

TEACHER'S NOTES

# Maths Level 1

## Chapter 2

### Working with fractions, decimals and percentages

<b>SECTION B</b>	1 Understanding fractions	28
	2 Finding fractions of quantities	31
	3 Remember what you have learned	33
<b>SECTION C</b>	1 Understanding decimals	36
	2 Calculating with decimals	38
	3 Rounding decimal amounts	41
	4 Estimating and checking answers	42
	5 Remember what you have learned	43
<b>SECTION D</b>	1 Understanding percentage	45
	2 Percentages of quantities	47
	3 One quantity as a percentage of another	49
	4 Percentage increase and decrease	51
	5 Remember what you have learned	52

# Maths Level 1

Carol Roberts

## Chapter 2: Working with fractions, decimals and percentages

### Use these free pilot resources to help build your learners' skill base

We are delighted to continue to make available our free pilot learner resources and teacher notes, to help teach the skills learners need to pass Edexcel FS Mathematics, Level 1.

### But use the accredited exam material and other resources to prepare them for the real assessment

We developed these materials for the pilot assessment and standards and have now matched them to the final specification in the table below. They'll be a useful interim measure to get you started but the assessment guidance should no longer be used and you should make sure you use the accredited assessments to prepare your learners for the actual assessment.

### New resources available for further support

We're also making available new learner and teacher resources that are completely matched to the final specification and assessment – and also providing access to banks of the actual live papers as these become available. We recommend that you switch to using these as they become available.

### Coverage of accredited specification and standards

The table below shows the match of the accredited specification to the unit of pilot resources. This table supersedes the pilot table within the teacher notes.

Coverage and Range	Exemplification	Learner Unit
Understand and use equivalences between common fractions, decimals and percentages	• Understand equivalent fractions	<b>B1</b> Understanding fractions <b>B2</b> Finding fractions of quantities
		<b>B3</b> Remember what you have learned
	• Convert between fractions, decimals and percentages	<b>C1</b> Understanding decimals <b>D1</b> Understanding percentages <b>D2</b> Percentages of quantities <b>D4</b> Percentage increase and decrease
		<b>D5</b> Remember what you have learned
	• Shade a fraction on a grid	This is covered in our new publishing (see below)
	• Order common fractions	<b>B1</b> Understanding fractions
Add and subtract decimals up to two decimal places	• Add decimals • Subtract decimals • Addition and subtraction with money	<b>C1</b> Understanding decimals <b>C2</b> Calculating with decimals <b>C3</b> Rounding decimal amounts <b>C4</b> Estimating and checking answers
		<b>C5</b> Remember what you have learned

### Where to find the final specification, assessment and resource material

Visit our website [www.edexcel.com/fs](http://www.edexcel.com/fs) then:

- **for the specification and assessments:** under **Subjects**, click on **Mathematics (Levels 1–2)**
- **for information about resources:** under **Support**, click on **Published resources**.

# 2

# Working with fractions, decimals and percentages

(pages 28–54 in the learner materials)

Performance	Coverage and Range	Unit Objectives
<b>Learners can:</b>	<b>Learners can:</b>	
<ul style="list-style-type: none"> <li>■ understand practical problems in familiar and unfamiliar contexts and situations, some of which are non-routine</li> <li>■ identify and obtain necessary information to tackle the problem</li> <li>■ select mathematics in an organised way to find solutions to practical problems for different purposes</li> <li>■ apply mathematics in an organised way to find solutions to practical problems for different purposes</li> <li>■ use appropriate checking procedures at each stage</li> <li>■ interpret and communicate solutions to practical problems, drawing simple conclusions and giving explanations</li> </ul>	<ul style="list-style-type: none"> <li>■ understand and use equivalencies between common fractions, decimals and percentages</li> <li>■ add and subtract decimals up to 2 decimal places</li> </ul>	<b>B1</b> Understanding fractions
		<b>B2</b> Finding fractions of quantities
		<b>B3</b> Remember what you have learned
		<b>C1</b> Understanding decimals
		<b>C2</b> Calculating with decimals
		<b>C3</b> Rounding decimal amounts
		<b>C4</b> Estimating and checking answers
		<b>C5</b> Remember what you have learned
		<b>D1</b> Understanding percentage
		<b>D2</b> Percentages of quantities
		<b>D3</b> One quantity as a percentage of another
		<b>D4</b> Percentage increase and decrease
		<b>D5</b> Remember what you have learned

## Approaches to teaching

This section covers the skills necessary for learners to be able to work efficiently with fractions, decimals and percentages. The unit focuses on the delivery of fractions, decimals and percentages and the questions set allow the learner to practice the full range of skills being taught. The table identifies the coverage and range from the functional skills standards: mathematics level 1 which are covered in this section.

## B Working with fractions

### B1 Understanding fractions

The main idea is that any number can be expressed as a fraction of another number. Encourage learners to read questions carefully to work out which number is the numerator and which is the denominator. Remind learners that the denominator will be the 'total value' and that it may be necessary to work this out by adding. Advise learners to look for a number by which they can divide 'top and bottom', to simplify the fraction. Emphasise that they can divide by 2 if both top and bottom numbers are even and by 5 if both numbers end in either 0 or 5. Discuss how they will

know when they have simplified the fraction as far as possible.

### Activities

Prepare a poster by writing a fraction, such as  $\frac{2}{3}$ , in the centre of a large sheet of paper. Write other fractions, such as  $\frac{4}{12}$ ,  $\frac{12}{16}$ ,  $\frac{9}{12}$ , on cards. Ask learners, in pairs, to decide which card fractions are equivalent to the fraction on the poster and to glue these cards on. Pairs of learners compare their results with those of other pairs.

### Misconceptions

Learners are often confused about which number to use as the numerator and which as the denominator. Emphasise that 'out of 50' means the denominator is 50. Learners may not simplify fractions fully. Encourage them to look for other factors.

### B2 Finding fractions of quantities

The main idea is to enable learners to work out a fraction of an amount or quantity. Encourage learners to explore the methods shown on page 32 of the

learner materials and to discuss which method they prefer to use. Emphasise that they always need to multiply the amount by the 'top number' and to divide the amount by the 'bottom number', and that it doesn't matter in which order they do it.

## Activities

Prepare a poster by writing a fraction of an amount, such as  $\frac{2}{3}$  of £12, in the centre of a large sheet of paper. Write methods and amounts, including incorrect methods and amounts, on cards. Ask learners, in pairs, to decide which cards show a correct method and amount and to glue these cards on to the poster. Pairs of learners compare their results with those of other pairs.

## Misconceptions

Learners are often confused about which numbers to multiply by and which numbers to divide by. For example, in question 8 on page 33 of the learner materials, learners need to work out  $\frac{2}{5} \times 300$ . They are often tempted initially to divide by 2 and multiply by 5 or may even divide 300 by both 2 and 5.

## C Working with decimals and money

### C1 Understanding decimals

The main idea is that learners apply place value in numbers with up to three decimal places and can order any group of decimals. Use money to illustrate the meaning of place value in decimal numbers, for example, What do the 2 and 5 represent in £34.25? Talk about the fact that 20p is two tenths of a pound and compare this with the meaning of the 2 in 34.25 – also two tenths of a pound. Advise learners to order decimals by comparing the values of the digits in every place after the decimal point. Remind them how to use zero as a place filler.

When working with pounds and pence, ensure learners can correctly write amounts of money, either in pounds or pence. Clarify with learners that there are 100 pence (100p) in one pound (£1.00), so this means that 236p is the same as £2.36. Ensure that learners understand that 0.2 pounds on a calculator means £0.20. Make sure they understand why zero is written between the decimal point and the 5, for example, when 5p is expressed in pounds as £0.05. Advise that writing amounts of money with both a £ sign and p is not acceptable.

## Activities

Ask learners to write a number between 3 and 4. Explore the range of answers (most will write 3.5 or

$3\frac{1}{2}$ ). Ask them to write another number between 3.4 and 3.5, to develop an understanding of hundredths. Choose five of their decimal numbers at random, then ask all learners to order them.

Prepare cards showing the following amounts: 60p, £0.60, £0.60p, 0.6, 0.60, 60, £0.6, 0.6p, 60.0p, £60.0, £06.0. Display the cards and ask learners to discuss which of them show the same amount as sixty pence and which versions they are used to seeing. Repeat with other amounts.

## Misconceptions

Learners sometimes make mistakes by treating the digits after the decimal point the same as those in a whole number. For example, in question 1c on page 37 of the learner materials, learners may read the three digits after the decimal point in 3.505km as five hundred and five, and in 3.55km as fifty-five, and hence think 34.505 is larger.

Learners often think that £2.34p is an acceptable form for writing money because they see this format on signs showing prices in shops. Stress that this is incorrect: blocking (or hiding) the p, £2.34 means two pounds thirty-four pence, but blocking the £ sign means two point three four pence.

### C2 Calculating with decimals

The main idea is to enable learners to build confidence in calculating with decimals. First, ensure that learners can add and subtract efficiently, writing decimal numbers so that the place-value columns are correctly aligned. Encourage them to subtract decimals by the method that is most familiar to them ('borrowing', 'paying back' or 'counting up').

Demonstrate how to use a calculator to add, subtract, multiply and divide with decimals. Emphasise the importance of interpreting display readings in the correct context, e.g. 2.5 in pounds needs to be written as £2.50.

## Activities

Write on the board examples of questions about decimal problems involving adding and subtracting. Ask work out the answer to each question and then to find a student who has used a different method to get the answer. Ask them, as pairs, to discuss the methods they have used and decide which they each prefer.

## Misconceptions

Learners are often confused about where to place the decimal point when calculating with decimals.

Encourage learners to use estimation in questions. For example, if they are trying to work out  $34.56 + 9.8$ , advise them to round off each value first to give an estimated answer;  $35 + 10 = 45$  so they know they are looking for an answer close to 45, not 4.5 or 450.

### C3 Rounding decimal amounts

### C4 Estimating and checking answers

The main idea is that learners understand the importance of being able to round decimals when estimating answers. Demonstrate how to round off to the nearest whole number, tenth or hundredth. Make connections between one tenth of a pound and ten pence, and between one hundredth of a pound and one pence.

Advise learners when estimating answers to round off to a degree of accuracy that is easier for them to work with.

### Activities

Prepare question cards, with three or four corresponding answer cards for each question; for example, 'A woman pays 12.3p for 1 unit of electricity and uses 751 units. What calculation can she use to estimate the amount she pays?' with answers:  $10 \times 700p$ ,  $10 \times 800p$ ,  $20 \times 700p$ ,  $20 \times 800p$ . Ask learners, in pairs or groups, to match questions with the correct answer cards.

### Misconceptions

Learners often make mistakes when rounding to a required degree of accuracy. For example, in question 6 on page 42, learners may not understand that 'to the nearest tenth' means they need to give an answer with just one digit after the decimal point: they need to realise that the digit to be rounded is 7 (and rounded up to give 1.9 litres).

## D Working with percentages

### D1 Understanding percentage

The main idea is to ensure that learners understand the meaning of percentages and the relationships between common fractions, decimals and percentages. Establish knowledge of relationships for 50%, 25% and 75%. Explain the meaning of 10%, using 10p in the pound as an example. Then develop the idea that 20% is double 10%, so is  $2 \times 0.1 = 0.2$ , and is therefore the same as  $\frac{1}{5}$ , and so on.

### Activities

Prepare cards showing half in different ways, for example, 50%, 0.5,  $\frac{1}{2}$ , a rectangle with half shaded, a scale 0 to 1 with 0.5 marked with arrow. Make similar cards for other percentages such as 75%, 10%. Ask learners, in pairs or groups, to match equivalent sets.

### D2 Percentages of quantities

### D4 Percentage increase and decrease

The main idea is to ensure that learners can correctly calculate simple percentages of quantities and find the value of percentage increases and decreases.

Encourage learners to find 50% of a quantity by halving it; from this, develop and establish strategies to find 25% and 75%. Establish the idea of finding 10% by dividing by 10, reinforcing previous work in decimals on moving digits one place to the right. Then advise learners to find 5%, 20%, 30% ... from the value of 10%. Establish the meaning of percentage increase and decrease in everyday contexts, for example, in sale discounts and interest.

### Activities

Prepare a handout showing three ways to find 40% of £2.40, for example, first find 10% then multiply by 4;  $\frac{40}{100} \times 2.4$  with cancelling;  $2.4 \times 2 \div 5$ . Ask learners to try the three methods and discuss which one they prefer.

Prepare a poster with a central statement: 'CAR SALES! Massive reduction! Normal cost £5500, 40% off!' Make cards showing correct and incorrect methods to work out the discount (e.g.  $4 \times 5500 \div 10$ ,  $5 \times 5500 \div 2$ ). Ask learners, in pairs or groups, to identify cards showing the correct methods and to stick these on the poster.

### Misconceptions

Learners can generally find 50%, 25% and 75% of a number but are often confused when finding multiples of 10%. Weaker learners have 100% in their heads and may be confused about what to do with it. For example, in question 1 on page 53 of the learner materials, some learners may think 60% is just 60 people or think it must be 600 as this involves 6 and 100. Others may think they have to divide by 6 instead of multiplying by it, resulting in 150 as a solution. Encourage learners to use the method of finding 10% and then using this to find any multiple of 10%. Stress that finding 10% by dividing by 10 only works with 10%.

Some learners make errors in 'increasing' or 'decreasing' problems, by not reading the question carefully and so not actually answering the question asked. For example, in question 6 on page 52, learners may just work out the increase rather than the new wage. Another common misreading error involves ignoring negative words (not) in a question. For example, in question 7 on page 54, learners may give 75% as a fraction instead of 25%.

### D3 One quantity as a percentage of another

The main idea is to ensure that learners can successfully express a fraction of a quantity as a percentage or can identify relevant quantities given in a question and can then work out how to express one as a percentage of the other. When expressing fractions as percentages, demonstrate different methods and encourage learners to identify the method they prefer (e.g. multiplying by 100 and cancelling, or by multiplying 'top and bottom' by the same number until the bottom number equals 100). When expressing one quantity as a percentage of another, advise learners that the larger number, total or starting value in the question generally acts as the 'bottom number'. Develop skills in how to recognise what number to divide top and bottom by, e.g. 2 if both are even, 5 if both end in either 0 or 5.

### Activities

Repeat the poster and method activities above, as these enable learners to explore the rules for cancelling down and multiplying a fraction by a quantity.

### Misconceptions

Learners are sometimes unsure what to multiply by and what to divide by. For example, in question 2 on page 53, when trying to work out  $\frac{2}{5} \times 100$ , learners may multiply 100 by 5 instead of 2. Advise learners that, when they are expressing fractions as percentages, they are trying to simplify the fraction into a fraction that they can identify easily. For example, in practice test question 8 on page 54,  $\frac{111}{444}$  reduces to  $\frac{1}{4}$ , which they should know is 25%.

### Apply the skills

The learners need to develop their Process Skills, which are:

Representing	Analysing	Interpreting
making sense of situations and representing them	processing and using the mathematics	interpreting and communicating the results of the analysis

At level 1 the learners may receive some guidance on how to first approach a problem but then must decide on the methods to be used and to identify the information they need for themselves. A suitable activity to practise these number skills would be to check the accuracy of fuel bills and to investigate more economical options. An example task is given below.

## How much does electricity cost?

The table shows part of Kerry's latest electricity bill.

Your task is to check to see if the amounts given in the bill have been calculated correctly and to investigate cheaper options.

You must show evidence of checking your work using different methods, including whether your results make sense. You may use ICT to complete this task, but you must include evidence of all your calculations.

1. Use a calculator to check if the number of units used is correct.
2. Use a calculator to check to see if the charges for electricity used are correct.
3. Round the charges for electricity to the nearest ten pounds. Use this value to work out the approximate amount for VAT at 5%. Is it close to the amount of VAT shown in the bill?
4. Without a calculator, add the VAT to the subtotal. Does this amount agree with the total charges shown in the bill?
5. Use the bill to estimate how much Kerry can expect to pay for electricity per month. Is your estimate a reasonable amount per month all year round?
6. Consumer advice suggests energy-saving devices can reduce Kerry's current bill by a third. How much can she expect to save per month if she follows this advice?

Kerry wants to switch to a monthly direct debit plan.

Discuss in your group how much would be a reasonable monthly amount to pay based on the information you have.

	Previous	Present	Units used	Total
<b>Readings</b>				
Period Covered	31/05/07	31/08/07		
	27578	28400	822 kWh	
<b>Charges for Tariff – Standard Meter/Monthly Direct Debit</b>				
Electricity charges from 29/05/07 to 15/08/07				
196 kWh at 15.35p				£30.09
626 kWh at 11.00p				£68.86
<b>Subtotal (excluding VAT)</b>				<b>£98.95</b>
VAT at 5% on £98.95				£4.95
<b>Charges for this period</b>				<b>£104.80</b>

### Sample extended tasks

Use a search engine to compare electricity costs to see if you can find Kerry a cheaper deal (e.g. [www.moneysupermarket.com](http://www.moneysupermarket.com))

For any offers investigated, check out

- the unit rate for electricity
- how much Kerry's electricity consumption would cost her with this rate before VAT is added
- how much she is likely to save.

## B Working with fractions

### 1 Understanding fractions

Reading and writing fractions – page 29

- a  $\frac{1}{4}$  b  $\frac{3}{8}$  c  $\frac{7}{10}$
- a one eighth b two fifths c three tenths
- half or  $\frac{1}{2}$
- $\frac{4}{5}$  or four fifths
- $\frac{3}{4}$  or three quarters

Ordering and comparing fractions – page 30

- a  $\frac{1}{5}, \frac{1}{2}, \frac{3}{5}$   
b  $\frac{1}{4}, \frac{1}{3}, \frac{2}{5}$
- Employment as  $\frac{1}{3}$  is bigger than  $\frac{1}{4}$
- Labour as  $\frac{1}{2}$  is bigger than  $\frac{2}{5}$
- Light entertainment as  $\frac{3}{10}$  is less than  $\frac{1}{3}$

### 2 Equivalent fractions – page 31

- a  $\frac{1}{2}$  b  $\frac{1}{5}$  c  $\frac{3}{5}$  d  $\frac{5}{8}$  e  $\frac{5}{8}$  f  $\frac{2}{5}$  g  $\frac{1}{4}$  h  $\frac{2}{5}$   
i  $\frac{2}{3}$  j 3 k  $\frac{4}{5}$  l  $\frac{1}{100}$
- $\frac{4}{5}$
- a  $\frac{3}{5}$  b  $\frac{2}{5}$

### 3 Finding fractions of quantities – page 32

- a  $\frac{3}{10}$  b  $\frac{2}{3}$  c  $\frac{2}{3}$  d  $\frac{5}{7}$
- $\frac{7}{8}$
- a 18 kg b £8 c 9 cm d £6 e 4 m f £18 g 2 g  
h 7 p
- £18
- £150
- 8 kg
- a 12 b 32 c 18 d 18 e £18 f 36 cm
- 120 people
- a 135 are female b 45 are male

### 4 Remember what you have learned – page 34

- B 2. D 3. C 4. C
- C 6. D 7. A 8. C

## C Working with decimals and money

### 1 Understanding decimals – page 36

- a 3.23 m, 3.22 m, 3.2 m, 2.3 m  
b 10.777 cm, 10.707 cm, 10.7 cm, 10.07 cm, 10.007 cm  
c 5.55 km, 5.305 km, 5.30 km, 3.55 km, 3.505 km
- a £0.02, £0.22, £2.20, £2.22  
b £0.33, £3.03, £3.33, £30.03, £33.30  
c £15.07, £15.10, £15.17, £17.05, £17.15
- a 350p b 65p c 3p
- a £5.55 b £0.20 c £0.05

## 2 Calculating with decimals

Adding and subtracting decimals without a calculator – page 38

- a 9.89 b £10.67 c 4.38 d 1.28
- a B b A
- 165.15 m
- 1.58 seconds
- 512.84 km

Using a calculator to calculate with decimals – page 39

- 17.5 litres
- £13.02 each
- £36.40
- £2.77
- £258.60
- $5 - 7 \times 0.52 = £1.36$
- $0.12 \times 250 + 12.5 = £42.50$
- (E.g.  $99.6 \times 35 \div 100 + 1.49 =$ ) £36.35

### 3 Rounding decimal amounts – page 41

- a 8 b 13 c 7
- 27 kg
- 2396
- 14
- a 5.6 b 12.9 c 6.9
- 1.9 litres
- a £24.50 b £15.60 c £8.00
- a 6.38 b 0.40 c 23.50
- 3.46 kg
- $£7 \times 20$
- $10 \times £10$

### 4 Estimating and checking answers – page 43

- $2 \times 47 + 120 = 214$ p student is wrong
- $450 + 180 - 80 = 550$  student is wrong
- $280 \div 8 = 35$  student is likely to be correct as this is very close to 36

### 5 Remember what you have learned – page 44

- A
- C
- C
- B
- D

## D Working with percentages

### 1 Understanding percentage – page 45

- a 0.75 b  $\frac{3}{4}$

	Percentage	Fraction	Decimal
a	50%	$\frac{1}{2}$	0.5
b	25%	$\frac{1}{4}$	0.25
c	10%	$\frac{1}{10}$	0.1
d	30%	$\frac{3}{10}$	0.3
e	40%	$\frac{2}{5}$	0.4
f	5%	$\frac{1}{20}$	0.05



3.  $50\% \rightarrow \frac{1}{2}$ ,  $30\% \rightarrow 0.3$ ,  $75\% \rightarrow \frac{3}{4}$ ,  
 $60\% \rightarrow \frac{3}{5}$ ,  $3\% \rightarrow 0.03$ ,  $80\% \rightarrow \frac{4}{5}$

## 2 Percentages of quantities – page 47

- a, c, d, f
- a 24 b 37 c 4 d 90
- £600
- £29500
- a £4 b £6.60 c £1.60 d £0.64 e £3 f £45  
g £1.20 h £1.24
- £28.50
- £18

## 3 One quantity as a percentage of another – page 49

- 25%
- 20%
- 5%
- 30%
- 20%
- 5%
- 20%
- 90%
- 20%
- 25%
- 30%
- 9%
- 80%

## 4 Percentage increase and decrease – page 51

- 66
- 36
- 100.8
- 60.8
- a 63 marks b 57 marks
- £313.50
- £2 100

## 5 Remember what you have learned – page 53

- D
- D
- A
- D
- B
- A
- B
- A
- C