

# Multiplication - Pencil and paper method

## Expectations for each year group:

- Year 3: Write and calculate mathematical statements for multiplication using the multiplication tables they know, including for two-digit numbers times one-digit numbers using mental and progressing to formal written methods.  
Solve problems involving multiplication.
- Year 4: Multiply two-digit and three-digit numbers by a one-digit number using formal written methods.  
Solve word problems involving the four operations
- Year 5: Multiply numbers up to 4 digits by a 1 or 2-digit number using a formal written method, including long multiplication for two-digit numbers.  
Solve problems involving multiplication
- Year 6: Multiply multi-digit numbers up to 4-digits by a two-digit whole number using the formal written method of long multiplication  
Solve problems involving multiplication.  
Multiply one-digit numbers with up to two decimal places by whole numbers

## Key skills to support understanding:

- Arrays
- repeated addition
- times tables
- place value
- commutative law i.e. multiplication can be done in any order
- distributive law i.e.  $30 \times 7 + 9 \times 7 = 39 \times 7$
- multiplying numbers by 10, 100, 1000
- patterns of similar calculations
- Models and images
- Reasoning: provide opportunities e.g., 'Talk it, Solve it' and White Rose activities.

## Multiplication - Pencil and paper method

**Doubling - the 'diamond' method:**

**Diamond Method:**

$$\begin{array}{r} \text{Double} \quad 47 \\ \quad \quad / \quad \backslash \\ \quad 40 \quad 7 \\ \quad \quad | \quad | \\ \quad 80 \quad 14 \\ \quad \quad \backslash \quad / \\ \quad \quad 94 \end{array}$$

**Grid method - informal**

TU x U

$$23 \times 8 =$$

Approximate first. E.g.  $23 \times 8$  is approximately  $20 \times 10 = 200$

$$\begin{array}{r} \times \quad 20 \quad 3 \\ 8 \quad \boxed{160} \quad \boxed{24} \quad = \quad 184 \end{array}$$

\* Multiply by least significant digit first

# Multiplication - Pencil and paper method

TU x TU

$$72 \times 38 =$$

Approximate first. E.g.  $72 \times 38$  is approximately  $70 \times 40 = 2800$

$$\begin{array}{r} \times \quad 70 \quad 2 \\ 30 \quad \boxed{2100} \quad \boxed{60} \\ 8 \quad \boxed{560} \quad \boxed{16} \\ \hline \end{array} = \begin{array}{r} 2160 \\ + 576 \\ \hline 2736 \end{array}$$

\* Multiply by least significant digit first

**Transition from grid method to standard written method**

Teach grid method alongside column written method.  
But start with least significant digit rather than significant digit

$$\begin{array}{r} \times \quad 20 \quad 3 \\ 8 \quad \boxed{160} \quad \boxed{24} \\ \hline \end{array} = 184$$

## Multiplication - Pencil and paper method

TU x TU

$$\begin{array}{r} \times \quad 70 \quad 2 \\ 30 \quad \boxed{\begin{array}{|c|c|} \hline 2100 & 60 \\ \hline \end{array}} = 2160 \\ 8 \quad \boxed{\begin{array}{|c|c|} \hline 560 & 16 \\ \hline \end{array}} = + 576 \\ \hline 2736 \\ \hline 1 \end{array}$$

## Standard written method - formal

TU x U

Approximate first. E.g.  $23 \times 8$  is approximately  $20 \times 10 = 200$

$$\begin{array}{r} 23 \\ \times \quad 8 \\ \hline 184 \\ 2 \end{array}$$

## Multiplication - Pencil and paper method

TU x TU

$$72 \times 38 =$$

Approximate first. E.g.  $72 \times 38$  is approximately  $70 \times 40 = 2800$

$$\begin{array}{r} 72 \\ \times 38 \\ \hline 576 \\ \phantom{5}1 \\ 2160 \\ \hline 2736 \\ \phantom{27}1 \end{array}$$