



Mathematics Enhancement Programme

Primary Demonstration Project

2B Decimals

Help Booklet



Support for Primary Teachers
in Mathematics

Primary Project
funded by
Pricewaterhouse
Coopers

Sponsored by

ESSO

CIMT
School of Education
University of Exeter

in association with
British Steel
Garfield Weston Foundation



Mathematics Enhancement Programme

Help Module 2

DECIMALS

Part B

Contents of Part B

Preface
Activities
Tests
Answers

Contents of Part A

Preface
Introductory Notes
Worked Examples and Exercises
Answers

PREFACE

This is one of a series of *Help Modules* designed to help you gain confidence in mathematics. It has been developed particularly for primary teachers (or student teachers) but it might also be helpful for non-specialists who teach mathematics in the lower secondary years. It is based on material which is already being used in the *Mathematics Enhancement Programme: Secondary Demonstration Project*.

The complete module list comprises:

- | | |
|--------------|-----------------------|
| 1. ALGEBRA | 6. HANDLING DATA |
| 2. DECIMALS | 7. MENSURATION |
| 3. EQUATIONS | 8. NUMBERS IN CONTEXT |
| 4. FRACTIONS | 9. PERCENTAGES |
| 5. GEOMETRY | 10. PROBABILITY |

Notes for overall guidance:

- Each of the 10 modules listed above is divided into 2 parts. This is simply to help in the downloading and handling of the material.
- Though referred to as 'modules' it may not be necessary to study (or print out) each one in its entirety. As with any self-study material you must be aware of your own needs and assess each section to see whether it is relevant to those needs.
- The difficulty of the material in **Part A** varies quite widely: if you have problems with a particular section do try the one following, and then the next, as the content is not necessarily arranged in order of difficulty. Learning is not a simple linear process, and later studies can often illuminate and make clear something which seemed impenetrable at an earlier attempt.
- In **Part B**, **Activities** are offered as backup, reinforcement and extension to the work covered in Part A. **Tests** are also provided, and you are strongly urged to take these (at the end of your studies) as a check on your understanding of the topic.
- The marking scheme for the revision test includes B, M and A marks.

Note that:

- | | |
|----------------|---|
| M marks | are for method; |
| A marks | are for accuracy (awarded only following a correct M mark); |
| B marks | are independent, stand-alone marks. |

We hope that you find this module helpful. Comments should be sent to:

Professor D. N. Burghes
CIMT, School of Education
University of Exeter
EXETER EX1 2LU

The full range of Help Modules can be found at

www.ex.ac.uk/cimt/help/menu.htm

ACTIVITIES

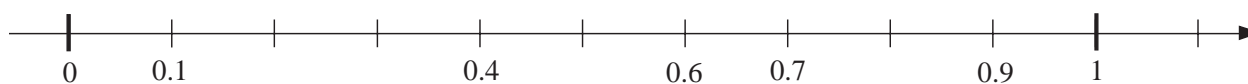
- 2.1 Decimal Scales
 - 2.2 Decimal Places
 - 2.3 Significant Figures
 - 2.4 Multiplying by Powers of 10
 - 2.5 Dividing by Powers of 10
 - 2.6 Magic Circle
 - 2.7 Decimal Arithmagons
 - 2.8 Estimation
 - 2.9 Decimal Equivalents
- Notes for Solutions

ACTIVITY 2.1

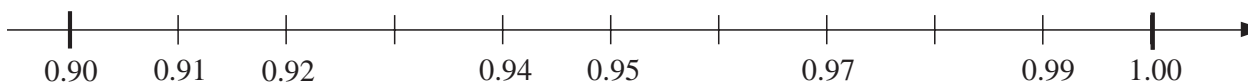
Decimal Scales

Fill in each gap with the correct number.

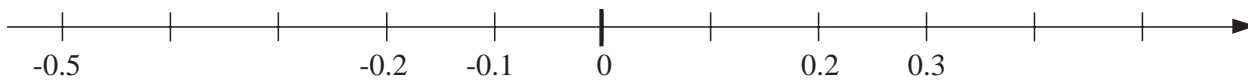
(a)



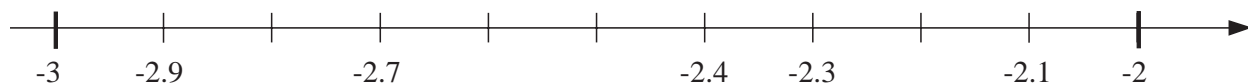
(b)



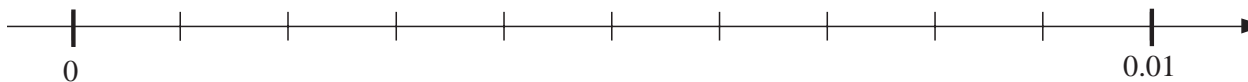
(c)



(d)



(e)



ACTIVITY 2.2*Decimal Places*

Write each number to the stated number of *decimal places*.

Number	2 d.p.	1 d.p.
2.459	2.46	2.5
10.726		
0.003		
1.999		
0.609		
5.446		
0.606		
0.084		
4.909		
20.009		

ACTIVITY 2.3*Significant Figures*

Write each number to the stated number of *significant figures*.

Number	3 s.f.	2 s.f.	1 s.f.
4 253	4 250	4 300	4 000
2 515			
2 087			
9 986			
2 198			
1 009			
13 004			
189 997			
1 993 349			

ACTIVITY 2.4*Multiplying by Powers of 10*

Complete the table.

Number	$\times 10$	$\times 100$	$\times 1000$
0.5		50	
- 62.3			
0.007			7
- 20.25			
0.013 75			
			1 400
58.16			
	- 15.11		
109.9			
- 0.084			
		780	
			- 312

ACTIVITY 2.5

Dividing by Powers of 10

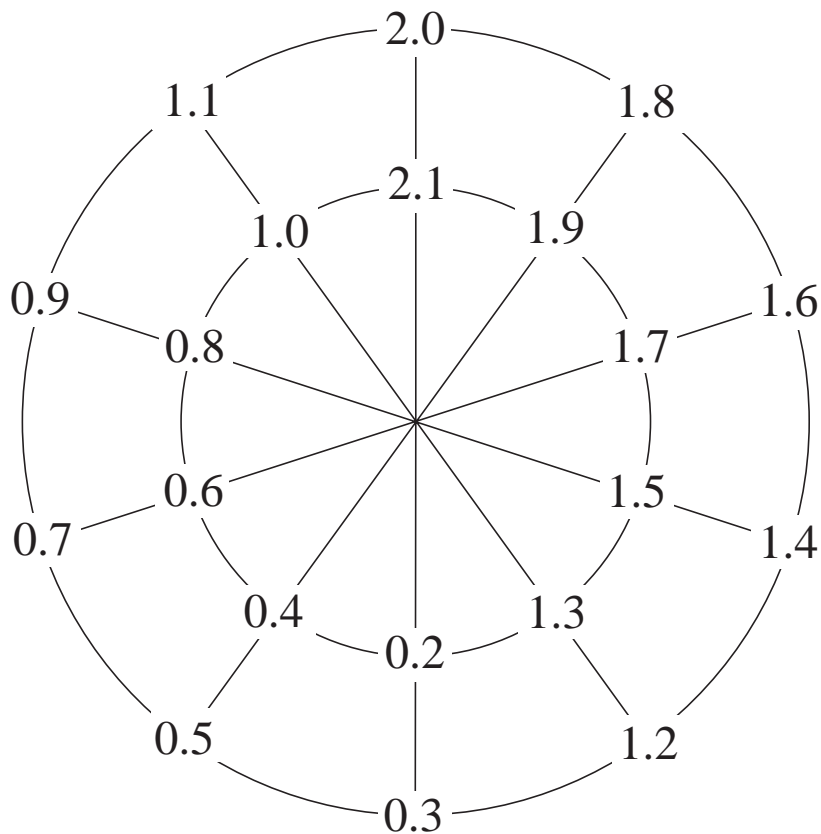
Complete the table.

Number	$\div 10$	$\div 100$	$\div 1\ 000$
49.8			
0.035			
- 7.09			- 0.007 09
0.01			
	6.4		
- 2.32			
5			
178			
		0.965	
0.16			
- 3.2			

ACTIVITY 2.6

Magic Circle

In this magic circle, there are two 'magic' totals.



- (a) What are they?
- (b) Explain how you found them.

Extension

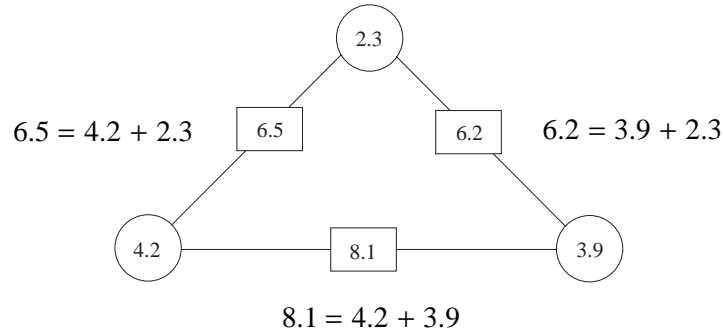
Design a magic circle of your own and ask someone else to solve it.

ACTIVITY 2.7

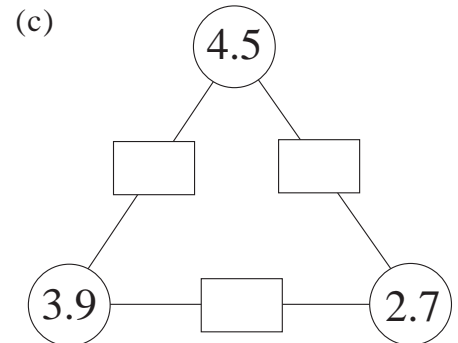
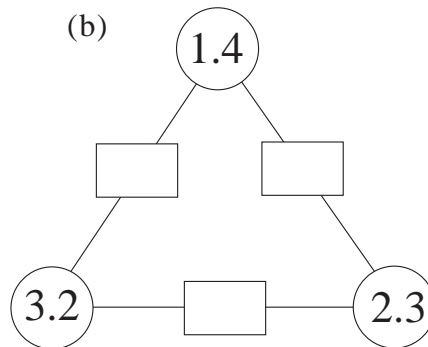
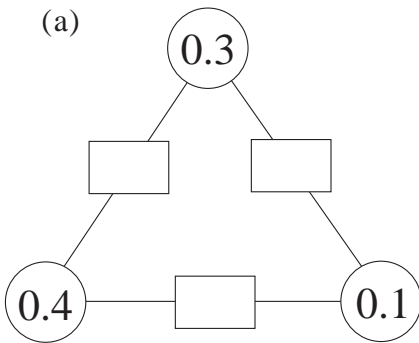
Decimal Arithmagons

In these arithmagons, the number in each **square** is the *sum* of the numbers in the **circles** on either side of the square.

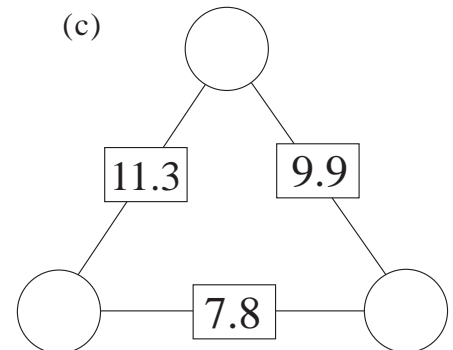
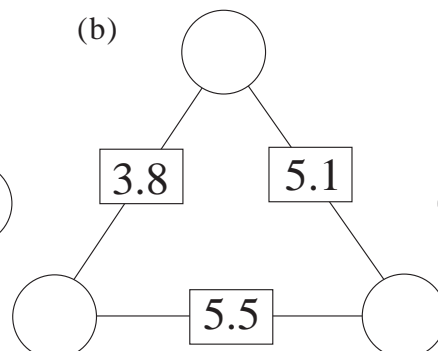
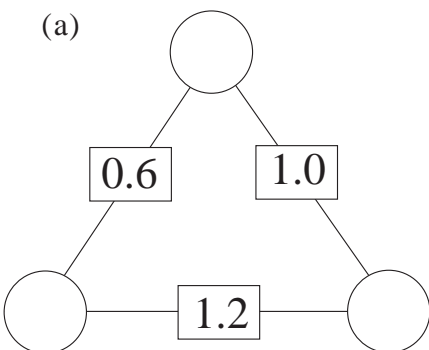
For example,



1. Find the numbers missing from the boxes.



2. Find the numbers missing from the circles.



ACTIVITY 2.8

Estimation

Do not use a calculator, except to check your answers.

For each of these sums, draw a circle around the number which you think is nearest the correct answer.

For example, $\frac{7.1 \times 20.5}{3.5}$ is about { 4.2 42 84 420 }

1. $\frac{5.5 \times 13}{7}$ is about { 0.1 1 10 100 }
2. $\frac{42 \times 39}{16}$ is about { 1 10 100 1000 }
3. $\frac{210 \times 37}{17}$ is about { 4.5 45 450 4500 }
4. $\frac{6.5 \times 4.2}{2.2}$ is about { 1.2 12 120 1200 }
5. $\frac{12.7 \times 2.9}{3.7}$ is about { 0.1 1 10 100 }
6. A drink costs 55 p.
About how many drinks could you buy for £5? { 90 9 19 }
7. At a fairground, rides cost 40 p each.
About how many rides can you go on for £7? { 7 17 70 }
8. Oranges cost 15 p each.
About how many oranges can you buy for £50? { 33 330 3300 }
9. Stamps cost 24 p each.
About how many stamps can you buy for £10? { 4 40 400 }
10. Petrol costs £2.40 per gallon.
About how many gallons can you buy for £25? (10 25 100)

ACTIVITY 2.9

Decimal Equivalents

Use a computer, calculator, or long division, to find the decimals equivalent for all the fractions $\frac{1}{1}, \frac{1}{2}, \dots, \frac{1}{10}$.

If the decimal equivalent is recurring, state the length of the cycle, i.e. the number of digits which repeat.

e.g. $\frac{3}{11} = 0.272\ 727\ 27\dots$ has a cycle of length 2, because 2 and 7 are repeated.

Complete the table below.

Fraction	Decimal Equivalent	Recurring	Length of cycle
$\frac{1}{1}$	1.000 000 ...	✗	
$\frac{1}{2}$			
$\frac{1}{3}$	0.333 333 ...	✓	1
$\frac{1}{4}$			
$\frac{1}{5}$			
$\frac{1}{6}$			
$\frac{1}{7}$			
$\frac{1}{8}$			
$\frac{1}{9}$			
$\frac{1}{10}$			

Extension Continue the activity for fractions up to $\frac{1}{20}$. Be careful with $\frac{1}{17}$ and $\frac{1}{19}$.

ACTIVITIES 2.1 – 2.5

Notes for Solutions

Notes and solutions are given only where appropriate.

2.2 2 d.p. 10.73, 0.00, 2.00, 5.45, 0.61, 0.08, 4.91, 20.01
 1 d.p. 10.7, 0.0, 2.0, 5.4, 0.6, 0.1, 4.9, 20.0

2.3 3 s.f. 2520, 2090, 9990, 2200, 1010, 13 000, 190 000, 1 990 000
 2 s.f. 2500, 2100, 10 000, 2200, 1000, 13 000, 190 000, 2 000 000
 1 s.f. 3000, 2000, 10 000, 2000, 1000, 10 000, 200 000, 2 000 000

2.4 No.	$\times 10$	$\times 100$	$\times 1000$
0.5	5	50	500
-62.3	-623	-6230	-62300
0.007	0.07	0.7	7
-20.25	-202.5	-2025	-20250
0.01375	0.1375	1.375	13.75
1.4	14	140	1400
58.16	581.6	5816	58160
-5.611	-56.11	-561.1	-5611
109.9	1099	10990	109900
-0.084	-0.84	-8.4	-84
7.8	78	780	7800
-0.312	-3.12	-31.2	-312

2.5 No.	$\div 10$	$\div 100$	$\div 1000$
49.8	4.98	0.498	0.0498
0.035	0.0035	0.00035	0.000035
-7.09	-0.709	-0.0709	-0.00709
0.01	0.001	0.0001	0.00001
64	6.4	0.64	0.064
4120	412	41.2	4.12
-2.32	-0.232	-0.0232	-0.00232
5	0.5	0.05	0.005
178	17.8	1.78	0.178
96.5	9.65	0.965	0.0965
0.16	0.016	0.0016	0.00016
-3.2	-0.32	-0.032	-0.0032

ACTIVITIES 2.6 – 2.9*Notes for Solutions*

- 2.6** (a) (i) 4.6 (ii) 11.6
(b) (i) sum across each diagonal (ii) sum around each circle

- 2.7** 1. (a) 0.7, 0.4, 0.5 (b) 4.6, 3.7, 5.5 (c) 8.4, 7.2, 8.6
2. (a) 0.2, 0.8, 0.4 (b) 1.7, 3.4, 2.1 (c) 6.7, 3.2, 4.6

- 2.8** 1. 10 2. 100 3. 400 4. 12 5. 10
6. 9 7. 17 8. 330 9. 40 10. 10

- 2.9** Recurring : $\frac{1}{6}, \frac{1}{7}, \frac{1}{9}, \frac{1}{11}, \frac{1}{12}, \frac{1}{13}, \frac{1}{14}, \frac{1}{15}, \frac{1}{17}, \frac{1}{18}, \frac{1}{19}$

Note that $\frac{1}{17}$ has a cycle of length 16, and $\frac{1}{19}$ has length 18

TESTS

- 2.1 Mental Practice
- 2.2 Mental Practice
- 2.3 Revision
- Answers

Tests 2.1 and 2.2**Mental Practice**

Answer these questions as quickly as you can, but without the use of a calculator.

Test 2.1

1. Write $\frac{7}{100}$ as a decimal.
2. Write 0.99 as a fraction.
3. $10.5 - 5.2$
4. $8.5 + 3.8$
5. $8.5 - 3.8$
6. Write down a 2-digit decimal between 0.87 and 0.89.
7. How much is left if 3 shelves, each of length 1.4 metres, are cut from a plank of length 5 metres?
8. 4.932×100
9. $26.87 \div 100$
10. What is 5.087 correct to 1 d.p.?

Test 2.2

1. Write $\frac{51}{100}$ as a decimal.
2. Write 0.03 as a fraction.
3. $12.7 - 8.2$
4. $7.7 + 3.5$
5. $9.5 - 3.8$
6. Write down a 3-digit decimal between 0.52 and 0.53
7. Four lengths of cloth, each of length 2.3 metres are cut from a roll of length 15 metres.
What length is left on the roll?
8. 22.47×100
9. $7.49 \div 10$
10. What is 76.962 correct to 1 d.p.?

Test 2.3

Revision

60 minutes are allowed.

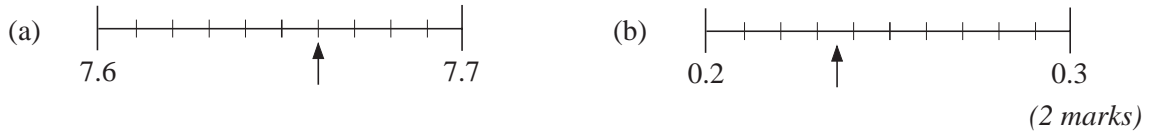
1. Write each of the following as a decimal.

- (a) $\frac{3}{10}$ (b) $\frac{17}{100}$ (2 marks)

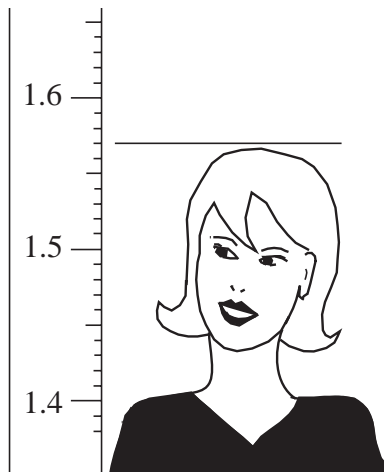
2. Write each of the following as a fraction.

- (a) 0.7 (b) 0.79 (2 marks)

3. Read the value indicated by each pointer.



4. This scale is in metres. What is Emma's height?



(2 marks)
(SEG)

5. In a shop, Alan spends £1.33 on milk,
 £3.14 on coffee,
 and £0.74 on sugar.

- (a) Calculate the total amount that Alan spends. (1 mark)
 (b) Alan pays with a £10 note. How much change should he be given? (1 mark)
(MEG)

6.



Wayne has 78p in his pocket.

What is the greatest number of pens he can buy? (2 marks)
(SEG)

Revision Test 2.3

7.

<p><i>Classified Advertisement Rates</i></p> <p>18p per word</p> <p>Minimum 10 words</p>

Find the cost of this advertisement.

Heated	Indoor	Swimming	Pool
Suitable	for	birthday	parties
ALL	ages	For	that
Special	occasion	phone	791612

(2 marks)
(SEG)

8. Neil has a Saturday job. His wages are worked out using this rule.

$$\text{Wages in pounds} = \text{number of hours worked} \times 5.$$

Neil worked for seven hours last Saturday.

(a) Work out Neil's wages for last Saturday. (2 marks)

On a Saturday last month Neil earned £20.

(b) How many hours did Neil work on that Saturday? (1 mark)
(LON)

9. (a) Mr. Grey receives an electricity bill for £42.91.

The bill includes a quarterly charge of £10.33 and the cost per unit is 7.49 pence.

He uses the following formula to calculate how many units of electricity he has used.

$$\text{Units used} = \frac{(42.91 - 10.33) \times 100}{7.49}$$

Calculate, to the nearest whole number, how many units he has used. (2 marks)

(b) In the next quarter he uses 578 units.

The cost of the quarterly charge is the same and the cost per unit is the same.

Calculate this quarterly bill. (3 marks)
(SEG)

Revision Test 2.3

10. Leroy changes £475.60 into Guilders for a holiday in Holland.

The exchange rate is £1 = 2.68 Guilders. There is a £5 charge for changing the money.

(a) How many Guilders should he receive? (2 marks)

(b) When he returns from Holland he has 84 Guilders left. He changes these back into British money and again £5 is deducted as a charge.

How much does Leroy receive? (3 marks)
(SEG)

11. Write each of the following numbers correct to

(a) 2 decimal places (b) 2 significant figures (c) 1 decimal place:

(i) 10.479 (ii) 0.0199 (6 marks)

12. Copy and complete this table.

<i>Proportion</i>	<i>Fraction</i>	<i>Decimal</i>	<i>Percentage</i>
Quarter	...	0.25	...
...	$\frac{3}{10}$
...	50%
...	$\frac{3}{4}$
...	...	0.9	...

(5 marks)

13.

**MAJESTIC
CINEMA**

====

Film starts : 7.50 pm

Running time : 145 minutes

Three friends, Ali, Brenda and Chris, go to the cinema one Saturday night.

(a) The film starts at 7.50 pm.
It lasts for 145 minutes.
At what time does it finish?

(2 marks)

(b) Do not use a calculator to answer this question.

The total cost of the three tickets is £11.55. Each ticket costs the same.

Work out the cost of one ticket. (Write down all your working to show that you have not used a calculator.)

(2 marks)
(NEAB)

Revision Test 2.3

14. A concert hall has 22 rows of seats. Each row has 69 seats.

The total number of seats is

$$22 \times 69.$$

- (a) Write down the numbers you could use to get an approximate answer to 22×69 .
(1 mark)
- (b) Write down your approximate answer.
(1 mark)
- (c) Using a calculator, find the difference between your approximate answer and the exact answer.
(1 mark)
(LON)
15. (a) Use your calculator to work out:
- (i) $\frac{59.7}{3.14 \times 2.8}$ (ii) $\frac{57}{9.8 + 7.3}$ (iii) $\frac{1}{3.9} + \frac{3.1}{4.3}$ (3 marks)
- (b) Explain how you could quickly check that your answer to (a) (iii) is of the right order of magnitude.
(2 marks)
(NEAB)

Tests 2.1 and 2.2**Answers**

Test 2.1

1. 0.07
2. $\frac{99}{100}$
3. 5.3
4. 12.3
5. 4.7
6. 0.88
7. 0.8 m
8. 493.2
9. 0.268 7
10. 5.1

Test 2.2

1. 0.51
2. $\frac{3}{100}$
3. 4.5
4. 11.2
5. 5.7
6. $0.52n$
7. 5.8 m
8. 2 247
9. 0.749
10. 77.0

Test 2.3

Answers

-
- | | | | | | | | | | | | |
|-----|----------------|---|-------|-----------------|-----------------------|----------------|--------------------|-----------|---------------------------------|----------------|-----------|
| 1. | (a) | 0.3 | (b) | 0.17 | | B1 B1 | (2 marks) | | | | |
| 2. | (a) | $\frac{7}{10}$ | (b) | $\frac{7}{100}$ | | B1 B1 | (2 marks) | | | | |
| 3. | (a) | 7.66 | (b) | 0.235 | | B1 B1 | (2 marks) | | | | |
| 4. | | 1.57 | | | | B2 | (2 marks) | | | | |
| 5. | (a) | £5.21 | (b) | £4.79 | | B1 B1 | (2 marks) | | | | |
| 6. | | 8 | | | | M1 A1 | (2 marks) | | | | |
| 7. | | $16 \times \text{£}0.18 = \text{£}2.88$ | | | | M1 A1 | (2 marks) | | | | |
| 8. | (a) | £35 | (b) | 4 | | M1 A1 B1 | (3 marks) | | | | |
| 9. | (a) | 435 | (b) | £53.62 | | B2 M2 A1 | (5 marks) | | | | |
| 10. | (a) | 1261 | (b) | £26.34 | (first A1 for £31.34) | M1 A1 M1 A1 A1 | (5 marks) | | | | |
| 11. | (a) | (i) | 10.48 | (ii) | 0.02 | B1 B1 | | | | | |
| | | (b) | (i) | 10 | (ii) | 0.020 | B1 B1 | | | | |
| | | (c) | (i) | 10.5 | (ii) | 0.0 | B1 B1 | (6 marks) | | | |
| 12. | Quarter | $\frac{1}{4}$ | 0.25 | 25% | | B1 | | | | | |
| | Three-tenths | $\frac{3}{10}$ | 0.3 | 30% | | B1 | | | | | |
| | Half | $\frac{1}{2}$ | 0.5 | 50% | | B1 | | | | | |
| | Three-quarters | $\frac{3}{4}$ | 75 | 75% | | B1 | | | | | |
| | Nine-tenths | $\frac{9}{10}$ | 0.9 | 90% | | B1 | (5 marks) | | | | |
| 13. | (a) | 10.15 pm | (b) | £3.85 | | B2 M1 A1 | (4 marks) | | | | |
| 14. | (a) | 20×70 | (b) | 1400 | (c) | 118 | B1 B1 B1 (3 marks) | | | | |
| 15. | (a) | (i) | 6.79 | (ii) | 3.33 | (iii) | 0.977 | (b) | $\frac{1}{4} + \frac{3}{4} = 1$ | B1 B1 B1 M1 A1 | (5 marks) |

(TOTAL MARKS 50)