

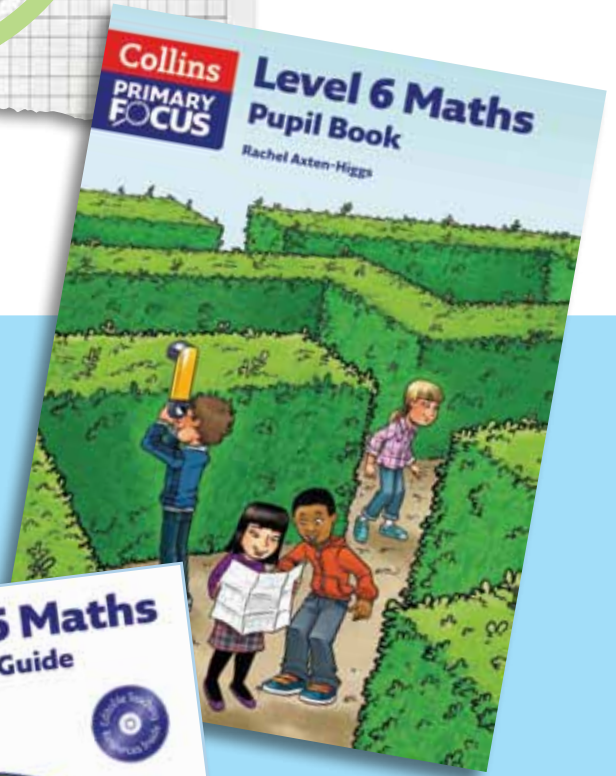
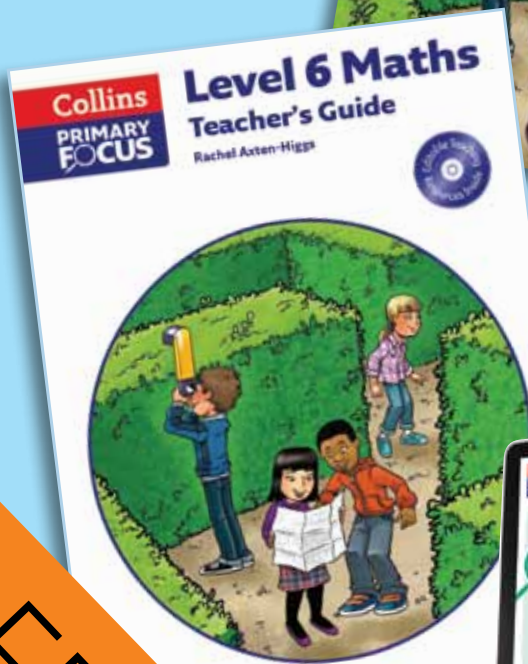
Collins

**PRIMARY
FOCUS**

Level 6 Maths

Leap up to Level 6

A complete solution to boosting success at Level 6. Straightforward teaching and practice activities give you the confidence to deliver Level 6 content with ease.



**Teacher's Guide
Resource Pack**

Your FREE
Evaluation Pack

Teaching Slides from Level 6 Maths Teacher's Guide

Download all the Teaching Slides for each unit in this evaluation pack at:
www.collinseducation.com/level6mathspp

Unit 1



Unit 2



Unit 3



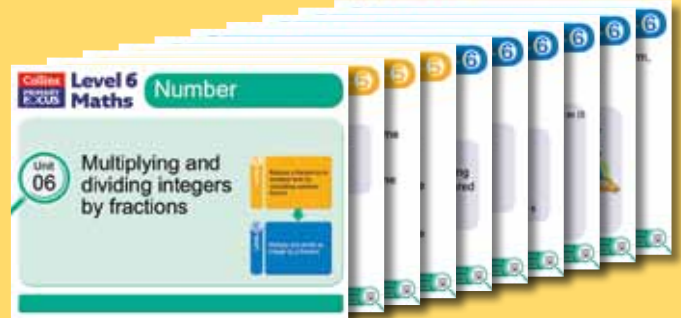
Unit 4



Unit 5



Unit 6



Unit 7



Unit 8





Resource features

Welcome to *Collins Primary Focus Level 6 Maths*. This resource is comprised of three elements that will allow you to teach all of the Level 6 objectives for Maths:

Teacher's Guide

Each *Teacher's Guide* unit contains a guided group session plan and a linked Powerpoint presentation to bring the learning alive.

Each session is designed to take 30 minutes. The resources can be used in your lesson for higher achievers or for stand-alone booster sessions.

The Level 5 warm-up shows the specific background learning that pupils need for this objective.

The timings give an indication of how long to spend on each part of the lesson.

The prompt questions help pupils to frame their thinking.

PowerPoint slide number

Answers for the final 'Have a Go' slide to check pupils' learning.

Group session		
Time	Activities	Purpose
RECAP		
2 mins	Show slide 1 and ask the questions. Ask pupils to discuss the three division sums. Check that children are adding their knowledge back to previous work.	When have you used this before? What might be useful to work for about?
2.5 mins	Show slide 2 and ask pupils to write down the three sums. Check that they can explain them to the class. Start with $30 \div 3 = 10$, $24 \div 3 = 8$, $18 \div 3 = 6$. Check the understanding of the order in which you can write the numbers in $12 \div 3 = 4$, $18 \div 3 = 6$.	What does the order in the division mean? What does the order in the sum mean? What does the order in the sum mean?
DISCUSS		
2 mins	Show slide 3 and ask the questions. Ask pupils to discuss the sums. Check that they can explain them to the class. Start with $30 \div 3 = 10$, $24 \div 3 = 8$, $18 \div 3 = 6$.	What does the order in the division mean? What does the order in the sum mean? What does the order in the sum mean?
5 mins	Discuss the sums. Ask pupils to write down the three sums. Check that they can explain them to the class. Start with $30 \div 3 = 10$, $24 \div 3 = 8$, $18 \div 3 = 6$. Check the understanding of the order in which you can write the numbers in $12 \div 3 = 4$, $18 \div 3 = 6$.	What does the order in the division mean? What does the order in the sum mean? What does the order in the sum mean?
HAVE A GO		
5 mins	Ask pupils to work independently to answer three questions. Encourage them to show their working clearly. After about 5 minutes, ask them to go through their answers using the provided resources.	Question 1: Also show the question being about money and the difference between the two sums in Question 1. Question 2: After they have done the division, ask them to explain their answers.
INDEPENDENT WORK		
Pages 10-13 in the <i>Pupil Book</i> provide the practice for the pupils to work independently. They should be able to work independently for you to check their understanding of the objective. Answers can be found on pages 10-13.		

Prompt questions to structure pupils' thinking

Slide 4 Discuss LEVEL 6

What does this mean?

Divide a quantity into two or more parts in a given ratio.

Level 6 Maths

Use a number to use proportional reasoning to solve a problem, involving the number 100 to find a percentage.

Work with numbers to find a pattern and describe it.

Each slide states the learning objective

Pupil Book

Each *Pupil Book* unit contains Level 5 warm-up questions followed by probing Level 6 questions to check understanding of the objective taught in the group session.

Learning Objective

Level 5 key learning points

Level 5 warm-up questions

Level 6 key learning points

Unit 3 Dividing quantities using ratio

Learning Objective: Divide quantities using ratio.

Key Vocabulary: Ratio, divide, multiply, fraction, decimal, percentage, proportion.

Getting started: A ratio is the comparison of two or more quantities. It can be written as a fraction, a colon, or as a word ratio. For example, 1:2, 1 to 2, or 1 is to 2. (Both are acceptable.)

Worked example: A bag of 100 sweets is shared between 4 children. How many sweets does each child get?

1. Write the ratio of sweets to children as $100:4$.

2. Divide the ratio by 4 to get $25:1$.

3. Each child gets 25 sweets.

Check: $25 \times 4 = 100$. The total number of sweets is 100.

Now try these: A bag of 120 sweets is shared between 6 children. How many sweets does each child get?

Answers: 20 sweets.

Level 6 questions: 1. A bag of 100 sweets is shared between 4 children. How many sweets does each child get? 2. A bag of 120 sweets is shared between 6 children. How many sweets does each child get? 3. A bag of 150 sweets is shared between 5 children. How many sweets does each child get? 4. A bag of 200 sweets is shared between 8 children. How many sweets does each child get?

Answers: 1. 25 sweets, 2. 20 sweets, 3. 30 sweets, 4. 25 sweets.

Top tip box: Remember to always check your answer by multiplying the number of children by the number of sweets each child gets to see if it equals the total number of sweets.

Top tip box to remind pupils of key points

Level 6 questions

Key vocabulary linked to the unit



Individual record sheet

Collins Primary Focus: Level 6 Maths

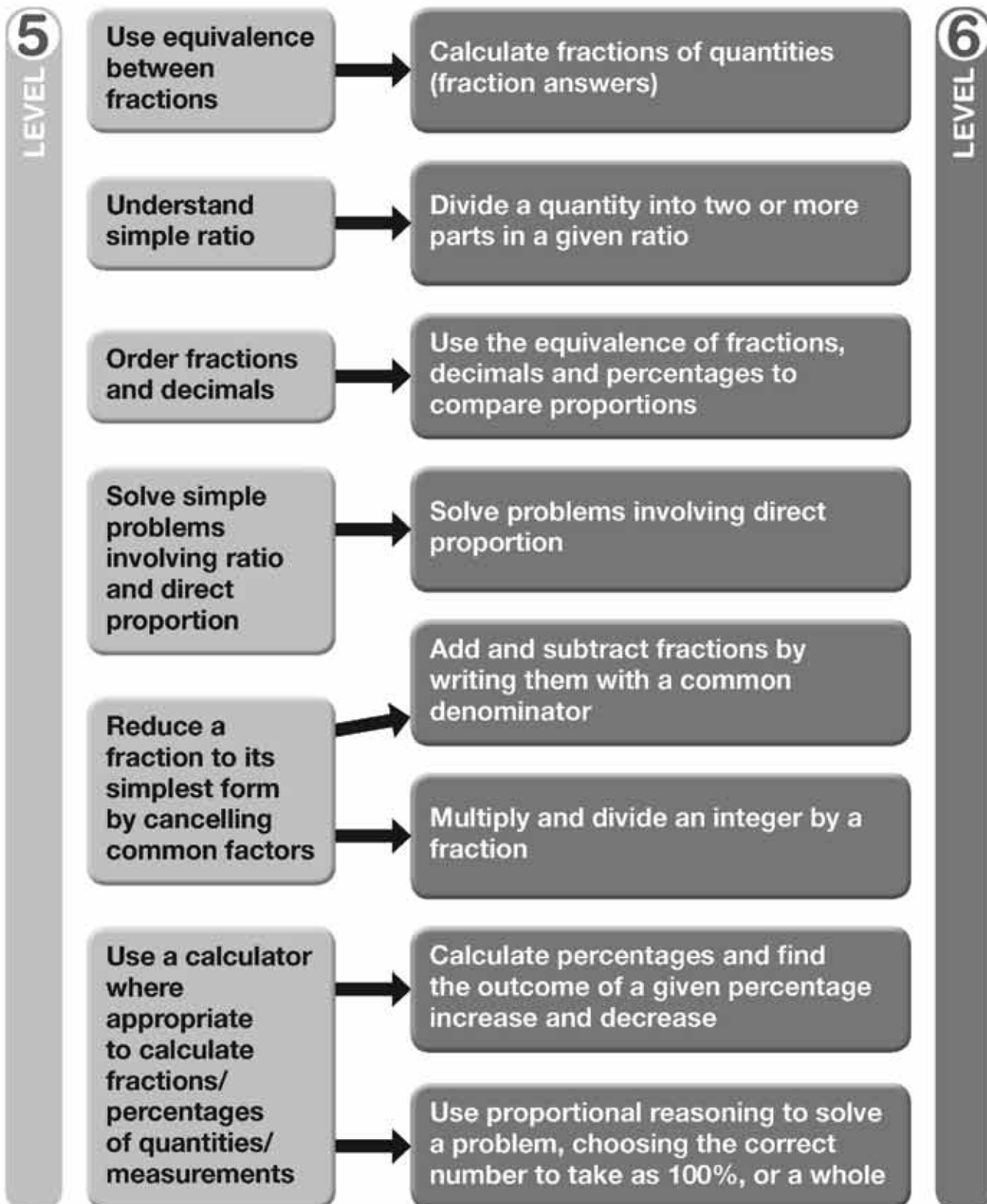
Name _____ Class _____

Unit	Comment	Date
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		



Progression maps

Number



Unit by unit overview charts

Number

Unit No.	Unit Title	Level 5 Objective	Level 6 Objective
1	Fractions of quantities	Use equivalence between fractions	Calculate fractions of quantities (fraction answers)
2	Comparing proportions	Order fractions and decimals	Use the equivalence of fractions, decimals and percentages to compare proportions
3	Dividing quantities using ratio	Understand simple ratio	Divide a quantity into two or more parts in a given ratio
4	Problems involving direct proportion	Solve simple problems involving ratio and direct proportion	Solve problems involving direct proportion
5	Adding and subtracting fractions	Reduce a fraction to its simplest form by cancelling common factors	Add and subtract fractions by writing them with a common denominator
6	Multiplying and dividing integers by fractions	Reduce a fraction to its simplest form by cancelling common factors	Multiply and divide an integer by a fraction
7	Calculating percentages	Use a calculator where appropriate to calculate fractions / percentages of quantities / measurements	Calculate percentages and find the outcome of a given percentage increase and decrease
8	Proportional reasoning	Use a calculator where appropriate to calculate fractions / percentages of quantities / measurements	Use proportional reasoning to solve a problem, choosing the correct number to take as 100%, or a whole



The units

Evaluating progress through the units

The units in this book can be taught in any order, based on your evaluation of what pupils need.

However, if pupils are starting their Level 6 learning from the beginning, it would be advisable to teach the units in order within each section, e.g. start at unit 17 and work through to unit 26 in Shape, space and measures.

A number of assessment tools have been included in this book to help you assess pupils' learning and identify next steps.

Unit by unit overview charts (page 10)

This chart identifies the name of the unit, the Linked Level 5 objective and the main Level 6 objective. This may be photocopied for each pupil and highlighted as they achieve the objectives, providing you with a visual record of gaps in learning to focus on in sessions.

Individual record sheet (page 5)

This sheet may be photocopied to keep a running record of learning from sessions, particularly if you, as the class teacher, are not teaching the session. It allows for notes regarding strengths and weaknesses within sessions, thus informing future learning.

Evaluation of learning by unit (page 15)

Again, this sheet can be photocopied to keep a record summarising individuals' learning across sessions, again identifying areas for future learning.

The review sections allow time for pupils to consolidate learning within a unit or across the whole of the Level 6 curriculum. The practice tests in the *Teacher's Guide* have been designed to reflect the final test that pupils will sit at the end of Year 6 (for Level 6), allowing them the opportunity to gain important test practice.



Evaluation of learning by unit

Pupil Name: _____

	Comments from session	L5 objective	L6 objective	Pupil Book score	Next steps
Unit 1					
Unit 2					
Unit 3					
Unit 4					
Unit 5					
Unit 6					
Unit 7					
Unit 8					
Review					
Unit 9					
Unit 10					
Unit 11					
Unit 12					
Unit 13					
Unit 14					
Unit 15					
Unit 16					
Review					
Unit 17					
Unit 18					
Unit 19					
Unit 20					
Unit 21					
Unit 22					
Unit 23					
Unit 24					
Unit 25					
Unit 26					
Review					
Unit 27					
Unit 28					
Unit 29					
Unit 30					
Unit 31					
Unit 32					
Unit 33					
Unit 34					
Unit 35					
Review					

Fractions of quantities

5
LEVEL

Recap objective

Use equivalence between fractions



Main objective

Calculate fractions of quantities (fraction answers)

6
LEVEL

Key learning points

- To find a fraction of a quantity there are two main methods.
- The first method involves dividing the number by the denominator of the fraction and then multiplying your answer by the numerator.

For instance:

$$\frac{7}{9} \text{ of } 441$$

$$441 \div 9 = 49 \text{ (this gives you what } \frac{1}{9} \text{ of } 441 \text{ is equal to)}$$

$$49 \times 7 = 343 \text{ (this gives you what } \frac{7}{9} \text{ of } 441 \text{ is equal to)}$$

- The second method involves multiplying fractions as you would carry out the following calculation:

$$\frac{7}{9} \times 441$$

$$\frac{7}{9} \times \frac{441}{1}$$

$$\frac{3087}{9} = 343$$

- As you can see, both give the correct answer, so it really is up to you which method you teach, or whether to teach both and let pupils choose.
- Often questions give the total amount of something (e.g. money in the bank = £680) and then an amount (e.g. money to be spent on presents = £268) and ask pupils to find the fraction of this amount.

In this scenario, pupils work out the fraction by putting the amount to be taken out as the numerator over the top of the total amount, e.g. $\frac{268}{680}$. They would then be expected to express this fraction in its lowest terms by finding common factors of each.

So (divide by 4) = $\frac{67}{170}$ (as 67 is a prime number, we know this is in its lowest terms).

Time	Activities	Prompts
RECAP		
2 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div>	Show slide 1 and pose the question shown. Ask pupils to discuss the meaning as a group. Click to display a simple definition. Discuss the example shown and check that pupils are linking to previous work.	What are equivalent fractions for $\frac{1}{4}$? What are equivalent fractions for $\frac{4}{10}$? What are equivalent fractions for $\frac{2}{12}$?
5 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">2-3</div>	Show slide 2 and ask the questions. Can pupils find other examples of equivalent fractions from the slide and write them? Display slide 3 and discuss the prompt question. Check they understand that they can find equivalent fractions by doing the same to the numerator and denominator (e.g. dividing both by 3 or multiplying both by 5). Ask them to work in pairs to write down 3 equivalent fractions for each fraction given. Discuss the answers.	If you divide the denominator by a given number (e.g. 3) what must happen to the numerator in order for the resulting fraction to be equivalent?
DISCUSS		
2 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">4</div>	Display slide 4 and discuss the learning objective. Can pupils offer suggestions as to what it means? Click to display a simple definition and example for discussion.	There are 400 pupils in a school and 220 are girls. What fraction of the school are boys? $\frac{180}{400}$ (divide by 10) = $\frac{18}{40}$ (divide by 2) = $\frac{9}{20}$
13 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">5-8</div>	There are 4 slides, each posing a question for pupils to discuss as a group, giving you a chance to note how they are attempting questions and their understanding of applying their knowledge of fractions of quantities. Each one has a breakdown of one way of answering the question. By clicking the mouse you will reveal each stage of the solution so that you can go through it step-by-step, checking pupils' understanding of the process.	What are the important words in the question? Why might it be important to express as a fraction – what extra meaning does this give to the number that they scored? Why can prime numbers not be cancelled down to their lowest terms? Why is it important to check your work, even when you think you have the answer?

(Continued)

HAVE A GO

8 mins

9

Ask pupils to work independently to answer these questions, encouraging them to show their workings clearly. After about 5 minutes, stop them and go through the answers using the PowerPoint resource.

ANSWERS:

Part a: Pupils divide the prize money in half to find the first prize: $\pounds 23,600 \div 2 = \pounds 11,800$. They then divide the prize money into 5 and multiply their answer by 2 to find the second prize: $(\pounds 23,600 \div 5) \times 2 = \pounds 9,440$.

They can then deduct these from the total prize money to find the third prize: $\pounds 11,800 + \pounds 9,440 = \pounds 21,240$; $\pounds 23,600 - \pounds 21,240 = \pounds 2,360$.

Part b: The children should notice that $\pounds 2,360$ is 10% of $\pounds 23,600$ and therefore $\frac{1}{10}$ of the total prize money. However, if they do not they can work it out by cancelling down:

$$\frac{2360}{23600}$$

$$(+10) = \frac{236}{2360}$$

$$(+236) = \frac{1}{10}$$

Part a:

How can you use the fractions to work out the amounts in money?

Part b:

Are there different ways that you can work out the fraction?

INDEPENDENT FOLLOW-UP



Pages 8–9 in the *Pupil Book* provide extra practice for the pupils to work independently. They should complete this work independently for you to assess their understanding of the objectives. Answers can be found on pages 112–126.


 Unit
2

Comparing proportions

5

LEVEL

Recap objective

Order fractions and decimals

Main objective

Use the equivalence of fractions, decimals and percentages to compare proportions

6

LEVEL

Key learning points

- Pupils need to confidently manipulate fractions, percentages and decimals in order to work out equivalence, compare them and use to solve problems. The simpler ones they need to know off by heart, but they need a clear method for working out the others.
- Pupils need to understand place value, in terms of what each part of a number represents.

tens
↓
 tenths
↓
 hundredths
↓
 thousandth
↓
7.431

7.431

7 tens, 4 tenths, 3 hundredths and 1 thousandth

With this understanding it is easier to understand that 0.431 means $\frac{431}{1000}$

or that 0.43 means $\frac{43}{100}$. This is then easily manipulated into a percentage; 'per cent' means part of one hundred. So 0.43 is the same as $\frac{43}{100}$, which is the same as 43%.

Decimal	Words	Fraction
0.1	one tenth	$\frac{1}{10}$
0.01	one hundredth	$\frac{1}{100}$
0.001	one thousandth	$\frac{1}{1000}$

- To compare amounts written in different forms, pupils need to convert these to the same form.

Over 90% of the class achieved level 4 or above.

2 out of 5 pupils did not achieve level 4 or above.

Can both statements be correct?

Pupils can convert 2 out of 5 to a percentage, to see that 20% did not achieve level 4 or above. They can then see that the two figures add up to 110% and that there must therefore be an error in one of the statements.

Group session

Time	Activities	Prompts
RECAP		
2 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div>	Display slide 1 and ask the question. Ask the pupils to discuss the meaning as a group. Click to reveal a simple definition. Discuss the other prompt questions in the notes section.	<i>What does ordering mean?</i>
8 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">2-3</div>	Display slide 2 and ask the questions in the notes section. ANSWERS: a) 20·43, 21·04, 22·45, 23·43, 25·75 b) 16·05, 16·11, 16·25, 16·44, 16·74 c) 39·01, 39·10, 39·25, 40·01, 40·55 d) 4·003, 4·03, 4·13, 4·31, 4·53 Show slide 3 and ask the prompt questions for each example. Check that pupils are using the lowest common denominator. ANSWERS: a) $\frac{1}{10}, \frac{3}{10}, \frac{1}{2}, \frac{6}{10}, \frac{7}{10}$ b) $\frac{2}{16}, \frac{1}{4}, \frac{3}{8}, \frac{3}{4}, \frac{15}{16}$ c) $\frac{3}{10}, \frac{2}{5}, \frac{12}{25}, \frac{6}{10}, \frac{4}{5}$ d) $\frac{2}{12}, \frac{1}{4}, \frac{4}{6}, \frac{7}{9}, \frac{15}{18}$	<i>Which of the place value columns do you need to look at to order this set of decimals?</i> See PPT notes for more question prompts.

DISCUSS		
2 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">4</div>	Display slide 4 and discuss the learning objective. Can pupils offer suggestions as to what it means? Click to reveal a simple definition and example for discussion.	<i>How can you convert all of them to the same type, e.g. all fractions?</i>
12 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">5-8</div>	There are 4 slides, each posing a question for pupils to discuss, giving you a chance to note how they approach questions and check their understanding of comparing proportions. Each slide has a breakdown of one way of answering the question. Click to reveal each stage of the solution step-by-step, checking pupils' understanding of the process.	<i>What does percentage mean?</i> (parts of 100) <i>Why is it useful to convert to a fraction with a denominator of 100?</i> See PPT notes for more question prompts.

(Continued)

HAVE A GO

6 mins

9

Ask pupils to work independently to answer these questions, encouraging them to show their workings clearly. After about 5 minutes, stop them and go through the answers using the PowerPoint resource.

BIKE:

$$100\% = \text{£}130$$

$$\frac{1}{100} \text{ or } 1\% = \text{£}1.30$$

$$\text{£}10 \div \text{£}1.30 = 7.69$$

saving = 7.69% of total price

CASTLE:

$$100\% = \text{£}65$$

$$\frac{1}{100} \text{ or } 1\% = \text{£}0.65$$

$$\text{£}10 \div \text{£}0.65 = 15.38$$

saving = 15.38% of total price

DOLLS' HOUSE:

$$100\% = \text{£}88.00$$

$$\frac{1}{100} \text{ or } 1\% = \text{£}0.88$$

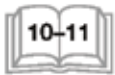
$$\text{£}10 \div \text{£}0.88 = 11.36$$

saving = 11.36% of total price

What conversion calculation do you have to do?

How could you create a fraction to convert to a percentage?

INDEPENDENT WORK



10-11

Pages 10–11 in the *Pupil Book* provide extra practice for the pupils to work independently. They should complete this work independently for you to assess their understanding of the objectives. Answers can be found on pages 112–126.

LEVEL
5

Recap objective

Understand simple ratio

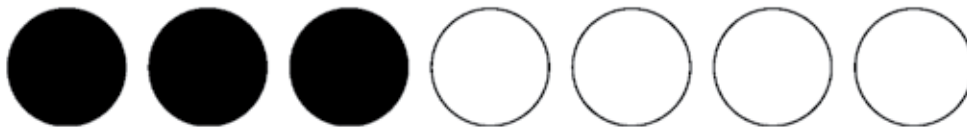
Main objective

Divide a quantity into two or more parts in a given ratio

LEVEL
6

Key learning points

- A ratio compares values. It shows how much of something there is compared to something else.



There are 4 white circles to 3 black circles.

This can be written like this: 4 : 3 or 4 to 3 or as a fraction $\frac{4}{3}$.

- Ratios can be scaled up and down. It is important that you multiply or divide both parts by the same number.

4 : 3 becomes 12 : 9 if both sides are multiplied by 3

8 : 6 becomes 4 : 3 if both sides are divided by 2

- In the examples above we have been dealing with part-to-part ratio. You can also work out the part-to-whole ratio:



The white to black ratio was 4 : 3. The ratio of white circles to all the circles is 4 : 7.

- Ratios can be applied to amounts. For instance if the total amount of money in a prize fund is £800 and it is divided between first, second and third places in the ratio 6 : 3 : 1, you can work out the value of each prize.

Add the ratio parts together: $6 + 3 + 1 = 10$

Divide the total prize money by the total ratio parts to find 1 part: $£800 \div 10 = £80$







Multiply 1 part by 6 to find first prize: $£80 \times 6 = £480$

Multiply 1 part by 3 to find second prize: $£80 \times 3 = £240$

Multiply 1 part by 1 to find third prize: $£80 \times 1 = £80$

Add the prizes to check the answer: $£480 + £240 + £80 = £800$

Group session

Time	Activities	Prompts
RECAP		
2 mins 	Show slide 1 and ask the question. Ask pupils to discuss their ideas as a group. Click on the slide to display a simple definition. Check that children are relating their knowledge back to previous work.	<i>When have you used ratios before?</i> <i>When might it be useful to work out ratios?</i>
2 mins 	Show slide 2 and ask pupils to write down the ratios shown. Check that they are writing them in the correct order, blue to green ($a = 1 : 2$ $b = 1 : 1$ $c = 1 : 5$). Check their understanding of the order in which ratios are written by showing slide 3. Let them write the ratios in the other order, green to blue ($a = 2 : 1$ $b = 1 : 1$ $c = 5 : 1$).	<i>In what order are the colours mentioned in the question? How does this affect our answer?</i> <i>What do you need to understand about the patterns? (e.g. where they repeat)</i>
DISCUSS		
2 mins 	Display slide 4 and discuss the learning objective. Ask pupils to offer suggestions as to what it means. Click to display a simple definition and example for discussion.	<i>What does the term 'quantity' mean? (e.g. an amount of something)</i>
16 mins 	There are 4 slides, each posing a question for the pupils to discuss as a group, giving you a chance to observe how they attempt questions and their understanding of applying their knowledge of ratio. Each has a breakdown of one way of answering the question. By clicking the mouse you will reveal each stage of the solution so that you can go through it step-by-step, checking pupils' understanding of the process.	<i>What are the important words in the question?</i> See PPT notes for more question prompts.
HAVE A GO		
8 mins 	Ask pupils to work independently to answer these questions, encouraging them to show their workings clearly. After about 5 minutes, stop them and go through the answers using the PowerPoint resource. ANSWERS: Question 1: Pupils should add the ratios together: $6 + 3 + 1 = 10$. They then divide the prize money by 10 : $£7000 \div 10 = £700$. They can therefore calculate that third place receives £700, second place £2100 ($£700 \times 3 = £2100$), and first place £4200 ($£700 \times 6 = £4200$). Question 2: Pupils add the ratios together ($10 + 3 = 13$). They then divide the amount that the tank holds by 13 ($520 \div 13 = 40$). They can then work out the amount of screenwash ($10 \times 40\text{ml} = 400\text{ml}$) and finally the amount of water ($3 \times 40\text{ml} = 120\text{ml}$).	Question 1: <i>How does the question being about money make a difference to working out the ratios? (It doesn't!)</i> Question 2: <i>How many steps does this question have? Can you write them down first?</i>
INDEPENDENT WORK		
	Pages 12–13 in the <i>Pupil Book</i> provide extra practice for the pupils to work independently. They should complete this work independently for you to assess their understanding of the objectives. Answers can be found on pages 112–126.	

Problems involving direct proportion

LEVEL 5

Recap objective

Solve simple problems involving ratio and direct proportion

Main objective

Solve problems involving direct proportion

LEVEL 6

Key learning points

- **Direct proportion means that the ratio between two quantities is constant so that when one increases or decreases, so does the other.**

If the direct proportion is 1 : 4 then this can be scaled up to 2 : 8 or 3 : 12.

This method of scaling up or down can be used for problem solving.

A cake to serve 4 people might use these ingredients:

400 g sugar : 300 g flour : 2 eggs

400 g : 300 g : 2

To make a cake for 3 times as many people (12), we multiply all of the ingredients by 3.

If we are asked the amount of sugar needed for a cake for 5 people, we need to divide each ratio by 4 to find out the amount for 1 person. We then multiply the amount of sugar by 5 to find how much is needed for 5 people.

- **Direct proportion questions can deal with a range of topics, including recipes, money and time. Pupils will always be given the information to work out a key ratio that they can then manipulate by keeping all parts of the ratio in proportion to each other.**

Group session

Time

Activities

Prompts

RECAP

2 mins

1

Show slide 1 and ask the questions. Ask pupils to discuss the meaning as a group. Click to reveal a simple definition.

What does direct proportion mean?

(Continued)

LEVEL 5

5 mins

2-3

Show slide 2. Ask the questions given and work through the questions as a group.

ANSWERS:

a) $4 : 32$

b) $\frac{1}{2} : 4$

Show slide 3 and ask the prompt questions, again working through the examples together.

ANSWERS:

1a) $1 : 6$

1b) $6 : 36$

2a) $16 : 7 : 19$

2b) $32 : 14 : 38$

What needs to happen to both sides of the ratio for it to stay in proportion?

How is finding the ratio for half a pizza different?

(dividing)

Why is it important to check your first ratio is correct?

How can you use the first ratio to find the answers to other questions?

DISCUSS

2 mins

4

Display slide 4 and discuss the learning objective. Elicit suggestions for what it means. Click to reveal a simple definition for discussion.

What is direct proportion?

13 mins

5-8

There are 4 slides, each posing a question for pupils to discuss as a group, giving you a chance to observe how they tackle questions and evaluate their understanding of direct proportion.

Each slide includes a breakdown of one way of answering the question. Click to reveal each stage of the solution step-by-step, checking pupils' understanding of the process.

How can you find the ratio for one person?

Why is the recipe given in 'parts'?

See PPT notes for more question prompts.

HAVE A GO

8 mins

9

Ask pupils to work independently to answer these questions, encouraging them to show their workings clearly. After about 5 minutes, stop them and go through the answers using the PowerPoint resource.

ANSWERS:

a) $7242 \text{ ml} \div 426 \text{ ml} = 17 \text{ bars}$

b) $426 \text{ ml} \div 2 = 213 \text{ ml}$

c) $426 \text{ ml} \times 60 = 25\text{-}560 \text{ ml}$

d) $300 \text{ ml} \div 228 = 1\text{-}3157$

$$1\text{-}3157 \times 426 \text{ ml} = 560\text{-}49 \text{ ml}$$

How do you round a number to the nearest millilitre?

INDEPENDENT WORK

14-15

Pages 14-15 in the *Pupil Book* provide extra practice for the pupils to work independently. They should complete this work independently for you to assess their understanding of the objectives. Answers can be found on pages 112-126.

Adding and subtracting fractions

5

LEVEL

Recap objective

Reduce a fraction to its simplest form by cancelling common factors



Main objective

Add and subtract fractions by writing them with a common denominator

6

LEVEL

Key learning points

- Pupils should be familiar with reducing fractions to their simplest form by cancelling common factors.

Identify all of the prime factors for both the numerator and denominator and then cancel out any that are in both the numerator and denominator:

$$\frac{30}{45} = \frac{2 \times 3 \times 5}{3 \times 3 \times 5} = \frac{2 \times \cancel{3} \times \cancel{5}}{3 \times \cancel{3} \times \cancel{5}} = \frac{2}{3}$$

- To add and subtract fractions it is important that pupils are able to quickly find a common denominator for the two fractions to be added or subtracted.

This can be done by cancelling common factors (as above) or dividing by a common factor.

$$\frac{8}{16} (8 \div 8 = 1 \quad 16 \div 8 = 2)$$

$$\frac{8}{16} = \frac{1}{2}$$

- To add fractions, each fraction needs to have the same denominator.

The numerators can then be added together and shown over the top of the common denominator. It is often useful to give the answer as a mixed number as the result is often an improper fraction.

$$\frac{2}{7} + \frac{19}{21} = \frac{6}{21} + \frac{19}{21} = \frac{25}{21} = 1\frac{4}{21}$$

- To subtract fractions, each fraction needs to have the same denominator.

One numerator can then be taken away from the other numerator and the result displayed above the common denominator as a fraction.

$$\frac{9}{18} - \frac{2}{6} = \frac{9}{18} - \frac{6}{18} = \frac{3}{18} \left(\text{or } \frac{1}{6} \right)$$

Time	Activities	Prompts
RECAP		
2 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div>	Display slide 1 and ask the questions. Ask the pupils to discuss the meaning as a group. Click to display a simple definition.	<i>How can you find the common prime factors of numbers?</i> <i>Why is it helpful to cancel down by factors?</i>
5 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">2-3</div>	Display slide 2 and ask the questions suggested. Demonstrate how to use factor trees to help find the answers. ANSWERS: a) 2, 43 b) 2, 3 c) 3, 5 d) 2, 3, 11 Show slide 3 and ask the prompt questions. Work through the examples together. ANSWERS: a) $\frac{40}{90} = \frac{4}{9}$ Pupils should know this but it will then help them to check their cancelling down of the prime factors: $5 \times 2 \times 2 \times 2 = \frac{4}{9}$ $9 \times 5 \times 2$ b) $\frac{12}{66} = \frac{2}{11}$ $3 \times 2 \times 2 = \frac{2}{11}$ $11 \times 3 \times 2$	<i>How could you use a factor tree to help you identify the prime factors?</i> <i>What is a prime number?</i> <i>When is a fraction reduced to its lowest terms, in relation to factors?</i>
DISCUSS		
2 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">4</div>	Display slide 4 and discuss the learning objective. Elicit suggestions as to what it means. Click to display a simple definition for discussion.	<i>Why is it necessary to find a common denominator? How does this change the calculation?</i>
13 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">5-8</div>	There are 4 slides, each posing a question for group discussion, giving you a chance to note how pupils approach questions and their understanding of adding and subtracting fractions. Each slide includes a breakdown of one way of answering the question. Click to display each stage of the solution so that you can go through it step-by-step, checking pupils' understanding of the process.	<i>Why is it best to give the answer as a mixed number?</i> <i>What is the purpose of finding the lowest common denominator?</i> <i>Why does the first number in the calculation need to be the larger of the two?</i>

(Continued)

HAVE A GO

8 mins

9

Ask pupils to answer these questions independently, encouraging them to show their workings clearly. When they have had about 5 minutes to work at the two questions, stop them and go through the answers using the PowerPoint resource.

- a) i) cannot add two different denominators
- ii) cannot subtract two different denominators

b) i) $\frac{6}{42} + \frac{14}{42}$

ii) $\frac{90}{21} - \frac{28}{21}$

c) i) $\frac{10}{21}$

ii) $2\frac{20}{21}$

How would you help the person that did this to correct their work in future?

INDEPENDENT WORK



Pages 16–17 in the *Pupil Book* provide extra practice for the pupils to work independently. They should complete this work independently for you to assess their understanding of the objectives. Answers can be found on pages 112–126.


 Unit
6

Multiplying and dividing integers by fractions

5

LEVEL

Recap objective

Reduce a fraction to its simplest form by cancelling common factors



Main objective

Multiply and divide an integer by a fraction

6

LEVEL

Key learning points

- Pupils should be familiar with reducing fractions to their simplest form by cancelling common factors. This means that they have to identify all of the prime factors for both the numerator and denominator and then cancel out any that are in both the numerator and denominator.

$$\frac{7}{42} = \frac{7 \times 1}{7 \times 3 \times 2} = \frac{\cancel{7} \times 1}{\cancel{7} \times 3 \times 2} = \frac{1}{3 \times 2} = \frac{1}{6}$$

- To multiply a fraction by an integer, follow the same method as you would if you were multiplying two fractions as the integer is simply itself over 1, e.g. $7 = \frac{7}{1}$ (improper fraction).

$$9 \times \frac{3}{7} = \frac{9}{1} \times \frac{3}{7} = 9 \times \frac{3}{1} \times 7 = \frac{27}{7}$$

As with addition of fractions, it is often useful to give the final fraction as a mixed number as the solution may be an improper fraction.

$$\frac{27}{7} = 3\frac{6}{7}$$

- To divide a fraction by an integer, follow the same method as you would if you were dividing two fractions: the integer is itself over 1.

$$9 = \frac{9}{1} \text{ (improper fraction)}$$

When dividing fractions it is important to remember that you invert the second fraction and then multiply the original fraction and the inverted fraction together:

$$8 \div \frac{4}{7} = \frac{8}{1} \div \frac{4}{7} = \frac{8}{1} \times \frac{36}{36} = 8 \times \frac{2}{3} \times 4 = \frac{56}{4}$$

As with multiplication of fractions, the answer is often best expressed as a mixed number.

$$\frac{56}{4} = 14$$

Group session

LEVEL 5

Time	Activities	Prompts
RECAP		
2 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">1</div>	Show slide 1 and pose the questions. Ask pupils to discuss the meaning as a group. Click to reveal a simple definition.	<i>What are common factors?</i>
5 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">2-3</div>	Show slide 2 and ask the questions. Demonstrate how to use factor trees to help find the answers. ANSWERS: a) 2, 2, 2, 3 b) 2, 2, 3, 3 c) 3, 5 d) 2, 2, 5, 5 Show slide 3 and ask the prompt questions. Work through the examples with the group. ANSWERS: a) $\frac{30}{75} = \frac{\cancel{2} \times 2 \times \cancel{2}}{\cancel{2} \times \cancel{2} \times 5} = \frac{2}{5}$ b) $\frac{20}{60} = \frac{\cancel{2} \times \cancel{2} \times \cancel{2}}{\cancel{2} \times 3 \times \cancel{2} \times \cancel{2}} = \frac{1}{3}$	<i>How could you use a factor tree to help you identify the prime factors?</i> <i>What is a prime number?</i> <i>When is a fraction reduced to its lowest terms, in relation to factors?</i>

LEVEL 6

DISCUSS		
2 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">4</div>	Show slide 4 and discuss the learning objective. Elicit suggestions as to what it means. Click to reveal a simple definition for discussion.	<i>What do you have to remember to do when dividing fractions?</i>
13 mins <div style="border: 1px solid black; padding: 2px; display: inline-block;">5-8</div>	There are 4 slides, each posing a question for group discussion, giving you a chance to note how pupils approach questions and evaluate their understanding of multiplying and dividing fractions. Each slide has a breakdown of one way of answering the question. Click to reveal each stage of the solution so that you can go through it step-by-step, checking understanding of the process.	<i>How can you turn an integer into a fraction?</i> <i>Why is it helpful to change the integer into a fraction?</i> See PPT notes for more question prompts.

(Continued)

HAVE A GO

8 mins

9

Ask pupils to work independently to answer these questions, encouraging them to show their workings clearly. After about 5 minutes, stop them and go through the answers using the PowerPoint resource.

Remember to read each calculation correctly and apply the correct method.

$$\text{a) } \frac{6}{8} \times \frac{7}{4} = \frac{42}{32} = \frac{21}{16} = 1\frac{5}{16}$$

$$\text{b) } \frac{9}{12} \times \frac{4}{3} = \frac{36}{36} = 1$$

$$\text{c) } 5 \times \frac{4}{9} = \frac{20}{9} = 2\frac{2}{9}$$

$$\text{d) } 11 \times \frac{3}{4} = 3\frac{3}{4} = 8\frac{1}{4}$$

$$\text{e) } 13 \times \frac{1}{5} = \frac{13}{5} = 2\frac{3}{5}$$

$$\text{f) } \frac{4}{5} \div \frac{3}{2} = \frac{4}{5} \times \frac{2}{3} = \frac{8}{15}$$

$$\text{g) } \frac{3}{2} \div \frac{7}{8} = \frac{3}{2} \times \frac{8}{7} = \frac{24}{14} = 1\frac{10}{14} = 1\frac{5}{7}$$

$$\text{h) } 9 \div \frac{4}{6} = 9 \times \frac{6}{4} = \frac{54}{4} = 13\frac{1}{2}$$

$$\text{i) } 17 \div \frac{3}{7} = 17 \times \frac{7}{3} = \frac{119}{3} = 39\frac{2}{3}$$

$$\text{j) } 12 \div \frac{1}{5} = 12 \times 5 = 60$$

INDEPENDENT WORK



18-19

Pages 18–19 in the *Pupil Book* provide extra practice for the pupils to work independently. They should complete this work independently for you to assess their understanding of the objectives. Answers can be found on pages 112–126.

LEVEL
5

Recap objective

Use a calculator where appropriate to calculate fractions / percentages of quantities / measurements



Main objective

Calculate percentages and find the outcome of a given percentage increase and decrease

LEVEL
6

Key learning points

- Pupils have already learnt that *percentage* means 'parts of one hundred'. They should be able to use a calculator to divide an amount by 100 and multiply up to find the percentage they require.

$$32\% \text{ of } 578 = (578 \div 100) \times 32 = 184.96$$

- In Level 6, pupils learn to apply this understanding to word problems. The resulting amount or percentage needs to then be used to answer a further question:

The price of all stock in a toy shop is increased by 8%. A construction set cost £14.99 before the increase.

How much does it increase by?

What is the new cost of the construction set?

$$(\pounds 14.99 \div 100) \times 8 = \pounds 1.20 \text{ (to 2 decimal places)}$$

$$\text{b) } \pounds 14.99 + \pounds 1.20 = \pounds 16.19$$

Group session

Time

Activities

Prompts

RECAP

2 mins

1

Show slide 1 and pose the questions. Ask pupils to discuss the meaning as a group. Click to display a simple definition.

What does percentage mean?

When might a calculator make a measurement calculation easier?

5 mins

2-3

Show slide 2 and ask the questions. Demonstrate how to work out the first percentage: $300 \div 4 = 75$ g. Pupils then work through the questions.

ANSWERS:

b) £4.00

c) 37.5 ml

d) 460

Why are these percentages easier to work from than others?

What do you need to type into the calculator for each question?

(Continued)

LEVEL
5

Show slide 3 and discuss how these problems are more difficult. Discuss how they could be worked out on a calculator. Check that pupils understand the method.

ANSWERS:

- a) $(98 \div 100) \times 37 = \text{£}36.26$
 b) $(9500 \div 100) \times 63 = \text{£}5985$
 c) $(92.68 \div 100) \times 71 = 65.8$
 d) $(6700 \div 100) \times 8.4 = 562.8$

DISCUSS

2 mins

4

Display slide 4 and discuss the learning objective. Elicit suggestions as to what it means. Click to display a simple definition for discussion.

What does 'find the outcome' mean?

13 mins

5-8

There are 4 slides for pupils to discuss as a group, allowing you to note how they attempt questions and their understanding of calculating percentages.

Each slide has a breakdown of one way of answering the question. Click to reveal each stage of the solution step-by-step, checking pupils' understanding.

Why is it helpful to find 1% of the amount?

What other percentages could you find? (e.g. 5%, 10%)

See PPT notes for more question prompts.

HAVE A GO

8 mins

9

Ask pupils to work independently to answer these questions, encouraging them to show their workings clearly. After about 5 minutes, stop them and go through the answers using the PowerPoint resource.

ANSWERS:

- a)** Tea bags = $(3.29 \div 100) \times 8 = 26\text{p}$
 Cat food = $(7.89 \div 100) \times 15 = \text{£}1.18$
 Crisps = $(2.79 \div 100) \times 18 = 50\text{p}$
 Flowers = $(8.50 \div 100) \times 24 = \text{£}2.04$
- b)** Tea bags: $\text{£}3.29 + \text{£}0.26 = \text{£}3.55$
 Cat food: $\text{£}7.89 - \text{£}1.18 = \text{£}6.71$
 Crisps: $\text{£}2.79 + \text{£}0.50 = \text{£}3.29$
 Flowers: $\text{£}8.50 - \text{£}2.04 = \text{£}6.46$

Read the table carefully to check what calculation is required.

INDEPENDENT WORK

20-21

Pages 20-21 in the *Pupil Book* provide extra practice for the pupils to work independently. They should complete this work independently for you to assess their understanding of the objectives. Answers can be found on pages 112-126.

5

LEVEL

Recap objective

Use a calculator where appropriate to calculate fractions / percentages of quantities / measurements

Main objective

Use proportional reasoning to solve a problem, choosing the correct number to take as 100%, or a whole

6

LEVEL

Key learning points

- Pupils know that percentage means 'parts of one hundred'. They should be able to use a calculator to divide the amount by 100 and multiply up to find the percentage they require.

$$69\% \text{ of } 407 = (407 \div 100) \times 69 = 280.83$$

- The objectives covered in Level 6 progress to applying this skill to word problems. Pupils must work out which part of the question applies to the whole or 100% to then answer the other parts of the question.

The number of children who attended a local football club was 36 in May, 30 in June and 49 in July.

What was the percentage decrease between May and June, based on May's total?

What was the percentage increase between May and July, based on May's total?

May = 36, June = 30

36 = 100% (divide each by 6 to find what percentage 6 children would be):

6 = 16.7% decrease

May = 36, July = 49

36 = 100%

49 - 36 = 13 additional children. We know that 6 children = 16.7% from the previous question.

We can work out 1 child:

6 = 16.7% + 6 = 2.78%

So 13 children is: (16.7% + 16.7% + 2.78%) = 36% increase

Group session

Time

Activities

Prompts

RECAP

2 mins

1

Show slide 1 and pose the questions shown. Let pupils discuss the meaning as a group. Click to reveal a simple definition.

Show slide 2 and ask the question prompts. Demonstrate how to work out the first percentage: $(£5692 \div 100) \times 98 = £5578.16$. Pupils then work through the other questions.

Why do you need to understand the calculation before using a calculator?

(Continued)

5

LEVEL

5 mins

2-3

ANSWERS:

- b) $(£431 + 100) \times 27 = £116.37$
- c) $(6.78 + 100) \times 12 = 0.81$
- d) $(589 \text{ g} + 100) \times 6.5 = 38.28 \text{ g}$

Look at slide 3 together and discuss how these problems are different. Discuss how they could be worked out on a calculator. Check that pupils understand the method.

ANSWERS:

- a) $(987 \div 8) \times 4 = 493.5$
- b) $(95.84 \div 12) \times 5 = 39.93$
- c) $(3500 \text{ g} \div 17) \times 7 = 1441.17 \text{ g}$
- d) $(£10.50 \div 6) \times 9 = £15.75$

What is the calculation that you need to type in to the calculator for each of these?

What is different about part d?

DISCUSS

2 mins

4

Show slide 4 and elicit suggestions about the meaning of the objective. Click to reveal a simple definition for discussion.

What is proportional reasoning?

13 mins

5-8

There are 4 slides, each posing a question for group discussion, giving you a chance to note how pupils approach questions and their understanding of proportional reasoning.

Each slide has a breakdown of one way of answering the question. Click the mouse to reveal each stage of the solution so that you can go through it step-by-step. Check pupils' understanding of the process.

Which part of the information is not required to answer this question?

Which number do you have to take as 100%?

See PPT notes for more question prompts.

HAVE A GO

8 mins

9

Ask pupils to work independently to answer these questions, encouraging them to show their workings clearly. After about 5 minutes, stop them and go through the answers using the PowerPoint resource.

ANSWERS:

a) $\frac{3}{2} + \frac{3}{2} + \frac{3}{10} + 3 + \frac{3}{16}$

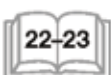
convert to lowest common denominator:

$$\frac{120}{80} + \frac{120}{80} + \frac{24}{80} + \frac{240}{80} + \frac{15}{80} = \frac{519}{80} = 6\frac{39}{80}$$

b) $280 \text{ g} + 280 \text{ g} + (280 \text{ g} + 5) + (280 \text{ g} \times 2) + (280 \text{ g} \div 8)$
 $= 280 \text{ g} + 280 \text{ g} + 56 \text{ g} + 560 \text{ g} + 35 \text{ g}$
 $= 1211 \text{ g}$

Make sure you think about which amount is being treated as 100% in order to work out the other amounts.

INDEPENDENT WORK



Pages 22-23 in the *Pupil Book* provide extra practice for the pupils to work independently. They should complete this work independently for you to assess their understanding of the objectives. Answers can be found on pages 112-126.

Fractions of quantities

Vocabulary equivalent; fraction; quantity

LEVEL 5

Getting started

Use equivalence between fractions

- Two fractions are equivalent when they have the same value.
- For example, $\frac{2}{8}$ is equivalent to $\frac{1}{4}$ since $\frac{2 \div 2}{8 \div 2} = \frac{1}{4}$
- It is important to be able to find the equivalence between fractions so you can solve problems involving fractions with different denominators.

1. Find three equivalent fractions for each of these:

a) $\frac{1}{2}$

b) $\frac{1}{4}$

c) $\frac{1}{10}$

2. Find three equivalent fractions for each of these:

a) $\frac{92}{100}$

b) $\frac{4}{5}$

c) $\frac{19}{21}$

LEVEL 6

Next steps

Calculate fractions of quantities (fraction answers)

- If you are asked to find what 225 g is as a fraction of 750 g, work through it like this:

Write as a fraction: $\frac{\text{amount to find}}{\text{total amount}} = \frac{225}{750}$

Simplify the fraction by dividing the numerator and the denominator by common factors: $\frac{225 \div 25}{750 \div 25} = \frac{9}{30}$

$$\frac{9 \div 3}{30 \div 3} = \frac{3}{10}$$

3 is a prime number, so we know this is in its lowest terms.

So, 225 g as a fraction of 750 g is $\frac{3}{10}$

Remember

To find an equivalent fraction, do the same to the numerator and the denominator (e.g. multiply both by 2).

3. 9900 people watched a netball game. Of these, 7200 were female.
 - a) What fraction of the spectators were female?
 - b) What fraction of the spectators were male?

4. In a school with 540 people, $\frac{1}{9}$ were men, $\frac{1}{3}$ were women and the rest were children. What fraction were children?

5. 30500 people live in Westborough City. Of these, 9500 are adult females, 11500 are children and the rest are adult males.
 - a) What fraction of the city are adult females?
 - b) What fraction of the city are children?
 - c) What fraction of the city are adult males?

6. The total number of marks for a mathematics test is 95. Thomas scored 90, Zack scored 75 and Lizzie scored 68. Express each child's mark as a fraction in its lowest terms.

7. The total cost of a house renovation was £56800. The materials cost £45000 and the labour costs were £11800.
 - a) Express the cost of the materials as a fraction of the total cost of the renovation. Give your answer in its lowest terms.
 - b) What fraction of the total cost was the labour? Give your answer in its lowest terms.

8. The total prize money for a spelling competition was £567. Half of this total was awarded for the first prize. The third prize was £56.70. The rest of the money was for the second prize.
 - a) How much was the first prize?
 - b) What fraction of the prize money was the third prize?
 - c) How much was the second prize?
 - d) What fraction of the prize money was the second prize?

Vocabulary ordering; fractions; decimals; equivalence; percentages; proportion

Getting started

Order fractions and decimals

- To order fractions, convert them to equivalent fractions with common denominators.
- The **lowest** common denominator can be one of the denominators that is already used.
- For example, to order $\frac{1}{2}$, $\frac{2}{8}$, $\frac{5}{16}$, $\frac{3}{4}$:

Find the common denominator: 16

Find the equivalent fractions:

$$\frac{1 \times 8}{2 \times 8} = \frac{8}{16}, \frac{2 \times 2}{8 \times 2} = \frac{4}{16}, \frac{3 \times 4}{4 \times 4} = \frac{12}{16}$$

Order the fractions: $\frac{4}{16}$, $\frac{5}{16}$, $\frac{8}{16}$, $\frac{12}{16}$

Put them back to their original form to answer the question: $\frac{2}{8}$, $\frac{5}{16}$, $\frac{1}{2}$, $\frac{3}{4}$

- Order the following decimals from **smallest to largest**.
 - 16.75, 16.71, 16.7001, 16.84, 15.95
 - 39.01, 39.001, 39.1, 39.005, 39.05
 - 6.12, 6.21, 6.012, 6.22, 6.56
- Order the following fractions from **largest to smallest**.
 - $\frac{1}{2}$, $\frac{14}{16}$, $\frac{3}{4}$, $\frac{5}{8}$
 - $\frac{14}{25}$, $\frac{1}{2}$, $\frac{1}{5}$, $\frac{6}{10}$
 - $\frac{1}{3}$, $\frac{7}{9}$, $\frac{25}{27}$, $\frac{4}{9}$

Next steps

Use the equivalence of fractions, decimals and percentages to compare proportions

- If you are given a range of quantities in different formats to compare, e.g. fractions, decimals and percentages, convert them to a common format first and then compare them.
- For example, to compare $\frac{1}{2}$, 0.6, 0.3 and 88%:
Convert to percentages: 50%, 60%, 30% and 88%
Then compare or order them.

Remember

Put fractions or decimals back to their original form when you write them in order. Always check whether you need to write them from largest to smallest or smallest to largest.

- Write these percentages as fractions and simplify them as far as possible.
 - 58%
 - 123%
 - 19%
 - 225%
- Write these decimals as percentages.
 - 0.9
 - 0.43
 - 0.234
 - 3.75
- Write these fractions as percentages. Round your answers to 1 decimal place if necessary.
 - $\frac{3}{8}$
 - $\frac{5}{13}$
 - $\frac{17}{21}$
 - $\frac{63}{85}$
- Is $\frac{6}{12}$ half of $\frac{12}{24}$? State **yes** or **no** and explain, mathematically, how you know.

Dividing quantities using ratio

Vocabulary ratio; quantity; division; fraction; ratio notation; comparative

LEVEL 5

Getting started

Understand simple ratio

- Ratio is the comparative value of two or more amounts. It can be written as numbers separated by colons, e.g. 3 : 4, or as a fraction.
- You can simplify ratios by using common factors.
- For example, $8 : 4 = 4 : 2$ (both parts can divide by 2).

1. Look at the coloured strip below.



- a) Write the ratio of white to red squares.
 - b) Write the ratio of red to white squares.
2. In a bag of counters there are 16 blue counters and 28 yellow counters. Write the ratio of yellow to blue counters as simply as possible.

LEVEL 6

Next steps

Divide a quantity into two or more parts in a given ratio

- If you are given a ratio and told one of the quantities, you can work out the other quantity or quantities and the total amount.
- For example, if the ratio of boys to girls in a class is 3 : 2 and there are 18 boys, use division to find out how many girls there are:

$$(18 \div 3) \times 2 = 6 \times 2 = 12 \text{ girls}$$

Add the number of boys to girls to find the total:

$$18 + 12 = 30 \text{ children in the class}$$

 **Remember**

Always check that you have written the ratio in the correct order, for example red to blue, or blue to red.

3. Some children did a traffic survey outside their school and found that during the morning rush hour 165 cars and buses passed by. The ratio of cars to buses was 9 : 2. How many cars passed by?
4. A new colour of paint is made by mixing 3 parts blue with 4 parts red. 665 ml of the new paint is mixed. How much of this is blue paint?
5. A recipe for a sponge cake uses flour and sugar in the ratio 3 : 2. How much sugar is needed if 270 g of flour is used?
6. On a visit to a museum, the children are split into three groups in the ratio 6 : 8 : 4. There are 108 children in total. How many are there in each group?
7. A fruit salad contains 5 different fruits. They are in the ratio of 6 : 3 : 2 : 3 : 4 being strawberries : peaches : apples : raspberries : grapes. If there are 52 g of grapes, find the number of grams of each of the other fruits.
8. Chris, Sandeep and Ana all collect money for the same charity. Between them, they collect £88. The ratio of the money they collected is 1 : 4 : 3. How much did each person collect?

Problems involving direct proportion

Vocabulary ratio; direct proportion; quantities; increase; decrease

LEVEL
5

Getting started

Solve simple problems involving ratio and direct proportion

- Direct proportion means a direct relationship between two quantities: when one quantity increases or decreases, the other quantity also increases or decreases in the same ratio.
- For example, concentrated squash is mixed with water in the ratio 1 : 9. This means that there is nine times as much water as there is squash. If there is 100 ml of squash, there will be 900 ml of water. 1 : 9, 100 : 900 and 2 : 18 are all equivalent ratios.

1. One cake serves six people.



- Write this as a ratio.
- Write an equivalent ratio showing the number of people that 4 cakes serve.
- Write an equivalent ratio showing the number of people that 72 cakes serve.

2. A bag of marbles contains 8 large marbles, 24 medium marbles and 30 small marbles.

- Write the ratio of large marbles : medium marbles : small marbles in the bag.
- An identical bag of marbles is tipped in to the first bag of marbles. Write an equivalent ratio showing the new quantities in the bag.
- The marbles added in part (b) are removed. Half of each type of marble is then taken out of the bag. Write an equivalent ratio showing the new quantities in the bag.

LEVEL
6

Next steps

Solve problems involving direct proportion

- When a question involves direct proportion, all parts of the ratio increase or decrease in the same way.

- For example, if a recipe for 8 people says 300 g of pasta, 140 g cheese, 200 g tomatoes and 350 g of vegetables, the quantities are in the ratio:

300 : 140 : 200 : 350

If the recipe is altered to serve 4 people, each quantity in the ratio is halved, because 4 is half of 8.

The new quantities are therefore: 150 : 70 : 100 : 175

Remember

Find equivalent ratios by multiplying or dividing both parts by the same number.

- A recipe for soup to serve 6 people is: 100 g carrots, 50 g coriander, 200 g stock and 150 g potatoes.

 - Write these quantities as a ratio.
 - How much of each ingredient is needed to serve 2 people?
 - Write the quantities to serve 8 people as a ratio.
- Delia is making a traybake. She uses the following ingredients for one bowl of traybake mixture.

4 cups plain flour
3 cups sugar
 $\frac{1}{2}$ cup baking powder
2 cups chocolate
1.5 cups butter

 - If she has one cup of plain flour, how many bowls of traybake mixture can she make?
 - If she has one cup of chocolate, how many bowls of traybake mixture can she make?
- Look at the following information about **Shakira** and **Rebecca**.

Shakira was born in **1998**.
Rebecca was born in **2010**.
They have the same birthday.
The ratio of **Shakira's** age to **Rebecca's** age on their birthday in **2011** was **3 : 1**.

 - What was the ratio of Shakira's age to Rebecca's age on their birthday in 2014? Write the ratio in its simplest form.
 - In what year will the ratio of Shakira's age to Rebecca's be age 3 : 2?
- A duckling lived in a cage. It doubled in size every day. After 16 days it filled the cage and had to be moved to another cage. After how many days did the duckling half-fill the cage?

Adding and subtracting fractions

Vocabulary addition; subtraction; fraction; factor; common factor; simplest form

Getting started

Reduce a fraction to its simplest form by cancelling common factors

- Common factors of fractions are factors that are the same in the numerator and the denominator of a fraction.
- Use common prime factors to cancel fractions to their simplest form.
- For example, $\frac{12}{18}$

12 as a product of prime factors: $2 \times 2 \times 3$

18 as a product of prime factors: $2 \times 3 \times 3$

Cancel the numerator and denominator by common prime factors: $2 \times 3 = 6$

$$\frac{\overset{2}{\cancel{12}}}{\underset{3}{\cancel{18}}} = \frac{2}{3}$$

- Find the prime factors of these numbers.

a) 56	b) 16
c) 22	d) 34
- Write these fractions in their simplest terms by finding and cancelling common prime factors.

a) $\frac{12}{16}$	b) $\frac{24}{30}$
c) $\frac{20}{50}$	d) $\frac{13}{24}$

Next steps

Add and subtract fractions by writing them with a common denominator

- Fractions must have the same denominator before you can add or subtract them.
- Find the lowest common denominator, convert the fractions and the calculation is straightforward.

- For example, $\frac{4}{5} - \frac{3}{10}$

Lowest common denominator = 10

$$\text{So, } \frac{4}{5} - \frac{3}{10} = \frac{8}{10} - \frac{3}{10} = \frac{5}{10} = \frac{1}{2}$$

- For example, $\frac{3}{9} + \frac{2}{6}$

Lowest common denominator = 18

$$\text{So, } \frac{3}{9} + \frac{2}{6} = \frac{6}{18} + \frac{6}{18} = \frac{12}{18} = \frac{2}{3}$$

Remember

Prime factors are prime numbers that multiply together to make a number.

3. Add these fractions. Give your answers as mixed numbers.

a) $\frac{5}{9} + \frac{2}{3}$

b) $\frac{4}{7} + \frac{1}{2}$

c) $\frac{5}{6} + \frac{8}{12}$

d) $\frac{3}{4} + \frac{10}{16}$

4. Complete these subtractions. Give your answers as proper fractions or mixed numbers.

a) $\frac{5}{8} - \frac{3}{6}$

b) $4\frac{1}{2} - \frac{9}{12}$

c) $1\frac{3}{8} - \frac{5}{6}$

d) $\frac{13}{25} - \frac{2}{5}$

5. Jacob took part in two races. In the first race he ran $3\frac{4}{5}$ laps of the

playing field. In the second race he ran $5\frac{5}{6}$ laps of the playing field. How many laps of the playing field did he run altogether?

6. Barbara read $\frac{2}{12}$ of her book before school, $\frac{2}{6}$ of her book at school and another $\frac{3}{18}$ before bed.

a) How much did she read altogether?

b) How much does she have left to read?

7. $\frac{1}{8} + \frac{3}{4} = \frac{4}{12}$

What is wrong with this? Explain your answer fully and write the correct answer to the calculation.

8. $\frac{16}{25} - \frac{3}{5} = \frac{13}{20}$

What is wrong with this? Explain your answer fully and write the correct answer to the calculation.

Multiplying and dividing integers by fractions

Vocabulary multiplication; division; fraction; integer; common factor; simplest form

LEVEL 5

Getting started

Reduce a fraction to its simplest form by cancelling common factors

- Common factors of fractions are factors that are the same in the numerator and the denominator of a fraction.
- Use common prime factors to cancel fractions to their simplest form.
- For example, $\frac{8}{12}$

8 written as a product of prime factors: $2 \times 2 \times 2$

12 written as a product of prime factors: $2 \times 2 \times 3$

Cancel the numerator and denominator by common prime factors: $2 \times 2 = 4$

$$\frac{\overset{2}{\cancel{8}}}{\underset{3}{\cancel{12}}} = \frac{2}{3}$$

- Find the prime factors of these numbers.

a) 18	b) 21
c) 32	d) 45
- Write the following fractions in their simplest terms by finding and cancelling common prime factors.

a) $\frac{20}{25}$	b) $\frac{18}{21}$
c) $\frac{18}{32}$	d) $\frac{21}{45}$

LEVEL 6

Next steps

Multiply and divide an integer by a fraction

- Multiplying or dividing an integer by a fraction is the same as multiplying or dividing two fractions. This is because the integer can be expressed as a fraction with a denominator of 1.
- For example, $7 \times \frac{4}{5}$ can be written as $\frac{7}{1} \times \frac{4}{5}$

To multiply fractions, multiply the two numerators together and the two denominators together: $\frac{7 \times 4}{1 \times 5} = \frac{28}{5}$

This is an improper fraction that can then be expressed as a mixed number: $5\frac{5}{5}$

- For example, $9 \div \frac{3}{8}$ can be written as $\frac{9}{1} \div \frac{3}{8}$

To divide fractions, switch the numerator and denominator of the second fraction and then multiply them: $\frac{9}{1} \times \frac{8}{3} = \frac{9 \times 8}{1 \times 3} = \frac{72}{3}$

This is an improper fraction that can then be expressed as a whole number: 24

Remember

Prime factors that appear in the numerator and denominator can be cancelled.

3. Complete the following calculations. Give your answers as improper numbers or mixed numbers.

a) $9 \times \frac{4}{7}$

b) $6 \times \frac{3}{18}$

c) $8 \times \frac{12}{16}$

d) $5 \times \frac{3}{5}$

e) $11 \times \frac{5}{7}$

f) $121 \times \frac{1}{16}$

4. Complete the following calculations. Give your answers

as improper numbers or mixed numbers.

a) $10 \div \frac{3}{8}$

b) $7 \div \frac{4}{9}$

c) $5 \div \frac{2}{16}$

d) $8 \div \frac{9}{12}$

e) $15 \div \frac{6}{9}$

f) $56 \div \frac{3}{7}$

5. A baker made 24 rolls. He then had a telephone order and made $\frac{4}{9}$ more rolls. How many rolls did he make altogether?

Vocabulary percentages; calculate; percentage decrease; percentage increase

Getting started

Use a calculator where appropriate to calculate fractions / percentages of quantities / measurements

- 'Per cent' means 'out of 100'. Because the metric system of measures is based on 10, 100 and 1000, it is quite straightforward to find percentages of these.

- You can use a calculator to find harder percentages.

- For example, to find 23% of 4589 ml

Enter:

$$4589 \div 100 =$$

gives $1\% = 45.89$

So $45.89 \times 23 = 1055.47$ ml gives 23%.



- For example, if you are told that 14% of your earnings is £178.50 and need to find your total earnings:

$$178.50 \div 14$$

gives $1\% = \text{£}12.75$

So $12.75 \times 100 = \text{£}1275$ gives 100% of your earnings.



1. Use a calculator to find these amounts:

- a) 33% of 567 g
- b) 92% of 80 ml
- c) 7% of 635
- d) 28% of 234.50

2. Use a calculator to find these amounts:

- a) The total amount if £1306 is 24%
- b) The total amount if 567 g is 67%
- c) 67% of an amount if 9% is £567
- d) The total amount if 88% is 23 450

Next steps

Calculate percentages and find the outcome of a given percentage increase and decrease

- To find a percentage increase or decrease, you may need to add or subtract the percentage you calculate from the original amount.
- For example, an item costing £50 is given a price increase of 15%. To find the new cost:

First find the price increase of 15%: $50 \div 100$ gives $1\% = 0.5$ (50p)

$50p \times 15 = £7.50$ gives 15%

Add the original cost and the price increase to get the new cost of the item: $£50 + £7.50 = £57.50$

Remember

Find 1% of the total and multiply by 100 to find the total amount.

Give money answers in pounds to 2 decimal places and in pennies to the nearest whole number.

3. A shopkeeper decided to decrease all of his prices by 12% in order to attract more customers. The table shows the cost of the items before the decrease.

Item	Amount before decrease
Trousers	£34.50
Jumper	£28.99
Coat	£103.00
Socks	£4.89
Trainers	£57.98

- a) Work out the amount of the decrease for each item.
- b) Work out the new price of each item.
4. A toyshop had a sale. Before the sale, a playtent cost £67.99. During the sale, the same playtent cost £53.03. Find the percentage decrease of the playtent to the nearest one per cent.
5. In 2013, 56 children attended a safety event. This number increased to 1320 in 2014. Find the percentage increase from 2013 to 2014 to the nearest one per cent.
6. The original cost of an item is £80. In a sale, the same item costs £45. What is the percentage reduction?

Vocabulary proportional reasoning; one hundred per cent; calculator; whole

Getting started

Use a calculator where appropriate to calculate fractions / percentages of quantities / measurements

- You can use a calculator to find fractions and percentages of amounts.
- To find a fraction of a quantity, divide the total amount by the denominator and multiply this number by the numerator. For example, to find $\frac{3}{5}$ of 960 g

Enter:

$$960 \div 5$$

$$\text{This gives } \frac{1}{5} = 192$$

$$\text{So } 192 \times 3 = 576 \text{ g gives } \frac{3}{5}$$



- For example, if you are told that 65% of your winnings is £2346 and want to know what 100% of your winnings would be:

$$2346 \div 65$$

$$\text{This gives } 1\% = \text{£}36.09$$

$$\text{So } 36.09 \times 100 = \text{£}3609.23 \text{ gives you } 100\% \text{ of your winnings.}$$



- Use a calculator to work out the following amounts:
 - 61% of 888 g
 - 11% of 103 ml
 - 54% of 1587
 - 34% of 589
- Use a calculator to find the following fractions of the amounts shown:

a) $\frac{7}{9}$ of 705	b) $\frac{6}{8}$ of 902.54
c) $\frac{7}{21}$ of 888	d) $\frac{12}{20}$ of £487.50

Next steps

Use proportional reasoning to solve a problem, choosing the correct number to take as 100%, or a whole

- Proportional reasoning means using the concept of proportions (e.g. a ratio) to solve a mathematical problem (See Unit 4).
- To solve these problems and find a percentage increase or decrease, you need to identify which figure represents 100% first.
- For example, in this question:

There are 30 children in a class. $\frac{4}{6}$ of them are boys. How many girls are there in the class?

$30 = 100\%$ or one whole

$\frac{4}{6}$ are boys, so $1 - \frac{4}{6} = \frac{2}{6}$ must be girls.

$$30 \div 6 = 5$$

$5 \times 2 = 10$, so there are 10 girls in the class.



Remember

Using a calculator to work out percentages and fractions of amounts will save you a lot of time.

- The results of a science experiment involving the distance a ball travelled down different heights of a slope are shown below:

Height of slope	Distance ball travelled
30 cm	2.56 m
50 cm	5.67 m
70 cm	8.94 m

 - What is the overall percentage increase from 30 cm to 70 cm?
 - What is the percentage increase from 50 cm to 70 cm?
- A clothing shop had a sale where it took 12% off all of its stock. In the sale, Tim bought a board game for £4.56. How much was the board game before the sale?
- A new floor cleaner usually costs £119.99. It is on sale at £89.99. What is the percentage reduction from the usual price to the sale price?
- In a car showroom, a new model of car is being advertised at a cost of £9867. Customers can take the car away on a finance plan once they pay a deposit of 8%. What is the cost of the deposit?



Review

- Nine students share a house. They pay £1335 per month rent which they share equally between them. Six of the students are male.
 - What fraction of the rent does each student pay?
 - What fraction of the rent is paid by the males? Give your answer in its simplest form.
 - How much rent does each student pay?
 - What is the total amount of rent paid by the females?
- A recipe for butterfly cakes uses flour, butter and sugar in the ratio 4 : 3 : 6.
 - If I make the cakes using 225 g of butter, how much flour and sugar should I use?
 - If I use 100 g of flour, I can make 12 cakes. How much of each ingredient do I need to make 48 cakes?
- A shopkeeper decides to hold a sale and reduce each of his sale items by a different amount. Copy and complete the table to show the amount and percentage reduction for each item.

Item	Amount before sale	Percentage decrease	Amount after sale
Chair	£65.00	13%	
Table	£179.00	20%	
Bed	£378.50		£344.43
Shelves	£85.75		£46.86

- You are given this information:
 - On average, each person pays 70 pence per kg for potatoes in a supermarket.
 - On average, each person eats 55 kilograms of potatoes each year.

- The potato growers receive 18% of the money from the sale of potatoes.

How much of the money that each person pays for potatoes in one year goes to the **growers**?

- Tamzin did three sponsored swims. In her first swim she swam $8\frac{1}{2}$ lengths of the pool. In her second swim she swam $4\frac{2}{3}$ lengths of the pool. In her final swim, she swam $12\frac{5}{6}$ lengths of the pool. How many lengths of the pool did she swim in total?
- Complete these calculations. Show your working.
 - $7 \times \frac{6}{8}$
 - $13 \times \frac{5}{12}$
 - $4 \times \frac{16}{21}$
 - $20 \div \frac{4}{8}$
 - $15 \div \frac{3}{8}$
 - $8 \div \frac{3}{7}$
- In 2013 there were 1345 children at a Furze Town secondary school. In 2014 the secondary school in a local village closed and the number of children at Furze Town increased by 12%.
 - How many children joined Furze Town school?
 - What was the total number of children at Furze Town school after the increase?
- A clothing shop has a sale. Before the sale a coat cost £112.99. In the sale, the price was reduced by 15%.
 - What was the amount of the percentage decrease?
 - What was the sale price of the coat?
- 456 children attend a music event.

$\frac{3}{8}$ of them are girls.

$\frac{5}{9}$ of the children play a woodwind instrument.

 - What is the total number of girls?
 - What is the total number of boys?
 - How many of the children play a woodwind instrument?

Level 6 Maths

Your FREE Evaluation Pack for Level 6 Maths

Leap up to Level 6

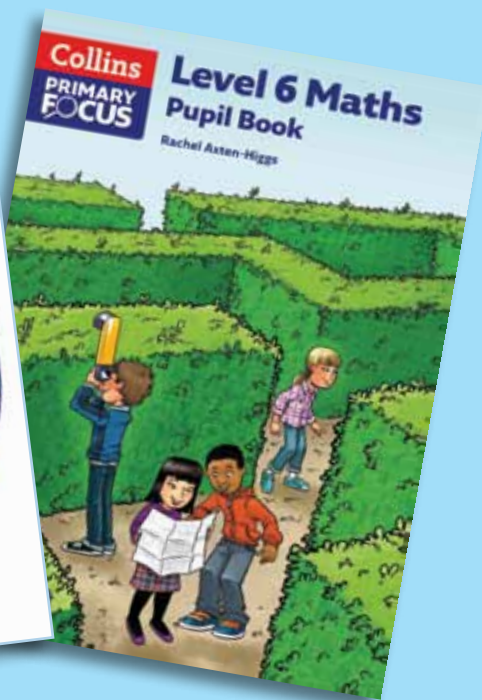
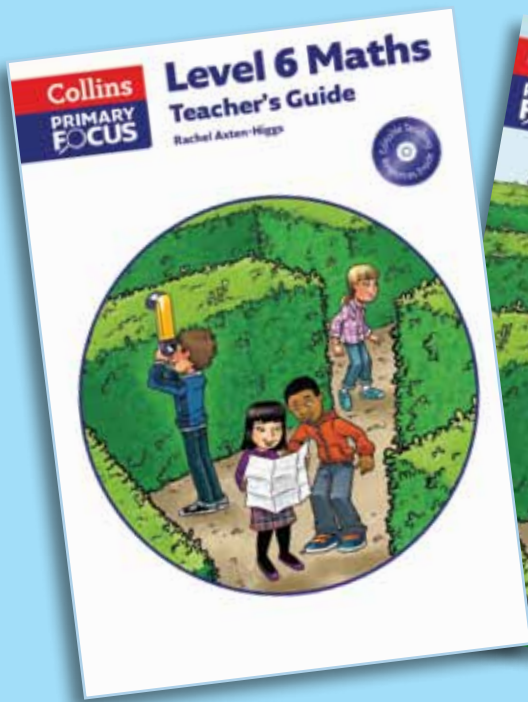
We hope you found using these resources with your pupils straightforward and easy.

To place an order or for more information contact your local primary specialist: www.collinseducation.com/findyourrep or call 0844 576 8126

This booklet includes material from:

978-0-00-753115-8 - Level 6 Maths Teacher's Guide & Resource Pack - £120.00 +VAT

978-0-00-753116-5 - Level 6 Maths Pupil Book - £5.95



**Teacher's Guide
Resource Pack**

ISBN 978-0-00-793604-5



9 780007 936045 >

Order your copies today!