 10.

Number lines

The children will use a number line to help them to 'count up' in different amounts, much like in the repeated addition evidenced in the number arrays. This will initially be using marked number lines.

Example

5 x 4 = ?

①   ②   ③   ④

+5   +5   +5   +5
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

So 5 x 4 = 20

The children will be encouraged to jot down / highlight important numbers along the way, especially the number of 'jumps' they have done.

Vocabulary associated with multiplication

It is important for children to see that the solution to the questions
'4x3' and '3x4 are identical.
However, in doing so we will emphasise that the actual representation of the two questions (through jottings or other models) are not. For example, '4x3' represents 4 'lots of' 3, whilst '3x4' asks for 3 'lots of 4' items.

Times table facts should be taught up to 12x_, alongside their corresponding division facts.

Understanding this and how the numbers can be manipulated in a number sentence will help to show the commutative law of multiplication, and how multiplication relates to division.

Partitioning numbers

Children will partition (break apart) each part of a large number, and then they will multiply each component to obtain a solution.

> **Example**
>
> 124 x 6 = ?
>
> | | | |
> |---|---|---|
> | (100 x 6) | = | 600 |
> | (20 x 6) | = | 120 |
> | (4 x 6) | = | 24 |
>
> 600 + 120 + 24 = 744

By the end of Year 3 children should know all multiplication facts for times tables 1 – 6 (Taught to 12x_)

Grid method

The grid method will then be introduced.

> **Example**
>
> 124 x 6 = ?
> 124 books were sold. Each book cost £6. How much money was taken?
>
> | x | H
100 | T
20 | U
4 | |
> |---|---|---|---|---|
> | 6 | 600 | 120 | 24 | = 744 |

124 is partitioned into 100, 20 and 4, and each part is multiplied by 6.

The three answers are then added together.

This method requires good understanding of times tables. As a result, a multiplication grid may need to be used at this stage.

Use of practical resources will be needed to support understanding of concept.

Extended grid method

Here the children will use the grid method for numbers, where both numbers are greater than 9.

> **Example**
>
> 72 x 34 = ?
> An exercise book costs 72p.
> How much would it cost for a class of 34 children?
>
> | x | 70 | 2 | |
> |---|---|---|---|
> | 30 | 2100 | 60 | = 2160 |
> | 4 | 280 | 8 | = 288 + |
> | | | | 2448 |

It does not matter which number is on the top, and which is down the side of the grid.

Both numbers are partitioned into 'tens' and 'units', and then each part is multiplied together. The total for each row is then added, before finally finding a total of these values.

This method requires good understanding of times tables.

By the end of Year 4 children should know all multiplication facts to 12x12

Short multiplication

Short multiplication will then be introduced. This involves multiplying any whole number by a single digit number.

Example

46 x 9 = ?

First, the 'unit' digit of 46 is multiplied by 9. As this results in a two-digit number, the 'tens' are then placed in the 'tens' column.

```
  4 6
x   9
    4
  5
```

Next, the 'tens' digit of 46 is multiplied by 9 (4tens x 9 = 36 tens). Since there is also 5 tens in this column from the first step, these are added to the total. We now have 41 tens (410), which can also be written as 4 hundreds, and 1 ten.

```
  4 6
x   9
  1 4
 4 5
```

As there are no 'hundreds' digit in 46 to multiply by 9, we record a 4 in the hundreds column (this was from the last step).

```
    4 6
x     9
  4 1 4
   4 5
```

This method will then lead to multiplication of numbers involving decimals. Estimation by rounding will be encouraged first.

Example

4.62 x 3 = ?

```
   4. 62
x      3
 13.86
     1
```

This method will initially be taught alongside the partitioning approach, however it is both more economical and quicker than the former method

If asked at any stage the children will be able to identify what each digit in a calculation represents (for example whether it represents so many 'hundreds', 'tens' or 'units').

Short multiplication methods

Example

46 x 19 = ?

```
      4 6
x   1 9
```

Step 1: Multiply top amount x units   4 1 4   (46x9)
Step 2: Multiply top amount x tens   4 6 0   (46x10)
Step 3: Add the answers together   8 7 4

This method will also be used to multiply HTU x TU and decimal numbers.