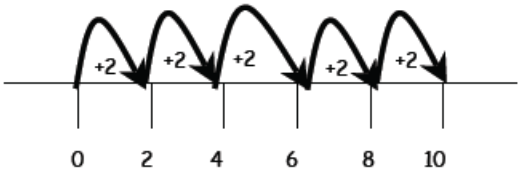
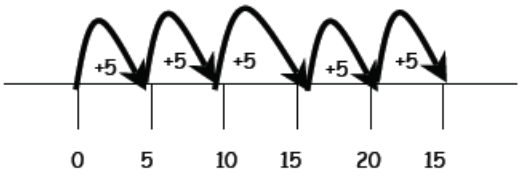
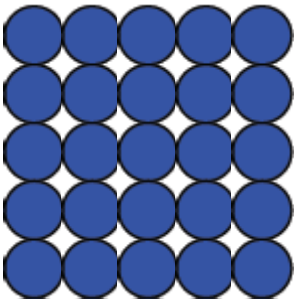
Strategies your Child might Use for...
MULTIPLICATION

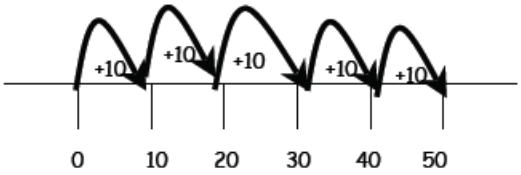
Repeated Addition

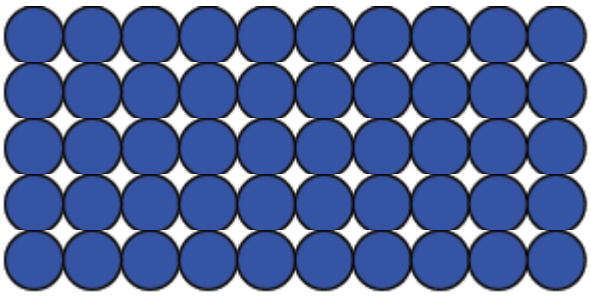
Often, the simplest way for a child to consider multiplication is by thinking in terms of 'how many times'. By using a method of repeated addition, either with objects, fingers or the 'good old number line', they will be able to calculate the solutions to some quite challenging multiplication problems. Although not particularly efficient, understanding repeated addition is a valuable process ahead of the development of more mature, economical strategies later on in a child's development.









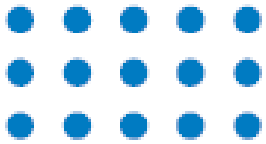


Arrays

Discuss ways of grouping a number of dots in a rectangular array.
For example, 12 can be represented as follows:

4x3=12 3x4=12 2x6=12 6x2=12

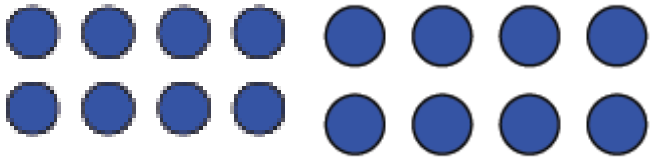
As a result, children begin to understand that 15 = 3 x 5 as well as 5 x 3, or 3 x 5 = 15 and 5 x 3 = 15. This is called the commutative law, although our pupils will not need to know this name.



The process of arranging counters in a rectangular array is a helpful introduction to understanding about factors. If a number can be arranged in a rectangle (excluding a straight line) then it can be factorised. Numbers that can only be arranged as a straight line are prime numbers.

Repeated Doubling

Once children recognise doubles as twice a number, and can find 'two times' a whole number, they can use this understanding to find other multiples of numbers.



Whilst 'double 4' is equal to eight, double this value is sixteen, which must therefore be equivalent to '4 lots of 4'.

Children across school will begin to recognise the value in using doubling as a way of finding not only twice the value of a number, but also 4x, 8x and beyond, eventually linking this idea to the fact that 'six times' a number is twice the value of 'three times'.

Mental recall (multiplication)

Mental recall of multiplication facts is the ability to recall answers to any of the multiplication tables up to 12 x 12. In order to become efficient and more rapid in their recall, children are encouraged to practise their times table facts using a number of strategies.

These include

- Listening to CDs
- Reciting tables aloud
- Writing them down
- Looking at posters or flashcards
- Learning mnemonics or rhymes for certain tables (I ate and I ate until I was sick on the floor, 8x8=64)
- Learning shortcut strategies and patterns in answers (Finger method for 9x, and how the units digit is always 0 for 10x)

Using Known Facts to Support Multiplication & Division

Often, we use what we already know as a point of reference for working out things that we do not know or need to work out. For example, we might recognise that 13 is not a multiple of 3 because we know that 12 is. The same idea can be applied to multiplication.
If a child knows his/her times tables facts up to 10x, then he/she should be able to use this knowledge and understanding to calculate more challenging problems, such as 12x7 or 18x6, for example...

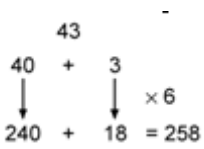
12 x 7 = (10 x 7) + (2 x 7)
= 70 + 14
= 84

18 x 6 = (10 x 6) + (8 x 6)
= 60 + 48
= 108

This strategy is very similar to the grid method of multiplication, but confident mathematicians are often able to manipulate numbers such as these in their heads.

Partitioning Mentally

Mental methods for multiplying TU × U allow the 'tens' and 'ones' to be multiplied separately to form partial products. These are then added to find the total product. Either the 'tens' or the 'units' can be multiplied first, but it is more common to start with the 'tens'. Informal recording (in Year 4, for example) might be:



Alternative recording of such a partitioning method might look like this:

$$14 \times 3 = (10 + 4) \times 3$$
$$= (10 \times 3) + (4 \times 3) = 30 + 12 = 42$$
$$43 \times 6 = (40 + 3) \times 6$$
$$= (40 \times 6) + (3 \times 6) = 240 + 18 = 258$$

Note: These methods are based on the distributive law. Children will be introduced to the principle of this law (not its name) in Years 2 and 3, for example when they use their knowledge of the 2, 5 and 10 times-tables to work out multiples of 7:

$$7 \times 3 = (5 + 2) \times 3 = (5 \times 3) + (2 \times 3) = 15 + 6 = 21$$

Grid Method

This method for working out multiplication calculations relies on some knowledge of partitioning the individual numbers according to their place value. It is a useful method for working out any multiplication calculation larger than single digit multiplied by single digit. A grid is drawn and the numbers that make up each part of the calculation are partitioned into units, tens, hundreds and thousands in line with each part of the grid. (See examples below)

7 x 36=

X	30	6
7		

12 x 124

X	100	20	4
10			
2			

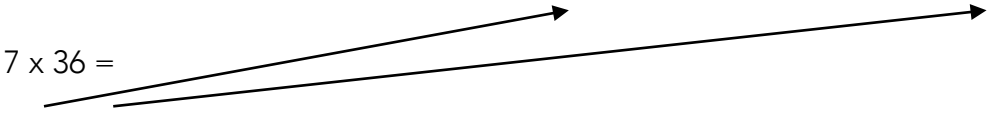
The next stage is to work out the individual answers for each square on the grid.

X	30	6
7	210	

X	100	20	4
10	1000		
2		40	

When every answer has been filled in and checked, you need to add up all of the answers within the grid to find the overall answer to the original calculation.

X	30	6
7	210	42



7 x 36 =

210 + 42 = 252

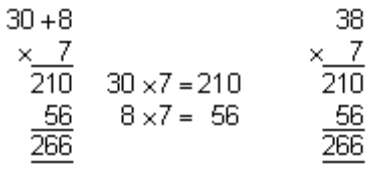
X	100	20	4
10	1000	200	40
2	200	40	8

12 x 124 = (1000 + 200 + 40) + (200 + 40 + 8) = 1488

This 'grid' method should always be used with another multiplication strategy for checking as it includes knowledge and understanding of place value, partitioning and addition.

An Expanded Method of Short Multiplication

The next step is to represent the method of recording in a column format, but showing the working. Children's attention will be drawn to the links with the grid method.
Children should describe what they do by referring to the actual values of the digits in the columns. For example, the first step in 38 × 7 is 'thirty multiplied by seven', not 'three times seven', although the relationship 3 × 7 will be stressed.



Short Multiplication

Short multiplication can be used to multiply a large number by a **single** digit number. Encourage your child to multiply each digit from the larger number by the single digit number. Start with the units column (number on the right) and work from right to left.

Example

Set out your short multiplication like this:

4 8 7
× 8

First multiply the number of ones, 7 multiplied by 8 in this example. This gives 56. Record the 6 on the answer line in the 'ones' column, and carry the 5 into the next column (put this under the answer line)

4 8 7
× 8
_ 6
5

The next job is to work out 80 lots of 8! This gives 640, but children who are confident enough in their maths to be using this strategy should understand that this can be simplified by considering it as 8 lots of '8 tens', which results in '64 tens'. Recording '64 tens' in the 'tens' column requires further carrying, but only after the addition of the 5 tens that were 'carried' across when multiplying 7 by 8. (64 + 5 = 69) So the children record '9' on the answer line, carrying 6 into the next column (this, in fact, is '6 hundreds', equivalent to the '60 tens' that have been carried across).

4 8 7
× 8
_ 9 6
6

This continues for each digit within the top number. In our example, '4 hundreds' times 8 gives '32 hundreds', and adding on the 6 that has been carried underneath gives '38 hundreds', equivalent to 3800. This is recorded in the appropriate 'hundreds' and 'thousands' columns. Since this is the last column to be multiplied, both digits can be placed on the answer line.

4 8 7
× 8
3896

Using Factors in Division and Multiplication

A factor is a number that divides exactly into another number. For example, the factors of 6 are 1, 2, 3 and 6. Factors can be used to solve division or multiplication problems:

960 ÷ 30 = 960 ÷ 3 ÷ 10 (or 960 ÷ 10 ÷ 3) This is because 30 is equivalent to 3 x 10 or 10 x 3.

17 x 12 = 17 x 3 x 4 (or 17 x 4 x 3) This is because 12 is equivalent to 4 x 3 or 3 x 4.