

Progression for Multiplication

Written methods for multiplication of whole numbers

The aim is that children use mental methods when appropriate, but for calculations that they cannot do in their heads they use an efficient written method accurately and with confidence. Children are entitled to be taught and to acquire secure mental methods of calculation and one efficient written method of calculation for multiplication which they know they can rely on when mental methods are not appropriate.

To multiply successfully, children need to be able to:

Understand multiplication as arrays and repeated addition

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 practiced and secured alongside their learning and use of an efficient written method for multiplication. Mental methods may be supported by jottings. **These jottings are part of the calculating process and must not be erased or written in a different place to the calculation.**

Level 3

Uses mental recall of 2, 3, 4, 5 and 10 multiplication tables.

Solve whole number problems involving multiplication.

Level 4

Uses understanding of place value to multiply whole numbers by 10 or 100.

Uses a range of mental methods of computation with the four operations.

Uses mental recall of multiplication facts up to 10×10 .

Uses efficient written methods of short multiplication.

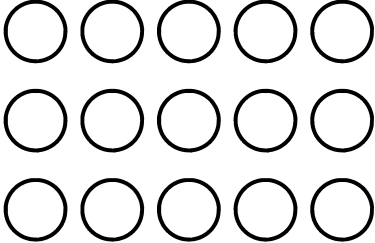
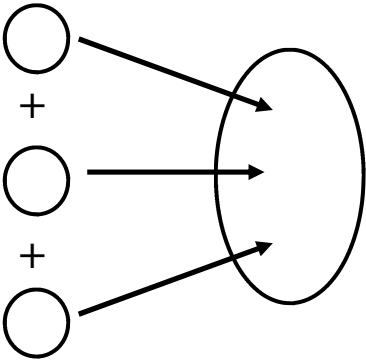
Recognises and describes number patterns and relationships including multiple and square.

Level 5

Uses understanding of place value to multiply whole numbers and decimals by 10, 100 and 1000.

Use multiplication with decimals to 2 places.

Understand and use an appropriate non-calculator method for solving problems that involve multiplying any three-digit number by any two-digit number (long multiplication).

Stage	Progression for Multiplication
1	<p>Use developing mathematical ideas and methods to solve practical problems in a real or role-play context. For example,</p> <ul style="list-style-type: none"> Count repeated groups of the same size (e.g. objects grouped in 2s, 5s or 10s). Respond, in practical situations, to questions such as: <i>How many socks in three pairs?</i> <i>How many 10p coins are here? How much money is that?</i>
2	<p>DEVELOPING UNDERSTANDING:</p> <ul style="list-style-type: none"> Use related vocabulary and symbols to describe and record multiplication number sentences. Recognise and represent arrays as multiplication. Develop and support understanding through images such as: <div style="text-align: center; margin: 10px 0;">  </div> Recognise and represent repeated addition as multiplication. Develop and support understanding through images such as: <div style="text-align: center; margin: 10px 0;">  </div> Interpret situations as multiplication calculations and explain reasoning. For example: <ul style="list-style-type: none"> <i>How many wheels are there on three cars?</i> <i>A baker puts 6 buns in each of 4 rows. How many buns does she bake?</i>

DEVELOPING MENTAL CALCULATION METHODS

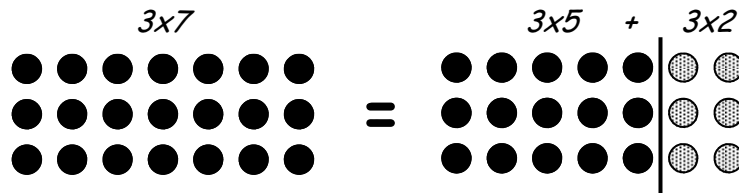
- Derive and recall multiplication facts up to 10×10 .

NB: Children should develop and use a 'toolbox' of mental calculation strategies from which they can choose the most efficient strategy to solve a calculation depending on the numbers involved in it.

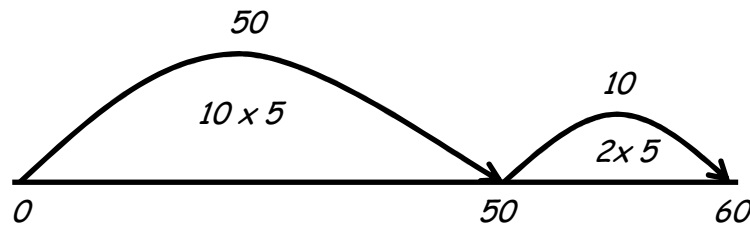
GENERAL STRATEGY

- Partitioning**

3×7 (3 lots of 7)



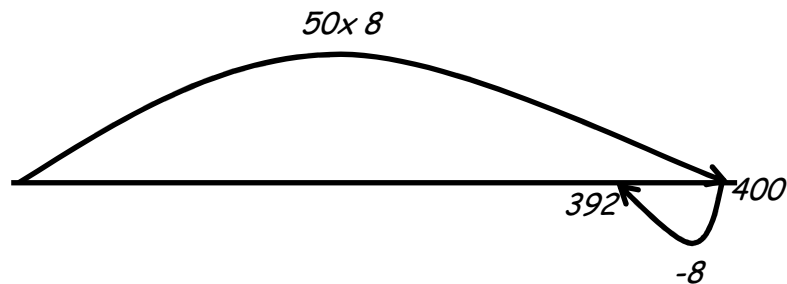
12×5 (12 lots of 5)



3

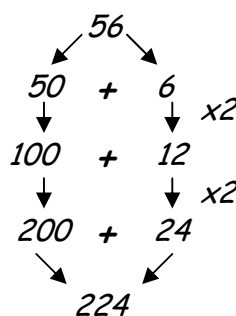
SPECIAL CASE STRATEGIES

- Multiplying whole numbers, then decimals by 10, 100 or 1000.
- Compensation** (multiplying by nearest multiple of 10, 100 etc then adjusting)
 $49 \times 8 = (50 \times 8) - 8$



- Doubling** (multiplying by 2, 4, 8, 25 or 50)

56×4



Y2-
Y6

Y3-
Y6

3	<p>SPECIAL CASE STRATEGIES (Contd)</p> <ul style="list-style-type: none"> Factorising $35 \times 6 = 35 \times 2 \times 3$ $= 70 \times 3$ $= 210$ $14 \times 20 = 14 \times 2 \times 10$ $= 28 \times 10$ $= 280$
---	--

Y5-
Y6
↓

4	<p>DEVELOPING WRITTEN METHODS: Children should be encouraged to select an appropriate calculation method, be it mental or written, dependent on the numbers involved in a calculation. To develop this skill children should be taught to ask themselves, 'Can I do this mentally?' Therefore, it is important that children's mental methods of calculation are practised and secured alongside their learning and development towards a compact written method.</p> <p>INFORMAL EXPANDED METHOD: This leads the children to the more compact standard written method, developing an understanding of its structure and efficiency.</p> <ul style="list-style-type: none"> Short multiplication TU × U 38 × 7 <table style="display: inline-table; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">X</td> <td style="padding: 5px;">7</td> </tr> <tr> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;">30</td> <td style="border-top: 1px solid black; padding: 5px;">210</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">8</td> <td style="padding: 5px;">56</td> </tr> <tr> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;"></td> <td style="border-top: 1px solid black; padding: 5px;">266</td> </tr> </table> <p style="margin-left: 100px;"><i>N.B. The number with the most digits is always placed in the left-hand column of the grid so that it is easier to add the partial products.</i></p> <ul style="list-style-type: none"> Short multiplication HTU × U 346 × 9 <table style="display: inline-table; border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">X</td> <td style="padding: 5px;">9</td> </tr> <tr> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;">300</td> <td style="border-top: 1px solid black; padding: 5px;">2700</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 5px;">40</td> <td style="padding: 5px;">360</td> </tr> <tr> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;">6</td> <td style="border-top: 1px solid black; padding: 5px;">54</td> </tr> <tr> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;"></td> <td style="border-top: 1px solid black; padding: 5px;">3114</td> </tr> <tr> <td style="border-top: 1px solid black; border-right: 1px solid black; padding: 5px;"></td> <td style="border-top: 1px solid black; padding: 5px;">11</td> </tr> </table>	X	7	30	210	8	56		266	X	9	300	2700	40	360	6	54		3114		11
X	7																				
30	210																				
8	56																				
	266																				
X	9																				
300	2700																				
40	360																				
6	54																				
	3114																				
	11																				

Y4
↓

Y5
↓

4

- Short multiplication U.t x U
4.6 x 7

X	7
4.0	28.0
0.6	4.2
	32.2

- Long multiplication TU x TU
72 x 38

X	30	8
70	2100	560
2	60	16

2660
+ 76
2736
1

- Short multiplication ThHTU x U
- Short multiplication U.th x U
4.73 x 4

X	4
4.00	16.00
0.70	2.80
0.03	0.12
	18.92

N.B. Fill in the place holders.

- Long multiplication HTU x TU
372 x 24

X	20	4
300	6000	1200
70	1400	280
2	40	8

7200
1680
+ 48
8928
1

Y5

Y6

5

- Reduce the recording making clear the links to the grid method

Short multiplication:

$$\begin{array}{r}
 246 \\
 \times 7 \\
 \hline
 42 \quad (6 \times 7) \\
 280 \quad (40 \times 7) \\
 + 1400 \quad (200 \times 7) \\
 \hline
 1722 \\
 \hline
 1
 \end{array}$$

$$\begin{array}{r}
 4.73 \\
 \times 4 \\
 \hline
 0.12 \quad (0.03 \times 4) \\
 2.80 \quad (0.7 \times 4) \\
 + 16.00 \quad (4 \times 4) \\
 \hline
 18.92 \\
 \hline
 1
 \end{array}$$

Long multiplication.

4

$$\begin{array}{r}
 372 \\
 \times 24 \\
 \hline
 8 \quad (2 \times 4) \\
 280 \quad (70 \times 4) \\
 1200 \quad (300 \times 4) \\
 40 \quad (2 \times 20) \\
 1400 \quad (70 \times 20) \\
 + 6000 \quad (300 \times 20) \\
 \hline
 8928 \\
 \hline
 1
 \end{array}$$

NB: *The calculations in brackets illustrate how the partial products in the columns were derived. There is no expectation that children should record these steps as part of their working.*

COMPACT WRITTEN METHOD:

Short multiplication

5

$$\begin{array}{r}
 4346 \\
 \times 8 \\
 \hline
 34768 \\
 \hline
 234
 \end{array}$$

Long multiplication

$$\begin{array}{r}
 352 \\
 \times 27 \\
 \hline
 2464 \\
 + 7040 \\
 \hline
 9504 \\
 \hline
 1
 \end{array}$$