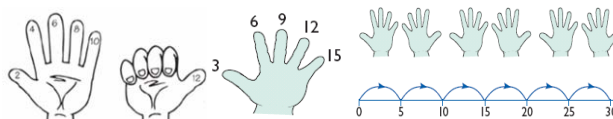


Multiplication

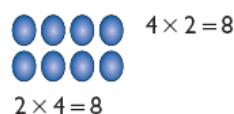
Early Skills

Multiplication as counting in equal steps - '5, 10, 15, 20', or in twos or tens or other multiples
Include practical activities and number rhymes.

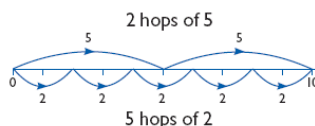


- leading to multiplication as repeated addition.

Understanding multiplication as describing an array.



Recognising that multiplication can be done in any order - e.g. realising that 5×2 is the same as 2×5 .



Mental multiplication using partitioning - Introduce in Year 3 develop in Year 4

- Mental methods for multiplying $TU \times U$ can be based on the distributive law of multiplication over addition. This allows 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 ones can be multiplied first but it is more common to start with the tens.

Informal recording in Year 3 might be:

$$\begin{array}{r} 43 \\ 40 + 3 \\ \downarrow \quad \downarrow \times 6 \\ 240 + 18 = 258 \end{array}$$

Also record mental multiplication using partitioning:

$$\begin{aligned} 14 \times 3 &= (10 + 4) \times 3 \\ &= (10 \times 3) + (4 \times 3) = 30 + 12 = 42 \\ 43 \times 6 &= (40 + 3) \times 6 \\ &= (40 \times 6) + (3 \times 6) = 240 + 18 = 258 \end{aligned}$$

To multiply successfully, children need to be able to:

- recall all multiplication facts to 10×10 ;
- partition number into multiples of one hundred, ten and one;
- work out products such as 70×5 , 70×50 , 700×5 or 700×50 using the related fact 7×5 and their knowledge of place value;
- add two or more single-digit numbers mentally;
- add multiples of 10 (such as $60 + 70$) or of 100 (such as $600 + 700$) using the related addition fact, $6 + 7$, and their knowledge of place value;
- add combinations of whole numbers using the column method.

Note: It is important that children's mental methods of calculation are practised and secured alongside their learning and use of an efficient written method for multiplication.

Grid method - end of Year 3, beginning of Year 4

- An expanded method that links directly to the mental method. It is an alternative way of recording.

$$\begin{array}{r|l|l} \times & 30 & 8 \\ 7 & 210 & 56 \\ \hline & 210 & 56 \\ & + & 56 \\ \hline & & 210 \\ & & + 56 \\ \hline & & 266 \end{array}$$

- Extend to $HTU \times U$

$$\begin{array}{r|l|l|l} \times & 200 & 80 & 4 \\ 3 & 600 & 240 & 12 \\ \hline & 600 & 240 & 12 \\ & + & & 12 \\ \hline & & & 612 \end{array}$$

- Extend to $TU \times TU$, asking children to estimate first.
- Start with the grid method. The partial products in each row are added, and then the two calculations at the end of each row are added to find the total product.

$$\begin{array}{r|l|l} \times & 50 & 6 \\ 20 & 1000 & 120 \\ 7 & 350 & 42 \\ \hline & 1000 & 120 \\ & + & 392 \\ \hline & & 1120 \\ & + & 392 \\ \hline & & 1512 \end{array}$$

- Extend to decimals

$$\begin{array}{r|l|l} \times & 4.0 & 0.9 \\ 3 & 12.0 & 2.7 \\ \hline & 12.0 & 2.7 \\ & + & 2.7 \\ \hline & & 12.0 \\ & + & 2.7 \\ \hline & & 12.9 \end{array}$$

Using and Applying

- Once children are secure with this method check understanding by using missing number examples

$$\begin{array}{r|l|l|l} \times & 200 & \blacksquare & \blacksquare \\ 3 & \blacksquare & 240 & 12 \end{array}$$

Expanded short multiplication

- The next step is to represent the method of recording in a column format, but showing the working. Draw attention to the links with the grid method above.
- 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 should be stressed.
- Most children should be able to use this expanded method for $TU \times U$ by the end of Year 4.

$$\begin{array}{r} 38 \\ \times 7 \\ \hline 210 \\ 56 \\ \hline 266 \end{array} \quad \begin{array}{l} 30 \times 7 = 210 \\ 8 \times 7 = 56 \end{array}$$

Short multiplication

- The recording is reduced further, with carry digits recorded below the line.
- If, after practice, children cannot use the compact method without making errors, they should return to the expanded format of stage 3.

$$\begin{array}{r} 38 \\ \times 7 \\ \hline 266 \\ \hline \end{array}$$

The step here involves adding 210 and 50 mentally with only the 5 in the 50 recorded. This highlights the need for children to be able to add a multiple of 10 to a two-digit or three-digit number mentally before they reach this stage.

Two-digit by two-digit products

- Showing the links to the grid method.

56×27 is approximately $60 \times 30 = 1800$.

$$\begin{array}{r} 56 \\ \times 27 \\ \hline 1000 \\ 120 \\ 350 \\ \hline 1512 \\ \hline \end{array} \quad \begin{array}{l} 50 \times 20 = 1000 \\ 6 \times 20 = 120 \\ 50 \times 7 = 350 \\ 6 \times 7 = 42 \end{array}$$

- Reduce the recording further.
- The carry digits in the partial products of $56 \times 20 = 120$ and $56 \times 7 = 392$ are usually carried mentally.

56×27 is approximately $60 \times 30 = 1800$.

$$\begin{array}{r} 56 \\ \times 27 \\ \hline 1120 \\ 392 \\ \hline 1512 \\ \hline \end{array} \quad \begin{array}{l} 56 \times 20 \\ 56 \times 7 \end{array}$$

- Children who are already secure with multiplication for $TU \times U$ and $TU \times TU$ should have little difficulty in using the same method for $HTU \times TU$.
- Again, the carry digits in the partial products are usually carried mentally.

286×29 is approximately $300 \times 30 = 9000$.

$$\begin{array}{r} 286 \\ \times 29 \\ \hline 5720 \\ 2574 \\ \hline 8294 \\ \hline \end{array} \quad \begin{array}{l} 286 \times 20 \\ 286 \times 9 \end{array}$$

Using and Applying

- Once children are secure with this method check understanding by using missing number examples

$$\begin{array}{r} \square \quad 4 \quad \square \\ \times \quad \quad \quad 6 \\ \hline 2 \quad 0 \quad 5 \quad 2 \end{array}$$