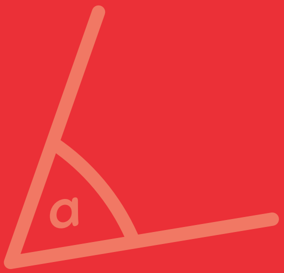
Primary
Practice

million

radius

$2n + 4 = 10$



Maths Practice Year 6

mean

−32

algebra

Answers

geometry

$3(2 + 1) = 9$

6:4:3

Includes explanations

Schofield&Sims

Notes for parents and carers

These answers are provided to accompany the **Maths Practice Year 6 Question Book**, which is part of the **Schofield & Sims Primary Practice Maths** series. Answers for all books in the series can be downloaded from the **Schofield & Sims** website.

The structure

This PDF contains answers for every question in the book. Navigate the PDF document by clicking on the hyperlink for the desired topic in the Contents page. Questions are presented in the order they appear in the book.

In most units, explanations are included for each set of questions to support understanding of the objective being covered. These explanations may suggest methods for working through each question. Explanations are also supplied for questions that children may find particularly challenging. Question number references have been added to answers when explanations from earlier questions may aid understanding.

In the 'Final practice' section, explanations have been provided for every question. Marking guidance is provided alongside the explanation to demonstrate how to allocate partial and full credit for work as applicable.

Using the answers

Encourage children to work through each question carefully. They should begin by reading the question thoroughly and identifying key terminology before forming their answer.

Although units have been included with these answers to aid understanding, note that children do not need to write the units in their answers for the answers to be marked correct unless it is specified in the question that units should be included.

Some questions in the **Maths Practice Year 6 Question Book** have multiple answers. The explanations accompanying the answers in this document indicate where this is the case. For these questions, accept any possible answers according to the limits laid out. There is no preference for any examples provided in this document over other possible answers not listed and no preference for answers listed first.

Where children have given an answer that is not correct, it may be useful to work through the question with them to correct any misunderstandings.

Marking the 'Final practice' section

The timing for the 'Final practice' section is intended as a guide only. Some children may prefer to work through the section with a longer time limit or without a time limit.

The marking guidance for some questions indicates that children may receive one mark for a correct method that would lead to a correct answer. This is intended to recognise ability in cases where children have used the correct method but have made a calculation error that has led to the use of incorrect figures in their calculation.

After completing the 'Final practice' section, children may choose to revise topics that they have identified as challenging. If they are comfortable with the material already covered, you may wish to print out and award the editable certificate from the **Schofield & Sims** website to recognise their achievement. The child may then wish to expand their learning by completing the **KS2 SATs Maths and English Practice Papers**.

Contents

Number and place value (pages 4–5)

Practise

1. **a.** 300 000 or three hundred thousand(s)

When working out number and place value, it can be helpful to put numbers into place value columns to show their value. For example:

M	HTh	TTh	Th	H	T	O
8	3	1	7	5	9	6

This shows that in the seven-digit number 8 317 596 there are 8 millions, 3 hundred thousands, 1 ten thousand, 7 thousands, 5 hundreds, 9 tens and 6 ones. The digit 3 appears in the hundred thousands column, so it is worth 300 000 or three hundred thousand.

b. 7000 or seven thousand(s)

c. 8 000 000 or eight million(s)

2. 2 498 132 498 065

Use place value columns for each number. Identify any number with the digit 4 in the hundred thousands column.

3. 6 357 056 47 920 867 034

4. **a.** 2 897 066, 2 953 678, 2 953 864, 2 978 351, 2 978 435

Use place value columns. The seven-digit numbers with the greatest value use the highest value digits. Work from the left-hand column to the right. All the numbers have 2 millions, so compare the hundred thousands digits. The number with the fewest hundred thousands is 2 897 066. Continue to compare the numbers with 2 900 000 by checking the ten thousands digits.

b. 6 923 875, 6 924 714, 7 034 829, 7 034 902, 7 040 956

c. 967 044, 970 689, 1 119 742, 1 208 656, 1 210 865

5. **a.** 6 032 409

Use place value columns. Write the number of millions in the millions column. This is 6. Use three digits to write the number of thousands. This is 032. Use three digits to write the hundreds, tens and ones. This is 409.

M	HTh	TTh	Th	H	T	O
6	0	3	2	4	0	9

Make sure that there is a 0 in the hundred thousands column and in the tens column.

b. 5 004 653

c. 1 105 074

d. 2 917 300

Extend

6. **a.** >

Use place value to compare the numbers. If necessary, write them in a place value chart. The number in words is 965 727 in digits. This has 0 millions and 6 023 968 has 6 millions, so 6 023 968 > 965 727.

b. <

c. >

7. **a.** 8 or 9

If 4 597 248 is less than 4 59? 019, then the thousands digit must be either 8 or 9 as both numbers have 4 590 000.

b. 0 or 1

c. 8 and 1

d. 0

8. **a.** 4 730 772

Write 4 930 472 in a place value chart. Subtract 200 000 and add 300.

	M	HTh	TTh	Th	H	T	O
	4	9	3	0	4	7	2
−		2	0	0	0	0	0
	4	7	3	0	4	7	2
+					3	0	0
	4	7	3	0	7	7	2

b. 9 570 928

Apply

9. **a.** £2 875 000

It may be helpful to use a place value chart to identify the greatest number. All the numbers have a 2 in the millions column, so move on to the hundred thousands column. Three numbers have an 8 in this column, so move on to the ten thousands column. 7 is the highest number in this column, so £2 875 000 is the correct answer.

b. 2 872 000

c. **i.** 10

ii. 100

Rounding numbers (pages 6–7)

Practise

1. **a.** 3 827 000 3 830 000 3 800 000 4 000 000

When rounding a number, find the place value column of the value to be rounded. This shows the values of the two nearest multiples of the value to be rounded. Then use the following digit to decide whether to round up or down. The digit in the thousands column is 7, so the number could be rounded to 3 827 000 or 3 828 000. Check the number in the column immediately to the right, which is the hundreds column. If the digit is 0, 1, 2, 3 or 4, then round down. If the digit is 5, 6, 7, 8 or 9, then round up. It is a 4, so round down to 3 827 000.

b. 6 174 000 6 170 000 6 200 000 6 000 000

c. 4 551 000 4 550 000 4 600 000 5 000 000

d. 629 000 630 000 600 000 1 000 000

e. 361 000 360 000 400 000 0

2. **a.** **i.** 2 300 000

Use the number line. There are ten divisions to show an increase of one million (from 2 000 000 to 3 000 000). Each division must represent 1 000 000 ÷ 10 = 100 000. Count along three divisions to the first arrow. This is 300 000. The arrow is pointing to 2 300 000.

ii. 2 800 000

iii. 640 000

iv. 650 000

b. **i.** 2 000 000

2 300 000 lies between two multiples of one million: 2 000 000 and 3 000 000. Use the number line to check which multiple 2 300 000 is nearer to.

ii. 3 000 000

iii. 600 000

iv. 700 000

Extend

3. **a.** **i.** 9 875 412

To make the largest possible number, the digits of the greatest value must be in the place value columns of the greatest value. The number must be an even number, so the lowest value even number must be placed in the ones column. The remaining digits must be placed from highest to lowest from left to right.

ii. 9 875 000

iii. 9 900 000

iv. 10 000 000

b. **i.** 1 245 789

ii. 1 246 000

iii. 1 200 000

iv. 1 000 000

4. **a.** 4 249 999

If a number rounded to the nearest hundred thousand is 4 200 000, the next multiple of a hundred thousand is 4 300 000. A number half-way between 4 200 000 and 4 300 000 would be 4 250 000 and would be rounded up to 4 300 000 to the nearest hundred thousand. However, 4 249 999 (which is 1 less) would be rounded down to 4 200 000.

b. 4 150 000

Apply

5. **a.** 5 200 000

b. 3 000 000

c. **i.** 380 000km

ii. 400 000km

d. **i.** 18 000 000km/min

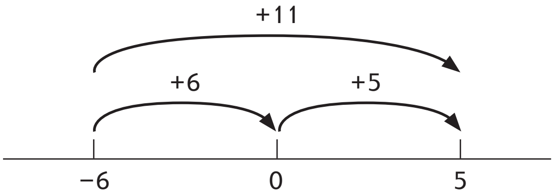
ii. 18 000 000km/min

Negative numbers (pages 8–9)

Practise

1. **a.** 11

Use a number line to find the difference. Count up from −6 to 0. This is +6. Count up from 0 to 5. This is +5. Add the two steps. 6 + 5 = 11.



b. 10

c. 19

d. 17

e. 20

f. 32

g. 32

h. 32

2. **a.** 6 floors

Use the illustration as a number line and count the jumps between the buttons. Remember to include the ground floor when counting. Alternatively, use the method used in **Question 1**. The ground floor will be 0 on the number line.

b. 5 floors

c. 4 floors

d. 9 floors

e. 11 floors

f. 10 floors

g. 9 floors

Extend

3. **a.** 14

Use the method used in **Question 1**. This is an addition calculation. The quick method for these questions is to treat the negative as a positive number because the difference between the negative number and zero is the same as the size of the negative number. Add to the second number. 5 + 9 = 14.

b. 18 **c.** 22 **d.** 29

4. **a.** 7°C

Use the method used in **Question 3**.

b. 13°C **c.** 8°C **d.** 9°C

Apply

5. **a.** 9 − 16 = −7

Look for a difference of 7 between any two of the numbers. 16 − 9 = 7. Change the order of the calculation because the answer is −7. 9 − 16 = −7.

b. 11 − 25 = −14

c. 8 − 16 = −8

d. 8 − 21 = −13

e. 16 − 25 = −9

f. 9 − 21 = −12

6. **a.** 4°C

Find the temperature at 6 p.m. 6°C − 10°C = −4°C. Find the difference in the temperatures at 6 p.m. and midnight. This is the difference between −4°C and −8°C. Use a number line if necessary.

b. £43

c. 4504m

Estimation (pages 10–11)

Practise

1. **a.** 400 000 + 300 000 = 700 000

416 823 rounded to the nearest 100 000 is 400 000. Identify the hundred thousands digit, which is the 4 in 416 823. This shows the two nearest multiples of a hundred thousand are 400 000 and 500 000. Check the next digit to the right, which is the ten thousands digit.
If it is 0, 1, 2, 3 or 4, round down to 400 000.
If it is 5, 6, 7, 8 or 9, round up to 500 000.
In this case, the digit is 1, so round down.
291 738 rounded to the nearest 100 000 is 300 000. Add the two rounded numbers: 400 000 + 300 000 = 700 000.

b. 420 000 + 290 000 = 710 000

c. 417 000 + 292 000 = 709 000

d. 416 800 + 219 700 = 708 500

2. **a.** 800 000 − 300 000 = 500 000

b. 760 000 − 330 000 = 430 000

c. 763 000 − 327 000 = 436 000

d. 762 900 − 327 500 = 435 400

3. **a.** 78 379 − 36 543 = 41 836
or 78 379 − 42 836 = 35 543

The inverse operation is an opposite calculation that begins with the answer (78 379) and subtracts the second number (36 543). If the calculation is correct, the answer to the inverse calculation will be the first number (42 836). The inverse calculation is 78 379 − 36 543 = 41 836. The first number in the original calculation is 42 836, so the calculation is not correct.

b. 51 710 + 14 384 = 66 094

c. 942 565 − 109 758 = 832 807
or 942 565 − 843 817 = 98 748

d. 216 120 + 304 823 = 520 943

e. 313 624 + 53 421 = 367 045
or 313 624 + 847 834 = 1 161 458

Extend

4. **a.** 70 000 × 7 = 490 000

Multiply 7 by 7. 7 × 7 = 49. Multiply the product by 10 000. 49 × 10 000 = 490 000.

b. 63 000 ÷ 9 = 7000

c. 108 000 ÷ 12 = 9000

5. **a.** 512

Calculate the actual answer of 26 204 + 18 308. 26 204 + 18 308 = 44 512. Calculate the estimated answer of 26 000 + 18 000. 26 000 + 18 000 = 44 000. Find the difference by subtraction. 44 512 − 44 000 = 512.

b. 212

Use the method used in **Question 5a**. 49 365 − 22 577 = 26 788. 50 000 − 23 000 = 27 000. 27 000 − 26 788 = 212.

Apply

6. **a.** 800 000 − 40 000 = 760 000

Accept other rounded calculations (for example: 800 000 − 35 000 = 765 000) supported by evidence that the calculation has been completed mentally (for example: no formal written method).

b. 5000 × 70 = 350 000

Accept other rounded calculations with a mentally calculated answer.

c. 5000 ÷ 50 = 100

Accept other rounded calculations with a mentally calculated answer.

7. **a.** 3000 ÷ 400 = 7(r.200)

Change 3 litres to millilitres so the units are the same. 3 litres × 1000 = 3000ml. Estimate the size of one 410ml glass as 400ml. Divide the quantity of juice by the estimated size of one glass. 3000 ÷ 400 = 7r.200. The answer is 7 full glasses.

b. 15 × 40 = £6 (or £6.00 or 600p)

c. 2000 ÷ 250 = 8

Special numbers (pages 12–13)

Practise

1. **a.** Multiples of 6: 6, 12, ⑱, 24, 30, ㊱, 42, 48, (54), 60, 66, (72), 78, 84, (90), 96

Multiples of 9: 9, ⑱, 27, ㊱, 45, (54), 63, (72), 81, (90), 99

Multiplying two whole numbers gives a multiple of both numbers. List the multiples of 6 that are less than 100. List the multiples of 9 that are less than 100. Common multiples are multiples of both numbers. They will be on both lists. The numbers that need to be circled are: 18, 36, 54, 72 and 90.

b. Multiples of 12: 12, 24, 36, 48, (60), 72, 84, 96

Multiples of 15: 15, 30, 45, (60), 75, 90

2. **a.** Factors of 48: ①, ②, ③, ④, ⑥, 8, ⑫, 16, 24, 48

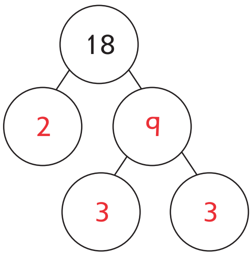
Factors of 60: ①, ②, ③, ④, 5, ⑥, 10, ⑫, 15, 20, 30, 60

Dividing a number by a whole number and getting a whole number answer gives a factor of the number. List the factors of 48 and then list the factors of 60. Common factors are factors of both numbers. They will be on both lists. The numbers that need to be circled are: 1, 2, 3, 4, 6, and 12.

b. Factors of 42: ①, ②, 3, 6, ⑦, ⑭, 21, 42

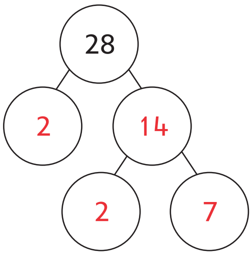
Factors of 56: ①, ②, 4, ⑦, 8, ⑭, 28, 56

3. **a.**



Divide the number in the top circle of the prime factor tree (18) by the smallest prime number that gives a whole number answer (2). 18 ÷ 2 = 9. Write these numbers in the first two empty circles. 9 is not a prime number. It is a composite number. Divide 9 by the smallest prime number (3) that gives a whole number answer (3). Write these numbers in the next two empty circles. 3 is a prime number, so no more prime factors can be found. The prime factor tree is complete.

b.



Extend

4. **a.** 20

Use the method used in **Question 1** to find the common multiples. The lowest common multiple is the common multiple of least value.

b. 6

5. **a.** 1 2 3 4 6 12

Use the method used in **Question 2**.

b. 1 2 3 6 9 18

6. **a.** 18

Use the method used in **Question 2** to find the common factors. The highest common factor is the common factor of greatest value.

b. 12

Apply

7. **a.** 7 + 23 **b.** 11 + 19 **c.** 13 + 17

Prime numbers are numbers that have only two factors, 1 and themselves. 1 is not a prime number because it only has one factor, which is 1. The prime numbers less than 30 are 2, 3, 5, 7, 11, 13, 17, 19, 23 and 29. Find pairs of numbers from this list that total 30.

8. **a.** 18 cards

Read word problems carefully and identify the numbers and operations needed. Find the common factors of 72 and 90. Use the method used in **Question 2**. Find the highest common factor, which is 18.

b. 16:00

Find the common multiples of 15 and 25. Use the method used in **Question 1**. Find the lowest common multiple, which is 75. Add 75 min to the time of 14:45, which gives 16:00. Accept the equivalent time written in other formats.

c. 75 eggs

The multiples of 15 to 100 are 15, 30, 45, 60, 75 and 90. Check to see which of these multiples has a remainder of 3 when divided by 6 and by 8. 75 is the only number that fits the criteria. 75 ÷ 6 = 12r.3. 75 ÷ 8 = 9r.3. There must be 75 eggs.

Multiplication and division (pages 14–15)

Practise

1. **a.** 1776

Set out the multiplication in place value columns.

$$\begin{array}{ccccc} & & & 7 & 4 \\ \times & & & 2 & 4 \\ \hline & & 2 & 9_{1} & 6 \\ & 1 & 4 & 8 & 0 \\ \hline & 1 & 7 & 7 & 6 \\ \hline & & 1 & & \end{array}$$

Multiply by 4 first. 74 × 4 = 296. Then multiply by 20 by first multiplying by 10 (write a 0 in the ones column) and then by 2. 74 × 20 = 1480. Add the two answers. 296 + 1480 = 1776.

b. 1666 **c.** 7000 **d.** 7105

e. 13 188 **f.** 18 792

2. **a.** 436

Set out the division in a division box. Use long division as this helps to work out the remainders for each step.

$$\begin{array}{ccccc} & & 4 & 3 & 6 \\ \cline{2-5} 4 \,\big| & 1 & 7 & 4 & 4 \\ - & 1 & 6 & & \\ \cline{2-3} & & 1 & 4 & \\ & - & 1 & 2 & \\ \cline{2-4} & & & 2 & 4 \\ & & - & 2 & 4 \\ \cline{3-5} & & & & 0 \end{array}$$

Divide from the left. 17 hundreds ÷ 4 = 4 hundreds. Calculate the remainder by writing (4 tens × 4 =) 16 below 17 hundreds. Subtract 16 hundreds from 17 hundreds. 17 hundreds − 16 hundreds = 1 hundred. 1 hundred is the remainder. Exchange 1 hundred for 10 tens. Write the tens (4) beside the now 10 tens. 14 tens ÷ 4 = 3 tens. Subtract 12 tens from 14 tens. 14 tens − 12 tens = 2 tens. 2 tens is the remainder. Exchange 2 tens for 20 ones. Write the ones (4) beside the now 20 ones. 24 ones ÷ 4 = 6 ones. Calculate the remainder by writing (6 ones × 4 =) 24 below 24 ones. Subtract 24 ones from 24 ones. 24 ones − 24 ones = 0. There is no remainder, so the division is complete.

b. 33 **c.** 24 **d.** 45 **e.** 36 **f.** 26

3. **a.** 39

Set out the division in a division box. Although this is a division by a two-digit number, short division can be used because the calculations can be completed mentally.

$$\begin{array}{cccc} & & 3 & 9 \\ \cline{2-4} 20 \,\big| & 7 & 8 & {}^{18}0 \end{array}$$

Divide from the left. 78 tens ÷ 20 = 3 tens r.18 tens. Exchange 18 tens for 180 ones. There is 0 in the ones column, so there are 180 ones altogether. 180 ones ÷ 20 = 9 ones. There is no remainder, so the division is complete.

b. 25 **c.** 16 **d.** 23

e. 29.5 (or 29r.10) **f.** 16

Extend

4. **a.** 54

Use the methods used in **Questions 1**, **2** and **3**. Calculate 45 × 36 = 1620. Use the inverse calculation, which is division, to find the missing number. 1620 ÷ 30 = 54.

b. 25

Calculate 1536 ÷ 24 = 64. Use the inverse calculation, which is division, to find the missing number. 1600 ÷ 64 = 25.

c. 104

d. 105

5. **a.** 17 520

365 × 24 = 8760. The next calculation is 365 × 48. 365 is being multiplied by twice as many (24 × 2 = 48), so the answer will be doubled. 8760 × 2 = 17 520.

b. 14 420

c. 400

d. 250

Apply

6. **a.** The 0 has not been included in the multiplication 436 × 60 to make the answer 10 times larger. 436 has only been multiplied by 6.

Answers may vary. Accept any explanation that show an understanding of the error made in the calculation.

b. The exchanged digit has not been included when the answers from each step of the multiplication are added.

7. 5966

? ÷ 45 = 132r.26. Use an inverse operation to find the missing number. Calculate 132 × 45 = 5940. Add the remainder. 5940 + 26 = 5966.

8. 555 × 55

Use a trial and improvement method. For example: 444 × 44 = 19 536. This answer is too small. Try multiplying larger numbers. 666 × 66 = 43 956. This answer is too large. Try numbers that lie between. 555 × 55 = 30 525. This answer is correct. Alternatively, notice that the ones digit in the answer is 5. The only two single digit numbers that multiply to an answer with 5 as the ones digit is 5 × 5 = 25. Test 555 × 55 = 30 525.

Number word problems (pages 16–17)

Practise

1. **a.** 7948 people

Read word problems carefully and identify the numbers and operations needed. This is a subtraction calculation. Use column subtraction.

$$\begin{array}{rccccc} & \overset{1}{\cancel{2}} & \overset{16}{\cancel{7}} & {}^{1}4 & \overset{7}{\cancel{8}} & {}^{1}6 \\ - & 1 & 9 & 5 & 3 & 8 \\ \hline & & 7 & 9 & 4 & 8 \\ \hline \end{array}$$

b. **i.** 4192 passengers **ii.** 5476 people

c. **i.** 84 seats **ii.** 117 seats

d. 6240 tins

e. **i.** 15 coaches **ii.** 18 seats

f. 2500 sheets

Extend

2. **a.** **i.** £251.16

Multiply the cost of one pack by the number of packs. Use an adjustment strategy. £2.99 is almost £3, so use £3 instead to make the calculation easier. 84 × £3 = £252. This is not the correct answer as it £0.01 × 84 too large. £0.01 × 84 = £0.84. Correct the answer by making an adjustment. £252 − £0.84 = £251.16.

ii. 336 cards **iii.** 84 pages

b. **i.** 241 920 pencils **ii.** 40 320 packs

Apply

3. **a.** Always true ☑

Investigate the statement by trying different examples. Try to think of examples that might prove or disprove the statement as well as any logical reasons why it might always or never be true. With this statement, whether the numbers have four or three digits is irrelevant. Every odd number is an even number plus one. If it is added to an even number, it will make an even number plus one. The statement is always true.

b. Sometimes true ☑

c. Sometimes true ☑

d. Never true ☑

4. **a.** 6881 candles

Each box has 24 candles and there are 286 full boxes. Use multiplication to find the number of candles. 286 × 24 = 6864. There are 17 candles left over, so add these to 6864. 6864 + 17 = 6881.

b. 46 boxes

Accept an answer correctly calculated using an incorrect answer given in **Question 4a**.

Order of operations (pages 18–19)

Practise

1. **a.** 13

Follow the order of operations using BIDMAS. B = Brackets. I = Indices. DM = Division and multiplication. AS = Addition and subtraction. The rules state that division must be done before addition. 20 ÷ 4 = 5. 8 + 5 = 13.

b. 28 **c.** 45 **d.** 20 **e.** 11
f. 21 **g.** 51 **h.** 76 **i.** 12
j. 48 **k.** 8 **l.** 20

2. **a.** 7

The rules state that calculations in brackets must be done first. 8 + 20 = 28. 28 ÷ 4 = 7.

b. 8 **c.** 60 **d.** 60 **e.** 3
f. 3 **g.** 72 **h.** 40 **i.** 3
j. 48 **k.** 30 **l.** 10

Extend

3. **a.** 17

The rules state that indices must be calculated first. 3^2 = 9. 6 + 5 × 4 − 9. The rules state that multiplication must be done before addition and subtraction. 5 × 4 = 20. 6 + 20 − 9. The rules state that addition and subtraction are done in the order they appear. 6 + 20 − 9. 26 − 9 = 17.

b. 31 **c.** 84 **d.** 510 **e.** 0 **f.** 55

4. **a.** 35

Use the methods used in **Questions 1**, **2** and **3**.

b. 4 **c.** 2 **d.** 700 **e.** 2 **f.** 25

Apply

5. **a.** [✓ (24 + 6) ÷ 3 − 2 = 8]

Calculate each equation using the methods used in **Questions 1**, **2** and **3**. 24 + 6 ÷ 3 − 2 = 24. 24 + 6 ÷ (3 − 2) = 30.

b. [✓ 40 − 5 × (2 + 2) = 20]

6. **a.** 20 + 5 × (4 + 6) = 70

Add a pair of brackets in different places in the equation and calculate to find the answer 70. Use the methods used in **Questions 1**, **2** and **3**.

b. (80 − 20) ÷ 2 − 1 = 29

c. 25 × (5 + 5) − 5 = 245

d. 30 + 6 ÷ (2 × 3) = 31

e. 16 + 24 ÷ (4 × 2) = 19

f. 10 × (10 ÷ 10 + 10) = 110

7. [✓ 3 (8 + 6)]

[✓ 3 × 8 + 3 × 6]

[✓ (6 + 8) × 3]

Use the methods used in **Questions 1**, **2** and **3**.

Equivalent fractions (pages 20–21)

Practise

1. **a.** $\frac{5}{6}$

Simplify $\frac{10}{12}$ by finding a common factor of 10 and 12. The common factor is 2. It is best to find the highest common factor possible. Divide the numerator and the denominator by the common factor. 10 ÷ 2 = 5. 12 ÷ 2 = 6. The simplified fraction is $\frac{5}{6}$.

b. $\frac{2}{3}$ **c.** $\frac{1}{2}$ **d.** $\frac{3}{4}$ **e.** $\frac{1}{3}$
f. $\frac{9}{10}$ **g.** $\frac{2}{9}$ **h.** $\frac{2}{5}$ **i.** $\frac{2}{5}$

2. **a.** 18

In this pair of fractions, both denominators are shown: 4 and 24. Work out how many times the denominator has been increased. 24 ÷ 4 = 6. Increase the numerator by the same number. 3 × 6 = 18. The equivalent fraction is $\frac{18}{24}$.

b. 8 **c.** 9 **d.** 6 **e.** 24 **f.** 28

3. **a.** 20

In this pair of fractions, both numerators are shown: 3 and 15. Work out how many times the numerator has been increased. 15 ÷ 3 = 5. Increase the denominator by the same number. 4 × 5 = 20. The equivalent fraction is $\frac{15}{20}$.

b. 25 **c.** 30 **d.** 24 **e.** 30 **f.** 100

Extend

4. **a.** $\frac{3}{8} = \frac{6}{16} = \frac{12}{32}$

Use the methods used in **Questions 2** and **3**.

b. $\frac{2}{5} = \frac{4}{10} = \frac{16}{40}$

c. $\frac{2}{3} = \frac{8}{12} = \frac{24}{36}$

d. $\frac{10}{25} = \frac{2}{5} = \frac{40}{100}$

5. Simplify to $\frac{2}{3}$: $\frac{16}{24}$ $\frac{24}{36}$

Simplify to $\frac{3}{4}$: $\frac{21}{28}$ $\frac{24}{32}$

Simplify to $\frac{3}{5}$: $\frac{21}{35}$ $\frac{27}{45}$ $\frac{24}{40}$

Simplify to $\frac{5}{8}$: $\frac{25}{40}$ $\frac{30}{48}$ $\frac{45}{72}$

Simplify the fractions. Use the method used in **Question 1**.

6. **a.** $\frac{20}{30}$ $\frac{24}{30}$ $\frac{9}{30}$

Use the denominators of all three fractions (3, 5 and 10) to find the lowest common multiple. Here the lowest common multiple is 30. Change all three fractions to thirtieths. Use the method used in **Question 2**. $\frac{2}{3} = \frac{20}{30}$. $\frac{4}{5} = \frac{24}{30}$. $\frac{3}{10} = \frac{9}{30}$.

b. $\frac{21}{24}$ $\frac{20}{24}$ $\frac{2}{24}$

Apply

7. **a.** $\frac{3}{10}$

In this question, 15 out of 50 crayons are red. This can be written as the fraction $\frac{15}{50}$. Simplify the fraction. Use the method used in **Question 1**. Using the common factor 5, $\frac{15}{50}$ simplifies to $\frac{3}{10}$.

b. $\frac{3}{5}$ **c.** $\frac{7}{10}$ **d.** $\frac{1}{5}$

8. **a.** $\boxed{\frac{27}{33}}$

Simplify each of the fractions. Use the method used in **Question 1**. Identify the fraction that is different. $\frac{27}{33}$ simplifies to $\frac{9}{11}$, while the other three fractions all simplify to $\frac{4}{5}$.

b. $\boxed{\frac{25}{30}}$

Comparing and ordering fractions (pages 22–23)

Practise

1. **a.** $<$

Compare the fractions by changing them so they have the same denominator. Find the lowest common multiple of the denominators. Here the lowest common multiple is 10. Change $\frac{1}{2}$ and $\frac{3}{5}$ to tenths. $\frac{1}{2} = \frac{1 \times 5}{2 \times 5} = \frac{5}{10}$. $\frac{3}{5} = \frac{3 \times 2}{5 \times 2} = \frac{6}{10}$. Compare the fractions as tenths. $\frac{5}{10} < \frac{6}{10}$ so $\frac{1}{2} < \frac{3}{5}$.

b. $<$ **c.** $>$ **d.** $=$ **e.** $>$ **f.** $>$

g. $>$ **h.** $=$ **i.** $=$ **j.** $=$ **k.** $<$

l. $<$

2. **a.** $\frac{1}{2}$ $\frac{7}{12}$ $\frac{5}{8}$ (accept $\frac{12}{24}$ $\frac{14}{24}$ $\frac{15}{24}$)

Change the fractions so they all share a common denominator. Use the method used in **Question 1**.

b. $\frac{3}{5}$ $\frac{7}{10}$ $\frac{3}{4}$ (accept $\frac{12}{20}$ $\frac{14}{20}$ $\frac{15}{20}$)

c. $\frac{5}{8}$ $\frac{11}{16}$ $\frac{3}{4}$ (accept $\frac{10}{16}$ $\frac{11}{16}$ $\frac{12}{16}$)

d. $\frac{2}{3}$ $\frac{7}{9}$ $\frac{5}{6}$ (accept $\frac{12}{18}$ $\frac{14}{18}$ $\frac{15}{18}$)

e. $\frac{3}{5}$ $\frac{2}{3}$ $\frac{11}{15}$ (accept $\frac{9}{15}$ $\frac{10}{15}$ $\frac{11}{15}$)

Extend

3. **a.** $<$ $<$

Change the fractions so they all share a common denominator. Use the method used in **Question 1**. $\frac{3}{20}$ is already in twentieths. $\frac{2}{5} = \frac{8}{20}$. $\frac{1}{2} = \frac{10}{20}$. Compare the numerators to check the order. Here the fractions begin with the lowest.

Add the ‘is less than’ symbol. $\frac{3}{20} < \frac{8}{20} < \frac{10}{20}$.

b. $>$ $>$

c. $>$ $>$

d. $<$ $<$

4. **a.** 13

Change the fractions so they all share a common denominator. Use the method used in **Question 1**. $\frac{7}{10} = \frac{14}{20}$. $\frac{3}{5} = \frac{12}{20}$. Compare the numerators. Here there is only one possibility for the numerator if the fractions are to be in order. It must be $\frac{13}{20}$.

b. 4 **c.** 11 **d.** 19

Apply

5. **a.** Nisha

Change the fractions so they all share a common denominator. Use the method used in **Question 1**. Look for the smallest fraction as that person must have the most homework left to do.

b. green

c. Arjun

d. Because $\frac{3}{8} + \frac{7}{24} + \frac{5}{12} = \frac{9}{24} + \frac{7}{24} + \frac{10}{24} = \frac{26}{24} = 1\frac{2}{24} = 1\frac{1}{12}$. $1\frac{1}{12}$ is more than 1.
Accept any explanation that shows the fractions have a total greater than 1.

Adding and subtracting fractions (pages 24–25)

Practise

1. **a.** $\frac{9}{6}$ (or $\frac{3}{2}$ or $1\frac{3}{6}$ or $1\frac{1}{2}$)

Only add fractions when they have the same denominator. Find the lowest common denominator for sixths and thirds. This is 6. $\frac{5}{6}$ is already in sixths. $\frac{2}{3} = \frac{4}{6}$. Add the numerators. $\frac{5}{6} + \frac{4}{6} = \frac{9}{6}$. This is an improper fraction and can be changed into a mixed number. $\frac{9}{6} = 1\frac{3}{6}$. $1\frac{3}{6}$ can be simplified to $1\frac{1}{2}$.

b. $\frac{11}{8}$ (or $1\frac{3}{8}$)

c. $\frac{19}{12}$ (or $1\frac{7}{12}$)

d. $\frac{12}{10}$ (or $\frac{6}{5}$ or $1\frac{2}{10}$ or $1\frac{1}{5}$)

e. $\frac{11}{12}$

f. $1\frac{2}{15}$

2. **a.** $\frac{5}{10}$ (or $\frac{1}{2}$)

Use the method used in **Question 1** for addition, but subtract the numerators.

b. $\frac{8}{25}$ **c.** $\frac{13}{30}$ **d.** $\frac{7}{24}$ **e.** $\frac{25}{36}$ **f.** $\frac{11}{30}$

3. **a.** $5\frac{17}{24}$

Add the whole numbers. $2\frac{1}{3} + 3\frac{3}{8} = 5 + \frac{1}{3} + \frac{3}{8}$. Convert the fractions so that they have the same denominators and add the fractions. $\frac{8}{24} + \frac{9}{24} = \frac{17}{24}$. $5 + \frac{17}{24} = 5\frac{17}{24}$.

b. $4\frac{3}{20}$

c. $1\frac{7}{12}$

Change the mixed numbers into improper fractions. $3\frac{1}{3} - 1\frac{3}{4} = \frac{10}{3} - \frac{7}{4}$. Convert the fractions so that they have the same denominators and subtract the fractions. $\frac{40}{12} - \frac{21}{12} = \frac{19}{12}$. Convert the fraction into a mixed number. $\frac{19}{12} = 1\frac{7}{12}$.

d. $\frac{13}{20}$ **e.** $5\frac{23}{30}$ **f.** $4\frac{1}{15}$

Extend

4. **a.** $\frac{11}{20}$

Use an inverse operation to find the missing fraction. $1\frac{1}{4} - \frac{7}{10}$. Use the method used in **Question 3c**.

b. $\frac{13}{20}$ **c.** $\frac{5}{24}$ **d.** $\frac{19}{12}$ (or $1\frac{7}{12}$)

e. 0 (or $\frac{0}{24}$) **f.** $\frac{7}{24}$

5. **a.** $\frac{2}{3} + \frac{4}{5}$

Accept fractions in either order for addition calculations. Try different combinations of the numbers as numerators and denominators. The denominator of the answer gives a hint. 15 is a common multiple of the two denominators, which must be 3 and 5.

b. $\frac{3}{4} + \frac{2}{5}$ **c.** $\frac{3}{4} - \frac{2}{5}$ **d.** $\frac{4}{5} - \frac{2}{3}$

Apply

6. **a.** $\frac{9}{40}$

Use the methods used in **Questions 1** and **2**.

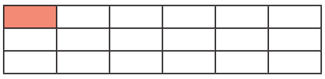
b. $\frac{21}{40}$ **c.** $7\frac{29}{30}$ bags **d.** $1\frac{7}{20}$km

Multiplying and dividing fractions (pages 26–27)

Practise

1. **a.** $\frac{1}{18}$

Multiply the numerators, then multiply the denominators. 1 × 1 = 1. 3 × 6 = 18. So $\frac{1}{6} \times \frac{1}{3} = \frac{1 \times 1}{6 \times 3} = \frac{1}{18}$. A rectangle can also be used to multiply $\frac{1}{6}$ by $\frac{1}{3}$. Divide the length into sixths so there are 6 parts. Divide the width into thirds so there are 3 parts. This means that the whole rectangle is divided into 18 parts. The numerators of the fractions shows there is one column and one row. This gives $\frac{1}{18}$. The shaded area shows the answer.



b. $\frac{3}{24}$ (or $\frac{1}{8}$) **c.** $\frac{1}{24}$ **d.** $\frac{2}{24}$ (or $\frac{1}{12}$)

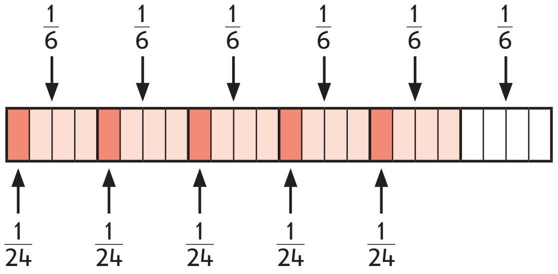
e. $\frac{2}{20}$ (or $\frac{1}{10}$) **f.** $\frac{2}{12}$ (or $\frac{1}{6}$) **g.** $\frac{3}{10}$

h. $\frac{3}{20}$ **i.** $\frac{8}{15}$ **j.** $\frac{7}{16}$

k. $\frac{9}{32}$ **l.** $\frac{3}{20}$

2. **a.** $\frac{5}{24}$

Multiply the denominator by the whole number. 6 × 4 = 24. So $\frac{5}{6} \div 4 = \frac{5}{6 \times 4} = \frac{5}{24}$.
A rectangle can also be used to divide $\frac{5}{6}$ by 4. Divide the whole rectangle into sixths. Divide each sixth into 4 parts to give 24 altogether. Each of these parts is $\frac{1}{24}$. As each of the $\frac{5}{6}$ has been divided into four parts, the answer is $\frac{5}{24}$. The dark shaded area shows the answer.



b. $\frac{3}{24}$ (or $\frac{1}{8}$) **c.** $\frac{1}{18}$ **d.** $\frac{3}{12}$ (or $\frac{1}{4}$)
e. $\frac{2}{20}$ (or $\frac{1}{10}$) **f.** $\frac{4}{10}$ (or $\frac{2}{5}$) **g.** $\frac{1}{5}$
h. $\frac{3}{32}$ **i.** $\frac{1}{100}$ **j.** $\frac{5}{12}$
k. $\frac{1}{20}$ **l.** $\frac{5}{24}$

Extend

3. **a.** $\frac{1}{5}$

To find the answer when multiplying fractions, multiply the numerators and then multiply the denominators. If the answer is $\frac{1}{15}$, the multiplication must have been $\frac{1}{3} \times \frac{1}{?} = \frac{1 \times 1}{3 \times ?} = \frac{1}{15}$. Use an inverse operation to find the missing denominator: 15 ÷ 3 = 5. The missing denominator must be 5 because $\frac{1}{3} \times \frac{1}{5} = \frac{1}{15}$.

b. $\frac{1}{4}$ **c.** $\frac{2}{5}$ **d.** $\frac{3}{5}$
e. $\frac{3}{4} \times \frac{3}{5}$ **f.** $\frac{4}{5} \times \frac{2}{3}$

4. **a.** $\frac{1}{2}$

To find the answer when dividing fractions, divide the denominator by the divisor. If the answer is $\frac{1}{10}$, then the division must have been: $\frac{1}{?} \div 5 = \frac{1}{? \times 5} = \frac{1}{10}$. Use an inverse operation to find the missing denominator: 10 ÷ 5 = 2. The missing denominator must be 5 because $\frac{1}{2} \div 5 = \frac{1}{10}$.

b. $\frac{7}{4}$ **c.** 3 **d.** $\frac{3}{7}$ **e.** $\frac{2}{7}$ **f.** $\frac{3}{8}$

5. **a.** $\frac{2}{3}$

Use the information in the multiplication. An equivalent fraction for $\frac{1}{12}$ with a numerator of 2 must be $\frac{2}{24}$. This means the calculation can be written as: $\frac{1}{8} \times \frac{2}{?} = \frac{1 \times 2}{8 \times ?} = \frac{2}{24} = \frac{1}{12}$.
Use an inverse operation to find the missing denominator: 24 ÷ 8 = 3. The missing denominator must be 3 because $\frac{1}{8} \times \frac{2}{3} = \frac{1}{12}$.

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

c. $\frac{3}{4}$ (or any equivalent fraction)

Apply

6. **a.** $\frac{12}{20}$m^2 (or $\frac{3}{5}$m^2)
Use the methods used in **Questions 1** to **5**.

b. $\frac{4}{20}$ (or $\frac{1}{5}$)

c. **i.** 2kg

ii. $\frac{2}{20}$kg (or $\frac{1}{10}$kg)

d. $\frac{6}{15}$ (or $\frac{2}{5}$)

Decimals (pages 28–29)

Practise

1. **a.** $\frac{7}{100}$ or 0.07

Use the place value of each digit in the number. If it helps, use a place value chart with the number. Read the place value for the digit 7. Here the digit 7 is in the hundredths column, so it has a value of seven hundredths or $\frac{7}{100}$.

H	T	O	.	t	h
3	2	5	.	8	7

b. $\frac{7}{1000}$ or 0.007

c. 70

d. $\frac{7}{1000}$ or 0.007

e. $\frac{7}{10}$ or 0.7

f. $\frac{7}{1000}$ or 0.007

2. **a.** 2.085 32.98 4924.681
b. 3.042 56.932 0.862

3. **a.** 470

When multiplying or dividing by 10, 100 or 1000, use a place value chart. Each column is ten times larger than the column to its right. Moving digits 2 columns to the left makes them 100 times larger. Add placeholder zeros to make sure the digit appears in the correct place value columns. 4.7 × 100 = 470.

TTh	Th	H	T	O	.	t	h	th
				4	.	7		

		4	7	0	.			

b. 8.308 **c.** 97.65 **d.** 5936 **e.** 90

f. 0.028 **g.** 0.6 **h.** 9010

Extend

4. **a.** $\frac{972}{1000}$ = 0.972

Use a place value chart. Add the digit 9 to the tenths column, the digit 2 to the thousandths column and the digit 7 to the hundredths column. As there are no whole numbers, also add a placeholder zero to the ones column.

TTh	Th	H	T	O	.	t	h	th
				0	.	9	7	2

b. $\frac{691}{1000}$ = 0.691

c. $\frac{237}{1000}$ = 0.237

d. $\frac{39}{1000}$ = 0.039

5. **a.** 100

Use the methods used in **Question 3** to work out how many columns the digits have moved left or right. The digits have moved two columns to the left, so the number has been multiplied by 100.

b. 1000

c. 7032

d. 2.005

Apply

6. **a.** 3.627 or 3.672 or 3.726

Use a place value chart to identify numbers that are greater than 3.5 and less than 3.75, using the digits 2, 3, 6 and 7 only. The digit 3 must be in the ones column. The tenths column must be 6 or 7. All four digits must be used.

O	.	t	h	th
3	.	5		
3	.	6	2	7
3	.	6	7	2
3	.	7	2	6
3	.	7	5	

b. 6.327 or 6.372 or 6.723 or 6.732

7. **a.** $4 + \frac{7}{10} + \frac{6}{100} + \frac{8}{1000}$ **b.** $\frac{476}{100} + \frac{8}{1000}$

Answers will vary. Accept any correct partitioning of 4.768 except $\frac{47}{10}$ and $\frac{68}{1000}$ because that has been used in the question. Use the methods used in **Question 4**.

8. **a.** 47.905 sec

Order the numbers using place value. Remember that the fastest time will have the lowest value. Circle the third fastest time.

T	O	.	t	h	th
4	7	.	7	8	4
4	7	.	8		
4	7	.	9	0	5
4	8	.	0	2	
4	8	.	1	8	2
4	8	.	6	2	

b. 7.107m

Remember that the longest length will have the greatest value. Circle the fourth longest length.

Multiplying decimals (pages 30–31)

Practise

1. **a.** 2.4

The key multiplication fact is 3 × 8 = 24. 0.3 is ten times smaller than 3, so the answer of 24 must be made ten times smaller too. 24 ÷ 10 = 2.4. 0.3 × 8 = 2.4.

b. 1.8 **c.** 2.1 **d.** 3.2

e. 4.5 **f.** 4.9

2. **a.** 0.14

The key multiplication fact here is 2 × 7 = 14. 0.02 is one hundred times smaller than 2, so the answer of 14 must be made one hundred times smaller too. 14 ÷ 100 = 0.14. 0.02 × 7 = 0.14.

b. 0.44 **c.** 0.36 **d.** 0.27

e. 0.54 **f.** 0.6 **g.** 0.64

h. 0.56

3. **a.** 5

Use the method used in **Question 1**, but also use an inverse operation. Make 0.3 a whole number (0.3 × 10 = 3) and multiply 1.5 by the same number (1.5 × 10 = 15). 15 ÷ 3 = 5. 3 × 5 = 15. 0.3 × 5 = 1.5.

b. 0.9 **c.** 0.6 **d.** 4

e. 9 **f.** 0.04 **g.** 0.09

h. 5

Extend

4. **a.**

$$\begin{array}{rrcrrr} & 4 & . & 2 & 6 & 8 \\ \times & & & & & 7 \\ \hline & 0 & . & 0 & \boxed{5} & 6 \\ & 0 & . & 4 & \boxed{2} & \\ & \boxed{1} & . & 4 & & \\ 2 & 8 & & & & \\ \hline \boxed{2} & 9 & . & \boxed{8} & 7 & 6 \\ \hline \end{array}$$

Partition 4.268 into 4 + 0.2 + 0.06 + 0.008. Multiply each partition by 7, beginning with 0.008. 0.008 × 7 = 0.056. 0.06 × 7 = 0.42. 0.2 × 7 = 1.4. 4 × 7 = 28. Add these answers: 0.056 + 0.42 + 1.4 + 28 = 29.876.

b.

$$\begin{array}{rrcrrr} & 3 & . & 7 & 3 & 5 \\ \times & & & & & 3 \\ \hline & 0 & . & \boxed{0} & \boxed{1} & 5 \\ & 0 & . & 0 & 9 & \\ & \boxed{2} & . & 1 & & \\ & \boxed{9} & & & & \\ \hline \boxed{1} & 1 & . & 2 & \boxed{0} & 5 \\ \hline \end{array}$$

c.

$$\begin{array}{rrcrrr} & 5 & . & 1 & 7 & 4 \\ \times & & & & & 6 \\ \hline & 0 & . & \boxed{0} & 2 & \boxed{4} \\ & \boxed{0} & . & 4 & \boxed{2} & \\ & 0 & . & \boxed{6} & & \\ 3 & \boxed{0} & & & & \\ \hline 3 & \boxed{1} & . & \boxed{0} & 4 & \boxed{4} \\ \hline \end{array}$$

d.

$$\begin{array}{rrcrrr} & 4 & . & 9 & 0 & 7 \\ \times & & & & & 7 \\ \hline & 0 & . & \boxed{0} & 4 & \boxed{9} \\ & 0 & . & \boxed{0} & & \\ & \boxed{6} & . & \boxed{3} & & \\ 2 & \boxed{8} & & & & \\ \hline 3 & \boxed{4} & . & \boxed{3} & 4 & \boxed{9} \\ \hline \end{array}$$

Apply

5. **a.** 2.25kg
Use the method used in **Question 4**.

b. £67.60
Do not accept £67.6.

c. 3.262 litres

d. 8.1 metres

e. 5.425km

Dividing decimals (pages 32–33)

Practise

1. **a.** 12.5
Complete as a short division, but add zeros as needed for remainders. 5 tens ÷ 4 = 1 ten r.1 ten. 10 ones ÷ 4 = 2 ones r.2 ones. Add a decimal point to the question and answer. 20 tenths ÷ 4 = 5 tenths.

$$\begin{array}{r|l} \multicolumn{1}{r}{} & 1\;\;2\;.\;5 \\ \cline{2-2} 4 & 5\;{}^{1}0\;.\;{}^{2}0 \end{array}$$

b. 14.2 **c.** 13.8 **d.** 48.5

2. **a.** 12.25
Use the method used in **Question 1**, but add a hundredths column.

b. 4.25 **c.** 6.75 **d.** 12.25

3. **a.** 92
Use an inverse operation. 18.4 × 5 = 92. 92 ÷ 5 = 18.4.

b. 4 **c.** 274 **d.** 207

4. **a.** 0.6
There are two methods. Change $\frac{3}{5}$ into a fraction that can be written as a decimal, such as tenths, hundredth or thousandths. $\frac{3}{5} = \frac{?}{10}$. $\frac{3}{5} = \frac{?}{5 \times 2}$ so $\frac{3}{5} = \frac{3 \times 2}{5 \times 2} = \frac{6}{10}$. Place the digit 6 in the tenths column of a place value chart along with a placeholder zero. $\frac{6}{10}$ = 0.6. Alternatively, think of this as a dividing calculation: 3 ÷ 5. Use the method used in **Question 1**. $\frac{3}{5}$ = 0.6.

$$\begin{array}{r|l} \multicolumn{1}{r}{} & 0\;.\;6 \\ \cline{2-2} 5 & 3\;.\;{}^{3}0 \end{array}$$

b. 0.25 **c.** 0.8 **d.** 0.35

e. 0.04 **f.** 0.125

Extend

5. **a.** 43 ÷ 5 = 8.6

Use the inverse calculation, which is multiplication, to test the numbers. Check that the answer to the multiplication can be represented by two of the cards. For example: 8.6 × 2 = 17.2 cannot be represented by two of the cards. Work through the multiplications until 8.6 × 5 = 43, which can be represented by two of the cards. The inverse calculation is 43 ÷ 5 = 8.6.

b. 62 ÷ 4 = 15.5

c. 42 ÷ 5 = 8.4

d. 45 ÷ 2 = 22.5

6. **a.** 84.0 ÷ 5 = 16.8

Work through the calculation from the beginning. ? ÷ 5 = 1r.3. This must be 1 × 5 + 3 = 8. The first missing number is 8. 34 ÷ 5 = 6r.4. The second missing number must be 6.

b. 73.88 ÷ 4 = 18.47

c. 51.44 ÷ 8 = 6.43

d. 89.58 ÷ 6 = 14.93

Apply

7. **a.** £19.25

Use the methods used in **Questions 1** and **2**.

b. 1.25m

c. 10.5 litres

d. 17.75km

e. 20.5kg

Fractions, decimals and percentages (pages 34–35)

Practise

1. **a.** 0.8 = 80%

Change $\frac{4}{5}$ into a decimal. $\frac{4}{5} = \frac{?}{5 \times 2}$ so $\frac{4}{5} = \frac{4 \times 2}{5 \times 2} = \frac{8}{10}$. As a decimal $\frac{8}{10}$ = 0.8. Percentages are 'out of one hundred'. Write $\frac{8}{10}$ as hundredths. $\frac{8}{10} = \frac{?}{10 \times 10}$ so $\frac{8}{10} = \frac{8 \times 10}{10 \times 10} = \frac{80}{100}$. $\frac{80}{100}$ = 80%.

b. 0.34 = 34%

c. 0.65 = 65%

d. 0.68 = 68%

e. 0.9 = 90%

f. 0.5 = 50%

2. **a.** 15% = $\frac{3}{20}$

Change 0.15 to a percentage. Percentages are 'out of one hundred'. Write 0.15 as hundredths. Use place value columns. 0.15 = $\frac{15}{100}$ = 15%. Change 0.15 to a fraction. Use the place value columns for decimals. 0.15 = $\frac{15}{100}$. $\frac{15}{100}$ can be simplified by dividing the numerator and denominator by the common factor 5. $\frac{15}{100} = \frac{15 \div 5}{100 \div 5} = \frac{3}{20}$.

b. 24% = $\frac{6}{25}$ **c.** 46% = $\frac{23}{50}$ **d.** 99% = $\frac{99}{100}$

e. 70% = $\frac{7}{10}$ **f.** 8% = $\frac{2}{25}$

3. **a.** 0.35 = $\frac{7}{20}$

Change 35% to a decimal. 35% is 35 out of 100, which can be written as the fraction $\frac{35}{100}$. $\frac{35}{100}$ as a decimal is 0.35. Change 35% to a fraction. $\frac{35}{100}$ can be simplified by dividing by the common factor 5. $\frac{35}{100} = \frac{35 \div 5}{100 \div 5} = \frac{7}{20}$.

b. 0.16 = $\frac{4}{25}$ **c.** 0.9 = $\frac{9}{10}$ **d.** 0.78 = $\frac{39}{50}$

e. 0.05 = $\frac{1}{20}$ **f.** 0.06 = $\frac{3}{50}$

Extend

4. **a.** >

Change $\frac{1}{5}$ and 0.18 to the same format. Change $\frac{1}{5}$ to a decimal. $\frac{1}{5}$ = 0.2. Compare 0.2 and 0.18. 0.2 is larger than 0.18, so use the 'greater than' symbol. $\frac{1}{5}$ > 0.18.

b. > **c.** > **d.** < **e.** < **f.** =

5. $\frac{8}{10}$, 80%, $\frac{40}{50}$, 0.8

Change all the fractions, decimals and percentages to fractions and simplify any fractions. Circle those equivalent to $\frac{4}{5}$.
45% = $\frac{45}{100} = \frac{9}{20}$. $\frac{8}{10} = \frac{4}{5}$. 0.45 = $\frac{45}{100} = \frac{9}{20}$.
80% = $\frac{80}{100} = \frac{4}{5}$. $\frac{40}{50} = \frac{4}{5}$. 0.8 = $\frac{8}{10} = \frac{4}{5}$.

6. $\frac{30}{50}$, 0.6, $\frac{12}{20}$, 60.0%, 0.60

7. 0.45, $\frac{6}{12}$, 55%, 0.6, $\frac{13}{20}$

Change all the fractions, decimals and percentages to the same format, such as decimals. 55% = 0.55. 0.6 is already a decimal. $\frac{13}{20}$ = 0.65. 0.45 is already a decimal. $\frac{6}{12}$ = 0.5. Use place value to arrange the fractions, decimals and percentages in order, starting with the smallest: 0.45, $\frac{6}{12}$, 55%, 0.6, $\frac{13}{20}$.

Apply

8. **a.** 1%

Turn each score into a fraction. $\frac{17}{20}$ and $\frac{21}{25}$. Then turn each fraction into a percentage. $\frac{17}{20}$ is $\frac{85}{100} = 85\%$. $\frac{21}{25} = \frac{84}{100} = 84\%$. Find the difference between the percentages. 85% − 84% = 1%.

b. $\frac{44}{100}$ (or $\frac{11}{25}$)

c. $\frac{8}{100}$ (or $\frac{2}{25}$)

d. $\frac{74}{100}$ (or $\frac{37}{50}$)

Fractions word problems (pages 36–37)

Practise

1. **a.** $\frac{2}{15}$

Add the fractions for the red and blue counters together. $\frac{2}{3} + \frac{1}{5} = \frac{10}{15} + \frac{3}{15} = \frac{13}{15}$. Subtract the total from 1 whole. $1 = \frac{15}{15}$. $\frac{15}{15} - \frac{13}{15} = \frac{2}{15}$. There are $\frac{2}{15}$ yellow counters.

b. **i.** $1\frac{3}{10}$km

Turn the distances into improper fractions to subtract them. $5\frac{1}{10} - 3\frac{4}{5} = \frac{51}{10} - \frac{19}{5}$. Make sure the fractions have the same denominator. $\frac{19}{5} = \frac{38}{10}$. $\frac{51}{10} - \frac{38}{10} = \frac{13}{10}$. Turn the fraction into a mixed number. $\frac{13}{10} = 1\frac{3}{10}$.

ii. 1km

$1\frac{3}{10}$ is less than $1\frac{1}{2}$, so round down to 1km.

c. 85%

$\frac{17}{20} = \frac{85}{100} = 85\%$.

d. $2\frac{2}{3}$ hours

Make sure all the fractions have the same denominator. $\frac{3}{4} = \frac{9}{12}$. $1\frac{1}{2} = 1\frac{6}{12}$. $\frac{5}{12}$ is already in twelfths. Add them together. $\frac{9}{12} + 1\frac{6}{12} + \frac{5}{12} = 1 + \frac{20}{12}$. Turn the fraction into a mixed number and simplify. $1 + 1\frac{8}{12} = 2\frac{8}{12} = 2\frac{2}{3}$.

e. **i.** 28.35mm

3.15 × 9 = 28.35.

ii. 28mm

28.35 rounded to the nearest whole is 28.

iii. 85.5g

9.5 × 9 = 85.5.

iv. 86g

85.5 rounded to the nearest whole is 86.

Extend

2. **a.** $\frac{7}{15}$

$\frac{2}{3} - \frac{1}{5} = \frac{10}{15} - \frac{3}{15} = \frac{7}{15}$

b. $\frac{3}{16}$

Divide the remaining amount of lemonade between the four friends. 1500ml ÷ 4 = 375ml. Turn the 375ml into a fraction of the original 2 litres, making sure that both are in the same units. 2l = 2000ml. $\frac{375}{2000}$. Simplify the fraction. $\frac{375}{2000} = \frac{3}{16}$.

c. £48.90

Do not accept £48.9 as money is always written with two decimal places. £12.45 × 6 = £74.70. £9.55 × 8 = £76.40. £74.70 + £76.40 = £151.10. £200 − £151.10 = £48.90.

d. $\frac{3}{8}$ 0.375 37.5%

The gauge is showing 8 divisions and the pointer is pointing to the third division. This is $\frac{3}{8}$. $\frac{3}{8}$ as a decimal is 3 ÷ 8 = 0.375. 0.375 as a percentage is 0.375 × 100 = 37.5%.

Apply

3. **a.** $\frac{4}{15}$

$\frac{2}{3} \times \frac{2}{5} = \frac{2 \times 2}{3 \times 5} = \frac{4}{15}$.

b. 39 questions

35 out of 50 = $\frac{35}{50}$. $\frac{35}{50} = \frac{35 \times 2}{50 \times 2} = \frac{70}{100} =$ 70%. 70% + 8% = 78%. 78% of 50 = 39.

c. **i.** £261.60

Do not accept £261.6 because money is always written with two decimal places. 20% = $\frac{1}{5}$. £327 ÷ 5 = £65.40. £327 − £65.40 = £261.60.

ii. £163.50

Do not accept £163.5. $1 - \frac{3}{8} = \frac{5}{8}$. $\frac{5}{8}$ of £261.60 = £261.60 ÷ 8 × 5 = £32.70 × 5 = £163.50.

iii. £164

£163.50 rounded to the nearest whole number is £164.

d. 3%

Turn each mark into a percentage. 13 out of 20 = $\frac{13}{20} = \frac{13 \times 5}{20 \times 5} = \frac{65}{100} = 65\%$. 17 out of 25 = $\frac{17}{25} = \frac{17 \times 4}{25 \times 4} = \frac{68}{100} = 68\%$. Subtract the smaller percentage from the larger percentage. 68% − 65% = 3%.

e. 98 counters
$\frac{7}{25}$ of 500 are red. 500 ÷ 25 × 7 = 140 red counters. 30% of 140 are small and red. 140 ÷ 10 × 3 = 42 small, red counters. 140 − 42 = 98 large, red counters.

Ratio (pages 38–39)

Practise

1. a. 3
There are five shaded counters. Count the number of unshaded counters.

b. 8

c. 5

2. a. 7
Use the method used in **Question 1**.

b. 10

c. 3

3. a. 2
The statement refers to 6 black squares. 3 white squares is half of 6, so the number of black squares must be half the number given in the statement. Half of 4 black squares is 2.

b. 50 **c.** 18 **d.** 18

Extend

4. a. 1:2 (accept 4:8)
There are 4 squares. There are 8 other shapes. The ratio must be 4:8. This can be simplified to 1:2.

b. 1:3 (accept 3:9)

c. 4:5:3

5. a. 4:1
Find the highest common factor of 16 and 4. The highest common factor is 4. Divide each number in the ratio by the highest common factor. 16 ÷ 4 = 4. 4 ÷ 4 = 1. The simplified ratio is 4:1.

b. 2:3 **c.** 2:3 **d.** 3:5

6. a. 25 (accept 10:25) **b.** 4 (accept 4:10)
If the ratio is 2:5 and one of the numbers is 10, then it could represent the 2 or the 5. If it is the 2, then 10 ÷ 2 = 5, so the 2 has been increased by a factor of 5. Increasing the 5 by a factor 5 would be 25. If it is the 5, then 10 ÷ 5 = 2, so the 5 has been increased by a factor of 2. Increasing the 2 by a factor of 2 would be 4. If one number in the ratio is 10, then the ratios could be 10:25 or 4:10.

Apply

7. a. i. 9 laps
Running 4 laps for every 3 that she jogs is a ratio of 4:3. If Zoe runs 12 laps, this is 3 lots of 4 so she needs to jog 3 lots of 3. 3 × 3 = 9. Zoe must have jogged 9 laps.

ii. 16 laps

b. i. 12 cars

ii. £75

c. 7:5

d. i. 150ml

ii. 300ml

iii. 1280ml

Proportion (pages 40–41)

Practise

1. a. $\frac{5}{12}$
5 out of 12 can be written as a fraction. 12 is the whole, written as the denominator, and 5 is the number being used, written as the numerator. The fraction is $\frac{5}{12}$.

b. $\frac{9}{10}$ **c.** $\frac{2}{5}$ **d.** $\frac{3}{10}$ **e.** $\frac{13}{25}$

f. $\frac{3}{8}$ **g.** $\frac{2}{9}$ **h.** $\frac{2}{3}$ **i.** $\frac{3}{4}$

2. a. 24 35 80
Identify the factor increase of the known number. To get 21, 7 has been increased by a factor of 3. 7 × 3 = 21. Increase 8 by a factor of 3. 8 × 3 = 24. To get 40, 8 has been increased by a factor of 5. 8 × 5 = 40. Increase 7 by a factor of 5. 7 × 5 = 35. To get 70, 7 has been increased by a factor of 10. 7 × 10 = 70. Increase 8 by a factor of 10. 8 × 10 = 80.

b. 20 21 48

c. 5 24 54

d. 8 27 72

3. a. 84kg
6 boxes have a mass of 42kg. 12 boxes is 6 boxes increased by a factor of 2, so the mass of 42kg must be increased by a factor of 2. 42kg × 2 = 84kg.

b. 120 toys

c. 3600cm^3

d. 2700ml

e. 84 eggs

f. 1.08 litres

Extend

4. £38.40

Find how much 24 of each item costs. Puzzles are £2.75 for 6. 24 ÷ 6 = 4. £2.75 × 4 = £11. Pencils are £1.40 for 12. 24 ÷ 12 = 2. £1.40 × 2 = £2.80. Bubble blowers are £1.20 for 2. 24 ÷ 2 = 12. £1.20 × 12 = £14.40. Mini games are £3.40 for 8. 24 ÷ 8 = 3. £3.40 × 3 = £10.20. Add the totals together. £11 + £2.80 + £14.40 + £10.20 = £38.40.

5. **a.** 1000ml (or 1l)

Use the method used in **Question 3**.

b. 5 lemons

c. 2400ml (or 2.4l)

d. 1200ml (or 1.2l)

e. 15 people

f. 60 strawberries

Apply

6. **a.** £0.72

There are 1000g in 1kg. 600g is $\frac{3}{5}$ of 1000g. The cost must be $\frac{3}{5}$ of £1.20. £1.20 = 120p. 120 ÷ 5 × 3 = 72.

b. 2.25kg 0.75kg

c. £19.20

Do not accept £19.2.

d. **i.** £0.96

ii. 187.5g

e. **i.** 4.8m

ii. 20 tiles

Unequal sharing (pages 42–43)

Practise

1. **a.** 45 and 30

The amount to be shared is 75. If the ratio is 3:2 this can be seen as 3 shares and 2 shares, so there are 5 shares altogether. As a bar model:

75				
3			2	
15	15	15	15	15
45			30	

75 is the total. 3:2 is the ratio. 75 ÷ 5 = 15. There are 5 shares of 15. The two parts are 45 and 30. 15 × 3 = 45. 15 × 2 = 30.

b. 80 and 40

c. 60 and 240

d. 60 and 100

e. 39 and 52

f. 120 and 24

2. **a.** 45 cards

The proportions can be seen in a bar model.

12 cards	
9 in colour	3 in black and white

The total number of cards has been increased by a factor of 5. The coloured and black and white cards must be increased by the same proportion. There are 45 cards in colour.

60 cards = 12 × 5	
45 in colour = 9 × 5	15 in black and white = 3 × 5

b. 108 cards

c. 48 cards

d. 96 cards

e. 144 cards

f. 60 cards

Extend

3. **a.** 36 24

Use the method used in **Question 1**. 60 ÷ 5 = 12. For the larger amount, multiply by 3. 12 × 3 = 36. For the smaller amount, multiply by 2. 12 × 2 = 24.

b. 3:2 30

Put the larger and smaller amount in a ratio and simplify. 18:12 = 3:2. Add the two amounts together to get the total. 18 + 12 = 30.

c. 5:1 6

d. 5:2 4

4. **a.** 12 3

Use the method used in **Question 2**. The part given in the original proportion is 3 out of 4, so the part remaining is 1 out of 4. The part given has been multiplied by 3, so the part remaining is 3. 3 + 9 = 12. This is the total.

b. 10 15

c. 4 out of every 5 4

d. 3 out of every 4 12

Apply

5. **a.** £1
Use the methods used in **Questions 1** and **2**.
b. 10 litres
c. **i.** 40 sandwiches **ii.** 3:2 **iii.** $\frac{2}{5}$

Finding percentages (pages 44–45)

Practise

1. **a.** 90%
A percentage is a fraction of 100 written as a number using the symbol %, which is said 'per cent'. 'per cent' means 'out of 100'. If a fraction is not written as hundredths, it must be changed to hundredths. To change $\frac{9}{10}$ into hundredths, multiply both the numerator and denominator by 10. $\frac{9}{10} = \frac{9 \times 10}{10 \times 10} = \frac{90}{100}$. $\frac{90}{100}$ can be written as 90 out of 100, which is 90%.
b. 23% **c.** 5% **d.** 83%
e. 50% **f.** 9%

2. **a.** > >
Change all the numbers to the same format, such as decimals. $\frac{7}{10}$ = 0.7. 0.69 is already a decimal. 68% = 0.68. 0.7 is greater than 0.69, which is greater than 0.68. Use the 'greater than' symbol.
b. = = **c.** < < **d.** < <

3. **a.** 16
20% = $\frac{1}{5}$. $\frac{1}{5}$ of 80 = 80 ÷ 5 = 16.
b. 48 **c.** 32.5 **d.** 72
e. 45 **f.** 225
g. 90
First find 10%. 10% = $\frac{1}{10}$. $\frac{1}{10}$ of 300 = 300 ÷ 10 = 30. Then find 30%. 30% = $\frac{3}{10}$. 30 × 3 = 90.
h. 891 **i.** 98 **j.** 4.5

Extend

4. **a.** 60
25% = $\frac{1}{4}$. If 15 = $\frac{1}{4}$, then the whole (100%) will equal $\frac{4}{4}$. 15 × 4 = 60.

15	15	15	15
60			

b. 25 **c.** 350 **d.** 50
e. 60 **f.** 500

5. **a.** =
Use the methods used in **Question 3**, then compare the amounts.
b. < **c.** = **d.** >
e. = **f.** <

Apply

6. **a.** 8 questions
Use the methods used in **Questions 1** and **3**.
b. 20 questions
c. 200 children
d. 168 cans
This is a two-step question. First, work out 70% of 1600 to find the number of cans of cola. 10% = $\frac{1}{10}$. $\frac{1}{10}$ of 1600 = 1600 ÷ 10 = 160. 70% = $\frac{7}{10}$. $\frac{7}{10}$ of 1600 = 1600 ÷ 10 × 7 = 1120. Then work out 15% of 1120 cans of cola to find out the number of cans of diet cola. 15% = 10% + 5%. 10% = $\frac{1}{10}$. $\frac{1}{10}$ of 1120 = 1120 ÷ 10 = 112. 5% is half of 10%. Half of 112 = 56. 112 + 56 = 168. 168 cans of diet cola were delivered.
e. 5 questions
f. 582 photos

Scale factors (pages 46–47)

Practise

1. Quadrilateral A: 14cm 12cm
Quadrilateral B: 45cm 54cm
The scale factor is 3. To find the missing sides on Quadrilateral A, divide the corresponding sides of Quadrilateral B by the scale factor. 42cm ÷ 3 = 14cm. 36cm ÷ 3 = 12cm. To find the missing sides on Quadrilateral B, multiply the corresponding sides of Quadrilateral A by the scale factor. 15cm × 3 = 45cm. 18cm × 3 = 54cm.

2. **a.** 32.5cm
b. 5.1cm
c. 16.5cm

Extend

3. Triangle G: 8cm and 10cm
Triangle H: 12cm
Triangle I: 42cm
Use the method used in **Question 1**.

4. 60cm, 72cm and 100cm

5. 2.5

Apply

6. **a.** 1 : 100

Identify the scale factor by checking the measurements. 15cm × (a scale factor) = 15m. Change the units to be the same. 15m = 1500cm. So, 15cm × (a scale factor) = 1500cm. Use an inverse operation to identify the scale factor. 1500 ÷ 15 = 100. Every centimetre on the plan represents 100 centimetres in real life. The scale is 1 : 100.

b. **i.** 10 squares

ii. 5 rectangles

c. 28cm and 14cm

Algebraic expressions (pages 48–49)

Practise

1. **a.** $a + 5$ or $5 + a$

Use a and add 5 using those terms and the operator. $a + 5$.

b. $e + 4$ or $4 + e$

c. $f - 7$

d. $h - 9$

e. $6i$

Terms using multiplication do not use the multiplication sign but are written together. The number is usually written first. 6 multiplied by i is written as $6i$.

f. $8j$

g. $\frac{k}{4}$ (accept $k \div 4$)

Division is written as a fraction. The dividend (term being divided) is written as the numerator and the divisor is the denominator. k divided by 4 is written as $\frac{k}{4}$.

h. $\frac{10}{l}$ (accept $10 \div l$)

2. **a.** $\boxed{12n - 2}$

There are a number of 'n's, which can be grouped together, in this case by adding. The number 2 cannot be included with the 'n's and must remain separate. $5n + 7n - 2 = 12n - 2$.

b. $\boxed{4n + 8}$

Extend

3. **a.** $m + 7$

Use the method used in **Question 1**.

b. $\frac{n}{3}$

c. $5p$

d. $q - 8$

4. **a.** $4r - 6$

Use the method used in **Question 1** but make sure that the order of the two operations is correct.

b. $\frac{t}{2} + 4$

c. $\frac{u - 6}{5}$

d. $5v + 3$

5. **a.** **i.** 26

If $x = 4$, then 4 can replace x in the expression. Remember $5x$ means $5 \times x$. This becomes 5×4. $5x + 6 = 5 \times 4 + 6 = 20 + 6 = 26$.

ii. 66

b. 3

$5x + 6 = 21$. Use inverse operations to find the value of x. Use the same operations on both sides of the equation. Subtract 6 from both sides. $5x + 6 - 6 = 21 - 6$. $5x = 15$. Divide both sides by 5. $\frac{5x}{5} = \frac{15}{5}$. $x = 3$.

Apply

6. **a.** $x - 8$

Read the statement and reduce it to the terms and operations given in the question. Use the method used in **Question 1**. Accept any letter in place of x throughout and accept any use of currency signs (£) throughout. x is the total amount of pocket money. Oliver has spent £8, so he has £8 less than he started with. This means £8 has been subtracted from the total amount. Write this as $x - 8$.

b. $\frac{x}{2}$

Accept $x \div 2$.

c. $x + 20$

Accept $20 + x$.

d. $2x$

Accept $2 \times x$ or $x \times 2$.

e. $x - \frac{x}{8} + 5$

Accept $5 + x - \frac{x}{8}$.

Unknowns (pages 50–51)

Practise

1. **a.** 15

The total is 32, a number is subtracted and 17 is left. This can be shown as a bar model.

By subtracting 17 from 32, the unknown number can be found. 32 − 17 = 15.

32	
■	17

b. 9 **c.** 48 **d.** 6

e. 5$\frac{1}{2}$ (accept 5.5) **f.** 41

2. **a.** ■ = 30 ● = 20

The three squares in the horizontal row total 90. Each square must have a value of 30, as 90 ÷ 3 = 30. The square and the circle in the vertical column total 50. The circle must have a value of 20 as 50 − 30 = 20.

b. ■ = 25 ● = 5

c. ■ = 30 ● = 10

d. ■ = 50 ● = 40

Extend

3. **a.** $a = 2$ $b = 4$

If a is half the value of b then $b = 2a$. $a + 2b = 10$. As a bar model:

a	$2b$			
a	b		b	
10				
a	a	a	a	a
2	2	2	2	2
2	4		4	

$2b = b + b$. $a + b + b = 10$. $b = 2a = a + a$, so $a + a + a + a + a = 10$. 10 ÷ 5 = 2. $a = 2$ and $b = 4$.

b. $c = 20$ $d = 10$

c. $e = 5$ $f = 15$

d. $g = 8$ $h = 2$

4. **a.** $a = 10$ $b = 2$

$a + b = 12$ and $a - b = 8$. a and b are whole numbers and total 12. $a + b$ could be 11 + 1, 10 + 2, 9 + 3, 8 + 4, 7 + 5, 6 + 6 and the reverse additions. $a - b = 8$. Select the pair of numbers that subtract to give 8. This must be 10 − 2. $a = 10$ and $b = 2$.

b. $c = 15$ $d = 5$

c. $e = 12$ $f = 4$

d. $g = 60$ $h = 1$

Apply

5. **a.** **i.** Coffee = £3 **ii.** Tea = £2.60

Do not accept £2.6. A cup of coffee costs 40p more than a cup of tea. If a cup of coffee costs 40p more than a cup of tea, then a cup of coffee costs a cup of tea + 40p. So 3 cups of coffee will cost 3 cups of tea + £1.20 (3 × 40p). 4 cups of tea + £1.20 = £11.60. £11.60 − £1.20 = £10.40. A cup of tea costs £2.60 (£10.40 ÷ 4). A cup of coffee costs £3 (£2.60 + 40p).

b. 12cm 6cm

3A + B = 42. A = 2B. 3A = 6B. The bar is equivalent to 6B + B = 7B. B = 42 ÷ 7 = 6. A = 6 × 2 = 12.

c. 4 2

The maths books cost £8, which is £3 more than the reading books. Reading books cost £8 − £3 = £5 each. Rishi spends £42 altogether and buys 6 books. Work out the first six multiples of £8 and £5.

Number of books	Maths books	Reading books
1	£8	£5
2	£16	£10
3	£24	£15
4	£32	£20
5	£40	£25
6	~~£48~~	£30

Find a total for maths books and a total for reading books that combine to £42. Remember that there must be 6 books in total. 4 maths books cost £32. 2 reading books cost £10.

Variables (pages 52–53)

Practise

1. **a.** ● = 1 ■ = 7 or
● = 2 ■ = 5 or
● = 4 ■ = 1

Accept any pair of correct answers. The total of two circles and one square is 9. Try a number and work logically. If a circle is 1, then two circles will be 2, which means that the square must be 7 (9 − 2). If a circle is 2, then two circles will be 4, which means that the square must be 5 (9 − 4). If a circle is 3, then two circles will be 6, which means that the square must be 3 (9 − 6). This cannot be correct as the circle and the square represent different numbers. If a circle is 4, then two circles will be 8, which means that the square must be 1 (9 − 8). Other numbers are not possible as their total would be greater than 9.

b. ▲ = 1 ◆ = 8 or
▲ = 2 ◆ = 5 or
▲ = 3 ◆ = 2

2. a. A = 1 B = 5 or A =7 B = 3 or
A = 10 B = 2 or A = 13 B = 1
Accept any three of the answer pairs.

b. C = 1 D = 7 or C = 4 D = 5 or
C = 7 D = 3 or C = 10 D = 1
Accept any three of the answer pairs.

3. a. *e* = 1 *f* = 48 or *e* = 48 *f* = 1 or
e = 2 *f* = 24 or *e* = 24 *f* = 2 or
e = 3 *f* = 16 or *e* = 16 *f* = 3 or
e = 4 *f* = 12 or *e* = 12 *f* = 4 or
e = 6 *f* = 8 or *e* = 8 *f* = 6
Accept any three of the answer pairs.

b. *g* = 1 *h* = 36 or *g* = 36 *h* = 1 or
g = 2 *h* = 18 or *g* = 18 *h* = 2 or
g = 3 *h* = 12 or *g* = 12 *h* = 3 or
g = 4 *h* = 9 or *g* = 9 *h* = 4
Accept any three of the answer pairs.

Extend

4. a. Accept any two numbers where *j* is 9 less than *k*. For example: 1 and 10 or 2 and 11. Use the method used in **Question 1**.

b. Accept any two numbers where *m* is 2 greater than *n*. For example: 3 and 1 or 4 and 2.

c. Accept any correct solution where *p* is 5 less than *qr*. For example: 1, 2 and 3 or 2, 1 and 7.

d. Accept any correct solution. For example: 1, 6, 2 and 3 or 2, 4, 8 and 1.

5. a. *w* = 1 *x* = 10 or *w* = 2 *x* = 8 or
w = 3 *x* = 6 or *w* = 5 *x* = 2
Accept any three of the answer pairs.

b. *y* = 1 *z* = 4 or *y* = 5 *z* = 3 or
y = 9 *z* = 2 or *y* = 13 *z* = 1
Accept any three of the answer pairs.

Apply

6. a. 33 years or 36 years or 39 years
If Max is over 10 years, he could be 11 years. Samir would be 33 years (11 × 3). If Max is 12 years, Samir would be 36 years (12 × 3). If Max is 13 years, Samir would be 39 years (13 × 3). Max and Samir cannot be any older as Samir is under 40 years.

b. 35p or 65p or 75p or 80p

c. i. 3 cups of coffee and 3 cups of tea

ii. 1 cup of coffee and 6 cups of tea

d. 1 box of 6 eggs and 4 boxes of 12 eggs or
3 boxes of 6 eggs and 3 boxes of 12 eggs or
5 boxes of 6 eggs and 2 boxes of 12 eggs or
7 boxes of 6 eggs and 1 box of 12 eggs
Accept any two correct answers.

Formulae and linear sequences (pages 54–55)

Practise

1. a. 54cm
Substitute known values into a formula. The formula for finding the perimeter of a rectangle is $P = 2(L + W)$. If the length is 15cm and the width is 12cm, then these measurements need to be substituted for *L* and *W*. $P = 2(L + W)$ so $P = 2(15 + 12) = 2 \times 27 = 54$.

b. 120cm

c. 225cm^2

d. 24.5cm

e. 42cm^2

2. a. 22
To find the 4th term in the sequence $5n + 2$, substitute *n* with 4. $5n + 2$ becomes $5 \times 4 + 2 = 20 + 2 = 22$.

b. 11 **c.** 27

Extend

3. a. $6n - 2$
The sequence is: 4, 10, 16, 22, 28. Each step in the sequence adds 6. There is a connection to multiples of 6, which gives 6*n*. But the sequence does not begin with 6, it begins with 4. This is 2 less than 6, which gives −2. The formula to describe the sequence is $6n - 2$.

b. 70
The formula to describe the sequence is $6n - 2$. To find the 12th term, substitute *n* with 12. $6n - 2$ becomes $6 \times 12 - 2$. $72 - 2 = 70$.
Accept any correct substitution of 12 into an incorrect formula from **Question 3a**. Answers could be 54, 50, 76 or 114.

4. a. $4n + 5$

b. 85
Accept any correct substitution of 20 into an incorrect formula from **Question 4a**. Answers could be 81, 29, 58 or 184.

Apply

5. **a.** No, because the 15th term of the sequence that uses the formula 7*n* − 2 would be 7 × 15 − 2 = 105 − 2 = 103.

Accept any explanation that shows the 15th term is not 102 or that it is 103. Use the method used in **Question 3**.

b. **i.** £24

$C = S(0.45 + 0.15)$. $C = 40(0.45 + 0.15)$. $C = 40 \times 0.6 = 24$.

ii. £72

iii. 400 sandwiches

Substitute the cost of £240 into the formula. $240 = S(0.45 + 0.15)$. $240 = S \times 0.6$. Use the inverse operation $240 \div 0.6 = S$. This is easier as a whole number calculation, so make both 240 and 0.6 ten times larger. $(240 \times 10) \div (0.6 \times 10) = 2400 \div 6 = 400$.

c. **i.** $4n + 8$

Use the method used in **Question 3a**.

ii. 108

Use the method used in **Question 3b**.

Units of measurement (pages 56–57)

Practise

1. **a.** 1050cm

1m = 100cm. Multiply the larger unit (m) by 100. 10.5 × 100 = 1050. 10.5m = 1050cm.

b. 10 500g **c.** 1005ml **d.** 100cm

e. 7.095 litres **f.** 9060m

2. 500mm, 5000mm, 505cm, 5.5m, 5.55m

Accept equivalents of these measurements in this order. Change the lengths to the same units so they can be compared easily, such as cm. 5000mm = 500cm. 5.5m = 550cm. 505cm is already in cm. 5.55m = 555cm. 500mm = 50cm. Order the lengths, starting with the shortest: 50cm, 500cm, 505cm, 550cm, 555cm. Convert the lengths back into their original units.

3. 5.5kg, 5055g, 5050g, 5.005kg, 5kg

Accept equivalents of these measurements in this order.

4. $\frac{1}{2}$ litre, 505ml, 0.55 litres, 555ml, 5 litres

Accept equivalents of these measurements in this order.

5. 60cm = A 925mm = D 0.7m = B 77.5cm = C

Convert the units to metres so they can be placed on the number line. 60cm = 0.6m. 925mm = 0.925m. 0.7m is already in m. 77.5cm = 0.775m. Match the lengths to their places on the number line.

Extend

6. **a.** 275cm

Change the units so they match the units to be used in the answer. 3m = 300cm. Complete the calculation. 300cm − 25cm = 275cm.

b. 2.025kg

c. 1.475 litres

d. 22.5cm

7. **a.** **i.** 64km

Use the approximation 5 miles ≈ 8km. Every 5 miles is approximately 8km. Find the number of 5 miles in 40 miles. 40 ÷ 5 = 8. There are 8 lots of 5 miles in 40 miles, so find 8 lots of 8km to convert the distance. 8 × 8 = 64. 40 miles ≈ 64km.

ii. 25 miles

iii. 160km

iv. 7.5 miles

b. 30cm

c. 36 litres

8. **a.** 4000mm = 400cm

b. 0.4km = 400m

Use the method used in **Question 2** and convert the lengths to the same units.

Apply

9. **a.** 25 days

1.25kg = 1250g. 1250 ÷ 50 = 25. The box of cereal will last 25 days.

b. **i.** 36p

Potatoes cost £1.20 per kg (= for each 1kg). 1kg = 1000g. 300g out of 1000g $= \frac{300}{1000} = \frac{3}{10}$. $\frac{3}{10}$ of £1.20. £1.20 = 120p. 120 ÷ 10 × 3 = 36. 300g of potatoes costs 36p.

ii. 750g

90p out of 120p $= \frac{90}{120} = \frac{3}{4}$. 1kg = 1000g. $\frac{3}{4}$ of 1000g = 1000 ÷ 4 × 3 = 750. 750g of potatoes can be bought for 90p.

c. 320g

Three identical large parcels have a mass of 2.4kg. 2.4kg = 2400g. One large parcel has a mass of 2400g ÷ 3 = 800g. Five identical small parcels have the same mass of 2400g.

One small parcel has a mass of 2400g ÷ 5 = 480g. Find the difference between the masses of a large parcel and a small parcel. 800g − 480g = 320g.

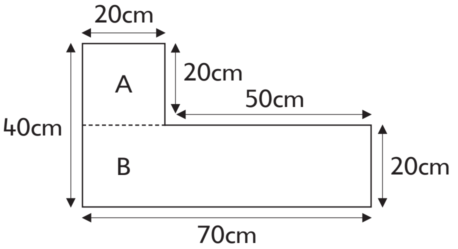
d. 1.425kg
Change the units so they are the same. Grams make the calculation easier. 1.35kg = 1350g. Add 75g to 1350g. 1350g + 75g = 1425g. 1425g = 1.425kg.

e. 1.49m
Nico is 3cm shorter than Chen, who is 1.51m. 1.51m = 151cm. 151cm − 3cm = 148cm. Nico is 148cm tall. Dean is 10mm taller than Nico. 10mm = 1cm. 148cm + 1cm = 149cm. 149cm = 1.49m.

Perimeter and area (pages 58–59)

Practise

1. a. perimeter: 220cm area: 1800cm^2
Divide this rectilinear shape into two rectangles and change the measurements to centimetres. 200mm = 20cm. 0.7m = 70cm. The missing width is 70cm − 50cm = 20cm. The missing height is 40cm − 20cm = 20cm.



Rectangle A is 20cm long and 20cm wide. Rectangle B is 70cm long and 20cm wide. To find the perimeter, use the formula $P = 2(L + W)$ on the whole shape. $P = 2(70 + 40) = 220$cm. For area, use the formula $A = L \times W$ on each rectangle. The area of A = 20cm × 20cm = 400cm^2. The area of B = 20cm × 70cm = 1400cm^2. Add the totals together. 400cm^2 + 1400cm^2 = 1800cm^2.

b. perimeter: 75cm area: 225cm^2
Make sure all the measurements are in the same units. 0.3m = 30cm. Use the formula $A = \frac{1}{2}(B \times H)$. $\frac{1}{2}(30 \times 15) = \frac{1}{2} \times 450 = 225$. The area is 225cm^2.

c. perimeter: 110cm area: 400cm^2
The perimeter is the total of the lengths of the four sides. Use the formula to find the area of a parallelogram: $A = (B \times H)$.

Extend

2. a. length = 24cm width = 1cm

b. length = 12cm width = 2cm

c. length = 6cm width = 4cm
Accept answers in any order. The area is 24cm^2. Find factor pairs of 24. 24 × 1 = 24. 12 × 2 = 24. 6 × 4 = 24. Note that 8 × 3 = 24 is also a factor pair of 24, but is not a correct answer because it has been used in the question.

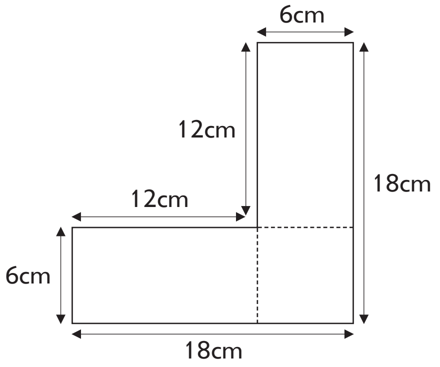
3. a. 10cm
Use the formula for the area of a rectangle: $A = B \times H$. $600 = 60 \times H$. $600 \div 60 = H$. $10 = H$.

b. 20cm
Use the formula for the area of a triangle: $A = \frac{1}{2}(B \times H)$. $600 = \frac{1}{2}(60 \times H)$. $600 \times 2 = (60 \times H)$. $1200 = 60 \times H$. $1200 \div 60 = H$. $20 = H$.

Apply

4. a. 216cm
One side of the hexagon is 72cm ÷ 6 sides = 12cm. There are 18 sides of a hexagon in the perimeter of the new shape. 18 sides × 12cm = 216cm.

b. i. 72cm
Calculate the length of each side. In both cases, the length of the missing side is 18cm − 6cm = 12cm. Total the lengths.



ii. 180cm^2
Use the method used in **Question 1a**.

c. i. 6cm
Use the method used in **Question 1a**.

ii. 18cm^2
Use the method used in **Question 1a**.

d. 675cm^2
Calculate the length and width. The length is three times the width and the perimeter is 120cm. The total of the length and the width

is 60cm. The ratio of the length to width is 3 : 1. The length is 45cm and the width is 15cm. Use the method used in **Question 1a**.

e. 60cm
If the area of a square is 225cm^2, use a trial and improvement method to find the length of one side. The square measures 15cm × 15cm. Use the method used in **Question 1a**.

Volume (pages 60–61)

Practise

1. a. 2400cm^3
Use the formula $V = L \times W \times H$. Change the measurements so they are in the same units. The length (L) = 0.3m, the width (W) = 8cm and the height (H) = 10cm. 0.3m = 30cm. Substitute the measurements into the formula. $V = L \times W \times H = 30 \times 8 \times 10 = 2400$cm^3. The volume is 2400cm^3.

b. 60cm^3 **c.** 64 000cm^3 **d.** 250cm^3

2. a. 375cm^3

b. 50cm
Use an inverse operation using the formula $V = L \times W \times H$. V = 30 000cm^3 = L × 30cm × 20cm. 30 000cm^3 = L × 600cm^2. 30 000cm^3 ÷ 600cm^2 = 50cm.

c. 12cm

Extend

3. a. 16cm^3
Use the net to identify the three dimensions of the cuboid. They are 4cm × 2cm × 2cm. Use the method used in **Question 1**.

b. 12cm^3

4. Accept any three whole numbers that multiply to 240. For example: 20cm × 6cm × 2cm or 12cm × 5cm × 4cm
Two different solutions should be given. Use a knowledge of factors and test any answers.

5. 8cm

Apply

6. a. 6cm
Calculate the volume of the cuboid. 18cm × 4cm × 3cm = 216cm^3. A length cubed equals 216cm^3. Use trial and improvement to find the number. 6cm × 6cm × 6cm = 216cm^3.

b. 98 litres
The height is 5cm less than 40cm. 40cm − 5cm = 35cm. 1000cm^3 = 1 litre. Use the method used in **Question 1**.

c. 3000cm^3
Find the volume of one block. 10cm × 5cm × 5cm = 250cm^3. There are 12 blocks so the volume of the tower will be 250cm^3 × 12 = 3000cm^3.

d. 16 jugs
Find the volume of a 20-centimetre cube. 20cm × 20cm × 20cm = 8000cm^3. 1000cm^3 = 1 litre. 8000cm^3 = 8 litres. $\frac{1}{2}$ litre = 1 jug. 8 litres ÷ $\frac{1}{2}$ litre = 16 jugs.

Measurement word problems (pages 62–63)

Practise

1. a. 18m^2
$A = L \times W$. 4.5m × 4m = 18m^2.

b. 285m
$P = 2(L + W)$. 2 × (80 + 65) = 2 × 145 = 290. Two gates have a length of (2.5m × 2) = 5m. Subtract this from the perimeter. 290m − 5m = 285m.

c. 240 000cm^3
$V = L \times W \times H$. 120cm × 40cm × 50cm = 4800cm^2 × 50cm = 240 000cm^3.

d. 27 minutes
Ten to three is 14:50 in 24-hour time. Count on from 14:50 to 15:17.

e. £32
Harper's share is twice Amy's share. There are three shares in total: Amy's share and 2 × Amy's share for Harper. £48 ÷ 3 = £16. Harper has two shares. £16 × 2 = £32.

f. 480g
2.4kg × 1000 = 2400g. 2400g ÷ 5 = 480g.

g. i. 2.7 litres
1000ml = 1 litre. 225ml × 12 cartons = 2700ml. 2700ml ÷ 1000 = 2.7 litres.

ii. £10.20
Do not accept £10.2. 85p × 12 cartons = 1020p. 1020p = £10.20.

h. 47.25km
1000m = 1km. 6750m × 7 days = 47 250m. 47 250m ÷ 1000m = 47.25km.

i. 3.5m (or 350cm)
100cm = 1m. Convert the measurements to the same units. 5m = 500cm. 500cm − 150cm = 350cm.

Extend

2. **a.** £9.75
£43.50 − £24 = £19.50. £19.50 ÷ 2 = £9.75.

b. 22:03
60 min = 1 hr. 208 min = 3 hr 28 min. 18:35 + 3 hr 28 min = 22:03.

c. **i.** 5
1m = 1000mm. 7m = 7000mm. Count in multiples of 1200mm up to 7000mm. This is 5. There are 5 sets of drawers.

ii. 1m (or 100cm or 1000mm)
1200mm × 5 = 6000mm. 7000mm − 6000mm = 1000mm. 1000mm = 100cm = 1m.

d. **i.** 45cm^2
Find the area of one square. 3cm × 3cm = 9cm^2. Multiply this by 5 to find the area of all five squares. This is the area of the whole face. 9cm^2 × 5 = 45cm^2. Remember to include the correct units.

ii. 225cm^3
Use the area of the end face and multiply by the depth of the shape. 45cm^2 × 5cm = 225cm^3. Remember to include the correct units.

Apply

3. **a.** 85p (or £0.85)
Three packs of 4 cans are needed for 12 cans of cola. £2.25 × 3 = £6.75. Two packs of 6 cans are needed for 12 cans of cola. £2.95 × 2 = £5.90. Subtract to find the difference. £6.75 − £5.90 = £0.85. £0.85 = 85p.

b. 62 days (accept 62.5 days)
1.25kg × 1000 = 1250g. 1250g ÷ 20g per day = 62.5 days. This is 62 whole days.

c. **i.** 660ml
Area of lawn: 22m × 15m = 330m^2. 10ml of lawn feed is needed for every 5m^2, so divide the total area by 5m^2. 330m^2 ÷ 5m^2 = 66. There are 66 sections of lawn that each have an area of 5m^2 and each needs 10ml of lawn feed. 66 × 10ml = 660ml.

ii. 330 litres
Every 10ml of lawn feed needs 5 litres of water. 660ml of lawn feed divided by 10ml = 66. 66 × 5 litres = 330 litres.

d. 64 cubes
The large cube has a volume of 1728cm^3. Use a trial and improvement method to work out the dimensions of the cube. It must be a 12-centimetre cube. If the smaller cubes have sides of 3cm, then 4 of these cubes can fit along the length, width and height. To find the number of smaller cubes, multiply 4 by 4 by 4. 4 × 4 × 4 = 64.

2D shapes (pages 64–65)

Practise

1. **a.** rectangle, square and rhombus. parallelogram may or may not be included in the list.
All the shapes in this list have two pairs of parallel sides. This is a property of parallelograms, so all the shapes listed are parallelograms.

b. square and rhombus. kite may or may not be included in the list.

c. rhombus and kite

2. 9.5cm (or $9\frac{1}{2}$cm)
The radius is half the diameter. The diameter is 19cm. 19 ÷ 2 = 9.5.

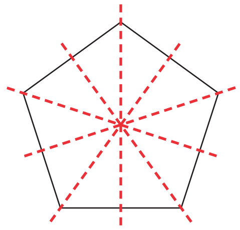
3. 35cm

Extend

4. **a.** Quadrilateral A could be a rectangle, square, trapezium or kite. parallelogram and rhombus may or may not be included in the list.
Identify the quadrilaterals that could have at least 1 right angle. Accept answers that include parallelogram and rhombus as, although the shapes are not labelled as such, rectangles are a special type of parallelogram and a square is a special type of rhombus.

b. Quadrilateral B could be a parallelogram, rhombus or isosceles trapezium.

5. **a.** 5
A line of symmetry divides a shape in half so that each half is a mirror image or reflection of the other. The pentagon has 5 lines of symmetry.



b. 8

c. 4

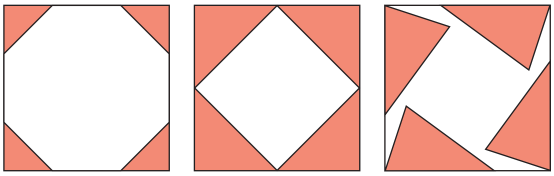
6. square

A regular shape must have equal sides and equal angles. The only quadrilateral with equal sides and angles is a square.

Apply

7. a. (regular) octagon or square or dodecagon (accept 12-sided shape)

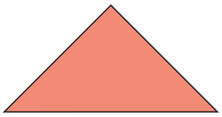
Accept any two correct answers. Cutting isosceles triangles from each corner means the shapes could be an octagon, a square, or a dodecagon. Accept any other shape if supported by evidence.



b. 72cm

c. i. Accept an explanation (or a drawing) that shows a right-angled triangle could also be an isosceles triangle.

Drawings may show a right-angled isosceles triangle.



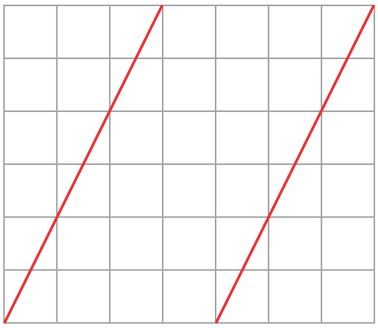
ii. Accept an explanation (or a drawing) that shows an isosceles triangle could also be a right-angled or obtuse-angled triangle.

Drawing 2D shapes (pages 66–67)

Practise

1. a. Accept any division of the rectangle into 2 right-angled triangles and a parallelogram.

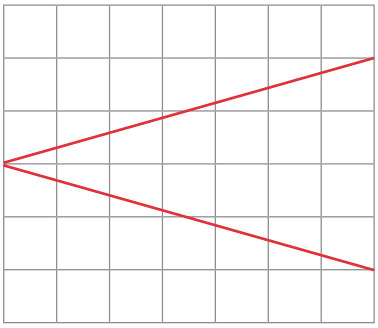
For example:



A right-angled triangle must have a right angle and will fit in one of the corners of the rectangle. Alternative solutions are possible.

b. Accept any division of the rectangle into 2 trapeziums and an isosceles triangle.

For example:



2. a. 55mm (accept +/−2mm)

Make sure a ruler is used.

b. 43mm (accept +/−2mm)

c. 118mm (accept +/−2mm)

3. a. 65° (accept +/−2°)

Make sure a protractor or angle measurer is used. Line up the protractor or angle measurer on the base line. Start counting from 0°.

b. 45° (accept +/−2°)

Extend

4. Accept another line (EF) drawn at 35° to line AB and parallel to line CD. Accept slight inaccuracies if the line is drawn +/−2°.

Parallel lines are two or more lines that stay the same distance apart. The line CD is drawn at 35° to line AB. Draw a second line at 35° to line AB.

5. Accept a completed triangle with angles at the base of 40° (accept +/−2°) and of 35° (accept +/−2°).

The angles can be in either position on the base.

Apply

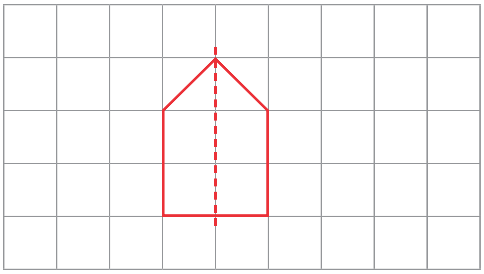
6. a. i. If one side is 15cm and the other two sides are 8cm and 7cm, these two sides would be the same length as the side of 15cm and form an identical line. or The sides of 8cm and 7cm could not connect to both ends of the 15cm line.

Accept any reasonable explanation that explains why these three sides would not form a triangle.

ii. The angles of a triangle total 180° and two obtuse angles must be greater than 90°. These two angles would be greater than 180°, so the three angles would total more than 180°.

iii. A parallelogram must have two pairs of opposite and equal angles, and the angles in this set would not be opposite and equal.

7.



Accept any pentagon drawn on the grid that is symmetrical and has three right angles.

3D shapes (pages 68–69)

Practise

1. **a.** 8 faces, 18 edges, 12 vertices
A face is a side of a 3D shape. An edge is where two faces meet. These appear as lines on the drawings of a shape. A vertex is where three or more edges meet. They are the corners of the shape.

b. 6 faces, 12 edges, 8 vertices

c. 6 faces, 10 edges, 6 vertices

d. 7 faces, 15 edges, 10 vertices

2. **a.** cylinder
Think about the properties of 3D shapes.

b. triangle-based pyramid

c. cube

d. square-based pyramid

Extend

3. **a.** 20 more straws 13 more balls of plasticine
Work out how many edges and vertices an octagonal prism has. It has 24 edges and 16 vertices. Subtract the number of straws (4) from 24. Subtract the number of balls of plasticine (3) from 16.

b. 12 more straws 6 more balls of plasticine

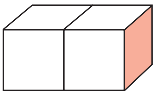
4. **a.** False ☑

b. True ☑

c. True ☑

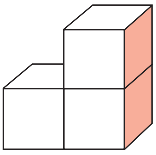
Apply

5. **a.** **i.** Yes, because two cubes joined by their faces can only form a cuboid.



Accept either an explanation or a drawing. No matter which two faces of two cubes are joined they will always form the cuboid in the drawing.

ii. No, because three cubes joined together will not always form a cuboid if the cubes are joined so one cube is at right angles.



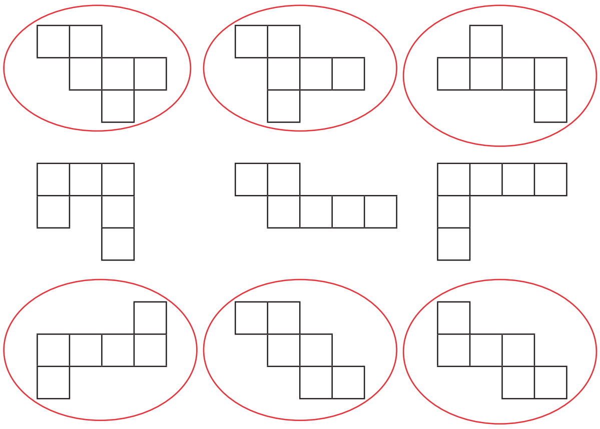
Accept either an explanation or a drawing.

b. 12 faces, 20 edges and 10 vertices

Nets of 3D shapes (pages 70–71)

Practise

1.



If in doubt, cut out a drawing of the net and fold it to make a cube. If the six squares are a net of a cube, the shape can be folded to make the cube.

2. A: triangle-based pyramid
B: square-based pyramid
C: triangular prism
D: cube
If in doubt, cut out a drawing of the net and fold it to see which shape it makes.

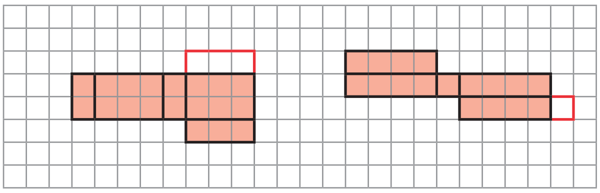
3. **a.** pentagonal pyramid
Learn the nets of common 3D shapes.

b. pentagonal prism **c.** cuboid

d. cylinder

Extend

4. Accept the addition of the one face required to complete the net of the cuboid in any correct position. For example:



The net of a cuboid has 3 pairs of rectangles. In the first net, there is only one rectangle that is 3 units by 1 unit. It must join another side of 3 units. Visualise folding the shapes to make sure the rectangle is placed in the correct place.

5. **a.** 2 3 0 0

Visualise or draw the shapes and count the 2D shapes that form the faces.

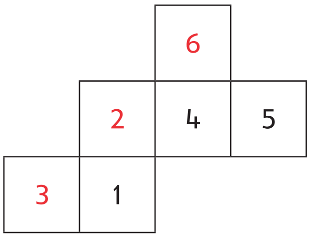
b. 6 0 0 1

c. 0 5 2 0

d. 4 0 0 0

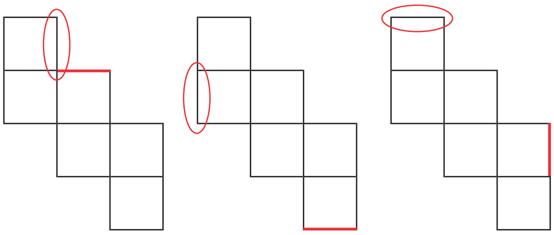
Apply

6. **a.**



Visualise or fold a net with 1, 4 and 5 drawn in the positions shown. See where the opposite faces are on the net.

b.



Use the method used in **Question 6a**.

Angles (pages 72–73)

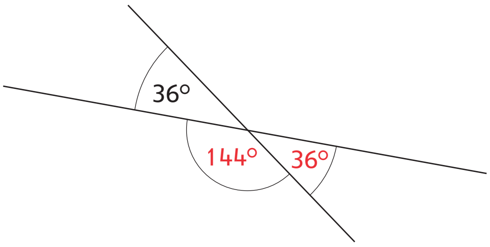
Practise

1. **a.** 49°

Angles on a straight line total 180°. 180° − 131° = 49°.

b. 144° 36°

Vertically opposite angles (angles opposite where two straight lines cross) are equal. 36° and 36° are vertically opposite. Angles on a straight line total 180°. 180° − 36° = 144°.



c. 58°

Angles on a straight line total 180°. Angles in a right angle total 90°. 90° + 32° = 122°. 180° − 122° = 58°.

d. 284°

Angles in a whole turn total 360°. 360° − 76° = 284°.

e. 55°

Angles in a triangle total 180°. 61° + 64° = 125°. 180° − 125° = 55°.

f. 165°

Angles in a quadrilateral total 360°. 68° + 88° + 39° = 195°. 360° − 195° = 165°.

Extend

2. **a.** 47°, 133° and 133°

Accept answers in any order. As opposite angles of a parallelogram are equal, one angle must be 47°. 47° + 47° = 94°. 360° − 94° = 266°. 266° ÷ 2 = 133°.

b. **i.** 62° and 62° **ii.** 56° and 68°

If 56° is not one of the equal angles, the two equal angles must be: (180° − 56°) ÷ 2 = 124° ÷ 2 = 62°. If 56° is one of the equal angles, the other equal angle must also be 56°. 56° + 56° = 112°. 180° − 112° = 68°.

c. 164°

Use the method used in **Question 1f**.

d. 54°

3. **a.** x° = 30° **b.** 2x° = 60° **c.** 3x° = 90°

The angles of a triangle total 180°. Use x° to represent the smallest angle. Another angle is twice the size. This is 2x°. The third angle is three times the size. This is 3x°. The total is x° + 2x° + 3x° = 6x°. x° = 180° ÷ 6 = 30°. 2x° = 2 × 30° = 60°. 3x° = 3 × 30° = 90°.

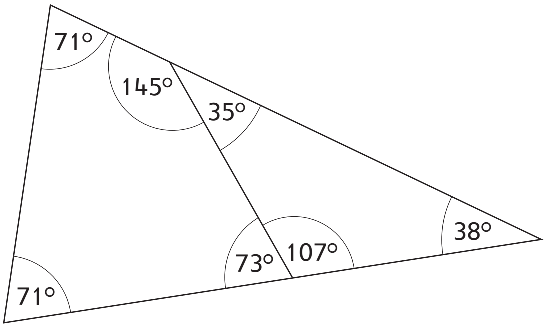
Apply

4. **a.** 120°

The angles of an equilateral triangle are each 60°. The angles of a square are each 90°. At the point of the missing angle, there are three known angles: 60°, 90° and 90°. 60° + 90° + 90° = 240°. 360° − 240° = 120°.

b. **i.** *b* = 35° **ii.** *c* = 38° **iii.** *d* = 107°

Two of the angles in an isosceles triangle are equal, so one angle is 71°. The angles in a quadrilateral total 360°. 71° + 71° + 73° = 215°. 360° − 215° = 145°. Angles on a line total 180°. 180° − 145° = 35°, so *b* is 35°. Angles on a line total 180°. 180° − 73° = 107°, so *d* is 107°. *c* is the third angle in the triangle. 35° + 107° = 142°. 180° − 142° = 38°, so *c* is 38°. If the isoceles triangle is reconstructed, it would look as follows.



Coordinate grids (pages 74–75)

Practise

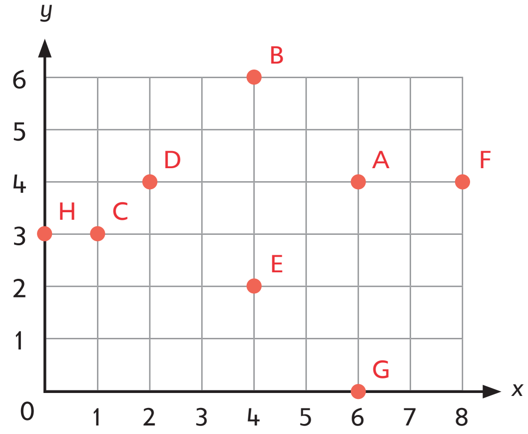
1. **a.** (2, 5)

Find point A. Find the vertical line from the *x*-axis (the horizontal axis) and read the number. This is 2. Find the horizontal line from the *y*-axis (the vertical axis) and read the number. This is 5. The coordinates are written in brackets and separated by a comma.

b. (7, 5) **c.** (5, 4) **d.** (4, 3) **e.** (2, 2)

f. (5, 2) **g.** (8, 1) **h.** (1, 0)

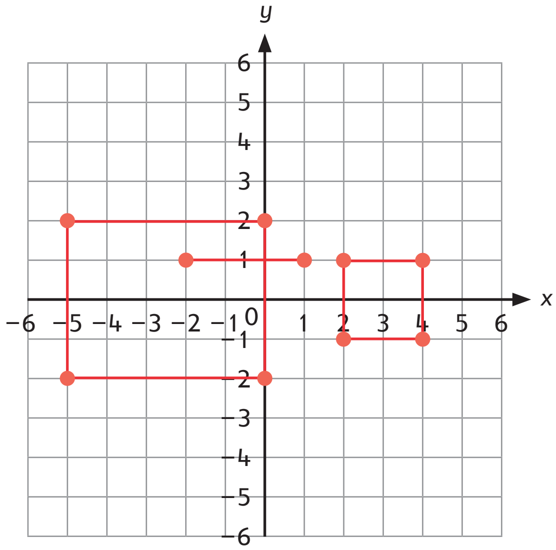
2.



Plot the coordinates for A by finding the first number on the *x*-axis (6) and then finding the second number on the *y*-axis (4). Read along both grid lines until the point where they cross. The coordinate is the point where the two lines cross. Repeat the process for each set of coordinates.

Extend

3.



a. The fourth vertex is at (4, −1).

Draw the coordinates on a grid and look at where the missing coordinate will go. The fourth vertex will have the same *x*-coordinate as (4, 1). It will have the same *y*-coordinate as (2, −1).

b. The fourth vertex is at (0, −2).

c. (−2, 4) and (1, 4) or (−2, −2) and (1, −2)

Use the method used in **Question 3a**. Use the coordinates to form two sides of a square. Remember, the sides must form right angles.

Apply

4. **a.** (14, 10)

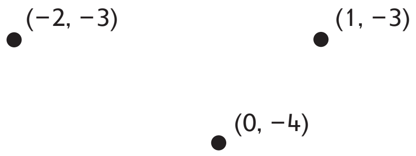
Use the method used in **Question 3**. If it helps, sketch a grid with the three coordinates.

b. Accept any coordinate with an *x*-coordinate of −8 and any *y*-coordinate except 12.

The three vertices show two sides of a kite. Remember, these are two adjacent and equal sides. The missing fourth vertex must be on the line *x* = −8. This will make the other pair of adjacent sides equal.

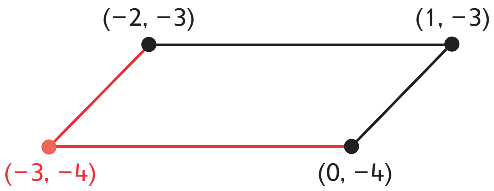
c. (−3, −4) or (−1, −2) or (3, −4)

Accept any two of the three possible options. If the three given vertices are plotted as shown:

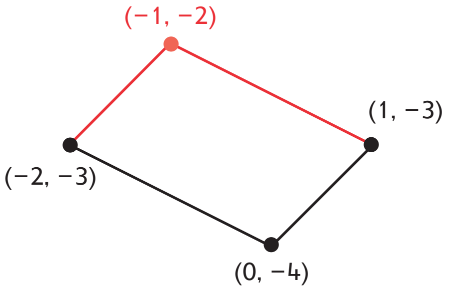


The fourth vertex can be plotted in three different positions depending on how the vertices are joined.

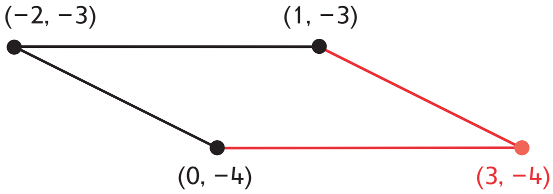
The fourth vertex could be (−3, −4).



The fourth vertex could be (−1, −2).



The fourth vertex could be (3, −4).



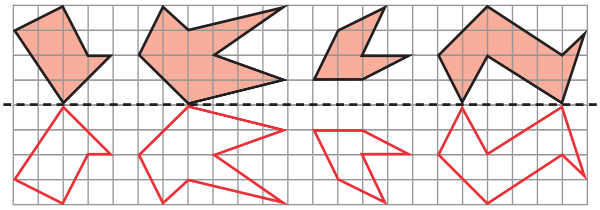
Reflection (pages 76–77)

Practise

1. A ☑ E ☑

A reflection is a mirror image. It is as though the shape has been 'flipped over'.

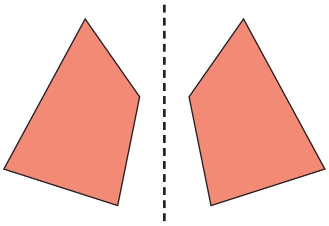
2.



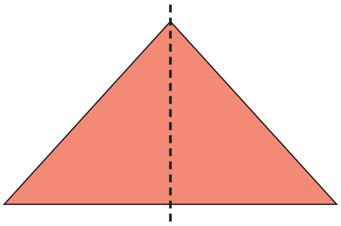
Count how many squares each vertex is from the mirror line. Draw the reflected vertex at the same distance on the opposite side of the line. Join the vertices to make the reflected shape.

3. [✓ False]

Any shape can be reflected as though in a mirror, but an internal line of symmetry is a property of certain shapes. This is a reflected shape. It does not have an internal line of symmetry.



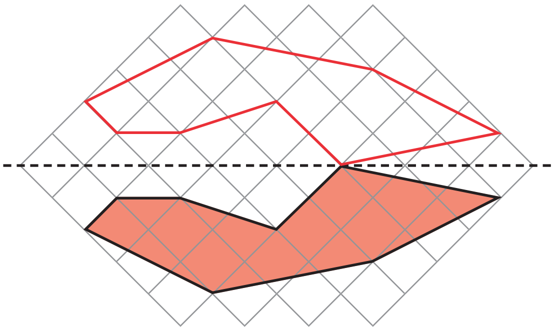
This shape has an internal line of symmetry.



Some reflected shapes have an internal line of symmetry, but all reflected shapes do not need to have one. The statement is false.

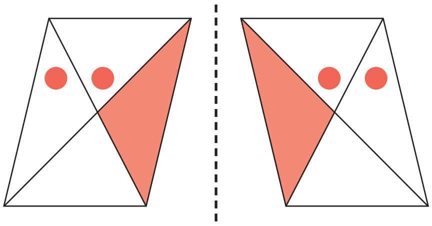
Extend

4.



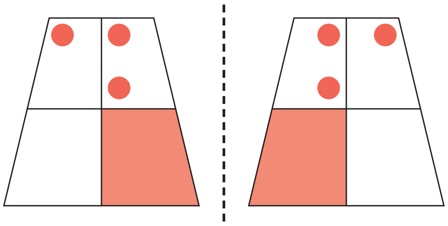
Use the method used in **Question 2**. Remember to plot one vertex at a time. Make sure the line between each vertex and its reflection is perpendicular to the mirror line.

5. a.



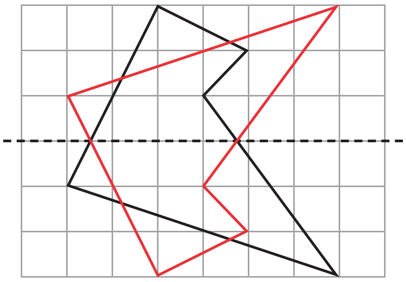
Use the method used in **Question 2**, but include the extra lines, shading and shapes.

b.



Apply

6.



This shape is on both sides of the line of reflection.

To reflect the shape, treat each vertex separately and draw each vertex on the opposite side of the line of reflection.

7. **a.** (1, −2)   (10, −2)   (10, −7)
First, A is reflected in the *y*-axis, so the *y*-coordinate of (−10, 7) will stay the same (7) and the *x*-coordinate will be the same distance from the *y*-axis on the positive side (the right-hand side). The coordinates for this vertex after the first reflection will be (10, 7). Then the new position of A is reflected in the *x*-axis, so the *x*-coordinate will stay the same (10) and the *y*-coordinate will be the same distance from the *x*-axis on the negative side (the lower side). The coordinates for this vertex after the second reflection will be (10, −7). This is repeated for each coordinate.

b. (−7, −4)   (−12, −8)   (−2, −8)   (−7, −12)

Translation (pages 78–79)

Practise

1. B ☑   C ☑

A translated shape has been moved vertically, horizontally or both. It is as though the shape has been slid across the grid.

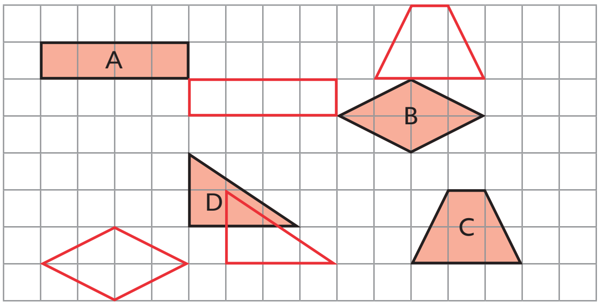
2. **a.** 4 units left and 2 units down
Count the units that one vertex has moved. The first count should be for the horizontal movement left or right. B has moved 4 units left. The second count should be for the vertical movement up or down. B has moved 2 units down.

b. 2 units left and 4 units up

c. 3 units right and 4 units down

Extend

3.



Use the method used in **Question 2**.

4. **a.** (−2, −3)
The coordinates (4, 7) are translated. Remember, the *x*-coordinate (horizontal coordinate) is 4 and the *y*-coordinate (vertical coordinate) is 7. If the translation is 6 units left, subtract 6 from the *x*-coordinate. 4 − 6 = −2. If the translation is 10 units down, subtract 10 from the *y*-coordinate. 7 − 10 = −3. The new coordinates will be (−2, −3).

b. (−6, 1)

Apply

5. **a.** A to B is a translation of 7 units left and 2 units down.
Use the method used in **Question 2**.

b. B to A is a translation of 7 units right and 2 units up.

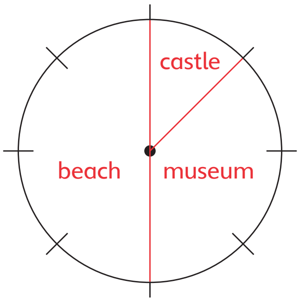
6. **a.** (−2, −2)   (13, −1)   (1, −8)   (12, −10)

b. (−11, 10)   (4, 11)   (−8, 4)   (3, 2)
Use the method used in **Question 4**.

Constructing graphs (pages 80–81)

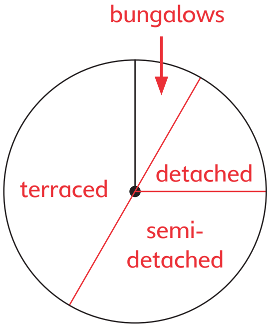
Practise

1.



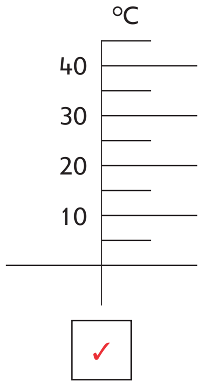
Sectors may vary in position. A key may be used instead of labels. The total number of children is 48. There are 8 sectors marked on the chart. 6 is $\frac{1}{8}$ of 48, so the castle should take up 1 of the 8 sectors. 18 is $\frac{3}{8}$ of 48, so the museum should take up 3 of the 8 sectors. 24 is $\frac{1}{2} = \frac{4}{8}$ of 48, so the beach should take up 4 of the 8 sectors.

2.



Sectors may vary in position. A key may be used instead of labels. Sectors: bungalow = 30°, detached = 60°, semi-detached = 120°, terraced = 150°. The total number of houses is 120. There are 360° in a full turn. 10 is $\frac{1}{12}$ of 120, so the bungalows sector will be $\frac{1}{12}$ of 360°, which is 30°. Use the same method to calculate the other angles.

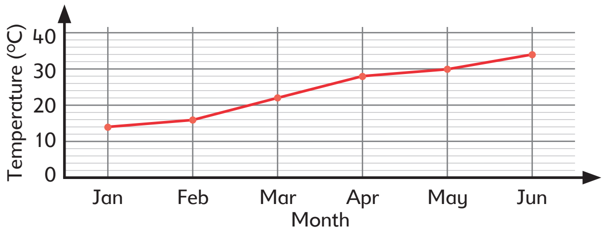
3.



The gaps between divisions should be as small as possible, while still fitting both the lowest and the highest temperature on the scale. The divisions should be equally spaced.

Extend

4.



Plot the temperature for each month to line up with the correct line on the y-axis. Join the points with straight lines.

Apply

5. **a.** No, because it should be 108° or No, because 30 is the number of children not the fraction/percentage of children or No, because there are 360° not 100° in a circle.

Accept any explanation that shows the size of the angle for the sector depends on the fraction of the children who cycle to school and not the number of children. There are 100 children in total, so the angle is $\frac{30}{100}$ of 360°, which is 108°.

b. Because $\frac{7}{10}$ of 62 = 43.4 and children must be measured in whole numbers.

Accept any explanation that shows the survey is of children and it is not possible to have 43.4 children/part of a child. The number of children must be a whole number.

c. No, because the temperature is recorded only at 08:00 and 10:00 and the line between is showing a trend.

Accept any explanation that shows that, although two points are connected by a straight line, this does not mean the temperature increased at a constant rate. This is only a trend. The precise temperature at 09:00 is unknown/was not measured.

Pie charts (pages 82–83)

Practise

1. **a.** 30 children

The pie chart is divided into eighths. $\frac{2}{8}$ or $\frac{1}{4}$ of the children ate sandwiches. The total is 120 children. $\frac{1}{4}$ of 120 = 30.

b. 30 children

c. 15 children

d. 45 children

2. **a.** 72 children

Use the method used in **Question 1**. This pie chart is divided into tenths.

b. 12 children

c. 36 children

3. **a.** 15 sparrows

The sector for sparrows is $\frac{1}{4}$ of the total. $\frac{1}{4}$ of 60 = 15.

b. 10 blackbirds

c. 12 magpies

Extend

4. **a.** 50 trombones

Use the methods used in **Questions 1** and **3**.

b. 40 tubas

72° is $\frac{1}{5}$ of 360°. The number of trombones is $\frac{1}{5}$ of the total number of instruments. $\frac{1}{5}$ of 200 is 40.

c. 40 horns

d. **i.** 60 cornets

ii. 10 drums

Apply

5. **a.** Howgreen School by 4 games

Work out the value of the sectors for both pie charts. Howgreen School played 24 games. They lost $\frac{1}{4}$ of 24 games = 6 games. Measure the angles for games drawn and games abandoned. They are 15° each. $\frac{15}{360} = \frac{1}{24}$. These sectors are both $\frac{1}{24}$ of the total number of games, which is 1 game each. Games won = 24 − (6 + 1 + 1) = 16 games. Wyewood School played 16 games. They won $\frac{3}{4}$ of 16 = 12 games. The games drawn and games lost sectors are both half of the remaining quarter, which is 2 games each. Subtract Wyewood School's wins from Howgreen School's wins to find the difference. 16 − 12 = 4.

b. **i.** 1 game **ii.** 2 games

c. 6 goals
To find the mean score, add the scores for each game and divide the answer by the number of games. The mean score is 3 and the number of games lost is 2. The total number of goals must be 3 × 2 = 6.

Line graphs (pages 84–85)

Practise

1. **a.** **i.** 4°C
Find 16:00 on the horizontal axis. Follow the line for 16:00 vertically to the line of the line graph. Move horizontally to the vertical axis. The labelled divisions are every 5°C and there are five unlabelled divisions for each 5°C, so each unlabelled division is 1°C. The temperature is 4°C.

ii. 0°C

iii. −4°C

iv. −8°C

b. **i.** 08:00
Use the method used in **Question 1a**, but work towards the *x*-axis (horizontal axis) from the lowest point on the line graph.

ii. 16:00

c. **i.** 9 hr
Use the method used in **Question 1a**, but work from the point where the line graph first crosses the 0°C line to where it crosses the same line again. Read the times for both these points. They are 13:00 and 22:00. This is 9 hours.

ii. $7\frac{3}{4}$ hr (accept +/−$\frac{1}{4}$ hr)

d. Because the temperature wasn't measured at 13:00, so it could have reached 0°C at any time between 12:00 and 14:00.
Accept any explanation that shows the temperature reached 0°C between 12:00 and 14:00. These are the times when the temperature was recorded. The time when the temperature reached 0°C is at some point between these two recorded times.

Extend

2. **a.** 60 beats / min (accept +/−5 beats / min)
Use the methods used in **Question 1**.

b. 10:10 (accept +/−2 min)
The line showing the distance travelled can be used to find the time Dev starts his cycle ride. The line starts between 10:00 and 10:15. It appears to be about $\frac{2}{3}$ of the distance between these times. A reasonable estimate is 10:10.

c. 160 beats / min (accept +/−5 beats / min)

d. 1 hr 20 min (accept +/−2 min)

e. 10:45

Apply

3. **a.** 11:00 to 11:15
Use the methods used in **Question 1**.

b. 20km

c. 15 beats / min (accept +/−2 beats / min)

d. 130 beats / min (accept +/−5 beats / min)

e. 6 km (accept +/−1km)

f. 30 min (accept +/−5 min)

Mean (pages 86–87)

Practise

1. **a.**

22	15	20
57		
19	19	19

Find the missing data item. Two of the items are 22 and 20 and the total is 57. Calculate the missing item: 57 − (22 + 20) = 15. Find the mean. The mean is a type of average. To find the mean, total the data and divide by the number of items (numbers) added. 57 ÷ 3 = 19.

b.

15	18	13	28
74			
18.5	18.5	18.5	18.5

2. **a.** 11
Use the method used in **Question 1**. 7 + 14 + 24 + 2 + 8 = 55. 55 ÷ 5 = 11.

b. 66

c. 378

d. 2.7

3. **a.** 17
If there are three items (numbers) and the mean is 15, the total must be 15 × 3 = 45. If two of the items are 7 and 21, the other item must be 45 − 21 − 7 = 17.

b. 28

Extend

4. **a.** 1 and 3 **b.** 2 and 2

Accept answers in any order. If the mean of three numbers is 4, then the total must be 4 × 3 = 12. If one of the numbers is 8, then the other two numbers must total 12 − 8 = 4. Find combinations of numbers that total 4.

5. **a.** 1, 1, 1 and 9 **b.** 2, 2, 2 and 6

Accept answers in any order.

6. **a.** 8, 7 and 3 or 8, 6 and 4 or 7, 6 and 5

Accept any correct answer.

b. 8, 7, 6 and 3 or 8, 7, 5 and 4

Accept any correct answer.

Apply

7. **a.** 27 or 24 or 21 or 18 children

Accept any correct answer. Use the method used in **Question 4**. The classes could both have 34, 33, 32 or 31 children.

b. 100%

c. 149cm

d. Accept any two numbers that total 131.

For example: 1 and 130.

Numbers must be positive whole numbers.

The numbers can be given in any order.

Final practice (pages 88–92)

1. **a.** triangular prism

Visualise folding up the net into a 3D shape. Alternatively, sketch the net on paper, cut it out and fold it. Award 1 mark for the correct answer.

b. pentagonal pyramid

Use the method used for **Question 1a**. Award 1 mark for the correct answer.

2. **a.** $\frac{25}{24} = 1\frac{1}{24}$

Find a common denominator. The lowest common multiple of 8 and 3 is 24. $\frac{3}{8} = \frac{9}{24}$. $\frac{2}{3} = \frac{16}{24}$. When both fractions have the same denominator, they can be added. $\frac{9}{24} + \frac{16}{24} = \frac{25}{24}$. This is an improper fraction, so change it to a mixed number. $\frac{25}{24} = 1\frac{1}{24}$. Award 1 mark for the correct answer.

b. $\frac{13}{20}$

Find a common denominator. The lowest common multiple of 10 and 4 is 20. $\frac{18}{20} - \frac{5}{20} = \frac{13}{20}$. Award 1 mark for the correct answer.

c. $2\frac{2}{15}$

Begin by turning the mixed number into an improper fraction. $2\frac{4}{5}$ is $\frac{14}{5}$. Use the method used in **Question 2b**. $\frac{42}{15} - \frac{10}{15} = \frac{32}{15} = 2\frac{2}{15}$. Award 1 mark for the correct answer.

d. $5\frac{13}{24}$

Use the method used in **Question 2a**. Add the mixed numbers first. 3 + 1 = 4. $4 + \frac{22}{24} + \frac{15}{24} = 4 + \frac{37}{24} = 5\frac{13}{24}$. Award 1 mark for the correct answer.

3. **a.** 75

Use the 10% method. 10% = $\frac{1}{10}$. $\frac{1}{10}$ of 250 = 250 ÷ 10 = 25. $\frac{3}{10}$ = 25 × 3 = 75. Award 1 mark for the correct answer.

b. 480

Find $\frac{1}{5}$ of 600. 600 ÷ 5 = 120. Find $\frac{4}{5}$ of 600. 120 × 4 = 480. Award 1 mark for the correct answer.

c. 350

Use the method used in **Question 3b**. 400 ÷ 8 = 50. 50 × 7 = 350. Award 1 mark for the correct answer.

d. 1800

75% is the same as $\frac{3}{4}$. 2400 ÷ 4 = 600. 600 × 3 = 1800. Award 1 mark for the correct answer.

4. 1 542 937 48 013 647 031

Use place value by adding the numbers to a place value chart. Identify the numbers with a digit 4 in the tens of thousands column.

M	HTh	TTh	Th	H	T	O	
		3	4	9	5	2	
1	5	4	2	9	3	7	✓
	4	8	2	0	1	9	
2	4	9	6	7	0	3	
		4	8	0	1	3	✓
	6	4	7	0	3	1	✓

Award 1 mark for two correct numbers selected and no incorrect numbers selected. Award 2 marks for three correct numbers selected and no incorrect numbers selected. Maximum 2 marks.

5. −9°C

The temperature in the kitchen is 21°C. Subtract 15°C from 21°C. 21°C − 15°C = 6°C. The temperature in the fridge is 6°C. Subtract 15°C from 6°C. 6°C − 15°C = −9°C. The temperature in the freezer is −9°C. Award 1 mark for a correct method that would lead to the correct answer. Award 2 marks for the correct answer. Maximum 2 marks.

6. **a.** 18

23 + a = 41. As a bar model this is:

41	
23	a

Subtract 23 from 41 to find a. 41 − 23 = 18. Award 1 mark for the correct answer.

b. 41

Use the method used in **Question 6a**. 27 + 14 = 41. Award 1 mark for the correct answer.

c. 21

4c = 84. As a bar model this is:

84			
c	c	c	c

Divide 84 by 4. 84 ÷ 4 = 21. Award 1 mark for the correct answer.

d. 72

$\frac{d}{6}$ = 12. As a bar model this is:

d					
12	12	12	12	12	12

Multiply 12 by 6. 12 × 6 = 72. Award 1 mark for the correct answer.

7. 100m^2

The full size of the original lawn is 30m long and 22m wide. The area of the lawn is 30m × 22m = 660m^2. One triangular lawn has a base of 28m and a height of 20m. The area of a triangle is given by $\frac{1}{2}$ × base × height = $\frac{1}{2}$ × 28 × 20 = 280m^2. The area of the two triangles is 280m^2 × 2 = 560m^2. Subtract the area of the two triangular lawns from the area of the original lawn. 660m^2 − 560m^2= 100m^2. Award 1 mark for an attempt to use the formula $A = L \times W$ to find the area of the rectangle. Award 2 marks for an attempt to find the area of the rectangle plus an attempt to use the formula $A = 2 \times \frac{1}{2} \times B \times H$ to find the areas of the two triangles. Award 3 marks for the correct answer. Maximum 3 marks.

8. 60 miles

5 miles ≈ 8 kilometres. 96km ÷ 8 = 12. 12 × 5 = 60 miles. Award 1 mark for the correct answer.

9. **a.** 63 936

$$\begin{array}{rrrrr} & 1 & 7 & 2 & 8 \\ \times & & & 3 & 7 \\ \hline 1 & 2_5 & 0_1 & 9_5 & 6 \\ 5_2 & 1 & 8_2 & 4 & 0 \\ \hline 6 & 3 & 9 & 3 & 6 \\ \hline & & 1 & & \end{array}$$

Award 1 mark for the correct answer.

b. 215

$$\begin{array}{rrrrr} & & 2 & 1 & 5 \\ \cline{2-5} 32 \big) & 6 & 8 & 8 & 0 \\ - & 6 & 4 & & \\ \cline{2-3} & & 4 & 8 & \\ & - & 3 & 2 & \\ \cline{3-4} & & 1 & 6 & 0 \\ & - & 1 & 6 & 0 \\ \cline{3-5} & & 0 & 0 & 0 \end{array}$$

Award 1 mark for the correct answer.

10. **a.** $\frac{4}{25}$

20 counters out of 125 counters can be written as $\frac{20}{125}$. Simplify the fraction by dividing by the highest common factor, which is 5. $\frac{20}{125} = \frac{20 \div 5}{125 \div 5} = \frac{4}{25}$. Award 1 mark for the correct answer.

b. 16%

Write $\frac{4}{25}$ as a percentage. A percentage is a fraction out of 100. $\frac{4}{25} = \frac{4 \times 4}{25 \times 4} = \frac{16}{100}$. $\frac{16}{100}$ = 16 out of 100 = 16%. Award 1 mark for the correct answer.

11. 0.3, 35%, 0.53, $\frac{3}{5}$, $\frac{5}{4}$

Change the numbers to the same format, such as decimals. 35% = 0.35. $\frac{3}{5}$ = 0.6. 0.53 is already a decimal. $\frac{5}{4}$ = 1.25. 0.3 is already a decimal. Arrange the numbers in order, starting with the smallest, in their original format. Award 1 mark for the correct answer.

12. **a.** 54

Follow the order of operations using BIDMAS. B = Brackets. I = Indices. DM = Division and multiplication. AS = Addition and subtraction. The rules state that division must be completed before addition. 50 + 200 ÷ 50 = 50 + 4 = 54. Award 1 mark for the correct answer.

b. 20

40 × 2 = 80. 100 − 80 = 20. Award 1 mark for the correct answer.

c. 5

50 + 200 = 250. 250 ÷ 50 = 5. Award 1 mark for the correct answer.

d. 160

20 + 20 = 40. 2 + 2 = 4. 40 × 4 = 160. Award 1 mark for the correct answer.

13. a. 79%

To find the mean, add the numbers and divide by the number of items. 70 + 78 + 73 + 92 + 82 = 395. 395 ÷ 5 = 79. The mean percentage is 79%. Award 1 mark for the correct answer.

b. 85%

If the mean of six numbers is 80%, then the total of the six numbers must be 80 × 6 = 480. Increase the total from 395 to 480. 480 − 395 = 85. The sixth score must be 85%. Check by calculating the new mean score. 70 + 78 + 73 + 92 + 82 + 85 = 480. 480 ÷ 6 = 80. The mean percentage is 80%. Award 1 mark for the correct answer.

14. a. 35 texts

There are 140 texts in total. The sector for Tanya is $\frac{1}{4}$ of the chart. 140 ÷ 4 = 35. Award 1 mark for the correct answer.

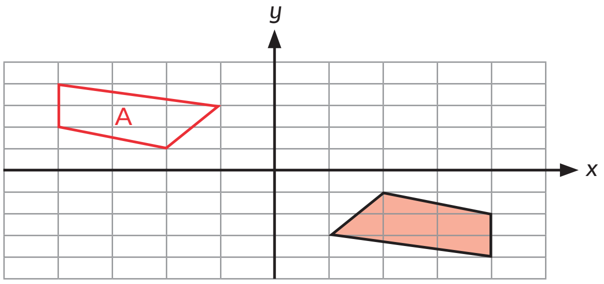
b. 10 texts

The sector for Jill and Other friends in total is half of the pie chart. This is 70. Other friends is 6 times the number for Jill. Jill is $\frac{1}{7}$ of the 70. 70 ÷ 7 = 10. Award 1 mark for the correct answer.

c. 60 texts

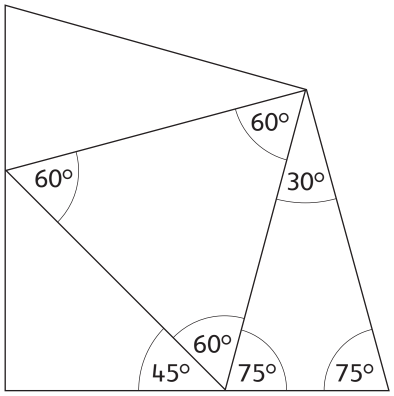
Manisha sends six times as many texts to other friends as she does to Jill. 10 × 6 = 60. Award 1 mark for the correct answer.

15.



Reflect the vertices of the shape in the y-axis. Remember the vertices need to be reflected so they are perpendicular to the axis and an equal distance from it. Repeat this to reflect the shape in the x-axis. Award 1 mark for the correct answer.

16. a. 30°



Angles in an equilateral triangle = 180° ÷ 3 = 60°. Angles on a straight line = 180°. 180° − (45° + 60°) = 75°. Two angles of an isosceles triangle are equal. Angles in a triangle = 180°. 180° − (75° + 75°) = 30°. a = 30°. Award 1 mark for the correct answer.

b. 136°

Angles around a point equal 360°. 360° − 88° = 272°. The parallelograms are identical, so both of the other angles around the point are the same size. 272° ÷ 2 = 136°. Opposite angles in a parallelogram are equal, so b = 136°. Award 1 mark for the correct answer.

17. 16 books

Calculate using an adjustment strategy. £6.99 × 20 books = £140 − £0.20 = £139.80. £8.99 × 20 books = £180 − £0.20 = £179.80. £139.80 + £179.80 = £319.60. £400 − £319.60 = £80.40. Estimate by rounding £4.99 to £5. £80.40 ÷ £5 = £16.08. This is 16 books. Check £4.99 × 16 books = £80 − £0.16 = £79.84. She could not buy 17. Award 1 mark for evidence of an appropriate method of finding the number of books costing £6.99 and £8.99. Award 2 marks for evidence of an appropriate method of finding the number of books costing £6.99, £8.99 and £4.99. Award 3 marks for the correct answer. Maximum 3 marks.

18. a. $\frac{6}{15} = \frac{2}{5}$

Multiply the numerators and multiply the denominators. $\frac{2}{3} \times \frac{3}{5} = \frac{2 \times 3}{3 \times 5} = \frac{6}{15}$. $\frac{6}{15}$ can be simplified by a common factor. $\frac{6}{15} = \frac{6 \div 3}{15 \div 3} = \frac{2}{5}$. Award 1 mark for the correct answer.

b. $\frac{4}{20} = \frac{1}{5}$

Divide the denominator of the fraction by multiplying the denominator by the whole number. $\frac{4}{5} \div 4 = \frac{4}{5 \times 4} = \frac{4}{20}$. $\frac{4}{20}$ can be simplified by a common factor.

$\frac{4}{20} = \frac{4 \div 4}{20 \div 4} = \frac{1}{5}$. Award 1 mark for the correct answer.

19. a. 0.8

Change the fraction to tenths. $\frac{4}{5} = \frac{4 \times 2}{5 \times 2} = \frac{8}{10}$. Write in the place value columns, writing 8 in the tenths column.

$\frac{8}{10}$ =

O	.	t
0	.	8

Award 1 mark for the correct answer.

b. 0.45

45% = 45 out of 100 = $\frac{45}{100}$. Write in the place value columns, writing 4 in the tenths column and 5 in the hundredths column.

$\frac{45}{100}$ =

O	.	t	h
0	.	4	5

Award 1 mark for the correct answer.

20. 5p (or £0.05)

10 boxes × 100 pens = 1000 pens. £50 ÷ 1000 = £0.05. £0.05 = 5p. Award 1 mark for the correct answer.

21. a. 20cm 50cm

Rectangles use 24 tiles with each tile measuring 1cm by 1cm. The area will be 24cm^2. The lengths, widths and perimeters of the rectangles could be:

L = 6cm *W* = 4cm *P* = 20cm
L = 8cm *W* = 3cm *P* = 22cm
L = 12cm *W* = 2cm *P*= 28cm
L = 24cm *W* = 1cm *P* = 50cm

Only the perimeters 20cm and 50cm match the list. Award 1 mark for two correct answers.

b. 32cm^2 36cm^2

A perimeter of 24 tiles with each tile measuring 1cm by 1cm. Since the perimeter (24cm) is the length + width multiplied by 2, the length + width will be half the perimeter, or 12cm. The lengths, widths and areas of the rectangles could be:

L = 11cm *W* = 1cm *A* = 11cm^2
L = 10cm *W* = 2cm *A* = 20cm^2
L = 9cm *W* = 3cm *A* = 27cm^2
L = 8cm *W* = 4cm *A* = 32cm^2
L = 7cm *W* = 5cm *A* = 35cm^2
L = 6cm *W* = 6cm *A* = 36cm^2

Only the areas of 32cm^2 and 36cm^2 match the list. Award 1 mark for two correct answers.

22. cuboid and pentagonal pyramid

The shapes with six faces (sides) are the cuboid and the pentagonal pyramid. Award 1 mark for one correct answer. Award 2 marks for two correct answers. Maximum 2 marks.

23. £24.25

£72.80 + £14.20 + £10 = £97. £97 ÷ 4 = £24.25.

$$\begin{array}{r|l} & 2\ \ 4\ .\ 2\ \ 5 \\ \hline 4 & 9\ {}^{1}7\ .\ {}^{1}0\ {}^{2}0 \end{array}$$

Award 1 mark for the correct answer.

24. 54cm^3

Identify the length, width and height from the net. *L* = 6cm, *W* = 3cm and *H* = 3cm. *V* = 6cm × 3cm × 3cm = 54cm^3. Award 1 mark for the correct answer.

25. 1.75km

The scale is 1 : 50 000. If the walk is 3.5cm on the map, then multiply each centimetre by 50 000. Partition 3.5 into 3 + 0.5. 3 × 50 000 = 150 000. 0.5 × 50 000 = 25 000. 150 000 + 25 000 = 175 000. These are centimetres. Change centimetres to metres by dividing by 100 (100cm = 1m). 175 000 ÷ 100 = 1750. Change metres to kilometres by dividing by 1000 (1000m = 1km). 1750 ÷ 1000 = 1.75. Award 1 mark for the correct answer.

26. a. 2 hr 50 min

The formula is 40*k* + 30, so substitute *k* with the mass of the chicken, which is 3.5kg. 40 × 3.5 + 30 = 140 + 30 = 170. There are 60 min in 1 hr. Change 170 min into hr and min = 2 hr 50 min. Award 1 mark for the correct answer.

b. 2.75kg

Use the inverse of the formula. Change 2 hr 20 min into 140 min. Subtract the extra 30 min cooking time. 140 min − 30 min = 110 min. Every 40 min is 1kg of the mass of a chicken. 110 min ÷ 40 min per kg = 2.75kg. Award 1 mark for the correct answer.

27. a. *a* = 2 *b* = 12 or
a = 4 *b* = 9 or
a = 6 *b* = 6 or
a = 8 *b* = 3

Try different values for *a*. If *a* = 1, then 3*a* = 3, so 2*b* = (30 − 3 =) 27. However, this would mean *b* = 13.5 and *b* must be a whole number. If *a* = 2, then 3*a* = 6, so 2*b* = (30 − 6 =) 24 and *b* = (24 ÷ 2 =) 12.

Follow the same method for other numbers until three possibilities have been found. Accept any three correct answers. Award 1 mark for one correct answer. Award 2 marks for three correct answers. Maximum 2 marks.

b. c = 1 d = 24 or
c = 2 d = 12 or
c = 3 d = 8 or
c = 4 d = 6
Use the method used in **Question 27a**. For example: if c = 1, then 2c = 2, so 2 × d = 48 and d = (48 ÷ 2 =) 24. Accept any three correct answers. Award 1 mark for one correct answer. Award 2 marks for three correct answers. Maximum 2 marks.