All sample answers to the Cambridge Secondary 1 Checkpoint-style questions have been written by the authors of this work

1 Integers, powers and roots

1.1 Directed numbers

1 **a** 5 + 1 = 6 **b** 2 + 4 = 6 **c** 8 + 1 = 9
d −3 + 1 = −2 **e** −1 + 5 = 4 **f** −7 + 5 = −2

2 **a** 3.5 + 1.2 = 4.7 **b** 2.2 + 3.4 = 5.6 **c** 2.7 + 2.2 = 4.9
d −4.6 + 2 = −2.6 **e** −2 + 3.5 = 1.5 **f** −6 + 2.3 = −3.7

3 5, 5.6, 0.9, −3

4 **a** −12 **b** 6 **c** −20 **d** −4.8 **e** −9.6 **f** 20.5

5 12.6, −7.5, 3.6, 18.3

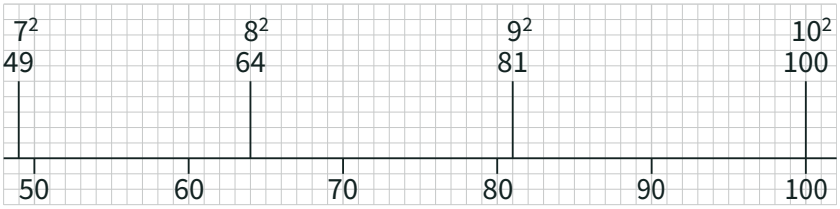
1.2 Square roots and cube roots

1 **a** The square of 6 is 36 $6^2 = 36$ The square root of 36 is 6 $\sqrt{36} = 6$
b The square of 5 is 25 $5^2 = 25$ The square root of 25 is 5 $\sqrt{25} = 5$

2 **a** 7 **b** 2 **c** 4 **d** 1

3 **a** 4 and 5 **b** 6 and 7 **c** 3 and 4 **d** 2 and 3 **e** 5 and 6 **f** 6 and 7

4



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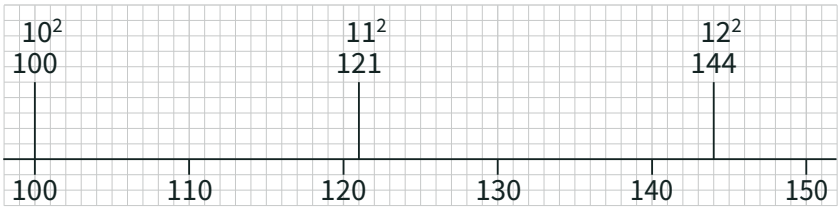


6 **a** 7 and 8 **b** 9 and 10 **c** 11 and 12 **d** 10 and 11 **e** 7 and 8 **f** 8 and 9

7 **a** 3 **b** 2 **c** 5 **d** 1

8 **a** 3 and 4 **b** 4 and 5 **c** 4 and 5 **d** 2 and 3 **e** 1 and 2 **f** 4 and 5

1.3 Indices

1 **a** $\frac{1}{2}$ **b** $\frac{1}{6}$ **c** $\frac{1}{8}$ **d** $\frac{1}{10}$

2 **a** 5^{-1} **b** 12^{-1} **c** 9^{-1} **d** 4^{-1}

3 **b** 6^{-2} **c** $\frac{1}{100} = 10^{-2}$ **d** $\frac{1}{81} = 9^{-2}$ **e** $\frac{1}{49} = 7^{-2}$ **f** $\frac{1}{64} = 8^{-2}$

2 Sequences and Functions

2.1 Generating sequences

1 **a** 5, 7, 9, 11, 13 **b** 0, 3, 6, 9, 12 **c** 11, 9, 7, 5, 3

d 210, 190, 170, 150, 130 **e** 2.5, 3, 3.5, 4, 4.5, 5

2 **a** 4, 5, 7, 10, 14 **b** 5, 7, 11, 17, 25 **c** 20, 17, 13, 8, 2

3 L: 18, 20, 22, 24, 26, … and 30, 25, 20, 15, 10, …

NL: 0, 3, 8, 15, 24, … and 50, 49, 47, 44, 40, …

2.2 Finding the nth term

1 5, 10, 15, 5 x 4 = 20

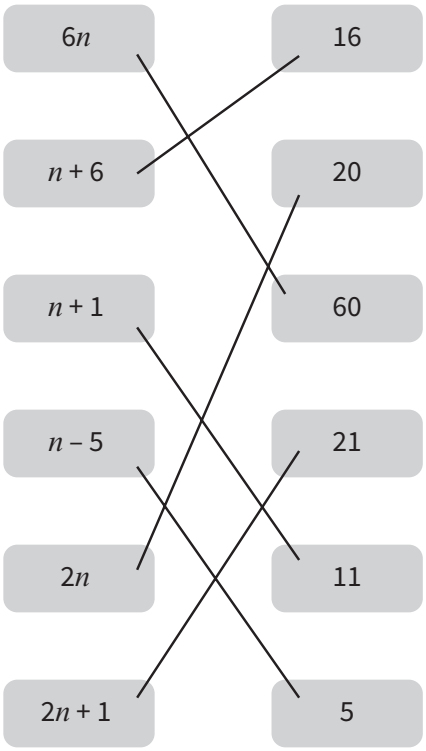
2 8, 16, 24, 32

3 4, 5, 6, 4 + 3 = 7

4 11, 12, 13, 14

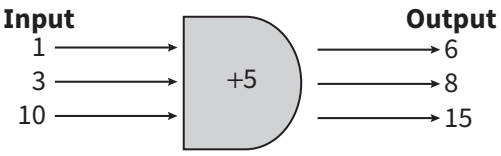
5 **a** 30 **b** 8 x 10 = 80 **c** 10 + 4 = 14 **d** 10 + 9 = 19

6



2.3 Finding the inverse of a function

1 **a**



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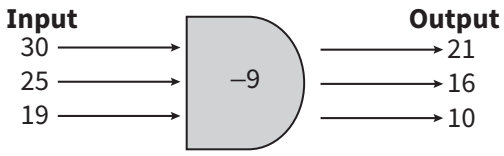

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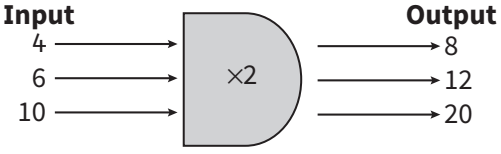

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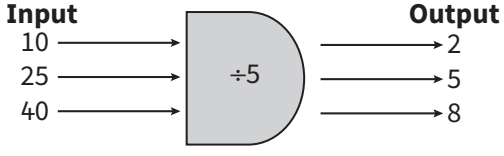
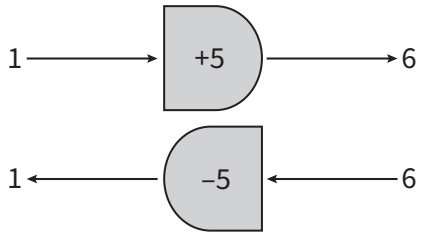
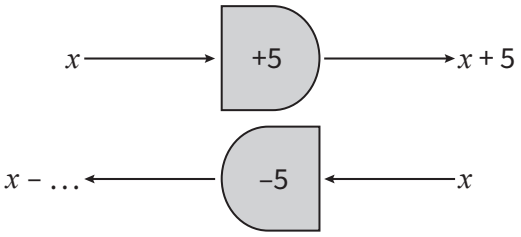


2 a





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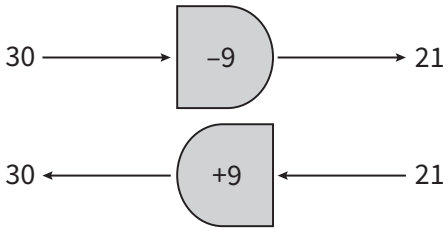

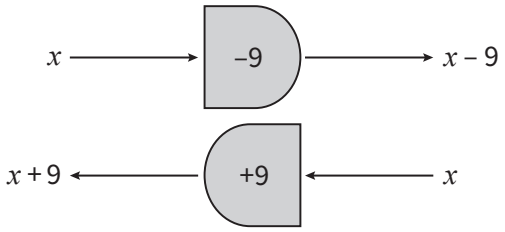

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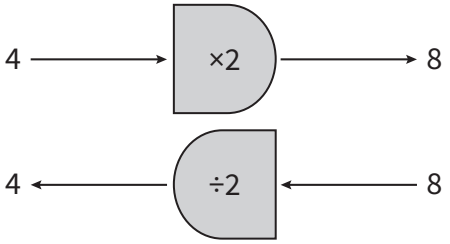

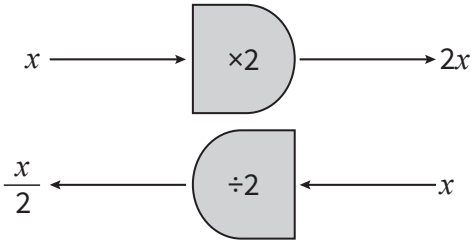

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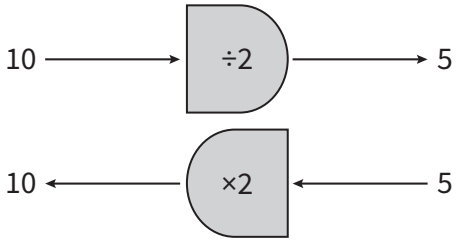
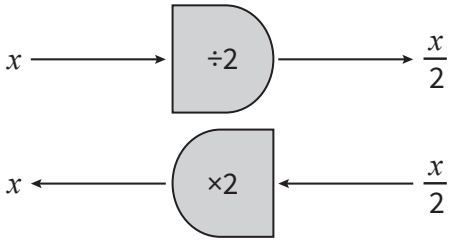
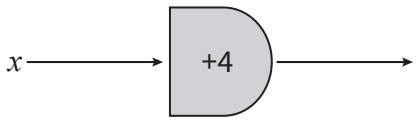
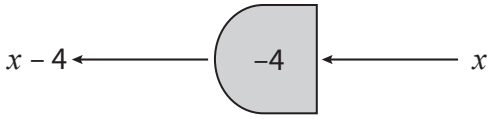
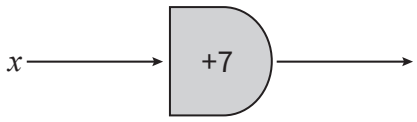
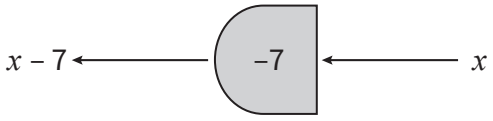




3 a

Machine		Equation	Mapping
Function		$y = x + 4$	$x \rightarrow x + 4$
Inverse		$y = x - 4$	$x \rightarrow x - 4$

b

Machine		Equation	Mapping
Function		$y = x + 7$	$x \rightarrow x + 7$
Inverse		$y = x - 7$	$x \rightarrow x - 7$

c Machine

			Equation	Mapping
Function	x →	−6	→ $x - 6$	$y = x - 6$	$x \to x - 6$
Inverse	$x + 6$ ←	+6	← x	$y = x + 6$	$x \to x + 6$

d Machine

			Equation	Mapping
Function	x →	×9	→ $9x$	$y = 9x$	$x \to 9x$
Inverse	$\frac{x}{9}$ ←	÷9	← x	$y = \frac{x}{9}$	$x \to \frac{x}{9}$

e Machine

			Equation	Mapping
Function	x →	÷4	→ $\frac{x}{4}$	$y = \frac{x}{4}$	$x \to \frac{x}{4}$
Inverse	$4x$ ←	×4	← x	$y = 4x$	$x \to 4x$

3 Place value, ordering and rounding

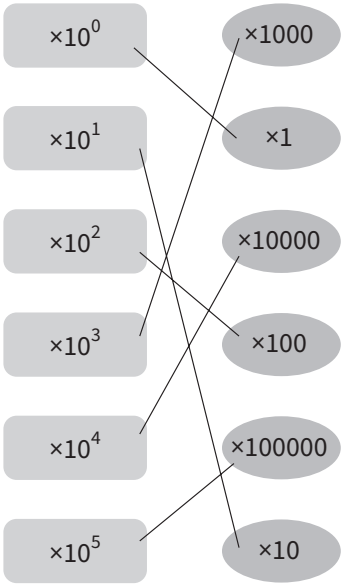
3.1 Multiplying and dividing decimals mentally

1 **a** 1.2 **b** 28, 2.8 **c** 9, 0.9 **d** 30, 3 **e** 0.16 **f** 20, 0.2 **g** 77, 0.77

2 **a** 20 **b** 2, 80 ÷ 2 = 40 **c** 90, 1, 90 ÷ 1 = 90 **d** 120, 4, 120 ÷ 4 = 30 **e** 300
f 800, 4, 800 ÷ 4 = 200 **g** 1600, 8, 1600 ÷ 8 = 200

3.2 Multiplying and dividing by powers of 10

1



2 **a** $3.4 \times 100 = 340$

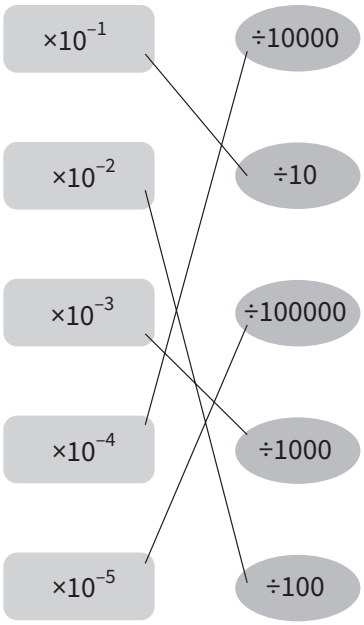
b $4.8 \times 1000 = 4800$

c $12.5 \times 10 = 125$

d $5 \times 100\,000 = 500\,000$

e $14 \times 1000 = 14\,000$

3



4 **a** $3.4 \div 100 = 0.034$

b $8 \div 1000 = 0.008$

c $15 \div 10000 = 0.0015$

d $12 \div 10 = 1.2$

3.3 Rounding

1 **a** 4.1 **b** 3.9 **c** 6.3 **d** 8.2 **e** 12.8 **f** 43.0

2 **a** 5.17 **b** 5.22 **c** 0.78 **d** 0.04 **e** 12.01 **f** 25.12

3 **a** ✓ **b** ✓ **c** ✗, 0.008 **d** ✓

3.4 Order of operations

1

	Order of operations	1st step	2nd step
a	M then S	$4 \times 3 = 12$	$20 - 12 = 8$
b	M then A	$8 \times 2 = 16$	$16 + 4 = 20$
c	D then A	$\frac{8}{2} = 4$	$3 + 4 = 7$
d	D then S	$\frac{30}{6} = 5$	$5 - 1 = 4$
e	I then A	$2^2 = 4$	$7 + 4 = 11$
f	B then M	$(9 + 11) = 20$	$2 \times 20 = 40$
g	B then S	$(30 - 10) = 20$	$50 - 20 = 30$
h	I then S	$5^2 = 25$	$25 - 15 = 10$

2 **a** $4 \times 2 = 8, 6 + 8 = 14$ **b** $2^2 = 4, 5 \times 3 = 15, 4 + 15 = 19$ **c** $3^2 = 9, 20 \div 2 = 10, 10 - 9 = 1$

4 Length, mass and capacity

4.1 Solving problems involving measurements

1

Length	Mass	Capacity
1 km = 1000 m	1 kg = 1000 g	1 l = 1000 ml
1 m = 100 cm		
1 cm = 10 mm		

2 **a** 5000 m **b** 450 cm **c** 32 mm **d** 250 m
e 7 m **f** 45 cm **g** 3.2 km **h** 12.5 m

3 **a** 5000 g **b** 3200 g **c** 500 g
d 2600 g = 2.6 kg **e** 0.25 kg **f** 14 kg

4 **a** 8000 ml **b** 12000 ml **c** 2400 ml
d 9 l **e** 3.5 l **f** 0.75 l

4.2 Solving problems involving average speed

1

Minutes	Fraction of an hour	Decimal of an hour
15	$\frac{1}{4}$	0.25
30	$\frac{1}{2}$	0.5
45	$\frac{3}{4}$	0.75

2 **a** 20 mins **b** 12 mins **c** 10 mins
d 6 mins **e** 20 × 2 = 40 mins **f** 12 × 4 = 48 mins

3 **a** $\frac{1}{10}$ hour **b** $\frac{4}{60} = \frac{1}{15}$ hour **c** $\frac{24}{60} = \frac{2}{5}$ hour **d** $\frac{50}{60} = \frac{5}{6}$ hour

4 **b** 12 mins **c** 0.6, 36 mins **d** 0.9, 54 mins

5 **b** $\frac{180}{3} = 60$ km/h **c** $\frac{450}{5} = 90$ km/h

6 **a** 2.5, $\frac{60}{2.5} = 24$ km/h **b** 3.25, $\frac{286}{3.25} = 88$ km/h **c** 1.75, $\frac{112}{1.75} = 64$ km/h

7 **a** 50 km **b** 70 x 4 = 280 km

4.3 Using compound measures

1 $1.20, $1.30, The small bag is the best value for money because $1.20 is less than $1.30

2 70, 65, The large bottle is the best value for money because 0.65 cents is less than 0.70 cents

3 $\frac{240}{2} = 120$ km/h, $\frac{345}{3} = 115$ km/h, The 1st train is the quickest because 120 km/h is faster than 115 km/h

5 Shapes

5.1 Regular polygons

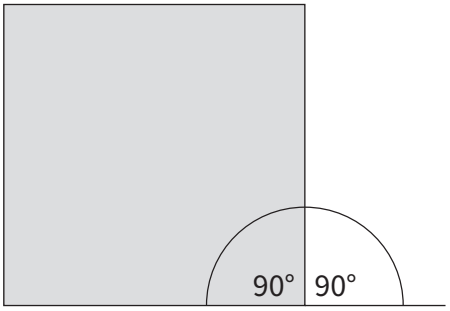
1 pentagon; 180 × 3 = 540; 540 ÷ 5 = 108; each angle is 108°

2 6 sides; hexagon; 180 × 4 = 720; 720 ÷ 6 = 120; each angle is 120°

3 8 sides; 180 × 6 = 1080; 1080 ÷ 8 = 135; each angle is 135°

4 10 sides; 180 × 8 = 1440; 1440 ÷ 10 = 144; each angle is 144°

5 **a**



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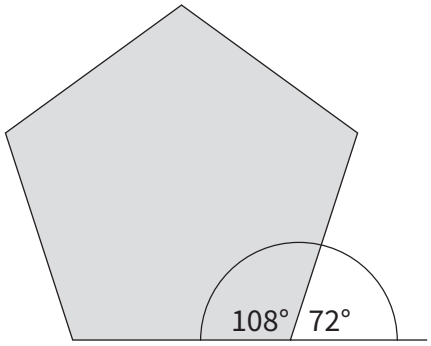

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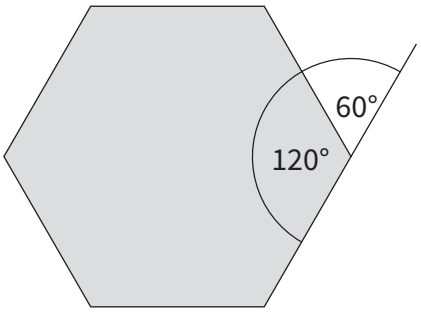

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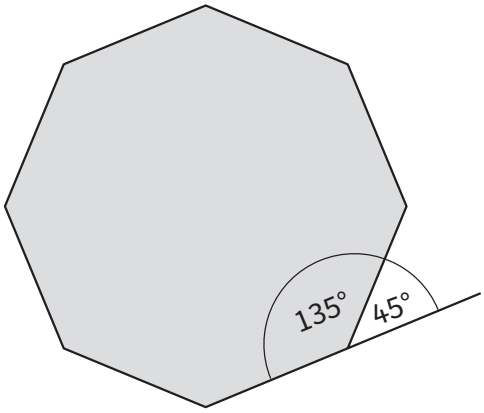

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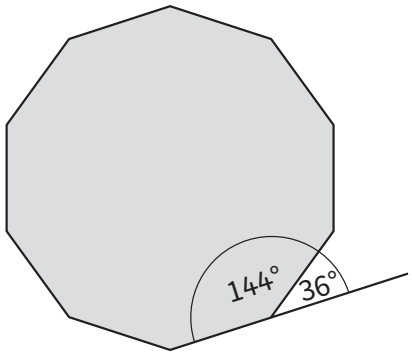
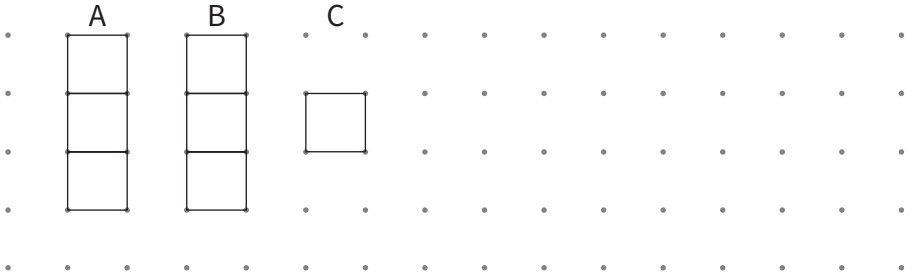


5.2 Plans and elevations

1



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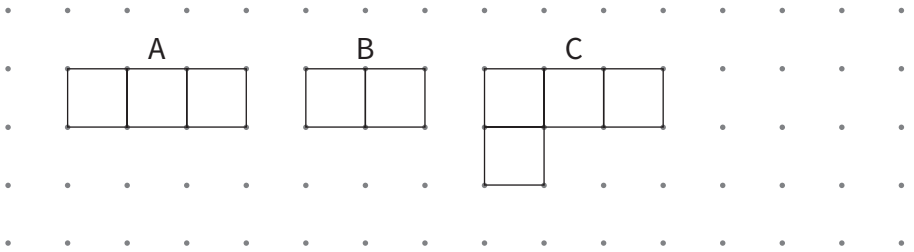

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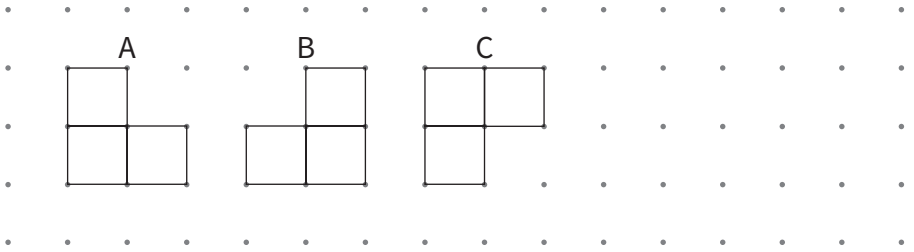

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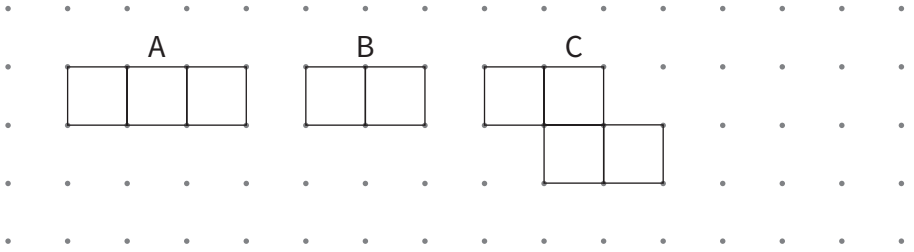

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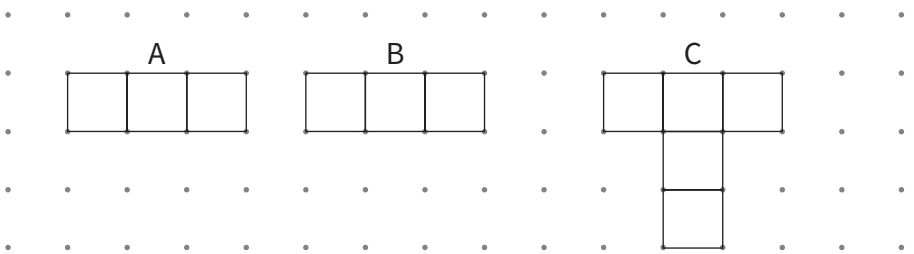


6 Planning and collecting data

6.1 Designing data collection sheets

1 **a** Students comment e.g. it doesn't include all possible answers

b Students comment e.g. it doesn't include all possible answers, but includes rowing which is not on his list.

c Students comment e.g. there is no box for the total frequencies

d Students comment e.g. it is not easy to quickly total all the tallies

2

Number on dice	Tally	Frequency
1		
2		
3		
4		
5		
6		
	Total frequency	

3

Colour	Tally	Frequency
Red		
Blue		
Green		
Yellow		
Orange		
	Total frequency	

4 Design B. Students comment, e.g. because every age is covered only once. Design A is wrong as [for e.g.] a 20 year old would be counted in two rows, 0 – 20 and 20 – 40

6.2 Collecting data

1 a

Colour	Tally	Frequency
Red	𝍸 ||	7
Black	𝍸	5
Silver	|||	3
White	𝍸	5
	Total:	20

b Red

c Students comment e.g. black and white are equally popular, or, silver is the least popular.

2 3 1 4 2 3 4 2 1 4 2 3 2 2

4 2 4 1 4 2 3 3 2 1 4 1

a

Number	Tally	Frequency
1	𝍸	5
2	𝍸 |||	8
3	𝍸	5
4	𝍸 ||	7
	Total:	25

b 2

c Students comment e.g. 1 and 3 landed equally

3 a

Number of runs	Tally	Frequency
0 – 29	𝍸	4
30 – 59	𝍸 𝍸	9
60 – 89	𝍸	5
90 – 119	||	2
	Total:	20

b Students comment e.g. 30 – 59 is the most common number of runs

4 a

Mass of apples, m (g)	Tally	Frequency
$100 < m \leq 125$	𝍸 |||	8
$125 < m \leq 150$	𝍸 𝍸 𝍸	15
$150 < m \leq 175$	𝍸 |	6
$175 < m \leq 200$	|	1
	Total:	30

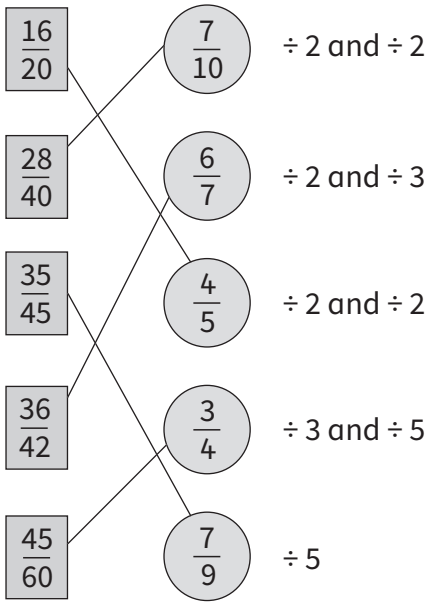
b Students comment e.g. most of the apples are in the range $125 < m \leq 150$

7 Fractions

7.1 Writing a fraction in its simplest for

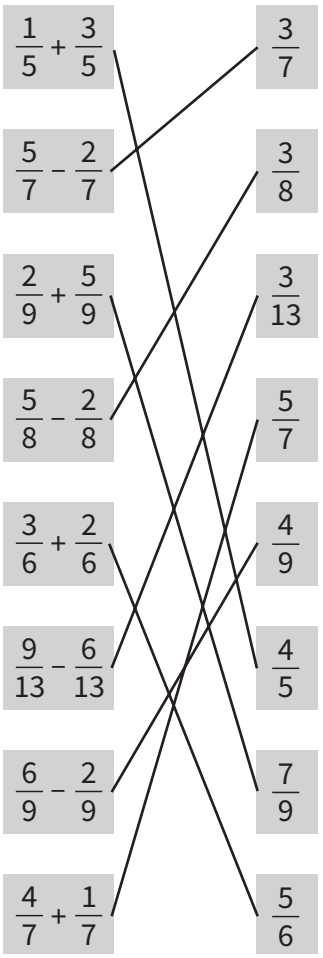
1 a $\frac{2}{5}$ **b** $\frac{3}{9} = \frac{1}{3}$ **c** $\frac{7}{11}$ d $\frac{15}{25} = \frac{3}{5}$ e $\frac{8}{12} = \frac{4}{6} = \frac{2}{3}$ f $\frac{2}{3}$

2



7.2 Adding and subtracting fractions

1



2 **a** $\frac{4}{9}$ **b** $\frac{11}{15}-\frac{3}{15}=\frac{8}{15}$ **c** $\frac{2}{12}+\frac{5}{12}=\frac{7}{12}$

d $\frac{12}{15}-\frac{10}{15}=\frac{2}{15}$ **e** $\frac{3}{12}+\frac{8}{12}=\frac{11}{12}$ **f** $\frac{3}{24}+\frac{20}{24}=\frac{23}{24}$

3 **a** $1\frac{1}{3}$ **b** $1\frac{4}{5}$ **c** $1\frac{1}{4}$ **d** $1\frac{5}{6}$

4 **a** $1\frac{2}{5}$ **b** $\frac{10}{9}=1\frac{1}{9}$ **c** $\frac{8}{10}+\frac{9}{10}=\frac{17}{10}, \frac{17}{10}=1\frac{7}{10}$

d $\frac{25}{30}+\frac{24}{30}=\frac{49}{30}, \frac{49}{30}=1\frac{19}{30}$

7.3 Multiplying fractions

1 **a** $2\times4=8$ **b** $\frac{3}{5}\times5\times4=3\times4=12$

c $\frac{5}{6}\times6\times3=5\times3=15$ **d** $\frac{4}{9}\times9\times3=4\times3=12$

2 **a** $\frac{1\times5}{2}=\frac{5}{2}=2\frac{1}{2}$ **b** $\frac{3}{2\times5}\times5\times5=\frac{3\times5}{2}=\frac{15}{2}=7\frac{1}{2}$

c $\frac{3}{4}\times14=\frac{3}{2}\times2\times2\times7=3\times\frac{7}{2}-21.2=10\frac{1}{2}$ **d** $\frac{5}{9}\times24=\frac{5}{3}\times3\times3\times8=5\times\frac{8}{3}=\frac{40}{3}=13\frac{1}{3}$

7.4 Dividing fractions

1

$12 \div \frac{3}{4}$	$12 \times \frac{4}{1}$
$12 \div \frac{3}{5}$	$12 \times \frac{4}{3}$
$12 \div \frac{1}{4}$	$12 \times \frac{3}{5}$
$12 \div \frac{5}{3}$	$12 \times \frac{3}{4}$
$12 \div \frac{4}{3}$	$12 \times \frac{5}{3}$

2 **a** $6 \times 3 = 18$ **b** $18 \times \frac{4}{3} = 6 \times 3 \times \frac{4}{3} = 6 \times 4 = 24$ **c** $20 \times \frac{7}{4} = 5 \times 4 \times \frac{7}{4} = 5 \times 7 = 35$

d $30 \times \frac{3}{2} = 15 \times 2 \times \frac{3}{2} = 15 \times 3 = 45$ **e** $24 \times \frac{5}{4} = 6 \times 4 \times \frac{5}{4} = 6 \times 5 = 30$

3 **a** $\frac{35}{2} = 17\frac{1}{2}$ **b** $12 \times \frac{9}{8} = 3 \times 4 \times \frac{9}{4 \times 2} = \frac{3 \times 9}{2} = \frac{27}{2} = 13\frac{1}{2}$

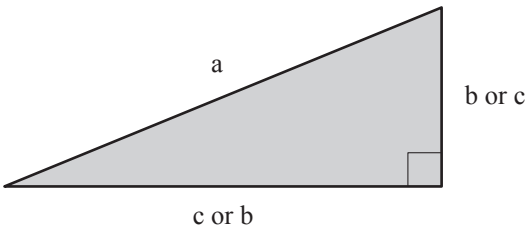
c $20 \times \frac{5}{6} = 10 \times 2 \times \frac{5}{2 \times 3} = \frac{10 \times 5}{3} = \frac{50}{3} = 16\frac{2}{3}$

d $15 \times \frac{13}{10} = 3 \times 5 \times \frac{13}{5 \times 2} = \frac{3 \times 13}{2} = \frac{39}{2} = 19\frac{1}{2}$

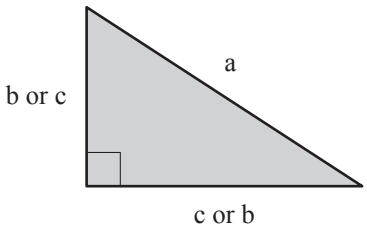
8 Constructions and Pythagoras' theorem

8.1 Using Pythagoras' theorem

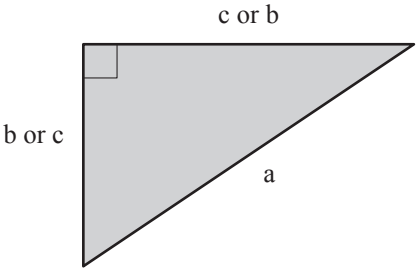
1 **a**



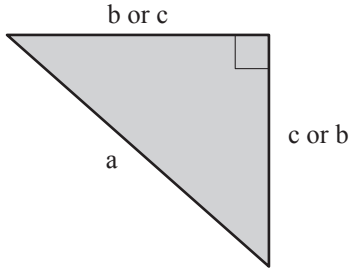
b



c



d



2 **b** $a = 10$ cm $b = 6$ or 8 cm $c = 8$ or 6 cm

c $a = 13$ cm $b = 12$ or 5 cm $c = 5$ or 12 cm

d $a = 25$ cm $b = 20$ or 15 cm $c = 15$ or 20 cm

3 **a** 15 cm

b ④ $a^2 = 6^2 + 8^2$ ⑤ $a^2 = 36 + 64$ $a^2 = 100$ a = $\sqrt{100} = 10$ cm

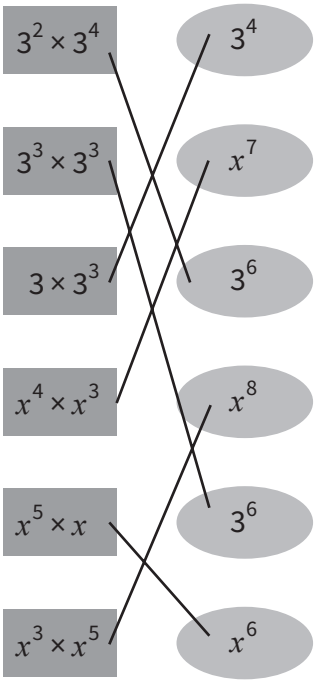
c ④ $a^2 = 4^2 + 9^2$ ⑤ $a^2 = 16 + 81$ $a^2 = 97$ a = $\sqrt{97} = 9.8$ cm

d ④ $a^2 = 5^2 + 7^2$ ⑤ $a^2 = 25 + 49$ $a^2 = 74$ a = $\sqrt{74} = 8.6$cm

9 Expressions and formulae

9.1 Simplifying algebraic expressions

1



2 **a** F, x^6 **b** T **c** T **d** F, y^6

3 **a** $30x^5$ **b** $4x^3 \times 3x^5 = 12x^8$

4 **a** x^3 **b** $x^{7-4} = x^3$ **c** $y^4 \div y^3 = y^{4-3} = y^1 = y$ **d** $y^{6-1} = y^5$

5 **a** x^6 **b** x^5 **c** y^7 **d** y^0

9.2 Constructing algebraic expressions

1 **b** $10 + 2 = 12$ **c** $12 + 2 = 14$ **e** $y + 2$ **f** $z + 2$

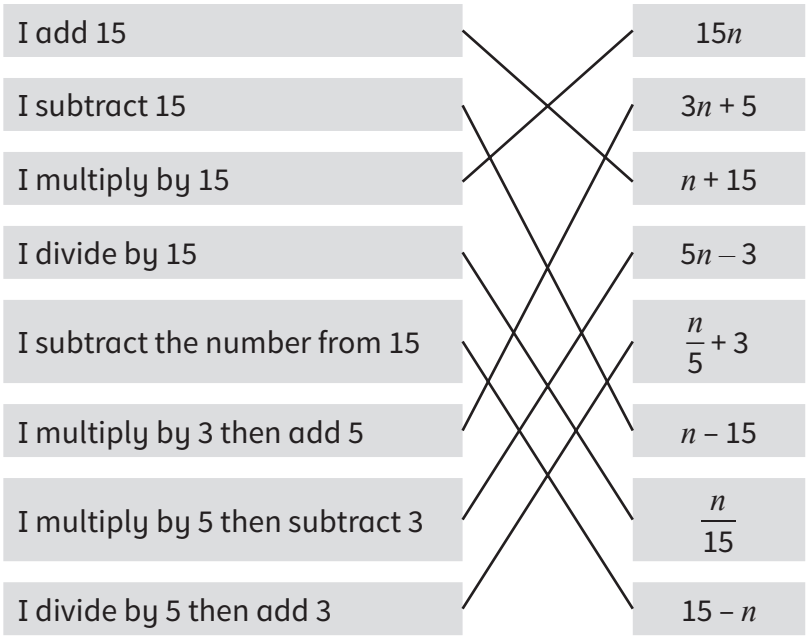
2 **a** $5 - 3 = 2$ **b** $8 - 3 = 5$ **c** $15 - 3 = 12$ **d** $x - 3$

e $y - 3$ **f** $z - 3$

3 **a** $2 \times 5 = 10$ **b** $4 \times 5 = 20$ **c** $a \times 5 = 5a$ **d** $b \times 5 = 5b$

4 **a** $15 \div 5 = 3$ **b** $30 \div 5 = 6$ **c** $a \div 5 = \frac{a}{5}$ **d** $b \div 5 = \frac{b}{5}$

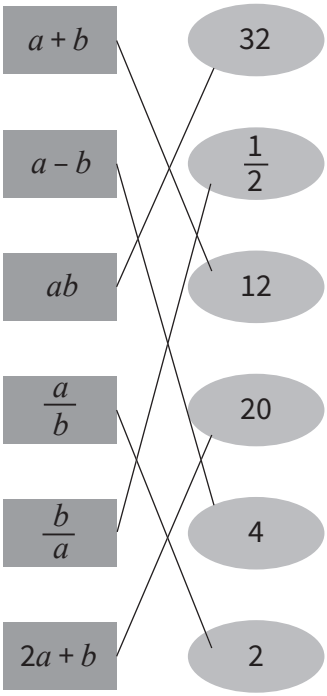
5



9.3 Substituting into expressions

1 **a** 20 + 3 = 23 **b** 5 – 4 = 1 **c** 4 × 100 = 400 **d** 3 × 12 = 36

2



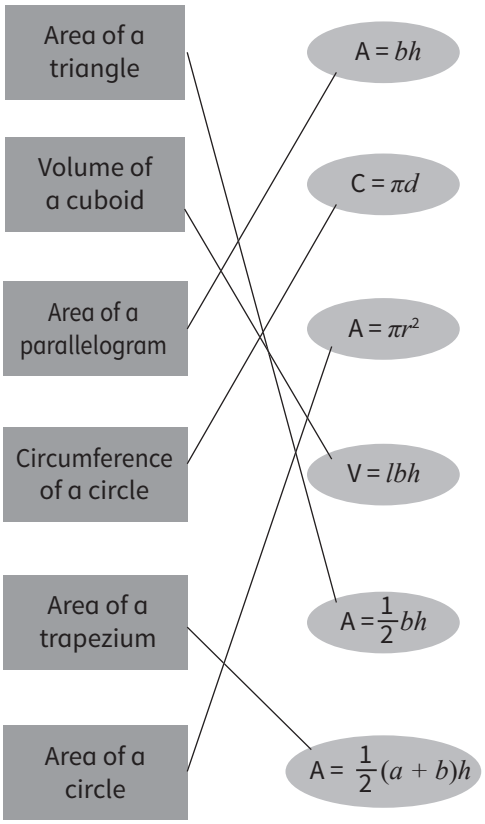
3 **a** 1 **b** 7 **c** –12 **d** 15

4 **a** 6 – 2 = 4 **b** 6 + 2 = 8 **c** 36 + 4 = 40

d 18 – 2 = 16 **e** 6 – 8 = –2 **f** 18 – 8 = 10

9.4 Deriving and using formulae

1



2 **a** **i** 24 **ii** 48 **iii** 72 **iv** $24d$

b 240

3 **a** **i** 7 **ii** 14 **iii** 21 **iv** $7w$

b D = $7w$, 56

4 **a** **i** 9 days **ii** 25 days **iii** $7w$ + d

b **i** 19 days **ii** 45 days

5 **b** $b \times g = \text{F}$ $b = \frac{F}{g}$ **c** $m \times b = \text{T}$ $b = \frac{T}{m}$ **d** $b + rt = \text{X}$ $b = \text{X} - rt$

e $b - kn = \text{M}$ $b = \text{M} + kn$

9.5 Factorising

1 **b** $3(x + 5) = 3x + 15$ **c** $5(y - 3) = 5y - 15$ **d** $4(y - 7) = 4y - 28$

2 **b** $3(x + 5)$ **c** $5(y - 3)$ **d** $4(y - 7)$

3 **a** $2(x + 4)$ **b** $3(x + 3)$ **c** $5(y - 6)$

d $8(y + 2)$ **e** $7(y - 3)$

4 **a** $6x + 3$ **b** $12x + 4$ **c** $10y - 2$ **d** $24y - 6$

5 **a** $3(2x + 1)$ **b** $4(3x + 1)$ **c** $2(5y - 1)$ **d** $6(4y - 1)$

6 **a** $2(2x + 3)$ **b** $3(2x - 3)$ **c** $5(3x + 2)$

9.6 Adding and subtracting algebraic fractions

1 $\frac{x}{2}$ $\frac{y}{9}$ $\frac{3x}{4}$ $\frac{11a}{12}$ $\frac{b}{c}$ $\frac{9g}{20}$ $\frac{1}{2d}$

2 **a** $\frac{2}{3}$ **b** $\frac{3}{5}$ **c** $\frac{5}{7}$ **d** $\frac{1}{2}$ **e** $\frac{3}{9} = \frac{1}{3}$ **f** $\frac{6}{10} = \frac{3}{5}$

3 **b** $\frac{x}{5} + \frac{2x}{5} = \frac{3x}{5}$ **c** $\frac{5y}{7}$ **d** $\frac{y}{2}$ **e** $\frac{3m}{9} = \frac{m}{3}$ **f** $\frac{6n}{10} = \frac{3n}{5}$

4 **a** $\frac{5}{8}$ **b** $\frac{3}{9} + \frac{2}{9} = \frac{5}{9}$

c $\frac{4}{6} - \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$ **d** $\frac{11}{12} - \frac{2}{12} = \frac{9}{12} = \frac{3}{4}$

5 **a** $\frac{5x}{8}$ **b** $\frac{5y}{9}$ **c** $\frac{p}{2}$ **d** $\frac{3b}{4}$

10 Processing and presenting data

10.1 Calculating statistics

1

Mass	Frequency	Mass × Frequency
4	1	4
5	4	20
6	5	30
7	8	56
8	2	16
Total	20	126

Mean mass = 126 ÷ 20 = 6.3 kg

2

People	Frequency	People × frequency
1	17	17
2	15	30
3	8	24
4	5	20
5	3	15
6	2	12
Total	50	118

Mean number of people = 118 ÷ 50 = 2.36

3

Time	Frequency	Time × Frequency
5	7	35
6	8	48
7	12	84
8	17	136
9	4	36
10	12	120
Total	60	459

Mean waiting time = 459 ÷ 60 = 7.65 minutes

4

Mark	Frequency	Mark × Frequency
14	2	28
15	11	165
16	10	160
17	4	68
18	5	90
19	3	57
20	5	100
Total	40	668

The mean mark is 668 ÷ 40 = 16.7

5 **a** 7 **b** 1 **c** 8 **d** 15

10.2 Using statistics

1 **a** 47 **b** 45 **c** greater; 15 **d** greater; 17.4

2 **a** 95 **b** 96.5 **c** greater; 3 **d** greater; 2.3

3 **a** 50.5 **b** 51 **c** Race 1 **d** Race 1

4 **a** 30 **b** 30

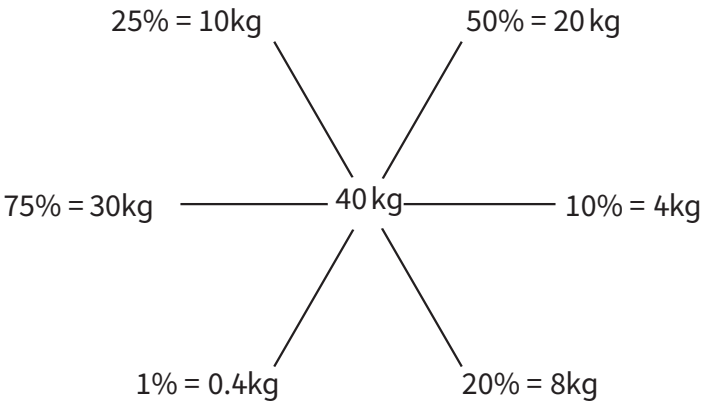
c Possible answers are: The median for class X is 10 minutes less than the median for class Y. The mean for class X is 5.5 minutes less than the mean for class Y.

11 Percentages

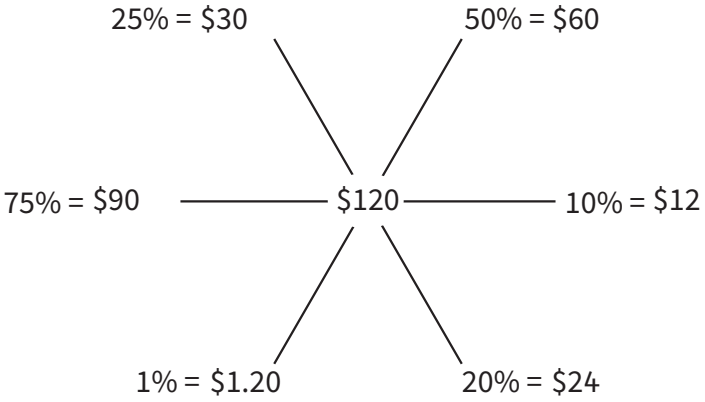
11.1 Using mental methods

1 **b** $\frac{1}{4}$ **c** $\frac{3}{4}$ **d** $\frac{1}{10}$ **e** $\frac{1}{5}$ **f** $\frac{1}{100}$

2



3



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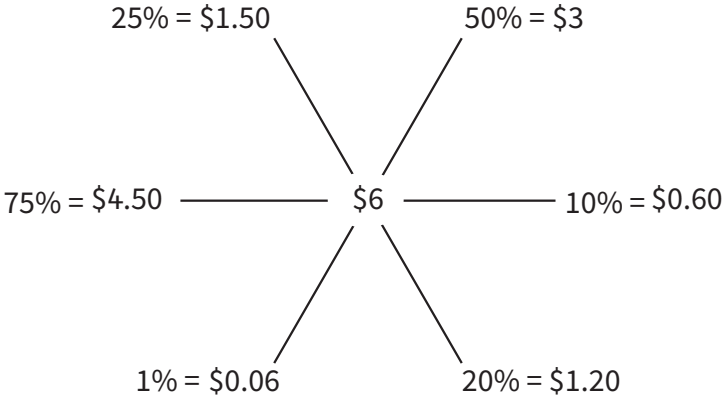


5

	80 kg	24 m	$ 240	$ 5	30 hours
50%	40 kg	12 m	$120	$2.50	15 hours
10%	8 kg	2.4 m	$24	$0.50	3 hours
60%	48 kg	14.4 m	$144	$3	18 hours

6

	20 km	$44	$6	64 cm	160 kg
25%	5 km	$11	$1.50	16 cm	40 kg
10%	2 kg	$4.40	$0.60	6.4 cm	16 kg
35%	7 kg	$15.40	$2.10	22.4 cm	56 kg

7

	50%	25%	10%	75%	60%	85%
$400	$200	$100	$40	$300	$240	$340
$80	$40	$20	$8	$60	$48	$68
$220	$110	$55	$22	$165	$132	$187

8

	50%	25%	75%	10%	65%	15%
60 kg	30 kg	15 kg	45 kg	6 kg	39 kg	9 kg
300 cm	150 cm	75 cm	225 cm	30 cm	195 cm	45 cm
420 g	210 g	105 g	315 g	42 g	273 g	63 g

11.2 Percentage changes

1

Original price	10% increase	New price
$600	$60	$660
$40	$4	$44
$70	$7	$77
$430	$43	$473
$2500	$250	$2750

2

Original height	25% increase	New height
32 cm	8 cm	40 cm
12 cm	3 cm	15 cm
28 cm	7 cm	35 cm
44 cm	11 cm	55 cm
124 cm	31 cm	155 cm

3

Original mass	10%	20%	New mass
12 kg	1.2 kg	2.4 kg	14.4 kg
20 kg	2 kg	4 kg	24 kg
15 kg	1.5 kg	3 kg	18 kg
44 kg	4.4 kg	8.8 kg	52.8 kg

4

Original price	25% decrease	New price
$32	$8	$24
$80	$20	$60
$44	$11	$33
$280	$70	$210
$620	$155	$465

5 **a** \$4; 10% **b** \$10; 25% **c** \$20; 50%

6 **a** \$40; 50% **b** \$20; 25% **c** \$8; 10%

7 **a** 30 cm; 25% **b** 12 cm; 10% **c** 60 cm; 50%

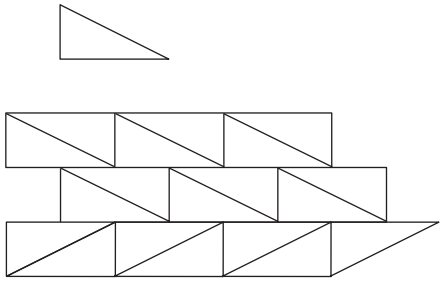
8 **a** \$2.50; 50% **b** \$0.50; 10% **c** \$1.25; 25%

12 Tessellations, transformations and loci

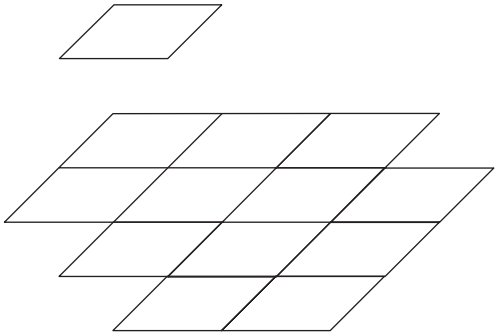
12.1 Tessellating shapes

1 Students own tessellations, examples below

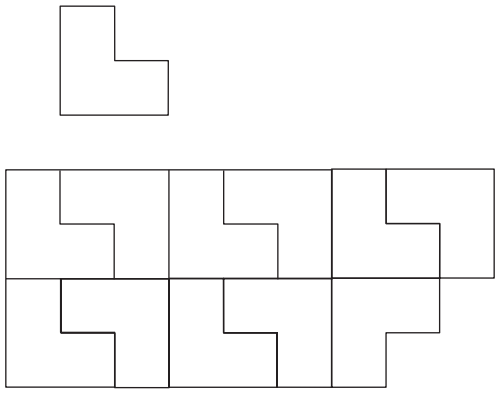
a



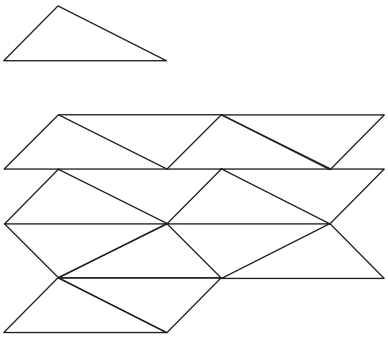
b



c



d



12.2 Solving transformation problems

1

$\begin{pmatrix}2\\3\end{pmatrix}$ move the shape 2 units left and 3 units down

$\begin{pmatrix}2\\-3\end{pmatrix}$ move the shape 3 units right and 2 units up

$\begin{pmatrix}-2\\-3\end{pmatrix}$ move the shape 2 units left and 3 units up

$\begin{pmatrix}-3\\2\end{pmatrix}$ move the shape 2 units right and 3 units up

$\begin{pmatrix}-2\\3\end{pmatrix}$ move the shape 3 units left and 2 units up

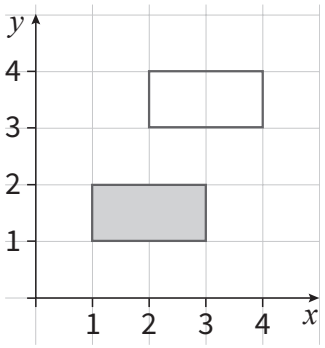
$\begin{pmatrix}3\\2\end{pmatrix}$ move the shape 2 units right and 3 units down

2 **a** The column vector $\begin{pmatrix}4\\5\end{pmatrix}$ means move the shape 4 units right and 5 units up.

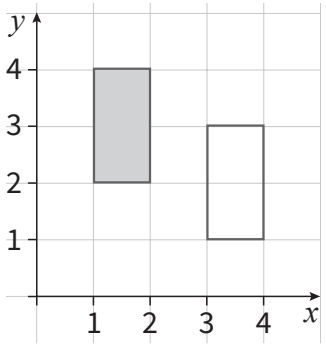
b The column vector $\begin{pmatrix}-1\\6\end{pmatrix}$ means move the shape 1 unit left and 6 units up.

c The column vector $\begin{pmatrix}2\\-4\end{pmatrix}$ means move the shape 2 units right and 4 units down.

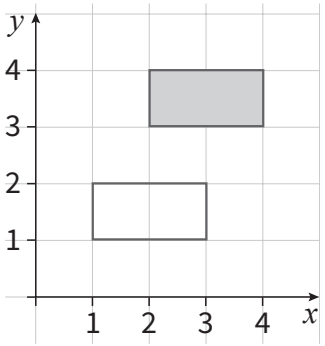
3 **a**



b



c



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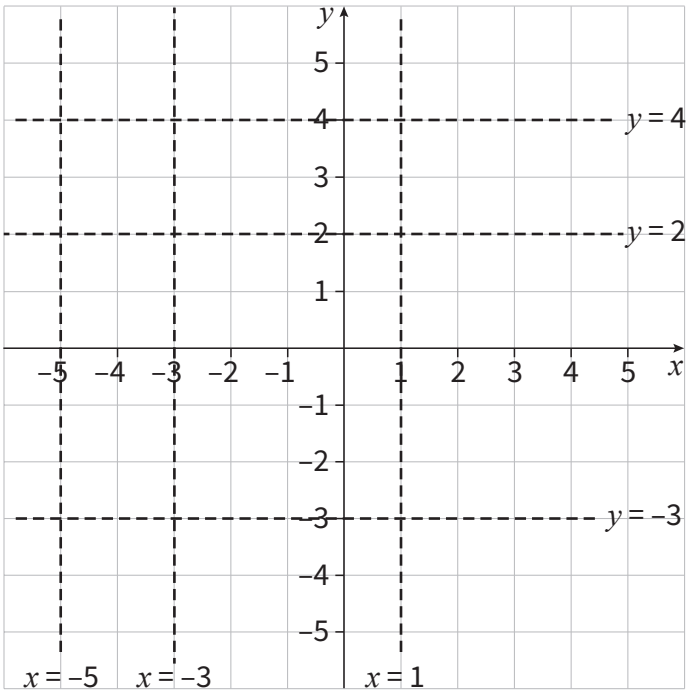
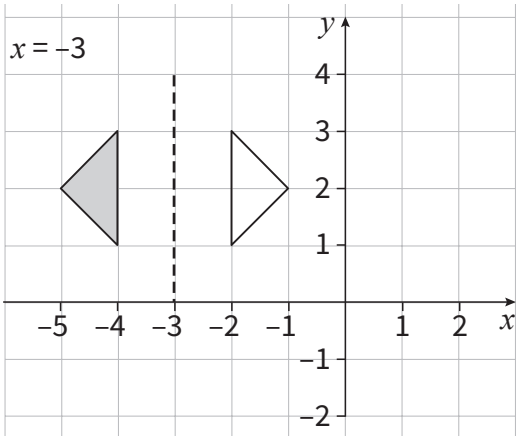
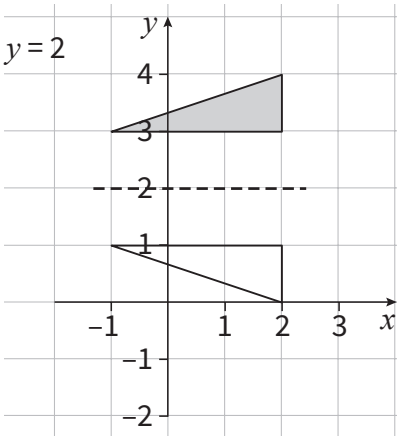


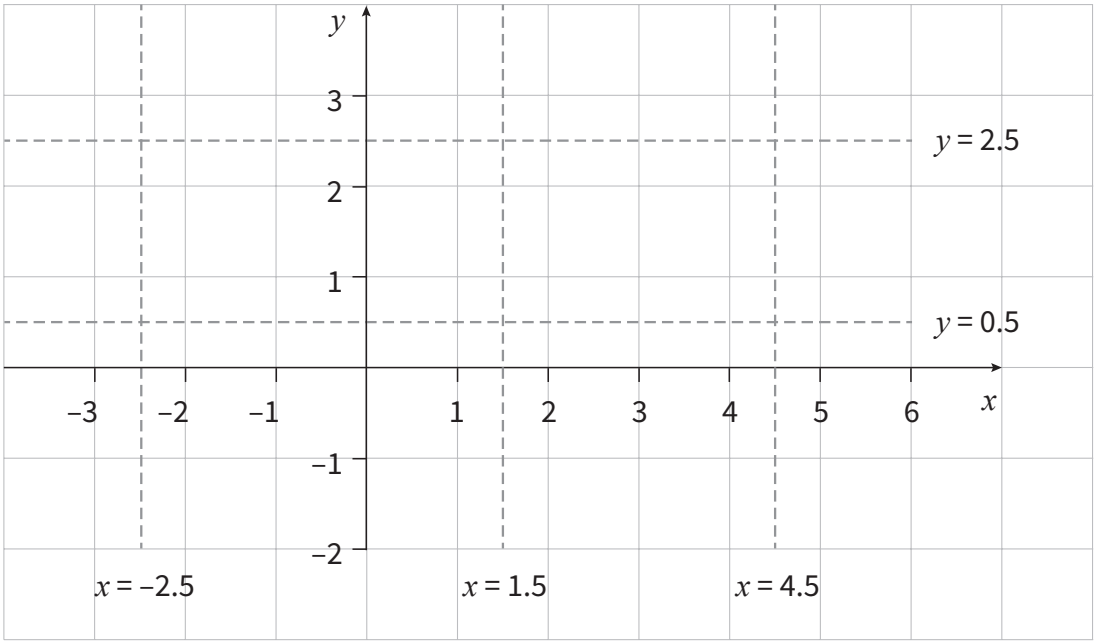
5 **a**



b

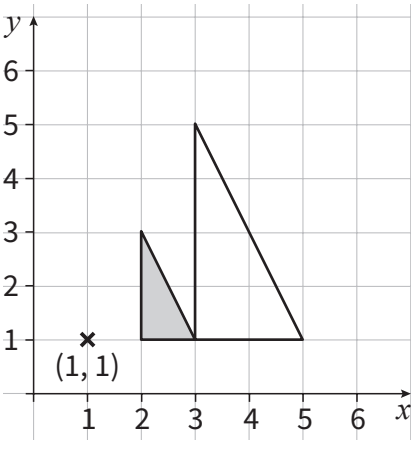


6

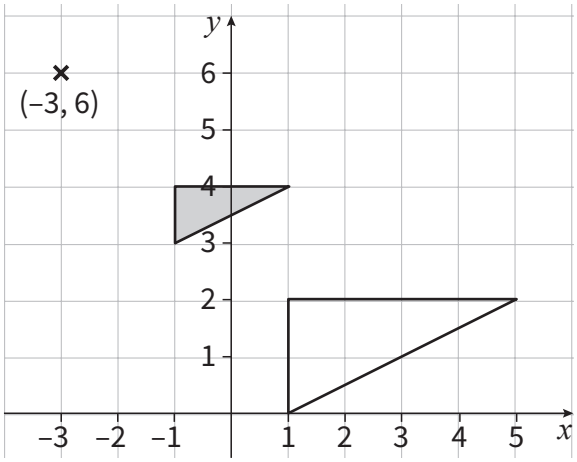


12.3 Enlarging shapes

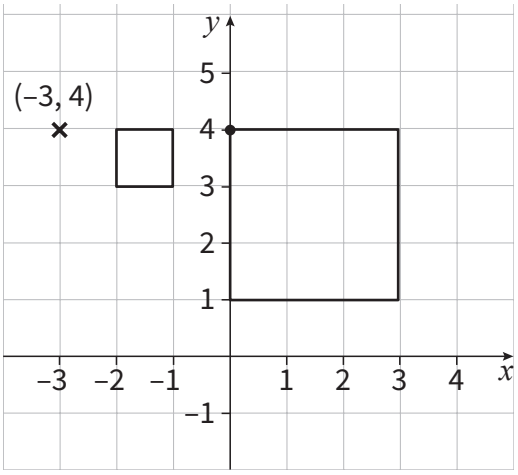
1 **a**



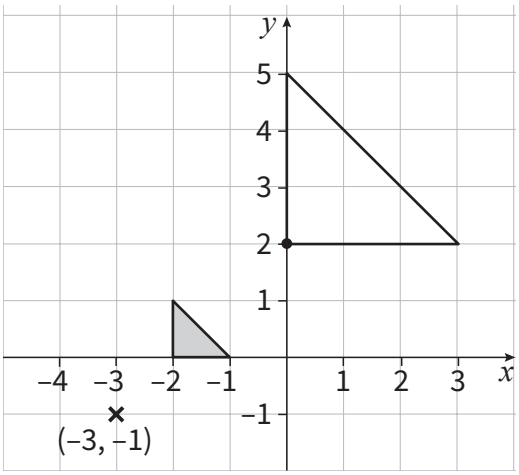
b



2 **a**



b



13 Equations and inequalities

13.1 Solving linear equations

1 **a** 11 **b** 1 **c** 15

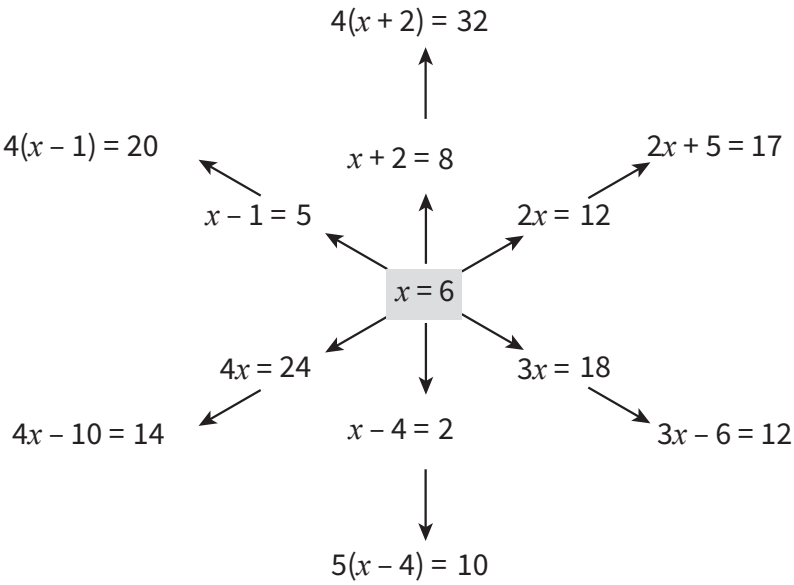
2 6, 11, 11

3 15, 13, 23

4 7, 14, 28

5 2, 8, 20

6



7 **a** $2x = 14; x = 7$ **b** $3x = 15; x = 5$ **c** $5x = 30; x = 6$

d $x - 2 = 10; x = 12$ **e** $x + 5 = 11; x = 6$ **f** $x - 4 = 7; x = 11$

8 $3(x - 2) = 15 \leftarrow x - 2 = 5 \leftarrow x = 7 \rightarrow 3x = 21 \rightarrow 3x - 2 = 19$

9 $4(x + 3) = 36 \leftarrow x + 3 = 9 \leftarrow x = 6 \rightarrow 4x = 24 \rightarrow 4x + 3 = 27$

13.2 Trial and improvement

1

x	$x^2 + x$	
5	30	too small
6	42	too small
9	90	too large
8	72	solution

$x = 8$

2 These are numbers you could try

x	$x^2 - 2x$	
9	63	too large
7	35	too large
4	8	too small
6	24	solution

$x = 6$

3 These are numbers you could try

x	$x^2 + 4x$	
9	117	too small
10	140	too small
12	192	too large
11	165	solution

$x = 11$

4 These are numbers you could try

x	$x^2 - 5x$	
8	24	too small
9	36	too small
11	66	too large
10	50	solution

$x = 10$

5 You might try other numbers

x	$x^2 + x$	
6	42	too small
7	56	too large
6.5	48.75	too large
6.4	47.36	too large
6.3	45.99	too large
6.2	44.64	too small

The solution is between 6.2 and 6.3.

6 You might try these numbers

x	$x^2 + 2x$	
4	24	too small
5	35	too large
4.5	29.25	too small
4.7	31.49	too large
4.6	30.36	too small

The solution is between 4.6 and 4.7.

7 You might try these numbers

x	$x^2 - x$	
10	90	too large
9	72	too small
9.5	80.75	too small
9.8	86.24	too small
9.9	88.11	too large

The solution is between 9.8 and 9.9.

14 Ratio and proportion

14.1 Comparing and using ratios

1 Harsha 1 : 2 Oditi 1 : 3

Oditi has the darker paint.

2 Jake 1 : 2.5 Razi 1 : 3.25

Razi has the darker paint.

14.2 Solving problems

1 6 toilet rolls costs \$4.02, so 1 costs \$4.02 ÷ 6 = \$0.67

10 toilet rolls costs \$6.80, so 1 costs \$6.80 ÷ 10 = \$0.68

The 6-pack is better value as it costs 1 cent less per toilet roll.

2 300g costs \$3.36, so 100g costs \$3.36 ÷ 3 = \$1.12

500g costs \$5.40, so 100g costs \$5.40 ÷ 5 = \$1.08

The 500 g bag is better value as it costs 4 cents less per 100g.

3 1 packet costs \$7.25 ÷ 5 = \$1.45

3 packets cost 1.45 × 3 = \$4.35

4 1 tin costs \$4.92 ÷ 6 = \$0.82

15 tins cost 0.82 × 15 = \$12.30

15 Area, perimeter and volume

15.1 Solving circle problems

1 **a** $d = 6$ cm

$C = \pi \times d = \pi \times 6$

$= 18.85$ cm

b $d = 5$ cm

$C = \pi \times d = \pi \times 5$

$= 15.71$ cm

c $d = 9$ cm

$C = \pi \times d = \pi \times 9$

$= 28.27$ cm

2 radius, $r = 4$ cm

diameter, $d = 2 \times 4 = 8$ cm

$C = \pi \times d = \pi \times 8 = 25.13$ cm

3 $C = \pi \times d = \pi \times 12 = 36.70$ cm

$\frac{1}{2}$ of the circumference = 36.70 ÷ 2 = 18.85 cm

Perimeter = 12 + 18.85 = 30.85 cm

4 **a** $r = 4$ cm

$A = \pi \times r^2 = \pi \times 4^2$

$= \pi \times 16$

$= 50.27 \text{cm}^2$

b $r = 1$ cm

$A = \pi \times r^2 = \pi \times 1^2$

$= \pi \times 1$

$= 3.14 \text{ cm}^2$

c $r = 6$ cm

$A = \pi \times r^2 = \pi \times 6^2$

$= \pi \times 36$

$= 113.10 \text{ cm}^2$

5 radius, $r = 6 \div 2 = 3$ cm

$A = \pi \times r^2 = \pi \times 3^2$

$= \pi \times 9 = 28.27 \text{ cm}^2$

6 $A = \pi \times r^2 = \pi \times 5^2$

$= \pi \times 25 = 78.54 \text{ cm}^2$

Area of semicircle = 78.54 ÷ 2 = 39.27 cm^2

7 Radius = 16 ÷ 2 = 8 cm

Area of circle = $\pi \times r^2 = \pi \times 8^2$

$= \pi \times 64 = 201.06$ cm^2

Area of semicircle = 201.06 ÷ 2 = 100.53 cm^2

15.2 Calculating with prisms and cylinders

1 ✓ a, c, e, f ✗ b, d

2 **a** Volume = area of cross-section × length

$= 20 \times 8 = 160$ cm^3

b Volume = area of cross-section × length

$= 15 \times 6 = 90$ cm^3

c Volume = area of cross-section × length

$= 12 \times 9 = 108$ cm^3

d Volume = area of cross-section × length

$= 30 \times 12 = 360$ cm^3

3 **a** Area of cross-section = area of rectangle

= base × height = 8 × 4 = 32 cm^2

Volume = area of cross-section × length

$= 32 \times 10 = 320$ cm^3

b Area of cross-section = area of triangle

$= \frac{1}{2} \times$ base × height $= \frac{1}{2} \times 6 \times 5 = 15$ cm^2

Volume = area of cross-section × length

$= 15 \times 7 = 105$ cm^3

c Area of cross-section = area of circle

$= \pi \times r^2 = \pi \times 4^2$

$= \pi \times 16 = 50.265\ldots$ cm^2

Volume = area of cross-section × length

$= 50.265 \times 11 = 552.92$ cm^3

16 Probability

16.1 Calculating probabilities

1

fraction	$\frac{2}{7}$	$\frac{3}{5}$	$\frac{9}{10}$	$\frac{2}{3}$	$\frac{3}{11}$	$\frac{7}{15}$
decimal (2 d.p.)	0.29	0.6	0.9	0.67	0.27	0.47
percentage	29%	60%	90%	67%	27%	47%

2 **a** **i** $\frac{5}{10}$ or $\frac{1}{2}$ **ii** $\frac{2}{10}$ or $\frac{1}{5}$ **iii** $\frac{3}{10}$ **b** $\frac{5}{10}+\frac{2}{10}+\frac{3}{10}=\frac{10}{10}=1$

3 **a** **i** $\frac{7}{20}$ **ii** $\frac{13}{20}$ **b** $\frac{7}{20}+\frac{13}{20}=\frac{20}{20}=1$

4 **a** 90% **b** 55%

5 **a** 0.2 **b** 0.05

6 25%

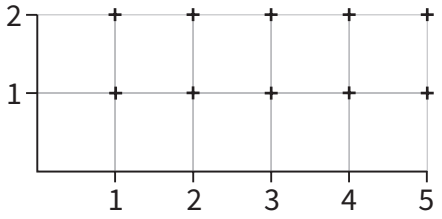
7 15%

8 0.19

16.2 Sample space diagrams

1 **a** $\frac{2}{12}=\frac{1}{6}$ **b** $\frac{3}{12}=\frac{1}{4}$ **c** $\frac{1}{12}$ **d** $\frac{1}{12}$

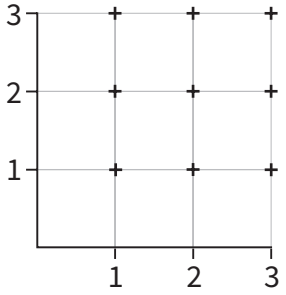
2 **a** Axes can be the other way round



b 7

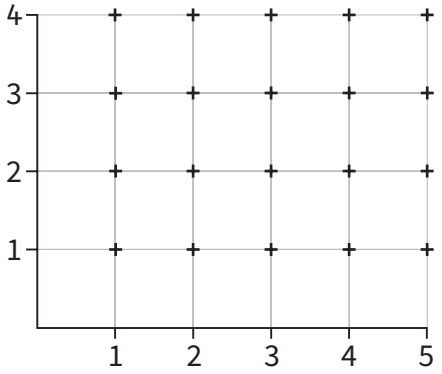
c **i** $\frac{2}{10}=\frac{1}{5}$ **ii** $\frac{2}{10}=\frac{1}{5}$ **iii** $\frac{1}{10}$

3 **a**



b 6 **c** **i** $\frac{2}{6}=\frac{1}{3}$ **ii** $\frac{3}{6}=\frac{1}{2}$ **iii** $\frac{2}{6}=\frac{1}{3}$

4 **a** Axes can be the other way round

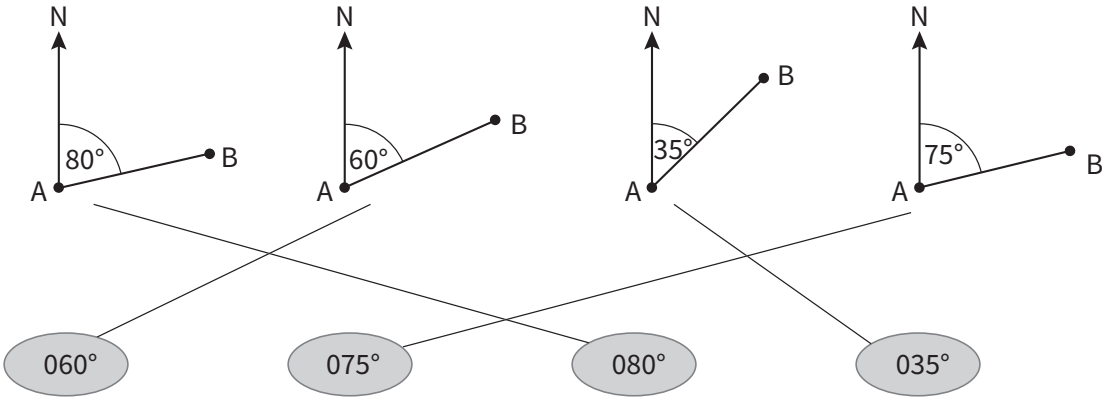


b **i** $\frac{2}{20}=\frac{1}{10}$ **ii** $\frac{4}{20}=\frac{1}{5}$ **iii** $\frac{3}{20}$

17 Bearings and scale drawing

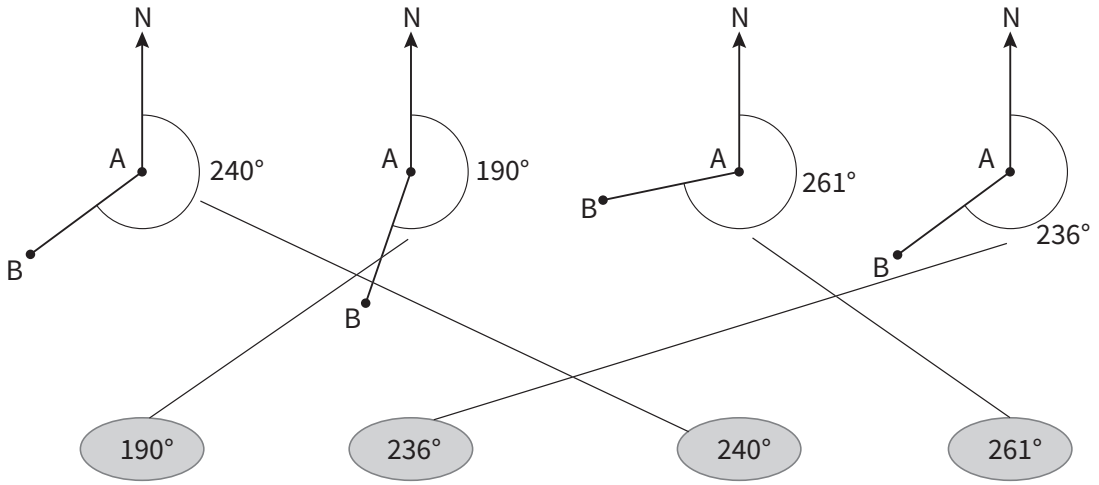
17.1 Using bearings

1



2 **a** 140^0 **b** 160^0 **c** 115^0 **d** 132^0

3

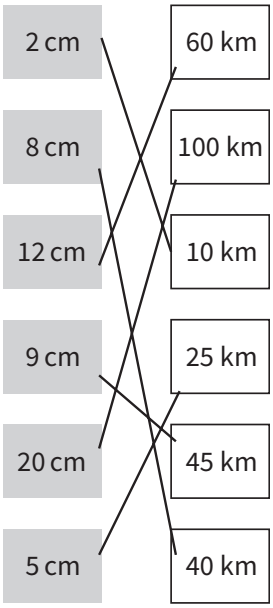


4 **a** 300^0 **b** 325^0 **c** 294^0 **d** 308^0

5 **a** 025^0 **b** 155^0 **c** 200^0

17.2 Making scale drawings

1



2 **a** **i** 24 km **ii** 60 km **iii** 120 km

b **i** 3 cm **ii** 4 cm **iii** 8 cm

3 **a** 4.5 × 8 = 36 km **b** 18 ÷ 8 = 2.25 cm

4 **a** 6, accurate scale drawing

b 8.5, 8.5, accurate scale drawing

5 accurate scale drawing

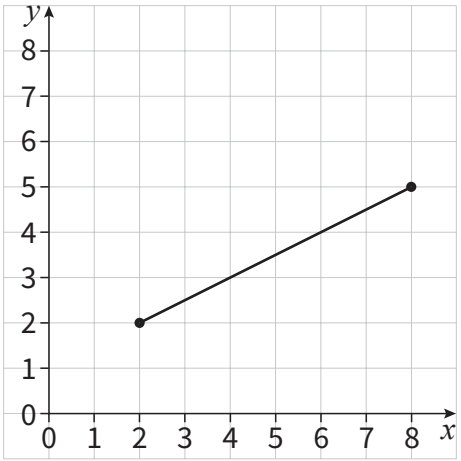
18 Graphs

18.1 Gradient of a graph

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

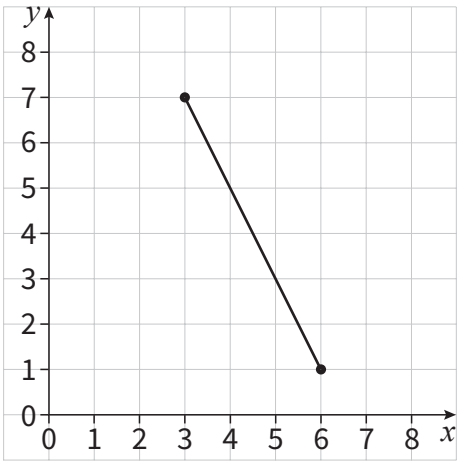
2 **a** $-\frac{1}{3}$ **b** −2 **c** $-\frac{2}{3}$ **d** $-\frac{3}{2}$ or $-1\frac{1}{2}$

3 **a**



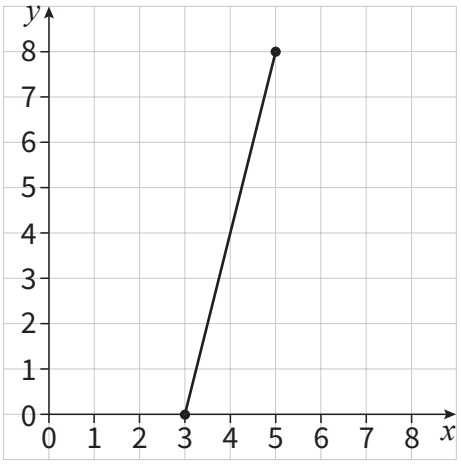
b $\frac{1}{2}$

4 **a**



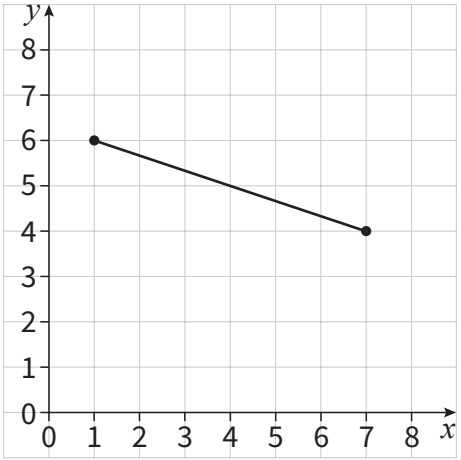
b −2

5 **a**



b 4

6 **a**



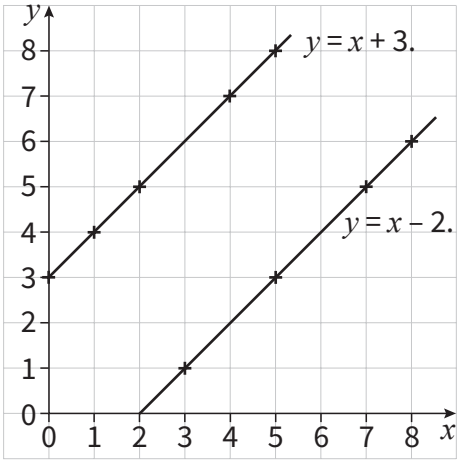
b $-\frac{1}{3}$

18.2 Graph of $y = mx + c$

1 **a**

x	0	1	2	4	5
$y = x + 3$	3	4	5	7	8

b, c & f



d 1

e

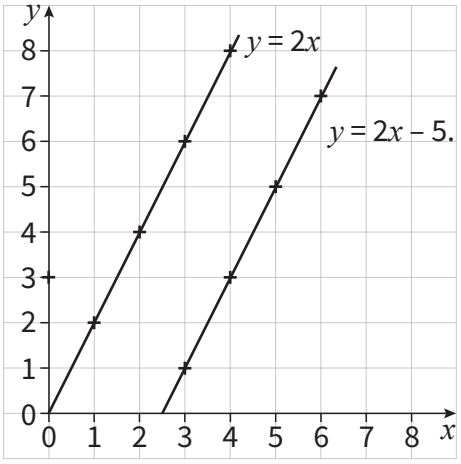
x	2	3	5	7	8
$y = x - 2$	0	1	3	5	6

g 1

2 **a**

x	0	1	2	3	4
$y = 2x$	0	2	4	6	8

b, c & f



d 2

e

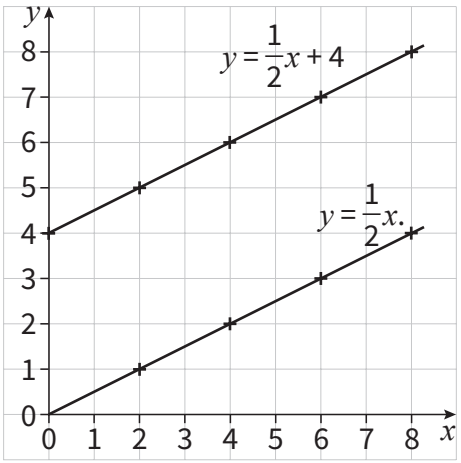
x	3	4	5	6
$y = 2x - 5$	1	3	5	7

g 2

3 **a**

x	0	2	4	6	8
$y = \frac{1}{2}x$	0	1	2	3	4

b, c & f



d $\frac{1}{2}$

e

x	0	2	4	6	8
$y = \frac{1}{2}x + 4$	4	5	6	7	8

g $\frac{1}{2}$

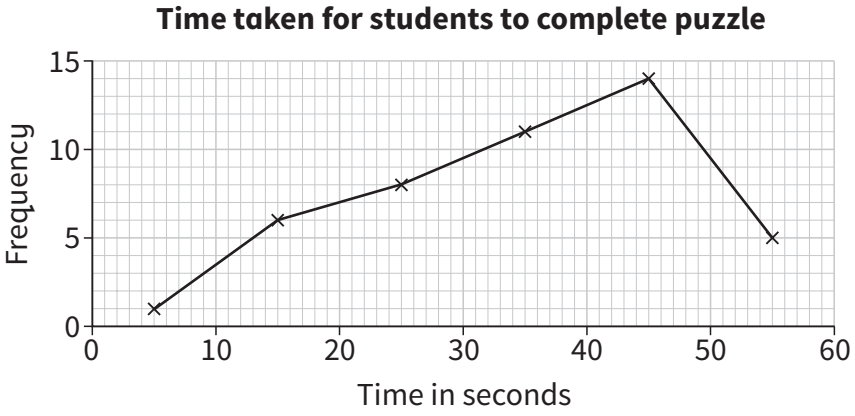
19 Interpreting and discussing results

19.1 Interpreting and drawing frequency diagrams

1 a

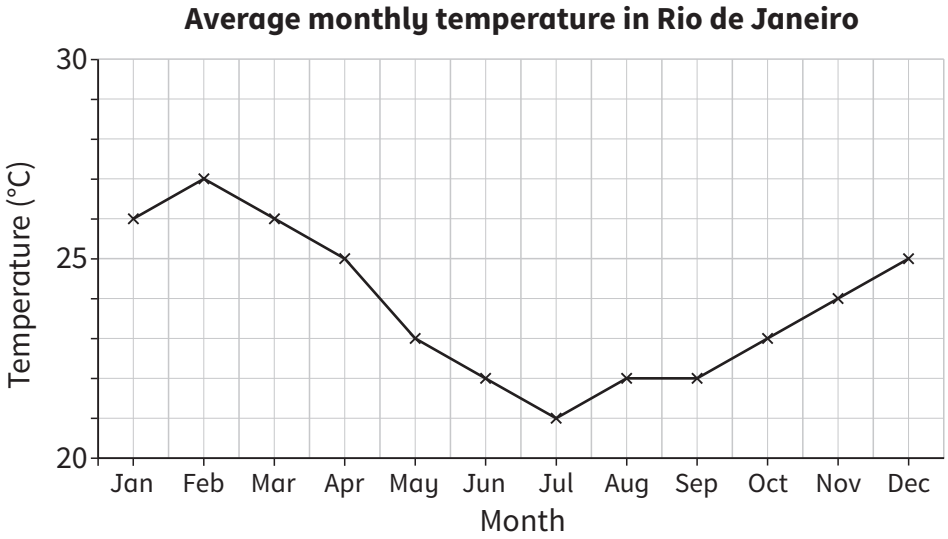
Time, t (seconds)	Frequency	Midpoint
$0 < t \leq 10$	1	5
$10 < t \leq 20$	6	15
$20 < t \leq 30$	8	25
$30 < t \leq 40$	11	35
$40 < t \leq 50$	14	45
$50 < t \leq 60$	5	55

b



19.2 Interpreting and drawing line graphs

1 a

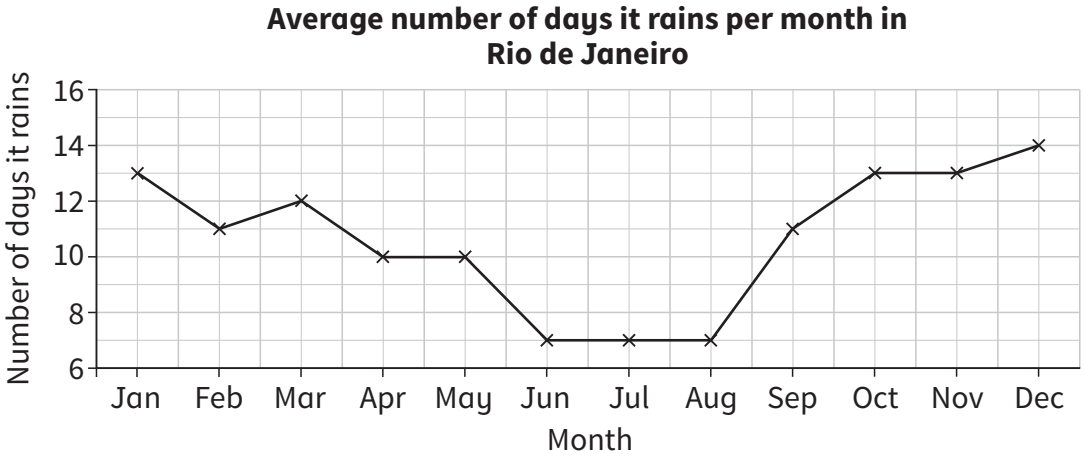


b i February

ii July

iii B

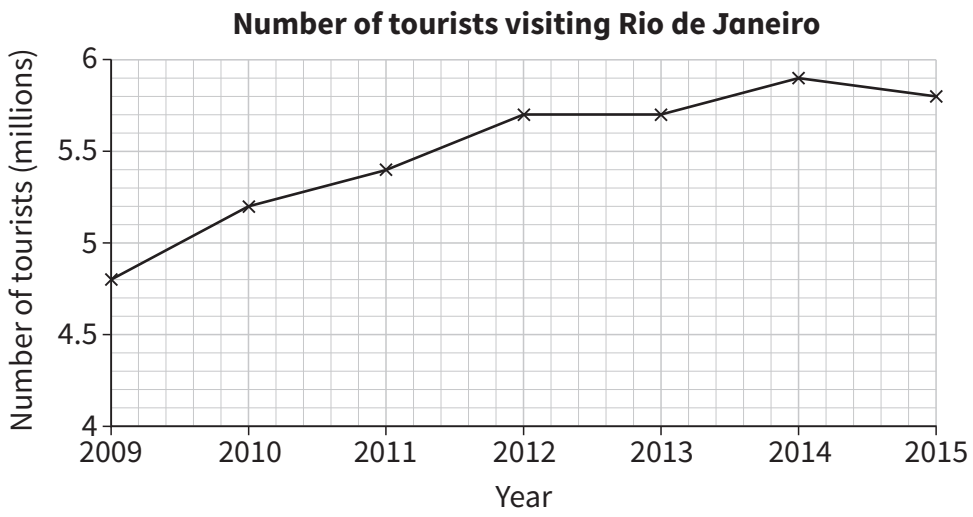
2 a



b i December

ii example: The number of days it rains per month is decreases after March until June, remains at its lowest from June to August, then increases towards the end of the year.

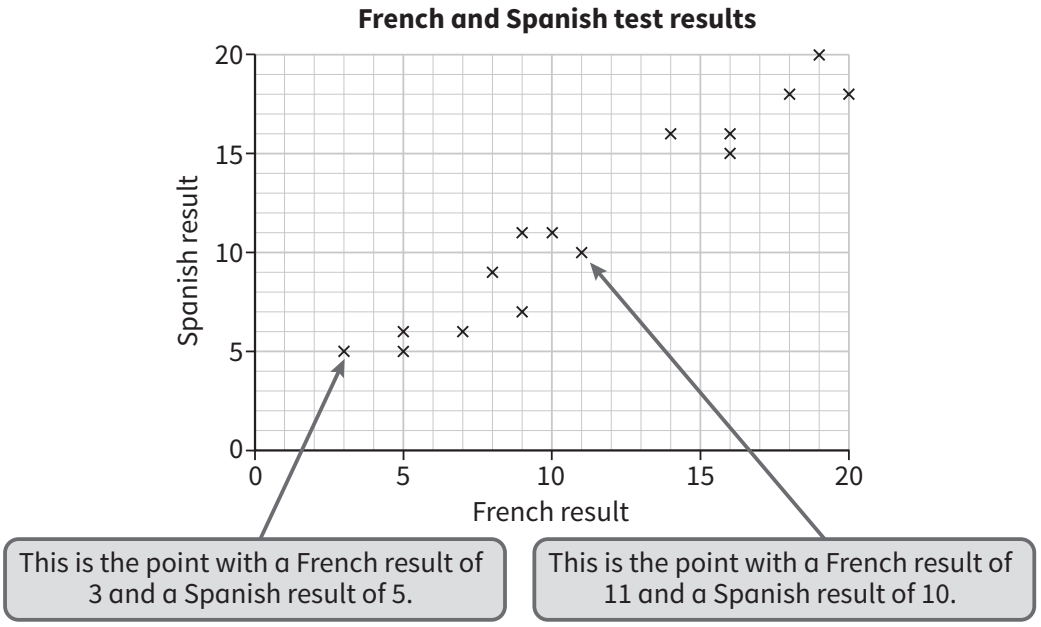
3 a



b example: The number of tourists increased gradually each year until 2012. It remained constant for one year then increased again to reach its highest value in 2014. 2014 to 2015 showed the only decrease.

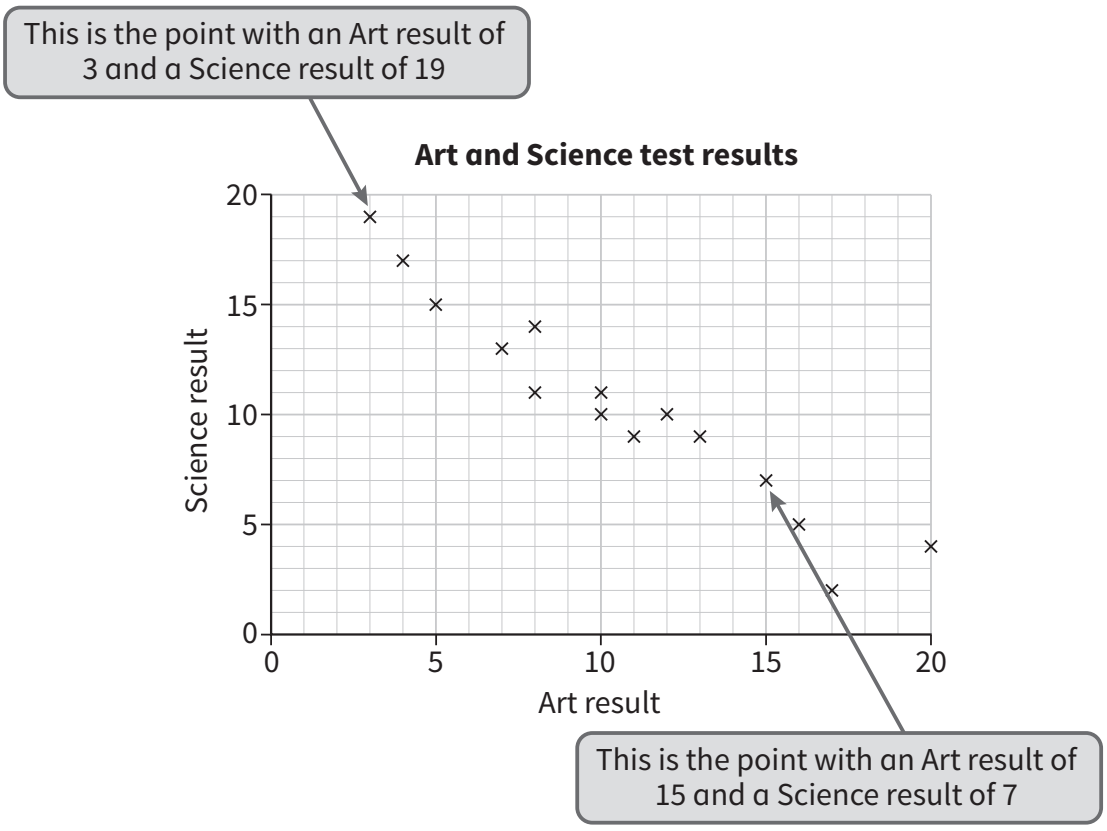
19.3 Interpreting and drawing scatter graphs

1 a



b A

2 a



b B

19.4 Interpreting and drawing stem-and-leaf diagrams

1 a **Key:** 0 | 5 means 5

0	5 7 9 9
1	5 4 6 0 8 7 9
2	6 2 5 1 2 7 3 0 4

b **Key:** 0 | 5 means 5

0	5 7 9 9
1	0 4 5 6 7 8 9
2	0 1 2 2 3 4 5 6 7

2 Unordered:

Key: 0 | 6 means 6

0	6 8 4 6
1	8 2 1 4 7 3 9 0 2
2	1 8 1 0 8 1 2

Ordered:

Key: 0 | 4 means 4

0	4 6 6 8
1	0 1 2 2 3 4 7 8 8 8 9
2	0 1 1 1 2 8 8

3 **Spanish test results for class 9R** **Spanish test results for class 9T**

	0	4 6 6 8
9 8 7 6 5 4 0	1	0 1 2 2 3 4 7 8 9
7 6 5 4 3 2 2 1 0	2	0 1 1 1 2 8 8

Key for class 9R: 5 | 0 means 5

Key for class 9T: 0 | 4 means 4