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Cambridge Checkpoint

Mathematics

Skills Builder Workbook

7

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Contents

Introduction

Welcome to Cambridge Checkpoint Mathematics Skills Builder Workbook 7

The *Cambridge Checkpoint Mathematics* course covers the Cambridge Secondary 1 Mathematics curriculum framework. The course is divided into three stages: 7, 8 and 9.

You can use this Skills Builder Workbook with Coursebook 7 and Practice Book 7. It gives you extra practice in key topics, focusing on those that are the most important, to improve your understanding and confidence.

Like the Coursebook and the Practice Book, this Workbook is divided into 19 units. In each unit there are exercises on each topic. There are introductory explanations and either worked examples or guided questions. These explain the skills you need to master and use to solve more complex problems.

This Workbook also gives you a chance to try further questions on your own. This will improve your understanding of the units. It will also help you feel confident about working on your own when there is no teacher to help you. At the end of each unit is a link to exercises to attempt in the Coursebook.

If you get stuck with a task:

- Read the question again.
- Look back at the introductory explanations and worked examples or guided questions.
- Read through the matching section in the Coursebook.

1 Integers

1.1 Multiples

Look at this sequence: 1 × 3 = 3   2 × 3 = 6   3 × 3 = 9   4 × 3 = 12

The numbers 3, 6, 9, 12 and 15 are the **multiples** of 3.

Make sure you know your multiplication facts up to 10 × 10 or further.

1 Write in the answers.

a 1 × 5 = ...   **b** 3 × 5 = ...   **c** 8 × 5 = ...   **d** 4 × 5 = ...

2 Write in the answers.

a 2 × 9 = ...   **b** 3 × 6 = ...   **c** 9 × 2 = ...   **d** 18 × 1 = ...

3 Here are some multiplication tables. Fill in the gaps.

a

×	3	4
3		12
5		

b

×	6	4
7	42	
10		

c

×	9	8
3		
4		

Here are the whole numbers up to 25. Multiples of 3 have been circled.

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

4 Circle the multiples of 4. Two have been done for you.

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

5 Circle the multiples of 5.

Remember to start with 5.

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

6 Circle the multiples of 2.

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

7 Circle the multiples of 6.

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

8 Here are two multiples of 8: **8** and **16**

Write down another one ......

9 Write down three multiples of 7. ...... and ...... and ......

Here are the multiples of 3 again.

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

Here are more multiples of 3.

26 (27) 28 29 (30) 31 32 (33) 34 35 (36) 37 38 (39) 40 41 (42) 43 44 (45)

10 Circle the multiples of 2.

25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45

11 Circle the multiples of 5.

25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45

12 Circle the multiples of 6.

25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45

13 Write down five multiples of 10.

....

14 Write down five multiples of 8.

....

15 Write down five multiples of 9.

....

16 Circle the multiples of 4.

10 16 26 28 30 36

17 Circle the multiples of 5.

15 22 30 45 54 50

18 Draw lines from numbers to their multiples. Two lines have been drawn for you.

Number	**Multiple**
3	12
	13
4	14
	15
5	16
	17
6	18

Now try Exercise 1.3 on page 11 of Coursebook 7.

1.2 Factors

A **factor** of a whole number divides into it without a **remainder**.

This means that 1 is a factor of every number. Every number is a factor of itself.

Look at these: $1 \times 12 = 12$ $2 \times 6 = 12$ $3 \times 4 = 12$

The numbers 1, 12, 2, 6, 3 and 4 are factors of 12.

1 Fill in the gaps.

a) $3 \times 5 =$ ...... 3 and 5 are factors of ......

b) $4 \times 6 =$ ...... 4 and 6 are .... of ......

c) $7 \times 3 =$ .... and ...... are .... of ......

2 Fill in the gaps.

a) $28 = 7 \times$ ...... Two factors of 28 are 7 and ......

b) $50 = 10 \times$ ...... Two factors of 50 are ...... and ......

c) $25 = 5 \times$ ...... A factor of 25 is ......

3 Here are some multiplication tables.

×	8	12
2	16	24
3	24	36

×	6	24
4	24	96
1	6	24

Use the tables to help you find the factors of 24.

Can you find eight factors?

....

4 Here are some multiplication tables.

×	5	15
2	10	30
6	30	90

×	10	1
3	30	3
30	300	30

Use the tables to help you find the factors of 30.

....

5 7 × 9 = 63   6 × 15 = 90   13 × 13 = 169

24 × 4 = 96   3 × 19 = 57

Use these facts to find:

a a factor of 90 ......

b a factor of 57 ......

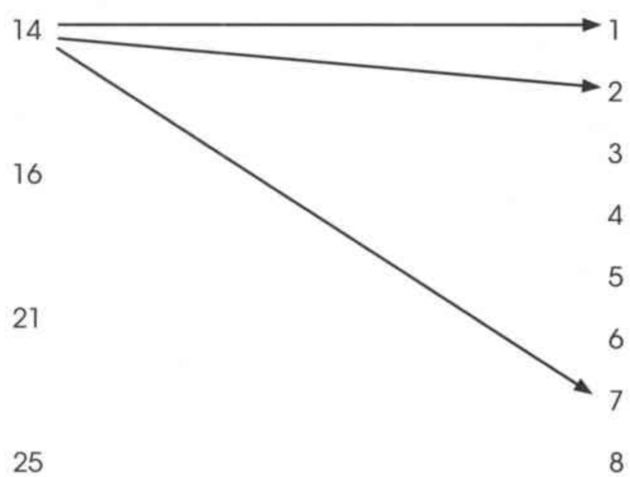
c a factor of 169 ......

d two factors of 63 ...... and ......

e two factors of 96 ...... and ......

6 Draw lines from the numbers to their factors. Three lines have been drawn for you.

Number   **Factor**



7 Circle the correct word in each sentence.

a 6 is a factor/multiple of 18.

b 18 is a factor/multiple of 6.

c 15 is a factor/multiple of 30.

d 8 is a factor/multiple of 4.

e 20 is a factor/multiple of 4.

f 9 is a factor/multiple of 90.

Now try Exercise 1.4 on page 13 of Coursebook 7.

2 Sequences, expressions and formulae

2.1 Generating sequences

Here is a **sequence** of numbers:
4, 6, 8, 10, 12, …

A sequence is just a list of numbers that follow a pattern.

The **first term** of the sequence is 4.

The first term is the first number in the list.

The **term-to-term rule** is 'Add 2'.

You add 2 to each number to get the next number: $4 + 2 = 6$, $6 + 2 = 8$, $8 + 2 = 10$, etc.

1 Fill in the missing two terms (numbers) in each of these sequences (lists).
Also write down the term-to-term rule.

a 5, 10, 15, 20, ……, ……
Term-to-term rule ………………

$5 + 5 = 10$, $10 + 5 = 15$, $15 + 5 = 20$, …
The rule is 'Add 5'.

b 1, 3, 5, 7, ……, ……
Term-to-term rule ………………

$1 + ? = 3$, $3 + ? = 5$, $5 + ? = 7$, $7 + ? = ?$
The rule is 'Add ?'.

c 6, 10, 14, 18, ……, ……
Term-to-term rule ………………

d 20, 28, 36, 44, ……, ……
Term-to-term rule ………………

e 10, 9, 8, 7, ……, ……
Term-to-term rule ………………

$10 - 1 = 9$, $9 - 1 = 8$, $8 - 1 = 7$, $7 - 1 = ?$
The rule is 'Subtract 1'.

f 16, 13, 10, 7, ……, ……
Term-to-term rule ………………

$16 - ? = 13$, $13 - ? = 10$, $10 - ? = 7$, $7 - ? = ?$
The rule is 'Subtract ?'.

g 20, 18, 16, 14, ……, ……
Term-to-term rule ………………

h 50, 45, 40, 35, ……, ……
Term-to-term rule ………………

2 Use the given first term and term-to-term rule to write down the next four terms of each sequence.

a Add 3 5, ……, ……, ……, ……

> The first term is 5, then 5 + 3 = 8, 8 + 3 = 11, 11 + 3 = ?, etc.

b Add 6 2 , ……, ……, ……, ……

> The first term is 2, then 2 + 6 = 8, 8 + 6 = ?, ? + 6 = ?, etc.

c Add 10 12, ……, ……, ……, ……

d Add 7 0, ……, ……, ……, ……

e Subtract 2 12, ……, ……, ……, ……

> The first term is 12, then 12 − 2 = 10, 10 − 2 = 8, 8 − 2 = ?, etc.

f Subtract 5 25, ……, ……, ……, ……

> The first term is 25, then 25 − 5 = 20, 20 − 5 = ?, ? − 5 = ?, etc.

g Subtract 1 13, ……, ……, ……, ……

h Subtract 20 100, ……, ……, ……, ……

3 Fill in the missing terms in each of these sequences.

a 4, 10, 16, ……, 28, ……, 40, 46

> 4 + ? = 10, 10 + ? = 16 so the rule is 'Add ?'.

b 45, 43, ……, 39, 37, ……, 33

> 45 − ? = 43, 39 − ? = 37 so the rule is 'Subtract ?'.

Now try Exercise 2.1 on page 20 of Coursebook 7.

2.2 Representing simple functions

Here is a **function machine**.

The **input** is the number that goes into the machine.

Input 3 → +6 → **Output** 9

The **output** is the number that comes out of the machine.

This machine tells you to add 6 to the input number to get the output number.

1 Find the missing output numbers in each of these function machines.

a **Input** 3 → ×2 → **Output** ......

Find the output number by working out: input number × 2, so 3 × 2 = ?

b **Input** 15 → ÷3 → **Output** ......

15 ÷ 3 = ?

c **Input**
8 → −8 → **Output** ......
10 → −8 → **Output** ......

There can be more than one input number, so this time work out both output numbers: 8 − 8 = ? and 10 − 8 = ?

d **Input**
2 → ×5 → **Output** ......
8 → ×5 → **Output** ......

e **Input**
4 → +2 → **Output** ......
7 → +2 → **Output** ......
19 → +2 → **Output** ......

2 Find the missing input numbers in each of these function machines.

a

Input		Output
……	+ 3	4

Find the input number by working backwards:
input + 3 = output, so
output − 3 = input, so 4 − 3 = ?

b

Input		Output
……	× 4	12

12 ÷ 4 = ?

c

Input		Output
……	− 6	2
……		5

Input − 6 = output, so
output + 6 = input

d

Input		Output
……	÷ 2	3
……		10

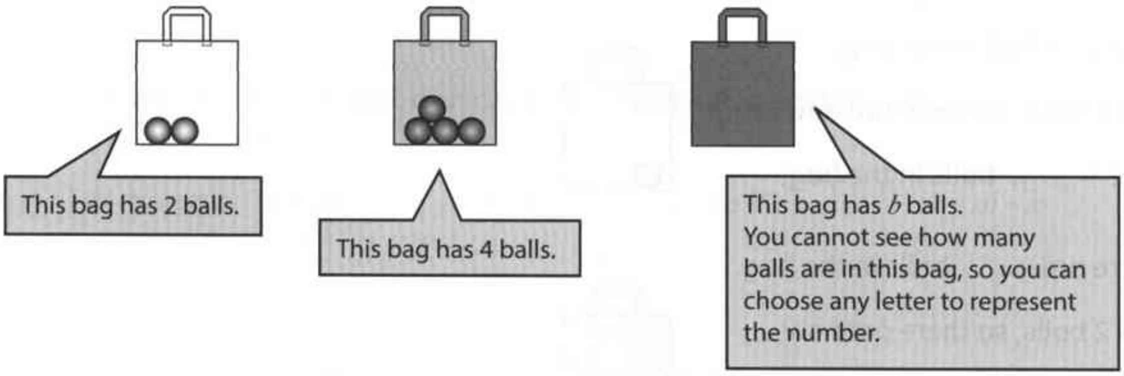
e

Input		Output
……	+ 7	10
……		14
……		30

Now try Exercise 2.3 on page 24 of Coursebook 7.

2.3 Constructing expressions

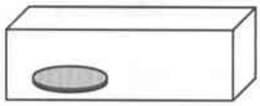
Here are three bags, each with a different number of balls inside.



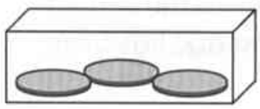
1 Fill in the missing numbers.

If you do not know the number, choose your own letter to represent it.

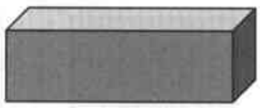
a This box has …… counter.



b This box has …… counters.

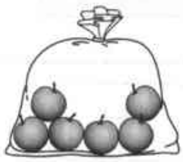


c This box has …… counters.



You do not know how many counters are in this box, so choose your own letter.

d This bag has …… apples.



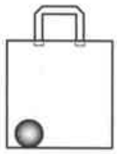
e This bag has …… apples.

2 Fill in the gaps to work out the total number of balls in each of these bags after you have added an extra 2 balls.

a There is 1 ball in the bag.

Add 2 balls, so there are now

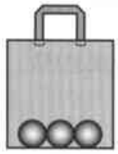
$1 + 2 =$ ...... balls in the bag.



b There are ...... balls in the bag.

Add 2 balls, so there are now

...... $+ 2 =$ ...... balls in the bag.



c There are ...... balls in the bag.

Add 2 balls, so there are now

...... $+ 2$ balls in the bag.

Choose your own letter for the number of balls, e.g. x. You cannot work out $x + 2$, so just leave it as it is.

3 A bag has n counters in it. Use a line to join the statement in each rectangle to the correct expression in the ovals. The first one has been done for you.

An expression is a statement that contains letters and sometimes numbers – for example, $n + 7$.

I add 3 counters to the bag.	I add 1 counter to the bag.	I add 6 counters to the bag.	I add 9 counters to the bag.	I add 7 counters to the bag.
$n+7$	$n+6$	$n+1$	$n+3$	$n+9$

Now try Exercise 2.4 on page 26 of Coursebook 7.

2.4 Deriving and using formulae

An **expression** is a statement that contains letters and sometimes numbers but has no '=' sign.

for example: p $x + 2$ $n - 3$ $4m$

A **formula** is a statement that contains letters and sometimes numbers and does have an '=' sign.

For example: $A = 2p$ $y = x - 2$ $v = 5n - 3$ $R = m + k$

1 Under each of these statements, write 'E' if it is an expression or 'F' if it is a formula.

The first two have been done for you.

a $8h$ ..E....

b $v = 9u$ ..F....

c $9u + 3$ ......

d $m = 4 + n$ ......

e $G = 2x + y$ ......

f $b - c$ ......

You can work out the value of an expression by **substituting** numbers into the expression.

For example, the value of $x + 2$ when $x = 5$ is:

$5 + 2 = 7$

Substitute the x for the number 5 and then work out 5 + 2.

2 Work out the value of $x + 6$ when:

a $x = 1$ $x + 6 =$ ....

$x + 6 = 1 + 6 = ?$

b $x = 2$ $x + 6 =$ ....

c $x = 3$ $x + 6 =$ ....

d $x = 4$ $x + 6 =$ ....

3 Work out the value of $n - 1$ when:

a $n = 5$ $n - 1 =$ ....

$n - 1 = 5 - 1 = ?$

b $n = 6$ $n - 1 =$ ....

c $n = 7$ $n - 1 =$ ....

d $n = 8$ $n - 1 =$ ....

4 Work out the value of the expression in each rectangle, then use a line to join each rectangle to the correct answer in the ovals. The first one has been done for you.

$y + 2$ when $y = 3$	$y - 2$ when $y = 10$	$4 + y$ when $y = 2$	$10 - y$ when $y = 1$	$y + 3$ when $y = 0$
8	6	5	3	9

5 Write down 'True' or 'False' for each of these. If a statement is false, work out the correct value of the expression. The first one has been done for you.

a The value of $2m$ when $m = 5$ is 7.

False, when $m = 5$, $2m = 10$ ....

$2m$ means $2 \times m$, so $2 \times 5 = 10$.

b The value of $3m$ when $m = 8$ is 24.

....

c The value of $9p$ when $p = 2$ is 11.

....

d The value of $\frac{w}{2}$ when $w = 6$ is 3.

....

$\frac{w}{2}$ means $w \div 2$.

e The value of $\frac{x}{3}$ when $x = 12$ is 6.

....

Now try Exercise 2.5 on page 28 of Coursebook 7.

3 Place value, ordering and rounding

3.1 Multiplying and dividing by 10, 100 and 1000

When you multiply a whole number by 10, add one zero on to the number.

When you multiply a whole number by 100, add two zeros on to the number.

This is the quickest way of multiplying a whole number by 10 and 100.

1 Multiply each of these numbers by 10.

Adding one zero on to 7 gives 70.

a 7 ....

b 9 ....

c 45 ....

2 Multiply each of these numbers by 100.

Adding two zeros on to 5 gives 500.

a 5 ....

b 30 ....

c 12 ....

3 Divide each of these numbers by 10.

Do the opposite of multiplying and take away one zero from the number: $80 \div 10 = 8$.

a 80 ....

b 20 ....

c 360 ....

4 Divide each of these numbers by 100.

> Do the opposite of multiplying and take away two zeros from the number: 700 ÷ 100 = 7

a 700 ....

b 3000 ....

c 6500 ....

When you multiply a **decimal number** by 10, move the decimal point one place to the right.

When you multiply a decimal number by 100, move the decimal point two places to the right.

> This is the quickest way of multiplying a decimal number by 10 and 100.

5 Multiply each of these numbers by 10.

> 3.56 × 10 = 3.5.6 = 35.6

a 3.56 ....

b 4.2 ....

c 15.89 ....

6 Multiply each of these numbers by 100.

> 7.2 × 100 = 7.2.0. = 720

> Once you have moved the decimal point, any empty spaces must be filled with zeros.

a 7.2 ....

b 12.6 ....

c 8.95 ....

d 10.851 ....

7 Divide each of these numbers by 10.

Do the opposite of multiplying and move the decimal point one place to the left:

82.5 ÷ 10 = 8.2.5 = 8.25

a 82.5 ....

b 330.9 ....

c 25.66 ....

8 Divide each of these numbers by 100.

Do the opposite of multiplying and move the decimal point two places to the left:

570 ÷ 100 = 5.7.0. = 5.70 or just 5.7

a 570 ....

b 330.9 ....

c 25.66 ....

If you cannot see a decimal point then imagine one at the end of the number.

Now try Exercise 3.2 on page 34 of Coursebook 7.

3.2 Ordering decimals

1 Write these numbers in order of size, starting with the smallest. The first one has been done for you.

Start by comparing the numbers in the tens, then the numbers in the hundreds.

176 204 23 498 45 12

...12... ....

2 In each of these lists of numbers:

i circle the number that is in the wrong place

ii write the list in the correct order of size, starting with the smallest.

a 34 59 70 215 152 251

....

b 67 88 39 95 101 321

....

c 6 8.2 14.5 67 10.9 100.7

....

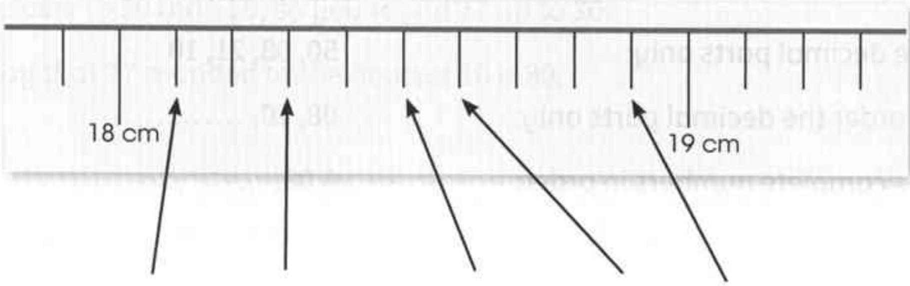
All the whole number parts are different, so you only need to compare these: 6, 8, 14, 67, 10, 100.

3

a Write these measurements in the spaces under the ruler.

One has been done for you.

18.6 cm   18.9 cm   18.1 cm   18.5 cm   18.3 cm



.... 18.3 cm ....

b Use your answer in part a) to write these numbers in order of size, starting with the smallest.

18.6   18.9   18.1   18.5   18.3

....

c Write these numbers in order of size, starting with the smallest.

9.5   9.3   9.8   9.2   9.7

....

d Write these numbers in order of size, starting with the smallest.

The first one has been done for you.

3.32   3.21   3.56   3.42

> The whole number parts are the same, so compare the numbers after the decimal point: 32, 21, 56, 42.

3.21 ....

4 Complete the workings to write these numbers in order of size, starting with the smallest.

6.5 6.08 6.21 6.1

Start by writing each number out to two decimal places:	6.50, 6.08, 6.21, 6.10
Now write the decimal parts only:	50, 08, 21, 10
Now write in order the decimal parts only:	08, 10, ..., ...
Now write the complete numbers in order:	6.08, ..., ..., ...

5 Write these numbers in order of size, starting with the smallest.

Use the same method as you did in Question 4.

a 4.67 4.21 4.5 4.02

....

....

....

....

b 12.9 12.41 12.08 12.3

....

....

....

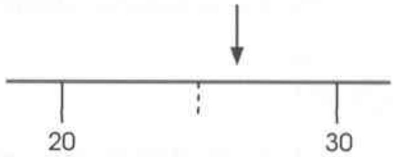
....

Now try Exercise 3.3 on page 35 of Coursebook 7.

3.3 Rounding

When you **round** a number you get an **approximate** value.

Look at this section of a number line.



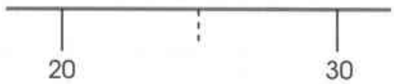
The arrow shows the approximate position of the number 27.

27 is closer to 30 than 20, so you round 27 up to 30.

You say that 27 rounded to the nearest 10 is 30.

1 On each of these number lines, draw an arrow to show the approximate position of the given number. Round each number to the nearest 10.

a 23



23 rounded to the nearest 10 is ....

b 49

49 rounded to the nearest 10 is ....

c 61

61 rounded to the nearest 10 is ....

d 15

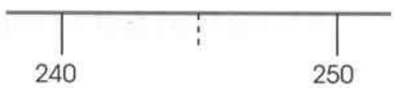
15 rounded to the nearest 10 is ....

15 is exactly half way between 10 and 20, so round up to 20.

e 132

132 rounded to the nearest 10 is ....

f 245



245 rounded to the nearest 10 is ....

2 On each of these number lines, draw an arrow to show the approximate position of the given number. Round each number to the nearest 10.

a 82

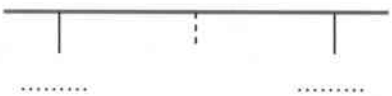
Start by writing 80 and 90 on the number line.

82 rounded to the nearest 10 is ....

b 36

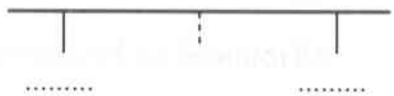
Start by writing 30 and 40 on the number line.

36 rounded to the nearest 10 is ....



c 25

25 rounded to the nearest 10 is ....



d 161

161 rounded to the nearest 10 is ....

3 On each of these number lines, draw an arrow to show the approximate position of the given number. Round each number to the nearest 100.

a 421

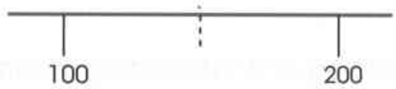
421 rounded to the nearest 100 is ....

b 678

678 rounded to the nearest 100 is ....

c 120

120 rounded to the nearest 100 is ....



d 350

350 rounded to the nearest 100 is ....

Now try Exercise 3.4 on page 37 of Coursebook 7.

3.4 Adding and subtracting decimals

Adding and subtracting decimals is almost the same as adding and subtracting whole numbers. Just make sure you write the numbers one underneath the other, with the decimal points in line.

1 Work out the answers to these whole number additions.

a
```
   7 5
 + 2 2
 _____
 _____
```

b
```
   3 6
 + 4 5
 _____
 _____
```

c
```
   7 9
 + 5 3
 _____
 _____
```

Remember to start from the right – add the units first, then the tens, then the hundreds.

d
```
   1 2 5
 + 3 1 4
 _______
 _______
```

e
```
   5 6 2
 +   3 6
 _______
 _______
```

f
```
   2 8 6
 +   7 7
 _______
 _______
```

2 Work out the answers to these decimal additions.

Use the same method as Question 1.
Do not let the decimal point put you off!

a
```
   3 . 4
 + 2 . 1
 _______
 ___.___
```

b
```
   5 . 2
 + 3 . 9
 _______
 ___.___
```

c
```
   6 . 8
 + 8 . 4
 _______
 ___.___
```

d
```
   4 2 . 5
 + 3 3 . 7
 _________
 _____.___
```

e
```
   7 3 . 7
 +   9 . 1
 _________
 _____.___
```

f
```
   8 . 4 9
 + 0 . 8 4
 _________
 ___._____
```

3 Work out the answers to these decimal additions.

Use the grid on the right to help you.

Remember to line up the decimal points in each question so they are underneath each other.

The first one has been started for you.

a		6	.	1								
	+	5	.	7								
			.									

a 6.1 + 5.7 **b** 8.3 + 4.8 **c** 12.9 + 5.3 **d** 3.21 + 0.58

4 Work out the answers to these subtractions.

Start from the right – remember to 'borrow' if you need to.

a
```
  7 8
- 4 2
-----
```

b
```
  4 9
- 2 1
-----
```

c
```
  8 4 3
-   2 8
-------
```

d
```
  6 . 7
- 1 . 4
-------
```

e
```
  8 . 2
- 4 . 6
-------
```

f
```
  2 . 6 3
- 0 . 4 5
---------
```

5 Work out the answers to these decimal subtractions.

Use the grid below to help you.

Remember to line up the decimal points in each question so they are underneath each other.

The first one has been started for you.

a 3.9 − 2.5 **b** 7.4 − 3.8 **c** 12.92 − 5.35

a		3	.	9																	
	−	2	.	5																	
			.																		

Now try Exercise 3.5 on page 39 of Coursebook 7.

3.5 Multiplying decimals

One of the best ways to see the effect of multiplying a whole number by a decimal is to look at some number patterns.

1 Fill in the missing numbers in these number patterns.

Look at how the numbers at the end of each pattern get smaller.

a

200	×	4	=	800
20	×	4	=	80
2	×	4	=	....
0.2	×	4	=	0.8

b

300	×	2	=	600
30	×	2	=	....
3	×	2	=	6
0.3	×	2	=	....

c

500	×	3	=	1500
50	×	3	=	....
5	×	3	=	....
0.5	×	3	=	1.5

d

700	×	5	=	3500
70	×	5	=	....
7	×	5	=	....
0.7	×	5	=	....

e

900	×	2	=	....
90	×	2	=	....
9	×	2	=	....
0.9	×	2	=	....

f

600	×	7	=	....
60	×	7	=	....
6	×	7	=	....
0.6	×	7	=	....

2 Write out two of your own number patterns in the space below.

Make the patterns look the same as those in Question 1, but choose your own numbers.

a

b

You could start with 400 × 6 or 800 × 3. It is up to you.

3 Complete the missing steps. The first one has been done for you.

a	0.3 × 6	First work out: 3 × 6 = 18	so 0.3 × 6 = 1.8
b	0.2 × 8	First work out: 2 × 8 = ...	so 0.2 × 8 = ...
c	0.4 × 4	First work out: 4 × 4 = ...	so 0.4 × 4 = ...
d	0.7 × 9	First work out: ...... × ...... = ...	so 0.7 × 9 = ...
e	0.5 × 5	First work out: ...... × ...... = ...	so 0.5 × 5 = ...

4 Fill in the missing numbers in this number pattern.

0.1	×	5	=	0.5	0.6	×	5	=	......
0.2	×	5	=	1	0.7	×	5	=	......
0.3	×	5	=	1.5	0.8	×	5	=	......
0.4	×	5	=	2	0.9	×	5	=	......
0.5	×	5	=	......	1	×	5	=	......

To work out 0.2 × 5, do 2 × 5 = 10, so 0.2 × 5 = 1.0, which is the same as 1.

5 Work out the answers to these questions. Show your working in the grid below.

The first one has been started for you.

		3	2
	×		7
	2	2	4
		1	

a 3.2 × 7 = ...

First work out 32 × 7 = 224, so 3.2 × 7 = 22.4

b 4.5 × 2 = ...

c 2.4 × 3 = ...

d 4.6 × 4 = ...

e 8.9 × 5 = ...

f 9.2 × 2 = ...

Now try Exercise 3.6 on page 40 of Coursebook 7.

4 Length, mass and capacity

4.1 Knowing metric units

You need to learn the **metric units** of measurement.

You also need to know how many smaller units make a bigger unit.

Units of length	Units of mass	Units of capacity
10 mm = 1 cm	1000 g = 1 kg	1000 ml = 1 l (litre)
100 cm = 1 m	1000 kg = 1 t (tonne)	
1000 m = 1 km		

1

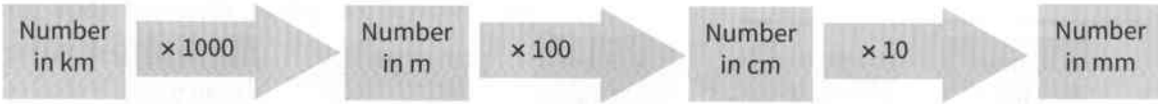
a Look at the table above. Now cover it over with your hand or a piece of paper. Use a pencil to fill in the missing values in the table below.

Units of length	Units of mass	Units of capacity
.... mm = 1 cm	.... g = 1 kg	.... ml = 1 litre
.... cm = 1 m	.... kg = 1 t	
.... m = 1 km		

Try not to look! Keep the table above covered up until you have filled in your table.

b Check the numbers in your table are correct. If they are wrong, rub them out and try part a) again.

This flow chart shows how you can change from bigger units of length to smaller units of length.



2 Use the flow chart to work out these conversions.

a) 7 km = ... m

7 km × 1000 = ... m

b) 3 km = ... m

c) 9 m = ... cm

9 m × 100 = ... cm

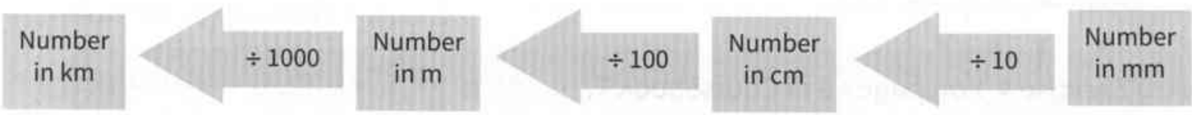
d) 4 m = ... cm

e) 5 cm = ... mm

5 cm × 10 = ... mm

f) 8 cm = ... mm

You reverse the flow chart to change from smaller units of length to bigger units of length.



3 Use the flow chart to work out these conversions.

a) 8000 m = ... km

8000 m ÷ 1000 = ... km

b) 12000 m = ... km

c) 700 cm = ... m

700 cm ÷ 100 = ... m

d) 200 cm = ... m

e) 30 mm = ... cm

f) 90 mm = ... cm

4 Complete these flow charts to change between the units of mass.

Compare the flow charts for the units of length with the table at the top of page 36.

Number in t → × .... → Number in kg → × .... → Number in g

Number in t ← ÷ .... ← Number in kg ← ÷ .... ← Number in g

5 Complete these flow charts to change between the units of capacity.

Number in l → × .... → Number in ml

Number in l ← ÷ .... ← Number in ml

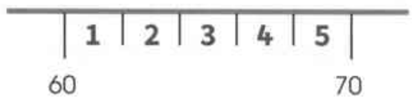
Now try Exercise 4.1 on page 48 of Coursebook 7.

4.2 Reading scales

The first thing to do when you read a **scale** is to work out what each **division** on the scale represents.

Look at this scale:

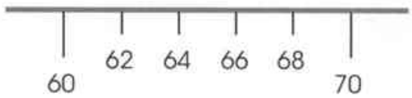
There are five divisions (shown in grey) between the 60 and the 70.



Work out the gap between 60 and 70: $70 - 60 = 10$

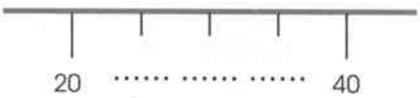
Divide the gap by the number of divisions: $10 \div 5 = 2$

Check the scale is correct:



1 Complete the workings to find the values on each of these scales.

a

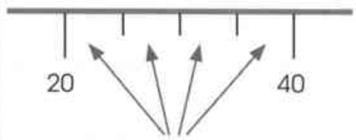


Number of divisions = ...

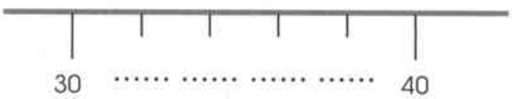
Gap between 20 and 40 = 40 – 20 = ...

Value of each division = ... ÷ .... = ...

Count the number of gaps on the scale between 20 and 40.



b



Number of divisions = ...

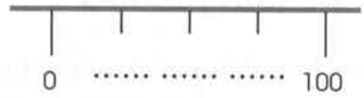
Gap between 30 and 40 = ... – .... = ...

Value of each division = ... ÷ .... = ...

c Number of divisions = ...

Gap between 0 and 100 = ... − .... = ...

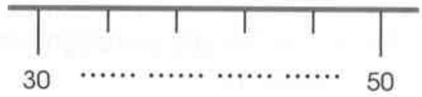
Value of each division = ... ÷ .... = ...



d Number of divisions = ...

Gap between 30 and 50 = ... − .... = ...

Value of each division = ... ÷ .... = ...



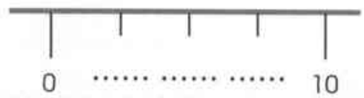
2 Fill in the missing values on each of these scales. Write down all your working.

a ....

....

....

....



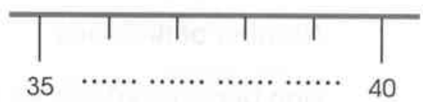
Compare with Question 1c, but this time 10 ÷ 4 = 2.5.

b ....

....

....

....

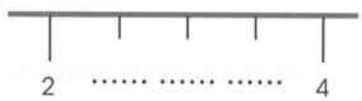


c ....

....

....

....

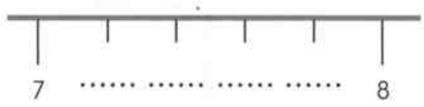


d ....

....

....

....

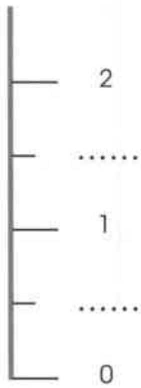


3 Complete the workings to find the missing values on each of these scales.

a Number of divisions between 0 and 1 = ...

Gap between 0 and 1 = ... − .... = ...

Value of each division = ... ÷ .... = ...

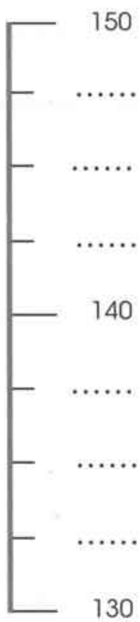


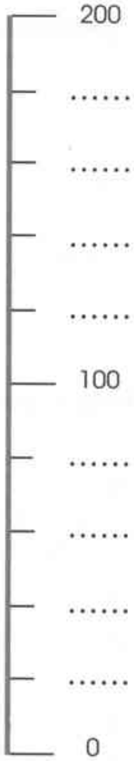
On a scale where you can see several numbers, just choose two of the numbers to work with.

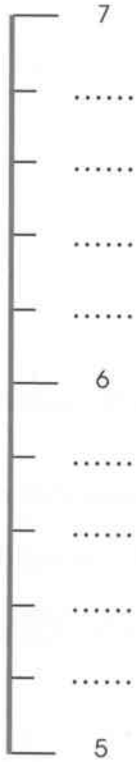
b Number of divisions between 140 and 150 = ...

Gap between 140 and 150 = ... − .... = ...

Value of each division = ... ÷ .... = ...







c ....
....
....
....
....

d ....
....
....
....
....

4 Choose your own numbers to put on these scales.

Make sure they are not the same numbers as in any of the other questions in this exercise.

a

....

Start by deciding on the numbers at the start, end and middle of the scale. Then work out all the other numbers in between.

....

....

....

b

....

....

....

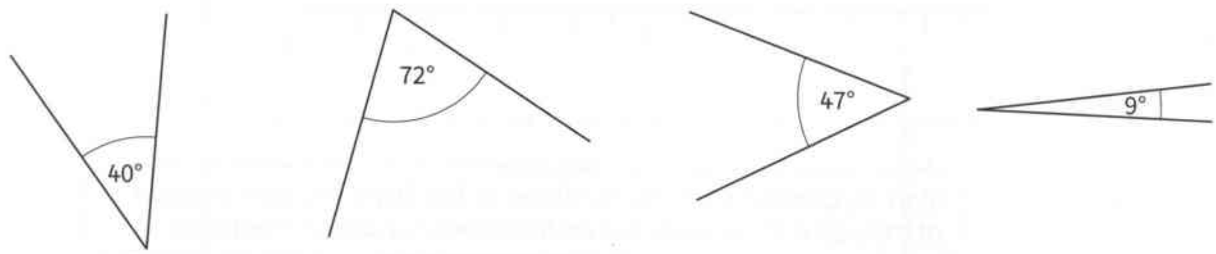
....

Now try Exercise 4.3 on page 50 of Coursebook 7.

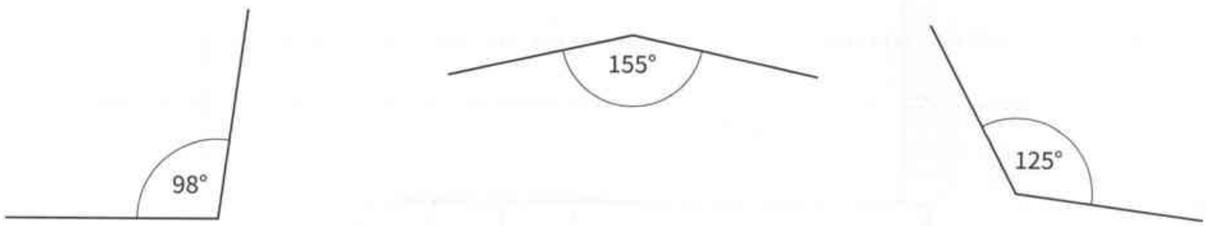
5 Angles

5.1 Labelling angles

An **acute** angle is less than 90°.

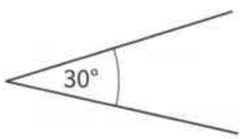


An **obtuse** angle is more than 90° and less than 180°.



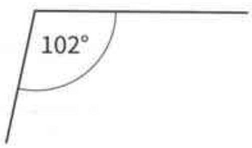
1 Write 'acute' or 'obtuse' under each angle.

a



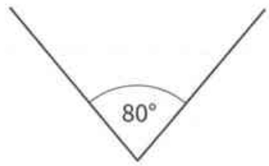
....

b



....

c

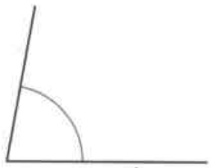


....

2 These angles are 150°, 100° and 80°.

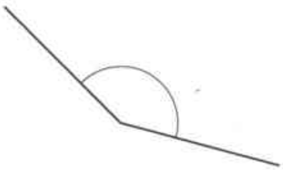
Write the correct angle on each diagram. Then write whether it is acute or obtuse.

a



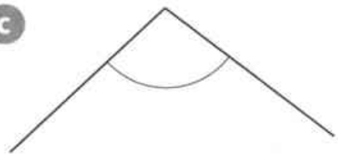
....

b



....

c



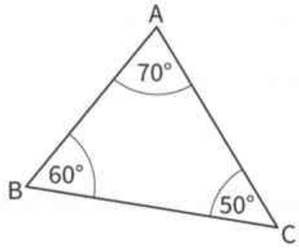
....

3 Look at these angles. Write whether they are acute or obtuse.

a 7° .... **b** 79° ....

c 107° .... **d** 97° ....

Look at this triangle.



Find the 70° angle.

This is called angle BAC or angle CAB.

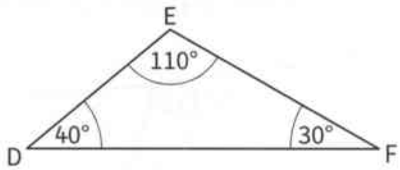
Letter A is in the middle.

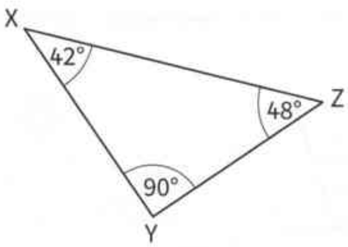
4 Complete these sentences.

a The 60° angle is called .... or ....

b The 50° angle is called .... or ....

5 Look at these triangles.





Fill in the gaps.

a Angle DEF = ... **b** Angle ZYX = ... **c** Angle EFD = ...

d Angle ...... = 48° **e** Angle ...... = 40° **f** Angle ...... = 42°

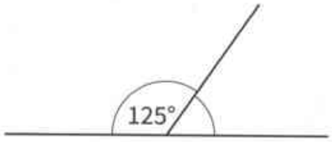
Now try Exercise 5.1 on page 55 of Coursebook 7.

5.2 Calculating angles

The angles round a point add up to 360°.

The angles on a straight line add up to 180°.

1 Look at this diagram.



a Why must these angles add up to 180°?

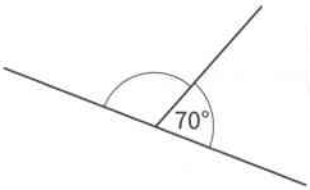
....

b Complete this sentence.

The missing angle is 180 – 125 = ...°

2 Work out the missing angle on each of these diagrams.
Write the answer on the diagram.

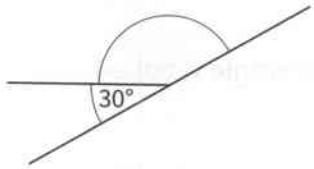
a



The angle is 180° – 70°.

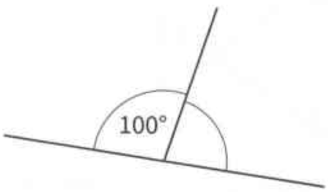
....

b



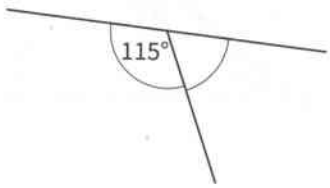
....

c



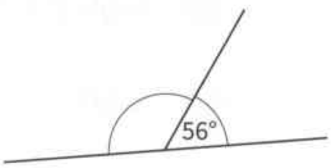
....

d



....

e

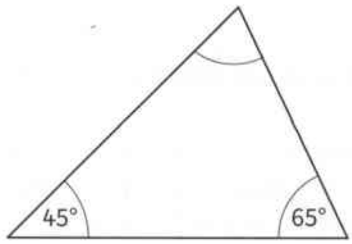


....

f

....

The three angles of a triangle add up to 180°.

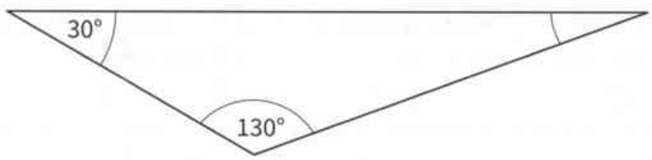


3 Complete these sentences.

45 + 65 = ...

The missing angle is 180 – ...... = ...°

4 Here is a triangle.



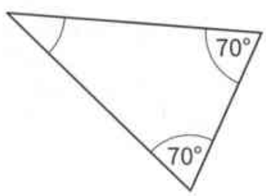
Complete these sentences.

30 + 130 = ...

The missing angle is 180 – ...... = ...°

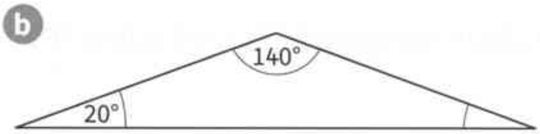
5 Work out the missing angles. Write them on the triangles.

a



....

b



....

Now try Exercise 5.3 on page 58 of Coursebook 7.

6 Planning and collecting data

6.1 Using frequency tables

This **frequency table** shows the favourite flavour ice cream of 20 students.

This row shows the different flavours of ice cream.

Flavour	Vanilla	Chocolate	Strawberry
Frequency	6	9	5

This row shows the number of students who chose each flavour.

1 This frequency table shows the favourite English football team of all the students in class 7R.

Football team	Arsenal	Manchester United	Liverpool	Chelsea
Frequency	12	11	3	6

a How many students chose Arsenal? ....

b How many students chose Manchester United? ....

c How many students chose Liverpool? ....

d How many students chose Chelsea? ....

e How many students are in class 7R? ....

Add together all the numbers in the table.

2 This frequency table shows the favourite sport of all the students in class 7T.

Sport	Football	Cricket	Athletics	Tennis
Frequency	5	9	13	3

a How many students chose cricket? ....

b How many students chose tennis? ....

c What is the most popular sport? ....

Look for the sport with the highest frequency.

d What is the least popular sport? ....

e How many students are in class 7T? ....

3 Mary recorded the favourite fruit of the students in her class.
This is her frequency table so far.

Fruit	Banana	Apple	Pineapple	Mango
Tally	|||	𝍸 |||	𝍸 𝍸 |||	||
Frequency	3	8		

Each student is represented by one tally mark 'I'. Five students is written as 𝍸.

a Complete the frequency row in the table.

Pineapple: 5 + 5 + 3 = ?

b What is the most popular fruit? ....

c What is the least popular fruit? ....

d How many students are in Mary's class? ....

4 Sita rolled a dice 45 times.

She recorded her scores on this frequency table.

Score	1	2	3	4	5	6
Tally	卌 |||	卌		卌 ||	卌 ||||	||||	卌 卌	
Frequency						

a Complete the frequency row in the table.

b Which number on the dice did Sita roll the most? ......

c Which number on the dice did Sita roll the least? ......

d Add up all the numbers in the frequency row of the table.

How can you tell if your total is correct?

Read the very first line of the question again.

....

....

....

....

5 This frequency table shows the make of mobile phone owned by 50 teachers.

Make of mobile phone	Apple	Sony	Samsung	Huawei
Tally				
Frequency	17	11	15	7

Complete the tally row in the table. Remember to use 卌 to represent five people.

6 Hans made a five-sided spinner.

He span the spinner 30 times and recorded the colour the spinner landed on each time.

This is his frequency table so far.

Colour	Tally	Frequency
Red	|||	3
Blue	~~||||~~ |||	
Green	~~||||~~ ||	
Yellow	||	
Orange	~~||||~~ ~~||||~~	
	Total	

This frequency table records the tally and frequency vertically. There is a box at the bottom of the frequency column for the total.

a Complete the frequency column in the table.

b Add up all the numbers in the frequency column of the table. Write the total in the box at the bottom.

How can you tell if your total is correct?

....

....

....

....

c Which colour on the spinner did Hans spin the most? ....

d Which colour on the spinner did Hans spin the least? ....

7 Arti asked the students in his class which capital city they would most like to visit, out of London, Paris, Rome, Madrid and Berlin. This is his frequency table so far.

City	Tally	Frequency
London	𝍸	
Paris	𝍸 ||||	
Rome	𝍸 𝍸		
Madrid	||||	
Berlin	||	
	Total	

a Complete the frequency column in the table.

b How many students are in Arti's class? ....

c How many more students wanted to go to Rome than to Berlin? ....

Find the difference between the frequencies for Rome and for Berlin.

8 Ellie asked 12 students to choose their favourite sport at the Winter Olympics out of skiing, snowboarding and ice skating. Here are her results.

~~Skiing~~	~~Ice skating~~	Snowboarding	Snowboarding
Snowboarding	Skiing	Skiing	Ice skating
Snowboarding	Snowboarding	Ice skating	Skiing

Complete the frequency table. The first two entries have been done for you.

Sport	Tally	Frequency
Skiing			
Snowboarding		
Ice skating			
	Total	

Work across the list of sports. Put a line through each sport as you add its tally mark to the table.

Now try Exercise 6.3 on page 69 of Coursebook 7.

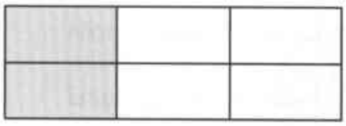
7 Fractions

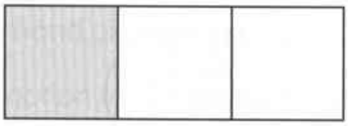
7.1 Simplifying fractions

Equivalent fractions are equal in value.

The same fraction of these rectangles is shaded.

$\frac{2}{6} = \frac{1}{3}$

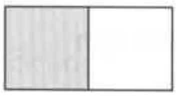


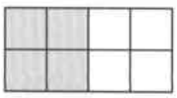


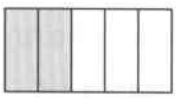
$\frac{2}{6}$ is equivalent to $\frac{1}{3}$

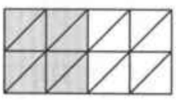
1

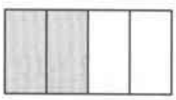
a Draw a line linking each shaded shape to the correct fraction.

A  $\frac{2}{5}$

B  $\frac{1}{2}$

C  $\frac{2}{4}$

D  $\frac{8}{16}$

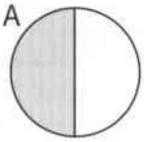
E  $\frac{4}{8}$

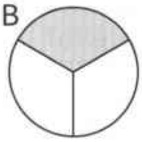
b Which one of the shapes – A, B, C, D or E – has a fraction shaded that is not equivalent to all the others? ......

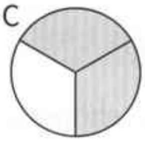
Which shape has a different proportion shaded?

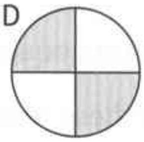
2

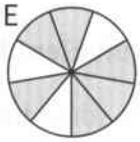
a Underneath each of these circles, write down the fraction that is shaded.

A


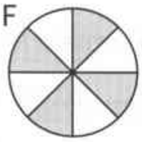
B


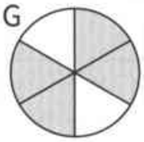
C


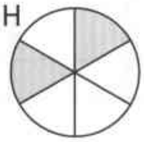
D


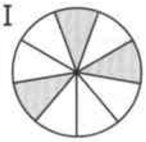
E


....

F


G


H


I


....

b Complete these statements.

i The fraction shaded in circle A is equivalent to the fraction shaded in circle ...... and circle ......

ii The fraction shaded in circle B is equivalent to the fraction shaded in circle ...... and circle ......

iii The fraction shaded in circle C is equivalent to the fraction shaded in circle ...... and circle ......

3 Complete the workings to find the equivalent fractions.
The first one has been done for you.

a $\frac{1}{2} = \frac{1 \times 2}{2 \times 2} = \frac{2}{4}$ $\frac{1}{2} = \frac{1 \times 3}{2 \times 3} = \frac{\square}{6}$ $\frac{1}{2} = \frac{1 \times 4}{2 \times 4} = \frac{4}{\square}$ $\frac{1}{2} = \frac{1 \times 5}{2 \times 5} = \frac{\square}{\square}$

b $\frac{1}{3} = \frac{1 \times 2}{3 \times 2} = \frac{\square}{6}$ $\frac{1}{3} = \frac{1 \times 3}{3 \times 3} = \frac{3}{\square}$ $\frac{1}{3} = \frac{1 \times 6}{3 \times 6} = \frac{\square}{\square}$ $\frac{1}{3} = \frac{1 \times 8}{3 \times 8} = \frac{\square}{\square}$

c $\frac{2}{5} = \frac{2 \times 2}{5 \times 2} = \frac{4}{\square}$ $\frac{2}{5} = \frac{2 \times 3}{5 \times 3} = \frac{\square}{15}$ $\frac{2}{5} = \frac{2 \times 5}{5 \times 5} = \frac{\square}{\square}$ $\frac{2}{5} = \frac{2 \times 10}{5 \times 10} = \frac{\square}{\square}$

4 Using multiplication, find two fractions that are equivalent to $\frac{1}{4}$.

....

....

Choose a number then multiply the top and the bottom of $\frac{1}{4}$ by that number.

Now try Exercise 7.1 on page 74 of Coursebook 7.

7.2 Recognising equivalent fractions, decimals and percentages

You need to remember the most common equivalent fractions, decimals and percentages:

$\frac{1}{4} = 25\% = 0.25$ $\frac{1}{2} = 50\% = 0.5$ $\frac{3}{4} = 75\% = 0.75$

1 Look at the equivalent fractions, decimals and percentages above.

Now cover them with your hand or a piece of paper.

Use a pencil to join each fraction to its equivalent percentage and decimal.

$\frac{1}{2}$	25%	0.75
$\frac{3}{4}$	50%	0.25
$\frac{1}{4}$	75%	0.5

Try not to look! Keep the numbers covered up until you have finished.

Check you have joined the correct numbers. If they are wrong, rub out the lines and try again.

2 $\frac{1}{10} = 10\% = 0.1$

Use this information to fill in the missing numbers on this number line.

0	$\frac{1}{10}$	$\frac{}{10}$	$\frac{}{10}$	$\frac{4}{10}$	$\frac{5}{}$	$\frac{}{10}$	—	$\frac{8}{10}$	—	1
0%	......%	20%	......%	......%	......%	60%	......%	......%	......%	100%
0	0.1	......	0.3	......	0.5	......	0.7	......	0.9	1

3 Draw lines linking the correct fraction, equivalent fraction, decimal and percentage from each column in the table below. The first one has been done for you.

Fraction	Equivalent fraction	Decimal	Percentage
$\frac{1}{5}$	$\frac{4}{10}$	0.6	80%
$\frac{2}{5}$	$\frac{8}{10}$	0.2	60%
$\frac{3}{5}$	$\frac{2}{10}$	0.8	40%
$\frac{4}{5}$	$\frac{6}{10}$	0.4	20%

4 Fill in the spaces in the following conversions.

$\frac{17}{100} = 0.17 = 17\%$

a $\frac{11}{100}$ = 0.11 = ...%

b $\frac{23}{100}$ = 0.23 = ...%

c $\frac{19}{100}$ = ... = ...%

d $\frac{57}{100}$ = ... = ...%

e $\frac{\quad}{100}$ = 0.21 = ...%

f $\frac{\quad}{100}$ = ... = 52%

5 Use the fact that $\frac{1}{100} = 0.01 = 1\%$ to complete these conversions.

Remember that 0.2 = 20%, which means that 0.02 = 2%

a $\frac{2}{100}$ = 0.02 = ...%

b $\frac{3}{100}$ = 0.03 = ...%

c $\frac{4}{100}$ = ... = ...%

d $\frac{5}{100}$ = ... = ...%

e $\frac{\quad}{100}$ = 0.06 = ...%

f $\frac{\quad}{100}$ = ... = 9%

6 Look at these conversions. Write down whether each is true or false. If the answer is false, write down the correct percentage.

a 0.3 = 30% ....

b 0.5 = 5% ....

c $\frac{7}{10}$ = 70% ....

d $\frac{8}{100}$ = 80% ....

Now try Exercise 7.2 on page 76 of Coursebook 7.

7.3 Comparing fractions

Remember that the symbol > means 'is greater than' and the symbol < means 'is less than'.

1 Write the symbol > or < between each pair of numbers.

You would say '5 is less than 7', so write 5 < 7.

a 5 7

b 9 4

c 27 22

d 39 89

e 145 541

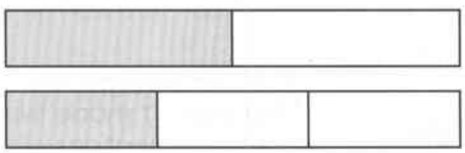
f 4.5 8

g 9.5 ...... 2.5

h 14.6 ...... 14.9

2 Compare each pair of fractions. Write down which is the larger fraction.

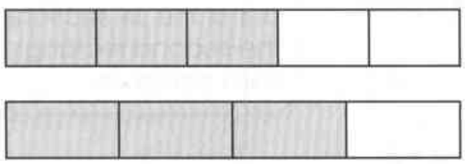
a



$\frac{1}{2}$

$\frac{1}{3}$ ...... is the larger fraction.

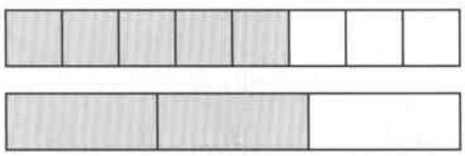
b



$\frac{3}{5}$

$\frac{3}{4}$ ...... is the larger fraction.

c



$\frac{5}{8}$

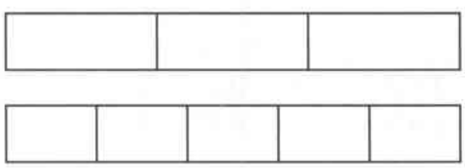
$\frac{2}{3}$ ...... is the larger fraction.

3 In each part of this question:

i Shade the fraction stated for each rectangle.

ii Write the symbol > or < between each pair of fractions.

a



$\frac{1}{3}$

$\frac{2}{5}$ $\frac{1}{3}$ ...... $\frac{2}{5}$

Always shade the rectangles from the left, as in Question 2. This makes it easy to compare the shaded sections.

b $\frac{4}{7}$

$\frac{1}{2}$ $\quad \frac{4}{7} \ldots\ldots \frac{1}{2}$

c $\frac{7}{8}$

$\frac{3}{4}$ $\quad \frac{7}{8} \ldots\ldots \frac{3}{4}$

d $\frac{2}{3}$

$\frac{7}{10}$ $\quad \frac{2}{3} \ldots\ldots \frac{7}{10}$

4 In each part of this question:

- **i** Complete the working to find the equivalent fraction.
- **ii** Shade in the fraction stated for each rectangle.
- **iii** Write the symbol > or < between each pair of fractions.

> For part a) shade five out of the six sections of the first rectangle, then four out of the six sections of the second rectangle, then compare.

a $\frac{5}{6}$

$\frac{2}{3}$ $\quad \frac{2}{3} = \frac{2 \times 2}{3 \times 2} = \frac{}{6} \quad \frac{5}{6} \ldots\ldots \frac{2}{3}$

b $\frac{3}{8}$

$\frac{1}{4}$ $\quad \frac{1}{4} = \frac{1 \times 2}{4 \times 2} = \frac{}{8} \quad \frac{3}{8} \ldots\ldots \frac{1}{4}$

c $\frac{3}{10}$

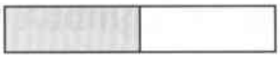
$\frac{2}{5}$ $\quad \frac{2}{5} = \frac{2 \times 2}{5 \times 2} = - \quad \frac{3}{10} \ldots\ldots \frac{2}{5}$

d $\frac{2}{9}$

$\frac{1}{3}$ $\quad \frac{1}{3} = \frac{1 \times 3}{3 \times 3} = - \quad \frac{2}{9} \ldots\ldots \frac{1}{3}$

Now try Exercise 7.3 on page 79 of Coursebook 7.

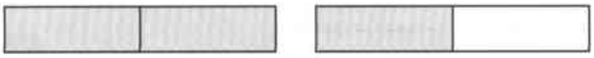
7.4 Improper fractions and mixed numbers



One half, $\frac{1}{2}$, of this rectangle is shaded.

$\frac{1}{2}$ is called a **proper fraction**.

In a proper fraction, the **numerator** is smaller than the **denominator**. In this case, 1 is smaller than 2.



In this diagram, three halves, $\frac{3}{2}$, are shaded.

$\frac{3}{2}$ is called an **improper fraction**.

$\frac{3}{2}$ is the same as $1\frac{1}{2}$.

$1\frac{1}{2}$ is called a **mixed number** because it contains a whole number and a fraction.

In an improper fraction, the numerator is larger than the denominator. In this case, 3 is larger than 2.

1 Write down whether each of these fractions is proper or improper.
The first one has been done for you.

a $\frac{5}{3}$ is improper

b $\frac{1}{3}$ is ....

c $\frac{3}{4}$ is ....

d $\frac{7}{4}$ is ....

e $\frac{2}{5}$ is ....

f $\frac{12}{5}$ is ....

g $\frac{11}{8}$ is ....

h $\frac{3}{8}$ is ....

If the number on the top of the fraction is smaller than the number on the bottom, write 'proper'. If the number on the top of the fraction is bigger than the number on the bottom, write 'improper'.

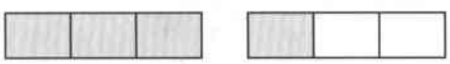
2 In each of these diagrams:

i Shade the improper fraction stated.

ii Write the fraction shaded as a mixed number.

The first one has been done for you.

a $\frac{4}{3}$



$\frac{4}{3} = 1\frac{1}{3}$

4 → the 4 tells you to shade four parts.
3 → the 3 tells you that each shape is divided into three equal parts.

b $\frac{5}{3}$ $\frac{5}{3} = 1\frac{\ }{3}$

c $\frac{7}{4}$ $\frac{7}{4} = \ldots\ldots$

> 7 → the 7 tells you to shade seven parts
> 4 → the 4 tells you that each shape is divided into four equal parts

d $\frac{9}{4}$ $\frac{9}{4} = 2\frac{\ }{4}$

e $\frac{7}{5}$ $\frac{7}{5} = \ldots\ldots$

f $\frac{13}{5}$ $\frac{13}{5} = \ldots\ldots$

3 In each of these diagrams:

i Shade the mixed number stated.

ii Write the fraction shaded as an improper fraction.

The first one has been done for you.

a $1\frac{1}{4}$ $1\frac{1}{4} = \frac{5}{4}$

> 5 → altogether you have shaded in five parts
> 4 → each shape is divided into four equal parts

b $1\frac{1}{5}$ $1\frac{1}{5} = \frac{\ }{5}$

> Shade in one whole rectangle and one part of the next one.

c $1\frac{4}{5}$ $1\frac{4}{5} = \frac{\ }{5}$

d $2\frac{2}{3}$ $2\frac{2}{3} = \frac{\ }{3}$

e $2\frac{3}{4}$ $2\frac{3}{4} = \frac{\ }{4}$

f $3\frac{1}{4}$ $3\frac{1}{4} = -$

Now try Exercise 7.4 on page 80 of Coursebook 7.

7.5 Adding and subtracting fractions

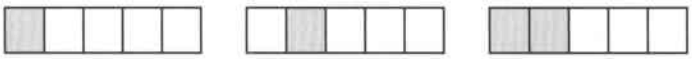
You can only add or subtract fractions when the denominators are the same.

1 Use the diagrams to help you answer these. The first one has been done for you.

a

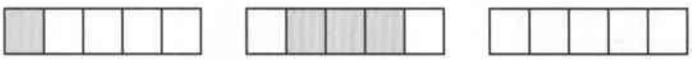
$\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$

b



$\frac{1}{5} + \frac{1}{5} = \frac{\quad}{5}$

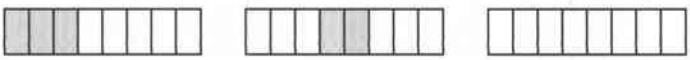
c



$\frac{1}{5} + \frac{3}{5} = \frac{\quad}{5}$

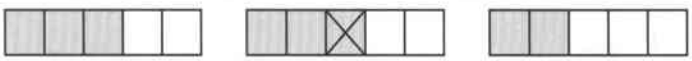
Shade in the total number of fifths on the final rectangle.

d



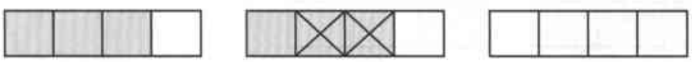
$\frac{3}{8} + \frac{2}{8} = \frac{\quad}{\quad}$

e



$\frac{3}{5} - \frac{1}{5} = \frac{\quad}{5}$

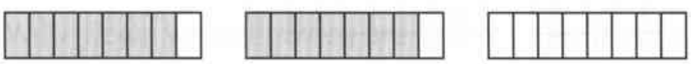
f



$\frac{3}{4} - \frac{2}{4} = \frac{\quad}{\quad}$

Shade in the number of quarters that are left on the final rectangle.

g



$\frac{7}{8} - \frac{4}{8} = \frac{\quad}{\quad}$

Cross out four of the eighths.

2 Draw a line linking each calculation to its correct answer. One has been done for you.

$\frac{1}{7}+\frac{1}{7}$	$\frac{8}{9}-\frac{1}{9}$	$\frac{2}{11}+\frac{3}{11}$	$\frac{5}{7}-\frac{2}{7}$	$\frac{5}{11}+\frac{4}{11}$	$\frac{4}{9}-\frac{2}{9}$	$\frac{3}{7}+\frac{2}{7}$	$\frac{7}{11}-\frac{4}{11}$
$\frac{3}{7}$	$\frac{9}{11}$	$\frac{2}{9}$	$\frac{3}{11}$	$\frac{7}{9}$	$\frac{5}{11}$	$\frac{2}{7}$	$\frac{5}{7}$

3 Fill in the missing numbers in these additions. All the additions give an answer of 1.

Use the diagrams to help you.

a $\frac{3}{4}+\frac{\square}{4}=1$

Remember that $1=\frac{4}{4}$, so $\frac{3}{4}+\frac{\square}{4}=\frac{4}{4}$

+ ? =

b $\frac{2}{5}+\frac{\square}{5}=1$

c $\frac{5}{7}+\frac{\square}{7}=1$

d $\frac{3}{10}+\frac{\square}{10}=1$

4 Work out the answers to these additions. Write each answer as a mixed number.

You can use the diagrams to help you. The first one has been done for you.

a $\frac{2}{3}+\frac{2}{3}=\frac{4}{3}, \frac{4}{3}=1\frac{1}{3}$

b $\frac{3}{5}+\frac{4}{5}=\frac{\square}{5}, \frac{\square}{5}=1\frac{\square}{5}$

c $\frac{5}{7}+\frac{6}{7}=\frac{\square}{7}, \frac{\square}{7}=1\frac{\square}{7}$

d $\frac{9}{10}+\frac{9}{10}=\frac{\square}{10}, \frac{\square}{10}=1\frac{\square}{10}$

Now try Exercise 7.5 on page 81 of Coursebook 7.

7.6 Finding fractions of a quantity

A **unit fraction** is a fraction that has a numerator of 1.

$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ are all unit fractions.

You work out a unit fraction of an amount by dividing the amount by the denominator.

$\frac{1}{2}$ of 12 kg = 12 ÷ 2 = 6 kg

$\frac{1}{4}$ of 12 kg = 12 ÷ 4 = 3 kg

> The denominator of $\frac{1}{2}$ is 2, so divide the amount by 2.
>
> The denominator of $\frac{1}{4}$ is 4, so divide the amount by 4.

1 Draw a line linking each fraction to the division you have to do when finding that fraction of an amount. The first one has been done for you.

$\frac{1}{7}$	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{12}$	$\frac{1}{5}$	$\frac{1}{9}$	$\frac{1}{10}$
÷ 2	÷ 5	÷ 10	÷ 9	÷ 7	÷ 3	÷ 12

2 Complete the workings to find the unit fraction of each amount.

a $\frac{1}{2}$ of 10 kg = 10 ÷ 2 = ... kg

b $\frac{1}{2}$ of 8 km = 8 ÷ ...... = ... km

c $\frac{1}{3}$ of 12 cm = 12 ÷ 3 = ... cm

d $\frac{1}{3}$ of 30 mm = 30 ÷ ...... = ... mm

e $\frac{1}{4}$ × 20 m = 20 ÷ ...... = ... m

> $\frac{1}{4}$ × 20 m is the same as $\frac{1}{4}$ of 20 m.

f $\frac{1}{5}$ × 20 m = 20 ÷ ...... = ... m

g $\frac{1}{10}$ × 40 kg = 40 ÷ ...... = ... kg

h $\frac{1}{8}$ × 40 km = 40 ÷ ...... = ... km

3 Write down whether these are true or false. If the answer is false, work out the correct answer.

a $\frac{1}{4}$ of 8 kg = 2 kg ....

b $\frac{1}{9}$ of 27 km = 18 km ....

c $\frac{1}{10}$ of 500 ml = 5 ml ....

d $\frac{1}{3}$ of \$300 = \$100 ....

4 Complete the workings to find the fraction of each amount.

> Always start by finding the unit fraction.

a $\frac{2}{3}$ of 12 kg $\frac{1}{3}$ of 12 kg = 12 ÷ 3 = 4 kg so $\frac{2}{3}$ of 12 kg = 4 × 2 = ... kg

b $\frac{3}{4}$ of 24 km $\frac{1}{4}$ of 24 km = 24 ÷ 4 = 6 km so $\frac{3}{4}$ of 24 km = 6 × 3 = ... km

c $\frac{2}{5}$ of 15 m $\frac{1}{5}$ of 15 m = 15 ÷ 5 = ... m so $\frac{2}{5}$ of 15 m = ... × 2 = ... m

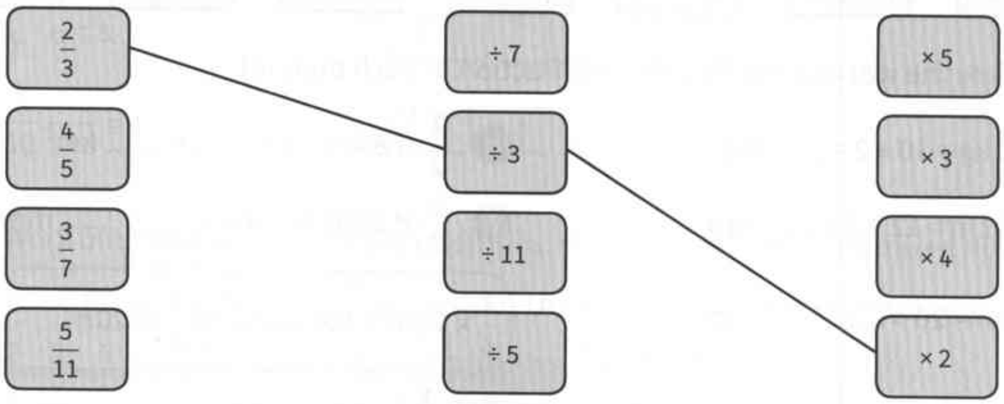
d $\frac{3}{7}$ of 21 l $\frac{1}{7}$ of 21 l = 21 ÷ 7 = ... l so $\frac{3}{7}$ of 21 l = ... × 3 = ... l

e $\frac{4}{9}$ × 45 t $\frac{1}{9}$ × 45 t = 45 ÷ 9 = ... t so $\frac{4}{9}$ × 45 t = ... × ...... = ... t

f $\frac{4}{5}$ × \$30 $\frac{1}{5}$ × \$30 = 30 ÷ 5 = \$...... so $\frac{4}{5}$ × \$30 = ... × ...... = \$......

g $\frac{3}{10}$ × 80 ml $\frac{1}{10}$ × 80 ml = 80 ÷ 10 = ... ml so $\frac{3}{10}$ × 80 ml = ... × ...... = ... ml

5 Draw lines linking each fraction to the division and then the multiplication you have to do when finding that fraction of an amount. The first one has been done for you.



6 Work out:

> Use Question 3 to help you.

a $\frac{2}{3}$ of 15 miles ....

b $\frac{4}{5}$ of 40 km ....

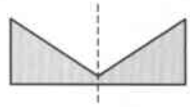
c $\frac{3}{7}$ of \$35 ....

Now try Exercise 7.6 on page 82 of Coursebook 7.

8 Symmetry

8.1 Recognising line symmetry

This shape has one **line of symmetry**.



If you place a mirror along the line of symmetry, when you look in the mirror you will see an exact reflection of the shape.

A line of symmetry is sometimes called a 'mirror line'.

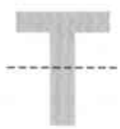
1 This is part of Jake's homework. He thinks he has drawn the correct line of symmetry on each of these letters.

Put a tick or a cross next to each letter to indicate whether the line of symmetry is right or wrong.

Use a mirror to help you.

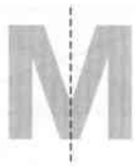
If the line of symmetry is wrong, draw it on the letter in the correct place.

a 

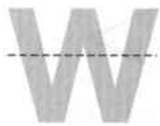
b 

c 

d 

e 

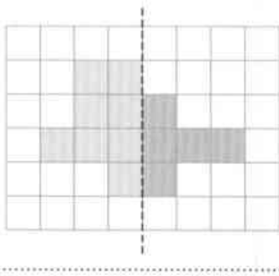
f 

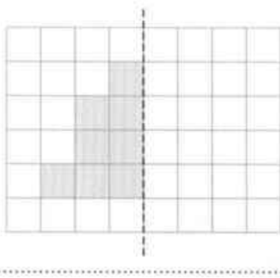
g 

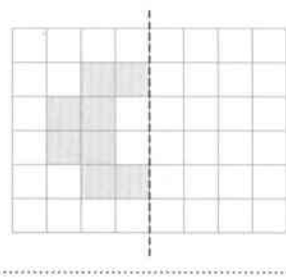
h 

2 Look at the grids below. The dotted line is a line of symmetry. The half of the shape to the left of the line of symmetry is shown.

Shade squares on the right of the line of symmetry to complete each shape. The first one has been started for you.

a 

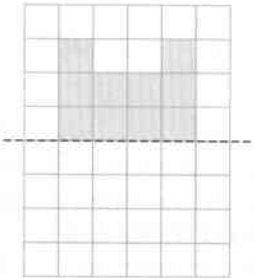
b 

c 

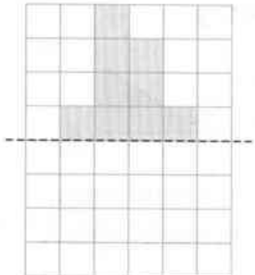
3 Look at the grids below. The dotted line is a line of symmetry. The half of the shape above the line of symmetry is shown.

Shade in squares below the line of symmetry to complete each shape.

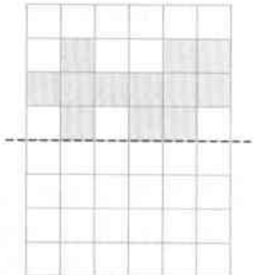
a



b



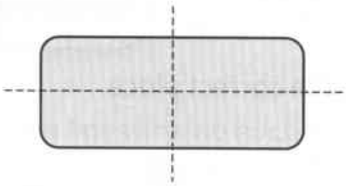
c



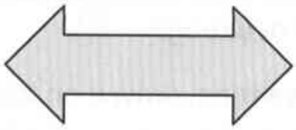
4 Each of these shapes has two lines of symmetry.
Draw both lines of symmetry on each shape.
The first one has been done for you.

> Each shape has one vertical and one horizontal line of symmetry.

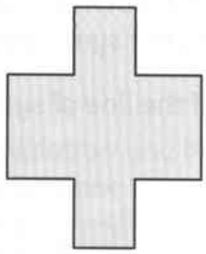
a



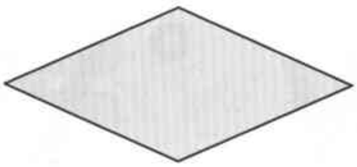
b



c

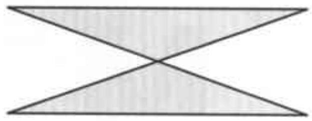


d



e

f



Now try Exercise 8.2 on page 89 of Coursebook 7.

8.2 Recognising rotational symmetry

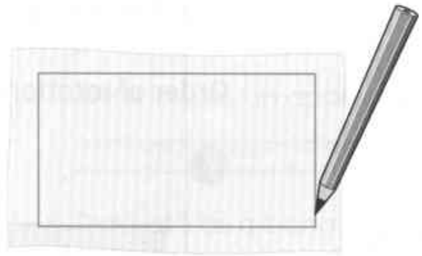
The **order** of **rotational symmetry** is the number of times a shape looks the same in one full turn.

The easiest way to work this out is by using tracing paper.

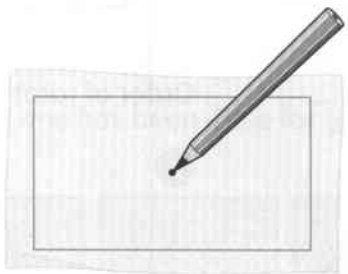
Follow these steps to work out the order of rotation of a shape.

This example shows a rectangle:

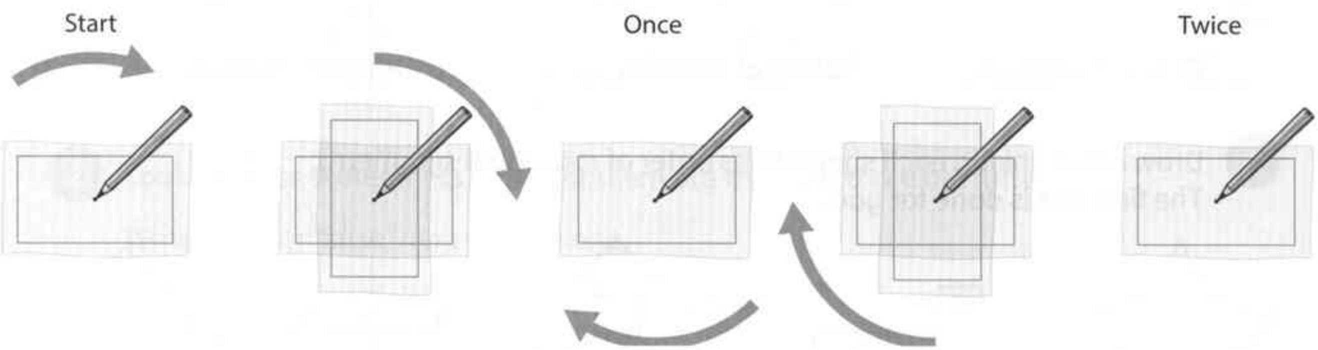
1 Trace the shape.



2 Put your pencil on the centre of the shape.



3 Turn the tracing paper one full turn and count the number of times the shape fits on itself.

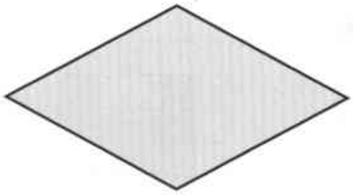


The rectangle fits on itself twice, so it has order of rotation 2.

1 Follow the steps on page 67 to work out the order of rotational symmetry of these shapes.

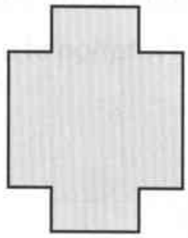
> A shape that only fits on to itself once has order of rotation 1.

a



Order of rotation ....

b

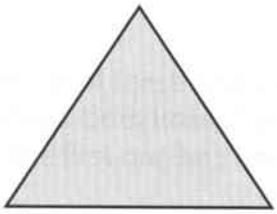


Order of rotation ....

c

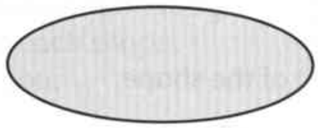
Order of rotation ....

d



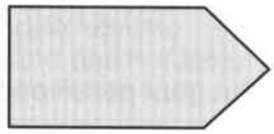
Order of rotation ....

e



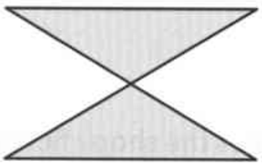
Order of rotation ....

f



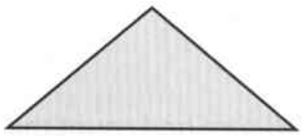
Order of rotation ....

g



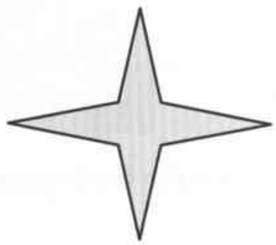
Order of rotation ....

h



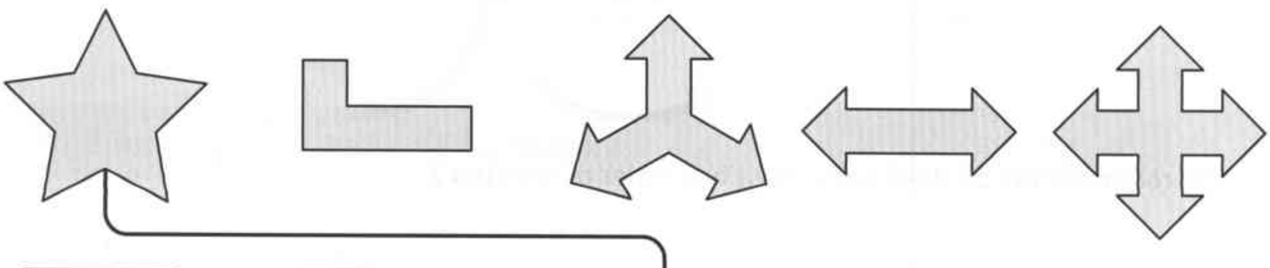
Order of rotation ....

i



Order of rotation ....

2 Draw a line linking each shape to its order of rotational symmetry.
The first one is done for you.



Order 1 | Order 4 | Order 5 | Order 3 | Order 2

Now try Exercise 8.3 on page 91 of Coursebook 7.

9 Expressions and equations

9.1 Collecting like terms

Like terms are terms that contain the same letter.

> $2a$ and $3a$ are like terms.
> $2a$ and $3b$ are NOT like terms.

The letter in an expression represents an unknown number, but if you find it easier, you can think of the letter as an object.

You **simplify** an expression by **collecting like terms**.

$a + a = 2a$

Think of a as an apple, so 

$2b + 3b = 5b$

Think of b as a banana, so 

1 Draw a line joining each expression in the top row to its simplified expression below.

The first one has been done for you.

> Remember that a means $1a$.

$a + 4a$	$a + a$	$3a + a$	$a + a + a$	$5a + 4a$	$2a + 2a + 2a$
$9a$	$3a$	$5a$	$6a$	$2a$	$4a$

2 Look at these statements. Three of them are true and three are false.

Write 'true' or 'false' next to each one.

If the statement is false, write the correct answer.

a $b + 2b = 3b$ .... **b** $4d + 2d = 5d$ ....

c $6f + 4f = 11f$ .... **d** $c + c + c = 3c$ ....

e $h + 3h + 5h = 8h$ .... **f** $7v + 2v + v = 10v$ ....

3 Each of these expressions simplifies to $3s$ or $5s$. Draw a line joining each expression in the top row to the correct simplified expression. The first one has been done for you.

Think of s as a sweet. You start with 9, you eat 4, so you have 5 sweets left.

$9s - 4s$	$5s - 2s$	$8s - 5s$	$6s - s$	$10s - 5s$

$3s$ $5s$

4 Look at these statements. Three of them are true and three are false.

Write 'true' or 'false' next to each one.

If the statement is false, write the correct answer.

a $7b - 2b = 3b$ .... **b** $4d - 2d = 2d$ ....

c $6f - f = 6$ .... **d** $8c - 2c - 3c = 3c$ ....

e $9h - h - h = 7h$ .... **f** $10v - 6v - v = 4v$ ....

5 Look at these expressions. Some of them can be simplified and some cannot.

If they can be simplified, put a tick next to them and work out the simplified answer.

If they cannot be simplified, put a cross next to them. For example:

$4m + 2m$ ✓ $6m$

$2a + 3b$ ✗

You can only simplify if the letters are the same.

a $5p + p$ .... **b** $6p + 2$ ....

c $5n - 2w$ .... **d** $8u - u$ ....

Now try Exercise 9.1 on page 98 of Coursebook 7.

9.2 Expanding brackets

You can use a box method to multiply numbers together like this:

$4 \times 16 = 4 \times (10 + 6)$

×	10	6
4	40	24

$4 \times (10 + 6)$ can be written as $4(10 + 6)$.

You use the table to **expand** the bracket $4(10 + 6)$ to get $4 \times 10 + 4 \times 6$.

$4 \times 16 = 40 + 24 = 64$

1 Complete the boxes to work out the answers.

a 5×13

×	10	3
5		

$5 \times 13 =$ ...... + ... = ...

b 2×38

×	30	8
2		

$2 \times 38 =$ ...... + ... = ...

c 7×21

×	20	1
7		

$7 \times 21 =$ ...... + ... = ...

d 4×17

×	10	7
4		

$4 \times 17 =$ ...... + ... = ...

2 Simplify these expressions.

a $3 \times x =$ ....

$3 \times x$ can simply be written as $3x$.

b $4 \times p =$ ....

c $9 \times f =$ ....

d $5 \times m =$ ....

3 Complete the boxes to simplify these expressions. The first one has been done for you.

a $2(x + 3)$

×	x	3
2	$2x$	6

$2(x + 3) = 2x + 6$

b $3(x + 4)$

×	x	4
3		

$3(x + 4) =$ …… + ……

c $5(m + 1)$

×	m	1
5		

$5(m + 1) =$ …… + ……

d $4(n + 2)$

×	n	2
4		

$4(n + 2) =$ …… + ……

4 Complete the boxes to simplify these expressions. The first one has been done for you.

a $3(x - 2)$

×	x	−2
3	$3x$	−6

$3(x - 2) = 3x - 6$

b $5(x - 6)$

×	x	−6
5		

$5(x - 6) =$ …… − ……

c $2(y - 4)$

×	y	−4
2		

$2(y - 4) =$ …… − ……

d $6(k - 3)$

×	k	−3
6		

$6(k - 3) =$ …… − ……

Now try Exercise 9.2 on page 100 of Coursebook 7.

9.3 Constructing and solving equations

When you **solve** an **equation**, you find the value of the unknown letter.

You can use a flow chart like this to solve an equation.

Solve: $x + 5 = 12$ x → +5 → 12

So $x = 7$ 7 ← −5 ← 12

Reverse the flow chart to work out the value of x.

1 Write down the missing numbers.

a ...... + 4 = 6

b ...... + 1 = 6

c ...... + 2 = 10

d 8 − ...... = 5

e 9 − ...... = 2

f 17 − ...... = 10

2 Complete these flow charts to work out the value of x.

a $x + 3 = 7$ x → +3 → 7

$x =$ .... ← −3 ← 7

b $x + 1 = 9$ x → +1 → 9

$x =$ .... ← −1 ← 9

c $x + 6 = 11$ x → +6 → 11

$x =$ .... ← −...... ← 11

d $x + 2 = 13$ x → +2 → 13

$x =$ .... ← ...... ← 13

e $x + 4 = 12$ x → +4 → 12

$x =$ .... ← ...... ← ......

f $x + 9 = 15$ x → ...... → ......

$x =$ .... ← ...... ← ......

3 Complete these flow charts to work out the value of x.

a $x - 1 = 5$

x → −1 → 5

$x = \ldots\ldots$ …… ← +1 ← 5

b $x - 3 = 8$

x → −3 → 8

$x = \ldots\ldots$ …… ← +3 ← 8

c $x - 2 = 9$

x → −2 → 9

$x = \ldots\ldots$ …… ← +…… ← 9

d $x - 5 = 12$

x → −5 → 12

$x = \ldots\ldots$ …… ← …… ← 12

e $x - 10 = 8$

x → −10 → 8

$x = \ldots\ldots$ …… ← …… ← ……

f $x - 4 = 5$

x → …… → ……

$x = \ldots\ldots$ …… ← …… ← ……

4 Complete these flow charts to work out the value of y.

a $2y = 6$

y → ×2 → 6

$y = \ldots\ldots$ …… ← ÷2 ← 6

b $4y = 8$

y → ×4 → 8

$y = \ldots\ldots$ …… ← ÷4 ← 8

c $\frac{y}{2} = 7$

y → ÷2 → 7

$y = \ldots\ldots$ …… ← ×2 ← 7

d $\frac{y}{3} = 5$

y → ÷3 → 5

$y = \ldots\ldots$ …… ← ×3 ← 5

Now try Exercise 9.3 on page 101 of Coursebook 7.

10.1 Average and range

An **average** is a representative value. It is a single number that gives a general idea about a set of numbers.

You need to know about three types of average: the **mode**, the **median** and the **mean**.

1 Here are the test marks of 15 students:

8 12 14 13 8 10 10 17 12 15 6 12 13 14 13

a Write down the highest mark. ......

b Write down the lowest mark. ....

c How many students got more than 11 marks? ......

2 Here are the times, in seconds, of eight runners in a race:

23.5 26.1 22.4 27.0 24.9 22.8 25.9 24.0

a Write down the fastest time. ...... seconds

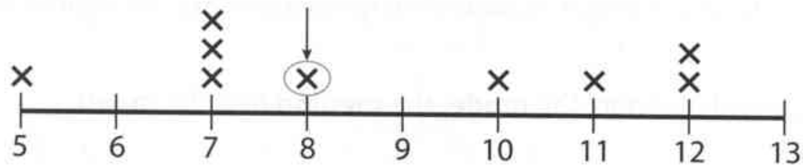
b Write down the slowest time. ...... seconds

c How many runners took less than 25 seconds? ......

Here are the ages of nine children:

5 12 7 8 10 12 7 11 7

Here are the ages on a number line:



The arrow points to the middle age.

The age in the middle is called the median.

Four children are less than 8 years old. Four children are more than 8 years old.
The median age is 8 years.

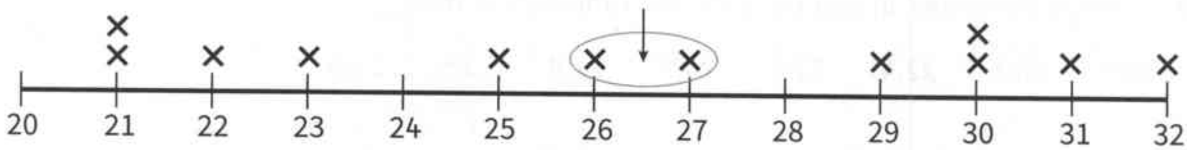
The range is 12 – 5 = 7 years.

The **range** is the difference between the largest and the smallest age.

Here are the masses, in kilograms, of 12 children:

23 26 25 32 30 30 21 29 22 21 27 31

Here are the masses on a number line:



There is no middle mass. There are six masses on either side of the arrow.

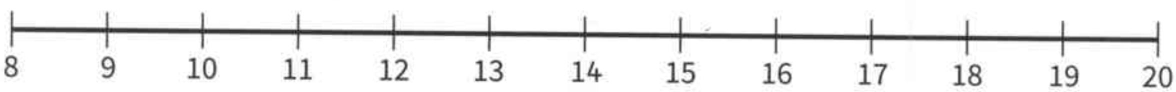
The median is 26.5 kg. It is half way between 26 and 27.

The range is 32 – 21 = 11 kg.

3 Here are the test marks of 13 students:

18 14 13 18 19 10 11 10 17 16 20 8 15

a Put the marks on this number line.



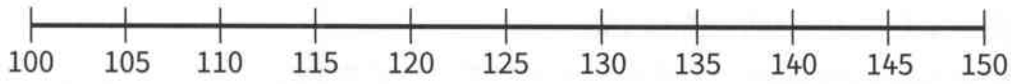
b Median mark = ...

c Range = ...

4 Here are the heights, in centimetres, of 11 children:

140 125 130 145 140 135 110 110 105 145 105

a Put the heights on this number line.



b Median height = ... cm

c Range = ... cm

5 Here are the distances, in kilometres, that eight students travel to school:

2 11 10 3 6 10 11 6

a Put the distances on this number line.

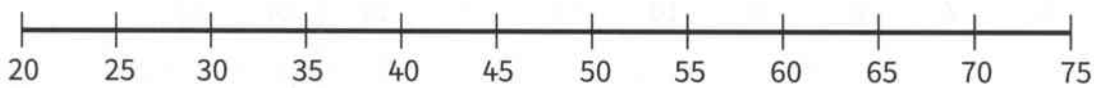
b Median distance = ... km

c Range = ... km

6 Here are the times, in minutes, that 14 students take to do their homework:

45 20 35 35 30 70 60 60 25 55 25 20 75 60

a Put the times on this number line.



b Median time = ... minutes

c Range = ... minutes

Now try Exercise 10.1 on page 105 of Coursebook 7.

10.2 The mean

Here are the heights, in centimetres, of five children:

120 135 145 150 150

To find the mean height, follow these steps:

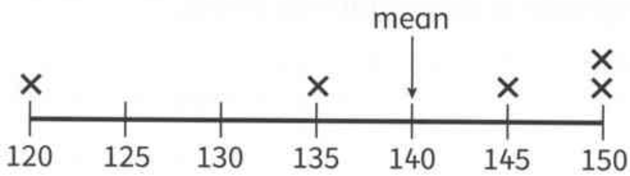
Add the five heights: 120 + 135 + 145 + 150 + 150 = 700

Divide the total by 5: 700 ÷ 5 = 140

There are five heights, so divide by 5.

The mean height is 140 cm.

Here are the heights and the mean on a number line:



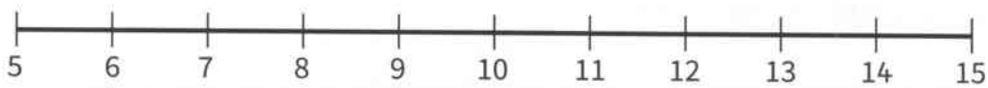
1 Here are the ages of four children:

13 6 10 7

Add the ages and then divide by the number of children.

a Work out the mean age. ......

b Show the ages and the mean age on this number line.

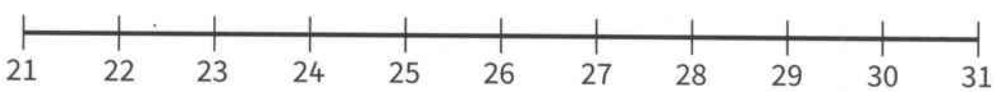


2 Here are the numbers of students in five classes:

24 28 22 30 31

a Work out the mean number of students. ......

b Show the numbers and the mean on this number line.

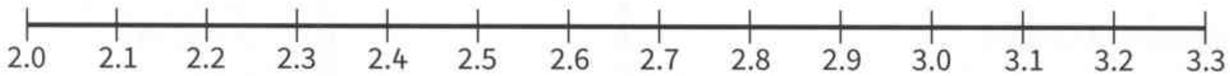


3 Here are the masses of six babies:

2.7 kg   2.2 kg   3.0 kg   3.1 kg   2.5 kg   2.1 kg

a Work out the mean mass. ......

b Show the masses and the mean mass on this number line.

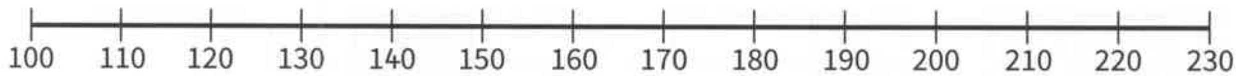


4 Here is the money spent in a shop by five people:

$130 $110 $230 $100 $120

a Work out the mean amount spent. ......

b Show the amounts and the mean on this number line.



5 Here are the goals scored in ten football matches:

2   2   6   5   1   5   0   7   3   4

a Work out the mean number of goals. ......

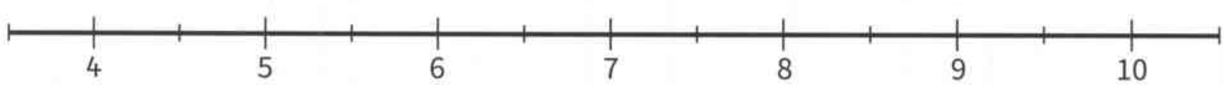
b Show the goals and the mean on this number line.

6 Here are eight test marks:

4   5   7   8   8   9   9   10

a Work out the mean mark. ......

b Show the marks and the mean on this number line.



Now try Exercise 10.2 on page 107 of Coursebook 7.

11 Percentages

11.1 Simple percentages

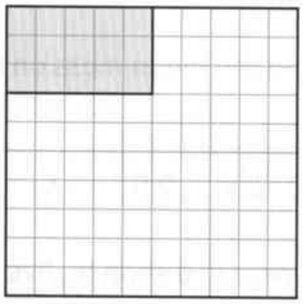
This large square has 100 small squares.

15 small squares out of 100 are shaded.

85 are not shaded.

15 out of 100 = 15 **per cent** or 15%

85 out of 100 = 85%



Per cent just means 'out of 100'.

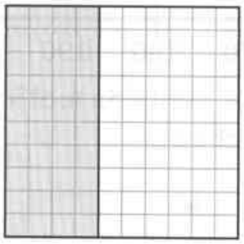
1 Write in the percentages.

a

Shaded ...... %

Unshaded ...... %

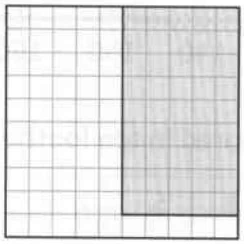
b



Shaded ...... %

Unshaded ...... %

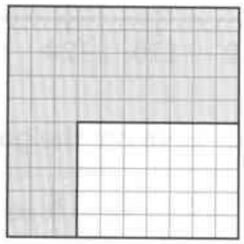
c



Shaded ...... %

Unshaded ...... %

d



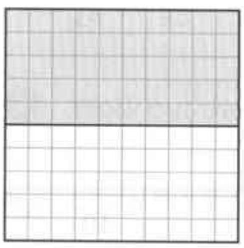
Shaded ...... %

Unshaded ...... %

2 Write the fraction and the percentage for the shaded part. The first one has been done for you.

Remember, a percentage is just a different way of writing a fraction.

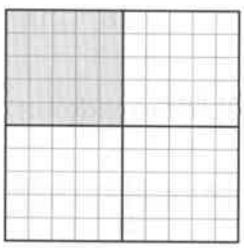
a



Fraction $\frac{1}{2}$

Percentage 50%

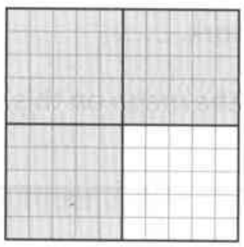
b



Fraction ......

Percentage ......

c



Fraction ......

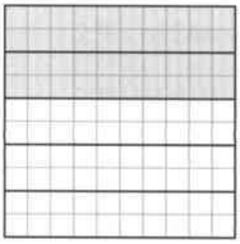
Percentage ......

d

Fraction ......

Percentage ......

e



Fraction ......

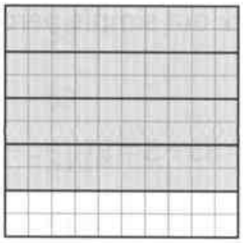
Percentage ......

f

Fraction ......

Percentage ......

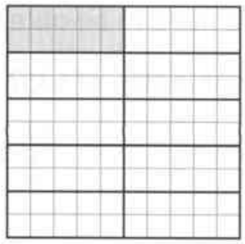
g



Fraction ......

Percentage ......

h



Fraction ......

Percentage ......

3 Fill in the percentages.

a $\frac{1}{10}$ = ...%

b $\frac{3}{10}$ = ...%

c $\frac{7}{10}$ = ...%

d $\frac{9}{10}$ = ...%

Now try Exercise 11.1 on page 113 of Coursebook 7.

11.2 Calculating percentages

You need to be able to work out simple percentages without a calculator.

What is 40% of $35?

$40\% = \frac{2}{5}$ $\frac{1}{5}$ of \$35 = 35 ÷ 5 = \$7 $\frac{2}{5}$ of \$35 = \$7 × 2 = \$14

1

a What fraction is 25%? ....

b 25% of $20 = $...........

c 25% of $12 = $...........

d 25% of $32 = $...........

2

a What fraction is 20%? ....

b 20% of $20 = $...........

b 20% of $15 = $...........

d 20% of $35 = $...........

3

a What fraction is 10%? ....

b 10% of $20 = $...........

c 10% of $40 = $...........

d 10% of $60 = $...........

4

a What fraction is 75%? ....

b 75% of $20 = $...........

c 75% of $40 = $...........

d 75% of $28 = $...........

5

a What fraction is 60%? ....

b 60% of $25 = $...........

c 60% of $30 = $...........

d 60% of $40 = $...........

6 Draw lines to the answers.

25% of $44	$8
20% of $40	$9
30% of $50	$11
75% of $12	$12
40% of $30	$15

7 Complete this table.

Amount	50%	25%	75%	20%
$20	$10			
$80				$16
$30		$7.50		

8 Complete this table.

Amount	10%	30%	70%	90%
$30	$3			
$50				$45
$80		$24		

9 Complete this table.

Amount	50%	25%	75%	20%
$200	$100			
$300				$60
$500		$125		

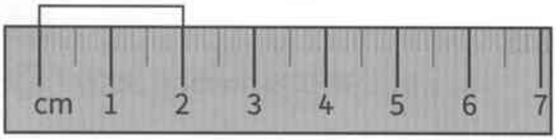
Now try Exercise 11.2 on page 115 of Coursebook 7.

12 Constructions

12.1 Measuring and drawing lines

You must use a **ruler** to measure and draw straight lines.

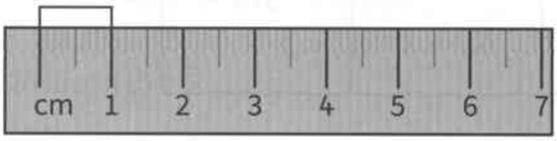
This ruler shows that this line is 2 cm long:



The line is also 20 mm long, because 1 cm = 10 mm.

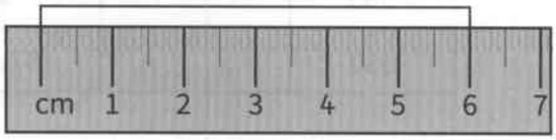
1 Write down the length of each of these lines in cm and mm.

a



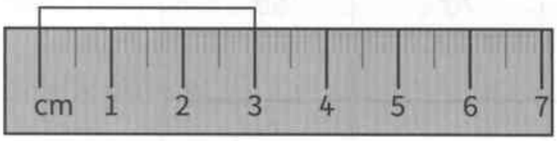
...... cm ...... mm

b



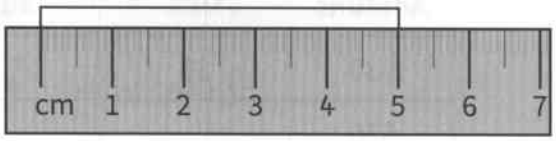
...... cm ...... mm

c



...... cm ...... mm

d



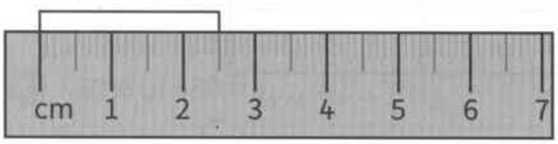
...... cm ...... mm

2 Draw a straight line 4 cm long.

3 Draw a straight line 70 mm long.

70 mm is the same as 7 cm.

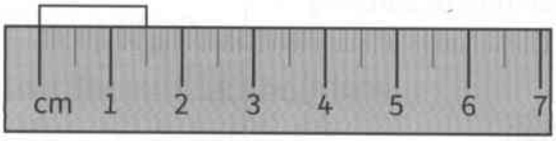
This ruler shows that this line is 2.5 cm long.



The line is also 25 mm long, as 0.5 cm = 5 mm

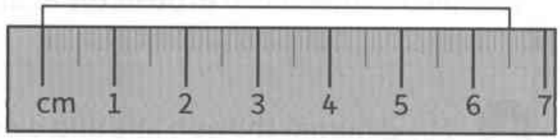
4 Write down the length of each of these lines in cm and mm.

a



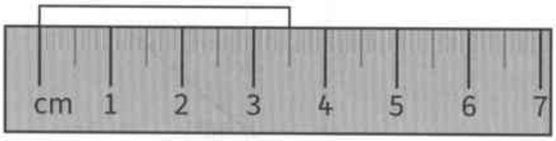
...... cm ...... mm

b



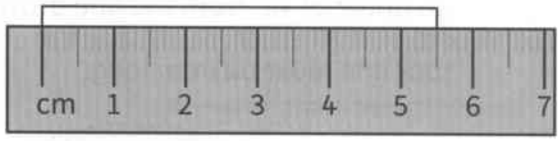
...... cm ...... mm

c



...... cm ...... mm

d

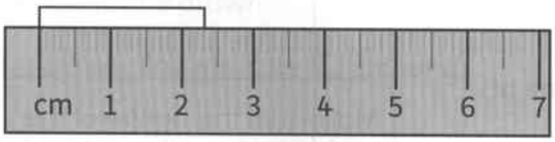


...... cm ...... mm

5 Draw a straight line 4.5 cm long.

6 Draw a straight line 75 mm long.

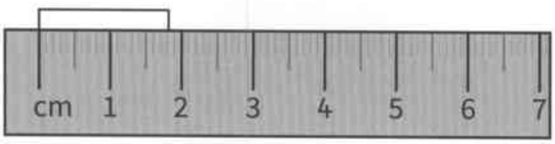
This ruler shows that this line is 2.3 cm long.



The line is also 23 mm long, as 0.3 cm = 3 mm

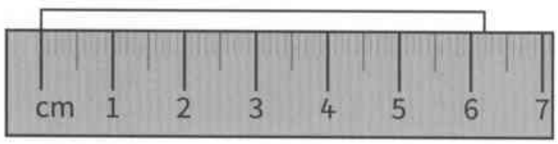
7 Write down the length of each of these lines in cm and mm.

a



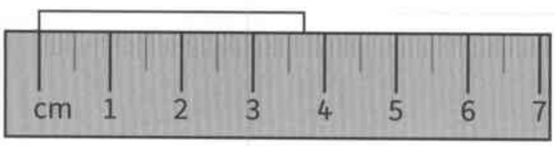
...... cm ...... mm

b



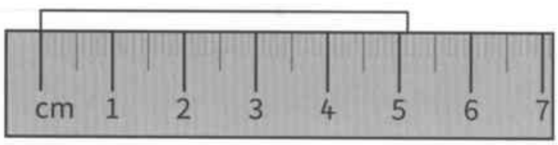
...... cm ...... mm

c



...... cm ...... mm

d



...... cm ...... mm

8 Draw a straight line 4.8 cm long.

9 Draw a straight line 77 mm long.

Now try Exercise 12.1 on page 120 of Coursebook 7.

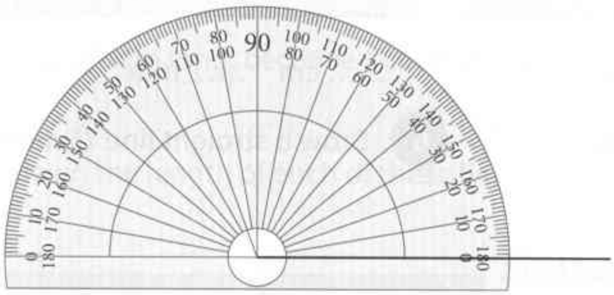
12.2 Constructing triangles

You need a ruler and a **protractor** to draw triangles accurately.

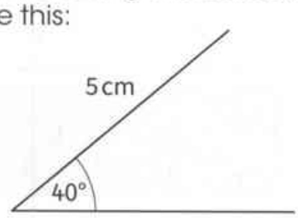
1 The diagram shows a line and a protractor.

Use a pencil and this protractor to draw a line at an angle of 40^0 from the line drawn.

Your line must be 5 cm long.



Your drawing should look like this:



2 From the dot at the end of this line, draw a line at an angle of 50^0 from the line drawn.

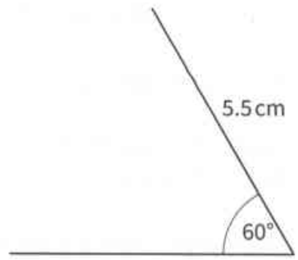
Your line must be 6 cm long.

Make sure the centre of the protractor is on the dot and that the line lines up with 0^0, as in Question 1.

3 From the dot at the end of the line, draw a line at an angle of 60^0 from the line drawn.

Your line must be 5.5 cm long.

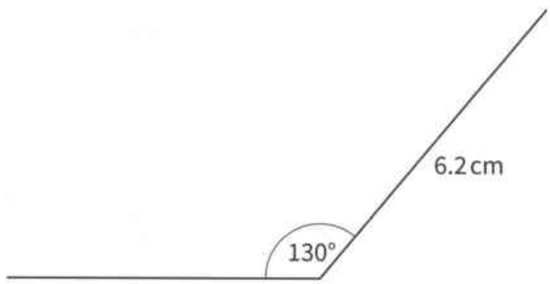
This time your drawing should look like this:



4 From the dot at the end of the line, draw a line at an angle of 130^0 from the line drawn.

Your line must be 6.2 cm long.

This time your drawing should look like this:



5

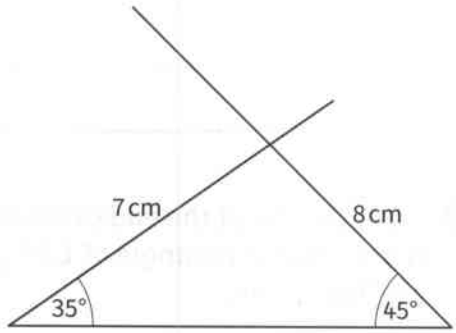
a From the dot at the left-hand end of the line below, draw a line at an angle of 35° to the line drawn.

Your line must be 7 cm long.

b From the dot at the right-hand end of the line below, draw a line at an angle of 45° to the line drawn.

Your line must be 8 cm long.

This time your drawing should look like this:



Now try Exercise 12.3 on page 123 of Coursebook 7.

13 Graphs

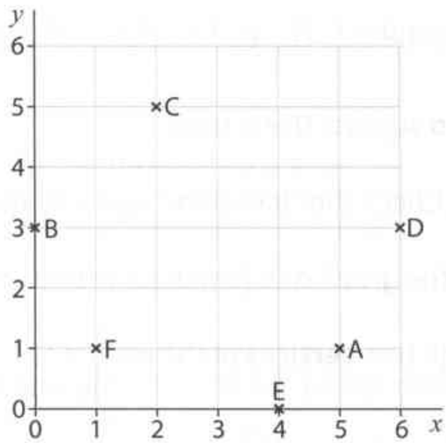
13.1 Plotting coordinates

Graphs are a picture showing the relationship between sets of numbers.
They make the information easy to understand.

Graphs are often drawn on **coordinate grids**, on squared paper.

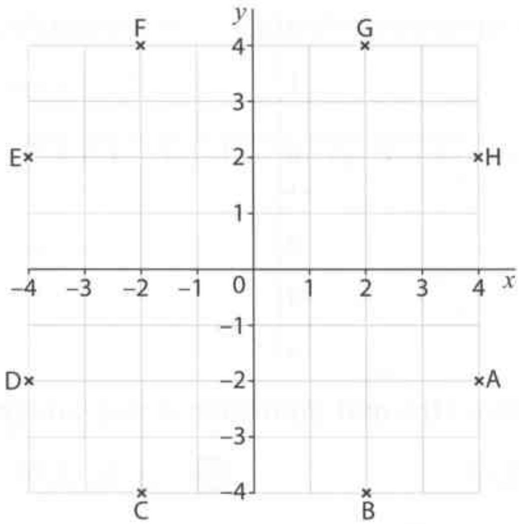
You can identify any point on a coordinate grid by stating its **coordinates**.
These are written as a pair, in brackets.

1 Write down the coordinates from this graph. The first two have been done for you.



A (5, 1) B (0, 3) C .... D .... E .... F ....

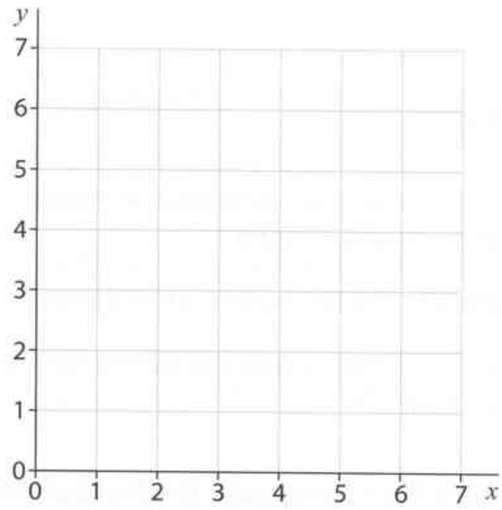
2



Write down the letter for each point.

a (−2, 4) ...... **b** (2, −4) ...... **c** (4, 2) ...... **d** (−4, −2) ......

3



a Put these points on the graph: (1, 2) (1, 6) (5, 6) (5, 2)

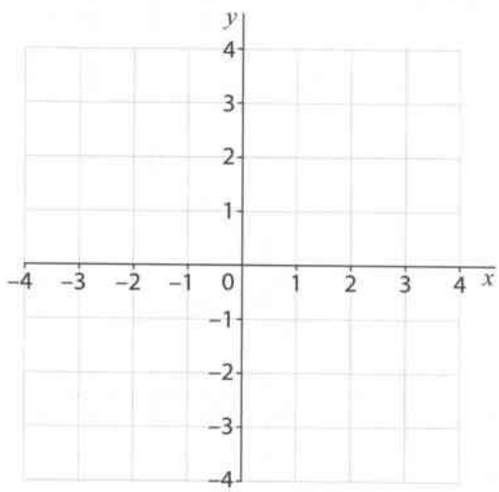
b Join the points to make a square. Use a ruler.

c Mark (3, 4) on your grid. Check that it is in the centre of the square.

d Mark (0, 7) and (7, 0) on the graph and join them with a straight line.

e Does your line go through two **vertices** of the square? ....

4



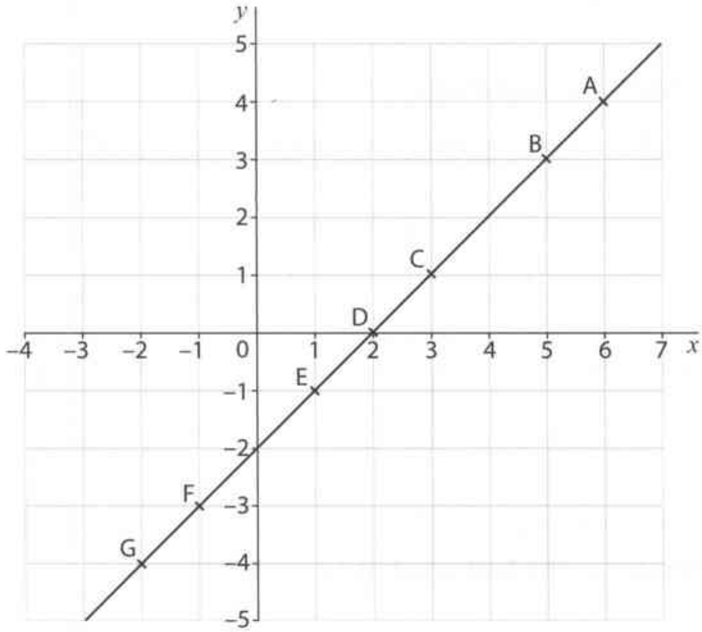
For each part, put the points on the grid. Join them with a straight line.

a (5, 4), (2, 4), (–3, 4), (–5, 4)

b (3, 3), (3, 0), (3, –2), (3, –4)

c (2, –3), (0, –3), (–2, –3), (–4, –3)

5



a Write down the coordinates of the lettered points.

A .... B .... C .... D ....

E .... F .... G ....

b These points are all in a straight line. Plot the points on the graph. Draw the line.

H (3, 4) I (1, 2) J (–1, 0) K (–3, –2) L (–5, –4)

6 In each of these lists, all points are in a straight line except one.

Which is the odd one out?

a (2, –2), (–2, 2), (0, –2), (–2, –2) ....

b (–4, 4), (4, –4), (4, 0), (4, 4) ....

c (0, 3), (–3, 3), (–3, 6), (3, 3) ....

d (0, 0), (5, 5), (5, –5), (–2, –2) ....

Now try Exercise 13.1 on page 130 of Coursebook 7.

13.2 Straight lines

$x + 2$ and $x - 3$ are examples of expressions.

You can work out the value of an expression for different values of x.

Suppose $x = 3$

$x + 2 = ?$ So, $3 + 2 = 5$.

$x + 4 = ?$ So, $3 + 4 = 7$.

$x - 3 = ?$ So, $3 - 3 = 0$.

1 Suppose $x = 1$.

Complete the following. The first one has been done for you.

a $x + 4 = 5$ **b** $x + 1 =$ ...... **c** $x - 1 =$ ...... **d** $x - 2 =$ ......

2

a Fill in the missing numbers in this table.

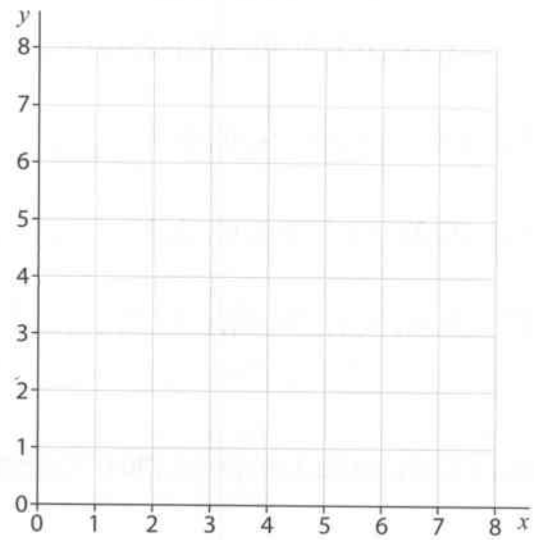
x	1	5	2	3	4	0
$x + 3$	4		5			

b Use the numbers in your table to write down the coordinates of six points. Two have been filled in for you.

(1, 4) (5, ...) (2, 5)

(3, ...) (4, ...) (0, ...)

c Plot the points on this graph. Join them with a straight line.



3

a Fill in the missing numbers in this table.

x	3	4	2	7	5	8
$x - 2$	1					

b Use the numbers in your table to write down the coordinates of six points.

(3, ...)   (4, ...)   (2, ...)   (7, ...)   (5, ...)   (8, ...)

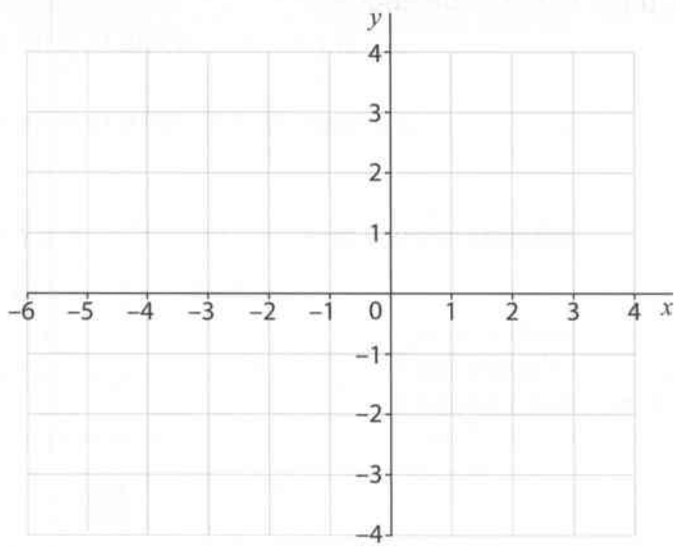
c Plot the points on the graph in Question 2. Join them with a straight line.

4

a Fill in the missing numbers in this table.

x	−5	−3	−2	2	1	0
$x + 1$	−4			3		

b Use the table to plot the six points on this graph. Join them with a straight line.



5

a Fill in the missing numbers in this table.

x	−6	−5	−3	1	3	0
$x + 3$	−3					

b Use the table to plot six points on the graph in Question 4. Join them with a straight line.

6

a Fill in the missing numbers in this table.

x	−1	0	1	5	6	2
$x - 2$	−3	−2				

b Use the table to plot six points on the graph in Question 4. Join them with a straight line.

Now try Exercise 13.2 on page 131 of Coursebook 7.

14 Ratio and proportion

14.1 Simplifying ratios

A **ratio** compares one amount to another.

In this diagram, there are two black squares and three white squares.

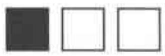
The ratio of black : white squares is 2 : 3

> This means that for every 2 black squares there are 3 white squares.

The ratio of white : black squares is 3 : 2

> This means that for every 3 white squares there are 2 black squares.

1 Look at this diagram.



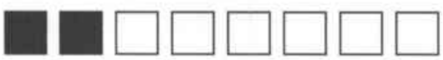
a Write down the number of black squares. ......

b Write down the number of white squares. ......

c Write down the ratio of black : white squares. ...... : ......

d Write down the ratio of white : black squares. ...... : ......

In this diagram, there are 2 black squares and 6 white squares.



The ratio of black : white squares is 2 : 6.

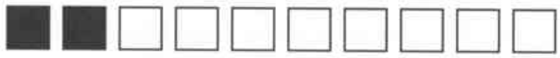
> This means that for every 2 black squares there are 6 white squares.

The diagram can be redrawn like this:

You can see that for every black square there are 3 white squares, so the ratio 2 : 6 is the same as 1 : 3.

You say that the ratio 2 : 6 in its **simplest form** is 1 : 3.

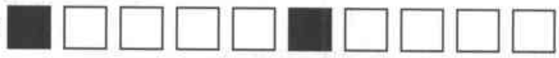
2 Complete the workings to find the ratio of black : white squares in this diagram.



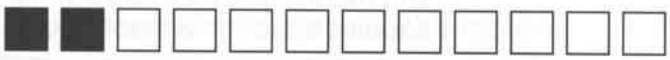
There are 2 black squares and ...... white squares.

The ratio of black : white squares is 2 : ......

which simplifies to 1 : ......

The diagram can be redrawn like this: 

3 Complete the workings to find the ratio of black : white squares in this diagram.



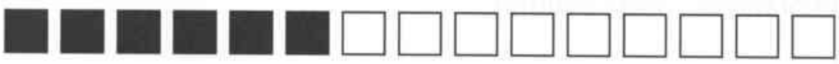
There are 2 black squares and ...... white squares.

The ratio of black : white squares is 2 : ......

which simplifies to 1 : ......

The diagram can be redrawn like this: 

4 Complete the workings to find the ratio of black : white squares in this diagram.

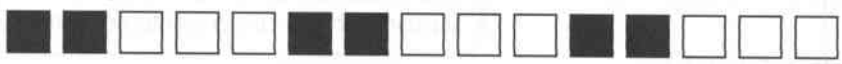


There are ...... black squares and ...... white squares.

The ratio of black : white squares is ...... : ......

which simplifies to 2 : ......

The diagram can be redrawn like this:



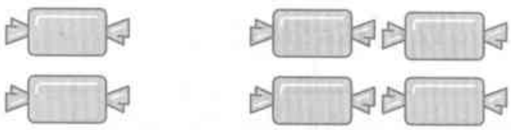
Now try Exercise 14.1 on page 137 of Coursebook 7.

14.2 Sharing in a ratio

This example shows how you can share an amount in a ratio.

Amy and Ben share 6 sweets in the ratio 1 : 2.

Amy Ben



1 + 2 = 3 sweets

1 + 2 = 3 sweets

2 + 4 = 6 sweets

For every 1 sweet Amy gets, Ben gets 2.

Amy gets 2 sweets and Ben gets 4 sweets.

1 Tudza and Pepi share 12 sweets in the ratio 1 : 3.

Complete the diagram and the working to show how many sweets they each get.

Tudza Pepi

1 + 3 = ... sweets

...... + ... = ... sweets

...... + ... = ... sweets

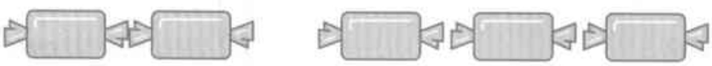
...... + ... = ... sweets

Tudza gets ...... sweets and Pepi gets ...... sweets.

2 Sassi and Mimi share 15 sweets in the ratio 2 : 3.

Complete the diagram and the working to show how many sweets they each get.

Sassi Mimi



2 + 3 = ... sweets

...... + ... = ... sweets

...... + ... = ... sweets

...... + ... = ... sweets

Sassi gets ...... sweets and Mimi gets ...... sweets.

This is an example of a different method you can use to share in a ratio.

Carl and Mich share \$48 in the ratio 1 : 3. How much do they each get?

Carl Mich

\$1 \$3 1 + 3 = 4 and 48 ÷ 4 = 12

\$1 × 12 = \$12 \$3 × 12 = \$36 (Check the total: \$12 + \$36 = \$48 ✓)

This method is useful when the amount you are sharing is a big number.

3 Nigel and Patch share \$48 in the ratio 1 : 2.

Complete the working to show how much they each get.

Nigel Patch

\$1 \$2 1 + 2 = ... and 48 ÷ ...... = ...

\$1 × ...... = \$...... \$2 × ...... = \$...... (check the total: \$...... + \$...... = \$......)

4 Eli and Fran share \$84 in the ratio 2 : 5.

Complete the working to show how much they each get.

Eli Fran

\$2 \$5 2 + 5 = ... and 84 ÷ ...... = ...

\$2 × ...... = \$...... \$5 × ...... = \$...... (check the total: \$...... + \$...... = \$......)

Now try Exercise 14.2 on page 138 of Coursebook 7.

14.3 Using direct proportion

One bag of chips costs \$1.20.

Two bags of chips costs \$2.40.

Three bags of chips costs \$3.60.

As the number of bags of chips increases, the total cost increases by the same amount.

The number of bags of chips and the cost are said to be in **direct proportion**.

1 Fill in the gaps.

One shirt costs \$30

Two shirts cost 2 × 30 = \$......

Three shirts cost 3 × 30 = \$......

Four shirts cost ...... × 30 = \$......

Ten shirts cost ...... × 30 = \$......

2 Fill in the gaps.

One chair weighs 8 kg

Two chairs weigh 2 × 8 = ... kg

Three chairs weigh ...... × ...... = ... kg

Five chairs weigh ...... × ...... = ... kg

Eight chairs weigh ...... × ...... = ... kg

You can use direct proportion to solve problems like this:

Two water bottles weigh 600 g. How much do five water bottles weigh?

Two bottles weigh 600 g

One bottle weighs 600 ÷ 2 = 300 g

Five bottles weigh 300 × 5 = 1500 g

Always find the weight of one item first, then find the weight of the number of items needed.

3 Two drinks cost \$3. How much do seven drinks cost?

Two drinks cost \$3

One drink costs 3 ÷ 2 = \$......

Seven drinks cost 7 × ...... = \$......

3 ÷ 2 = 1.5. In dollars, this is \$1.50.

4 Five sweets weigh 60 g. How much do four sweets weigh?

Five sweets weigh 60 g

One sweet weighs 60 g ÷ ...... = ... g

4 sweets weigh ...... × ...... = ... g

Now try Exercise 14.3 on page 140 of Coursebook 7.

15 Time

15.1 The 12-hour and 24-hour clock

In the **12-hour clock** system, 3:45 am is in the morning and 3:45 pm is in the afternoon.

In the **24-hour clock** system, 03:45 is in the morning and 15:45 is in the afternoon.

You need to understand both the 12-hour and the 24-hour systems.

> 24-hour times always have four digits.

1 Fill in the missing numbers.

a 1 hour = ... minutes

b 2 hours = ... minutes

c $\frac{1}{2}$ hour = ... minutes

d $\frac{1}{4}$ hour = ... minutes

e $\frac{3}{4}$ hour = ... minutes

2 Fill in the missing numbers.

a 1 day = ... hours

b 2 days = ... hours

c $\frac{1}{2}$ day = ... hours

d $\frac{1}{4}$ day = ... hours

e 1 week = ... hours

3 Are these 24-hour clock times DAY or NIGHT?

a 23:00 ....

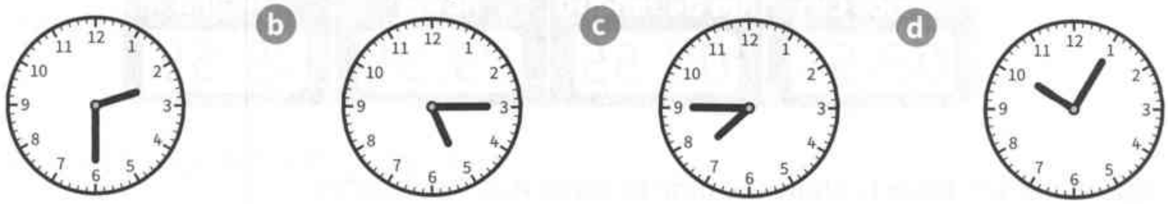
b 03:00 ....

c 15:00 ....

d 11:00 ....

4 Here are four clocks.

a b c d



For each clock, write the time in two different ways using the 24-hour clock.
The first one has been done for you.

Before midday **a** 02:30 **b** .... **c** .... **d** ....

After midday **a** 14:30 **b** .... **c** .... **d** ....

5 Work out each time on a 24-hour clock.

a 12 hours after 03:30 ....

b 12 hours after 09:50 ....

c 12 hours before 14:45 ....

d 12 hours before 20:20 ....

6 An airport clock shows the time in four cities.

Complete these sentences.

a New York is ...... hours BEHIND London.

b Dubai is ...... hours AHEAD OF London

c Singapore is ...... hours ...... Dubai

d New York is ...... hours ...... Singapore

7 Auckland is 3 hours ahead of Tokyo.

a Find the time in Auckland when it is 09:45 in Tokyo. ....

b Find the time in Tokyo when it is 15:35 in Auckland. ....

8 A clock shows these times in four cities.

Mexico City	Rio de Janeiro	Rome	Beijing
02:55	04:55	09:55	15:55

a Fill in the table to show the time in each city 7 hours later.

Mexico City	Rio de Janeiro	Rome	Beijing

b Find the time difference between:

i Mexico City and Rome ....

ii Rio de Janeiro and Beijing ....

9 A train journey takes 2 hours and 30 minutes.

Fill in the arrival times in the table.

Depart	09:10	12:20	14:15	16:30	19:45
Arrive	11:40				

10 A flight from Kuala Lumpur to Hong Kong takes 4 hours and 10 minutes.

Fill in the arrival times in the table.

Kuala Lumpur	07:30	10:20	13:40	15:25	18:50
Hong Kong	11:40				

Now try Exercise 15.1 on page 145 of Coursebook 7.

15.2 Timetables

The 24-hour system is usually used for timetables, because it is clear whether the time is in the morning or the afternoon.

1 Work out the number of minutes from:

a) 09:25 to 10:00 ....
b) 14:35 to 15:00 ....
c) 22:10 to 23:00 ....

2 Work out the number of minutes from:

a) 13:40 to 14:00 ....
b) 13:40 to 14:05 ....
c) 13:40 to 14:25 ....

3 Work out the number of minutes from:

a) 08:20 to 09:00 ....
b) 08:20 to 09:10 ....
c) 08:20 to 09:15 ....

4 Work out the number of minutes from:

a) 16:48 to 17:00 ....
b) 16:48 to 17:06 ....
c) 16:48 to 17:13 ....

5 Here are some bus journeys. The time between stops is given. Fill in the missing times.

a)

Bus station	09:40
↓	8 minutes
Park	09:48
↓	9 minutes
Harbour	....
↓	10 minutes
Hotel	....

b)

Airport	15:45
↓	10 minutes
Museum	....
↓	15 minutes
Train station	....
↓	7 minutes
Hospital	....

c)

Concert hall	17:35
↓	12 minutes
Art gallery	....
↓	9 minutes
School	....
↓	11 minutes
Bus station	....

6 Here are two bus timetables. Work out the time between each stop.

a

Station	13:20	15 minutes
Town square	13:35	...... minutes
Shopping mall	13:47	...... minutes
Monument	14:02	...... minutes
Market	14:11	...... minutes
Racecourse	14:22	...... minutes

b

Station	17:50	...... minutes
Bridge	18:05	...... minutes
Museum	18:21	...... minutes
Zoo	18:42	...... minutes
Statue	18:52	...... minutes
Docks	19:10	...... minutes

7 Here is a bus timetable.

School	12:15
Football stadium	12:35
Swimming pool	12:51
Sports centre	13:08
Concert hall	13:20

a Work out the minutes to travel from the school to the:

i football stadium ....
ii swimming pool ....
iii sports centre ....

b Work out the minutes to travel from the football stadium to

i swimming pool ....
ii sports centre ....
iii concert hall ....

Now try Exercise 15.2 on page 146 of Coursebook 7.

16 Probability

16.1 The probability scale

Probability is the branch of maths that measures how likely it is that something will happen.

Probabilities can be written as fractions, decimals or percentages.

1 Write these fractions as percentages. The first one has been done for you.

a $\frac{1}{2}$ = 50% b $\frac{1}{4}$ = ... c $\frac{3}{4}$ = ... d $\frac{1}{10}$ = ...

2 Write these decimals as percentages. The first one has been done for you.

a 0.5 = 50% b 0.4 = ... c 0.8 = ... d 0.35 = ...

3 Write these decimals as fractions. The first one has been done for you.

a 0.3 = $\frac{3}{10}$ b 0.7 = ... c 0.1 = ... d 0.9 = ...

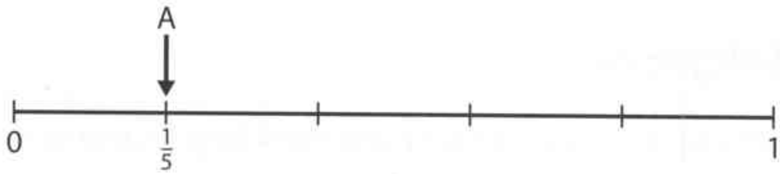
4 Fill in the gaps in the table.

Fraction	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{1}{10}$
Decimal	0.2	0.4			
Percentage	20%		60%		

Probabilities can be shown on a **probability scale**. The scale goes from 0 to 1.

It helps to mark a few fractions on the probability scale.

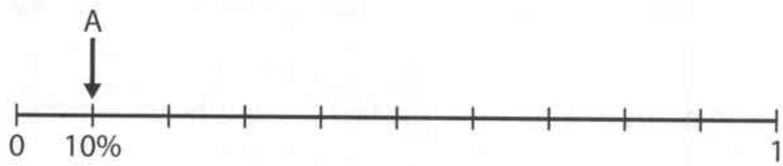
5 Here is a probability scale.



Mark these probabilities on the scale using arrows. The first one has been done for you.

a $\frac{1}{5}$ **b** $\frac{2}{5}$ **c** $\frac{3}{5}$ **d** $\frac{4}{5}$ **e** $\frac{1}{2}$

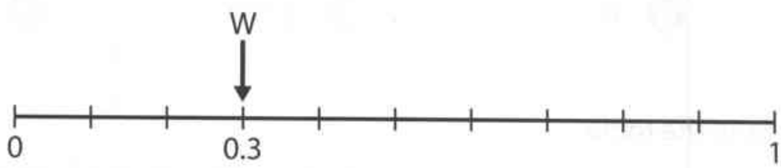
6 Here is a probability scale.



Mark these probabilities on the scale using arrows. The first one has been done for you.

a 10% **b** 50% **c** 30% **d** 90% **e** 70%

7 Here is a probability scale.



Mark these probabilities on the scale using arrows. One has been done for you.

W: The probability that my team will win the football match is 0.3.

L: The probability that my team will lose the football match is 0.6.

D: The probability that my team will draw the football match is 0.1.

8 Here is a probability scale.

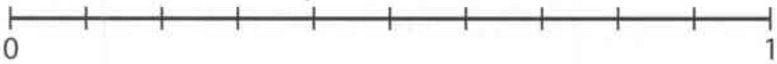
Mark these probabilities on the scale using arrows.

T: The probability that the train will be late is $\frac{1}{2}$.

B: The probability that the bus will be late is $\frac{1}{3}$.

C: The probability that the coach will be late is $\frac{1}{6}$.

9 Here is a probability scale.



Mark these probabilities on the scale using arrows.

R: The probability of rain is 80%.

S: The probability of sunshine is 30%.

W: The probability it will be windy is 60%.

F: The probability of fog is 10%.

10 The probability that Ann is late for school is 25%.

The probability that Carlos is late for school is 30%.

Circle TRUE or FALSE for each of these statements.

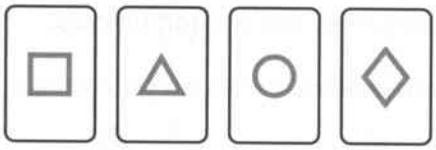
a	The probability that Ann is late is $\frac{1}{4}$.	TRUE	FALSE
b	The probability that Carlos is late is more than $\frac{1}{2}$.	TRUE	FALSE
c	Ann is certain to be late.	TRUE	FALSE
d	Ann is less likely than Carlos to be late.	TRUE	FALSE

Now try Exercise 16.1 on page 153 in Coursebook 7.

16.2 Equally likely outcomes

For some simple activities or **events**, such as spinning a coin, throwing a dice or picking a card from a pack, there are various results, or **outcomes**, that are all equally likely.

1 Maria has four cards.



She takes one at random.

> If a card is chosen at random it means that all the cards have the same chance of being chosen.

Circle the correct probability for the shape on her card.

a	The shape is a square.	0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1
b	The shape is a circle.	0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1
c	The shape has straight sides.	0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1
d	The shape has four sides.	0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1
e	The shape is symmetrical.	0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1

2 Marcus has five numbered cards.

2	5	7	11	13

Circle the correct probability for the number on his card.

a	The number is less than 10.	0	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$
b	The number is odd.	0	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$
c	The number is 13.	0	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$
d	The number has two digits.	0	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$
e	The number is more than 15.	0	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$

3 Here are five cards.

A	E	I	O	U

Barak takes one card at random. Find the probability that he takes:

a O .... **b** U .... **c** A or E .... **d** I, O or U ....

4 Here are seven cards.

T	U	R	N	I	N	G

Alysha takes one card at random. Find the probability that she takes:

a T .... **b** R .... **c** N ....

d T, U or R .... **e** I, N or G ....

5 This is a dice with six faces.

Joel rolls the dice. Work out the probabilities of these outcomes. The first one has been done for you.

a 2 $\frac{1}{6}$ **b** 5 .... **c** 6 ....

d 1 or 2 .... **e** 3, 4 or 5 ....

6 Lisa rolls the dice in Question 5. Work out the probabilities of these outcomes.

a an even number .... **b** an odd number .... **c** more than 2 ....

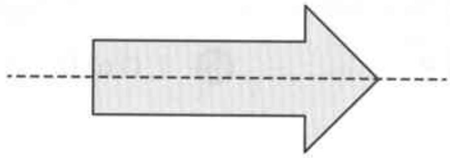
d less than 2 .... **e** 1, 2, 3 or 4 .... **f** 2, 3, 4, 5 or 6 ....

Now try Exercise 16.2 on page 154 of Coursebook 7.

17 Position and movement

17.1 Reflecting shapes

This arrow has one line of symmetry, shown by the dotted line.

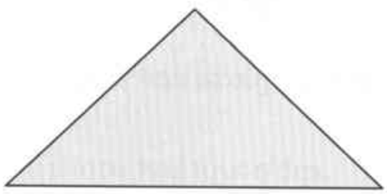


1 Look at these shapes. Each shape has one line of symmetry.

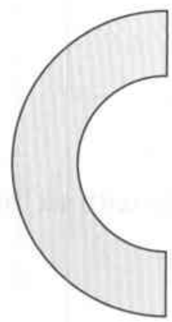
Draw the line of symmetry on each shape.

Use a dotted line for the line of symmetry.

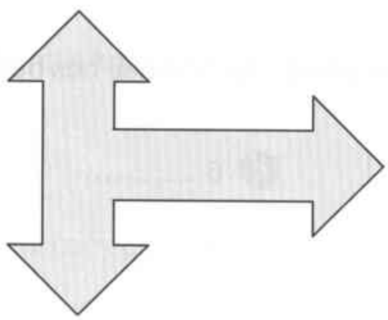
a



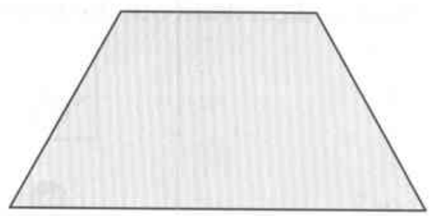
b



c



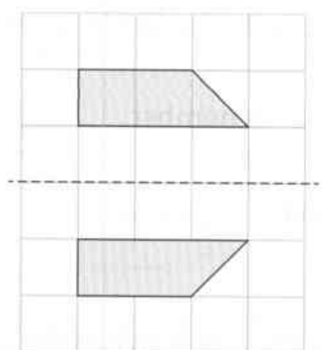
d



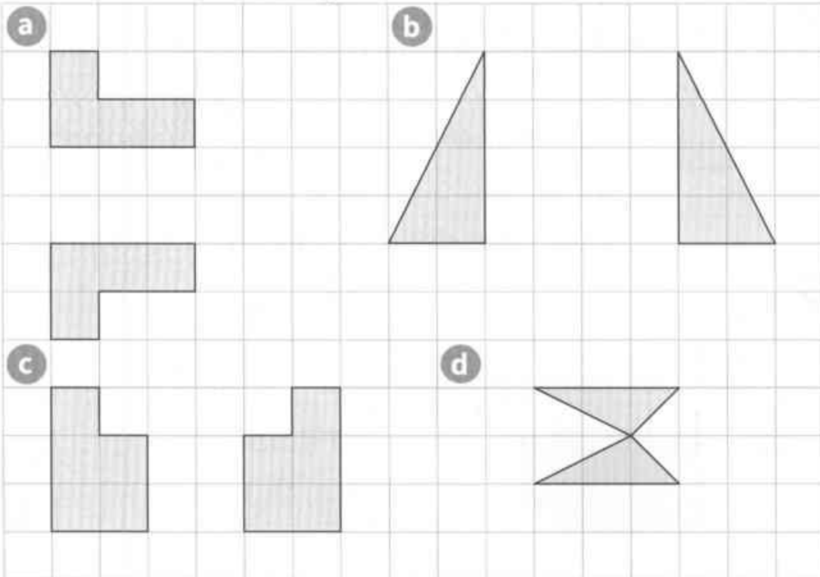
This diagram has one line of symmetry.

The line of symmetry is shown by the dotted line.

The dotted line is called a **mirror line**.



2 Each of these shapes has one line of symmetry. Draw the line of symmetry on each shape.

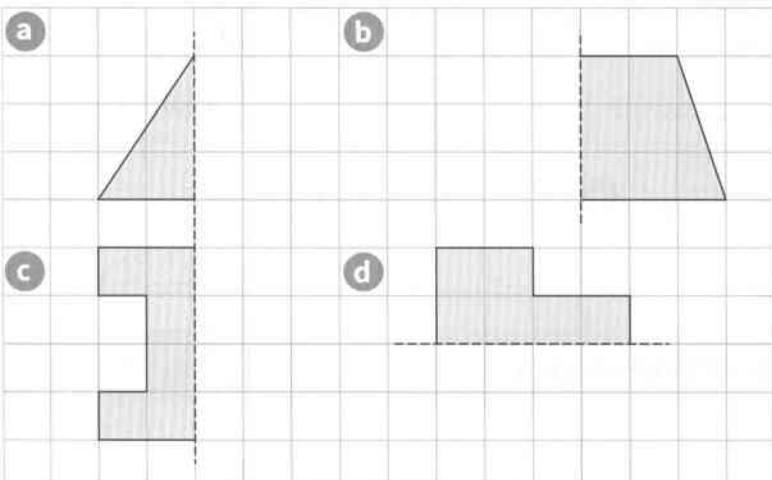


When you **reflect** a shape in a mirror line, the mirror line must be a line of symmetry for the WHOLE SHAPE.

Look at this L shape.

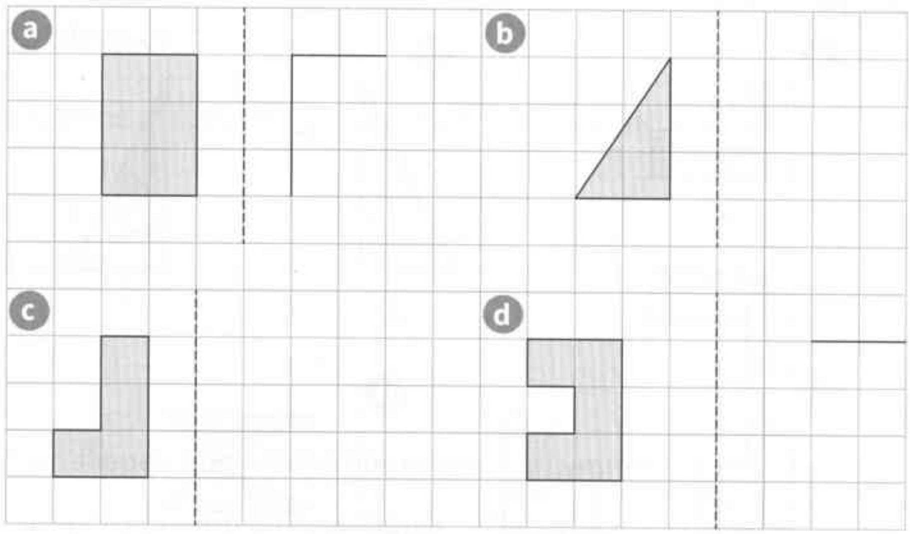
When reflected in the mirror line it looks like this.

3 Reflect each shape in the mirror line.

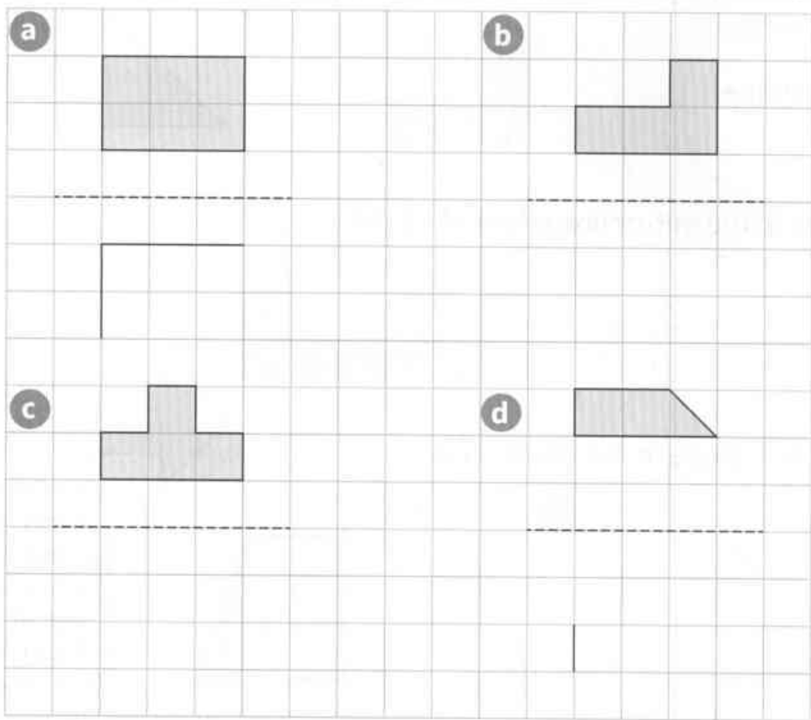


If you have a mirror, place it on the mirror line and look into it to see what the reflection should look like.

4 Reflect each shape in the mirror line. Some of them have been started for you.



5 Reflect each shape in the mirror line. Some of them have been started for you.



Now try Exercise 17.1 on page 163 of Coursebook 7.

17.2 Rotating shapes

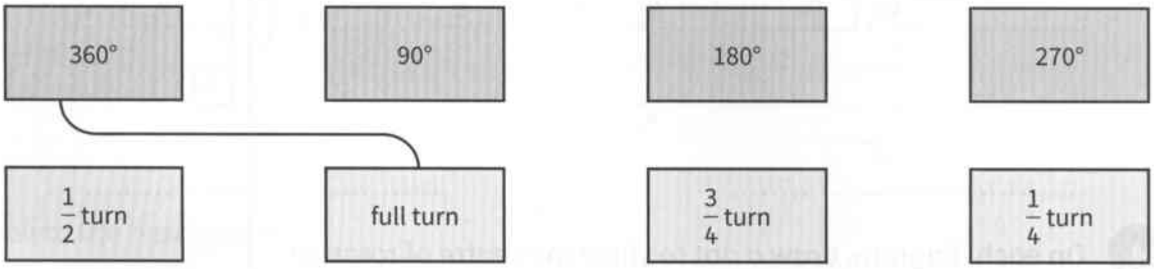
When you rotate a shape, you turn it about a fixed point called the **centre of rotation**.

The centre of rotation is usually shown as a dot ● with the letter C.

You turn a shape **clockwise** or **anticlockwise**.

You turn the shape through a fraction of a whole turn (360^0).

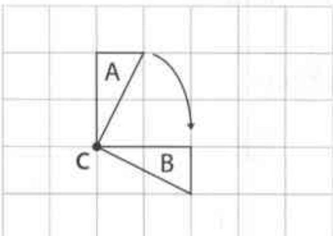
1 Draw lines linking the number of degrees to the correct fraction of a turn.



2 Write down the fraction of a turn each shape A has been turned through to get to shape B.

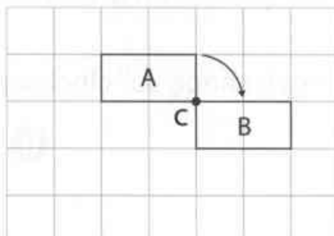
Say if the turn was clockwise or anticlockwise. The first one has been done for you.

a



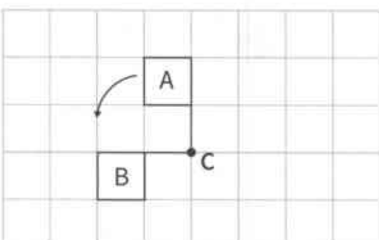
$\frac{1}{4}$ turn clockwise

b



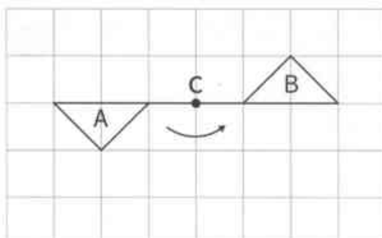
....

c



....

d

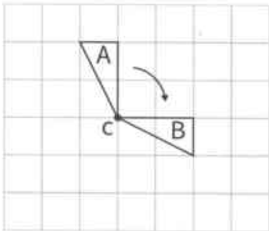


....

3 Write down the number of degrees each shape A has been turned through to get to shape B.

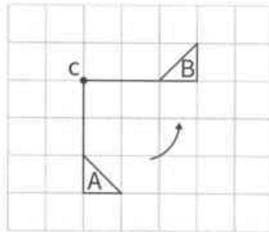
Also say if the turn was clockwise or anticlockwise. The first one has been done for you.

a



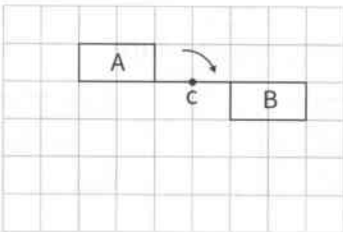
90^0 clockwise

b



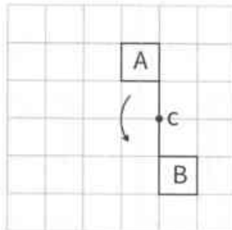
....

c



....

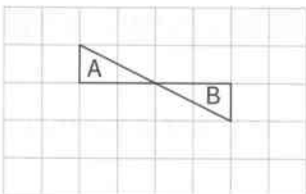
d



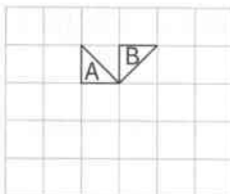
....

4 On each diagram, draw a dot to show the centre of rotation.
Label the dot with the letter C.

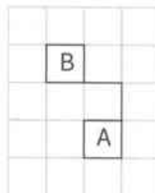
a



b

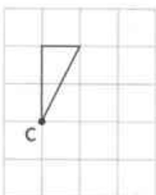


c

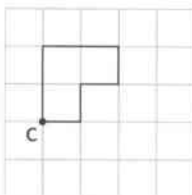


5 Rotate each shape 90^0 clockwise about the centre of rotation C.

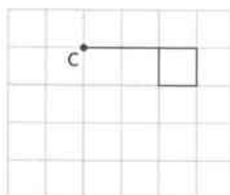
a



b

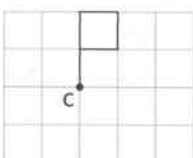


c

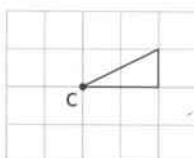


6 Rotate each shape 180^0 about the centre of rotation C.

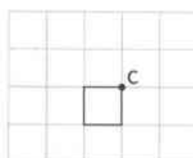
a



b



c

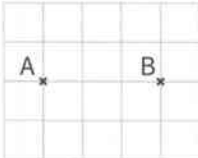


Now try Exercise 17.2 on page 165 of Coursebook 7.

17.3 Translating shapes

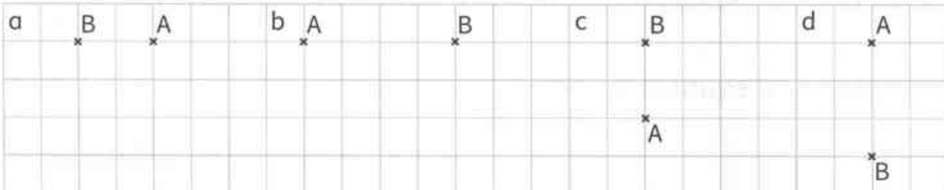
When you move a shape, you **translate** it.

In this diagram, cross A has been moved three squares to the right to become cross B.



You say 'cross A is translated 3 squares right'.

1 In each of the diagrams, cross A is translated to cross B.



Complete the descriptions.

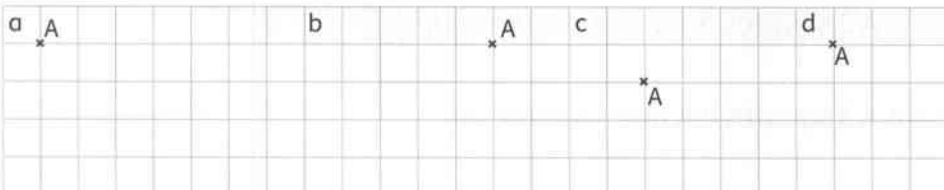
a) Cross A is translated ...... squares left.

b) Cross A is translated ...... squares ......

c) Cross A is translated ...... squares up.

d) Cross A is translated ...... squares ......

2 In each of these diagrams, translate cross A to cross B. Use the description given.



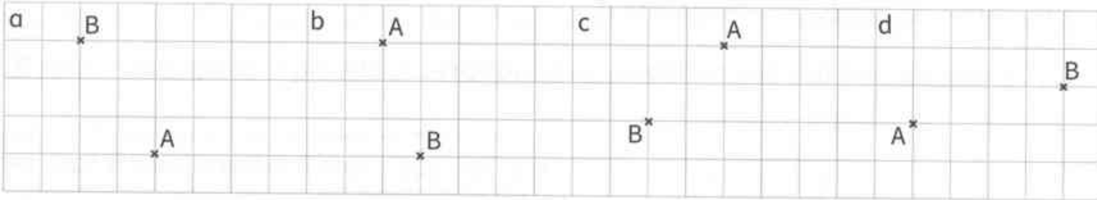
a) Translate cross A 2 squares right.

b) Translate cross A 3 squares left.

c) Translate cross A 1 square up.

d) Translate cross A 2 squares down.

3 In each of these diagrams, cross A is translated to cross B. Complete the descriptions.



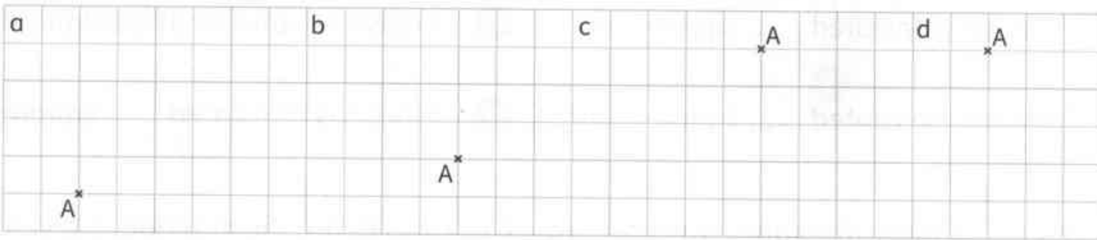
a Cross A is translated ...... squares left and ...... squares up.

b Cross A is translated ...... square right and ...... squares down.

c Cross A is translated ...... squares ...... and ...... squares ......

d Cross A is translated ...... squares ...... and ...... square ......

4 In each of these diagrams, translate cross A to draw cross B.
Use the descriptions given.



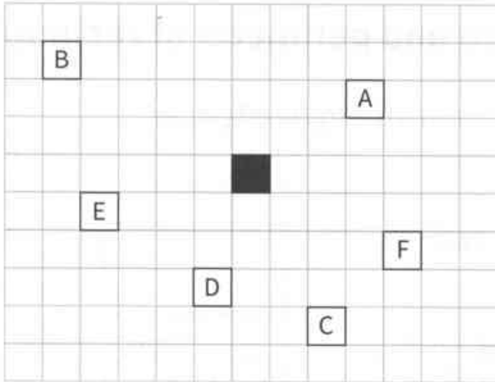
a Translate cross A 2 squares right and 3 squares up.

b Translate cross A 3 squares left and 1 square up.

c Translate cross A 1 square left and 4 squares down.

d Translate cross A 4 squares right and 2 squares down.

5 The black square has been translated six different times to become squares A, B, C, D, E and F.



Match the correct translation to the correct square.

The first one has been done for you.

1 square left and 3 squares down	A
4 squares left and 1 square down	B
3 squares right and 2 squares up	C
5 squares left and 3 squares up	D
4 squares right and 2 squares down	E
2 squares right and 4 squares down	F

Now try Exercise 17.3 on page 166 of Coursebook 7.

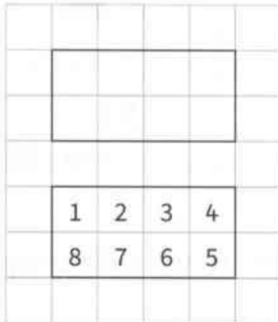
18 Area, perimeter and volume

18.1 Calculating the area and perimeter of rectangles

This rectangle is drawn on centimetre squared paper.

Each square has an area of $1\,cm^2$.

You can count the number of squares to find the **area** of the rectangle.

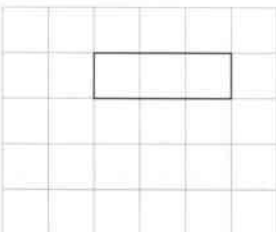


Write the numbers into the squares as you count them.

Area = $8\,cm^2$

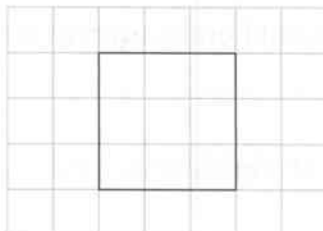
1 Count the number of squares to find the area of these rectangles.

a



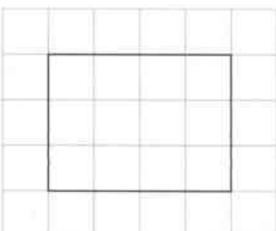
Area = ... cm^2

b



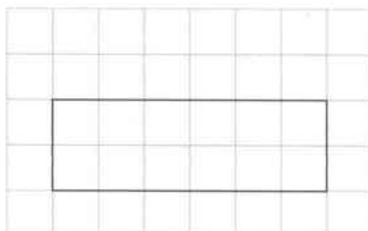
Area = ... cm^2

c



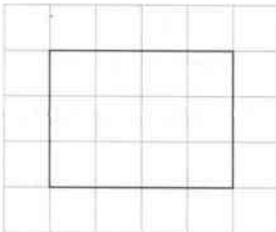
Area = ... cm^2

d



Area = ... cm^2

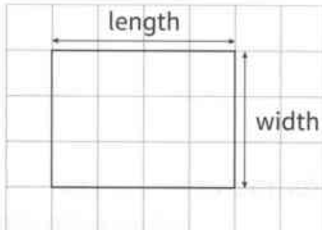
2 This diagram shows a rectangle.



a What is the area of this rectangle?

Area = …… cm^2

The length is the number of squares across. The width is the number of squares up.



b Fill in the missing numbers in this working.

Length of rectangle = …… cm

Width of rectangle = …… cm

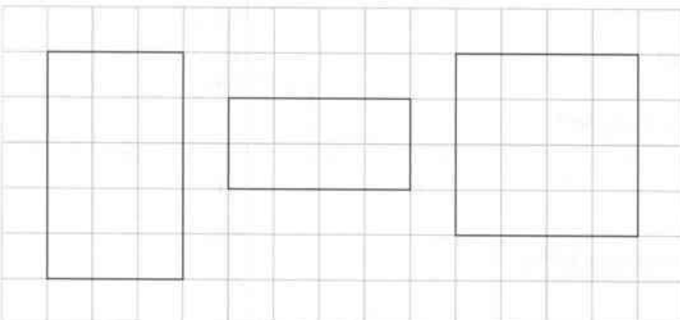
Length × width = 4 × 3 = ……

c What do you notice about your answers to parts a) and b)?

………………………………………………………………………………………………

3 Match each rectangle to its correct area. Use the formula:

area = length × width



Area = 16 cm^2

Area = 15 cm^2

Area = 8 cm^2

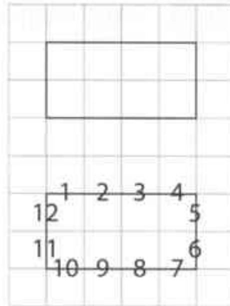
Check your answers by counting the squares.

The **perimeter** of a rectangle is the total distance around the edge of the rectangle.

This rectangle is drawn on centimetre squared paper.

You find the perimeter by adding all the side lengths together.

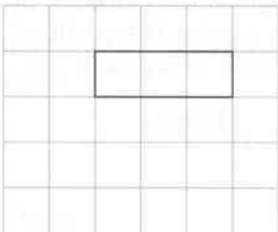
You can write the numbers on the sides of the squares as you count them.



Perimeter = 12 cm

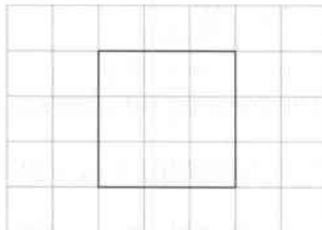
4 Count the distance around the edge of these rectangles.

a



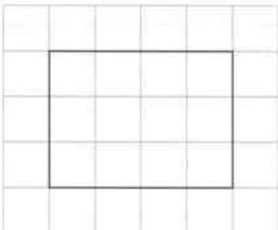
Perimeter = ... cm

b



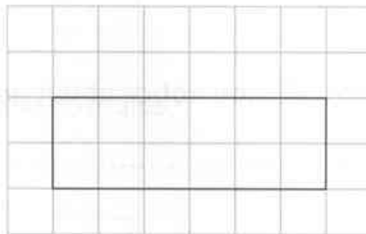
Perimeter = ... cm

c



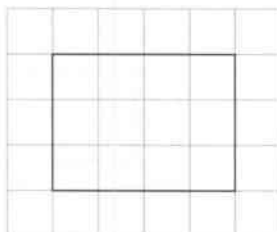
Perimeter = ... cm

d



Perimeter = ... cm

5 This diagram shows a rectangle.



a What is the perimeter of this rectangle?

Perimeter = ... cm

b Fill in the missing numbers in this working:

Length of rectangle = ... cm

Width of rectangle = ... cm

Perimeter = 4 + 3 + 4 + 3 = ... cm

c What do you notice about your answers to parts a) and b)?

....

Now try Exercise 18.2 on page 172 of Coursebook 7.

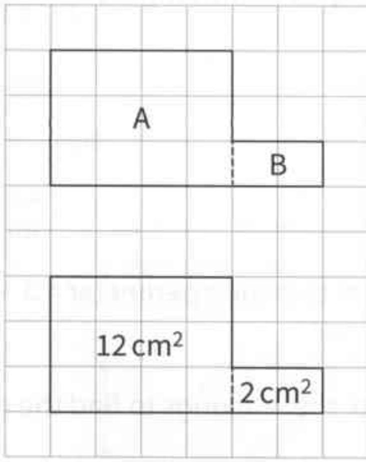
18.2 Calculating the area and perimeter of compound shapes

This **compound shape** is drawn on centimetre squared paper.

It is made by joining rectangles A and B together.

You can work out the area of the shape by adding the areas of the rectangles:

Area = 12 cm^2 + 2 cm^2 = 14 cm^2



1 Look at these diagrams. Complete the workings to find the area of the compound shapes.

a Area A = ... cm^2

Area B = ... cm^2

Total area = ... + ... = ... cm^2

b Area C = ... cm^2

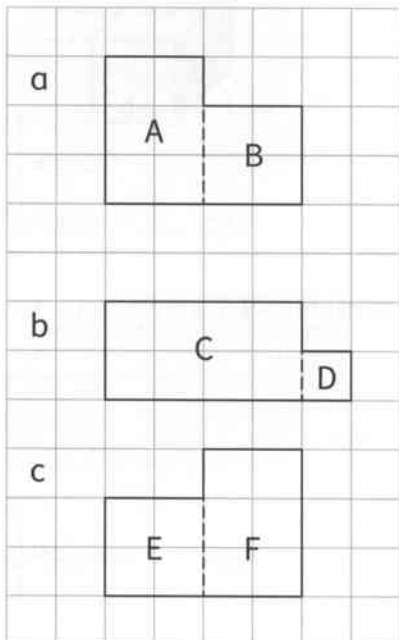
Area D = ... cm^2

Total area = ... + ... = ... cm^2

c Area E = ... cm^2

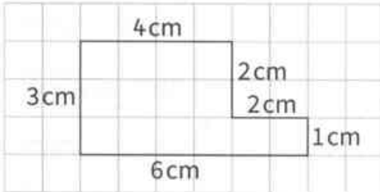
Area F = ... cm^2

Total area = ... + ... = ... cm^2



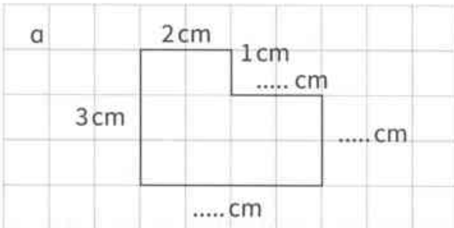
You work out the perimeter of a compound shape by adding all the side lengths together.

Start by writing all of the lengths of the sides on the shape like this:

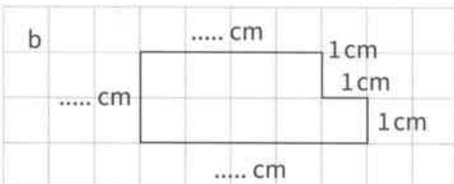


Then add them together: perimeter = 3 + 4 + 2 + 2 + 1 + 6 = 18 cm

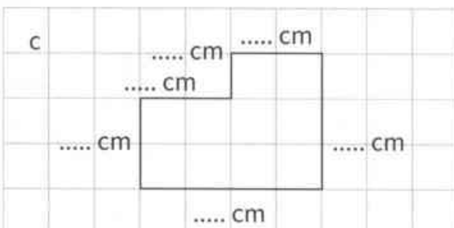
2 Complete the workings to find the perimeter of these compound shapes.



a Perimeter = 3 + 2 + 1 + ... + ... + ... = ... cm



b Perimeter = 1 + 1 + 1 + ... + ... + ... = ... cm

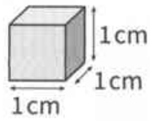


c Perimeter = ... + ... + ... + ... + ... + ... = ... cm

Now try Exercise 18.3 on page 173 of Coursebook 7.

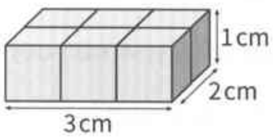
18.3 Calculating the volume of cuboids

This cube has a **volume** of one **cubic centimetre** (1 cm^3).

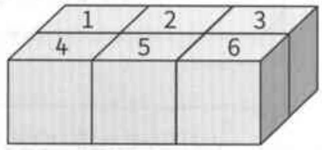


You can work out the volume of a cuboid by counting the number of cubes.

This cuboid has a volume of 6 cm^3.



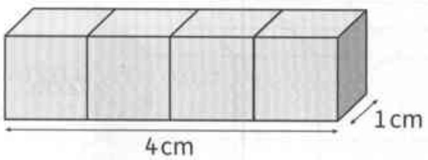
You can write the numbers on the cubes as you count them.



1 Count the cubes to find the volume of each cuboid.

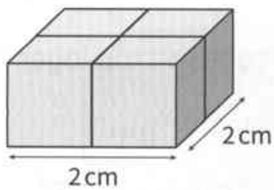
All these cuboids have a height of 1 cm.

a



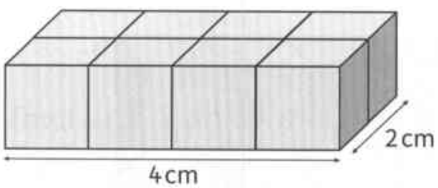
Volume = ... cm^3

b



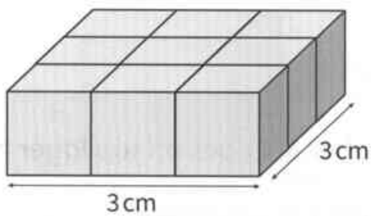
Volume = ... cm^3

c



Volume = ... cm^3

d



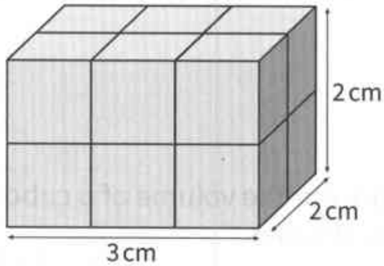
Volume = ... cm^3

2 Complete the workings to find the volume of each cuboid.
The first one has been started for you.

a Number of cubes on top layer = 6

Number of layers = 2

Volume of cuboid = 6 + 6 = …… cm^3

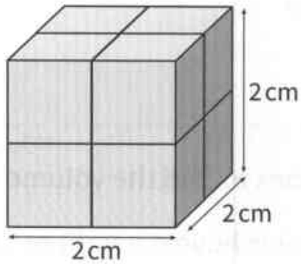


There are 6 cubes on each layer, so work out 6 + 6 or 2 × 6 to find the volume.

b Number of cubes on top layer = ……

Number of layers = ……

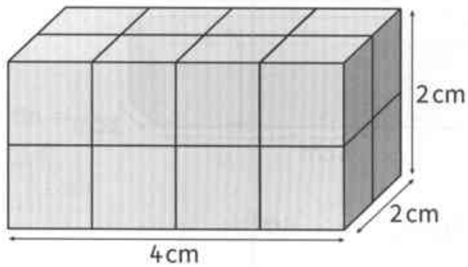
Volume of cuboid = …… cm^3



c Number of cubes on top layer = ……

Number of layers = ……

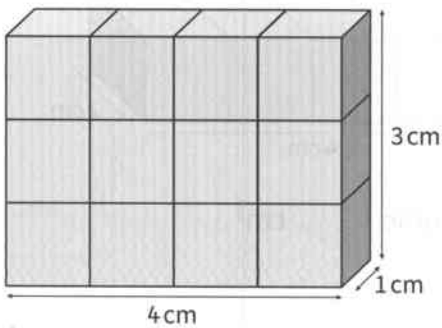
Volume of cuboid = …… cm^3



d Number of cubes on top layer = ……

Number of layers = ……

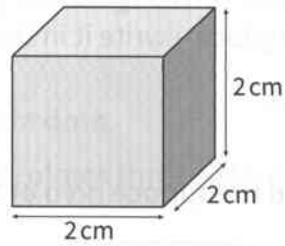
Volume of cuboid = …… cm^3



Now try Exercise 18.4 on page 175 of Coursebook 7.

18.4 Calculating the surface area of cubes and cuboids

The **surface area** of a cube or cuboid is the total area of ALL its faces.



This cube has all side lengths of 2 cm.

You can work out the surface area of the cube like this:

Area of one face = $2 \times 2 = 4\,cm^2$

The area of one face = length × width.

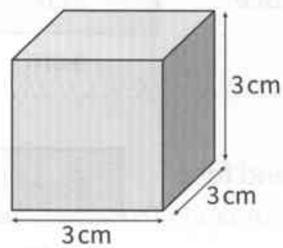
Total surface area = $6 \times 4\,cm^2 = 24\,cm^2$

The six faces of a cube are all the same size.

1 Complete the working to find the surface area of these cubes.

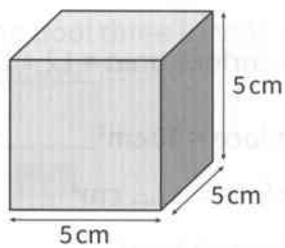
a Area of one face = ... cm^2

Total surface area = 6 × ...... = ... cm^2



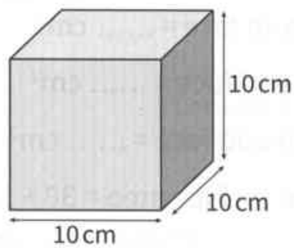
b Area of one face = ... cm^2

Total surface area = 6 × ...... = ... cm^2



c Area of one face = ... cm^2

Total surface area = 6 × ...... = ... cm^2



Follow these steps to work out the surface area of a cuboid:

Step 1 Make a sketch of every face of the cuboid and write on the length and width.

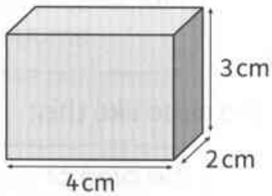
Step 2 Work out the area of every face – write it in the centre of the face.

Step 3 Add together all the areas.

Make sure you have worked out the area of all six faces.

2 Complete the working to find the surface area of these cuboids.

a



Front face: $12\,cm^2$, 3 cm, 4 cm

Back face: $12\,cm^2$, 3 cm, 4 cm

Top face: $8\,cm^2$, 2 cm, 4 cm

Bottom face: ...... cm^2, ... cm, 4 cm

Left end face: $6\,cm^2$, 3 cm, 2 cm

Right end face: ...... cm^2, ... cm, ... cm

Total surface area = 12 + 12 + 8 + ... + 6 + ... = ... cm^2

b

Front face = $30\,cm^2$

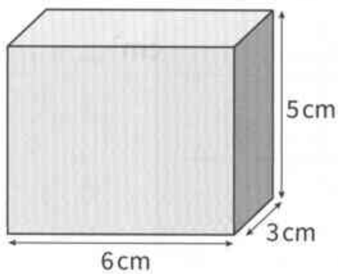
Back face = ... cm^2

Top face = $18\,cm^2$

Bottom face = ... cm^2

Left end face = ... cm^2

Right end face = ... cm^2



Total surface area = 30 + ... + 18 + ... + ... + ... = ... cm^2

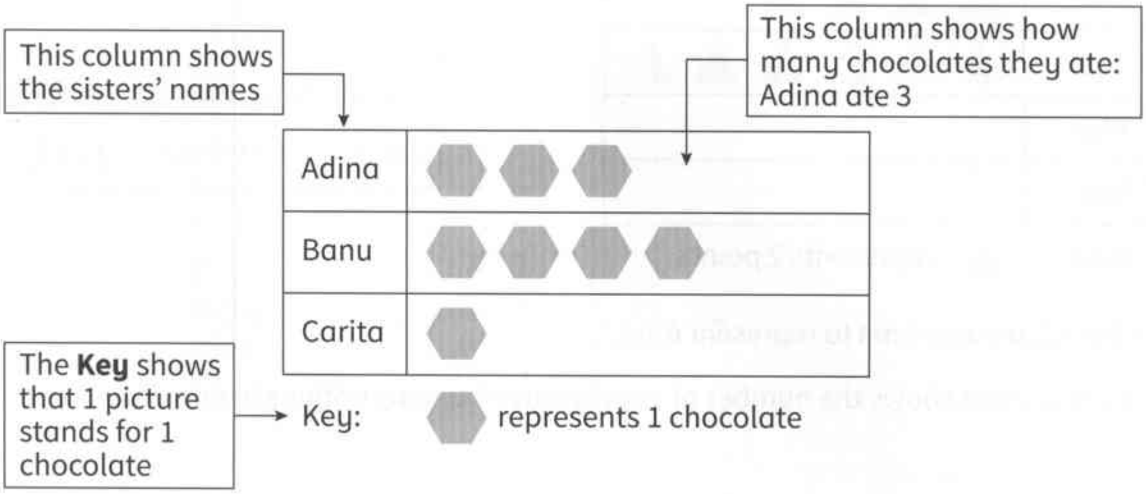
Now try Exercise 18.5 on page 177 of Coursebook 7.

19 Interpreting and discussing results

19.1 Interpreting and drawing pictograms, bar charts, bar-line graphs and frequency diagrams

A **pictogram** uses pictures to represent data.

This pictogram shows how many chocolates three sisters ate in one day.

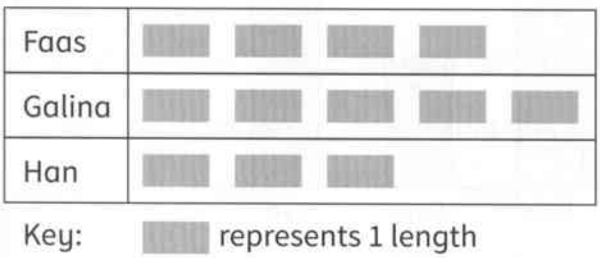


1 Look at the pictogram above.

a Who ate the most chocolates? ....

b Who ate the fewest chocolates? ....

2 This pictogram shows how many lengths of a swimming pool three friends swam.



a How many lengths does 1 picture stand for? ....

Look at the key.

b How many lengths did each friend swim?

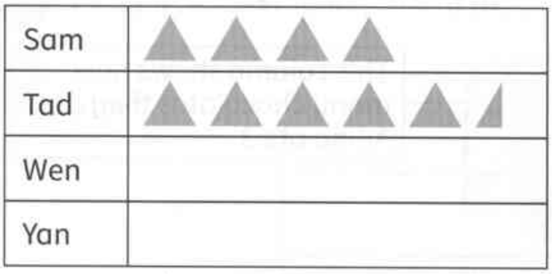
Faas .... lengths Galina .... lengths Han .... lengths

c How many lengths did they swim altogether? ....

3 This table shows the number of points scored by four students in a quiz.

Student	Sam	Tad	Wen	Yan
Points	8	11	6	9

Complete the pictogram to show this data.

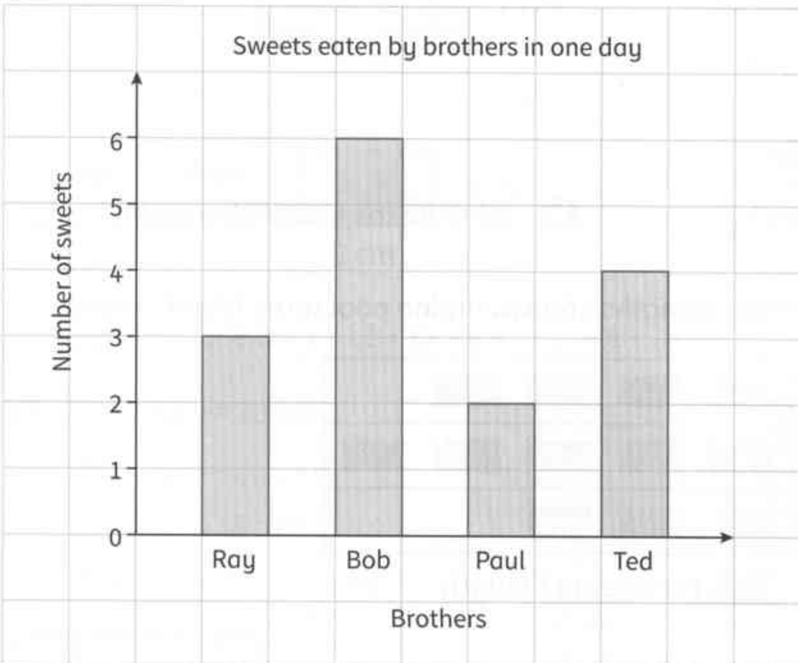


Key: represents 2 points

The key shows that stands for 2 points, so stands for 1 point.

A **bar chart** uses bars to represent data.

This bar chart shows the number of sweets eaten by four brothers in one day.



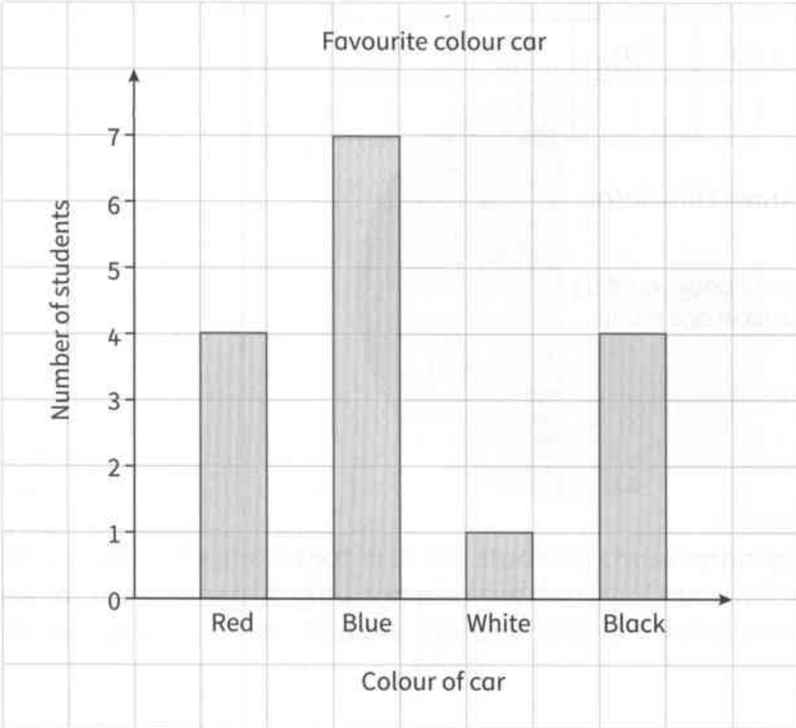
You can see from the heights of the bars that Ray ate 3 sweets, Bob ate 6 sweets, Paul ate 2 sweets and Ted ate 4 sweets.

4 Look at the bar chart above.

a Who ate the most sweets? ....

b Who ate the least sweets? ....

5 This bar chart shows the favourite colour car of some students.



a Which is the most popular colour? ....

b Which is the least popular colour? ....

c Which two colours were chosen by the same number of students?

....

d Write down the number of students who chose each colour.

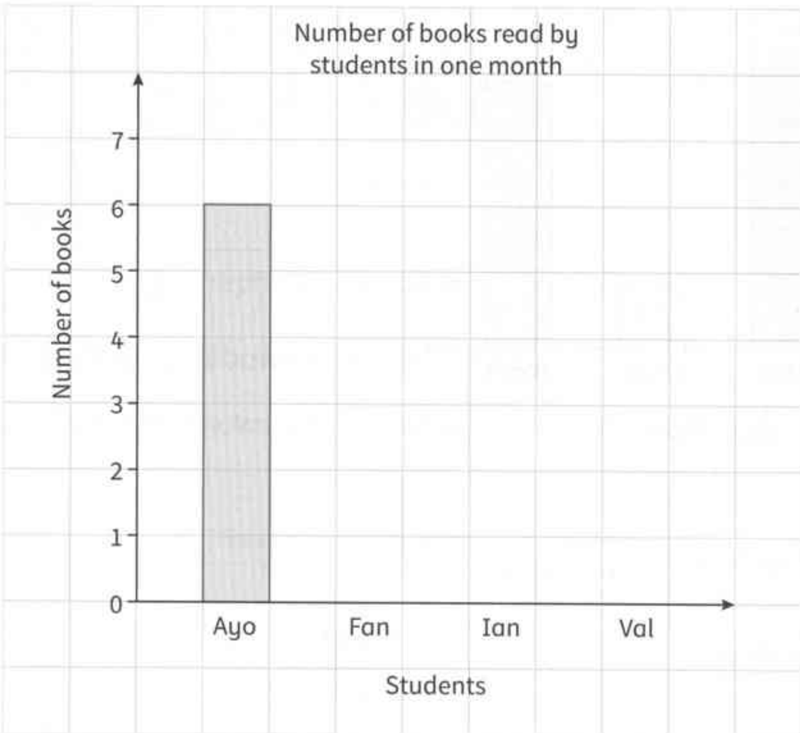
Red .... students　　Blue .... students

White .... students　　Black .... students

6 The table shows the number of books read by four students in a month.

Student	Ayo	Fai	Ian	Val
Number of books	6	1	4	3

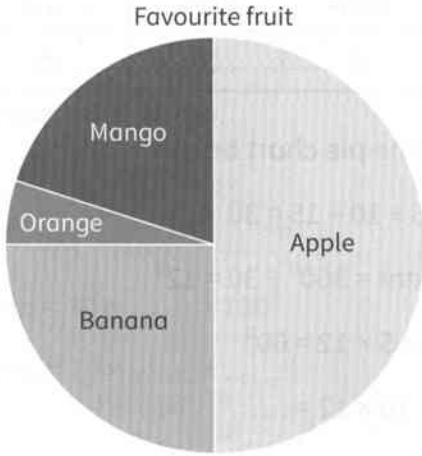
Complete the bar chart to show this data.



Now try Exercise 19.1 on page 183 of Coursebook 7.

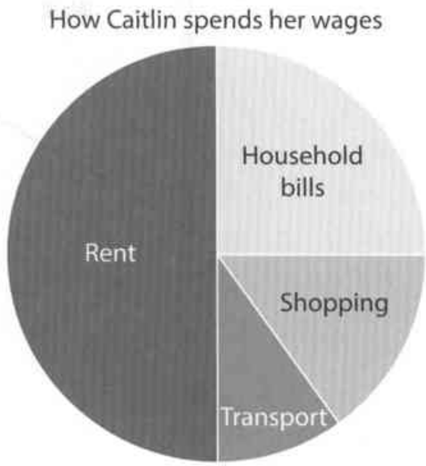
19.2 Interpreting and drawing pie charts

This **pie chart** shows the favourite fruit of the students in class 7Y.



You can see from the chart that ½ of the students chose apple as their favourite fruit. This was the most popular fruit. You can also see that ¼ of the students chose banana. The least popular was orange as this had the smallest slice of the pie chart.

1 This pie chart shows how Caitlin spends her wages.



a. What does Caitlin spend half of her wages on? ....

b. What does Caitlin spend a quarter of her wages on? ....

c. What does Caitlin spend the largest amount of her wages on? ....

d. What does Caitlin spend the smallest amount of her wages on? ....

2 This table shows how some students travel to school.

Method of travel	Walk	Bus	Bicycle
Number of students	5	10	15

Complete the workings and the pie chart below.

Total number of students = 5 + 10 + 15 = 30

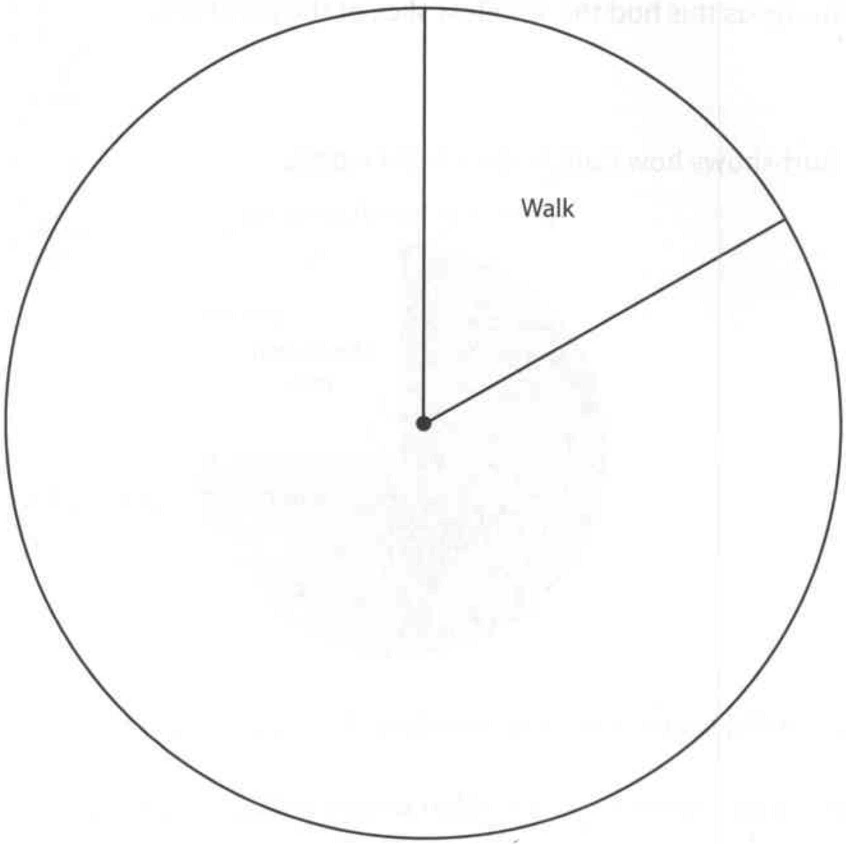
Number of degrees per student = $360^0 \div 30 = 12^0$

Number of degrees for walk = $5 \times 12 = 60^0$

Number of degrees for bus = $10 \times 12 = ...^0$

Number of degrees for bicycle = $15 \times 12 = ...^0$

How students travel to school



3 This table shows the favourite swimming stroke of some students.

Favourite swimming stroke	Front crawl	Backstroke	Breaststroke	Butterfly
Number of students	30	10	15	5

Complete the workings and the pie chart below.

Total number of students = 30 + 10 + 15 + 5 = ...

Number of degrees per student = 360^0 ÷ ...... = ...^{0}

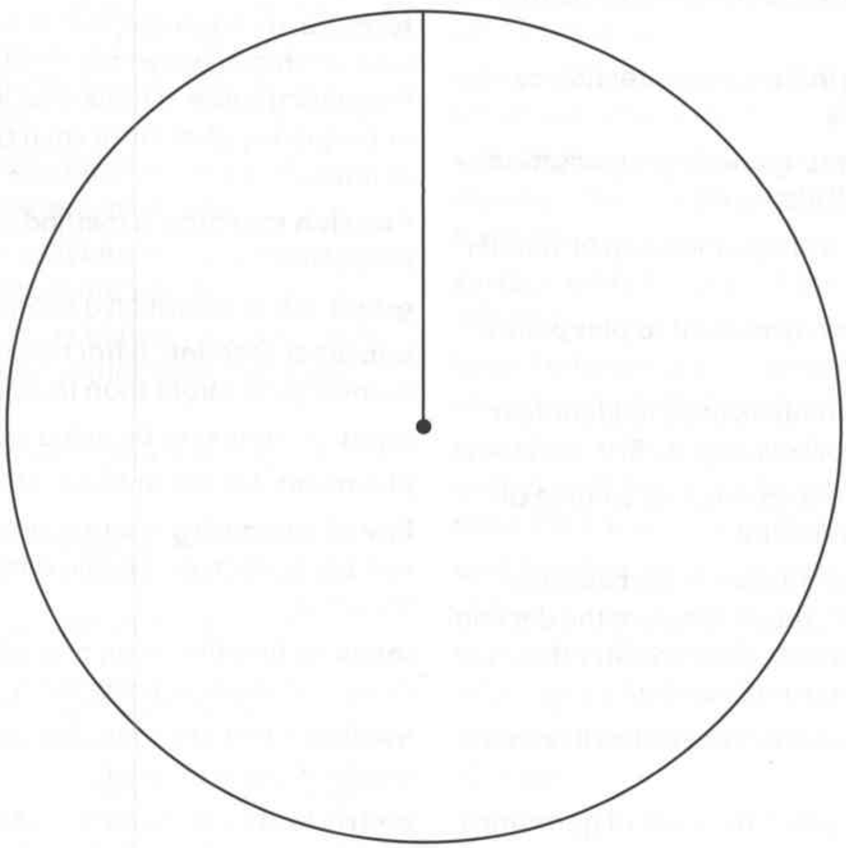
Number of degrees for front crawl = 30 × ...... = 180^0

Number of degrees for backstroke = 10 × ...... = ...^{0}

Number of degrees for breaststroke = 15 × ...... = ...^{0}

Number of degrees for butterfly = 5 × ...... = ...^{0}

Favourite swimming stroke



Now try Exercise 19.2 on page 185 of Coursebook 7.

Glossary

12-hour clock a system of measuring time in terms of a repeating period of 12 hours

24-hour clock a system of measuring time in terms of a repeating period of 24 hours

acute an angle less than 90 degrees

anticlockwise turning in the opposite direction from the hands of a clock

approximate rounding a number to a suitable degree of accuracy

area the amount of surface covered by a flat shape

average a representative value; mode, median and mean are examples

bar chart a diagram where values are represented by the length of bars

centre of rotation the point about which a shape is rotated

clockwise turning in the same direction as the hands of a clock

collecting like terms gathering, by addition and subtraction, all like terms

compound shape a shape made up of simpler shapes

coordinate grid two axes used to plot points, using coordinates

coordinates two numbers used to identify a point, written in brackets, e.g. (4, 6)

cubic centimetre unit of volume; volume of a cube of side 1 centimetre

decimal number a number in the counting system based on 10; the part before the decimal point is a whole number, the part after the decimal point is a decimal number

denominator the number below the line in a fraction

direct proportion when the ratio of quantities stays the same

division the value between successive marks on a scale

equation a way of labelling a line on a grid

equivalent fractions fractions that represent the same amount

event an action that can have different outcomes; throwing a dice is an event, scoring a six is an outcome

expand (brackets) to multiply all parts of the expression inside the brackets by the term alongside the bracket

expression a collection of symbols representing numbers and mathematical operations, but not including an equals sign

factor a factor of a whole number will divide into it without a remainder; 6 and 8 are factors of 24

first term the first number in a list

formula an equation that shows the relationship between two or more quantities

frequency table a table that lists the number or frequency of items of each category in a set of data

function machine a method of showing a function

graph a line drawn on a coordinate grid

improper fraction a fraction in which the numerator is larger than the denominator

input a number to be acted upon by a function

like terms terms containing the same letter(s)

line of symmetry a line dividing a shape into two parts, each part being a mirror image of the other

mean to find the mean of a set of numbers, add them and divide by how many there are

median the middle number when a set of numbers is put in order

metric units measurements based on multiples and divisions of ten; the most common units of measurement

mirror line a line dividing a diagram into two parts, each being a mirror image of the other

mixed number a number expressed as the sum of a whole number and a proper fraction

mode the most common number in a set

multiple the result of multiplying a number by a positive integer; the first few multiples of 3 are 3, 6, 9, 12, …

numerator the number above the line in a fraction

obtuse an angle between 90 and 180 degrees

order (of rotational symmetry) the number of times a shape looks the same in one full turn

outcome a possible result of an event; throwing a dice is an event, scoring a six is an outcome

output the result after a number has been acted upon by a function

per cent out of 100; the symbol for this is %

perimeter the length of the boundary of a flat shape (the perimeter of a circle is called the circumference)

pictogram a simple graph made up of pictures or symbols to represent information

pie chart a circle split into sectors, each sector represents its share of the whole

probability a number between 0 and 1, used to measure the chance that something will happen

probability scale a number line to show probabilities

proper fraction a fraction in which the numerator is smaller than the denominator

protractor a curved device used for drawing and measuring angles

range the difference between the largest and smallest number in a set

ratio an amount compared to another amount, using the symbol :

reflect transform a shape, resulting in the mirror image of that shape

remainder the number that is left after a division; 20 divided by 7 has a remainder of 6

rotational symmetry a shape that can be rotated a fraction of a whole turn and looks the same

round make an approximation of a number, to a given accuracy

ruler a device used for drawing straight lines and measuring distances

scale a number of marks along a line used in making measurements; equal distances usually represent equal amounts

sequence a set of numbers arranged in order, according to a rule

simplest form dividing all parts of a fraction or ratio by their highest common factor

simplify (fraction) find an equivalent fraction with smaller numbers

solve calculate the value of any unknown letter(s) in an equation

substituting replacing part of an expression, usually a letter, with another value, usually a number

surface area the area of the faces of a solid or 3D shape

term-to-term rule a rule to find a term of a sequence given the previous term

translate transform a shape, resulting in each part of the shape being moved the same distance in the same direction

unit fraction a fraction that has a numerator of 1

vertices plural of vertex: a point where the edges of a 2D or 3D shape meet

volume the space occupied by a solid or 3D shape