

Unit 1 Answers

1.1 Mode, median and range

- 1 a 44
b 21
- 2 a 9
b 6
- 3 e.g. 1, 1, 2, 3, 3
- 4 any five different numbers
- 5 mode 15, range 5, median 15
- 6 any number, 150 or lower
- 7 b five numbers, middle number = 7.5
b four numbers, sum of middle two numbers = 15

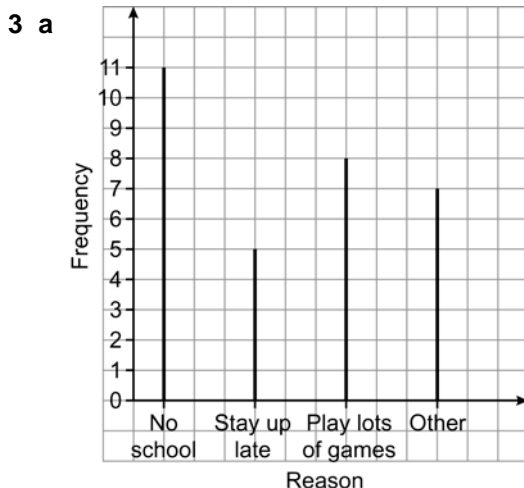
1.2 Displaying data



- 2 a 11 students
- b, c

Reason	Tally	Frequency
no school	+	11
stay up late		5
play lots of games		8
other		7

d e.g. 'Other' is for students with reasons other than the first three given in the table.

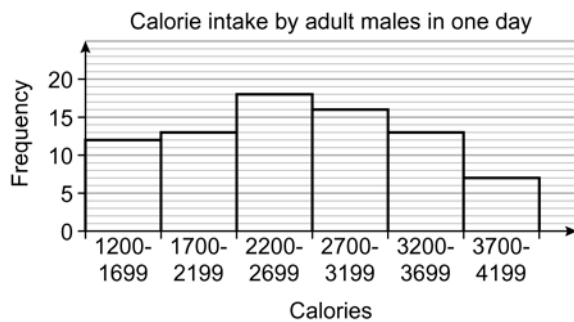


- b** no school
- c** e.g. The reasons given cannot be ordered.

1.3 Grouping data

- 1 a** 18 men
- b** 7 men
- c**

Calories	Frequency
1200–1699	12
1700–2199	13
2200–2699	18
2700–3199	16
3200–3699	13
3700–4199	7



- d** 2200–2699 calories
- e** 79 men

2 a

Goals scored	Tally	Frequency
0–4		2
5–9		8
10–14		3
15–19		4
20–24		0

- b** 5–9 goals

- 3 a** e.g. The bar chart shows that 36 of these men are having 2700 calories or more, and that 43 of them are having less than 2700 calories. (Whether or not 2700 calories is ‘enough’ is a different question and depends on how active the men are. The NHS guideline for men is 2500 calories a day.)
- b** e.g. We cannot tell because the data is grouped, with 2500 calories in the middle of a group.

1.4 Averages and comparing data

1 10

2 10.095 s

3 a

	Mode	Range	Median	Mean
Richard	75	16	79	79.5
Nora	77	8	79	80

b e.g. Nora's mean is slightly higher than Richard's mean (he is slightly better, on average). Nora's range is smaller than Richard's range (she is more consistent).

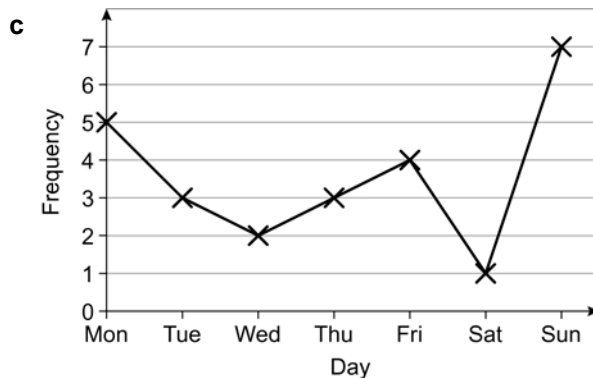
4 median (31)

5 6 baskets

1.5 Line graphs and more bar charts

1 a 3 friends

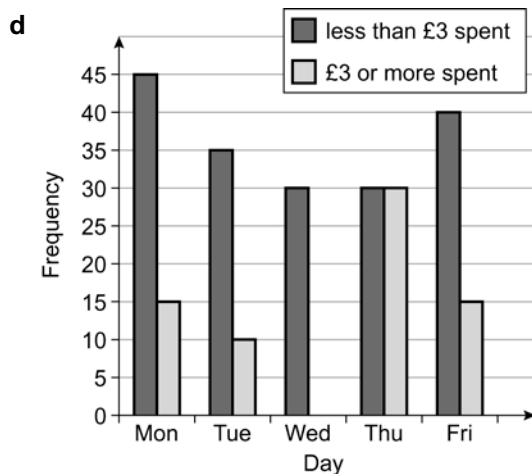
b Tuesday and Thursday



2 a 60 customers

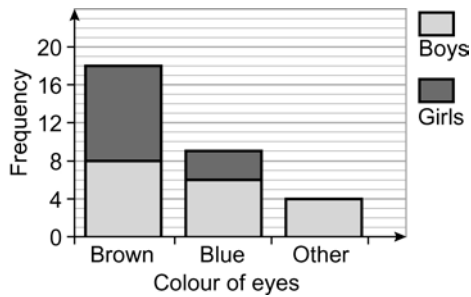
b Monday

c e.g. No one spent £3 or more on Wednesday.



3

	Brown	Blue	Other
Boys	8	6	4
Girls	10	3	0



1.6 Using spreadsheets

1 b iv 2 pets

c ii =median(

iii Enter, A13

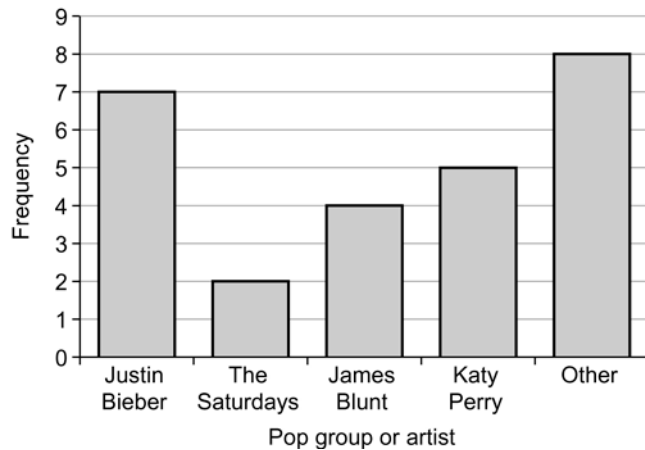
iv 2 pets

2 b Cell B9 has the largest data value, and cell B5 has the (joint) lowest.

c B8

d iv 2.22...

3 b



1 Strengthen

Averages and range

1 a red

b 43

c 0 and 3

2 a 3

b 8

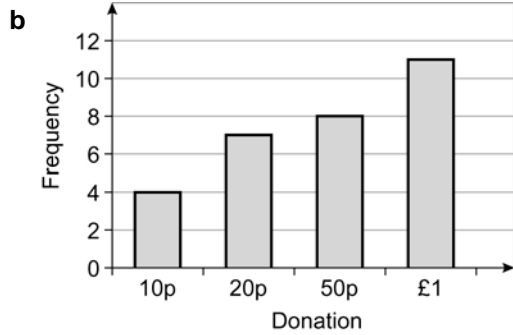
c 3.5

3 395.2 g

Charts and tables

4 a

Amount	Tally	Frequency
10p		4
20p		7
50p		8
£1	+	11



c £1

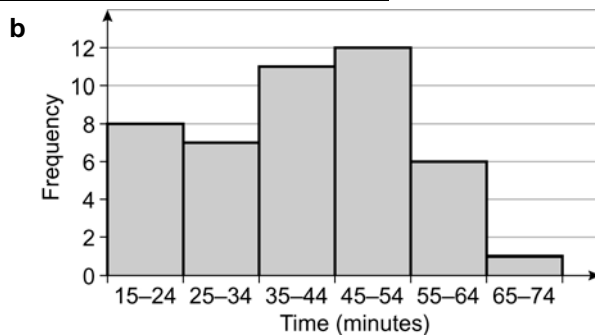
d 50p

e 30 people

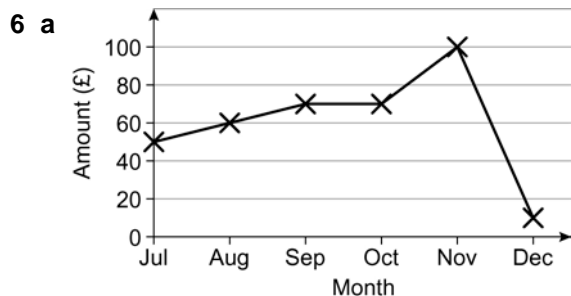
f 90p

5 a

Time (minutes)	Frequency
15–24	8
25–34	7
35–44	11
45–54	12
55–64	6
65–74	1



c 45–54 minutes



- b** £50
- c** October
- d** e.g. He didn't save any money.
- e** £90

Comparing data

7 e.g. Rosie's pocket money had a smaller range (was more consistent). Jim had the higher modal amount of pocket money.

1 Extend

- 1 a i** 7
- ii** 7
- b i** 6
- ii** 4
- c** e.g. Blue had a higher median than the red. Blue also had a higher range (the marks were less consistent).
- 2** e.g. Player B, as had just one fewer header on average, but was much more consistent.
- 3 a** any pair of numbers from 4, 7 or 3, 6 or 2, 5 or 1, 4
- b** any integer of 4 or less, and 8
- c** 2, 2, 11
- d** any two pairs of integers with a sum of zero, e.g. 0, 0 or -1, 1 or -2, 2
- 4 a i**

Distance skied (d km)	Tally	Frequency
$40 \leq d < 60$		1
$60 \leq d < 80$		9
$80 \leq d < 100$		7
$100 \leq d < 120$		3

- ii** $60 \leq d < 80$
- iii** 17 days

b i

Distance (d km)	Tally	Frequency
$50 \leq d < 60$		1
$60 \leq d < 70$		4

$70 \leq d < 80$		5
$80 \leq d < 90$		4
$90 \leq d < 100$		3
$100 \leq d < 110$		3

ii $70 \leq d < 80$

c e.g. It is more accurate as the groups are smaller.

d 08 45

e 400 m

f 15 minutes

g 200 m

h No; e.g. he will go to different places with different customers.

1 Unit test

1 a 0

b 15

c 5

d 6

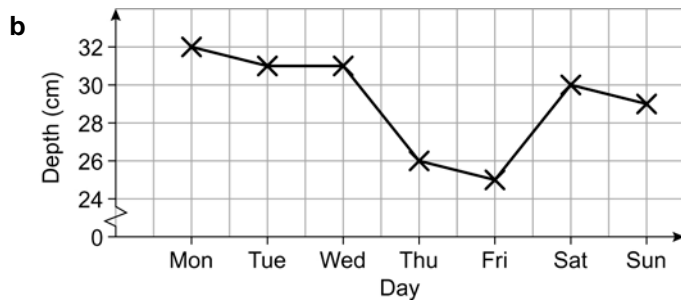
e 7.5

f 0 and 10

g Larger; e.g. 10 is larger than the old mean.

2 a

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Depth (cm)	32	31	31	26	25	30	29



c 31 cm

d Friday

e Between 9 am Friday and 9 am Saturday; the pond has got deeper by Saturday morning.

3 a 7G has a higher mean score than 7B. 7B has a lower range of scores than 7G.

b Student's own answer, e.g. 7G, as they have a much higher mean score than 7B, even though they are much less consistent.

Unit 2 Answers

2.1 Mental maths

- 1 a** 13
b 25
c 30
d 14
e 9
f 1
- 2 a** $10 + 2 + 4 \times 2 = 20$
b $2 \times 5 - 8 + 2 = 4$
- 3 a** 70
b 81
c 48
- 4 a** 2000
b 12 000
c 250
d 78
e 30
f 230
- 5 a** 144
b 145
c 252
d 384
- 6 a** 28
b 30
c 8
d 8
- 7** e.g. $14 = 5 + 3 \times (10 - 4) \div 2$
 $15.5 = (5 + 3 \times 10 - 4) \div 2$
 $24 = (5 + 3) \times (10 - 4) \div 2$
 $33 = 5 + 3 \times 10 - 4 \div 2$
 $48 = (5 + 3) \times (10 - 4 \div 2)$
 $78 = (5 + 3) \times 10 - 4 \div 2$

2.2 Addition and subtraction

- 1 a** 600
b 400
c 3200
- 2 a** 6000
b 3000
c 1000

3 a 900

b 10 000

$$\begin{array}{r} 4 \text{ a } \quad 6 \ 5 \ 2 \\ \quad + 2 \ 2 \ 3 \\ \hline \quad 8 \ 7 \ 5 \end{array}$$

$$\begin{array}{r} \text{b} \quad 2 \ 7 \ 5 \\ \quad + 5 \ 6 \ 7 \\ \hline \quad 8 \ 4 \ 2 \end{array}$$

$$\begin{array}{r} \text{c} \quad 6 \ 2 \ 9 \\ \quad - 3 \ 0 \ 5 \\ \hline \quad 3 \ 2 \ 4 \end{array}$$

5 a 611

b 3372

c 3024

6 a 3483

b 6590

7 £41 306

2.3 Multiplication

1 a 1422

b 1422

2 a 651

b 1968

3 a 1200

b 3000

d e.g. The student wrote 26, not 6 carry 2.

4 a 816

b 22 338

5 profit, £85

2.4 Division

1 a 76

b 157

2 a 59

b 123

c 152

3 35 r 2

4 a 34 r 7

b 41 r 3

5 No; $428 \div 7 = 61 \text{ r } 1$, not 64.

6 28 test tubes

2.5 FINANCE: Time and money

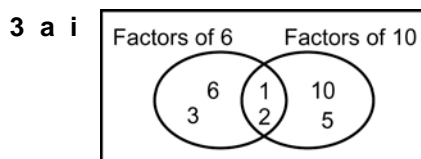
- 1 a 4
 b 36
 c 22
 d 1
- 2 £8
- 3 £21
- 4 £365
- 5 e.g. The 0.75 is 0.75 of 60 (minutes), not 0.75 of 100.
- 6 600 m/ cup

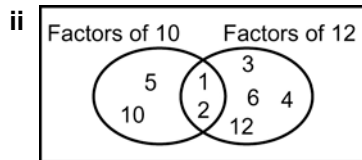
2.6 Negative numbers

- 1 a -4°C , -2°C , 1°C , 3°C , 5°C
 b -9°C , -5°C , 0°C , 3°C , 6°C
 c -8°C , -3°C , -1°C , 0°C , 20°C
- 2 a $>$
 b $>$
- 3 a -9°C
 b 20 degrees
- 4 a 0
 b 0
 c 0
 d -8
- 5 a e.g. Three lots of -1 make -3 , and five lots of $+1$ make 5, so the counters show $-3 + 5$.
 b 2
- 6 a -8
 b -4
 c -5
- 7 a $5 \times -1 = -5$
 b $4 \times -2 = -8$

2.7 Factors, multiples and primes

- 1 1, 133, 7 and 19
- 2 a 1, 2, 3, 6
 b 1, 2, 5, 10
 c 1, 2, 3, 4, 6, 12





- b i** 1, 2
ii 1, 2
- 4 a** 1, 11
b 2 factors
c 13
- 5 a i** 1, 2, 4, 8
ii 1, 2, 4, 5, 10, 20
b 1, 2, 4
c 4
- 6 a** 8
b 5
- 7 a i** 3, 6, 9, 12, 15, 18
ii 5, 10, 15, 20, 25, 30
b 15
- 8** 45

2.8 Square and triangle numbers

- 1 a** 1
b 4
c 9
- 2 a** 16
b 25
c 36
d 100
- 3 a** 49
b 64
c 81
- 4 a** 3
b 7
c 8
d 12
- 5 a**
-
- b** 5 dots
c e.g. The increases are + 2, + 3, + 4 so the next increase is + 5.
d No; e.g. $1 + 2 + 3 + 4 + 5 + 6 = 21$ and $1 + 2 + 3 + 4 + 5 + 6 + 7 = 28$
- 6 a** 49 tiles

b 36 tiles and 16 tiles

7 a 90

b 128

c 53

d 103

2 Strengthen

Written methods

1 a 600

b 2400

c 3500

2 a 986

b 215

3 a ii 651

b i 3600

ii 3444

4 a i 800

ii 736

b i 2500

ii 2625

5 i 75

ii 82

6 36 r 1

7 a 900

b 896

Mental work

8 a 30

b 20

c 1

9 a >

b >

c >

10a true

b false

11a 210

b 266

12a 10, 20, 30, 40

b 6, 12, 18, 24

c 30

13a 1, 2, 5, 10

b 1, 2, 3, 6

c 2

14a 6

b 30

c 19

15a 0

b -6

c -7

Problem-solving

16a 212 and 257

b 412 and 166

17 £85

18 £120

2 Extend

1 a i 1

ii 2

iii 3

iv 4

v 5

vi 6

b e.g. consecutive numbers

c i e.g. $3 \times (2 - 1) + 4$

ii e.g. $(3 + 1) \div 2 \times 4$

iii e.g. $1 \times (2 + 3 + 4)$

2 6 packs

3 a $201 \times 43 = 8643$

b $636 \div 23 = 27.65\dots$

c $332 \times 46 = 15\,272$

4 Yes; 19 720 is more than 18 000.

5 a Supa-pack

b 128 packets (by buying 10 Supa-packs, 1 Mega-pack and 1 Big-pack, total cost £29.83)

6 657

7 a 120

b 100

c 36

d 8

e 9

8 92 minutes 55 seconds

9 a 4

b -4

c 8

d -4

10a $\sqrt{8}$ lies between 2 and 3 because $2^2 = 4$ and $3^2 = 9$.

b $\sqrt{20}$ lies between 4 and 5 because $4^2 = 16$ and $5^2 = 25$.

c $\sqrt{75}$ lies between 8 and 9 because $8^2 = 64$ and $9^2 = 81$.

1170

128

13a -9

b -12

c 9

d 30

2 Unit test

1 a 7500

b 7000

2 163

3 Ricky

4 9 degrees

5 No; $4 \times 6 = 24$ and $3 \times 6 = 24$. LCM = 24.

6 1, 2, 3, 4, 6, 8, 12, 24

7 Alton, 30p more

8 a 18

b 196

c 60

9 7704 books

10a 20

b 7

c 6

114941 stamps

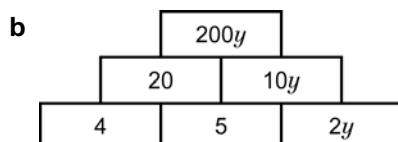
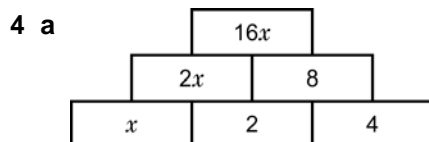
Unit 3 Answers

3.1 Functions

- 1 a 2, 3, 6
 b 40, 45, 60
 c 20, 30, 60
 d 10, 14, 21
- 2 a + 10
 b $\div 2$, $\times \frac{1}{2}$, halve
- 3 a 6, 20, 50
 b 20, 50, 200
- 4 e.g. -5 , $\times 3$
- 5 a 15 metres
 b 7 metres
 c 11 metres

3.2 Simplifying expressions 1

- 1 c $8h$
 d $12b$
 e $5y$
 f $3j$
 g $-2f$
- 2 b $2t$
 c ab
 d st
 e p
 f bf
- 3 a $32b$
 b $0.6c$
 c $4f$
 d $2d$
 e $6q$
 f p



5 Student's own answers

3.3 Simplifying expressions 2

1 185

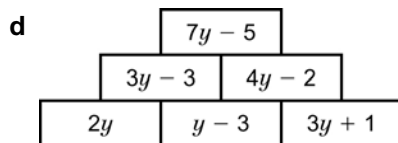
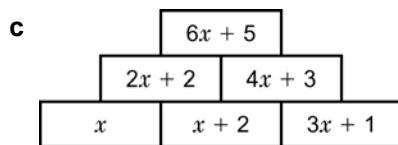
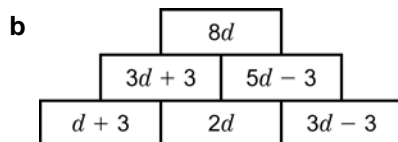
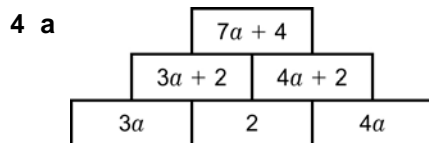
2 a 483

b 204

3 a $2h$

b $5 + 6h$

c $3 + 4a - 2b$



5 a $2 + x$

b $8 \times (2 + x)$

c $16 + 8x$

6 b $3d - 18$

7 a $8h + 6$

b $3t + 1$

c $5y - 10$

8 $16x + 8 + 5x - 5 = 21x + 3$

3.4 Writing expressions

1 a $x + 4$

b $x - 7$

2 a $w + 7.5$

b $w - 10$

3 a $s + 5$

b $m + 1$

- c** $b - 12$
- 4 a** $n + 10$
b $n - 2$
c $100 - n$
- 5 a** $2s$
b $s + b$
c $3b + 2$
- 6 a i** beads
ii $210b$
- b i** $g =$ green glass beads, $s =$ silver beads
ii $90g + 120s$
- c** Dee's model; e.g. it splits the beads into the different types.

3.5 STEM: Substituting into formulae

- 1 a** 80 miles
b 180 miles
c 10 miles
- 2 a** 5 m/s
b 50 m/s
- 3 a** 2%
b 9%
c 13%
- 4 a** 3 m/s^2
b 2.5 m/s^2

3.6 Writing formulae

- 1** $d + 2$
- 2** $S = d - 10$
- 3** $P = 9w$
- 4** $C = 24b$
- 5** $T = x + y$
- 6** 42 people; e.g. $2 \times 20 + 2 = 42$

3 Strengthen

Functions

- 1 a** 13
b 40
c 4
d 10
- 2 a** $+ 6$
b $\times 2$

$$c \div 2 \text{ or } \times \frac{1}{2}$$

3 15, 35, 85

Expressions

4 25

5 a $2a$

b $4d$

c $7b$

d $11j$

e $7y$

6 a $6a + 2b$

b $3t + 10n$

c $3 + 11i$

7 a $5t$

b $5t$

c $7e$

d de

e ef

8 a $8w$

b $15d$

c $24h$

9 a $n - 4$

b $4 - n$

10a $7p$

b $4 + v$

11a $6 + 2t$

b $20 + 4p$

c $3h - 12$

d $36 + 12w$

e $5 - 5a$

12a e.g. $2 \times 3 = 6$, not 23

b $2y + 1$

Formulae

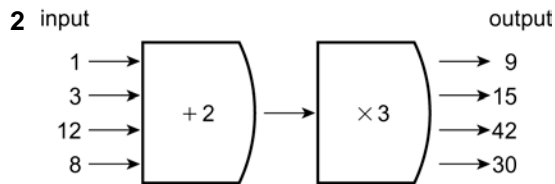
13a 1.2

b 6

14 $T = 120 + 40h$

3 Extend

1 -4 ; e.g. $3 \times 3 = 9$; $9 - 4 = 5$, so the missing function is -4 . (Check: $7 \times 3 = 21$; $21 - 4 = 17$ ✓)



3 $10a \times 2$; this is the only card which simplifies to $20a$.

4 $3(x + 2) + 3x + 3$

5 LHS = $6x + 30 + 10x - 5 = 16x + 25$

RHS = $4(4x + 5) + 5 = 16x + 20 + 5 = \text{LHS}$

6 $5(5a + 3) - 7$ is larger.

7 a $\frac{x}{2}$

b $\frac{4}{x}$

c $5x + 6$

d $8(x + 4)$

8 $8c + 2t$

9 a 3

b 6

10a $d = \frac{t}{5}$

b i 3 to $3\frac{1}{2}$ miles

ii e.g. The formula says it's approximate, and the counting of 17 seconds would be approximate.

11a $C = 4.99 + 10r$

b £34.99

12a $15C$

b $P = 15C + 21A$

c $P = £138$

3 Unit test

1 a 12, 16, 22

b 14, 17, 26

2 a $2p$

b $11t$

c $9y$

d $9k$

e bf

f $8c + 5d$

3 a $(c + 5)$ cm

b $(c - 2)$ cm

4 $P = g - 3$

5 a $10x$

b $30w$

c t (or $1t$)

6 $C = 3r$

7 a $4(x + 3) = 4x + 12$

b 28 cm^2

8 a $10d$

b ab

9 6

Unit 4 Answers

4.1 Decimals and rounding

- 1 a 8.5 cm line drawn accurately (± 0.2 cm)
b 77 mm line drawn accurately (± 2 mm)
- 2 a two hundredths
b two units
c two tenths
d two thousandths
- 3 a <
b >
c >
- 4 4.09, 4.1, 4.37, 4.41, 4.44
- 5 a 8
b 18
c 6
d 1
- 6 a 3.9
b 33.4
c 26.3
d 12.2
- 7 a 20
b 3
c 4
d 70

4.2 Length, mass and capacity

- 1 a 30 mm
b 4 m
c 70 km
d 8000 mm
- 2 a 3500 m
b 0.45 km
c 5.5 cm
d 65 cm
- 3 a 13 cm
b 1.15 m
c No; e.g. the increase gets smaller each year.
- 4 a 3000 g
b 4 l
- 5 a 0.075 l
b 8500 g

- c 9.5 kg
 - d 150 ml
- 6 a 36 000 g
- b 36 kg

4.3 Scales and coordinates

- 1 a 8.6 cm
- b 160 g
 - c 162.5 ml
- 2 a No
- b 50 mph
- 3 a A and C
- b C
 - c B
- 4 A (4, 1)
- B (-1, 4)
 - C (0, 1)
 - D (-4, -1)
 - E (-1, -4)

4.4 Working with decimals mentally

- 1 a 0.8
- b 4.5
 - c 0.09
 - d 0.49
- 2 £0.30
- 3 a 22
- b 100
- 4 18 kg
- 5 a 164.3
- b 214.2
 - c 100.1
- 6 a 2.035
- b 203.5
 - c 2.035
- 7 $0.7 \times 4 = 2.8$, not 28

4.5 Working with decimals

- 1 a 33.83
- b 168.6
 - c 174.28
- 2 £19.27

- 3 a** 28.5
b 123.54
- 4 a** 23.4
b 42.24
- 5 a** 12.23
b 43.28

4.6 Perimeter

- 1 a** 24 cm
b 24 cm
- 2** 154 mm
- 3** 32 cm
- 4 a** Shape A $8x + 10y$
 Shape B $10x + 10y$
 Shape C $8x + 10y$
b Shape B, e.g. shapes A and C have the same perimeter.
- 5** 10 cm
- 6** 6 cm

4.7 Area

- 1 a** 8 cm^2
b 8 cm^2
- 2** e.g. He has added instead of multiplying. $8 \times 3 = 24 \text{ cm}^2$.
- 3 a** $60a \text{ cm}^2$
b $15b \text{ cm}^2$
- 4** 108 m^2
- 5** 28 cm

4.8 STEM: More units

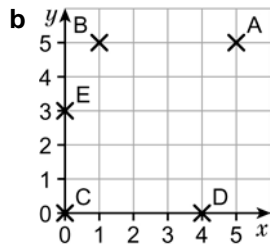
- 1 a** metres
b litres
c cm^2
- 2 a** 450 m
b 10 boxes
- 3 a** 10 000 kg
b $20\,000 \text{ m}^2$
c 5000 cm^3
- 4 a** 45 ha
b 7.8 l
c 3 t
- 5 a** 1.5 l

- b i** 150 l
- ii** 4500 l
- c** 4.5 t
- 6 a** 100 miles
- b** 32 km
- c** 180 cm

4 Strengthen

Units, scales and coordinates

- 1 a** >
- b** >
- c** <
- d** <
- 2 a** A (5, 5), B (1, 5), C (0, 0), D (4, 0)



- 3 a** 4000 m
- b** 800 cm
- c** 10 mm, 50 mm
- d** 1000 ml, 6000 ml
- 4 a** 220 cm
- b** 8.75 kg
- c** 0.8 m
- d** 500 m
- 5 a** 10 miles
- b** 32 km
- c** 240 cm
- d** 2 ft

Decimals

- 6** £24.45
- 7 a** 6.88
- b** 3.25
- 8 a** 0.9
- b** 0.25
- 9** 43.2
- 10a** 114

b 22.6

11a 7.2 m

b 6.4 s

c 4.0 km

Perimeter and area

1224 cm

13a perimeter 20 m, area 25 m²

b perimeter 20 cm, area 21 cm²

1436 cm²

4 Extend

1 a 3.864

b 38 640

c 4.6

d 4.6

2 a 74 560 000

b 74 600 000

c 75 000 000

d 70 000 000

3 £58.29

4 a £16.85

b Zoom

5 6.1 cm

6 a Type A 96.75, Type B 87.63

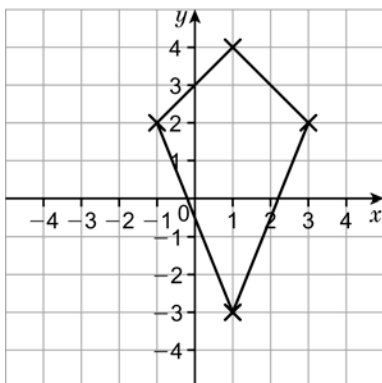
b Yes, e.g. $96.75 - 87.625 = 9.125 \approx 9$

c i 104.82

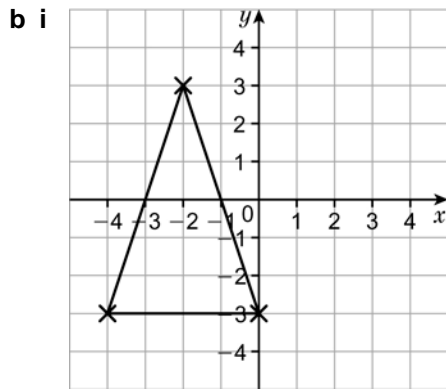
ii e.g. Vicky's statement is wrong now, as $104.81 - 87.625 \approx 17$.

d e.g. Yes, about 17 more on average (although some Type B toys do more back-flips than some Type A toys).

7 a i



ii kite



ii isosceles

4 Unit test

1 30 cm

2 a >

b >

c <

3 a 0.4

b 5.4

c 0.28

4 a i 26 cm

ii 30 cm^2

b i 80 cm

ii 400 cm^2

5 57.8

6 a 300 cm

b 2 l

7 22.8

8 100 cm^2

9 13.05

10a 73 500 000

b 74 000 000

11A(2, 1), B(-1, 2), C(3,-2), D (-2, -2), E(-3,-1)

Unit 5 Answers

5.1 Comparing fractions

1 a i $\frac{3}{4}$

ii $\frac{1}{4}$

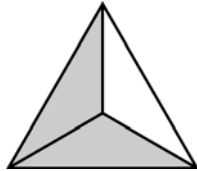
b i $\frac{5}{8}$

ii $\frac{3}{8}$

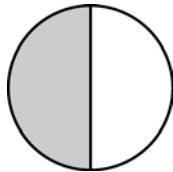
c i $\frac{16}{25}$

ii $\frac{9}{25}$

2 a two thirds shaded, e.g.



b one half shaded, e.g.



c one eighth shaded, e.g.



3 $\frac{5}{16}$

4 a >

b e.g. The shaded $\frac{1}{7}$ is bigger than the shaded $\frac{1}{8}$.

5 $\frac{16}{20}$

5.2 Simplifying fractions

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

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

2 $4\frac{4}{5}$ litres

3 a $\frac{12}{27}$

b $\frac{9}{39}$

c $\frac{2}{5}$

d $\frac{4}{5}$

e $\frac{9}{20}$

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

b $\frac{1}{3}$

c $\frac{2}{5}$

5 e.g. Choi has cancelled down, but $\frac{9}{15}$ can be cancelled further to give the simplest form, which is $\frac{3}{5}$.

5.3 Working with fractions

1 a $\frac{2}{7}$

b $\frac{5}{9}$

c $\frac{1}{7}$

d $\frac{5}{8}$

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

b $\frac{1}{3}$

c $\frac{1}{10}$

d $\frac{2}{3}$

3 e.g. $\frac{1}{9}$ and $\frac{2}{9}$

4 a £4

b £12

c 3 g

d 12 g

e 10 km

f £25

5 a 400 g

b 800 g

6 £8.80

5.4 Fractions and decimals

1 a $\frac{3}{10}$

b $\frac{7}{10}$

c $\frac{9}{50}$

d $\frac{21}{25}$

2 a 0.6

b 0.26

c 0.35

d 0.32

3 e.g. $\frac{6}{15} = \frac{2}{5} = \frac{4}{10} = 0.4$

4 $\frac{2}{3}$

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

b 0.8

5.5 Understanding percentages

1 a i 6%

ii 94%

b e.g. Add the answers and you should get 100.

2 a $\frac{13}{50}$

b $\frac{4}{5}$

c $\frac{4}{25}$

d $1\frac{1}{5}$

3 a $\frac{3}{10}$

b $\frac{1}{4}$

c $\frac{4}{5}$

d $\frac{3}{4}$

4 a 0.5

b 0.3

c 0.05

d 1.05

- 5 a 49%
- b 33%
- c 6%
- d 150%

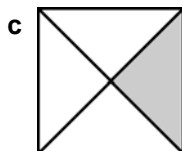
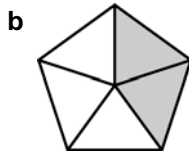
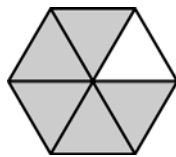
5.6 Percentages of amounts

- 1 a 4 g
- b 45 m
- c £12
- d 27 t
- e £7.50
- 2 a £60
- b £225
- 3 £165.47
- 4 a 4.5 m/
- b 21 g
- 5 e.g. Yes, $\frac{17}{20} = 85\%$, which is almost 90% but not quite.
- 6 a 6 kg
- b 7.5 m
- c £42
- d 24.5 cm
- 7 £415 or £414.40 or £414.43

5 Strengthen

Fractions

- 1 a five parts shaded, e.g.



- 2 $\frac{1}{4}$
- 3 $\frac{3}{8}$

4 a $2\frac{1}{3}$

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

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

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

b $\frac{3}{7}$

6 a $\frac{7}{8}$

b $\frac{2}{3}$

c $\frac{1}{5}$

d $\frac{2}{3}$

7 $\frac{3}{10}$

8 a £5

b 4 kg

c 3 mm

Fractions, decimals and percentages

9 a 0.2

b 0.25

c 0.44

d 0.05

10a $\frac{21}{50}$

b $\frac{3}{5}$

c $\frac{8}{25}$

d $\frac{2}{5}$

Percentages

11a 6 g

b £0.50 or 50p

12a 8 t

b \$640

c 100 ml

d 49 kg

5 Extend

- 1 a i** $\frac{3}{4}$
ii 75%
iii 0.75
- b i** $\frac{13}{25}$
ii 52%
iii 0.52
- 2** 2 more squares; e.g. $\frac{3}{5}$ of 25 = 15, 15 - 13 = 2
- 3 a** $1\frac{1}{4}$
b $1\frac{3}{4}$
c $1\frac{3}{4}$
- 4 a i** $\frac{4}{25}$
ii 16%
b 84%; e.g. 100% - 16% = 84%
- 5 a** $\frac{96}{4000} = \frac{3}{125}$
b Yes; e.g. $\frac{96}{4000} = 2.4\%$, which is more than 2%.
- 6 a** 20% of children have a packed lunch.
b 17.5% of bikes have no lights.
c 1.24% of skateboards are white.
- 7 a i** $\frac{8}{24}$
ii $\frac{10}{24}$
iii $\frac{9}{24}$
b $\frac{1}{3}, \frac{3}{8}, \frac{5}{12}, 0$
- 8** $\frac{7}{16}, \frac{5}{8}, \frac{3}{4}$
- 9** 14
- 10a** $\frac{85}{8} = 10\frac{5}{8}$ g
b $\frac{21}{4} = 5\frac{1}{4}$ cm
- 11** 1600 cm²

5 Unit test

- 1 a** 4 kg
b £21

2 $\frac{1}{6}$

3 a $\frac{23}{100}$

b $\frac{9}{100}$

c 6%

d 90%

4 a 35%

b 1%

c 0.8

d 0.06

5 $3\frac{3}{4}$

6 a $\frac{20}{25}$

b $\frac{9}{20}$

7 a $\frac{7}{9}$

b $\frac{6}{11}$

8 $\frac{3}{4}$

9 14 miles

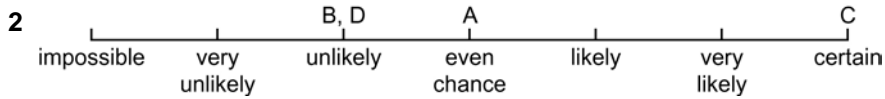
10a True, e.g. $70\% = \frac{70}{100} = 0.7$

b False, e.g. $5\% = \frac{5}{100} = 0.05$

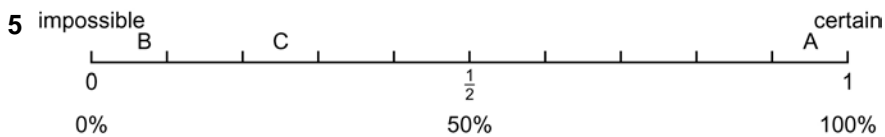
Unit 6 Answers

6.1 The language of probability

- 1 **B** unlikely
C certain
D unlikely



- 3 **a** Student's own answer
b Student's own answer
- 4 **a** Spinner A
b Spinner B
c Spinners A and C; e.g. they both have 4 white parts out of 8 parts in total.
d Spinner C; e.g. Spinner C has 2 out of 8 chances of 'grey' and Spinner B only has 1 chance out of 8.



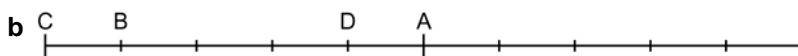
- 6 e.g. It may have won 80% of its recent races.

6.2 Calculating probability

- 1 **a** Spinner A 1, 2, 3
 Spinner B 1, 2, 3, 4
 Spinner C 1, 2, 3, 4, 5, 6
- b** Spinner A 3
 Spinner B 4
 Spinner C 6
- c** Spinner B

- 2 **a** 1, 3, 5, 7, 9
b 4, 8

- 3 **a** A $\frac{4}{8}$
B $\frac{1}{8}$
C 0
D $\frac{3}{8}$



- 4 e.g. Although there are two choices, they are not equally likely.
- 5 **a** 0.6
b 0.3

c 0.1

6.3 More probability calculations

1 a $\frac{4}{9}$

b $\frac{6}{9} = \frac{2}{3}$

c 0

d 1

2 a $\frac{2}{52} = \frac{1}{26}$

b $\frac{8}{52} = \frac{2}{13}$

c $\frac{14}{52} = \frac{7}{26}$

3 a i 65%

ii 35%

b 40%

c 0.2

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

b $\frac{1}{4}$

5 35%

6.4 Experimental probability

1 a 90

b

Outcome	Frequency	Experimental probability
very happy	60	$\frac{60}{90}$
fairly happy	20	$\frac{20}{90}$
not happy/no improvement	10	$\frac{10}{90}$
Total frequency	90	

c e.g. The claim is true, as only $\frac{10}{90}$ were unhappy.

2 a No

b e.g. If the manufacturer had showed the number of different cars tested and the total number of tests carried out.

3 a $\frac{888}{1000}$

b No; e.g. it's winter then, so it's less likely to be sunny.

4 a i $\frac{8}{25}$

ii $\frac{11}{25}$

b e.g. Some customers would get both.

6.5 FINANCE: Expected outcomes

1 This means there should be **1** winner on average for every **5** tickets.

The 5 tickets will earn $5 \times 10p = 50p$ and 1 winner will cost Ollie 20p.

So Ollie can expect to make **30p** for every 5 tickets sold.

2 a $\frac{7}{50}$

b $50 \times 20p = £10$, $7 \times £1 = £7$, $£10 - £7 = £3$ profit

c Yes

3 a $\frac{4}{8}$

b 50 wins

c £20

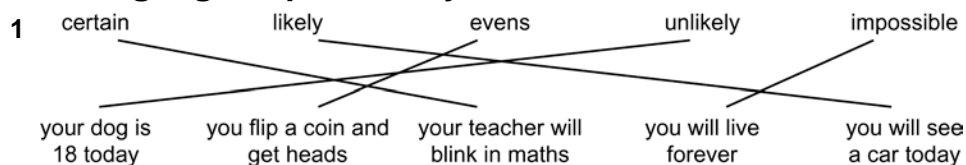
d an amount less than 40p, e.g. 30p

4 Student's own answer, e.g. need to raise money for 20 prizes @ 90p each = £18 and profit of £20, so £38 minimum.

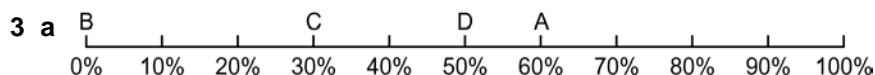
Cost per ticket = $£38 \div 100 = 38p$, but 38p will need lots of change, so 40p each.

6 Strengthen

The language of probability



2 Statements B and C are true.



b The weather forecast says rain is unlikely.

Calculating probability

4 a 8

b A 3

B 5

c $\frac{3}{8}$

5 $\frac{5}{6}$

6 30%

Experimental probability

7 a, b

Colour	Tally	Frequency	Experimental probability
gold		7	$\frac{7}{50}$
silver	+	13	$\frac{13}{50}$
purple	+ +	16	$\frac{16}{50}$
red	+	14	$\frac{14}{50}$
Total frequency		50	

- c 14 wins
- d £50
- e an amount less than £3.50, e.g. £1

8 a 70 people

b $\frac{15}{70}$

- c e.g. No, he should be in bed.

6 Extend

- 1 a e.g. spinner landing on a number less than 10
- b e.g. spinner landing on a 6
- c e.g. spinner landing on a number bigger than 6
- d e.g. spinner landing on a number smaller than 6

2 70%

3 a $\frac{100}{80000} = \frac{1}{800}$

b very unlikely

c $\frac{79900}{80000} = \frac{799}{800}$

4 a 10 diamonds

b 5 times

c 6 times

5 e.g. It is probably not working properly, as 0.0003 is 3 times what it should be, but it could just be coincidence.

6 Student's own answers

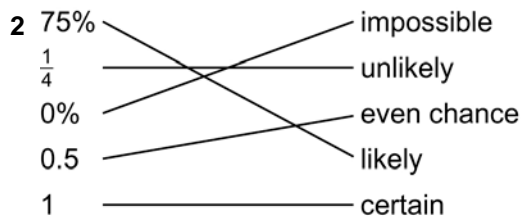
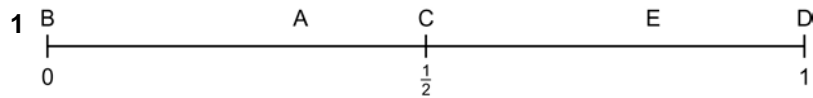
7 40%

8 a

Student 1	Student 2
Paper A	Paper A
Paper A	Paper B
Paper B	Paper A
Paper B	Paper B

b $\frac{1}{4}$

6 Unit test



3 a 5%

b 95%

4 0.2

5 $\frac{8}{160} = \frac{1}{20}$

6 a

Action taken	Frequency	Experimental probability
helped to cross	47	$\frac{47}{80}$
looked, but walked on	12	$\frac{12}{80}$
did not look, walked on	21	$\frac{21}{80}$
Total frequency	80	

b $\frac{47}{80}$

Unit 7 Answers

7.1 Direct proportion

- 1 a £26
b £39
c £78
- 2 a 12 chillies
b 3 chillies
c 9 chillies
- 3 a 20 litres
b 120 litres
c 400 litres
- 4 25 minutes
- 5 £162

7.2 Writing ratios

- 1 a 2 : 1
b 2 : 5
- 2 a 2 squares and 3 triangles (or multiples of 2 and 3), in any order
b 3 squares and 2 triangles (or multiples of 3 and 2), in any order
- 3 a 2.1 : 1
b e.g. They scored on average 2.1 times as many goals in 2012 as in 2013.
- 4 a 1 : 1
b 2 : 1
- 5 a 1 : 5
b 2 : 1
c 2 : 5
d 3 : 5
e 7 : 3
- 6 a 1 : 2 : 3
b 2 : 4 : 3
c 3 : 2 : 7
d 1 : 9 : 2

7.3 Using ratios

- 1 a 3 squares
b 9 triangles
c e.g. $3 + 9 = 12$
- 2 4 squares, 16 triangles
- 3 a Abbie £15, Emma £5; $£15 + £5 = £20$
b Abbie £30, Emma £20; $£30 + £20 = £50$

- c** Abbie £30 Emma £70; $£30 + £70 = £100$
- 4 a** 15 g
b 45 g
c £1306.50
- 5** 3 buckets
- 6** 750 g

7.4 Scale and measures

- 1** Every 1 m is the same as **100** cm. The ratio of m : cm is 1 : **100**.
- 2 a** 100 : 1
b 10 : 1
c 1000 : 1
d 1 : 1000
e 1000 : 1
- 3 a** 50 mm
b 0.2 km
c 2500 g
d 9.9 cm
- 4 a** 3250 g
b 640 cm
- 5** 12 kg
- 6** 20 t

7.5 Proportions and fractions

- 1 a** $\frac{14}{24} = \frac{7}{12}$
b $\frac{10}{24} = \frac{5}{12}$
- 2** Saturday ($\frac{6}{7} > \frac{5}{7}$)
- 3** 9 pm ($\frac{4}{5} > \frac{3}{5}$)
- 4 a i** $\frac{5}{8}$
ii $\frac{3}{8}$
b e.g. $\frac{5}{8} + \frac{3}{8} = 1$
c 60 litres
- 5** Jackson; e.g. $\frac{7}{9} = \frac{14}{18}$ and $\frac{14}{18} > \frac{13}{18}$

7.6 Proportions and percentages

- 1** 30%

- 2 geography (80% > 78%)
- 3 small tile ($\frac{9}{25} = \frac{36}{100}$ and $\frac{36}{100} > \frac{32}{100}$)
- 4 a i 40%
ii 60%
- b $40\% + 60\% = 100\%$
- 5 Sue ($\frac{35}{250} = \frac{70}{500}$ and $\frac{70}{500} > \frac{60}{500}$)
- 6 a 7 : 13
- b i 35%
ii 65%
- c $35\% + 65\% = 100\%$

7 Strengthen

Direct proportion

- 1 a £6
b £9
- 2 a £48
b £12
c £36
- 3 a £4
b £8
c £24

Ratio

- 4 a 9 pens
b 3 pens
c $9 + 3 = 12$
- 5 any 2 squares in one colour and the other 4 in a different colour
- 6 a 1 : 4
b 3 : 1
c 5 : 3
- 7 15 tonnes
- 8 a £4, £16
b £18, £3
c £18, £12
- 9 1.15 g

Comparing proportions

- 10 $\frac{3}{8}$
- 11 Show A; e.g. $\frac{7}{10} > \frac{12}{20} = \frac{6}{10}$

12 Ron; e.g. $\frac{5}{25} = \frac{20}{100}$ and $\frac{20}{100} > \frac{15}{100}$

7 Extend

- 1 1080 kg or 1.08 t
- 2 a 37.5%
b 33.3%
c Chan
- 3 a 3 : 7 : 4
b 100 g
- 4 1 : 29
- 5 a 8 km
b 4500 g
c 3 litres
d 9 litres
- 6 a i 50 men
ii 75 women
iii 125 children
b $50 + 75 + 125 = 250$

7 Unit test

- 1 a 7
b 14
- 2 a £6
b £30
- 3 Yes, e.g. $6 \times \underline{5} = 30$ minutes, $4 \times \underline{5} = 20$ questions, and $20 > 18$.
- 4 6 : 5
- 5 a $\frac{6}{10} = \frac{3}{5}$
b 60%
c 65%
d second
- 6 a £7
b £14
c £35
- 7 25 yachts
- 8 Jayne; e.g. $\frac{80}{500} = \frac{160}{1000}$ and $\frac{160}{1000} > \frac{150}{1000}$
- 9 a 23 : 2
b 8%

Unit 8 Answers

8.1 Lines, angles and triangles

- 1 **a** obtuse
b acute
c reflex
d right angle
- 2 **b** LG, LD, GD or JF
c e.g. DE, CE, BE, AE, IJ, IK, IL, IM, AB, AC, ...
d No; e.g. they are not at 90° .
e e.g. $\angle HML$, $\angle AML$, $\angle MAE$, $\angle FIJ$,... or $\angle LHB$, $\angle HLG$, $\angle FJB$, ...
- 3 **a** any one of X, Y or Z
b XZ and XY
c isosceles
d $\angle XZY$ and $\angle XYZ$
e 1
- 4 **a** isosceles
b 4 (6 if FHB and DBH are included)
c e.g. $\angle AGC = \angle ACG$, $\angle AHB = \angle ABH$, $\angle EHB = \angle EBH$, $\angle GFH = \angle EFH$, ...
d e.g. AH and AB, AH and EH, ...
e $\angle AHB$
f 1
g Yes; e.g. the triangle is isosceles.

8.2 Estimating, drawing and measuring angles

- 1 40°
- 2 **a** Student's own estimates
b i 35°
ii 145°
- 3 **a** 30° angle drawn accurately
b 220° angle drawn accurately
- 4 23° angle from horizontal drawn accurately

8.3 Drawing triangles accurately

- 1 **a** triangle ABC drawn accurately
b triangle DEF drawn accurately
- 2 **a** 89 mm to 93 mm (90.6 mm)
b 25° and 25°
c isosceles
- 3 triangle PQR drawn accurately
- 4 triangle drawn accurately

8.4 STEM: Calculating angles

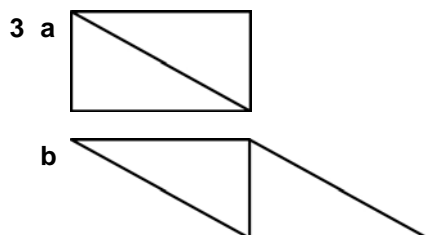
- 1 a i 40°
 ii 140°
 iii $180^\circ (\pm 2^\circ)$
 b i 130°
 ii 50°
 iii $180^\circ (\pm 2^\circ)$
 c e.g. Both are 180° .
- 2 a 110°
 b 56°
- 3 $p = 240^\circ, q = 120^\circ$
- 4 a $a = 25^\circ$
 b $b = 40^\circ, c = 140^\circ, d = 40^\circ$

8.5 Angles in a triangle

- 1 a i 40°
 ii 140°
 b i 90°
 ii 90°
- 2 a 35°
 b 30°
- 3 Not necessarily; e.g. although it could be a $40^\circ, 40^\circ, 100^\circ$ triangle, it could also be a $40^\circ, 70^\circ, 70^\circ$ triangle.
- 4 i $a = 25^\circ, b = 25^\circ$
 ii $c = 50^\circ, d = 80^\circ$
- 5 a $p = 60^\circ, q = 80^\circ$
 b $w = 70^\circ, x = 110^\circ$

8.6 Quadrilaterals

- 1 rectangle G, rhombus A, parallelogram D, trapezium C, kite E, arrowhead F
- 2 a equilateral triangle, isosceles trapezium
 b equilateral triangle: 3 equal sides, 3 equal angles, angles sum to 180° , 3 lines of symmetry, rotational symmetry of order 3
 trapezium: 2 pairs of equal angles, angles sum to 360° , 1 pair of equal sides, 1 pair of parallel sides, 1 line of symmetry, rotational symmetry of order 1



- 4 a $a = 50^\circ$
 b $b = 70^\circ, c = 110^\circ$
 5 $r = 90^\circ$

8 Strengthen

Measuring angles

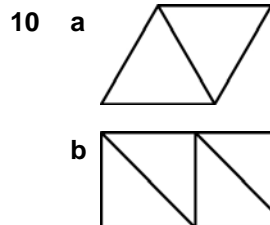
- 1 50°
 2 No; e.g. the angle is acute (less than 90°).
 3 triangle ABC drawn accurately

Calculating angles

- 4 a 70°
 b 40°
 5 a 360°
 b 150°
 6 a 110°
 b 70°
 7 $x = 40^\circ, y = 140^\circ$
 8 60°

Solving geometric problems

- 9 10 slices



8 Extend

- 1 50°
 2 triangle ABC accurately drawn
 3 a 72°
 b Isosceles; e.g. the triangles are identical so they all have 2 equal sides.
 4 $a = 60^\circ, b = 120^\circ, c = 30^\circ$
 5 a 45°
 b 80°
 c 260°
 d 140°
 6 $p = 70^\circ, q = 120^\circ, r = 30^\circ, s = 140^\circ$; sum = 360°
 7 a triangle drawn accurately

b 14° to 19° (16.7°)

8 Unit test

1 $d = 50^\circ$

2 angle D

3 No; e.g. the angles do not add to 180° .

4 18 slices

5 $a = 70^\circ$, $b = 110^\circ$

6 triangle drawn accurately (6 cm lengths to ± 2 mm, 20° to $\pm 2^\circ$)

7 $a = 50^\circ$, $b = 130^\circ$, $c = 20^\circ$

8 $b = 100^\circ$

Unit 9 Answers

9.1 Sequences

- 1 a i 31, 38, 45
 ii add 7
 b i 24, 27, 30
 ii add 3
 c i 42, 40, 38
 ii subtract 2
 d i 9.6, 10.0, 10.4
 ii add 0.4
 e i 8, 7.5, 7
 ii subtract 0.5
- 2 a 5, 7, 9, 11, 13
 b infinite
- 3 a 0, 1.1, 2.2, 3.3, 4.4
 b 20, 19.7, 19.4, 19.1, 18.8
- 4 a 16
 b 7th square
- 5 a $1\frac{2}{3}$, 2, $2\frac{1}{3}$
 b $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$
 c 7, 9, 11
 d 9, 19, 29
 e -4, -8, -12
 f 9.5, 9.2, 8.0

9.2 Pattern sequences

- 1 a 

b

Pattern number	1	2	3	4	5
Number of counters	4	6	8	10	12

c e.g. The first term is 4 and the sequence grows by adding 2.

2 a

Week number	1	2	3	4	5
Amount of money	20	35	50	65	80

b 7th week

- 3 a 5×3 , 15
 6×4 , 24

b e.g. The first number starts 3, increases by 1 each time, and the second number starts 1, increases by 1 each time, OR the number of rectangles starts 3, then add 5, then add 7, then 9, etc.

c 10×8

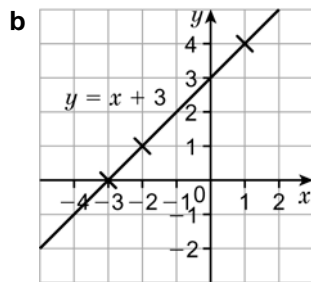
4 Anna, by 10 cm

9.3 Coordinates

1 a A (-3, -2), B (2, -2), C (2, 3)

b (-3, 3)

2 a (-3, 0), (-2, 1), (1, 4)



c e.g. (-4, -1), (-1, 2), (0, 3), (2, 5), ...

d add 1

e $y = x + 3$

3 a (4, 6)

b (0, 2.5)

4 (-0.5, -2)

9.4 Extending sequences

1 a

b 10, 15, 21

c triangular numbers

d No; the steps between terms are not equal.

2 a 1, 4, 10, 22

b 10, 15, 25, 45

c 37, 17, 7, 2

3 a 6 days

b Yes; the steps between terms are equal.

4 a not arithmetic

b 5, + 5

c not arithmetic

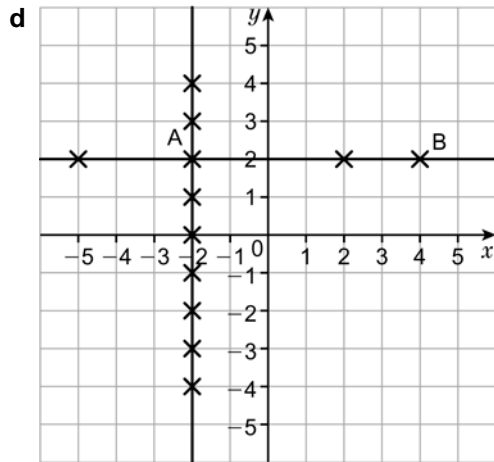
d 5, - 3

9.5 Straight-line graphs

1 a $(-2, 4), (-2, 3), (-2, 2), (-2, 1), (-2, 0), (-2, -1), (-2, -2), (-2, -3), (-2, -4)$

b $x = -2$

c $(4, 2), (2, 2), (-5, 2)$



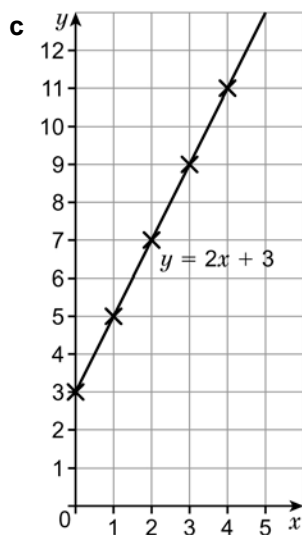
e.g. It is perpendicular to line A, parallel to the x -axis, all coordinate points have y as 2.

e $y = 2$

2 a

x	0	1	2	3	4
y	3	5	7	9	11

b $(2, 7), (3, 9), (4, 11)$

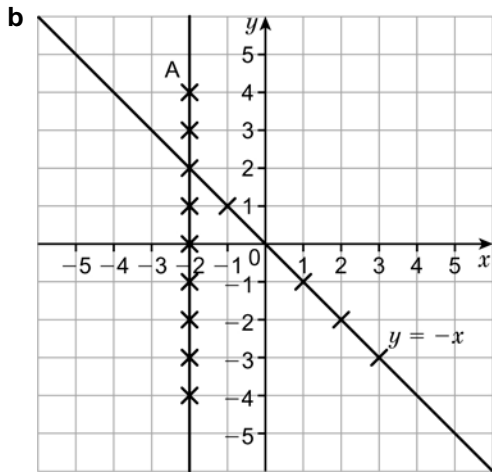


d 13

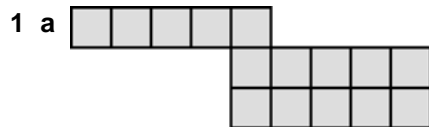
e 10

3 a

x	-3	-2	-1	0	1	2	3
y	3	2	1	0	-1	-2	-3



9.6 Position-to-term rules



b

Shape number (position)	1	2	3	4	5
Number of squares (term)	3	6	9	12	15

c + 3

d 18

e 3

f 30

g 60

2 $4n$

3 a + 1

b position + 9

c $n + 9$

4 $6n$

5 a 15, 20, 25, 30

b $5n$

c 50 minutes

d Yes; e.g. when $n = 30$, $5n = 150$, and 150 minutes is $2\frac{1}{2}$ hours. Keene will need to be able to keep rowing for at least as long as this for his sponsored row. But illness and other commitments might interrupt his training so he might not be able to stick to the daily requirements of the model.

9 Strengthen

Sequences

1 a

Pattern	1	2	3
Number of grey squares (term)	8	13	18

- b 5 squares
- c 5 squares
- d 18 squares
- e 23, 28, 33, 38, 43

2 a 1, 6, 16, 36

- b 2, 3, 6, 15
- c 16, 12, 10, 9

3 a 3, 11

- b 28, 22
- c 9, 23
- d -3, 3

The n th term

4 a + 2

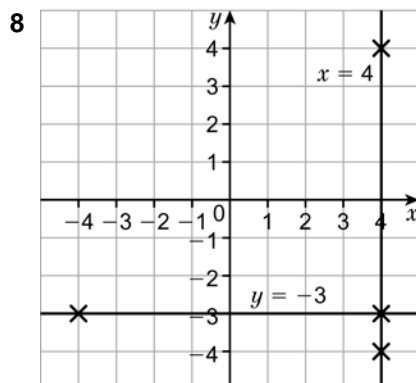
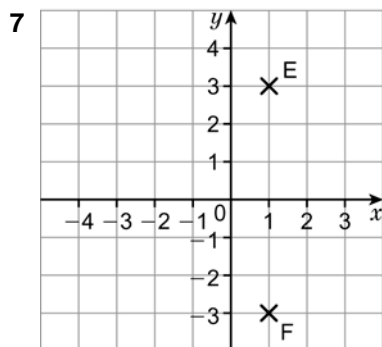
b $\times 10$

5 a $2n$, 20, 100

b $10n$, 100, 500

Graphs

6 A (1, 4), B (-2, 3), C (-3, -2), D (2, -3)



9 Extend

1 a 80

b $\div 2$ or $\times \frac{1}{2}$

2 a 6, 8, 10, ... or 8, 16, 32, ... or 2, 4, 2, 4, 2, ...

b They are both infinite; not been told that there is a certain number of terms.

3 Student's own answer, e.g. 2, 8, 14, 20, ... (+ 6)

4 a 16 squares

b square numbers

c 3 squares

d 103 squares

5 a i 6, 7, 8, 9

ii 25

b i 4, 9, 14, 19

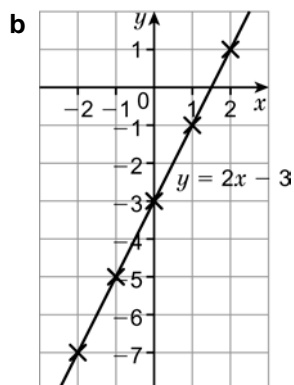
ii 99

c i 6, 9, 14, 21

ii 405

6 a

x	-2	-1	0	1	2
y	-7	-5	-3	-1	1



c (0, -3) or $y = -3$

9 Unit test

1 a 30

b 13

c 1

2 a - 4

b 14, 10, 6

3 a

Shape number	1	2	3	4	5
Number of metal pieces	3	5	7	9	11

b + 2

4 A (-2, 1), B (4, 2), C (-1, -3), D (3, -2)

5 a copy of table, with: 14, 16, 18, 20

<i>x</i>	1	2	3	4	5
<i>y</i>	12	14	16	18	20

b 30

6 a 11, 21, 31, 41

b 3, 6, 11, 18

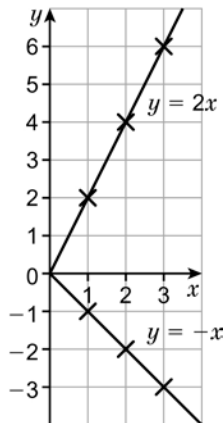
7 a

<i>x</i>	0	1	2	3
<i>y</i>	0	2	4	6

b

<i>x</i>	0	1	2	3
<i>y</i>	0	-1	-2	-3

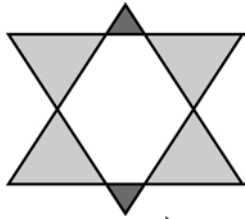
a, b



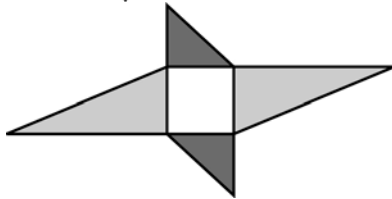
Unit 10 Answers

10.1 Congruency and enlargements

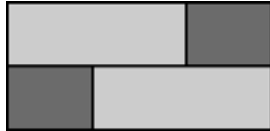
1 a



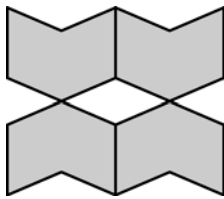
b



c



d



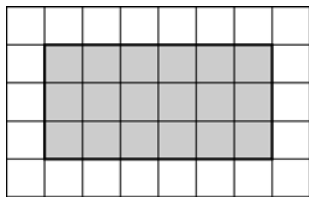
2 a Length y is the same as length v .

b Length z is the same as length w .

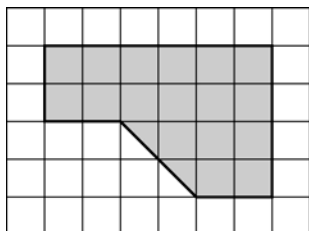
c Angle A is the same size as angle D .

d Angle B is the same size as angle F .

3 a



b



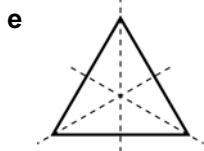
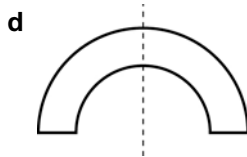
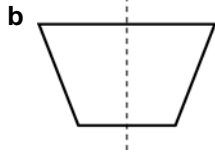
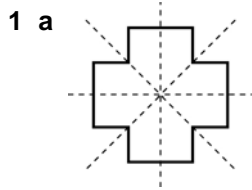
4 a i 1 : 2

ii 2

b i 1 : 3

ii 3

10.2 Symmetry



2 b order 4

c order 3

d order 4

e order 2

3

Shape	Number of lines of symmetry	Order of rotational symmetry
isosceles triangle	1	1
kite	1	1
rectangle	2	2

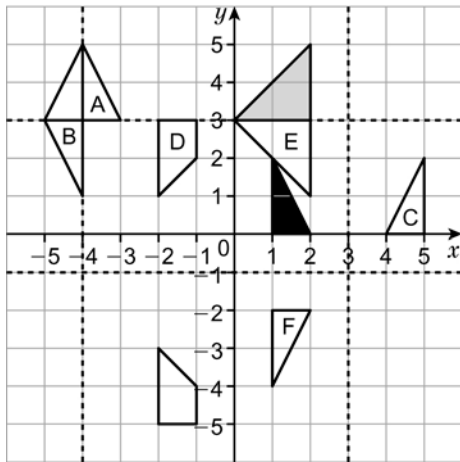
4 shapes A, C and D

10.3 Reflection

1 b Yes

c No; it's not a mirror image.

2



3 Yes; student's own explanation

4 a $y = -1$

b $x = 1$

c $x = -1$

d $x = 0$ or the y -axis

10.4 Rotation

1 c 180° rotation about (1, 1)

d 90° rotation clockwise about (1, 1)

e 180° rotation about (1, 1)

f 180° rotation about (1, 1)

2 a (0, 1), (-2, 1), (-2, 0)

b (3, 0), (3, 2), (2, 2)

c (1, -2), (1, -4), (2, -4)

3 rotation **clockwise** through 90° about (2, 1)

4 a 90° rotation anticlockwise about (-1, -1)

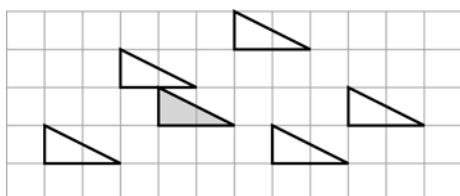
b 180° rotation about (-1, 1)

c 180° rotation about (2, 1)

d 90° rotation clockwise about (4, 1)

10.5 Translations and combined transformations

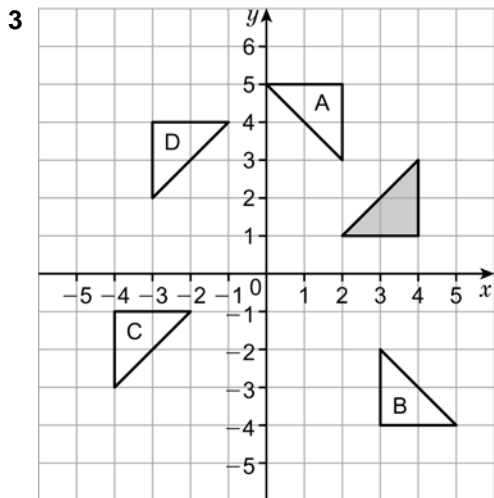
1



2 a 3 squares right, 1 square up

b 3 squares left, 2 squares up

c 8 squares left, 1 square down



- 4 a True
 b False; e.g. the triangles are not equilateral.
 c True

10 Strengthen

Shapes and symmetry

- 1 a
- b
- c
- d

- 2 a order 1
 b order 4
 c order 3
 d order 2
 e order 5

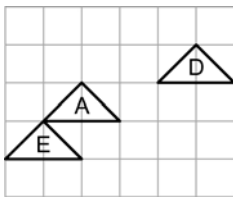
3

Shape	Number of lines of symmetry	Order of rotational symmetry
equilateral triangle	3	3
square	4	4
rhombus	2	2

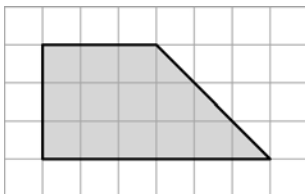
Translations, reflections and enlargements

- 4 a 2 squares right, 2 squares up
 b 3 squares right, 1 square down
 c 1 square left, 3 squares up
 d 1 square right, 3 squares down

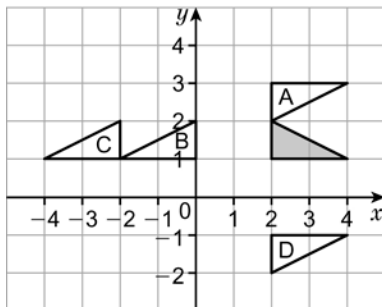
5



6

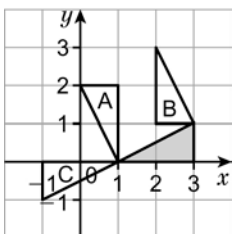


7

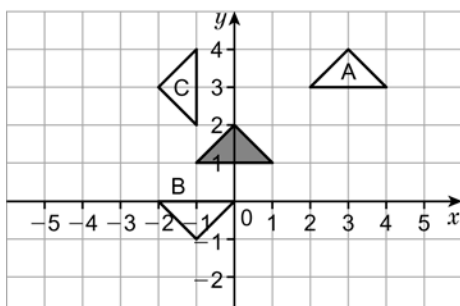


Rotations and combined transformations

8



9



10 Extend

- 1 a rotation 90° clockwise about $(2, -4)$
 b rotation 90° clockwise about $(3, 2)$
 c rotation 90° anticlockwise about $(2, -2)$
 d rotation 180° about $(2.5, 2)$

- 2 a 1 : 2, scale factor 2
 b 1 : 3, scale factor 3
 c 2 : 3, scale factor 1.5

d

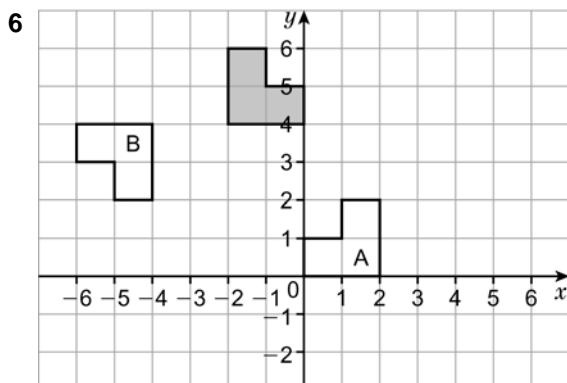
Square	Perimeter (cm)	Area (cm ²)
A	8	4
B	16	16
C	24	36

e

Squares	Ratio of side length	Ratio of perimeters	Ratio of areas
A : B	1 : 2	1 : 2	1 : 4
A : C	1 : 3	1 : 3	1 : 9
B : C	2 : 3	2 : 3	4 : 9

- f e.g. The ratios of the side lengths and the perimeters were the same, but each ratio of the areas was the square of the other two ratios.

- 3 reflection in the line $x = -2$
- 4 a 3 squares right and 1 square down
 b e.g. 3 squares left + 6 squares right = 3 squares right
 2 squares up + 3 squares down = 1 square down
- 5 a 3
 b 4
 c 1



- a ii rotation 90° clockwise about $(2, 4)$
 b ii rotation 180° about $(-3, 4)$

10 Unit test

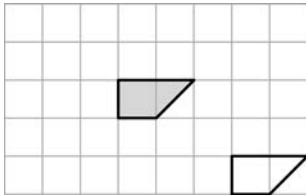
1 a 2

b 1

c 0

d 4

2



3 No; he can rotate one to fit over the other as they are the same size and shape.

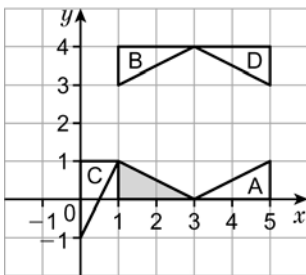
4 a order 2

b order 1

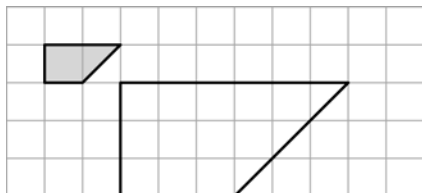
c order 1

d order 4

5



6 a



b 1 : 3

7 a 2

b 1

c 3