

Unit 3

Multiplication and division, written methods

Five daily lessons

National
Numeracy Strategy

Year 6
Autumn term

Unit Objectives

Year 6

- Use pencil and paper methods to support, record or explain multiplications and divisions.
- Extend written methods to short multiplication of numbers involving decimals.
- Round up or down after division, depending on context.
- **Identify and use the appropriate operations (including combinations of operations) to solve word problems involving numbers and quantities.**
- Develop calculator skills and use a calculator effectively.

Pages 67, 69

Pages 67, 69

Page 57

Pages 82-89

Pages 70-71

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:

- OHP calculator
- Calculators
- Whiteboards
- Related Key Stage 2 national test questions

Link Objectives

Year 5

Year 7

- Extend written methods to:
 - short multiplication of HTU by U;
 - long multiplication of TU by TU;
 - short division of HTU by U.
- Use all four operations to solve simple word problems.
- Develop calculator skills and use a calculator effectively.

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

(Key objectives in bold)

Planning sheet	Day One	Unit 3 <i>Multiplication and division, written methods</i>	Term: <i>Autumn</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 mentally any two-digit number to 50 by a single-digit number.</p> <p>VOCABULARY partition</p> <p>RESOURCES Whiteboards Set of place value cards to 100</p>	<ul style="list-style-type: none">Quickly demonstrate one way of using partitioning with jottings to aid multiplication of a two-digit number by a single-digit number. e.g. 36×6 <div><div>180</div><div>36</div><div>216</div></div> <ul style="list-style-type: none">Give children similar questions to answer, writing their solutions on whiteboards. Give 15 seconds ‘thinking time’ for each question before asking them to show their answers. Modify the time according to your observation of the children, reduce the time to 10 seconds as children get quicker. Emphasise the importance of jottings as a means of recording information they cannot keep in their heads.	<p>Use informal pencil and paper methods to support, record or explain multiplications.</p> <p>VOCABULARY partition product</p>	<ul style="list-style-type: none">Using place value cards make the number 746 in front of the class. Say that you want to multiply this number by 6. <div><div>700</div><div>40</div><div>6</div><div>746</div></div> <p>Partition 746 and give the 700 to one child, 40 to another and 6 to a third. Ask them each to multiply their parts of the numbers by 6 and check the answer with a friend before coming to write it on the board. Together add up these partial products to find the answer to 746×6.</p> <ul style="list-style-type: none">Ask for a volunteer to show how this can be laid out on a grid on the board. Say that you want to multiply 4746 by 6. Ask the children to discuss in pairs how much bigger the answer will be than the previous answer and to give an estimate ($5000 \times 5 = 25\ 000$). Demonstrate the grid method to record this multiplication and compare the answer with the estimate.Give the children a multiplication calculation to do in their books using the grid method. Check their answers. Ask the children to make up two of their own four-digit by single-digit multiplications, recording their use of the grid method in their books, ensure that they estimate the answer first. Check their use of the grid method is correct.Ask for a volunteer to remind the class how to use the grid method to solve 72×38, estimating the answer first ($70 \times 40 = 2800$). Get the children to use the same method for 372×24. Demonstrate another calculation, emphasising the need to estimate and the setting out of the grid method. Give the class a set of three-digit by two-digit calculations to do, ensure that they estimate the answer first. <div><p>Q Can you explain how to use the grid method to a friend and also why it is helpful?</p></div> <ul style="list-style-type: none">Take feedback and establish that the grid method is helpful because it uses the real value of the numbers and ensures that we multiply all the numbers by each other.	<ul style="list-style-type: none">Write an incomplete grid on the board such as: <table><tr><td>×</td><td>?</td><td>?</td><td>?</td><td>?</td><td></td></tr><tr><td>?</td><td>42 000</td><td>3600</td><td>240</td><td>12</td><td>?</td></tr><tr><td>5</td><td>?</td><td>?</td><td>?</td><td>?</td><td>?</td></tr></table> <div><p>Q What two numbers have been multiplied together in this grid. How do you know? (7642×6, then 7642×5)</p></div> <p>Establish answers and that partial products are multiples of 6.</p> <ul style="list-style-type: none">Now ask children to devise a partly completed grid for their partner to solve. <p>HOMEWORK – Give the children a small number of multiplication calculations to do using the grid method. Include multiplication of three-digit by two-digit numbers and short multiplication of decimals.</p> <div><p>By the end of the lesson the children should be able to:</p><ul style="list-style-type: none">Approximate first;Explain orally how the grid method works and use it for $\text{ThHTU} \times \text{U}$ and $\text{HTU} \times \text{TU}$.<p>(Refer to supplement of examples, section 6, page 67.)</p></div>	×	?	?	?	?		?	42 000	3600	240	12	?	5	?	?	?	?	?
×	?	?	?	?																		
?	42 000	3600	240	12	?																	
5	?	?	?	?	?																	

Planning sheet	Day Two	Unit 3 <i>Multiplication and division, written methods</i>	Term: <i>Autumn</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 and place value to multiply mentally.</p> <p>VOCABULARY tenths hundredths</p> <p>RESOURCES Counting stick</p>	<ul style="list-style-type: none"> Use the counting stick to count in 5s and then in 0.5s. Point to different marker points on the stick and ask, 'What number would lie here?' e.g. 3.5, and 'How many 0.5s are represented by 3.5?' Continue to reduce the intervals by counting in 0.05s and ask similar questions which encourage the children to identify multiplication facts e.g. $7 \times 0.05 = 0.35$. Repeat the exercise counting in 3s, 0.3s and then 0.03s. Use the counting stick to help children become more fluent in answering questions such as 0.3×7. 	<p>Extend written methods to short multiplication of numbers involving decimals.</p> <p>VOCABULARY tenths hundredths partition product</p>	<ul style="list-style-type: none"> Go through the multiplication calculations children attempted for homework. <p>Q. Estimate the answer to 4.13×7</p> <p>Establish that the answer is roughly $4 \times 7 = 28$</p> <p>Q. How would you multiply 4.13×7?</p> <p>Draw out that you could partition 4.13 into units and tenths.</p> <p>Demonstrate the grid method to calculate 4.13×7</p> <table border="1"> <tr> <td>\times</td><td>4</td><td>0.1</td><td>0.03</td><td></td></tr> <tr> <td>7</td><td>28</td><td>0.7</td><td>0.21</td><td>28.91</td></tr> </table> <ul style="list-style-type: none"> Compare the answer of 28.91 to the estimate of 28. Ask why the answer is bigger, and by how much. Suggest that thinking of a hundred square can help them get the digits in the correct place in the decimals if they are unsure. Point to a hundred square saying that each square is a hundredth of the whole which is 0.01. Three squares represents 0.03. Multiplying the 3 squares by 7 gives 21 squares or 21 hundredths or 0.21 which would look like two rows of 10 and one left over, i.e. 2 tenths and 1 hundredth. <p>Q. Why can't the answer to 0.03×7 be 0.021?</p> <ul style="list-style-type: none"> Establish that 0.021 is smaller than 0.03. Ask the children to work in pairs to use the grid method to calculate the answer to 3.23×3. Take feedback and ensure that the children understand the method and can interpret the difference between their estimate (3×3) and the answer. Write 4.96×3 on the board and get an estimate for the answer ($5 \times 3 = 15$). Ask the children if they think the answer will be bigger or smaller than this estimate. Demonstrate 4.96×3 using the grid method and highlight the 'carry' in the addition. Compare estimate and answer. Set the children other calculations, ensuring that some calculations include the crossing of the place value boundaries when adding together the partial products. Collect responses and deal with misconceptions. 	\times	4	0.1	0.03		7	28	0.7	0.21	28.91	<ul style="list-style-type: none"> Display the following partially completed grid. <table border="1"> <tr> <td>\times</td><td>?</td><td>?</td><td>?</td><td></td></tr> <tr> <td>?</td><td>18</td><td>2.1</td><td>0.15</td><td>20.25</td></tr> </table> <p>Q. What two numbers have been multiplied to get this answer? How do you know? (6.75×3)</p> <p>Establish the numbers and that the clue is that the partial products are multiples of 3.</p> <p>By the end of the lesson the children should be able to:</p> <ul style="list-style-type: none"> Extend written methods to decimals with up to two decimal places multiplying by a single-digit number. <p>(Refer to supplement of examples section 6, page 67.)</p>	\times	?	?	?		?	18	2.1	0.15	20.25
\times	4	0.1	0.03																					
7	28	0.7	0.21	28.91																				
\times	?	?	?																					
?	18	2.1	0.15	20.25																				

Planning sheet	Day Three	Unit 3 <i>Multiplication and division, written methods</i>	Term: <i>Autumn</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>Consolidate knowing by heart multiplication and division facts to 10×10. Derive quickly corresponding division facts.</p> <p>VOCABULARY division divided by share</p>	<ul style="list-style-type: none"> Chant in 7s forwards and back. <p>Stop at various multiplications and ask for other facts e.g. $9 \times 7 = 63$.</p> <p>The class chant: 9×7 is 63 $63 \div 7$ is 9 $63 \div 9$ is 7</p> <ul style="list-style-type: none"> Repeat for $6 \times$ and $8 \times$ table. Use 'share' and 'divided by'. 	<p>Use informal pencil and paper methods to support, record or explain divisions.</p> <p>VOCABULARY divisor multiple</p>	<ul style="list-style-type: none"> Tell the children that self-adhesive stamps come in sheets of 24. <div>Q Estimate how many sheets you would need to buy if you wanted 500 stamps.</div> <p>Establish that it is roughly $500 \div 25 = 20$</p> <div>Q How would we work it out exactly?</div> <ul style="list-style-type: none"> Draw out that one way would be to subtract multiples of 24 from 500. <p>Record on board</p> $\begin{array}{r} 500 \\ - 240 \quad (24 \times 10) \\ \hline 260 \\ - 240 \quad (24 \times 10) \\ \hline 20 \quad (\text{will need 1 more sheet}) \end{array}$ <div>Q How many sheets of stamps does this represent? How many sheets will you have to buy to get 500 stamps?</div> <ul style="list-style-type: none"> Establish that 20 sheets will buy 480 stamps so to get 500 they will need 21 sheets. Explain that subtracting 10 lots of 24 is more efficient than subtracting single multiples. Tell the children that this method of subtracting multiples of the divisor, 24, is called chunking. Emphasise the importance of recording the chunks in this way. <div>Q How many coaches would be needed to take 780 people on coaches which hold 42 people each?</div> <ul style="list-style-type: none"> Ask the children how they would use this chunking method to answer the question. Get them to identify the divisor and what chunks they wish to subtract. Record their suggestions on the board and work through the calculations ensuring that there are examples with different sized chunks. Emphasise the importance of recording how they calculated their chunks. Draw out that different people will use different sized 'chunks' and that with more practice they will probably use larger chunks, as these are more efficient. Point out that finding multiples of 10, 5 and 2 are usually the easiest to find and are often useful. Give the children problems to solve which involve similar calculations. Encourage the children to work with a partner and discuss the size of the chunks they are going to use. Review the children's answers and address any misconceptions. 	<div>Q How many teachers are required if 900 children are taught in classes of 23?</div> <ul style="list-style-type: none"> Show a solution based on subtracting 10 lots of 23. <div>Q Is this solution efficient?</div> <ul style="list-style-type: none"> Establish that larger chunks could be subtracted. <div>Q What larger chunks could be used here?</div> <ul style="list-style-type: none"> Work through the children's ideas. <div> <p>By the end of the lesson the children should be able to:</p> <ul style="list-style-type: none"> Use multiples of the divisor to solve $HTU \div TU$. <p>(Refer to supplement of examples, section 6, page 69.)</p> </div>

Planning sheet	Day Four	Unit 3 <i>Multiplication and division, written methods</i>	Term: <i>Autumn</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 and place value to multiply and divide mentally.</p> <p>RESOURCES Whiteboards</p>	<ul style="list-style-type: none"> Write the number 21 and say that you want as many multiplication and division facts with an answer of 21 as possible. Encourage use of decimals. Ask children to write a question on their whiteboards. Share some of the answers. Repeat with another starting number. This time pairs of pupils find 5 different questions in 1 minute. Share/discuss answers. Repeat with another starting number. 	<p>Round up or down after division, depending on the context.</p> <p>VOCABULARY round up round down decimal fraction remainder</p> <p>RESOURCES OHP calculator</p>	<ul style="list-style-type: none"> Remind children of the calculation they carried out in the previous lesson ($500 \div 24$) which they did by chunking. Now demonstrate how to do this with a calculator. Using the OHP calculator show the answer: 20.83333333. <p>Q What does the decimal part mean?</p> <p>Draw out that this means 20 sheets and some more but that we cannot tell how many more. We need to round up to 21 as the answer to the problem.</p> <p>Q How many CDs at £11.99 each could you buy with £50?</p> <ul style="list-style-type: none"> Get the children to estimate an answer and establish that this is roughly $48 \div 12 = 4$ CDs. <p>Demonstrate the division $£50 \div 11.99$ on the OHP calculator and show this is 4.1701418.</p> <p>Discuss this answer and compare it with the earlier estimate.</p> <p>Q What does the decimal part represent? Is there enough money to buy 5 CDs?</p> <p>Establish that the decimal part means there will be some money left over but not enough to buy a 5th CD. In this instance the answer needs to be rounded down to 4. The decimal fraction is the remainder.</p> <ul style="list-style-type: none"> Explain to children that they are now going to work in pairs solving division problems, one in each pair using the chunking method and one using a calculator. They are then to compare answers and decide whether to round them up or down and why. Tell them they have 15 minutes. <p>Give the class problems involving division with remainders to solve in pairs.</p> <ul style="list-style-type: none"> While children are working on problems choose 2 pairs to come out at the end of the lesson to demonstrate their solution to a chosen problem. 	<ul style="list-style-type: none"> Two pairs of children to demonstrate their problems and solutions. <p>Q What can you say about the remainder and the number you are dividing by?</p> <p>Establish that the remainder is always smaller than the divisor.</p> <p>Q How do you decide whether to round up or down?</p> <ul style="list-style-type: none"> Discuss responses and establish for given questions why rounding up or down is required. <p>By the end of the lesson the children should be able to:</p> <ul style="list-style-type: none"> Decide what to do after division, and round up or down accordingly. <p>(Refer to supplement of examples, section 6, page 57.)</p>

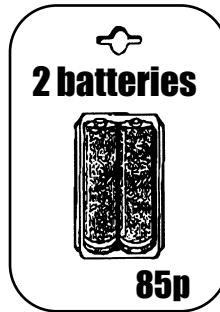
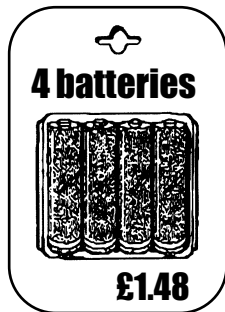
Planning sheet	Day Five	Unit 3 <i>Multiplication and division, written methods</i>	Term: <i>Autumn</i>	Year Group: 6
Oral and Mental		Main Teaching		Plenary
Objectives and Vocabulary	Teaching Activities	Objectives and Vocabulary	Teaching Activities	Teaching Activities / Focus Questions
<p>Use known number facts and place value to multiply and divide mentally.</p> <p>RESOURCES Whiteboards</p>	<ul style="list-style-type: none"> Write the number 240 on the board and say that you want as many multiplication and division facts with an answer of 240 as possible, including those with numbers with decimal places. Ask them this time to express some divisions as fractions e.g. $\frac{1}{4}$ of 960 or $\frac{1}{10}$ of 2400. Ask children individually to show one answer on their whiteboards. Repeat with another three-digit number, this time children work in pairs to find as many facts as they can find in 3 minutes. Draw out different facts and pull out pairs of facts which are the inverse of one another. e.g. $\frac{1}{4}$ of 960 = 240, $240 \times 4 = 960$ 	<p>Identify and use appropriate operations (including combinations of operations) to solve word problems involving numbers and quantities.</p> <p>Develop calculator skills and use a calculator effectively.</p> <p>VOCABULARY estimate</p> <p>RESOURCES Calculators Set of multiplication and division problems</p>	<ul style="list-style-type: none"> Tell the children that they are going to be solving multiplication and division problems using a step-by-step guide. <div> <div>R</div> <div>U</div> <div>S</div> <div>A</div> <div>C</div> </div> <p>Read the problem Understand the problem Choose the operation and estimate the answer Solve the problem Answer the question Check the answer</p> Present the word problem and work through the step-by-step guide. 89 children are camping. There are 3 tents that each take 9 children and other tents that each take 4 children. How many tents taking 4 children are needed, and how many tents are needed altogether? Say that before solving the problems they need to read through all of them and decide for each one whether they would solve them mentally (M), using written methods (W) or save them for later and use a calculator (C) and record M, W or C next to each question. Allow 15 minutes to do this and solve those questions they have identified to be done mentally or using a written method. Remind the class that they should estimate their answers first and record their working. <div>Q Which questions have you chosen to do on the calculator and why?</div> <ul style="list-style-type: none"> Now give out calculators and allow children 10 minutes to complete the questions they saved for calculator solutions. Remind them that they must record the calculations they do on their calculator and that they will be required to show their method on the KS2 calculator test paper. <div>Q When is it quicker to use a calculator than mental methods?</div> <div>Q Is it always quicker to use a calculator than mental methods when the calculation involves big numbers?</div> <ul style="list-style-type: none"> Establish that calculations such as $2\,400\,000 \div 6$ can still be done more quickly mentally and why this is the case. 	<ul style="list-style-type: none"> Remind the children that over the last 10 days they have been learning about methods of multiplication and division, estimating and checking, and solving word problems. <div>Q What steps are involved in solving a word problem? Explain to a partner.</div> <p>Reinforce the step by step guide and emphasise the importance of estimating before calculating.</p> <div> <p>By the end of the lesson the children should be able to:</p> <ul style="list-style-type: none"> Solve 'story' problems about numbers in real life, choosing the appropriate operation and method of calculation. <p>(Refer to supplement of examples, section 6, pages 82-89.)</p> </div>

Related Key Stage 2 national test questions:

2000 Test B

6

A shop sells batteries in **packs of four** and **packs of two**.



Simon and Nick want two batteries each.

They buy a **pack of four** and share the cost equally.

How much does each pay?



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



6a

2 marks

Mary buys **2 packs of two** batteries.

Hamid buys **1 pack of four**.

How much **more** does Mary pay than Hamid?



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



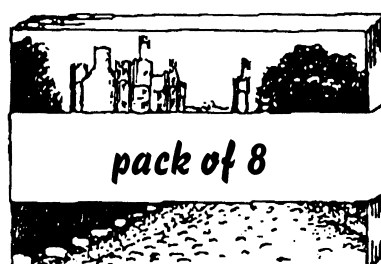
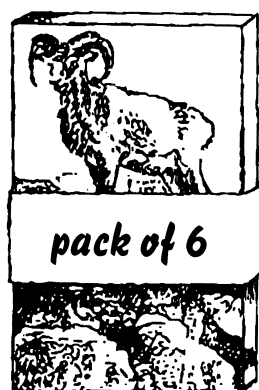
6b

2 marks

2000 Test B

5

A shop sells postcards in **packs of 6** and **packs of 8**.



Alan bought **4 packs of 8 cards**.

How many cards did he get?



5a

1 mark

Shereen bought some **packs of 6 cards**.

Altogether she has **30 cards**.

How many **packs of 6** did she buy?



5b

1 mark

Unit 3 Year 6 (Autumn Term)

2000 Test B

17

Put a tick (✓) in the correct box for each calculation.

Use a calculator.

The first one has been done for you.



	less than 1000	equal to 1000	more than 1000
$8.9 \times 9.9 \times 11.9$			✓
$(786 - 387) \div 0.41$			
$95.4 + (91 \times 9.95)$			
$12.5 \times (21.1 + 58.9)$			

2 marks

17

2001 Test A

11

Calculate $847 \div 7$



1 mark

11

2002 Test B

10

Write in the missing number



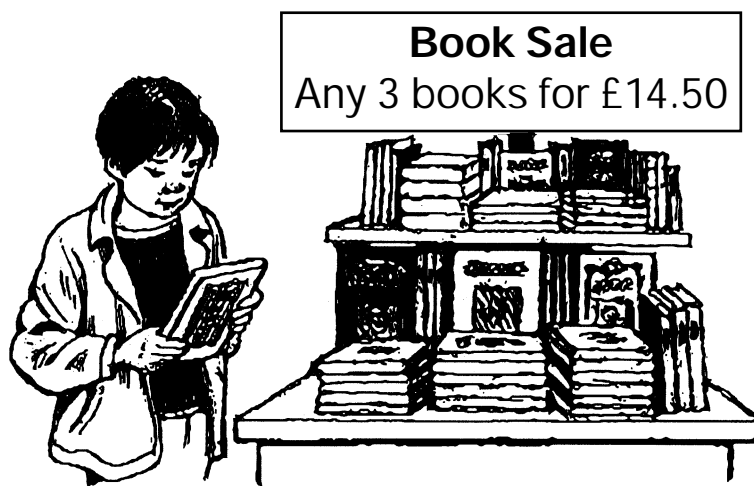
$$32.45 \times \boxed{} = 253.11$$

1 mark

10

2001 Test A

14



Lee bought these **three books** in the sale for **£14.50**.

How much money did he save altogether compared to the **full price** of the books?



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

£

14

2 marks

2001 Test B

21

Write in the missing number



$$404.09 \div \boxed{} = 8.5$$

21

1 mark

2002 Test A

22

Calculate $924 \div 22$



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



22



2 marks

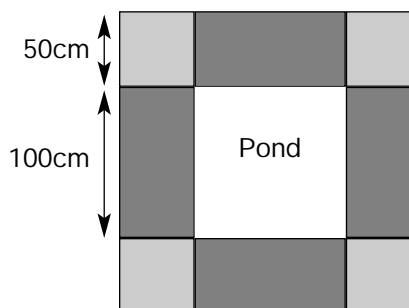
Total

2002 Test A

11

Mr Singh buys paving slabs to go around his pond.

PAVING SLABS	
£1.95 each	Square slabs
	50cm by 50 cm
£3.50 each	Rectangular slabs
	100cm by 50cm



He buys 4 rectangular slabs and 4 square slabs.

What is the total cost of the slabs he buys?



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

£

Mr Singh says,

'It would cost more to use square slabs all the way round.'

Explain why he is correct.



.....

.....

.....

11a

2 marks

11b

1 mark

Total

2002 Test A

18



6 green apples for 75p



10 red apples for 90p

Jason bought some bags of green apples and some bags of red apples.

He spent **£4.20**

How many **bags** of each type of apple did he buy?



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

**bags of
green apples**

**bags of
red apples**

Nika and Hassan bought some bags of apples.

'I bought more apples than Hassan, but I spent less money.'

Explain how this is possible.



.....

.....

.....

18a

2 marks

18b

1 mark

Total

2002 Test B

6



A box of four balls costs **£2.96**

How much does each ball cost?



6a

1 mark

Dean and Alex buy **3 boxes** of balls between them.

Dean pays **£4.50**

How much must Alex pay?



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



£

6b

2 marks

Total

2001 Test B

10



This is the cost to visit the waxworks.

Adults	£8.50
Children	£4.50

On Friday morning **12 adults** and **20 children** visit the waxworks.

How much do they pay altogether?



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



£

Guide books cost **£1.50** each.

The waxworks sells **£24** worth of **guide books**.

How many guide books is this?



2002 Test B

11



185 people go to the school concert.

They pay £1.35 each.

How much ticket money is collected?



11a

1 mark

Programmes cost 15p each.

Selling programmes raises £12.30.

How many **programmes** are sold?



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



11b

2 marks