

# Unit 3

## Multiplication and division 2

Five daily lessons

National  
**Numeracy Strategy**

Year 6  
Spring term

### Unit Objectives Year 6

- Understand and use the relationship between the four operations, and the principles (not the names) of the arithmetic laws.
- Use brackets.
- Use factors.
- Use closely related facts.
- **Extend written methods to:**
  - long multiplication of a three-digit by a two-digit integer;**
  - short division of TU or HTU by U (mixed-number answer);**
  - division of HTU by TU (long division, whole-number answer);**
  - short division of numbers involving decimals.**

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This Unit Plan is designed to guide your teaching.

You will need to adapt it to meet the needs of your class.

### Resources needed to teach this unit:

- Resource sheet 3.1
- Resource sheet 3.2
- OHT 3.1
- Counting stick
- Whiteboards
- Calculators
- Related Key Stage 2 national test questions

### Link Objectives

Year 5

Year 7

- Partition.
- Use factors.
- Begin to use brackets.
- **Extend written methods to:**
  - short multiplication of HTU or TU by U;**
  - long multiplication of  $TU \times TU$ ;**
  - short division HTU by U with integer remainder.**

- **Multiply and divide three-digit by two-digit whole numbers; extend to multiplying and dividing decimals with one or two places by single-digit whole numbers.**
- Carry out calculations with more than one step using brackets and the memory.

(Key objectives in bold)

department for  
**education and skills**

## Cards

$3.6 \times 2$	$0.9 \times 4$	$0.86 \times 10$	$4 \times 0.6$	$3.2 \times 3$
$4 \times 1.8$	$2 \times 1.8$	$4.3 \times 2$	$1.2 \times 2$	$6 \times 1.6$
$0.9 \times 8$	$27 \times 0.2$	$3.4 \times 2$	$8 \times 0.3$	$10 \times 0.8$
$2.7 \times 2$	$0.45 \times 10$	$1.7 \times 4$	$4.3 \times 2$	$0.4 \times 20$

**Targets**

5.4	9.6	8.0
2.4	4.5	3.6
7.2	8.6	6.8

$$\begin{array}{r} 24 \overline{) 768} \\ \underline{480} \phantom{0} \\ 288 \\ \underline{240} \phantom{0} \\ 48 \\ \underline{48} \\ 0 \end{array}$$

A  $\longrightarrow$

B  $\longrightarrow$

C  $\longrightarrow$

Answer: 32

## Unit 3 Year 6 (Spring Term)

### Related Key Stage 2 National Test Questions:

#### 2001 Test A

1

Write in the missing numbers.



$$45 + \boxed{\phantom{00}} = 110$$

1a

1 mark

$$(4 \times 5) - \boxed{\phantom{00}} = 12$$

1b

1 mark

$$60 \times 3 = \boxed{\phantom{00}}$$

1c

1 mark

9

Write in the **missing** digits to make this correct.



$$\begin{array}{r} \boxed{\phantom{00}}4\boxed{\phantom{00}} \\ \times \phantom{00}6 \\ \hline 2052 \end{array}$$

9a

1 mark

9b

1 mark

#### 2001 Test B

7

Write in what the **missing** numbers could be.



$$\left( \boxed{\phantom{00}} \div \boxed{\phantom{00}} \right) + 90 = 100$$

7

1 mark

Total

## Unit 3 Year 6 (Spring Term)

## 2001 Test B

2

Write in the **missing** number.



$$8 \times \square = 400$$

1 mark

2

# 2002 Test A

22

Calculate  $924 \div 22$



Show  
your **working**.  
You may get  
a mark.

2 marks

2

14

Calculate **417**  $\times$  **20**



\_\_\_\_\_

1 mark

4

## 2002 Mental Arithmetic

19	What is three thousand divided by twenty?
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**Total**

## Unit 3 Year 6 (Spring Term)

### 2002 Test B

10

Write in the **missing** number.


  $32.45 \times \boxed{\phantom{000}} = 253.11$

10

1 mark

2

Write in the **missing** number.

  $22 \times \boxed{\phantom{000}} = 660$

2a

1 mark

$\boxed{\phantom{000}} - 22 = 109$

2b

1 mark

Total

Planning sheet	Day One	Unit 3 <i>Multiplication and division 2</i>	Term: <i>Spring</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>Multiply any two-digit number by a one-digit number mentally by partitioning.</p> <p>VOCABULARY partitioning</p> <p>RESOURCES Whiteboards</p>	<ul style="list-style-type: none"> <li>Write <math>38 \times 7</math> on the board. Ask children to work out the answer mentally then explain how they worked it out to a partner.</li> <li>Take feedback, discussing different methods, then focus on partitioning. Record the method as: <math display="block">(30 \times 7) + (8 \times 7)</math> <math display="block">= 210 + 56</math> <math display="block">= 266</math> <div>Q Why is there an addition sign?</div> </li> </ul> <p>Establish that addition recombines the partitioning.</p> <ul style="list-style-type: none"> <li>Provide further examples such as <math>43 \times 6</math>, <math>86 \times 3</math>, <math>64 \times 7</math>. Ask children to use partitioning to work out the answers, showing the answers on whiteboards.</li> </ul>	<p>Use brackets.</p> <p>Understand and use the relationships between the four operations, and use the principles (not names) of the arithmetic laws.</p> <p>VOCABULARY operation brackets inverse estimate approximate</p> <p>RESOURCES Class set of calculators</p>	<ul style="list-style-type: none"> <li>Remind children about the use of brackets, e.g: write <math>3 + 5 \times 4 = \square</math> on the board. Ask children to work out the answer. Take feedback and establish that it could be 32 or 23. <div>Q How could we make sure the answer is 32?</div> </li> </ul> <p>Establish the use of brackets and place them around <math>(3 + 5)</math> in the calculation on the board.</p> <ul style="list-style-type: none"> <li>Write on the board: <math>(\square + \square) \times \square = 20</math> <div>Q What does this statement represent?</div> </li> </ul> <p>Ask children to discuss in pairs. Take feedback and confirm that it represents two numbers which are added together, then multiplied by another number to give the answer 20.</p> <div>Q Which numbers could fit in the third box?</div> <p>Discuss and establish that such numbers must be factors of 20, i.e. 1, 2, 4, 5 or 10. Ask children to work out possible solutions to this problem.</p> <ul style="list-style-type: none"> <li>Discuss some possible solutions, e.g.: <math display="block">(5 + 5) \times 2 = 20 \qquad (4 + 1) \times 4 = 20</math> </li> <li>Write on the board: <math>(4 + \square) \times \square = 100</math></li> <li>Ask children to solve this problem using calculators if they wish. Take feedback on solutions and the strategies used.</li> <li>Using <math>(4 + \square) \times \square = 200</math> <p>Ask children what <math>4 + \square</math> must be if we choose 40 for the other number. Discuss and confirm that 1 is the only possible number, using inverse operations to explain, i.e. <math>200 \div 40 = 5</math> and <math>5 - 4 = 1</math></p> </li> <li>Set the children a series of problems to solve, such as: <math display="block">(4 - \square) \times \square = 50</math> <math display="block">(4 - \square) \times (5 - \square) = 20</math> <math display="block">30 - (\square + \square) = 4</math> <math display="block">(30 - \square) + \square = 4</math> <math display="block">30 - (\square - \square) = 4</math> <p>Ask for at least two different solutions to each. Allow the use of calculators.</p> </li> <li>Collect responses and discuss methods used. Reinforce the use of inverse operations to help with finding the solutions.</li> </ul>	<ul style="list-style-type: none"> <li>Write on the board: <math display="block">950 \div \square = 47 \cdot 5</math> <div>Q How could we solve this?</div> <p>Try out suggestions on the board.</p> </li> <li>Write on the board: <p>A. <math>4 \times (\square + \square) = 80</math>  B. <math>4 \times \square + 4 \times \square = 80</math>  C. <math>4 \times (\square + 4) \times \square = 80</math></p> <p>Ask children for pairs of numbers that work for A.</p> <div>Q Do the same pairs work for B and C?</div> <p>Discuss why they do for B but not for C.</p> </li> </ul> <div> <p><b>By the end of the lesson children should be able to:</b></p> <ul style="list-style-type: none"> <li><b>Use brackets: know that they determine the order of operations, and that their contents are worked out first;</b></li> <li><b>Understand and use when appropriate the principles (but not the names) of the commutative, associative and distributive laws as they apply to multiplication.</b></li> </ul> <p>(Refer to supplement of examples, section 6, page 53.)</p> </div>



Planning sheet	Day Two	Unit 3 <i>Multiplication and division 2</i>	Term: <i>Spring</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>Use factors.</p> <p>VOCABULARY factor factor pair</p>	<ul style="list-style-type: none"> <li>Ask children to give factor pairs of 12: (12, 1), (6, 2), (4, 3). Record them on the board.</li> <li>Show the calculation <math>15 \times 12</math>.</li> </ul> <div>Q How could we use factors of 12 to help with this calculation?</div> <p>Record suggestions such as:  <math>15 \times 2 \times 6</math> ; <math>15 \times 4 \times 3</math></p> <p>Ask children to work out the answers.</p> <ul style="list-style-type: none"> <li>Repeat with factors of 15 then ask how they could be used to solve <math>15 \times 12</math>. Record suggestions:  <math>5 \times 3 \times 12 = 180</math>  <math>5 \times 3 \times 2 \times 6 = 180</math>  <math>5 \times 3 \times 4 \times 3 = 180</math></li> </ul> <div>Q Which method is the most efficient? Why?</div> <p>Discuss, e.g. <math>\underline{5} \times 3 \times \underline{2} \times 6</math> enables  <math>10 \times (3 \times 6)</math>.</p>	<p>Extend written methods to short division of HTU by U with mixed number answers.</p> <p>VOCABULARY approximate estimate mixed number</p>	<ul style="list-style-type: none"> <li>Give the children this problem: 238 children are staying for lunch today. There are 6 chairs at every table. How many tables do we need?</li> </ul> <div>Q How could we estimate the answer?</div> <p>Collect suggestions, e.g. <math>240 \div 6 = 40</math></p> <ul style="list-style-type: none"> <li>Demonstrate chunking to remind children about the method:</li> </ul> $\begin{array}{r} 6 \overline{) 238} \\ \underline{- 180} \quad (30 \times 6) \\ 58 \\ \underline{- 54} \quad (9 \times 6) \\ 4 \text{ Answer: } 39 \text{ r } 4 \end{array}$ <p>Show that the answer can be written like this:</p> $\begin{array}{r} 39 \text{ r } 4 \\ 6 \overline{) 238} \end{array}$ <p>Compare answer with estimates. Remind children that we would need to round up to 40 tables, and to express the answer in a sentence.</p> <ul style="list-style-type: none"> <li>Remind children that they showed answers to divisions as mixed numbers in the previous week.</li> </ul> <div>Q What fraction of the chairs around the unfilled table would be used?</div> <p>Establish that <math>\frac{4}{6}</math> (or <math>\frac{2}{3}</math>) of the chairs would be used, so <math>39\frac{4}{6}</math> tables would be filled.</p> <ul style="list-style-type: none"> <li>Work through the following division with the children, first asking them to estimate the answer. Express the answer as a mixed number.</li> </ul> $7 \overline{) 327}$ <ul style="list-style-type: none"> <li>Set examples for children to solve. Remind them to estimate first and write their answers as mixed numbers.</li> </ul>	<ul style="list-style-type: none"> <li>Collect answers and correct any misconceptions. If necessary model one or two solutions on the board.</li> </ul> <div> <p><b>By the end of the lesson children should be able to:</b></p> <ul style="list-style-type: none"> <li>Use short division to divide three-digit integers by units;</li> <li>Express answers as mixed numbers;</li> <li>Approximate first.</li> </ul> <p>(Refer to supplement of examples, section 6, page 69.)</p> </div>

Planning sheet	Day Three	Unit 3 <i>Multiplication and division 2</i>	Term: <i>Spring</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>Use closely related facts to multiply.</p> <p>RESOURCES Whiteboards</p>	<ul style="list-style-type: none"> <li>Give the children the problem:  <math>13 \times 50 = \square</math>  Ask them to solve this on whiteboards using jottings.  Take feedback and emphasise <math>13 \times 50</math> is the same as <math>13 \times 100 \div 2</math>. <div> <b>Q</b> Using the answer to <math>13 \times 50</math>, what else can you work out? </div> </li> <li>Write:  <math>13 \times 51 = \square</math>  Ask children to give the answer, using whiteboards.</li> <li>Take feedback.  Emphasise that knowing <math>13 \times 50</math> helped to work out <math>13 \times 51</math>.</li> <li>Set some more related questions e.g. <math>13 \times 49</math>, <math>14 \times 51</math> etc. for children to work mentally with jottings.</li> </ul>	<p>Extend written methods to short division of numbers involving decimals.</p> <p>VOCABULARY divide divisibility inverse operation</p>	<ul style="list-style-type: none"> <li>Begin by asking: £38 is shared between 4 people. How much each? How did you work it out? Discuss to remind children that <math>38 \div 4 = 9 \text{ r}2</math>, or <math>9\frac{2}{4}</math>, which is £9.50 in the context of the problem. <div> <b>Q</b> What if £38.60 is shared between 4 people? </div> </li> </ul> <p>Confirm the answer as £9.65 since <math>(60 \div 4)</math> pence is added to the previous answer.</p> <div> <b>Q</b> How could we work out £66.50 shared between 7 people? </div> <p>Discuss suggestions then focus on using short division. Demonstrate on the board, emphasising the importance of aligning decimal points:</p> $  \begin{array}{r}  9.5 \\  7 \overline{) 66.5} \\  \underline{63} \phantom{00} \\  3.5 \phantom{00} \\  \underline{3.5} \phantom{00} \\  0  \end{array}  \begin{array}{l}  (9 \times 7) \\  (0.5 \times 7)  \end{array}  $ <ul style="list-style-type: none"> <li>Make sure children understand <math>3.5 \div 7 = 0.5</math>, then repeat with another example.</li> <li>Provide examples for children to solve.</li> </ul>	<ul style="list-style-type: none"> <li>Address any misconceptions which emerged during the activity. <div> <b>Q</b> How can we check our answers? </div> </li> </ul> <p>Establish using the inverse operation.</p> <ul style="list-style-type: none"> <li>Ask children to check their own answers.</li> </ul> <div> <p><b>By the end of the lesson children should be able to:</b></p> <ul style="list-style-type: none"> <li>Use a standard written method to divide numbers with up to two decimal places by a single-digit number;</li> <li>Check their results using the inverse operation.</li> </ul> <p>(Refer to supplement of examples, section 6, page 69.)</p> </div>

Planning sheet	Day Four	Unit 3 <i>Multiplication and division 2</i>	Term: <i>Spring</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>Multiply two-digit integers mentally.</p> <p>VOCABULARY multiply product</p>	<ul style="list-style-type: none"> <li>Write a set of calculations on the board:  <math>18 \times 7</math>    <math>14 \times 15</math>    <math>35 \times 18</math>  <math>13 \times 99</math>    <math>76 \times 7</math>    <math>93 \times 6</math> </li> <li>Ask children to discuss in pairs how they would work out each product and record the answer and the method used.</li> <li>Take feedback. Discuss different methods used, asking children to justify their choices.</li> </ul>	<p>Multiply HTU by TU (long multiplication).</p> <p>VOCABULARY long multiplication</p>	<ul style="list-style-type: none"> <li>Quickly draw on previous knowledge of the grid method and partitioning. Demonstrate one example and encourage participation.  <math display="block">  \begin{array}{r}  135 \times 28 \\  \times \quad 100 \quad 30 \quad 5 \\  20 \begin{array}{ c c c } \hline 2000 &amp; 600 &amp; 100 \\ \hline \end{array} 2700 \\  8 \begin{array}{ c c c } \hline 800 &amp; 240 &amp; 40 \\ \hline \end{array} +1080 \\  \hline  3780  \end{array}  </math> <p>Write on the board:</p> <math display="block">  \begin{array}{r}  135 \\  \times 28 \\  \hline  2000 \quad 100 \times 20 \\  600 \quad 30 \times 20 \\  100 \quad 5 \times 20 \\  800 \quad 100 \times 8 \\  240 \quad 30 \times 8 \\  40 \quad 5 \times 8 \\  \hline  3780  \end{array}  </math> <p>Explain the steps and links to the grid method.</p> <p>Now demonstrate the compact method:</p> <math display="block">  \begin{array}{r}  135 \\  \times 28 \\  \hline  2700 \quad (135 \times 20) \\  1080 \quad (135 \times 8) \\  \hline  3780  \end{array}  </math> <p>Discuss that this is a more efficient method and show how <math>135 \times 20</math> and <math>135 \times 8</math> can each be calculated in one step.</p> </li> <li>Get the children to work through <math>135 \times 34</math> in pairs. Collect responses and correct errors, remind them to compare the answer with their estimates.</li> <li>Now set a problem: 36 boxes of screws:  <div>Q With 154 screws in each box how many screws altogether?</div> </li> <li>Encourage children to discuss their calculations then explain and demonstrate their method.</li> <li>Set class further questions that involve HTU <math>\times</math> TU.</li> </ul>	<ul style="list-style-type: none"> <li>Review questions and answers. Correct any errors encouraging discussion.</li> <li>'Spot the Mistake'. Display some examples of incorrect calculations, including approximations. Ask the children to discuss in small groups where the mistakes might have been made and how they should be corrected.  <div>Q What is an important fact to remember when calculating?</div> </li> </ul> <p>Draw these together on the board.</p> <p>HOMEWORK – Give the children a set of four multiplication (HTU <math>\times</math> TU) statements. Ask them to write a short real life word problem for each and then complete the task using an efficient method (encourage the standard method where appropriate).</p> <div> <p><b>By the end of the lesson children should be able to:</b></p> <ul style="list-style-type: none"> <li>Use standard algorithm to multiply HTU by TU, e.g. <math>352 \times 27</math>.</li> </ul> <math display="block">  \begin{array}{r}  352 \\  \times 27 \\  \hline  352 \times 20 \quad 7040 \\  352 \times 7 \quad 2464 \\  \hline  9504  \end{array}  </math> <p>(Refer to supplement of examples, section 6, page 67.)</p> </div>

Planning sheet	Day Five	Unit 3 <i>Multiplication and division 2</i>	Term: <i>Spring</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>Use known number facts to consolidate mental multiplication and division.</p> <p>VOCABULARY multiple</p> <p>RESOURCES Counting stick Resource sheet 3.1 Resource sheet 3.2</p>	<ul style="list-style-type: none"> <li>Use a counting stick. Count in steps of 25 and stop at any given point, e.g. 175.</li> </ul> <div>Q What multiple of 25 equals 175?</div> <p>Repeat for multiples of 2·5. Stop at any given point, e.g. 17.5.</p> <div>Q What do you notice about the relationship between 25 and 175 and 2·5 and 17.5?</div> <ul style="list-style-type: none"> <li>Give out the question cards on Resource sheet 3.1 to small groups of children. Work through some of the questions. Display the target board on Resource sheet 3.2. Point to a number on the board and get children to hold up the associated calculations.</li> </ul>	<p>Divide HTU by TU (long division, whole number answers).</p> <p>VOCABULARY long division approximate</p> <p>RESOURCES OHT 3.1</p>	<ul style="list-style-type: none"> <li>Review the homework. Ask the children to give examples of their word problems.</li> </ul> <div>Q How did you check your answers were correct?</div> <ul style="list-style-type: none"> <li>Explain that this lesson is about dividing by two-digit numbers.</li> <li>Show OHT 3.1. Ask children to discuss in pairs what they think is happening at the indicated stages of the calculation.</li> <li>Take feedback. Explain any stage that caused difficulties.</li> <li>Write on the board: <math>23 \overline{)897}</math></li> </ul> <div>Q How could we approximate the answer?</div> <p>Discuss suggestions, e.g. <math>(900 \div 25) = 36</math></p> <div>Q What multiples could we use to do this calculation?</div> <ul style="list-style-type: none"> <li>Work through questions on the board. A suitable way would be:</li> </ul> $  \begin{array}{r}  39 \\  23 \overline{)897} \\  \underline{460} \quad (20 \times 23) \\  437 \\  \underline{230} \quad (10 \times 23) \\  207 \\  \underline{115} \quad (5 \times 23) \\  92 \\  \underline{46} \quad (2 \times 23) \\  46 \\  \underline{46} \quad (2 \times 23) \\  0  \end{array}  $ <p>Write <math>897 \div 23 = 39</math> and ask:</p> <div>Q How can we check our answer is correct?</div> <ul style="list-style-type: none"> <li>Remind children that <math>39 \times 23</math> should be 897. Ask what <math>40 \times 23</math> is and use this answer 920 to confirm that 897 is correct.</li> <li>Work through <math>16 \overline{)928}</math> on the board. Approximate first and get children to demonstrate steps.</li> <li>Give children some examples to work through. Collect answers and correct mistakes.</li> </ul>	<ul style="list-style-type: none"> <li>Write <math>897 \div 23</math> on the board. Ask the children to invent a 'real life' problem related to this calculation.</li> <li>Take feedback from the children. Write <math>23 \times 39 = 897</math> on the board and ask the children to invent some real life problem related to this calculation.</li> <li>Stress the links between multiplication and division.</li> </ul> <div> <p><b>By the end of the lesson children should be able to:</b></p> <ul style="list-style-type: none"> <li><b>Develop an efficient standard method that can be applied generally, approximating first. Where calculations are set out in columns, know that units should line up under units, tens under tens,...</b></li> </ul> <p>(Refer to supplement of examples, section 6, page 69.)</p> </div>