

Notes 4 Parents Multiplication



Marpool Primary School

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'Every child will have confidence in their own self-worth and an aspiration to achieve.'

Multiplication vocabulary = multiplied by, multiply, product, groups of, lots of, times table, times x

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

Stage 1: Mental multiplication using partitioning

Method

Mental methods for multiplying $TU \times U$ are a useful starting point as is linking multiplication to repeated addition. This allows the tens and ones to be multiplied separately. 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.

Example

Informal recording in Year 4 might be:

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

Also record mental multiplication using partitioning:

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

Note: Children should be introduced to this method 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:



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

Stage 2: The grid method

Method

As a starting point, a written method which uses a grid can be used. It is an alternative way of recording the above steps.

It is better to place the number with the most digits in the left-hand column of the grid so that it is easier to add the partial answers.

The next step is to move the number being multiplied (38 in the example shown) to an extra row at the top. Presenting the grid this way helps children to set out the addition of the partial answers 210 and 56.

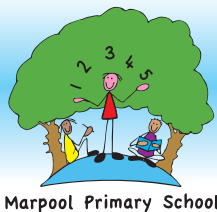
Example

$$38 \times 7 = (30 \times 7) + (8 \times 7) = 210 + 56 = 266$$

| | |
|----|-----|
| x | 7 |
| 30 | 210 |
| 8 | 56 |
| | 266 |

| | |
|---|--------|
| | 30 + 8 |
| x | 7 |
| | 210 |
| | 56 |
| | 266 |

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Stage 3: Expanded short multiplication

Method

The next step is to represent the method of recording in a column format, but showing the working.

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 x U by the end of Year 4.

Example

| | |
|--|--|
| $30 + 8$ | 38 |
| $\begin{array}{r} \times 7 \\ \hline 210 \\ 56 \\ \hline 266 \end{array}$ | $\begin{array}{r} \times 7 \\ \hline 210 \\ 56 \\ \hline 266 \end{array}$ |
| $30 \times 7 = 210$ | |
| $8 \times 7 = 56$ | |

Stage 4: Short multiplication

Method

Extend to TU x TU, asking children to estimate first.

Start with the grid method. The partial products in each row are added, and then the two sums at the end of each row are added to find the total product.

As in the grid method for TU x U in stage 4, the first column can become an extra top row as a stepping stone to the method below.

The next step is to reduce the recording, showing the links to the grid method above. The carry digits in the partial products of $56 \times 20 = 120$ and $56 \times 7 = 392$ are usually carried mentally.

The aim is for most children to use this long multiplication method for TU x TU by the end of Year 5.

Example

| | | | |
|----|------|-----|------|
| x | 20 | 7 | |
| 50 | 1000 | 350 | 1350 |
| 6 | 120 | 42 | 162 |
| | | | 1512 |
| | | | 1 |

| | | | |
|---|------|-----|------|
| x | 50 | 6 | |
| | 20 | 7 | |
| | 1000 | 350 | 1350 |
| | 120 | 42 | 162 |
| | | | 1512 |
| | | | 1 |

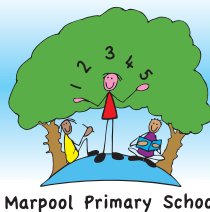
56×27 is approximately $60 \times 30 = 1800$.

| | |
|--|-----------------------|
| $\begin{array}{r} 56 \\ \times 27 \\ \hline 1000 \\ 120 \\ 350 \\ 42 \\ \hline 1512 \\ 1 \end{array}$ | $50 \times 20 = 1000$ |
| | $6 \times 20 = 120$ |
| | $50 \times 7 = 350$ |
| | $6 \times 7 = 42$ |

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

| | |
|--|----------------|
| $\begin{array}{r} 56 \\ \times 27 \\ \hline 1120 \\ 392 \\ \hline 1512 \\ 1 \end{array}$ | 56×20 |
| | 56×7 |

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Stage 5: Three-digit by two-digit products

Method

Extend to HTU x TU asking children to estimate first. Start with the grid method.

It is better to place the number with the most digits in the left-hand column of the grid so that it is easier to add the partial products.

The next step is to reduce the recording, showing the links to the grid method above.

This expanded method is long with six multiplications and a lengthy addition of numbers with different numbers of digits to be carried out.

Children who are already secure with multiplication for TU x U and TU x TU should have little difficulty in using the same method for HTU x TU.

Again, the carry digits in the partial products are usually carried mentally.

Example

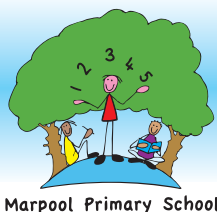
286×29 is approximately $300 \times 30 = 9000$.

| | | | |
|-----|------|------|------|
| x | 20 | 9 | |
| 200 | 4000 | 1800 | 5800 |
| 80 | 1600 | 720 | 2320 |
| 6 | 120 | 54 | 174 |
| | | | 8294 |
| | | | 1 |

$$\begin{array}{r}
 286 \\
 \times 29 \\
 \hline
 4000 \\
 1600 \\
 120 \\
 1800 \\
 720 \\
 54 \\
 \hline
 8294 \\
 1
 \end{array}$$

$$\begin{array}{r}
 286 \\
 \times 29 \\
 \hline
 5720 \\
 2574 \\
 \hline
 8294 \\
 1
 \end{array}$$

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Key objectives for multiplication

| Year group | Objective |
|------------|--|
| Year 1 | <ul style="list-style-type: none"> Count on or back in ones, twos, fives and tens and use this knowledge to derive the multiples of 2, 5 and 10 to the tenth multiple |
| Year 2 | <ul style="list-style-type: none"> Represent repeated addition and arrays as multiplication Use practical and informal written methods and related vocabulary to support multiplication Use the symbols \times and $=$ to record and interpret number sentences |
| Year 3 | <ul style="list-style-type: none"> Multiply one-digit and two-digit numbers by 10 or 100, and describe the effect Use practical and informal written methods to multiply two-digit numbers (e.g. 13×3); round remainders up or down, depending on the context Understand that division is the inverse of multiplication and vice versa; use this to derive and record related multiplication and division number sentences |
| Year 4 | <ul style="list-style-type: none"> Multiply numbers to 1000 by 10 and then 100 (whole-number answers), understanding the effect; relate to scaling up or down Develop and use written methods to record, support and explain multiplication of two-digit numbers by a one-digit number (e.g. 15×9) Use a calculator to carry out one-step and two-step calculations |
| Year 5 | <ul style="list-style-type: none"> Use a calculator to solve problems, including those involving decimals or fractions Refine and use efficient written methods to multiply and divide HTU \times U, TU \times TU, U.t \times U Use understanding of place value to multiply whole numbers and decimals by 10, 100 or 1000 Extend mental-methods for whole-number calculations, for example to multiply a two-digit by a one-digit number (e.g. 12×9), to multiply by 25 (e.g. 16×25) |
| Year 6 | <ul style="list-style-type: none"> Calculate mentally with integers (whole numbers) and decimals: TU \times U, TU \div U, U.t \times U, U Use efficient written to multiply integers and decimals by a one-digit integer, and to multiply two-digit and three-digit integers by a two-digit integer Relate fractions to multiplication Use a calculator to solve problems involving multi-step calculations |