Unit 1 Answers

Exercise 1.1

1 a 5

b juice

c 4

d 30

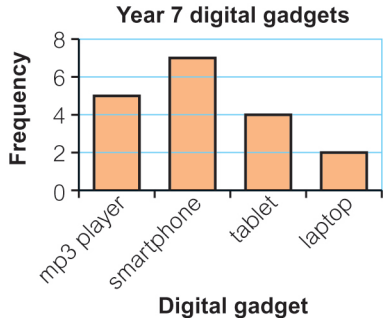
2

	Saturday	Sunday	Total
Alan	20	22	42
Yolanda	20	15	35
Total	40	37	77

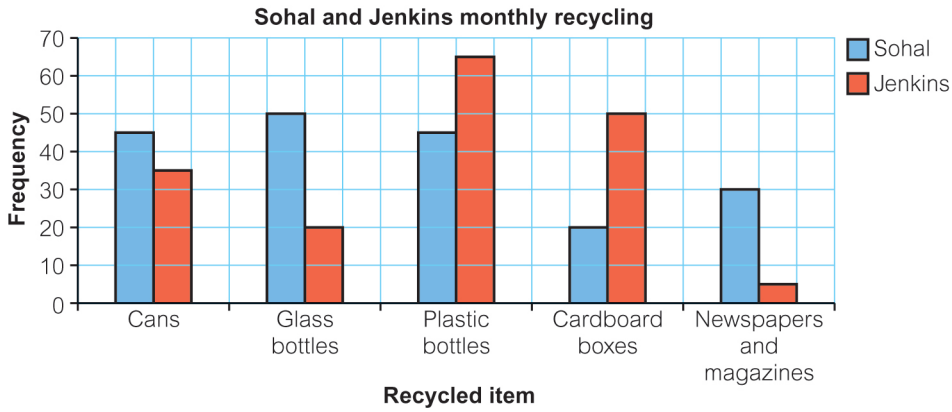
3 a

Digital gadget	Frequency
mp3 player	5
smartphone	7
tablet	4
laptop	2

b



4 a



b 35 **c** Glass bottles **d** 180 **e** Sohal family

5 a i 50

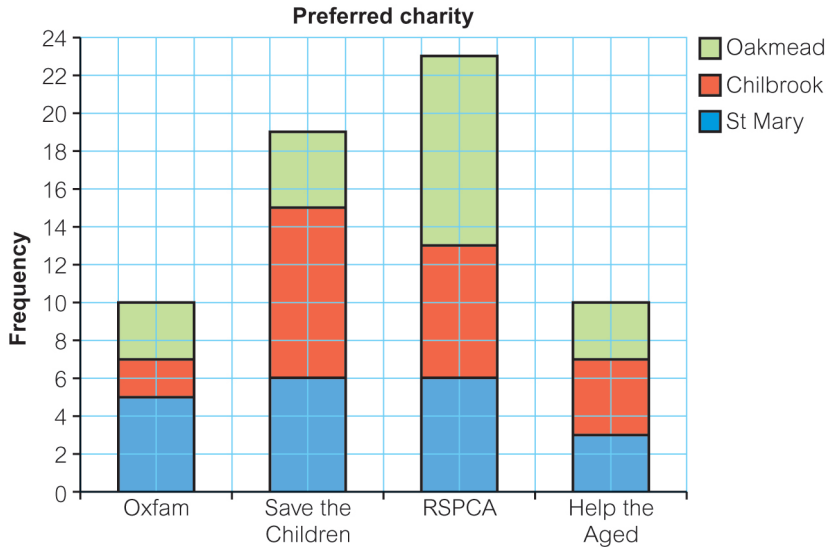
ii 20

b

	Facebook	Flickr	Instagram	Tumblr
Photos of Giselle	50	30	20	20
Photos of places	20	30	10	40

c There are 120 photos of herself in total, and only 100 photos of places, so she has taken more photos of herself.

6 a



b 22

c Oakmead

d RSPCA

7 a 21

b blue

c Not able to say for certain. There were more bees overall so a smaller proportion liked white, but the sample size is small.

d i Butterflies appear to prefer red much more than bees, and bees appear to prefer blue much more than butterflies.

ii Neither butterflies nor bees appeared to be attracted to green flowers.

Unit 1 Answers

Exercise 1.2

1 **a** Sara's mode: 10 Jamil's mode: no mode

b Sara's median: 10 Jamil's median: 7

c Sara's mean: 10.4 Jamil's mean: 6.33

d Sara's range: 3 Jamil's range: 12

2 football

3 **a** Wanderers' range: 7 Rangers' range: 2

The Rangers are more consistent because they have a smaller range.

b Wanderers' median: 1 Rangers' median: 1.5

4 1.35

5 1.35

6 Sheffield Wednesday had a higher mean fee. Sheffield Wednesday were also more consistent because they had a smaller range.

7 **a** 100

b Mean: 27.5 Median: 20 Modes: 18, 20, 21

c Median, because it isn't affected by extreme values. There are three modes, so it isn't a very good average to use.

8 The dog has the biggest range of values, so is the least consistent, while the plane has the smallest range and is the most consistent. The helicopter has the highest median so it can travel furthest on average.

Unit 1 Answers

Exercise 1.3

1

Class	Tally	Frequency
1–5	𝍸	5
6–10	||	2
11–15	𝍸 |	6
16–20	||	2
21–25	|	1

2 a 8

b 10

c 80–89

3 a continuous

b discrete

c continuous

d discrete

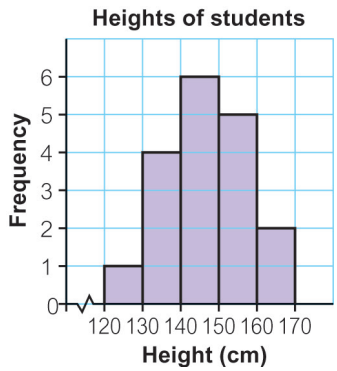
e discrete

4 a

Wingspan, w (cm)	Frequency
$0 \le w < 10$	2
$10 \le w < 20$	4
$20 \le w < 30$	6

b $20 \le w < 30$

5 a



b $140 \le h < 150$ **c** 7

Unit 1 Answers

Exercise 1.4

1 a i 15 litres

ii 13 litres

b 40 minutes

c 3 litres

d Between 20 and 30 minutes. The graph is steeper so the diver used up air more quickly, so was probably more active.

2 a Correct points plotted on given axes

b Students' own answers. For example:

'The wind speed is likely to vary according to the seasons, and may be quite different after a few months.'

3 a i 10am

ii 4.5 m

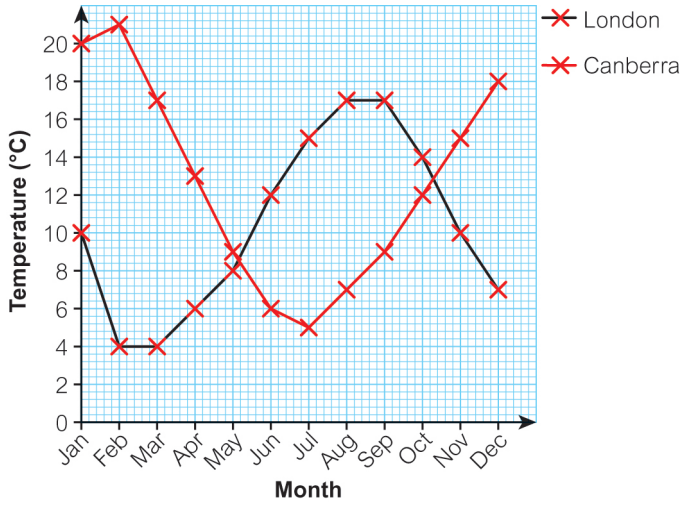
iii 1.5 m

b 6pm

c i The predicted times for high and low tides are the same as the recorded times.

ii The recorded tide height at a particular time was always higher than the predicted height.

4 a



b i June, July and August

ii February, March and April

c Students' own observations. For example:

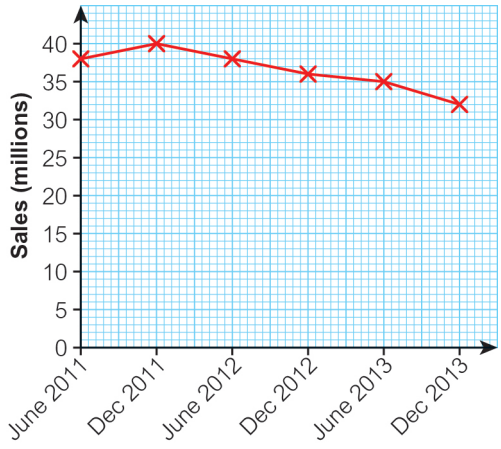
'The minimum temperature in Canberra is higher than the minimum temperature in London.'

'The maximum temperature in Canberra is also higher than the maximum temperature in London.'

'The minimum temperatures in Canberra occur when the maximum temperatures in London occur.'

5 a The scales on the sales axes are different. The scale for tablet sales starts at 0 and goes up in intervals of 1 million. The scale for PC sales has a discontinuity between 0 and 30 and goes up in intervals of 2 million.

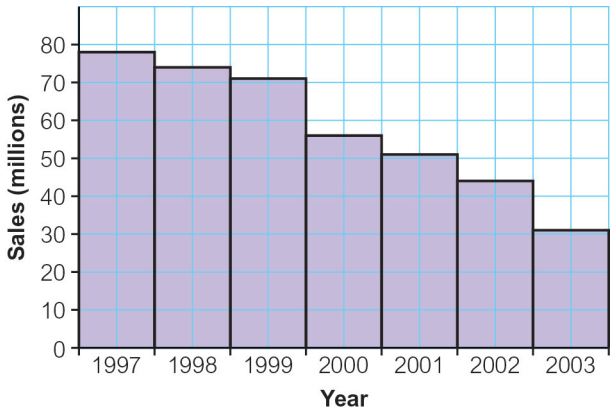
b



c Students' own answers. For example: 'Tablet sales increase by more than 4 times in 2 years'.

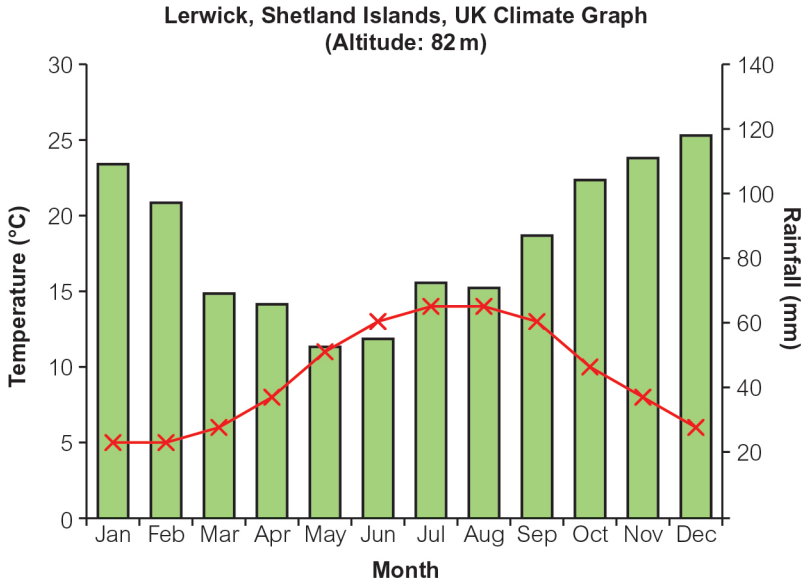
6 a The scale on the vertical axis has unequal intervals. Bars for 2002 and 2003 are wider.

b



7 **a** bar chart for rainfall

b line graph for maximum temperature (°C)



c The maximum temperature increased steadily between March and July, then began to decrease between September and December.
The rainfall decreased between January and May, then began to increase again between June and December.

Unit 1 Answers

Exercise 1.5

1 a 30

b 8

c 2

d 40

e 90

f 32.5

2 a, b Students' correctly drawn angles

3 a Violin. It has the highest proportion.

b i $\frac{1}{4}$ **ii** $\frac{1}{8}$

c

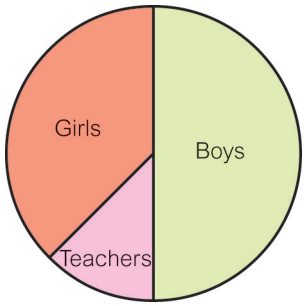
Instrument	Frequency
Violin	16
Flute	4
Cello	8
Drum	4

4 a 24

b One musician is 360° ÷ **24 = 15°**

c Boys: 180° Girls: 135° Teachers: 45°

d

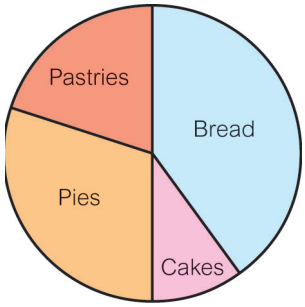


5 a i 144°

ii 108°

iii 36°

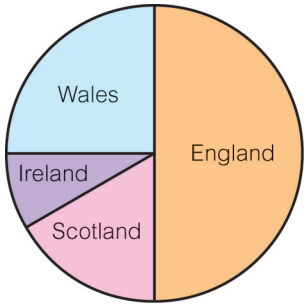
b



6 a 2°

b 30°; 60°; 90°; 180°

c



7 a £40 000

b £100 000

c Even though the band earned a greater proportion from CDs in 2004, the total income from CDs was greater in 2014 – £100 000 compared with £80 000.

d

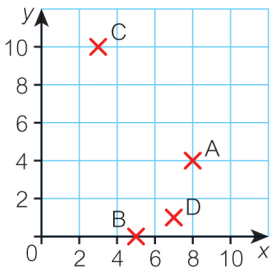
	Concerts	**CDs**	**Downloads**
2004	£40 000	£80 000	0
2014	£200 000	£100 000	£100 000

Unit 1 Answers

Exercise 1.6

1 A(0, 2), B(4, 4), C(6, 8), D(10, 3)

2



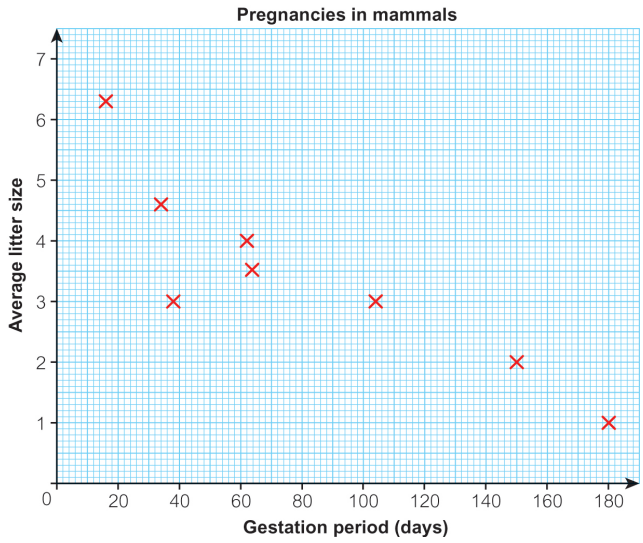
3 **a** (strong) positive correlation

b 8 m

c 24 cm and 32 cm

d (41, 16), because the point lies well away from all the other points on the graph.

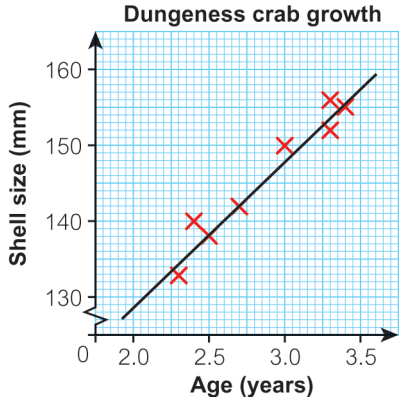
4 **a**



b (weak) negative correlation

c Mammals with **longer** gestation periods tend to have **fewer** offspring in each litter.
OR
Mammals with **shorter** gestation periods tend to have **more** offspring in each litter.

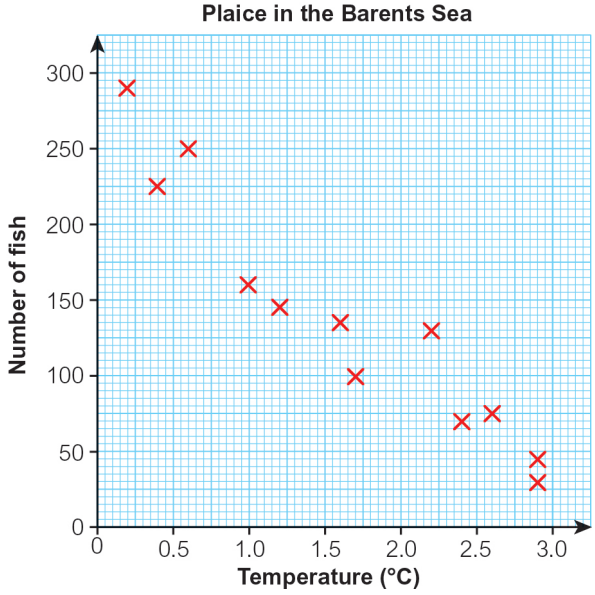
5 **a** scatter graph **c** line of best fit



b positive correlation

d Students' own answers from their line of best fit. Between 2.6 and 3 years. (Read off 146 mm from y-axis and corresponding x-value.)

6 **a** scatter graph **c** line of best fit



b negative correlation

d Students' own answers from their line of best fit. Between 90 and 110 fish. (Read off 2.1°C from x-axis and corresponding y-value.)

e The population of plaice in the Barents Sea could decrease if the temperature of the sea rises.

Unit 1 Answers

1 Check up

Averages and range

1 1.8

2 **a** **i** 1.5 km

ii 2 km

iii 6.5 km

b Yes. The mean is affected by the extreme value of 7 km, and there is more than one mode, so the median is best.

c Students live closer to **primary** school, on average.

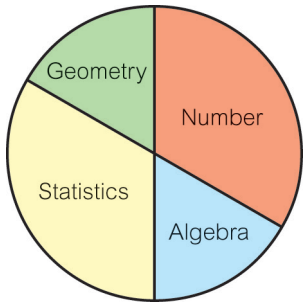
Charts and tables

3 **a** Number

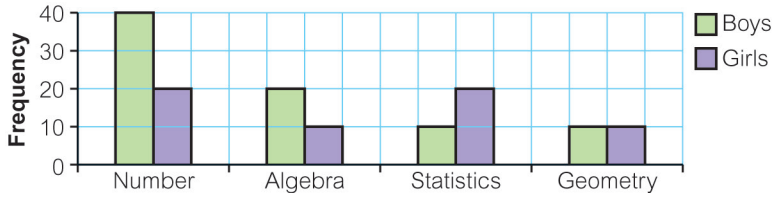
b

	Number	Algebra	Statistics	Geometry
Boys	40	20	10	10
Girls	20	10	20	10

c



d



4 **a** $125 \leq h < 130$

b 64

c 134

d There is a break in the scale on the y-axis, so it looks like there are more than double but that is because we can't see the beginning of the scale.

5 **a** Iran

b 3

c Iran

d Gold

Line graphs, scatter graphs and correlation

6 **a** 200 cm

b Winter Park

c November and April

d Avoriaz. The depth starts to decrease in February, compared with March in Winter Park.

e 70 cm

7 **a** positive correlation

b The greater the mass of the car, the **higher** the fuel consumption.

c **i** between 10 and 15 mpg

ii between 1100 and 1200 kg

Unit 1 Answers

1 Strengthen

Averages and range

1 a Jo

b Jo's range: 2 Karl's range: 11

c The **smaller** the range, the more consistent the results.

d Student's own choice with reasons. For example: 'Jo, her scores were consistently OK' or 'Karl, although he had one very bad score, he had one very good score and one medium score.'

2 a i 2.6

ii 7

b Mean: 1.8 Range: 2

c On average, Fiona used her smartphone **more** on Sunday.
The data for Sunday is **less** consistent than the data for Monday.

3 a, b, c

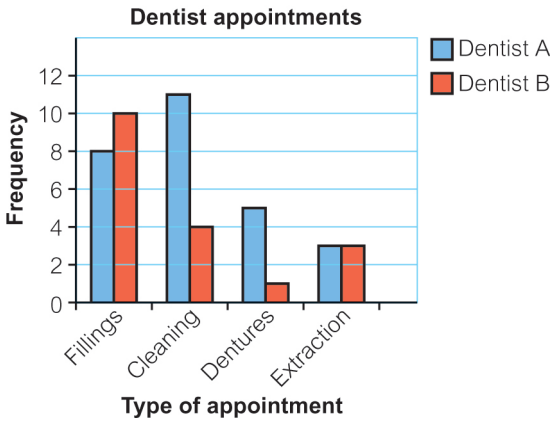
Mass (kg)	Frequency	Total mass (kg)
2	3	3 × 2 = 6
3	4	3 × 4 = 12
4	2	4 × 2 = 8
5	10	5 × 10 = 50
Total	19	76

d 4 kg

Charts and tables

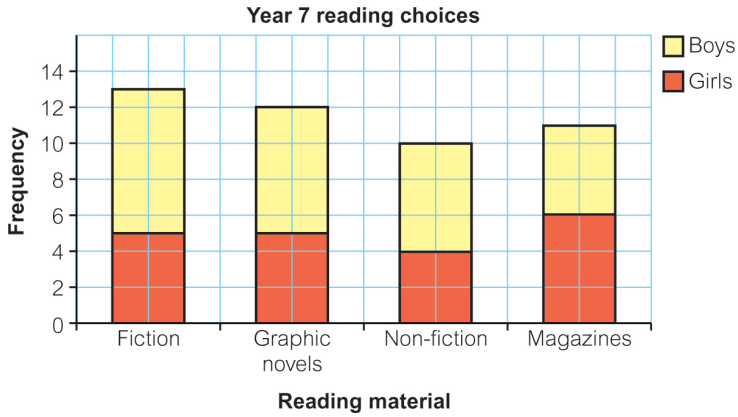
1 a 10

b



2 **a** 5 girls **b** 8 boys

c



3 **a** Karen **b** $\frac{1}{2}$ **c** £20 **d** $\frac{1}{3}$ **e** £10

f

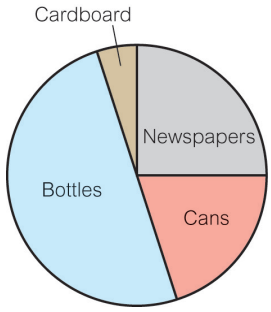
	Music	Clothes	Food
Dana	£20	£10	£10
Karen	£10	£10	£10

4 **a** 20 **b** 18° **c** 1 **d** 4 **e** 72°

f

Item	Frequency	Sector angle
Newspapers	5	90°
Cans	4	72°
Bottles	10	180°
Cardboard	1	18°

g

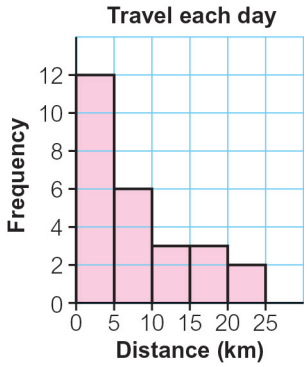


5 a

Distance, d (km)	Tally	Frequency
$0 \le d < 5$	𝍸 𝍸 ||	12
$5 \le d < 10$	𝍸 |	6
$10 \le d < 15$	|||	3
$15 \le d < 20$	|||	3
$20 \le d < 25$	||	2

b $0 \le d < 5$

c



Lines graphs, scatter graphs and correlation

1 The first graph, because it has a steeper increase due to the different scale.

2 a Oxfam: £30 RSPCA: £10

b June

c April

d £10

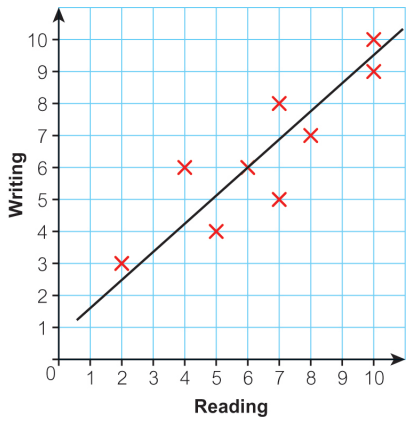
e i Between April and June, the amount donated to the RSPCA **decreased.**

ii Between April and June, the amount donated to Oxfam **increased.**

3 a scatter graph

b There is **positive** correlation between the students' reading and writing results.

c line of best fit



d i Students' own answers from line of best fit. Between 3 and 4.

ii Students' own answers from line of best fit. Between 7 and 9.

Enrichment

1 a 21 minutes

b 46 minutes

Unit 1 Answers

1 Extend

1 Arsenal

2 **a** The Netherlands **b** 30% **c** 2 **d** 6

e

	Gold	Silver	Bronze
The Netherlands	6	6	8
Poland	2	2	6

3 **a** Student's own grouped frequency table. For example:

Minutes late, m	Frequency
$0 \leq m < 5$	8
$5 \leq m < 10$	1
$10 \leq m < 15$	4
$15 \leq m < 20$	2
$20 \leq m < 25$	1
$m \geq 25$	2

b Students' own answers. For example:

'The modal class is $0 \leq m < 5$, but this doesn't mean most trains were less than 5 minutes late.'

'Very few trains were more than 20 minutes late.'

4 **a** 27 million

b 110 million

c The scales for full time and part time workers are different, so they aren't comparable.

5 **a** **i** 91.4 kg **ii** 19 kg **iii** 88.45 kg

b The Cambridge rowers have more consistent weights, with a smaller range.

The Oxford rowers are light on average (median and mean).

c **i** The range, because the cox's mass is less than any other member of the team.

ii The median, as the mean is brought down by the extreme value.

6 a 1

b 5

c

Number of generators hired	Frequency
0	4
1	6
2	5
3	3
4	1
5	1

d 1.7

7 a

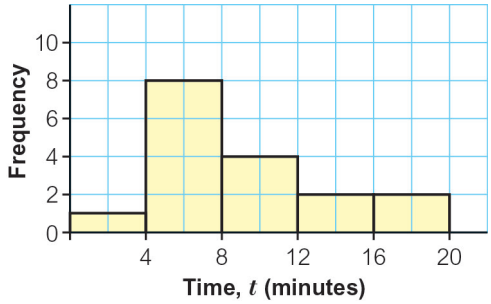
Time, t minutes	Frequency
$0 \le t < 4$	1
$4 \le t < 8$	8
$8 \le t < 12$	4
$12 \le t < 16$	2
$16 \le t < 20$	2

b $4 \le t < 8$

c i 9

ii 8

d



e i There are no times greater than 10 minutes. This may have been because there were fewer calls.

ii There is no mode. Median: 7.55 Mean: 7.175

iii The median. It lies exactly in the middle and is not affected by extreme values. The mean is also reasonable because it takes all values into account.

8 a i Students' own answers. About $\frac{4}{5}$. **ii** Students' own answers. About $\frac{1}{3}$.

b Students' own answers. About 3600 GWh.

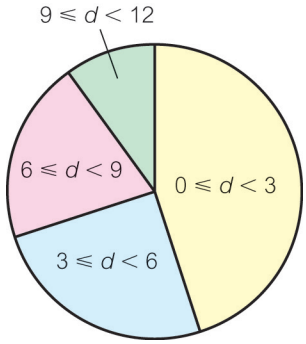
c Students' own answers. About 41 000 GWh.

d Students' own observations. For example:

'France generates the majority of its renewable energy through hydropower.'

'Germany generates the majority of its renewable energy through wind power.'a

9 a



b i The modal distance travelled to the shops is **0 ⩽ *d* < 3.**

ii Fewer than half the shoppers had travelled less than **3 miles.**

iii Just over 25% of shoppers had travelled more than **6 miles.**

10a

	135 ⩽ *h* < 140	**140 ⩽ *h* < 145**	**145 ⩽ *h* < 150**	**150 ⩽ *h* < 155**	**155 ⩽ *h* < 160**	**Total**
Boys	3	7	3	4	0	**17**
Girls	2	2	6	4	1	**15**
Total	**5**	**9**	**9**	**8**	**1**	**32**

b 10

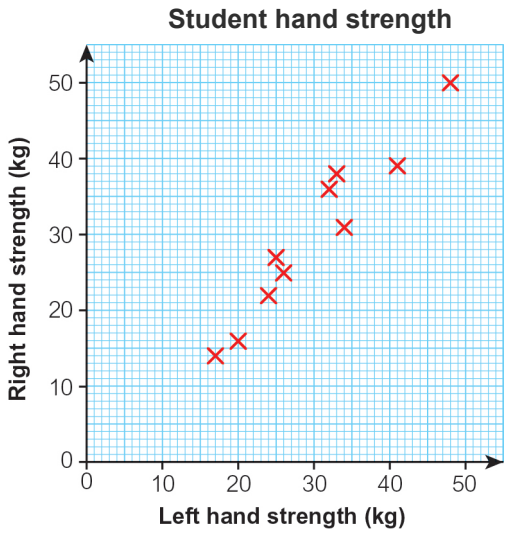
c 18

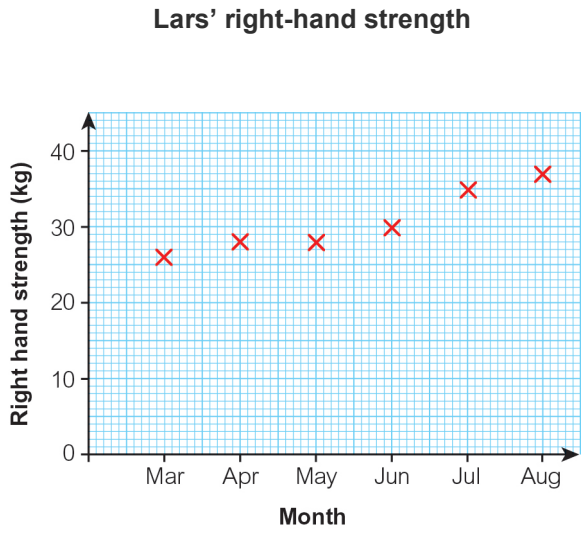
d The mode height for girls is 145 ⩽ h < 150, whereas the mode height for boys is shorter, at 140 ⩽ h < 145.

We can only estimate the mean because the data is grouped.

11 £3.26

12a





b Students' own answer. Between 33 kg and 36 kg.

Unit 1 Answers

1 Unit test

1 **a** 30

b 25

c 75

d **i** 15

ii 20

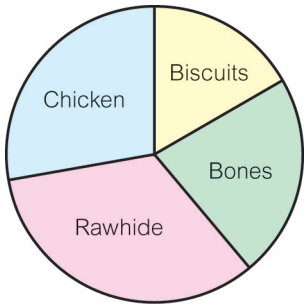
iii 55

2 **a** 1

b $1.\dot{3}$

c The mode number of accidents and the mean number of accidents both reduced after speed cameras were fitted.

3



4 The median. There is an extreme value, which will skew the mean.

The mode is lower than most of the values.

5 **a** 55°C

b 20°C

c The pan without the lid reached room temperature after 40 minutes. The pan with the lid took 20 minutes longer, and reached room temperature after 60 minutes.

d 15°C

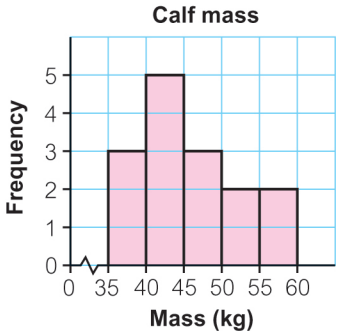
6 127.9 m

7 a

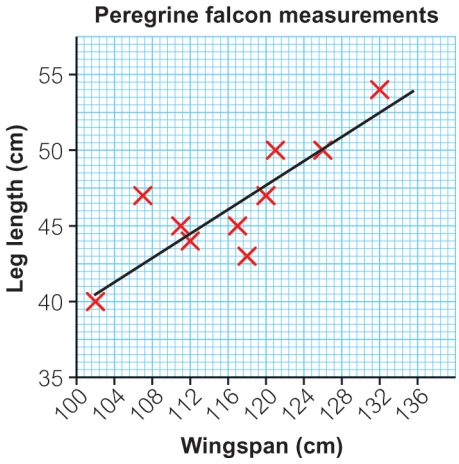
Mass, m	Tally	Frequency
$35 \leq m < 40$	|||	3
$40 \leq m < 45$	𝍸	5
$45 \leq m < 50$	|||	3
$50 \leq m < 55$	||	2
$55 \leq m < 60$	||	2

b $40 \leq m < 45$

c



8 a, c



b positive correlation

d i Students' own answers. Between 46 cm and 50 cm.

ii Students' own answers. Between 110 cm and 115 cm.

Unit 2 Answers

Exercise 2.1

1 a 3, 12, 15, 18, 24, 30

b 5, 15, 20, 30

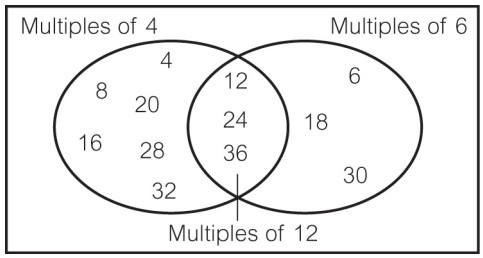
c 2, 4, 5, 8, 20

2 a i 4, 8, 12, 16, 20, 24, 28, 32, 36

ii 6, 12, 18, 24, 30, 36

iii 12, 24, 36

b



3 2, 3, 11, 17

4 a 1, 2, 4, 7, 14, 28

b 2, 7

5 a 1, 2, 3, 4, 6, 8, 12, 16, 24, 48

b 1, 2, 4, 7, 8, 14, 28, 56

c 1, 2, 4, 8, 13, 26, 52, 104

d 1, 2, 4, 5, 10, 20, 25, 50, 100

e 1, 2, 3, 4, 9, 12, 18, 36

6 1, 2, 3, 4, **6**, 9, 12, 13, **18, 26**, 36, 39, **52**, 78, **117**, 156, 234, 468

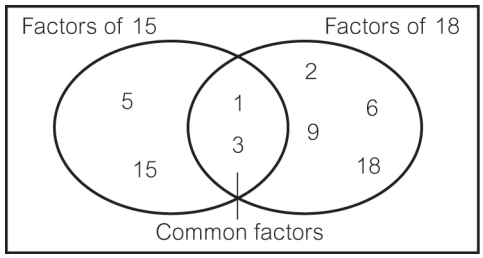
7 a 1, 2, 4, 8

b 1, 2, 3, 4, 6, 12

c 1, 2, 4

d 4

8 a



b 3

9 a 3

b 4

c 6

10a 6 in the middle, 12 opposite 18, and 54 opposite 60

11a 3, 6, 9, 12, 15, 18, 21, 24, 27, 30

b 5, 10, 15, 20, 25, 30

c 15, 30

d 15

12a LCM of 4 and 5 is 20, LCM of 4 and 6 is 12, LCM of 4 and 10 is 20, LCM of 5 and 10 is 10, LCM of 5 and 6 is 30, LCM of 6 and 10 is 30

b 5 and 10 have an LCM of 10.

c 4 and 5 and 4 and 10 both have an LCM of 20.

6 and 5 and 6 and 10 both have an LCM of 30.

The LCMs of 4 and 5 and 6 and 10-are also multiples of 10.

13 2 turns on the large cog and 3 turns on the small cog

14 The LCM of 9 and 15 is 45.

Unit 2 Answers

Exercise 2.2

1 −2 and −5

2 **a** −2°C

b −2°C

3 **a** >

b <

c >

d >

4 **a** −5

b 6

c −9

d −2

5 **a** **i** 2 + 3 = 5
2 + 2 = 4
2 + 1 = 3
2 + 0 = 2
2 + −1 = 1
2 + −2 = 0
2 + −3 = −1

ii 2 – 3 = −1
2 – 2 = 0
2 – 1 = 1
2 – 0 = 2
2 – −1 = 3
2 – −2 = 4
2 – −3 = 5

b **i** −

ii +

c replace + − with –
replace – + with –
replace – – with +

6 **a** 2

b 5

c −15

d 4

7 **a** **i** 125ºC

ii 65ºC

b 123ºC

c 235ºC

8 **a** **i** 9 + 3 = 12

ii −7 + −5 = −12

b **i** 9 – −7 = 16

ii −7 – 9 = −16

9 a

i $2 \times 3 = 6$
$2 \times 2 = 4$
$2 \times 1 = 2$
$2 \times 0 = 0$
$2 \times -1 = -2$
$2 \times -2 = -4$
$2 \times -3 = -6$

ii $-2 \times 3 = -6$
$-2 \times 2 = -4$
$-2 \times 1 = -2$
$-2 \times 0 = 0$
$-2 \times -1 = 2$
$-2 \times -2 = 4$
$-2 \times -3 = 6$

b positive × negative = negative
negative × positive = negative
negative × negative = positive

10a −20
b −14
c 30
d −18
e 16
f −24
g 30
h −210

11 Students' own answers

12

a $8 \times -2 = -16$
$-16 \div -2 = 8$
$-16 \div 8 = -2$

b $-8 \times 2 = -16$
$-16 \div 2 = -8$
$-16 \div -8 = 2$

c $-8 \times -2 = 16$
$16 \div -2 = -8$
$16 \div -8 = -2$

13a −4
b −6
c 4
d −5
e −6
f 3
g −1
h 1

14a $-7 \times -5 = 35$
b $-7 \times 9 = -63$

15a 35ºC
b −2ºC
c Range doesn’t change.
d Mean increases to −1.67ºC.

Unit 2 Answers

Exercise 2.3

1 a 37

b 8

c 3

2 a 45

b 52

c 244

3 a 1000

b 506

c 598

4 a i 800 **b i** 851

ii 1400 **ii** 1296

iii 2400 **iii** 2496

5 a 192

b 192

c 192

d 192

6 a centre 900, orange 100, pink 18

b orange 8, pink 16, green any two numbers that multiply to give 480 other than 30 × 16 and 60 × 8,
e.g. 10 × 48, 5 × 96, 20 × 24 etc.

7 a 63

b 32

c 25

d 23

8 a 71 r 5

b 23 r 2

c 25 r 7

d 17 r 20

9 19

10a The missing digit is 6.

b i 0.625

ii 1.75

iii 2.8

Unit 2 Answers

Exercise 2.4

1 4, 16, 36, 49

2 **a** 4

b 16

c 81

3 **a** 64 cm^2

b 81 cm^2

c 144 cm^2

4 **a**

1^2	2^2	3^2	4^2	5^2	6^2	7^2	8^2	9^2	10^2	11^2	12^2	13^2	14^2	15^2
1	4	9	16	25	36	49	64	81	100	121	144	169	196	228

b **i** 8

ii 11

iii 13

iv 15

5 **a** **i** $4 \times 4 = 16$ **ii** $7 \times 7 = 49$

$-4 \times -4 = 16$ $-7 \times -7 = 49$

so, $\sqrt{16} = 4$ or -4 so, $\sqrt{49} = 7$ or -7

b **i** 5 and −5 **ii** 9 and −9 **iii** 3 and −3

6 Ishan, because you can't have a negative length.

7 **a** $\sqrt{196} = 14$

b $\sqrt{6.25} = 2.5$

c $46^2 = 2116$

d $3.6^2 = 12.96$

8 **a** Students' own estimates

b **i** 4.5

ii 2.2

iii 8.9

iv 9.5

9 a i 4

ii 400

iii 40 000

iv 0.04

b i 2500

ii 810 000

iii 16 000 000

iv 0.36

10a 6

b 6

c 18

d 28

Unit 2 Answers

Exercise 2.5

1 **a** 125
b 27
c −1
d −64

2 **a** 52
b 10
c 47
d 3

3 **a** 3^4
b 2^5
c 7^3

4 $1^3 = 1$, $2^3 = 8$, $3^3 = 27$, $4^3 = 64$, $5^3 = 125$, $6^3 = 216$, $10^3 = 1000$

5 **a** 1000
b 100 000
c 10 000
d 1 000 000

6 **a** 3
b 5
c 10
d 1
e −2
f −4

7 **a** 2 × 3 = 6
b 4 × 5 = 20
c 3 × 4 = 12

8 **a** 4
b 84
c 41
d −6
e 47
f 105

9 **a** 24
b 5000
c 2
d 5
e 16
f 12

10a 23

b 100

c 30

d 5

e 0

11a 370

b 400

c 3084

d 40

e 0

f −1

12a 4 s

b 5 s

c 9 s

13a 1050 or 100

b The missing number could be either the smallest number (900 – 800) or the largest number (250 + 800).

14a 2

b 24

c 48

15 8

16 24

Unit 2 Answers

Exercise 2.6

1 **a** 7
b 3
c 9
d 6

2 **a** 30
b 40
c 80
d 60

3 **a** 29
b −4
c 18
d 31
e 24
f 24

4 $\sqrt[3]{64} - 8 = -4$, $\sqrt{36} - \sqrt[3]{27} = 3$, $\sqrt{9} + 12 = 15$

5 **a** **i** 220 **ii** 700
iii 40 **iv** 20
v 23 **vi** 5
b **i** 235.2 **ii** 328
iii 27.276 **iv** 21.65 (2 d.p.)
v 23.27 (2 d.p.) **vi** 4.44 (2 d.p.)

6 No, an estimate of the total is £5 + £6 + £5 + 2 × £2 + 2 × £3 + 3 × £2 = £32
The total cost is £29.65

7 **a** 20 **b** 4
c 81 **d** 9
e 4 **f** −8
g 8 **h** 3

8 **a** 7.7 m/s (1 d.p.)
b 20.5 m/s (1 d.p.)
c 26.2 m/s (1 d.p.)

9 **a** 6
b 49
c 50
d 64
e 133
f 64

10a 6

b 11

c 3

d 3

e 2

f 10

11a $\sqrt{3^3+3^2}$ = 6, 13 – $\left(\sqrt[3]{125}+3\right)$ = 5, 8 × (11 − $\sqrt[3]{1000}$) = 8, $\sqrt[3]{40+24}$ = 4

b Students' own calculation that gives an answer of 7, e.g. $\sqrt{9}+\sqrt[3]{64}$

12a 675

b 135

c 2025

13 3 × 2^2, $\sqrt{64}$ + $\sqrt[3]{8}$, $\sqrt{25}$ + 2^2, 2^3 − 1, $\sqrt{5^2-4^2}$

14a $3(2 \times 5)^2$

b 3 × 2 × 5

Unit 2 Answers

2 Check up

Working with numbers

1 **a** 1, 2, 3, 4, 6, 12
b 1, 2, 3, 6, 9, 18
c 2, 3
d 6

2 24

3 **a** 34
b 52 r 5

4 **a** 16
b −4
c 6
d −19
e 3
f 4

5 **a** −18
b −36
c 56
d −4
e −4
f 3

6 **a** 120
b 13

Powers and roots

7 **a** 10 000
b 8
c 49
d 6
e 5
f 8
g −5

8 9 or −9

9 6.2

10a 270
b 32

11a 60

b 6

c 16

d 36

12 24

13 15

Working with brackets

14a 28

b 100

c 6

d 22

e 25

f 37

15a 18.79 (2 d.p.)

b 0.47 (2 d.p.)

16a 5

b 7

c 2

d 2

17a 100

b 80

c 400

Unit 2 Answers

2 Strengthen

Working with numbers

1 The numbers that are left are 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

2 a Factors of 16: 1, 2, 4, 8, 16
Factors of 20: 1, 2, 4, 5, 10, 20
Common factors: 1, 2, 4

b 4

3 6

4 a 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, 36, 39

b 4, 8, 12, 16, 20, 24, 28, 32, 36

c 12, 24, 36

d 12

5 30

6 a 96, 120, 144, 168, 192, 216

b 38

7 46

8 64 r 7

9 32 r 1

10a 2

b 15

c −16

d 1

e −15

f −14

11a −28

b −24

c 20

d −4

e −5

f 3

12a 8

b 7 or 8

c 12

d 13

Powers and roots

1 a $8^2 = 8 \times 8 = 64$

b $3^3 = 3 \times 3 \times 3 = 27$

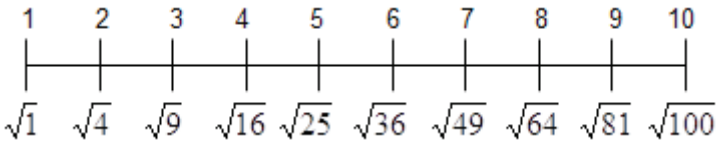
c $7^2 = 7 \times 7 = 49$

d $5^3 = 5 \times 5 \times 5 = 125$

e $9^2 = 9 \times 9 = 81$

f $2^3 = 2 \times 2 \times 2 = 8$

2 a



b i 6.7 **ii** 4.2 or 4.3 **iii** 9.7

3 a 40

b 54

c 8

d 2

4 a 40

b 14

c 18

d 20

e 37

f −16

5 a 4, 5, 6, 7, 8, 9

b 27

c 42

d 45

6 a 4, 5, 10

b 40

c 20

d 12

Working with brackets

1 a 64

b 27

c 48

d 70

e 50

f 63

2 a 7

b 4

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

4 **a** 3
b 2
c 6
d 4
e 3
f 2

5 **i** C
ii E
iii F
iv A
v D
vi B

Enrichment

1 **a** 9 and −2 or 11 and −4
b 9 and −2 or 11 and −4
c 9 × −2 or −3 × 6
d 11 + 9 + 6 = 26

Unit 2 Answers

2 Extend

1 £57

2 **a** 211

b 523 r 11

c 530 r 7

d 92 r 4

3 950

4 **a** £47.55

b 10p

5 2^3, 4^2, 5^2, 3^3, 4^3

6 $15^2 = 225$, $2^{15} = 32\,768$, so 2^{15} is larger

7 **a** **i** 1, 2, 4, 8, 16

ii 1, 2, 4, 5, 8, 10, 20, 40

iii 1, 2, 4, 7, 8, 14, 28, 56

b 4

8 **a** **i** 3, 6, 9, 12, 15, 18, 21, 24, 27, 30

ii 4, 8, 12, 16, 20, 24, 28, 32, 36, 40

iii 6, 12, 18, 24, 30, 36, 42, 48, 54, 60

b 12

9 240 seconds

10 Students' own calculations that give an answer of −12, e.g. 6 × −2, 10 – 22, −20 + 8, −60 ÷ 5

11a **i** 7 and −5 or 8 and −6

ii 7 and −5 or 8 and −6

b **i** −6 −−5 or 7 − 8

ii −6 − −5 or 7 − 8

c **i** 7 – 8 × −6 = 55

ii −6 – 7 × 8 = −62

12 $5^2 = 25$ so the side length must be greater than 5 cm

13 Side length estimate is 8.4, so perimeter is about 33.6 cm

14a square B

b square C

15a **i** 5 s

ii 10 s

iii 6 s

b **i** 6.3 s

ii 7.7 s

16a 5 or −5

b 7 or −7

c 4 or −4

d 3 or −3

17a 16 **b** 4 **c** 36

d 100 **e** 30 **f** 15

g 61 **h** 17

18a i

$(-1)^3 = -1 \times -1 \times -1 = -1$

$(-2)^3 = -2 \times -2 \times -2 = -8$

$(-3)^3 = -3 \times -3 \times -3 = -27$

$(-4)^3 = -4 \times -4 \times -4 = -64$

$(-5)^3 = -5 \times -5 \times -5 = -125$

ii negative

b i

$(-1)^4 = -1 \times -1 \times -1 \times -1 = 1$

$(-2)^4 = -2 \times -2 \times -2 \times -2 = 16$

$(-3)^4 = -3 \times -3 \times -3 \times -3 = 81$

$(-4)^4 = -4 \times -4 \times -4 \times -4 = 256$

$(-5)^4 = -5 \times -5 \times -5 \times -5 = 625$

ii − × − = + and + × + = +

c i negative

ii positive

iii negative

iv positive

19a positive

b negative

c negative

d negative

e positive

f positive

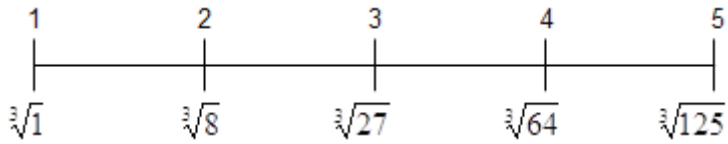
20a i $10 \times 3^2 = 90$ **ii** $4^2 + 5 \times 10 = 66$ **iii** $8^2 - 5^2 = 39$

iv $\sqrt{16} \times 20 = 80$ **v** $7 \times 8 - \sqrt{49} = 49$ **vi** $\frac{\sqrt{81}}{\sqrt{9}} = 3$

b i 94.08 **ii** 67.77 **iii** 41.23

iv 93.34 **v** 45.86 **vi** 3.22

21a



b Students' own estimates

c **i** 2.71 **ii** 3.11 **iii** 4.48

22a 2

b 3

c 250

d 8

e 0

f 54

23a **i** −8

ii −27

iii −64

b **i** 10

ii 15

iii 30

iv 1

24a 15

b 44

25 18

26 Kai is correct because 3^2 and $(-3)^2$ give the same answer of 9, so 10 – 9 = 1

27 a A 90 000 J, B 451 250 J, C 360 000 J

b No, it has 4 times as much energy.

Unit 2 Answers

2 Unit test

1 **a** 1, 8

b 2, 3, 5, 13

2 4

3 60

4 £62

5 **a** 55 r 10

b 314 r 3

c 0.875

6 $6^2 = 36$, $4^3 = 64$, $5^2 = 25$, $5^3 = 125$, $9^2 = 81$

7 **a** 4

b 20

c −3

d −7

e −30

f −17

g 0

8 2.8 or 2.9

9 **a** 42

b 16

c 8

d 54

e 61

10 10 or −10

11 **a** 108

b 64

c 250

d 4

12 A 87, B 88, C86, D 85

13 **a** −10

b −48

c −4

d −3

14 **a** $20 \times 40 + 20 \times 10 = 1000$

b $90 - 8 \times 3 = 66$

c $50 + \frac{12}{4} = 53$

15a 288
b 500
c 2
16 −2
17 24
18 −6
19 a 8
b 6
c 1
d 2
20 a 36
b 48
c 144
d 144

Unit 3 Answers

Exercise 3.1

1 a 3^4

b 2^3

c 5^6

2 a $2n$ **b** $5y$

c $5a$ **d** $11b$

e $2a$ **f** $5b$

g $6y$

3 a $6x + 2$

b $2b + 3c$

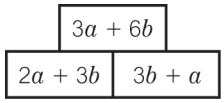
c $4y - 3b + 8$

d $7y - 2$

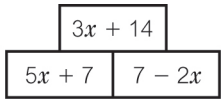
e $2x - 3y + 3$

f $11a - 7b + 5$

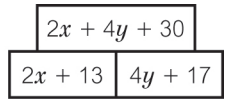
4 a



b



c



5 a b^2

b t^3

c m^4

6 a $5x^2$

b $4a + 5b^2$

c $3b^2 + 3b$

d $12x + 2x^2$

e $7x^4$

f $12x^2 + x^3$

7 a ab

b bt^2

c p^3y^2

d $2m$

e $5x$

f $7pq$

8 a $10b^2$

b $27a^2$

c $18a^3$

d $3b$

e $4.5a$

f $3b$

9 $2x = x + x$

$x^2 = x \times x$

$3x + 4x = 7x$

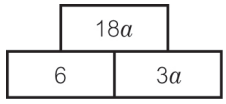
$2x \times 2x = 4x^2$

$x \times 2x = 2x^2$

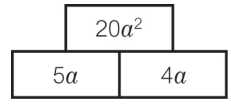
$4x - 3x = x$

$\frac{9x}{3} = 3x$

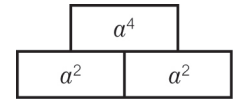
10 a



b



c



11 pairs a and c

Unit 3 Answers

Exercise 3.2

1 a 0

b $5x^2 - 4x$

c $x + 9$

2 a y^2

b b^3

c $8n$

d $8b^2$

e $4c$

3 a $b + 2$

b $b - 4$

c $b + 17$

d $5b$

e $\frac{b}{2}$

4 a $x + y$

b i $x + y - 3$

ii $x + y - 3$

5 a $4m$

b $m + 5$

c $m - 6$

d $\frac{m}{2}$

e $2m + 5$

f $5m - 3$

6 a $x + y$ **b** xy

c $x - y$ **d** $2y + x$

e $3y + 4x$ **f** y^2

g $4x^2$ **h** $y^2 - 7$

i $\frac{x}{y}$ **j** $\frac{20}{x} + 2$

7 **a** $3t + 2$ **b** $2t - 5$

c $2t + 4$ **d** $2t$

e $t - 5$ **f** t^2

g $\frac{t}{3}$ **h** $\frac{3}{t}$

8 **a** $3a - 17$

b $\frac{b}{4} + 3$

c $25c$

d $\frac{d+2}{5}$

9 **a** $b + 5$

b $4b + 10$

c 50 cm

Unit 3 Answers

Exercise 3.3

1 a 140 minutes or 2 hours 20 minutes

2 a 202

b 175

c 141

3 a 6

b 6

c −2

d 9

e 7

4 a 15

b 29

c 8

d 4

e 4

5 a $8\frac{1}{3}$ m/s

b 12 m/s

c 15.625 m/s

6 a 54

b 160

c 175

7 a i 50 N

ii 700 N

iii 300 N

b i 8 N

ii 112 N

iii 48 N

8 a 10 N/m^2

b 4 N/m^2

9 a 40 V

b 46.5 V

c 144 V

10a 28 cm

b 18 m

c 33 cm

11a 373 K

b 253 K

c 273 K

d 173 K

12a 5°C

b 15°C

c 25°C

d −5°C

Unit 3 Answers

Exercise 3.4

1 a $x + 2$

b $y - 5$

c $20x$

2 a $r + b$

3 a 14

b 8

c 4

d 25

4 a r = number of films rented

b d = number of films downloaded

c £35

5 a £45

b £108

c $9x$

d $E = 9x$

6 a $15x$

b $C = 15x$

7 $L = b + 10$

8 $R = x + y$

9 $L = 6B$

10a $\frac{x+y+z}{3}$

b Mean = $\frac{x+y+z}{3}$

c 13

11 $P = \frac{a+b+c}{3}$

12a i £52.50

ii £12.50

b $C = 12.5 + 4n$

13a i 28

ii −7

iii −32

iv $5x + 3$

b $y = 5x + 3$

14a 155 minutes

b $C = 45k + 20$

Unit 3 Answers

Exercise 3.5

1 a $3y$

b $6a$

c $-3p$

d $14s$

e $45z$

2 a b^2

b $2m^2$

c a^3

d $6b^2$

e $18n^2$

3 a i 21

ii 21

They are equal.

b i 20

ii 20

They are equal.

4 a $3x + 12$ **b** $2n + 24$ **c** $3p - 21$ **d** $4y - 20$

e $4 + 2r$ **f** $40 - 5b$ **g** $16 - 8q$ **h** $100 - 10a$

5 $2(x + 3)$

6 $P = x(T - 50)$

7 a $x - 5$

b $x(x - 5) = x^2 - 5x$

c $A = x^2 - 5x$

d i 50 cm^2

ii 84 cm^2

8 a $b^2 + 4b$ **b** $y^2 - 2y$ **c** $10t + t^2$ **d** $2r - r^2$

e $3w^2 + 2w$ **f** $10p + 4p^2$ **g** $15q - 2q^2$ **h** $6r^2 + 2r$

i $16m^2 - 24m$ **j** $40b - 8b^2$

9 a 9 **b** 12 **c** 14 **d** 29

e 5 **f** 16 **g** 49 **h** 60

i 38 **j** 1

10a 25

b 26

c 44

11a x^2

b $x^2 + 5$

c $2x^2 + x + 5$

d 60

12a 13 **b** 0 **c** 4 **d** 8
e 35 **f** 135 **g** 64 **h** 1
i 1 **j** 27

Unit 3 Answers

Exercise 3.6

1 a $2x + 6$

b $12x + 8$

c $18 – 9x$

d $20 – 35x$

2 a 9

b 4

c 7

3 a 1, 2

b 1, 3

c 1, 5

d 1, 2 and 4

4 a 8

b 12

5 a $4x + 8 = 4(x + 2)$ **b** $12x + 3 = 3(4x + 1)$

c $9x – 15 = 3(3x − 5)$ **d** $14x – 21 = 7(2x – 3)$

e $12x + 6 = 6(2x + 1)$ **f** $9x – 3 = 3(3x – 1)$

g $11x + 33 = 11(x + 3)$ **h** $10 – 5x = 5(2 – x)$

i $12 + 3x = 3(4 + x)$

6 a $3(x + 4)$ **b** $5(p – 3)$

c $11(2z – 1)$ **d** $2(y – 10)$

e $5(2 + m)$ **f** $13(2 – n)$

g $7(2 + s)$ **h** $7(1 – 4t)$

7 a expression iv

b expression vi

c expression ii

d expression v

e expression iii

f expression i

8 $12(x + 2b)$ $6(2x + 4b)$ $4(3x + 6b)$ $3(4x + 8b)$

9 a $4(x + 2)$ **b** $4(2y + 3)$

c $14(m + 2)$ **d** $6(2n – 1)$

e $10(2 – s)$ **f** $4(2 + 5t)$

g $45(2y + 1)$ **h** $33(2 + z)$

10a $2(2m + n + 8)$

b $5(3 + 2b + 11c)$

c $p(q + 14)$

11 Amount paid = $70 + 10m$

12 Amount paid = $120 + 25n$

Unit 3 Answers

3 Check up

Simplifying expressions

1 a $3x + 12$

b $2a - 2w$

c $55 - 5x$

2 a $2x$

b $11x$

c $5c$

d $3t$

e $2x + 2b$

3 a y^3 **b** x^2 **c** $3t^2$

d $10r^3$ **e** $5r^2$ **f** $14t^2$

g $\frac{y}{7}$ **h** $2y$

4 a $4x^2$

b $x^2 + 2x$

c $3x^2 - 3$

5 a $x^2 + 3x$

b $b^2 - 2b$

c $10a - a^2$

d $6x^2 + 2x$

e $40t - 8t^2$

6 a $4(x + 5)$

b $3(2x - 3)$

c $7(2a - 3b)$

Substitution

7 84 cm^2

8 $t = 60$

9 5 kg/m^3

10 10 cm

11a $b = 25$

b $b = -17$

c $b = 42$

d $b = -26$

12 28

13 49

14a 15

b 64

c 27

d 45

e 19

Writing expressions and formulae

15a $x - 7$

b $12x$

c $\frac{x}{2}$

d mx

16 $T = 5x$

17a $b + a$

b $b(a + 3)$

c a^2

d $\frac{b}{5}$

18 $P = 5a$

19 $S = \frac{p}{30}$

20 $A = a^2$

21 $C = 2t + 3c$

Unit 3 Answers

3 Strengthen

Simplifying expressions

1 **a** $3p$

b $4m$

c $2d$

d $5t$

2 **a** $5t$ **b** $12g$ **c** $7y$ **d** $4p$

e $13y + 2b$ **f** $11m + n$ **g** $3a + 3b$ **h** $3q - b$

i $2t + 7$ **j** $7y + 6$

3 18

4 **a** $2(x + 3) = 2x + 6$ **b** $3(x + 4) = (x + 4) + (x + 4) + (x + 4) = 3x + 12$

c $4(b + 2) = 4b + 8$ **d** $5(t + 3) = 5 \times t + 5 \times 3 = 5t + 15$

e $3(6 + a) = 18 + 3a$ **f** $2(r - 3) = 2 \times r + 2 \times -3 = 2r - 6$

g $6(10 - b) = 60 - 6b$

5 **a** 6^3

b 5^4

c 11^2

6 **a** iv **b** iii **c** v **d** i **e** ii

7 **a** $6w^2$

b $8a^2$

c $15b^2$

d $24m^2$

e $99n^2$

8 **a** n^2 **b** $2n$ **c** $2n$ **d** $2n$

Expression a is the odd one out.

9 **a** $m(m + 1) = m \times m + m \times 1 = m^2 + m$

b $b(b + 2) = b \times b + b \times 2 = b^2 + 2b$

c $d(3 + d) = d \times 3 + d \times d = 3d + d^2$

d $r(r - 1) = r \times r - r \times 1 = r^2 - r$

e $m(m - 3) = m \times m - m \times 3 = m^2 - 3m$

f $t(10 - t) = t \times 10 - t \times t = 10t - t^2$

10a $t^4 + t^4 = 2t^4$

b **i** $2p^2$

ii $2x^3$

iii $3m^2$

iv $5x^2$

11a $2t^2 + 3t$

b $p^3 + 2p$

c $x^2 + 5x$

12a 3

b $3x + 9 = 3(x + 3)$

13a $4x + 8 = 4(x + 2)$

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

c $15x + 5 = 5(3x + 1)$

d $18x - 12 = 6(3x - 2)$

e $3x + 15 = 3(x + 5)$

f $7x - 14 = 7(x + -2)$

Substitution

1 £72

2 100 km

3 **a** 5 **b** 1 **c** 8

d 8 **e** 18 **f** 3

g 12 **h** 14 **i** 3

4 **a** 15

b 63

c 16

d 20

5 **a** 120

b 70

c 150

6 **a** $P = 8$

b $P = 5$

c $P = 0$

7 **a** 25

b 1

c 49

8 **a** $m^4 = 2 \times 2 \times 2 \times 2 = 16$

b $m^2 + 1 = 2 \times 2 + 1 = 5$

c $m^2 - 2 = 2 \times 2 - 2 = 2$

d $3m^2 = 3 \times 2 \times 2 = 12$

Writing expressions and formulae

1 **a** iii **b** i **c** v **d** iv **e** ii

2 $S = \frac{p}{3}$

3 **b** $\frac{m}{2}$

c $5n$

4 $p = 100m$

5 $y = \frac{x}{10}$

6 **a** y more than x **b** x multiplied by y **c** y less than x **d** x divided by y
e x more than y **f** x less than y **g** y divided by x **h** y multiplied by x

7 $M = b + s$

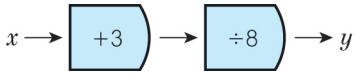
8 $M = \frac{5k}{8}$

9 **a** $\frac{a+b}{2}$

b $M = \frac{a+b}{2}$

10a 3

b



c $y = \frac{x+3}{8}$

Enrichment

1 **a i** 1 **ii** 1 **iii** 1 **iv** 1

b 1

2 Subtracting x from both sides of the inequality leaves $2 < 3$, which is always true, so Victoria is correct.

Unit 3 Answers

3 Extend

1 a $4x$

b x^2

2 a 100 cm^2

b 600 cm^2

c x^2

d $6x^2$

3 a i 300

ii 432

b 3 cm

4 a Customer A: £20.50 Customer B: £15.40 Customer C: £50

b Customer A: £11 Customer B: £30.20 Customer C: £100

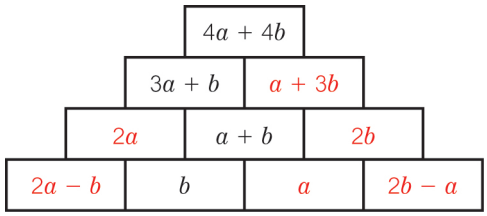
c Customer A should use company 2. Customers B and C should use company 1.

5 Students' own pairs of coordinates, e.g. (0, 3), (1, 4), (2, 5), (3, 6), (4, 7), etc.

The line crosses the y-axis at $y = 3$.

6 $n + 2n - 5 + 4n - 10 = 7n - 15$

7



8 The algebraic expression is $2(x + 3) - 2x$ which expands to $2x + 6 - 2x$, giving 6.

9 a

8	1	6
3	5	7
4	9	2

b

$c + a$	$c - a - b$	$c + b$
$c - a + b$	c	$c + a - b$
$c - b$	$c + a + b$	$c - a$

10 $-4a + 2$

11a 200

b = B3*C3, = B4*C4

c 285

d 19

e The mean pay per hour

12 1 and $6x^3$, 2 and $3x^3$, 3 and $2x^3$, 6 and x^3, x and $6x^2$, $2x$ and $3x^2$, $3x$ and $2x^2$, $6x$ and x^2

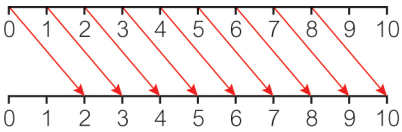
13 $3x$ and $5x$

14a $3x^2$

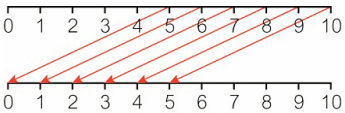
b $8x$

15 WHY IS IT CALLED FACTORISING?

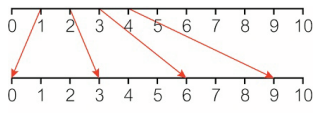
16



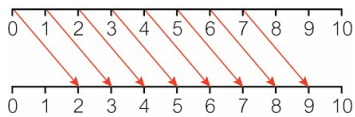
17 a



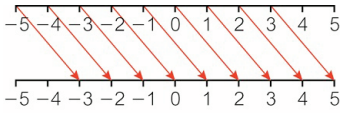
b



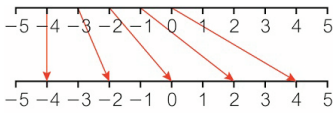
c



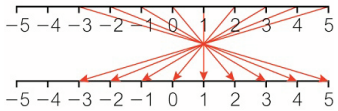
18 a



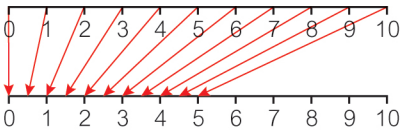
b



c



19a



b 20

20a $x + 1$, $x + 2$

b $x + x + 1 + x + 2 = 3x + 3$

c $3(x + 1)$

d $x + 1$

This is the middle of the three numbers.

21a **i** 1

ii −1

iii 1

iv −1

b −1

22a $x < 0$

b $x = 0$, $x = 2$

c $x < 0$, $x > 2$

d $0 < x < 2$

23a 2U Taxis: £10 A2B Taxis: £11

b 2U Taxis: $T = d$ A2B Taxis: $T = 0.5d + 2p$

c A2B Taxis

d 20 miles

e 32 miles

Unit 3 Answers

3 Unit test

1 420 minutes

2 $P = 31$

3 $m = 3.25$

4 $D = 2$

5 **a** $3x + 12$

b $5x - 35$

c $70 - 7x$

6 **a** $y - 2$

b $5m$

c $\frac{y}{10}$

d $y + x$

7 $A = I + 10$

8 **a** b^2

b $2b$

c $\frac{a}{b}$

9 $T = 2r + 5c$

10a 12

b 60

11a $3x$

b $3x + 2y$

c $17 - 2y$

12a 38

b 5

c 73

13a $z = -7$

b $z = -4$

14a r^5

b $14y^3$

c $3y^2$

d $15m^2$

e $6x$

15a $13r^3$

b $7x + 3x^2$

16a $x^2 + 7x$

b $r^2 - 5r$

c $2b^2 + 10b$

d $6b^2 - 12b$

17a 8

b –5

c 10

d 77

e 21

f 49

18a $2(x + 6)$

b $3(4x - 5)$

c $10(5 - 2x)$

Unit 4 Answers

Exercise 4.1

1 **a** 4

b 3

c 7

d 8

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

b $\frac{1}{3}$

c $\frac{3}{8}$

d $\frac{5}{9}$

3 $\frac{1}{4} = \frac{2}{8}$ $\frac{4}{5} = \frac{8}{10}$ $\frac{1}{2} = \frac{3}{6}$ $\frac{15}{20} = \frac{3}{4}$

4 **a** $\frac{2}{7} < \frac{3}{8}$ **b** $\frac{5}{6} > \frac{3}{4}$

c $\frac{1}{3} < \frac{3}{7}$ **d** $\frac{3}{5} > \frac{1}{2}$

5 $\frac{2}{5}, \frac{1}{2}, \frac{4}{7}, \frac{5}{8}$

6 $\frac{3}{4}$

7 $\frac{4}{5}$

8 **a** $\frac{3}{5}$ **b** $\frac{3}{4}$

c $\frac{2}{3}$ **d** $\frac{1}{2}$

e $\frac{1}{3}$ **f** $\frac{2}{5}$

9 $\frac{1}{2}$

10 $\frac{1}{3}$

11a $\frac{3}{4}$

b $\frac{1}{5}$

c $\frac{1}{20}$

12 $\frac{2}{3}$

13a £20

b 5 kg

c 100 m/

d 15 cm

14a £60

b 21 m

c 100 mm

d 12 kg

15 $\frac{5}{6}$ of 24 m

16 42 cm^2

Unit 4 Answers

Exercise 4.2

1 a $\frac{1}{2}$ **b** $\frac{2}{3}$

c $\frac{3}{5}$ **d** $\frac{6}{7}$

2 a 6

b 10

c 24

3 a 2 remainder 2

b 2 remainder 2

c 4 remainder 2

d 15 remainder 1

4 a 4

b 5

c 3

d 10

5 $\frac{11}{5}$

6 a $1\frac{3}{4}$ **b** $2\frac{2}{5}$

c $4\frac{3}{7}$ **d** $7\frac{2}{3}$

7 a $\frac{2}{3}$ **b** $\frac{6}{7}$

c $\frac{5}{11}$ **d** $\frac{2}{5}$

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

b $\frac{1}{6}$

9 Students' own answers, e.g. $\frac{1}{10}+\frac{3}{10}$, $\frac{2}{15}+\frac{4}{15}$, $\frac{5}{20}+\frac{3}{20}$, etc.

10a $\frac{7}{10}$ **b** $\frac{1}{6}$

c $\frac{7}{9}$ **d** $\frac{8}{15}$

11 $\frac{11}{16}$ inch

12a $\frac{5}{6}$

b $\frac{21}{40}$

13a $1\frac{1}{2}$ **b** $1\frac{1}{90}$

c $1\frac{7}{20}$ **d** $1\frac{7}{18}$

14a Any one of:

$\frac{7}{10}+\frac{27}{30}=1\frac{3}{5}$ $\frac{7}{10}+\frac{5}{12}=1\frac{7}{60}$ $\frac{7}{10}+\frac{11}{15}=1\frac{13}{30}$

$\frac{27}{30}+\frac{5}{12}=1\frac{19}{60}$ $\frac{27}{30}+\frac{11}{15}=1\frac{19}{30}$ $\frac{5}{12}+\frac{11}{15}=1\frac{3}{20}$

b $\frac{27}{30}+\frac{11}{15}=1\frac{19}{30}$

c Any one of:

$\frac{27}{30}-\frac{7}{10}=\frac{1}{5}$ $\frac{27}{30}-\frac{5}{12}=\frac{29}{60}$ $\frac{27}{30}-\frac{11}{15}=\frac{1}{6}$

$\frac{7}{10}-\frac{5}{12}=\frac{17}{60}$ $\frac{11}{15}-\frac{7}{10}=\frac{1}{30}$ $\frac{11}{15}-\frac{5}{12}=\frac{19}{60}$

d $\frac{27}{30}-\frac{5}{12}=\frac{29}{60}$

15a $1\frac{11}{12}$ **b** $1\frac{11}{20}$

c $\frac{3}{4}$ **d** $\frac{3}{10}$

16a $\frac{2}{5}$

b 30, as the LCM of 15, 10 and 6 is 30, and a normal class size is around 30 students.

Unit 4 Answers

Exercise 4.3

1 a $\frac{2}{10}$

b $\frac{4}{10}$

c $\frac{6}{10}$

2 a 0.875

b 0.45

3 $\frac{5}{12}$

4

Fraction	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{3}{10}$	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{3}{5}$	$\frac{7}{10}$	$\frac{3}{4}$	$\frac{4}{5}$	$\frac{9}{10}$
Decimal	0.1	0.2	0.25	0.3	0.4	0.5	0.6	0.7	0.75	0.8	0.9
Percentage	10%	20%	25%	30%	40%	50%	60%	70%	75%	80%	90%

5

Fraction	$1\frac{3}{4}$	$1\frac{1}{2}$	$1\frac{3}{10}$	$1\frac{1}{5}$	$1\frac{7}{10}$	$1\frac{2}{5}$
Decimal	1.75	1.5	1.3	1.2	1.7	1.4
Percentage	175%	150%	130%	120%	170%	140%

6 a 2.5

b £455 000

7 a 0.8

b 0.15

c 0.75

d 1.875

e 0.4

8 a $\frac{13}{20}$

b 0.65

c 65%

9 a A $\frac{132}{150}=\frac{22}{25}$, B $\frac{182}{200}=\frac{91}{100}$, C $\frac{68}{80}=\frac{17}{20}$, D $\frac{320}{350}=\frac{32}{35}$, E $\frac{382}{420}=\frac{191}{210}$

b Yes, because the success rates are all close to 0.9

A 0.88, B 0.91, C 0.85, D 0.91 (2 d.p.), E 0.91 (2 d.p.)

10 Yes. Fraction carrot cake = $\frac{17}{37}$ = 0.459… = 45.9…% which is approximately 45%

11a 0.125

b 0.0625

c 0.03125

12a 0.005

b 0.0025

c 0.02

d 0.04

Unit 4 Answers

Exercise 4.4

1 a £30

b 9 m

c 12 cm

d 20 kg

2 $\frac{4}{6}=\frac{2}{3}$, $\frac{12}{15}=\frac{4}{5}$, $\frac{16}{28}=\frac{4}{7}$, $\frac{35}{50}=\frac{7}{10}$

3 a 8 **b** 18 **c** 20 **d** 6

e 10 **f** 9 **g** 4 **h** 40

4 a $7\frac{1}{5}$ kg **b** $9\frac{3}{4}$ m **c** $16\frac{2}{3}$ mm **d** $4\frac{2}{3}$ km

5 $26\frac{1}{4}$ miles

6 a $1 \div \frac{1}{2} = 1 \times 2 = 2$ **b** $1 \div \frac{1}{3} = 1 \times 3 = 3$

c $1 \div \frac{1}{4} = 1 \times 4 = 4$ **d** $1 \div \frac{1}{5} = 1 \times 5 = 5$

7 a $4 \div \frac{1}{2} = 4 \times \frac{2}{1} = 8$ **b** $8 \div \frac{2}{3} = 8 \times \frac{3}{2} = 12$

c $6 \div \frac{3}{5} = 6 \times \frac{5}{3} = 10$ **d** $15 \div \frac{5}{8} = 15 \times \frac{8}{5} = 24$

8 a 480

b 600

9 a $\frac{1}{6}$ **b** $\frac{1}{6}$

c $\frac{1}{5}$ **d** $\frac{4}{9}$

10 $\frac{1}{8}$

11a $\frac{3}{7}$ **b** $\frac{2}{7}$

c $\frac{3}{8}$ **d** $\frac{3}{4}$

12a $\frac{7}{18}$ m^2

b $\frac{2}{9}$ m^2

13a $\frac{4}{7}$ **b** $\frac{13}{15}$

c $\frac{2}{3}$ **d** $\frac{2}{3}$

Unit 4 Answers

Exercise 4.5

1 a $\frac{11}{15}$

b $\frac{1}{24}$

2 a $\frac{2}{5}$

b $\frac{3}{4}$

3 a $1\frac{2}{3}$ **b** $3\frac{1}{2}$

c $1\frac{4}{5}$ **d** $2\frac{2}{7}$

4 a $2\frac{1}{4}$ hours **b** $5\frac{1}{3}$ hours

c $4\frac{1}{5}$ hours **d** $7\frac{1}{6}$ hours

5 a 3.25

b 2.2

c 3.6

6 a $3\frac{7}{8}$ **b** $20\frac{11}{15}$

c $6\frac{3}{10}$ **d** $5\frac{1}{2}$

e $6\frac{1}{6}$ **f** $12\frac{9}{20}$

7 a $2\frac{1}{2}$ **b** $2\frac{1}{10}$

c $3\frac{5}{24}$ **d** $1\frac{5}{6}$

e $1\frac{5}{8}$ **f** $2\frac{11}{15}$

g $2\frac{15}{28}$

8 a 6 hours 20 minutes

b 4.05 pm

9 $4\frac{17}{18}$

10a $17\frac{1}{2}$ **b** $27\frac{1}{3}$

c $1\frac{1}{2}$ **d** $1\frac{3}{5}$

e $6\frac{1}{3}$

11 $2\frac{5}{6}$ m²

12a $1\frac{3}{8}$ **b** $2\frac{5}{6}$

c $5\frac{1}{4}$ **d** $8\frac{2}{3}$

e $3\frac{5}{7}$

13a 22

b 5 cm

Unit 4 Answers

4 Check up

Equivalence

1 $\frac{7}{10}$

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

b $\frac{2}{3}$

3 $\frac{1}{3}$

4 a $\frac{5}{6}$ **b** $\frac{13}{18}$

c $\frac{1}{20}$ **d** $\frac{1}{15}$

5

Fraction	$\frac{1}{4}$	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{7}{10}$	$1\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{5}$
Decimal	0.25	0.4	0.5	0.7	1.5	2.75	3.2
Percentage	25%	40%	50%	70%	150%	275%	320%

6 $\frac{2}{5}$

7 a 0.875

b 4.4

Multiplying and dividing with fractions

8 a £5

b 10 kg

9 15

10 $12\frac{1}{2}$ tonnes

11a 24

b 42

12 $\frac{1}{10}$

13 $\frac{3}{5}$

14a 6

b $\frac{5}{6}$

Working with mixed numbers

15a $10\frac{5}{12}$

b $1\frac{19}{30}$

16a $4\frac{3}{4}$ hours

b $3\frac{1}{6}$ hours

17 $29\frac{1}{4}$

18 $2\frac{5}{16}$

Unit 4 Answers

4 Strengthen

Equivalence

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

c $\frac{5}{6}$ **d** $\frac{3}{8}$

e $\frac{8}{11}$

2 $\frac{3}{8}$

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

b $\frac{2}{3}$

4 a 64

b i $\frac{1}{8}$

ii $\frac{3}{8}$

5 a $\frac{3}{4}$ = 0.75 = 75%

b $\frac{2}{5}$ = 0.4 = 40%, $\frac{3}{5}$ = 0.6 = 60%, $\frac{4}{5}$ = 0.8 = 80%

c $\frac{2}{10}$ = 0.2 = 20%, $\frac{3}{10}$ = 0.3 = 30%, $\frac{4}{10}$ = 0.4 = 40%, $\frac{5}{10}$ = 0.5 = 50%, $\frac{6}{10}$ = 0.6 = 60%, $\frac{7}{10}$ = 0.7 = 70%, $\frac{8}{10}$ = 0.8 = 80%, $\frac{9}{10}$ = 0.9 = 90%

6

Fraction	$1\frac{1}{4}$	$1\frac{2}{5}$	$2\frac{1}{2}$	$2\frac{3}{5}$	$3\frac{1}{10}$
Decimal	1.25	1.4	2.5	2.6	3.1
Percentage	125%	140%	250%	260%	310%

7 a 0.125

b 1.375

c 2.25

d 0.35

Multiplying and dividing with fractions

1 a £12

b 21 kg

c 15 km

2 a 26

b 12

c 20

3 a $8\frac{2}{3}$ kg **b** $13\frac{3}{5}$ km

c $5\frac{3}{7}$ m **d** $17\frac{1}{2}$ km

4 a 4

b 4

Dividing by $\frac{3}{4}$ is the same as multiplying by $\frac{4}{3}$.

5 a 9

b 9

Dividing by $\frac{2}{3}$ is the same as multiplying by $\frac{3}{2}$.

6 10

7 a $\frac{1}{3}$ **b** $\frac{1}{8}$

c $\frac{2}{15}$ **d** $\frac{3}{20}$

8 a $\frac{1}{14}$ **b** $\frac{6}{35}$

c $\frac{3}{10}$ **d** $\frac{1}{3}$

9 a $\frac{5}{6}$

b $\frac{2}{5}$

c $\frac{7}{8}$

Working with mixed numbers

1 a $\frac{9}{4}$ **b** $\frac{7}{2}$

c $\frac{17}{3}$ **d** $\frac{23}{10}$

e $\frac{17}{6}$ **f** $\frac{53}{5}$

2 a 5 **b** 3

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

e $3\frac{1}{3}$ **f** $2\frac{2}{7}$

3 a $9\frac{1}{6}$ **b** $9\frac{11}{20}$

c $9\frac{8}{9}$ **d** $3\frac{7}{12}$

4 a $\frac{14}{3}-\frac{11}{9}=\frac{42}{9}-\frac{11}{9}=\frac{31}{9}=3\frac{4}{9}$

b $\frac{4}{15}$ **c** $\frac{1}{2}$ **d** $1\frac{2}{3}$

5 a i 10 minutes = $\frac{10}{60}$ hour = $\frac{1}{6}$ hour

ii 12 minutes = $\frac{12}{60}$ hour = $\frac{1}{5}$ hour

iii 15 minutes = $\frac{15}{60}$ hour = $\frac{1}{4}$ hour

iv 25 minutes = $\frac{25}{60}$ hour = $\frac{5}{12}$ hour

v 45 minutes = $\frac{45}{60}$ hour = $\frac{3}{4}$ hour

vi 40 minutes = $\frac{40}{60}$ hour = $\frac{2}{3}$ hour

b i $1\frac{1}{4}$ hours

ii $4\frac{11}{12}$ hours

6 a $4\frac{7}{12}$ hours

b $3\frac{1}{2}$ hours

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

7 a $4\frac{13}{20}$

b $4\frac{22}{35}$

8 a $17\frac{3}{5}$

b $26\frac{2}{3}$

c 2

Enrichment

1 a $\frac{9}{10}+\frac{3}{5}$

b $\frac{3}{4}\times\frac{2}{3}$

c $\frac{9}{10}+\frac{3}{4}=1\frac{13}{20}$

d $\frac{9}{10}-\frac{3}{5}=\frac{3}{10}$

Unit 4 Answers

4 Extend

1 $\frac{28}{49}$ is the odd one out because in all the other fractions, once they are simplified, the denominator is 1 more than the numerator

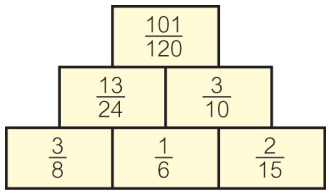
$\frac{15}{20}=\frac{3}{4}, \frac{30}{36}=\frac{5}{6}, \frac{19}{38}=\frac{1}{2}, \frac{28}{49}=\frac{4}{7}, \frac{34}{51}=\frac{2}{3}, \frac{36}{45}=\frac{4}{5}$

2 a 400 g

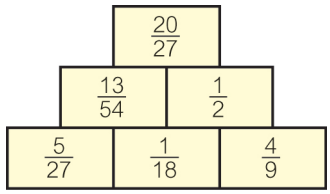
b $\frac{1}{4}$

3 $\frac{1}{3}$

4 a



b



5

6 Nitrogen $1\frac{4}{5}$ tonnes, phosphorus $3\frac{3}{5}$ tonnes

7 a Any one of:

$\frac{5}{8}\times 315 = 196\frac{7}{8}$ $\quad \frac{5}{8}\times 320 = 200$ $\quad \frac{5}{8}\times 280 = 175$ $\quad \frac{5}{8}\times 360 = 225$

$\frac{3}{5}\times 315 = 189$ $\quad \frac{3}{5}\times 320 = 192$ $\quad \frac{3}{5}\times 280 = 168$ $\quad \frac{3}{5}\times 360 = 216$

$\frac{7}{9}\times 315 = 245$ $\quad \frac{7}{9}\times 320 = 248\frac{8}{9}$ $\quad \frac{7}{9}\times 280 = 217\frac{7}{9}$ $\quad \frac{7}{9}\times 360 = 280$

$\frac{4}{7}\times 315 = 180$ $\quad \frac{4}{7}\times 320 = 182\frac{6}{7}$ $\quad \frac{4}{7}\times 280 = 160$ $\quad \frac{4}{7}\times 360 = 205\frac{5}{7}$

b i $\frac{7}{9}\times 360 = 280$ $\quad$ **ii** $\frac{4}{7}\times 280 = 160$

8 a Yes. As long as both numbers are positive, whether you're adding two integers, fractions or decimals, the answer will always be bigger than the individual numbers you are adding.

b No. The answer will be smaller than the first fraction, but may not be smaller than the second.

For example, $\frac{7}{9} - \frac{2}{9} = \frac{5}{9}$

$\frac{5}{9}$ is smaller than $\frac{7}{9}$, but is not smaller than $\frac{2}{9}$.

9 a She divided 16 by 15 rather than 15 by 16.

b 0.9375

10a 8

b $8\frac{17}{20}$

c $8\frac{1}{18}$

11a $12\frac{2}{3}$ m

b $11\frac{11}{20}$ m

12a $\frac{1}{14}$

b $\frac{5}{7}$

13a $\frac{39}{50}$

b $\frac{21}{100}$

c $\frac{1}{100}$

14 $12 \div \frac{2}{5} = 30$, $13 \div \frac{1}{2} = 26$, $15 \div \frac{5}{7} = 21$, $18 \div \frac{3}{4} = 24$, $30 \div \frac{5}{6} = 36$

15a $13\frac{1}{2}$ **b** $8\frac{3}{4}$

c $4\frac{2}{3}$ **d** $6\frac{3}{4}$

16a 90 miles **b** $137\frac{1}{2}$ miles

c 200 miles **d** $210\frac{4}{5}$ miles

17a i £5

ii £5

iii They are the same. $\frac{1}{6}$. Multiply them.

b i £24

ii £24

iii $\frac{3}{10}$. Multiply them.

c Yes

18

$9\frac{13}{30} - 6\frac{9}{10}$	$8\frac{2}{3} - 6\frac{2}{15}$
$4\frac{2}{5} - 2\frac{1}{4}$	$5\frac{17}{20} - 3\frac{7}{10}$
$7\frac{2}{3} - 5\frac{11}{12}$	$5\frac{19}{36} - 3\frac{7}{9}$

19 Students' own answers, e.g. $10\frac{3}{4} - 6\frac{11}{20} = 4\frac{1}{5}$

20 Yes. When you multiply a number by 1 you get the same number. When you multiply a number by a fraction less than 1, you will get a fraction of the number you started with, so the answer must be less than the number you started with.

21 $\frac{3}{10}$

22 No. $\frac{3}{8} \div 4 = \frac{3}{32}$

23 $\frac{2}{3}$

24 $23\frac{13}{30}$

Unit 4 Answers

4 Unit test

1 $\frac{2}{3}, \frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{3}{5}$

2 $\frac{3}{8}$

3 $\frac{6}{7}$ of 21 kg, $\frac{1}{5}$ of 100 kg, $\frac{2}{3}$ of 36 kg

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

5 a $\frac{7}{8}$ **b** $\frac{23}{36}$

c $\frac{16}{25}$ **d** $\frac{1}{15}$

6 $6\frac{3}{4}$

7 $\frac{67}{10}$

8 a 12

b 20

9

Fraction	$\frac{1}{2}$	$\frac{4}{5}$	$\frac{3}{4}$	$\frac{3}{10}$	$1\frac{1}{4}$	$4\frac{7}{10}$	$6\frac{2}{5}$
Decimal	0.5	0.8	0.75	0.3	1.25	4.7	6.4
Percentage	50%	80%	75%	30%	125%	470%	640%

10 3.4

11a $8\frac{3}{8}$ **b** $3\frac{1}{15}$

c $4\frac{5}{9}$ **d** $\frac{7}{22}$

12 $\frac{5}{13}$

13a 64

b 48

14a $3\frac{1}{2}$ hours

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

15 5 hours 42 minutes

16 $\frac{4}{15}$

17 $7\frac{19}{30}$

18a $\frac{5}{14}$

b $\frac{1}{8}$

19 $13\frac{1}{3}$

20 $16\frac{4}{5}$

Unit 5 Answers

Exercise 5.1

1 a A reflex, B acute, C obtuse

b Students' own estimates

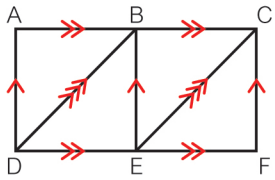
c A 200°, B 40°, C 110°

2 a i BE, AD

ii AD, BE, CF

b Yes, because they are both identical diagonals and DEF is a straight line.

c



3 e Vertically opposite angles are **equal**.

4 a = 25°, b = 155°, c = 155°

5 a a = 140° (angles on a straight line)

b = 140° (vertically opposite angles or angles on a straight line)

c = 120° (angles on a straight line)

b d = 70° (vertically opposite angles)

e = 60° (angles on a straight line)

f = 50° (vertically opposite angles or angles on a straight line)

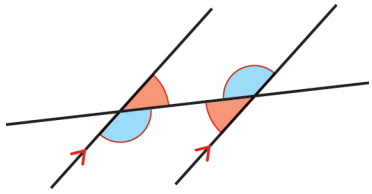
g = 60° (vertically opposite angles or angles on a straight line)

c h = 75° (angles on a straight line)

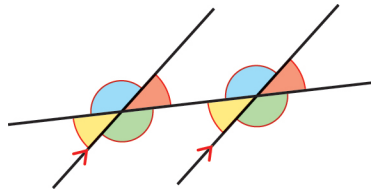
i = 75° (vertically opposite angles or angles on a straight line)

j = 105° (angles on a straight line or vertically opposite angles)

6 a



b



7 a a = 60° (alternate angles) b = 120° (angles on a straight line)

b c = 145° (corresponding angles) d = 35° (angles on a straight line)

c e = 25° (corresponding angles) f = 25° (vertically opposite angles or alternate angles)

g = 155° (angles on a straight line) h = 155° (corresponding angles or angles on a straight line)

d p = 115° (corresponding angles) q = 65° (angles on a straight line)

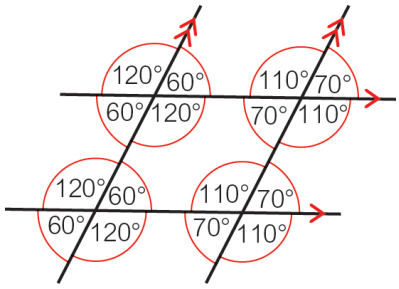
r = 65° (alternate angles or angles on a straight line)

s = 115° (vertically opposite angles or angles on a straight line) t = 70° (vertically opposite angles)

u = 110° (angles on a straight line) v = 70° (corresponding angles)

w = 110° (angles on a straight line or corresponding angles)

8



9 **a** a = 45° (alternate angles) b = 25° (alternate angles) c = 110° (angles on a straight line)

b j = 50° (alternate angles) k = 95° (angles on a straight line)

l = 35° (vertically opposite angles or angles on a straight line)

m = 145° (angles on a straight line)

c p = 115° (alternate angles and angles on a straight line)

q = 100° (alternate angles and angles on a straight line)

d w = 130° (alternate angles) x = 110° (angles at a point) y = 110° (alternate angles)

m = 120° (angles at a point)

Unit 5 Answers

Exercise 5.2

1 a A: equilateral, B, D: isosceles, C, E: scalene

b A: $a = b = c$, B: $e = f$, D: $k = l$, C, E: no equal angles

2

Triangle	Equilateral	Isosceles	Scalene
number of lines of symmetry	**3**	**1**	**0**
order of rotational symmetry	**3**	**1**	**1**

3 b Angle x = angle a (alternate angles)

Angle y = angle b (**alternate** angles)

$x + c + y$ = **180**° (angles on a **straight** line)

$x + c + y = a + c + b$ (because $x = a$ and $y = b$)

So $a + b + c$ = **180**°

This proves that the angles in a triangle add up to **180**°.

4 a a = 180° − 55° − 45° = 80°

b b 180° − 150° − 12° = 18°

c c = 180° − 90° − 25° = 65°

5 a 180° − 50° = 130°

a = 130° ÷ 2 = 65° (isosceles triangle)

b 180° − 120° = 60°

b = 60° ÷ 2 = 30° (isosceles triangle)

c 180° − 90° = 90°

c = 90° ÷ 2 = 45° (isosceles triangle)

d d = 180° − 40° − 40° = 100° (isosceles triangle)

6 Two angles must be equal; the equal angles cannot each be 100° because of the angle sum of a triangle.

180° − 100° = 80°

80° ÷ 2 = 40°

Both angles are 40°.

7 a a = 60° (angles on a straight line) b = 70° (angle sum of a triangle)

b c = 55° (angle sum of a triangle) d = 125° (angles on a straight line)

c e = 100° (angles on a straight line) f = 60° (angle sum of a triangle)

8 a

	a	b	c
exterior angle	120°	**125°**	**80°**
sum of opposite interior angles	50° **+ 70° = 120°**	**90° + 35° = 125°**	**20° + 60° = 80°**

b The exterior angle of a triangle is the sum of the opposite interior angles.

9 $e + a$ = **180°** because they lie on a **straight line**.

$b + c + a$ = **180°** because the angles in a triangle sum to **180°**

10a Interior angles are equal, so interior angle = 180° ÷ 3 = 60°

b Exterior angle = sum of the two opposite interior angles = 60° + 60° = 120°

11a 180 − 84° = 96°

p = 96° ÷ 2 = 48° (isosceles triangle)

q = 180° − 48° = 132° (angles on a straight line)

b r = 180° − 124° = 56° (angles on a straight line)

s = 180° − 56° − 56° = 68° (isosceles triangle)

c t = 180° − 76° − 76° = 28° (isosceles triangle)

u = 180° − 76° = 104° (angles on a straight line)

12a 180° − 110° = 70° (angles on a straight line)

x = 180° − 70° − 70° = 40° (isosceles triangle)

b 180° − 100° = 80°

y = 80° ÷ 2 = 40° (isosceles triangle)

c 180° − 110° − 40° = 30° (angle sum of a triangle)

or 100° − 40° = 60°

60° ÷ 2 = 30°

Unit 5 Answers

Exercise 5.3

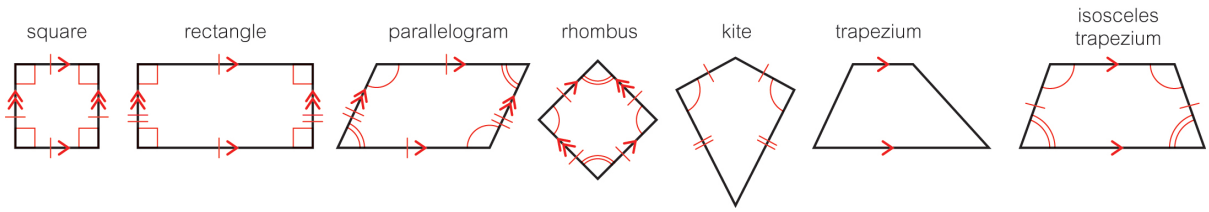
1 **a** B(5, 4), C(1, 4), D(3, 2)

b square

2

Quadrilateral	Square	Rectangle	Parallelogram	Rhombus	Kite	Arrowhead	Trapezium	Isosceles trapezium
Number of lines of symmetry	**4**	**2**	**0**	**2**	**1**	**1**	**0**	**1**
Order of rotational symmetry	**4**	**2**	**2**	**2**	**1**	**1**	**1**	**1**

3



4 **a** a = 110°, b = 4 cm

b m = 90°, n = 12 cm

c p = 60°, q = 120°, r = 4 cm

d x = 40°, y = 140°, z = 6 m

5 **a** e = 90°, f = 45°

b p = 6 cm, q = 8 cm

c x = 40°, y = 90°

6 square

7 **a** A rectangle is a special type of **parallelogram**.

b Students' own answers. For example:

'A rhombus is a special type of parallelogram.'

8 **a** **i** parallelogram

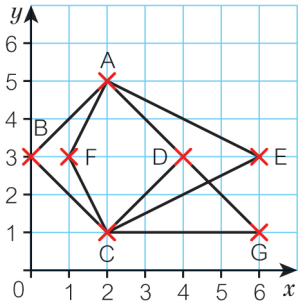
ii kite

iii rhombus

iv kite

b Students' own answers

9 a



b i (4, 3) **ii** e.g. (6, 3) **iii** e.g. (1, 3) **iv** e.g. (6, 1)

10 $p + r + c$ = **180**° because the angles in a triangle sum to **180**°

$q + s + d$ = **180**° because the angles in a triangle sum to **180**°

$p + q + r + s + c + d$ = **180**° + **180**° = **360**°

$a + b + c + d$ = 360° because $a = p + q$ and $b = r + s$

This proves that the angles in a quadrilateral add up to **360**°

11a 133°

b 220°

12a i trapezium

ii b = 50° (angle sum of a quadrilateral)

b i arrowhead

ii f = 25° (line of symmetry or pair of equal angles), g = 210° (angle sum of a quadrilateral)

c i rectangle

ii k = 80° (vertically opposite angles), l = 100° (angles on a straight line)

m = 40° (isosceles triangle), n = 50° (isosceles triangle or right-angled triangle)

d i rhombus

ii p = 20° (isosceles triangle), q = 20° (alternate angles)

r = 140° (line symmetry or opposite angles of a rhombus are equal)

Unit 5 Answers

Exercise 5.4

1 a $x = 45°$

b $x = 150°$

c $x = 84°$

2 a i 5

ii 5

b Students' own answers

c Number of lines of symmetry = order of rotational symmetry

3 a $a = 120°$

b $b = 120°$

4 15

5 a 120°

b 140°

6 a 108°

b 72°

c 5

d 360°

7 a 120°

b 60°

c 6

d 360°

8 d The exterior angles of any polygon add up to **360**°.

e Exterior angle = 360° ÷ number of sides

f $\frac{360°}{n}$

9 a 360°

b 40°

c 140°

10a 165°

b 360 ÷ 15 = 24

11a 12°

b 168°

12a $a = 150°$

b $b = 150°$

c $c = 108°$

d $d = 120°$, $e = 90°$

13 720° − 90° − 90° = 540°

x = 540° ÷ 4 = 135° (two lines of symmetry)

Unit 5 Answers

5 Check up

Angles and parallel lines

1 a $a = 50°$ (vertically opposite angles)

b $b = 30°$ (vertically opposite angles)

c $c = 40°$ (angles on a straight line), $d = 140°$ (angles on a straight line)

2 $x = 30°$ (alternate angles)

3 a $w = 180° - 70° = 110°$ (corresponding angles and angles on a straight line)

b $x = 120°$ (corresponding angles)

Triangles and quadrilaterals

4 a $a = 28°$ (angle sum of a triangle)

b $b = 60°$ (equilateral triangle)

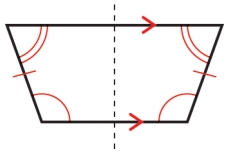
5 a $a = 50°$ (isosceles triangle)

b $b = 124°$ (isosceles triangle)

6 $x = 100° - 65° = 35°$ (exterior angle of a triangle)

or $180° - 100° = 80°$, $x = 180° - 65° - 80° = 35°$ (angle sum of a triangle)

7 a, b



c 1

8 (5, 4)

9 square, rhombus, kite

10a $w = 95°$ (angle sum of a quadrilateral)

b $x = 55°$ (diagonal bisector of a rhombus), $y = 70°$ (isosceles triangle)

$z = 70°$ (opposite angles of a rhombus)

Interior and exterior angles

11 1080°

12a $360° \div 10 = 36°$

b 144°

13 18

Unit 5 Answers

5 Strengthen

Angles and parallel lines

1 a $a = 30°$

b $b = 10°$

2 a $p = 50°$ (angles on a straight line), $q = 110°$ (angles on a straight line or angles at a point)

b $t = 30°$ (vertically opposite angles)

c $p = 110°$ (angles at a point)

d $x = 30°$ (angles on a straight line), $y = 150°$ (angles on a straight line or angles at a point)

3 a $x = 125°$ (alternate angles)

b $y = 40°$ (alternate angles)

c $z = 95°$ (alternate angles)

4 a $e = 115°$ (corresponding angles)

b $f = 34°$ (corresponding angles)

c $g = 100°$ (corresponding angles)

5 a $m = 35°$, $n = 75°$

b $p = 50°$, $q = 60°$

Triangles and quadrilaterals

1 a $a = 55°$ (angle sum of a triangle)

b $b = 90°$ (angle sum of a triangle)

c $c = 60°$ (angle sum of a triangle)

2 a $x = 95°$

b $x = 120°$

c $x = 65°$

3 a $m = 40°$ (isosceles triangle), $n = 100°$ (angle sum of a triangle)

b $p = 70°$ (isosceles triangle), $q = 40°$ (angle sum of a triangle)

c $180° - 30° = 150°$ (angle sum of a triangle), $s = 150° \div 2 = 75°$ (isosceles triangle)

d $w = 180° - 35° - 35° = 110°$ (angle sum of a triangle and isosceles triangle)

e $180° - 90° = 90°$ (angle sum of a triangle), $x = 90° \div 2 = 45°$ (isosceles triangle)

4 a y

b $x = 60°$ (angle sum of a triangle)

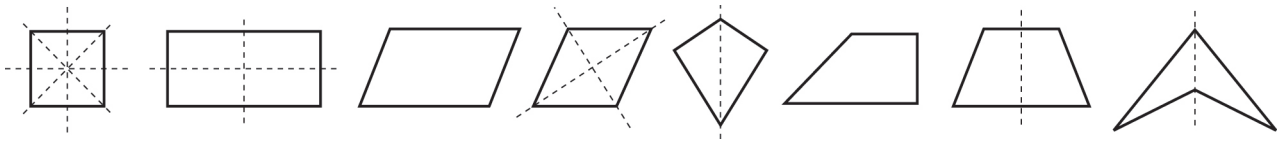
c $y = 120°$ (angles on a straight line or exterior angle of a triangle)

5 a $a = 130°$

b $b = 85°$

c $c = 20°$

6 a



b i B, C, D

ii E, F, G, H

7 a $x = 100°$

b $x = 25°$

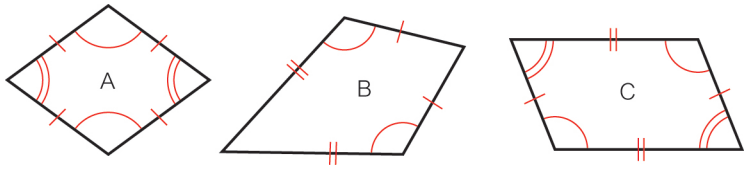
c $x = 95°$, $y = 85°$

8 a $x = 120°$, $y = 60°$

b Opposite angles of a parallelogram are **equal**.

9 a A rhombus, B kite, C parallelogram

b



10 $a = 130°$, $b = 20°$, $c = 30°$

Interior and exterior angles

1 a–c A pentagon, 5 sides, 5 interior angles

B hexagon, 6 sides, 6 interior angles

C octagon, 8 sides, 8 interior angles

d Number of sides = number of interior angles

2

Polygon	Angle sum
pentagon	540°
hexagon	720°
heptagon	900°
octagon	1080°

3 a $a = 130°$

b $b = 130°$

c $c = 150°$

4 The exterior angles don't add up to 360° (they add up to 370°).

5 a 12

b 12

Enrichment

1 a–c Students' own diagrams and observations

d Co-interior angles add up to 180°.

Unit 5 Answers

5 Extend

1 a $x = 85°$

b $360° - 3 \times 85° = 105°$

$y = 105° \div 3 = 35°$

2 Students' own answers

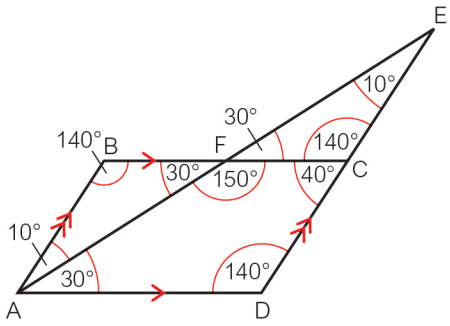
3 $x = 230°$

4 a Isosceles: ABD, DCB, EFC, EGC, ADC, ABC, Scalene: BEF, DEG, Right-angled: AEB, BEC, AED, DEC

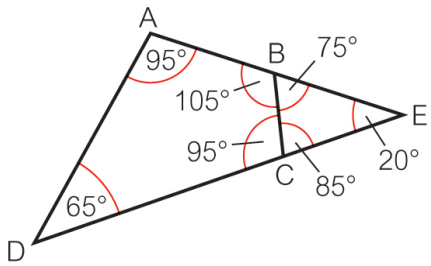
b i kite

ii rhombus

5 a



b



6 a $a + b + c + d = 360°$

b Angles at a point add up to 360°.

7 a rhombus

b i rhombus, parallelogram or kite

ii isosceles triangle, parallelogram, kite or rectangle/square, depending on the two sides joined and angles

8 $12 - 2 = 10$, $10 \times 180° = 1800°$

9 a BAC = $130° - 60° = 70°$ (equilateral triangle)

$v = 180° - 70° - 70° = 40°$ (isosceles triangle and angle sum of a triangle)

b PSR = 60° (equilateral triangle)

PSQ = 120° (angles on a straight line)

$180° - 120° = 60°$

$z = 60° \div 2 = 30°$ (isosceles triangle and angle sum of a triangle)

10 BCA = 50° (exterior angle of a triangle)

DCE = 40° (angles on a straight line)

FEG = 60° (exterior angle of a triangle)

DEC = 30° (angles on a straight line)

x = 110° (angle sum of a triangle)

11 p = 85° (corresponding angles)

q = 55° (exterior angle of a triangle)

r = 40° (angles on a straight line)

s = 40° (vertically opposite angles)

12 parallel

13 $a = \boldsymbol{x}$ (corresponding angles)

$b = \mathbf{180}° - \boldsymbol{x}$

$a + b = \boldsymbol{x} + \mathbf{180°} - \boldsymbol{x} = \mathbf{180}°$

14a a = 130°

b b = 60°

c c = 80°

15a 39° (exterior angle of a triangle)

b No, because 80° + 96° = 176° (or 100° + 84° = 184°) so they are not co-interior angles.

16a parallel

b isosceles trapezium

c **i** 75°

ii 30°

17a g = 120° (interior angle of a regular hexagon), h = 60° (line symmetry)

b p = 108° (interior angle of a regular pentagon), q = 36° (isosceles triangle)

c x = 135° (interior angle of a regular octagon), y = 45° (line symmetry and angle sum of a quadrilateral)

z = 135° − 45° = 90°

18a 3.6°

b 176.4°

19 a = 144°

b = 240°

c = 90°

d = 30°

20a 150°

b 150°

c 75°

d 45°

21 b = 230°

Unit 5 Answers

5 Unit test

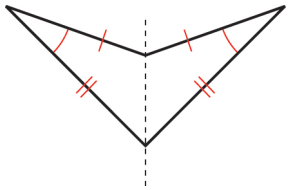
1 a = 40° (vertically opposite angles)

b = 90° (vertically opposite angles)

c = 50° (angles on a straight line)

2 x = 35°

3 a



b 1

c none

4 (5, 4)

5 x = 55°

6 kite or arrowhead

7 x = 130°

8 a = 40° (alternate angles)

b = 50° (opposite angles of a parallelogram)

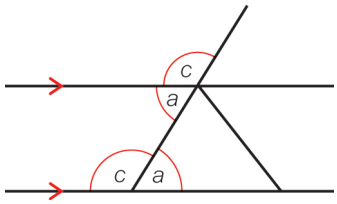
c = 90° (angle sum of a triangle)

d = 90° (alternate angles)

9 a x = 80°

b 540°

10 Students' own answers, for example:



11 p = 100° (co-interior angles)

12 a = 35°

13a 24°

b 156°

14 30

15a 45

b x = 86°

c 172°

Unit 6 Answers

Exercise 6.1

1 a −3, −2, 0, 5, 7

b −5, −3, −2, 0, 2

c −8, −7, −5, −3

2 a <

b >

c >

3 0.006, 0.06, 0.6

4 Students' own answer. For example: 'No, because 4 is less than 5 so 10.42 is less than 10.5'

5 a 0.703, 0.7124, 0.724, 0.7241, 0.73

b 12.8475, 12.874, 12.9, 12.92

c −0.291, −0.29, −0.24, −0.203, −0.2

d −0.491, −0.49, −0.45, −0.43, −0.405

6 a 0.376, 0.37, 0.3516, 0.315, 0.3105

b 18.9142, 18.49, 18.429, 18.4

c −0.107, −0.13, −0.17, −0.7, −0.73

d −0.502, −0.514, −0.52, −0.55, −0.56

7 a Gold − Barbara Špotáková Silver − Christina Obergföll Bronze − Linda Stahl

b descending order

c Gold − Sanya Richards-Ross Silver – Christina Ohuruogu Bronze − DeeDee Trotter

d ascending order

8 1 – Lewis Hamilton

2 – Nico Rosberg

3 – Sebastian Vettel

4 – Mark Webber

5 – Daniel Ricciardo

9 0.098 cm, 0.1 cm, 0.0955 cm

10

Time (seconds)	Tally	Frequency
$11.5 \leqslant t < 12.5$	|||	3
$12.5 \leqslant t < 13.5$	||||	4
$13.5 \leqslant t < 14.5$		0
$14.5 \leqslant t < 15.5$	|||	3

11a <

b >

c >

d >

e <

Unit 6 Answers

Exercise 6.2

1 a 4

b 5

c 5

d 6

2 a 12

b 3

c 7

d 11

e 37

3 a 5.6

b 3.9

c 0.7

d 9.0

e 10.0

4 32.2

5 3.35, 3.36, 3.37, 3.38, 3.39, 3.40, 3.41, 3.42, 3.43, 3.44

6 a 2.95

b 0.80

c 13.00

d 14.02

7 a 0.71

b 0.82

8 a 7 is the nearest whole number, but is not written to 2 decimal places.

b 7.00

9 £1.10

10a

Country	Population (numbers)	Population (numbers and words)
Italy	60 000 000	60 million
Canada	34 300 000	**34.3 million**
Sri Lanka	**20 400 000**	20.4 million
Norway	**5 100 000**	5.1 million
Fiji	900 000	**0.9 million**

b Sweden 9 700 000, 9.7 million Barbados 300 000, 0.3 million

11 2.646

12a Athlete B

b No

c Yes. Both athletes have a time of 9.75 seconds.

13 4.286 and 4.293

14a 3.150–3.249 inclusive

b 2.500–2.549 inclusive

c 2.450–2.499 inclusive

d 3.245–3.249 inclusive

e 3.250–3.254 inclusive

15a 2375

b 2400

Unit 6 Answers

Exercise 6.3

1 a 231

b 352

2 a 117

b 633

3 a 0.6

b 0.7

c 0.58

d 0.33

4 a 2.8

b 6.6

c 3.66

d 91.41

5 a 5.96

b 12.44

c 23.23

d 9.92

6 Students' own answers. For example: 'The correct answer is 6.45' or 'She forgot to line up the decimal points.'

7 a 2.83

b 0.72

c 6.85

8 £9.61

9 a £300

b £296.75

10 1.78 m

11a 12.27

b 9.19

c 8.85

12 0.7 million

13a 0.12

b 0.12

c 0.04

Unit 6 Answers

Exercise 6.4

1 a 332

b 1261

c 11 658

2 a $4 \times 56 = 4 \times 50 + 4 \times 6 = 224$

b $9 \times 27 = 9 \times 20 + 9 \times 7 = 243$

c $83 \times 7 = 7 \times 80 + 7 \times 3 = 581$

3 a 400

b 1200

c 6000

4 a 36.8

b 51.38

c 148.56

d 16.12

e 52.08

5 £38

6 £21.12

7 a 42

b 4.2

c 4.2

d 0.42

8 a 1.8

b 1.4

c 1.8

d 0.24

e 0.006

f 0.0056

9 a i 4.2

ii 4.2

b i 37

ii 37

10a 72, 7.2, 0.72

b ÷ 100

11a 72.6

b 32.4

c 96.9

12 €60

13a 30

b 30

c 30

d **i** 140

ii 1200

14 about 2.1 m

15a 0.2905

b 290.5

c 29.05

d Students' own answers, for example

0.083 × 35, 0.0083 × 350, 0.00083 × 3500, 8.3 × 0.35, 83 × 0.035, 830 × 0.0035

e Students' own answers. For example: 'The correct answer would be 2905.'

Unit 6 Answers

Exercise 6.5

1 a 5

b 50

2 a 129

b 56.5

c 29

3 a $\frac{3}{8} = \frac{6}{16} = \frac{60}{160}$

b $\frac{19}{25} = \frac{190}{250} = \frac{1900}{2500}$

4 a 14.6

b 6.92

c 24.83

d 15.32

5 £12.85

6 a 40

b 1130

c 9

d 800

e 720

f 83

7 a 500

b 750

c 500

d 12 500

e 30 000

f 600

8 a 0.4

b 0.9

c 70

d 60

9 3 ÷ 0.5 = 6

10a 4 and 4

b 7 and 7

c 132 and 132

d 38 and 38

11a 3
b 0.6
c 0.3
d 2
e 45
f 3

12a **i** 7300
ii 73 000
iii 730 000
b **i** 2.7
ii 0.27
iii 0.027

13a 7.8
b 54
c 78
d 0.78
e 5.4

Unit 6 Answers

Exercise 6.6

1 **a** 3 tenths

b 6 hundredths

2 **a** 0.8

b 0.875

c 0.08

3

Fraction	$\frac{1}{10}$	$\frac{1}{4}$	$\frac{3}{10}$	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{2}$	$1\frac{3}{5}$
Decimal	0.1	0.25	0.3	0.4	0.5	0.75	1.5	1.6
Percentage	10%	25%	30%	40%	50%	75%	150%	160%

4 To correct a decimal to a percentage × **100**

To correct a percentage to a decimal ÷ **100**

5 **a** 72%

b 23%

c 9%

d 108%

6 **a** She did not multiply by 100, she only multiplied by 10.

b 58%

7 **a** 0.42

b 1.91

c 0.06

d 0.013

e 0.294

8 **a** 6%, 0.6, 0.606, 63%, 0.66

b 8%, 8.8%, 80%, 0.85, 0.88

9 **a** 1.5 hours

b 5.25 hours

c 3.75 hours

d 2.2 hours

e Students' own answers

10a $\frac{3}{10}$ **b** $\frac{8}{10}=\frac{4}{5}$

c $\frac{39}{100}$ **d** $1\frac{85}{100}=1\frac{17}{20}$

e $5\frac{48}{100}=5\frac{12}{25}$ **f** $2\frac{529}{1000}$

11a $\frac{6}{10} = \frac{3}{5}$

b Students' own answer, e.g. $\frac{9}{15}, \frac{12}{20}, \frac{30}{50}, \frac{60}{100}$

12 $\frac{5}{6} = 0.8\dot{3}$, $\frac{2}{9} = 0.\dot{2}$, $\frac{7}{15} = 0.4\dot{6}$, $\frac{3}{11} = 0.\dot{2}\dot{7}$, $\frac{5}{12} = 0.41\dot{6}$

13a $0.\dot{7}$

b $0.\dot{3}$

c $0.\dot{2}\dot{8}$

d $0.\dot{1}4\dot{5}$

e $0.0\dot{7}\dot{6}$

f $0.09\dot{1}$

14a i 0.33

ii 0.67

b $33.\dot{3}\%$ and $66.\dot{6}\%$

15a 25%, $\frac{1}{3}$, 35%, 0.38, 0.39, $\frac{2}{5}$

b $\frac{7}{10}$, 73%, 0.74, 79%, $\frac{17}{20}$, 0.86

c 0.08, 0.56, $\frac{4}{5}$, $\frac{5}{6}$, 84%, 86%

16

Fraction	Decimal	Percentage
$\frac{27}{50}$	0.54	54%
$\frac{5}{8}$	0.625	62.5%
$\frac{19}{25}$	0.76	76%

17a $\frac{23}{100}$ **b** $\frac{9}{100}$

c $\frac{1}{100}$ **d** $\frac{4}{25}$

e $\frac{3}{25}$ **f** $\frac{9}{20}$

18a 47.5%

b 22%

c 96.3%

d 68.9%

e 55.2%

19 Tiger Woods 43.1% Roger Federer 45.5%. Roger Federer won the higher proportion of his matches.

20a 0.035, $\frac{35}{1000} = \frac{7}{200}$

b 0.255, $\frac{255}{1000} = \frac{51}{200}$

c 0.325, $\frac{325}{1000} = \frac{13}{40}$

d 0.625, $\frac{625}{1000} = \frac{5}{8}$

Unit 6 Answers

Exercise 6.7

1 a 6 m

b 21 kg

c 163 g

2 a 6 g

b 12 g

c 42 g

d 3 g

e 0.6 g

3 £24

4 a £25.20

b £112

c £761.40

5 £84

6 £52.50

7 £367.50

8 Computer World £552.50 Plenty of PCs £560 Computers for You £576

She should buy from Computer World.

9 a 5%

b 47.5%

c 47.5%

10 £14.04

11a £45

b £345

c £345

d They are the same.

e Increase by 5%, multiply by 1.05. Increase by 10%, multiply by 1.1. Increase by 50%, multiply by 1.5

12a 1.16

b 1.05

c 1.037

d 0.86

e 0.951

13

Year	Savings R Us		Gold savings		Investor's Delight	
	Interest	Total savings	Interest	Total savings	Interest	Total savings
1	4.3%	£834.40	5.1%	£840.80	4.8%	£838.40
2	4.3%	£868.80	5.1%	£881.60	4.8%	£876.80
3	4.3%	£903.20	5.1%	£922.40	4.8%	£915.20

14 £14.73

15 £8000

16 £486.67

Unit 6 Answers

6 Check up

Ordering and rounding decimals

1 52.13

2 6.015, 6.05, 6.53, 6.535, 6.6

3 49p

4 0.29

5 −2.03, −2.1, −2.203, −2.43, −2.5

Add and subtract decimals

6 **a** 13.3

b 11.89

c 6.9

d 1.87

e 60.8

7 £273.20 – £65.85 ≈ £270 – £70 **=** £200

8 0.85 m

Multiply and divide decimals

9 1.4 kg × 7 ≈ 2 × 0.7 × 7 ≈ 2 × 4.9 ≈ 10 kg

10a 37.1

b 17.3

c 73.04

11a 9.2

b 0.81

c 0.028

d 0.0018

12a 3000

b 3

c 40

d 0.3

13a 128.8

b 128.8

c 0.1288

Fractions, decimals and percentages

14

Fraction	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{7}{10}$	$1\frac{4}{5}$
Decimal	0.25	0.75	$0.\dot{3}$	$0.\dot{6}$	0.7	1.8
Percentage	25%	75%	$33.\dot{3}\%$	$66.\dot{6}\%$	70%	180%

15a $\frac{7}{25}$

b 28%

16a 2700

b 11 700

17 0.04, 25%, $\frac{3}{8}$, 38%, $\frac{2}{5}$, 44%

18

Fraction	**Decimal**	**Percentage**
$\frac{13}{40}$	0.325	32.5%
$\frac{49}{200}$	0.245	24.5%
$\frac{7}{40}$	0.175	17.5%

19 £68

20 £4.11

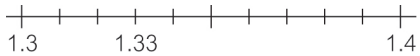
21 £19

Unit 6 Answers

6 Strengthen

Ordering and rounding decimals

1 a



b 1.4

c 1.39

2 a 6.3, 6.5, 7.2, 7.4

b 4.06, 4.4, 4.44, 4.5, 4.6

c 0.004, 0.033, 0.04, 0.33, 0.404

3 9.34, 0.01

4 a 0.35

b 0.37

c 0.34

5 £0.79

6 a £0.83

b £11.67

Add and subtract decimals

1 a 13.7

b 93.6

c 97.9

2 a 10.3

b 7.2

c 14.03

d 11.02

e 12.5

f 1.23

3 a 1.17

b 7.58

c 1.418

4 0.85 m

Multiply and divide decimals

1 a 8.6

b 98.4

c 32.76

2 a 4 × 0.03 = 0.12

b 7 × 6 = 42, 7 × 0.6 = 4.2, 7 × 0.06 = 0.42

3 **a** 1.4

b 8

c 0.45

d 1.8

4 **a** 0.36

b 0.048

c 0.002

5 **a** 0.322

b 2.025

c 0.4004

6 **a** 0.06

b 1.23

7 **a** 8.3

b 7.3

c 5.27

8 **a** 20

b 90

c 4100

9 **a** 30

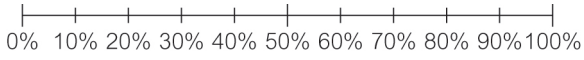
b 4

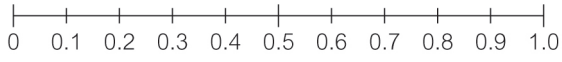
c 0.75

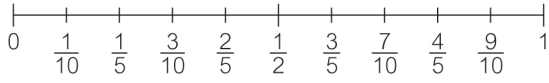
d 0.2

Fractions, decimals and percentages

1







2

$\frac{15}{10}$ = 1.5 = 150%, $\frac{1}{4}$ = 0.25 = 25%, $\frac{1}{3}$ = $0.\dot{3}$ = 33.3…%, $\frac{13}{10}$ = 1.3 = 130%, $\frac{3}{4}$ = 0.75 = 75%, $\frac{5}{4}$ = 1.25 = 125%, $\frac{14}{10}$ = 1.4 = 140%

3 **a** 24%

b 198%

c 134.5%

4 a 0.27

b 0.855

c 1.32

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

b $1\frac{49}{50}$

c $1\frac{69}{200}$

6 a $\frac{27}{100}$

b $\frac{171}{200}$

c $1\frac{8}{25}$

7 a i 23%, $\frac{3}{10}$, 40%, 0.45, 0.79, $\frac{4}{5}$

ii 27%, $\frac{7}{20}$, $\frac{2}{5}$, 0.6, 0.72, 75%

b 90%, $\frac{4}{5}$, $\frac{3}{10}$, 9%, $\frac{3}{25}$, 0.08

8 a 37.5%

b 17.5%

c 32%

9 a 0.3

b 1.5

c 0.75

10a 7.2

b 38.4

c 85.2

11a 29.23

b £14.40

c 405 km

12a £96

b 62.4 kg

c 45 m

d 285 students

13a 128.74 m*l*

b 91.35 m

14a 180

b 90

c 40

Enrichment

1 a

Year	Value at start of year	Percentage change	Value at end of year
1	£50	30% increase	£50 × 1.3 = £65
2	£65	20% decrease	**£52**
3	**£52**	20% decrease	**£41.60**
4	**£41.60**	10% increase	**£45.76**
5	**£45.76**	5% increase	**£48.05**

b It decreased by £4.24

Unit 6 Answers

6 Extend

1 a decimal = percentage ÷ 100

b percentage = decimal × 100

2 a 150

b 43.3…%

c 46.6…%

d 43.3% and 46.7%

e $43.\dot{3}\%$ and $46.\dot{6}\%$

3 a

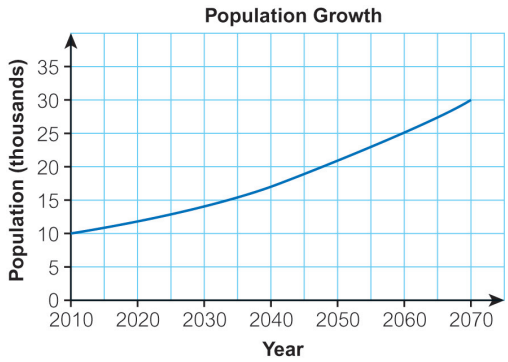
	Full calculator display	Rounded to 2 decimal places
$\sqrt{2}$	1.414 213 562	1.41
$\sqrt{3}$	1.732 050 808	1.73
$\sqrt{5}$	2.236 067 977	2.24
$\sqrt{6}$	2.449 489 743	2.45

b $\sqrt{4}$ = 2, so it is an exact value.

4 a

Year	2010	2020	2030	2040	2050	2060	2070
Population (thousands)	10	12	**14**	**17**	**21**	**25**	**30**

b



c approximately 18 000

d Students' own answers. e.g. 'The population is expected to roughly treble.'

5 a

Original number	Rounded to 1 d.p.	Rounded to nearest whole number
$6.45 - 6.4\dot{9}$	6.5	6
$6.5 - 6.54\dot{9}$	6.5	7

b Students can have different answers and both be correct.

6 1991 Tokyo: 9.720 seconds

7 76° − 89° inclusive

8 Yes. After expansion, the door dimensions are 1.957 m by 0.824 m.

9 21 minutes

10a 640, 6400, 64 000

b 6.4

11a 27.72

b 2.772

c 2.772

d 4.4

e 44

f 4.4

12a $0.\dot{3}\dot{0}$

b $0.\dot{0}\dot{1}$

c $1.\dot{0}\dot{1}$

d $0.\dot{3}$

e $\frac{1}{3}$

f $0.\dot{2}3\dot{4}$

13a £69.71

b £209.12

c £41.82

d £794.65

14a 6.166 666 667

b 6.17

c $6.1\dot{6}$

15a 0.67

b 3.5

c 0.48

d 0.44

16a 0.06

b 0.7

c 0.16

d 0.42

e Students' own answer. For example: 'Jose has not got the correct place value.' The correct answer is −0.024.

17a £630

b £727.50

18 5%

19a £313.05 **b** £365.25

c

Year	Money at start of year	Interest rate	Money at end of year
1	£300	4.35%	£313.05
2	£313.05	4.35%	**£326.67**
3	**£326.67**	4.35%	**£340.88**
4	**£340.88**	4.35%	**£355.71**
5	**£355.71**	4.35%	**£371.18**

20 0.3%, $\frac{9}{200}$, 4.51%, 7.7%, $\frac{7}{90}$, 0.79

21a 7 000 000

b 25 400 000

c 5 588 000

d 1 412 000

e 20.2%

22a 4.662

b 1.748

c 0.6068

23 a i >

ii <

b i <

ii >

24 9.65, 9.66, 9.67, 9.68, 9.69, 9.70, 9.71, 9.72, 9.73, 9.74

25a any number with 3 digits after the decimal point

b 9.500–10.499 inclusive

c 10.150–10.249 inclusive

d 10.245–10.254 inclusive

Unit 6 Answers

6 Unit test

1 a 8.4

b 0.84

c 24.36

2 1.56 m

3

Fraction	$\frac{3}{10}$	$\frac{2}{5}$	$\frac{1}{4}$	$1\frac{1}{3}$	$1\frac{1}{5}$	$1\frac{3}{4}$
Decimal	0.3	0.4	0.25	$1.\dot{3}$	1.2	1.75
Percentage	30%	40%	25%	$133.\dot{3}\%$	120%	175%

4 219.11

5 a $\frac{17}{20}$

b 85%

6 a 2.943

b 294.3

c 10.9

7 5.078, 5.08, 5.287, 5.78, 5.8

8 4.39

9 No, the correct answer is 5.00

10a £75

b £300

11a 2.8

b 3

c 20 000

d 8

12a £550

b £552.50

13 16

14a 0.1218

b 3.4164

c 1.8864

15a £520

b £575

16a <

b >

Unit 7 Answers

Exercise 7.1

1 a 3
b 18
c 6
d 2
e 1
f 18

2 $x + 3$

3 £5y

4 a 6, 7, 8, 9
b 0, 5, 10, 15

5 a 8
b 20
c 20

6 a $x = 10$
b $x = 3$
c $x = 21$
d $x = -3$

7 a $x = 6$
b $n = 6$
c $m = 10$
d $p = 2.8$

8 a $z = 12$ **b** $x = 9$ **c** $y = 21$
d $c = 3.4$ **e** $a = 0.9$ **f** $k = 3$
g $x = -4$ **h** $y = -17$ **i** $n = -3$
j $p = 0$ **k** $x = -1$ **l** $x = -7$

9 a $x = 11$
b $m = 8$
c $t = 5$
d $m = 14$
e $R = 2$
f $d = 40$

10a $C = x + 3$
b £33.50

11a $3x = 180°$
b $x = 60°$

12a $m = 30°$
b Angles are 30°, 60° and 90°

13a 540°

b a = 55°, $2a$ = 110°

14 2 hours 40 minutes

15 £8

Unit 7 Answers

Exercise 7.2

1 a $y = 14$

b $a = -8$

c $x = -3$

2 a $2x + 8$

b $3y - 6$

c $15 - 5z$

3 a 6, 10, 14

b 0, 2, 3

4 a $x = 5$

b $y = 10$

c $z = 6$

d $m = -20$

5 a $x = 4$

b $y = 7$

c $r = -6$

6 a $x = 4$ **b** $x = 4$ **c** $x = 2$

d $x = 6$ **e** $x = 12$ **f** $x = 8$

g $x = 8$ **h** $x = 5$ **i** $x = 3$

7 a $v = 11$

b $x = 4$

c $w = 80$

d $h = 3$

e $a = 4.5$

f $u = 5$

8 a $x = 4$

b $x = 10$

c $x = 20$

9 a $6n + 3 = 21$

b $n = 3$

10a $\frac{n}{4} - 10 = 1$, $n = 44$

b $6(n + 7) = 54$, $n = 2$

c $2n + 12 = 42$, $n = 15$

d $\frac{n-3}{2} = 5$, $n = 13$

11a 13

b 40°

c Exterior angle = $\frac{360^\circ}{n}$

d 20

12a $x = 40°$

b $y = 25°$

13a $z = 25°$, $2z = 50°$, $3z = 75°$

b $a = 7.5°$, $2a = 15°$, $5a = 37.5°$

c 55°

14a $3x - 5 = 31$

b £12

Unit 7 Answers

Exercise 7.3

1 **a** $n + 5$

b $2n + 10$

c $7(n + 4)$

2 **a** $x = 4$

b $x = 3$

c $x = -4$

3 **a** $x = 3$ **b** $x = 5$

c $y = 7$ **d** $m = -3$

e $x = 12$ **f** $x = 11$

g $x = 8$ **h** $m = 9$

i $r = 3$

4 **a** $2n + 4$, $5n - 20$

b $2n + 4 = 5n - 20$

c $n = 8$

5 Students' own answers

6 **a** $x = 6$

b $x = 6$

c $y = 3$

d $x = 8$

e $m = 2$

f $y = 3$

7 **a** $3y + 20 = 5y - 20$, angle = 80°

b $2x + 100 = 4x + 90$, angle = 110°

c $7z - 30 = 2z + 10$, angle = 26°

8 **a** y is larger, by 8

b s is larger, by 2

Unit 7 Answers

Exercise 7.4

1 **a** 6 and 7

b 8 and 9

c 2 and 3

d −1 and −2

2 **a** **i** 14

ii 12.84

b **i** 64

ii 42.875

c 17.39

3 **a** 12.3

b 11.72

c 12.019

4 **a** $x = \pm 5$

b $x = 5$

c $x = \pm 9$

d $x = \pm 10$

e $x = 4$

f $x = -3$

5 **a** x^2

b $4x^2 = 10\,000$

c 50 cm

6 **a** $x = 6.5$ (1 d.p.)

b $x = 3.4$ (1 d.p.)

7 4.5 cm (1 d.p.)

8 **a** $x = \pm 6.9$ (1 d.p.)

b $x = 2.8$ (1 d.p.)

c $x = 5.8$ (1 d.p.)

d $x = 4.6$ (1 d.p.)

Unit 7 Answers

7 Check up

Solving equations

1 a $x = 19$

b $n = 11$

c $s = 15$

d $y = 4$

e $m = 0$

f $p = -4$

2 a $I = 2$

b $d = 21$

3 a $x = 4$

b $x = 5$

c $n = 6$

d $m = 2$

e $x = -3$

f $x = 3$

4 8 miles

5 $x = 8$

6 $n = 3$

7 a $x = \pm 8$

b $x = \pm 7$

8 $x = 5$

Writing equations

9 a $a = 90 - 67$ or $180 = 90 + 67 + a$

b $a = 23°$

10a $x = 45°$

b $x = 45°$, $3x = 135°$

11 $x = 57.5°$, $x - 50° = 7.5°$, $2x = 115°$

12 $x = 55°$

13a $15C = £45$

b £6

14a $3n + 4 = 2(n + 5)$

b $n = 6$

Trial and improvement

15 $x = 4.6$ (1 d.p.)

Unit 7 Answers

7 Strengthen

Solving equations

1 **a** □ = 5

b Δ = 6

c ◊ = 3

d ⌂ = 18

2 $x = 6$

3 **a** $x = 4$

b $m = 14$

c $n = 16$

d $x = 9$

e $y = 11$

f $s = 35$

4 **a** $x = 7$ **b** $y = 8$

c $p = 7$ **d** $q = 9$

e $s = -3$ **f** $n = 40$

g $h = 8$ **h** $y = 15$

i $m = -8$

5 **a** $m = 22$ **b** $x = 9$

c $A = 5$ **d** $x = 7$

e $x = 3$ **f** $a = 3$

g $P = 22$ **h** $d = 20$

6 **a** Yes

b **i** $x = 6$

ii $n = 2$

iii $x = 20$

iv $y = 30$

7 **a** $x = 5$

b $x = 3$

c $x = -2$

8 $v = 4$

9 **a** $x = 8$

b **i** $x = 3$

ii $x = 2$

10a $4n + 8 = 5n + 5$

b $n = 3$

c $x = 9$

11a 4

b 49

c 9

d 36

e ±7

f ±6

12a 8

b −27

c 27

d −1

e 2

f −3

13a $x = \pm 9$

b $x = \pm 10$

14 $x = 3$

Writing equations

1 a $x + 95° = 180°$

b $x = 85°$

2 $4n + 20° = 180°$, $n = 40°$, $3n = 120°$

3 Sides are 4 cm, 4 cm, 14 cm and 14 cm

4 Sides are 8 cm, 8 cm, 13 cm and 13 cm

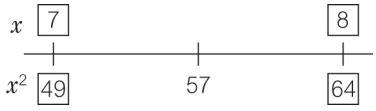
Trial and improvement

1 a 1, 4, 9, 16, 25, 36, 49, 64, 81, 100

b 1, 8, 27, 64, 125

2 a 49 and 64

b



c, d, e

x	x^2	Comment
7	**49**	too small
8	64	**too big**
7.5	**56.25**	**too small**
7.6	**57.76**	**too big**

f $x^2 = 56.25$, $x = 7.5$ (1 d.p.)

3 $x = 3.2$ (1 d.p.)

Enrichment

1 $x = 13$, $y = 7$

Unit 7 Answers

7 Extend

1 a 360°

b $10x = 360°$

c 36°

2 a 30°

b 150°

3 24

4 heptagon (7 sides)

5 $a = 60°$, $2a = 120°$, $b = 120°$, $c = 60°$, $d = 60°$, $e = 60°$

6 a $x = 10$

b $x = 7$

7 a $x + 87$

b $\frac{x+87}{5}$

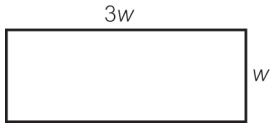
c $\frac{x+87}{5} = 20$

d $x = 13$

8 $y = 15$

9 length = 12 cm, width = 6 cm

10a



b length = 9 cm, width = 3 cm

11 $2(x + 2) = 5(x – 1)$, $20x + 3 = 9(x + 4)$, $3x + 2 = 2x + 5$

12 Angles are 40°, 70° and 70°

13a 50 cm

b 150 cm^2

14a $2n + 1$

b $2n + 1 = 351$

c $n = 157$

d 157, 158

15 261, 262

16 20, 21, 22

17a $m + 25$

b $2m + 25$

c $2m + 25 = 57$, $m = 16$

d 16 years old

e 41 years old

18 70 and 42

19 Students' own answers

20 adult £30, child £5

21 h = 4 cm

22a $n^2 + 14 = 63$

b $n = 7$

23a $2x^2 = 26$

b x = 3.6 m (1 d.p.)

24 3.9 (1 d.p.)

25 x = 15.7 (1 d.p.)

26 x = 4.41 (2 d.p.)

x	$x^3 - 6$	Comment
4	58	too small
5	119	too big
4.5	85.125	too big
4.4	79.184	too small
4.45	**82.12 …**	**too big**
4.41	**79.766…**	**too small**
4.42	**80.350**	**too big**

27 x = 4.57 (2 d.p.)

28a $x = 2$

b $x^2 - 2x$

c $400 = x^2 - 2x$

d

x	$x^2 - 2x$	Comment
21	399	too small
21.1	403.01	too big
21.05	401.0025	too big
21.03	400.2009	too big
21.02	399.8004	too small

x = 21.02 m (to the nearest centimetre)

Unit 7 Answers

7 Unit test

1 **a** $x = 23$

b $x = 9$

c $x = 14$

2 **a** $x = 7$

b $x = 12$

c $x = 9$

d $x = 3$

e $x = -8$

3 $x = 40°$, $2x + 10 = 90°$, $2x - 30 = 50°$

4 $x = 7$

5 $v = 55$

6 **a** $m = 6$

b $n = 10$

c $x = 9$

7 15, 16, 17

8 $x = 12$

9 **a** $x = \pm 7$

b $y = -3$

10 8.2 (1 d.p.)

11 4.39 (2 d.p.)

Unit 8 Answers

Exercise 8.1

1 **a** cm or m

b mm

c m/

2 **a** 1.4 kg

b 3.5 m

c 0.73 m

d 2800 m/

e 30 m/

f 2040 m

3 **a** 30 000 m^2

b 0.5 ha

c 2500 kg

d 10 t

4 20 000

5 0.03 litre or 30 millilitres

6 **a** 1.175 t

b 6 cars

7 **a** 8 km

b 0.8 km = 800 m

c 180 cm = 1.8 m

d 15 cm

e 909 g = 0.909 kg

f 227 g = 0.227 kg

g 2.29 litres = 2290 m/

h 0.29 litres = 290 m/

i 18 litres

j 0.9 litre = 900 m/

8 **a** 95 kg

b 54 kg

c 64 kg

d 58 kg

9 **a** 80–160 km

b The car will definitely have enough charge to get to the friend's house but possibly not enough to return.

10 No, because 25 cm is more than 9 in.

11 son 177.75 cm, daughter 164.75 cm

12 No, it needs to be more accurate. Using 1 inch = 2.54 cm, 3 inches = 7.62 cm.

A 7.5 cm part would be 0.12 cm too short.

Unit 8 Answers

Exercise 8.2

1 a 5

b 8

c 9

2 There are 6 red cubes for every 4 blue cubes.

3 a 100 cm

b 0.01 m

c 1000 m

d 1000 g

4 a 3 : 2

b 2 : 3

c 3 : 4

5 a Yes

b No

c No (usually the other way around)

6 a 2 : 5

b 4 : 10

7 6 cans

8 2 : 4, 6 : 12, 5 : 10

9 a 10 : 5

b 10 g

c 50 g

10a 1 : 4

b 1 : 3

c 1 : 5

d 5 : 1

e 4 : 5

f 2 : 1

11 Ratio of adults to students is 8 : 120 which can be simplified to 1 : 15.

Therefore the ratio of adults to students is correct.

12a 1 : 5 : 9

b 1 : 4 : 2

c 5 : 4 : 9

d 3 : 1 : 4

e 5 : 8 : 3

f 9 : 7 : 3

13 14 : 1 : 5

14 5 : 4 : 5

15 2 : 1

16a 4 : 3
b 5 : 8
c 5 : 3
d 1 : 3
e 4 : 1
f 1 : 6
g 315 : 1
h 1 : 1

17 9 : 7

18a 2 : 5
b 4 : 13
c 4 : 7
d 50 : 11

19 15 cm

Unit 8 Answers

Exercise 8.3

1 **a** 2 : 5 = 6 : 15

b 4 : 7 = 16 : 28

c 3 : 10 = 15 : 50

d 6 : 4 = 48 : 32

2 3 : 2

3 Students' own answers. For example: 'Sarah has paid more for the lottery ticket than Paul. The ratio of the amounts paid by Paul and Sarah is 20 : 80 or 1 : 4. It would be fairer if Paul received $\frac{1}{5}$ of the winnings and Sarah received $\frac{4}{5}$ of the winnings. This would mean Paul received £200 and Sarah received £800.'

4 **a** £8: £12

b £40 : £20

c £15 : £20

d £35 : £42

e £40 : £32

f £50 : £70

5 Peter £36, Catherine £24

6 15

7 **a** 6

b 12

8 **a** 88

b 198

9 12 million

10 £500

11a £14 : £21 : £28

b £45 : £9 : £54

c £280 : £420 : £280

d £640 : £240 : £400

12 Adam £24, Billy £32, Charlie £16

13a 120 g

b 40 g

14a 30 litres of red, 6 litres of white

b 60 litres altogether

15 48 cm

Unit 8 Answers

Exercise 8.4

1 **a** 30%

b 8%

c 15%

d 28%

e 80%

2 **a** $\frac{2}{5}$ **b** $\frac{3}{4}$ **c** $\frac{4}{5}$ **d** $\frac{16}{27}$

3 **a** 2 : 1

b $\frac{2}{3}$

4 **a** 12 : 8 or 3 : 2

b $\frac{8}{20}$ or $\frac{2}{5}$, 40%

5 **a** 12 : 8 : 5

b James $\frac{12}{25}$ or 48%, Robert $\frac{8}{25}$ or 32%, Fernando $\frac{1}{5}$ or 20%

6 **a** $\frac{6}{20}$ or $\frac{3}{10}$, 30%

b $\frac{8}{20}$ or $\frac{4}{10}$ or $\frac{2}{5}$, 40%

7 **a** $\frac{33}{45}$ or $\frac{11}{15}$ or 73%

b Stunt 1 is $\frac{15}{20}$ or 75% successful, Stunt 2 is $\frac{18}{25}$ or 72% successful. Stunt 1 was more successful.

8 Proportion of goals scored: Ronaldo $\frac{247}{343}$ = 72%, Ferenc $\frac{512}{528}$ = 97%

Ferenc was the better footballer.

9 Jennie's lemonade contained 40% lemon, Claire's lemonade contained 42% lemon.

Claire's lemonade was stronger.

10 7 : 8 : 5

11 3 : 2

12 7 : 3

Unit 8 Answers

Exercise 8.5

1 **a** £6

b £20

c 8

2 **a** £5.00

b £7.50

c £1.25

d £8.75

3 **a** £22.50

b £67.50

4 To make the recipe for 14 people, Sophie needs 700 g of flour, 1225 m*l* of milk and 7 eggs. She does not have enough milk.

5 Cost per plant: Fazia £0.60, Kunal £0.67. Fazia got the better deal.

6 **a** 6 hours

b 9 hours

c 1.5 hours

7 **a** 4 days

b 16 days

8 £333.33

9 **a** 60 mins

b 240 mins

c 80 mins

Unit 8 Answers

Exercise 8.6

1 a 25 cm
b 40 g
c £0.50
d 60 m
e £4.50
f £7.70

2 a 10 : 1
b 10 : 1
c 1 : 3
d 1 : 50

3 a i £0.60
ii £0.30
iii £0.90
b 10

4 a £0.90
b £6.30
c 8

5 £50

6 £208.25

7 Mr Smith sells 100 g for £0.20, Mrs Jones sells 100 g for 30p. Mr Smith sells the cheaper apples.

8 1 kg for £1.70

9 a £280
b £350

10 £4.40 for 8 pack

11 Jonathon travels 9 miles on 1 litre, Sandra only travels 8 miles on 1 litre. Jonathon's car is more economical.

12a 1 : 3 **b** 1 : 6
c 1 : 6 **d** 1 : 10
e 1 : 2 **f** 1 : 4
g 1 : 6 **h** 1 : 4

13a 2 : 1 **b** 5 : 1
c 4 : 1 **d** 0.5 : 1
e 0.5 : 1 **f** 3 : 1
g 0.75 : 1 **e** 43 : 1

14 1 : 6

15a Offer A 1 : 15, Offer B 1 : 18
b Offer A is better value for money.

16a Dylan 1 : 4.5, Sarah 1 : 3.33
b Sarah's drink was stronger.

17 £1.35

18a **i** 30p

ii 29.8p

iii 27.5p

b Large, as it is the cheapest per packet of crisps.

19a **i** 24p

ii 19p

iii 21p

b Honey B, as it is the cheapest per gram of honey.

Unit 8 Answers

8 Check up

Ratio and measures

1 **a** 2 : 5

b 7 : 8

2 2 : 4 : 5

3 £60 : £140

4 **a** 6 : 1

b 40 : 1

c 3 : 4

5 **a** 6.4 km

b 1360 g

c 4.0 litres

d 40.9 litres

e 122 cm, 1.22 m

6 £4.26

7 French 90, Spanish 120

8 12

9 100

10a 1 : 2

b 5 : 4

11 1 : 1.5

12 3.5 : 1

Direct and inverse proportion

13a $\frac{3}{5}$

b $\frac{2}{5}$

c 3 : 2

14 $\frac{3}{10}$, 30%

15a 40%

b 60%

16a 100 minutes

b 25 minutes

c 75 minutes

17 £26.00

18 6 cartons of milk for £4.80 is cheaper.

19 Saturday

20a 8 days

b 2 days

c 24 days

21a 20 minutes

b 160 minutes

Unit 8 Answers

8 Strengthen

Ratio and measures

1 **a** 4.8 km **b** 0.8 km
c 5 miles **d** 3.1 miles
e 4.4 litres **f** 8.8 pints
g 2.9 gallons **h** 40.9 litres
i 8.8 lb **j** 5.5 kg

2 **a** 1 : 4
b 1 : 4

3 3 : 6 = 1 : 2 4 : 12 = 1 : 3 5 : 20 = 1 : 4 24 : 6 = 4 : 1,
6 : 9 = 2 : 3 8 : 28 = 2 : 7 4 : 10 = 2 : 5

4 **a** 1 : 5
b 1 : 4
c 1 : 2

5 **a** 1 : 2
b 4 : 1
c 2 : 3

6 **a** 10: 1
b 1 : 20
c 1 : 15
d 2 : 15

7 12

8 **a** 4
b 12
c Yes

9 **a** 8
b 12

10 9

11 Ally 30, Billie 33

12a £4 : £16
b £8 : £24
c £25 : £5

13a £2 : £4 : £6
b £3 : £9 : £15
c £18 : £12 : £30

14 9 cm : 12 cm : 15 cm

Direct and Inverse proportion

1 a $\frac{3}{10}$ or 30%

b $\frac{3}{5}$, 60%

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

b $\frac{1}{3}$

c June

3 a 25

b 10 out of 25 or 40%

c $\frac{10}{25}$

d $\frac{2}{5}$

4 a 70%

b 30%

5 a 20%

b 80%

6 a 70%

b 20%

c Anna

7 a £8.00

b £12.00

c £2.00

8 a £6

b £36.00

c £84.00

9 a 12p

b 11p

c Shop B

10 Price per bottle: Shop A £1.90, Shop B £1.80

Shop B is better value for money.

11a Plan A 500 : 25 Plan B 750 : 30

b Plan A 1 : 0.05 Plan B 1 : 0.04

c Plan B gives the better deal.

12a 1 minute

b 3 minutes

c 4 minutes

13 more time

14 less time

15 half the time

16a 4 days

b 2 days

17 2 days

18a 5 days

b 20 days

c 40 days

Enrichment

1 £5

2 **a** 168 miles

b **i** 414 miles

ii 662.4 km

c £66.24

3 Students' own question. For example: 'How long would it take 2 people to clean a car? Answer: 15 minutes'

Unit 8 Answers

8 Extend

1 4 : 5 : 6

2 1 : 2 : 6

3 **a** 2272.5 g = 2.273 kg

b 120 cm = 1.2 m

c 4.8 km = 4800 m

d 23 litres = 23 000 m/

e 1.8 litres = 1800 m/

4 **a** GB top speed is 86.7 mph, US top speed is 86.8 mph.
US top speed is faster than GB top speed.

b GB range is 0.07 s, US range is 0.58 s. GB is more consistent.

c GB team mass is 886.7 lbs, US team mass 900 lbs.

d Total GB mass is 1001 lbs, total US mass 950 lbs.

e 5%

f 11%

5 $\frac{32}{50} = \frac{16}{25}$, 64%

6 **a** Team A 50%, Team B 53%

b Team B

7 **a** 9 : 1

b 11.1 g

8 18

9 **a** 6 : 2 : 1

b Josh £180, Emma £60, Paul £30

c £150

10a 2 : 3

b 24

c 60

11a 3 : 7

b 18

c 60

12 2000 m^2

13 £180

14a 8

b £4.40

15 3 : 6 : 8

16 8

17a cans 135°, glass 90°, boxes 45°, newspapers 90°

b 3 : 2 : 1 : 2

c 8 boxes

d They recycled more in August.

18 144°

19a Offer C

b Students' own answers

20a Price per bottle: 6-bottle deal 58p, 8-bottle deal 63p

b The 6-bottle deal is better value for money.

21 Potatoes bought for £1: 1st farmer 1.1 kg, 2nd farmer 1.6 kg. The 2nd farmer's potatoes are better value.

22 8 : 5 : 7

23a 45 : 17 : 1

b 45

24a British Museum 29 : 28, Tate Modern 489 : 530, National Gallery 265 : 271

b In 2011 36% of the total visitors to the top three attractions went to the British Museum.
In 2012, the proportion had reduced to 34%.

25 1 : 4

26a 7 : 10 : 3

b 6

27 Earth 1 : 1068, Mars 1 : 52 918 062, Mercury 1 : 67 886 181

28a June 1 : 1.67, July 1: 2

b July had the higher proportion of children.

29 16 people

Unit 8 Answers

8 Unit test

1 a 2 : 3

b 5 : 2

2 £45 : £27

3 a 16

b 28

4 a 2 : 4 : 7

b 12.5

c 1 : 8

d 9.1

5 a 2727 g

b 91.4 cm

c 16 km

d 18 litres

6 a 3.4 litres

b 3400 m/

c 5 days

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

b 10%

8 Murray won 70% and Djokovic won 58%. Murray won the greater proportion.

9 2 : 3

10 £225

11 60 g : 120 g : 240 g

12 Offer C

13 3 : 4

14 1 : 2 : 1

15a 35%

b 28

16a 1 : 6

b 1 : 4

17a 8 : 1

b 0.83 : 1

18a 10 hours

b 2.5 hours

c 20 people

Unit 9 Answers

Exercise 9.1

1 a 20 cm^2

b 2100 mm^2

c 18 cm^2 or 1800 mm^2

2 a 5 cm

b 4 cm

c 2.5 cm

3 a 10

b 28

c 9

4 b Area of A = 24 cm^2 Area of B = 18 cm^2

c

Parallelogram	Base length (cm)	Perpendicular height (cm)	Area (cm^2)
A	6	4	24
B	3	6	18

d Students' own answers. Base length multiplied by perpendicular height gives the area.

e Area of a parallelogram = base length × perpendicular height

5 a 21 cm^2

b 2666 mm^2

6 a 3 cm

b 9.5 cm

c 6.4 cm

7 a 16.5 cm^2

b 12 cm^2 or 1200 mm^2

c 2400 mm^2 or 24 cm^2

8 a 8 cm

b 6 cm

c 5 cm

9 6000 cm^2

10 Students' own answers

11a b on the top of the diagram, a on the bottom of the diagram

b parallelogram

c The length of the base of the parallelogram is $b + a$

d The area of the parallelogram is $h \times (a + b)$

e The area of one trapezium is $\frac{1}{2}(a + b)h$

12a 22 cm^2

b 42.5 m^2

c 2100 cm^2

13 £250.25

Unit 9 Answers

Exercise 9.2

1 **a** Area = 30 cm^2 or 3000 mm^2. Perimeter = 22 cm or 220 mm

b Area = 600 mm^2. Perimeter = 12 cm or 120 mm

c Area = 16 cm^2 or 1600 mm^2. Perimeter = 22 cm or 220 mm

d Area = 51 cm^2. Perimeter = 31 cm

2 **a** 9 cm and 3 cm

b 2 cm and 5 cm

3 **a** 18 cm

b 20 m

c 280 mm

4 36 m^2

5 **a** Students' own answers, showing the perimeter of each shape is 20 m.

b Design B: area is 21 m^2

6 **a** 20 cm^2

b 1600 mm^2

c 24 cm^2

7 Whole area = 140 cm^2

Area of shapes = 53 cm^2

Area of plastic = 87 cm^2

Unit 9 Answers

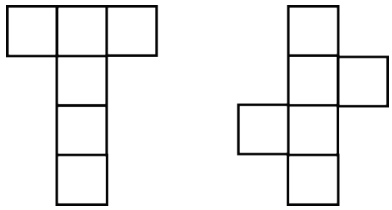
Exercise 9.3

1 **a** cube, cuboid, triangular prism, tetrahedron (triangle-based pyramid), square-based pyramid, cylinder

b square, rectangle, triangle, circle

2 **a, b** Nets A, D and F form cubes.

c Students' own answers, for example:



3 **a–c** Students' own answers. Correct nets of cuboids drawn, with dimensions labelled.

4 **a** net B

b net C

c net A

5 faces = 5, edges = 8, vertices = 5

6 triangular prism

7 **a** 2 cuboids

b 2 cuboids

c 2 triangular prisms

8 **a** GC **b** HG, AB, DC

c Any two of AD, EH, BC, FG, AE, DH, BF, CG

d EFGH **e** BF

f vertex **g** edge

9 3 different colours

Unit 9 Answers

Exercise 9.4

1 **a, b** Students' own answers. Correct nets of cuboids drawn, with dimensions labelled.

2 **a** 400 mm^2

b 7.5 cm^2

3 24 cm^2

4 **a** 54 cm^2

b 2400 mm^2 (or 24 cm^2)

c 150 cm^2

5 **a** n^2 cm^2

b surface area = $6n^2$

c 96 cm^2

6 **a** 34 cm^2

b 78 cm^2

7 **a** 62 cm^2

b 7000 mm^2 (or 70 cm^2)

c 59.5 cm^2

8 **a** 16 cm^2

b 4 cm

9 **a** wh

b wl

c hl

d $wh + wl + hl$

e $2(wh + wl + hl)$

10 No. Even though surface area of box < area of wrapping paper, a net of the box would not fit on the wrapping paper.

11 Yes. Surface area of outside of box = 13 400 cm^2

12 10 800 cm^2

Unit 9 Answers

Exercise 9.5

1 a 120

b 72

c 32

2 a 12

b 10 (assuming that there are 2 hidden cubes, or 8 if there are not)

c 20

3 a 1, 8, 27

b 1, 8, 27

They are the same numbers.

4 512 cm^3

5 a 9 cm^2

b 3 cm

c 27 cm^3

6 a A 30, B 18, C 36

b

Cuboid	Length	Width	Height	Length × width × height
A	5	3	2	30
B	3	2	3	18
C	4	3	3	36

7 a A 42 cm^3

B 48 000 mm^3 (or 48 cm^3)

C 31.25 cm^3

b i Yes. The volumes will be added together.

ii No. Some surfaces will be hidden or joined.

8 a 450 cm^3

b 6.3 m*l*

c 7.346 litres

9 a 66 300 cm^3

b 66.3 litres

c Yes

10 7 cm

11 26 cm^3

12a 2

b 72 cm^3

13a A 6 cm by 5 cm, B 6 cm by 7cm, C 7 cm by 5 cm

b 210 cm^3

c 214 cm^2

Unit 9 Answers

Exercise 9.6

1 a 250

b 400

c 4.5

d 0.9045

2 a 10 000

b 100

c 3

3 a m^2

b km^2

c cm^2

4 a Yes. 5.3 hectares = 53 000 m^2

b 15 625

5 192 hectares

6 a 400 mm^2

b 5800 cm^2

c 0.017 km^2

d 3 500 000 m^2

7 a i 403.2 cm^2

ii 40 320 mm^2

b 360 mm × 112 mm = 40 320 mm^2

8 a 96 (or 90, if the possible arrangement of the quadrats within a rectangular plot is considered)

b $\frac{1}{8}$ or 12.5%

9 a 10 mm, 10 mm, 10 mm

b i 1 cm^3 **ii** 1000 mm^3

c i multiply by 1000 **ii** divide by 1000

d 100 cm, 100 cm, 100 cm

e i 1 m^3 **ii** 1 000 000 cm^3

f i multiply by 1 000 000 **ii** divide by 1 000 000

10a 8000 mm^3

b 0.095 cm^3

c 73 400 000 cm^3

d 0.25 m^3

11 No. $\frac{40}{8000} = 0.005 < \frac{5600}{1000000} = 0.0056$

Unit 9 Answers

9 Check up

Area and perimeter of 2D shapes

1 44 m

2 33 m^2

3 750 mm^2 (or 7.5 cm^2)

4 **a** 10 cm^2

b 15 cm^2

Working with 3D solids

5 40 cm^2

6 Students' own answers. A correct net of triangular prism given, with dimensions.

7 **a** 30 cm^3

b 216 cm^3

8 192 cm^3

Measures of area and volume

9 1800 mm^2

10a 600 mm^2

b 90 mm^2

c 3.5 cm^2

d 30 000 m^2

e 50 200 m^2

f 0.259 m^2

11a 18 000 mm^3

b 0.265 cm^3

c 700 000 cm^3

d 0.931 m^3

e 42 000 000 m/

f 3000 cm^3

Unit 9 Answers

9 Strengthen

Area and perimeter of 2D shapes

1 a 24 cm^2, 12 cm^2

b 5 cm^2, 2.5 cm^2

2 a A i base length = 6 cm **ii** perpendicular height = 2 cm

B i base length = 3 cm **ii** perpendicular height = 7 cm

C i base length = 10 cm **ii** perpendicular height = 4 cm

b A 6 cm^2

B 10.5 cm^2

C 20 cm^2

3 a Perimeter = 10 + 2 + 10 + 2 = 24 cm

Area = 10 × 2 = 20 cm^2

b Perimeter = 10 + 2 + 7 + 3 + 5 + 3 = 30 cm

Area = 10 × 2 + 3 × 3 = 29 cm^2

4 a Perimeter = 32 cm

Area = 49 cm^2

b Perimeter = 30 cm

Area = 19 cm^2

5 a 15 cm^2

b 21 cm^2

6 a–c Sketches of trapezia with perpendicular height labelled h, parallel sides labelled a and b

7 a Area = $\frac{1}{2}(a + b)h$

$= \frac{1}{2}(6 + 9) \times 4$

$= \frac{1}{2} \times 15 \times 4$

= 30 cm^2

8 a 16.5 cm^2

b 22 cm^2

Working with 3D solids

1 a i bottom **ii** back **iii** left-hand side

b

Face	Area
Top	1 × 5 = 5 cm^2
Bottom	1 × 5 = 5 cm^2
Front	3 × 5 = 15 cm^2
Back	3 × 5 = 15 cm^2
Right	1 × 3 = 3 cm^2
Left	1 × 3 = 3 cm^2
Total surface area	46 cm^2

2 72 cm^2

3 a A l = 1 cm, w = 5 cm, h = 2 cm

B l = 2 cm, w = 4 cm, h = 2 cm

C l = 3 cm, w = 5 cm, h = 2 cm

b A 10 cm^3

B 16 cm^3

C 30 cm^3

4 a 70 cm^3

b 35 cm^3

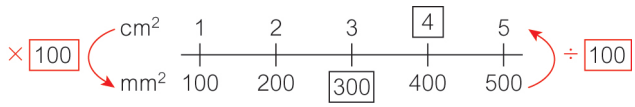
c 27 cm^3

Measures of area and volume

1 a A 1 cm^2

B 100 mm^2

b



2 a 12 cm^2, 1200 mm^2

b 5 cm^2, 500 mm^2

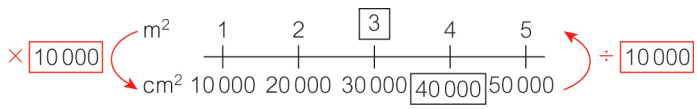
3 a 1600 mm^2, 16 cm^2

b 1200 mm^2, 12 cm^2

4 a A 1 m^2

B 10 000 cm^2

b



5 a 2.05 m^2 = 2.05 × **10 000** = **20 500** cm^2

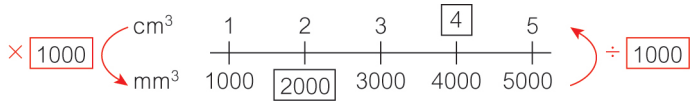
b 0.07 m^2 = **700** cm^2

c **0.86** m^2 = 8600 cm^2

6 a A 1 cm^3

B 1000 mm^3

b



7 a i 6000 mm^3

ii 12 mm^3

iii 15.8 cm^3

b I 40 000 cm^3

ii 12 700 000 cm^3

iii 1.4 m^3

Enrichment

1 a 2 m^3

b 100 cm × 400 cm × 50 cm

c 2 000 000 cm^3

d 50 bags

e £125

f £2000

Unit 9 Answers

9 Extend

1 a i 2 hexagons, 6 rectangles

ii 2 heptagons, 7 rectangles

iii 2 decagons, 10 rectangles

b

Solid	Faces	Edges	Vertices	Check: F + V = E + 2
Pentagonal prism	7	15	10	7 + 10 = 17 = 15 + 2
Hexagonal prism	8	18	12	8 + 12= 20 = 18 + 2
Heptagonal prism	8	14	8	8 + 8= 16 = 14 + 2
Decagonal prism	10	24	16	10 + 16= 26 = 24 + 2

c octagonal prism

2 a 52 cm^2

b 52 cm^2

3 32 cm

4 a 42 cm

b 66 cm^2

5 a Students' own answers. For example: 'The area is multiplied by 4.'

b Students' own counter example. For example:

'The area and perimeter of a square with side length 4 are the same.'

6 a 1200 cm, 240 cm, 255 cm

b 73 440 000 cm^3

c 600

d 12–13 containers high; 3060–3215 cm high (102–110.5 ft high)

7 50 cm

8 a i Students' own answers, e.g. 3 ft × 3 ft × 2 ft

ii Students' own answers, e.g. 90 cm × 90 cm × 60 cm

b 486 000 cm^3

9 a $24x$ cm^2

b $4y$ cm^2

10 20 cm^2

11a 1800 cm^2

b 1260 mm^2

c 15.912 m^2

d 4.8 m^2

12a A 15 cm^2

B 15 cm^2

b 30 cm^2

c Use the formula for the area of a trapezium.

13a 49 cm^2

b 19 cm^2

c 64 cm^2

14a 5 cm^3

b 22 cm^2

c **i** 2 high and 3 deep, or 3 high and 2 deep (surface area 62 cm^2)

ii end to end (surface area 122 cm^2)

15a 200 cm^3

b 168 cm^3

c 144 cm^3

16a 6 cm

b 4 cm

c 3 cm

d 3 cm

17a **i** 3750 m^3

ii 3 750 000 000 cm^3

b 3 750 000 litres

18 Area of triangle A = $\frac{1}{2}$ **× 3 × 4 = 6** cm^2

Area of triangle B = $\frac{1}{2}$ **× 3 × 4 = 6** cm^2

Area of rectangle C = **10 × 5 = 50** cm^2

Area of rectangle C = **10 × 3 = 30** cm^2

Area of rectangle C = **10 × 4 = 40** cm^2

Surface area = **6** + **6** + **50** + **30** + **40** = **132** cm^2

Unit 9 Answers

9 Unit test

1 **a** 26 cm

b 22 cm^2

2 **a** cube 125 cm^3, cuboid 84 cm^3

b cube 150 cm^2, cuboid 122 cm^2

3 **a** 10 cm^2

b 14 cm^2

4 **a** 32 cm^2

b 35 cm^2

5 **a** 3600 cm^2

b 0.36 m^2

c 0.8 m

6 324 cm^3

7 26 cm^2

8 **a** 4 300 000 cm^3

b 8.5 cm^3

c 540 cm^3

Unit 10 Answers

Exercise 10.1

1 a 20, 24, 28
b 3, 3.5, 4
c 3.9, 4.1, 4.3
d 0.6, 0.3, 0

2 a 18 and 27
b 8 and 64
c 3 and 9
d 25 and 20

3 sequences a, b and c

4 a infinite
b finite
c infinite
d finite
e infinite

5 a 1st term = 5, term-to-term rule = +2
b 1st term = 100, term-to-term rule = −10
c 1st term = 15, term-to-term rule = +6
d 1st term = 20, term-to-term rule = −5

6 a, c and d

7 a 9, 14, 19, 24, 29
b 15, 12, 9, 6, 3
c −50, −55, −60, −65, −70
d 0, 4, 8, 12, 16
e 9.5, 9.7, 9.9, 10.1, 10.3
f −12, −11.7, −11.4, −11.1, −10.8

8 a 1st term = 9, common difference = 9
b 1st term = 20, common difference = 10
c 1st term = 3, common difference = 2
d 1st term = 30, common difference = −5
e 1st term = 9, common difference = 2
f 1st term = 100, common difference = −11

9 a £1, £3, £5, £7, £9, £11, £13, £15, £17, £19, £21
b 21 days

10a 30
b 150
c 300

11a 67 000 000

b No. Students' own explanation. For example: 'When there are more people there will be more births.'

c Yes. The new data shows it is not necessarily an arithmetic sequence.

Unit 10 Answers

Exercise 10.2

1 a +5

b −3

2 a 6

b 11

c 11

3 a $n = 12$

b $n = 7$

4 a 4, 8, 12, 16, 20

b 60

5 a 5, 10, 15, 20, 25

b 7, 14, 21, 28, 35

c 12, 24, 36, 48, 60

6 a 7

b 44

c 30

7 a $3n$

b $2n$

c $10n$

d $11n$

8 a i 11, 12, 13, 14, 15

ii −6, −5, −4, −3, −2

iii 13, 14, 15, 16, 17

iv 0, 1, 2, 3, 4

b i 1st term = 11, common difference = 1

ii 1st term = −6, common difference = 1

iii 1st term = 13, common difference = 1

iv 1st term = 0, common difference = 1

9 $n + 2$

10a $n + 4$

b $n - 1$

c $n + 9$

d $n + 20$

11a 7, 10, 13, 16, 19

b 7, 9, 11, 13, 15

c 2, 6, 10, 14, 18

d 13, 14, 15, 16, 17

e 2, 7, 12, 17, 22

12a −11, −10, −9, −8, −7

b −13, −11, −9, −7, −5

c −7, −6, −5, −4, −3

d −40, −30, −20, −10, 0

13a $3n + 1$ **b** $2n + 5$

c $5n + 7$ **d** $10n - 2$

e $12n + 12$ **f** $9n - 1$

g $10n - 1$

14a No. 35 is not a multiple of 10.

b 6th term

c 11th term

15a $n = 5$

b Yes. 2 × 5 + 1 = 11

c 11th term

16a 5

b 10

c 23

17 $n = 2.5$ No, the position number has to be an integer.

18a –3, 3, 7, 47

b –3, 7, 32, 47

19a 3000

b Students' own answers. For example: 'No, it won't be an infinite sequence' or 'If more people read the blog the more people they will tell about it, so it might not be arithmetic.'

20a $5n - 17$

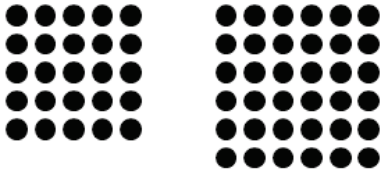
b 44

Unit 10 Answers

Exercise 10.3

1 a

2 a

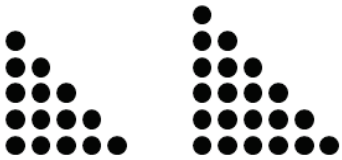


b 25, 36, 49

c square numbers

d They are increasing odd numbers. It is not an arithmetic sequence.

3 a

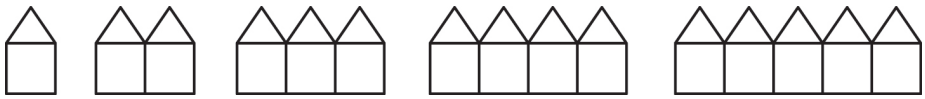


15 21

b They are the positive integers from 2.

c 55

4 a i

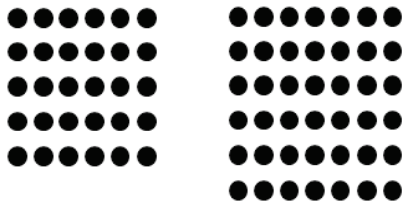


ii

Term number	1	2	3	4	5
Number of lines	6	11	16	21	26

iii 1st term = 6, term-to-term rule = +5

b i



ii

Term number	1	2	3	4	5	6
Number of dots	2	6	12	20	30	42

iii 1st term = 2, term-to-term rule = add the even numbers

5 2, 4, 8, 16, 32, 64

6 a 1st term = 1, term-to-term rule = ×3

b 1st term = 10, term-to-term rule = ×10

c 1st term = 1, term-to-term rule = $\times \frac{1}{2}$ or ÷2

7 a arithmetic

b geometric

c geometric

d geometric

e arithmetic

8 a i 1st term = 1, term-to-term rule = ×2 **ii** 32, 64

b i 1st term = 200, term-to-term rule = ÷2 **ii** 12.5, 6.25

c i 1st term = 5, term-to-term rule = ×5 **ii** 3125, 15 625

d i 1st term = 1, term-to-term rule = ÷2 **ii** $\frac{1}{16}, \frac{1}{32}$

9 a 3, 12, 27

b 5, 8, 13

c $\frac{1}{2}$, 2, $4\frac{1}{2}$

10a 8, 13

b The differences between terms are also the Fibonacci sequence.

Unit 10 Answers

Exercise 10.4

1 **a** A(0, 3), B(6, 6), C(2, 0)

b trapezium

2 2 units

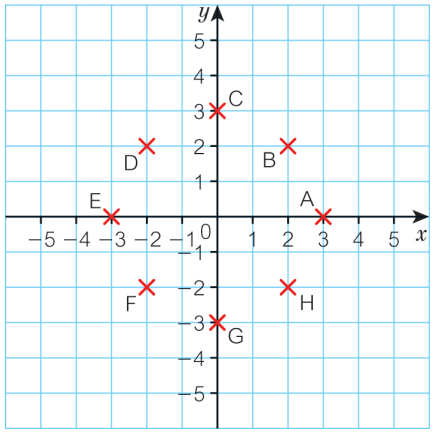
3 **a** 5 units

b 8 units

c 2 units

4 A(1, 4), B(−4, 3), C(2, −2), D(−2, −5)

5 **a**



b octagon

6 Midpoint of CD = (2, −3) Midpoint of EF = (−2, −2.5) Midpoint of GH = (−3.5, 4)
Midpoint of IJ = (−1, 3) Midpoint of KL = (−4, 0)

7 **a** (3, 2)

b (1, 1)

c (−2, 4)

d (−5, −1.5)

8 **a** (2, 8)

b (8, 4)

c (4, 7)

d (5, 1)

e (−3, −1)

f (8.5, −4.5)

Unit 10 Answers

Exercise 10.5

1 a 17

b −8

2 a i $y = 21$

ii $y = -12$

b i $y = 3$

ii $y = -7$

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

b The x -coordinate is always −2.

c i $x = -2$

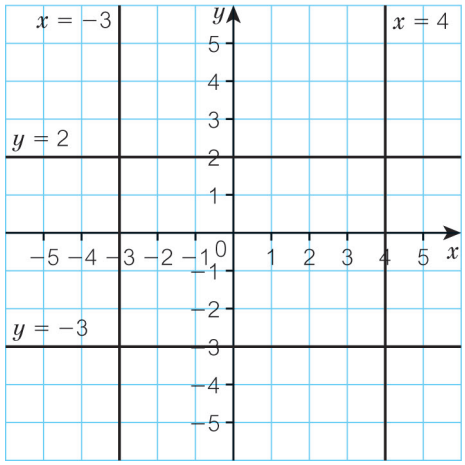
ii $x = 3$

iii $y = -1$

4 a points P, R and S

b points Q and T

5



6 a

x	0	1	2	3	4
y	2 × 0 = 0	2	4	6	8

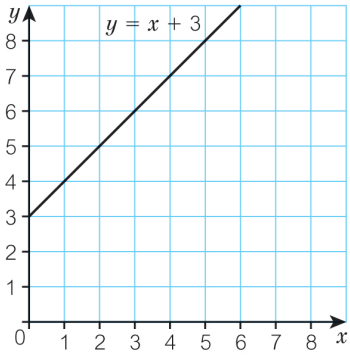
b (0, 0), (1, 2), (2, 4), (3, 6), (4, 8)

7 a

x	0	1	2	3	4
y	3	4	5	6	7

b (0, 3), (1, 4), (2, 5), (3, 6), (4, 7)

c

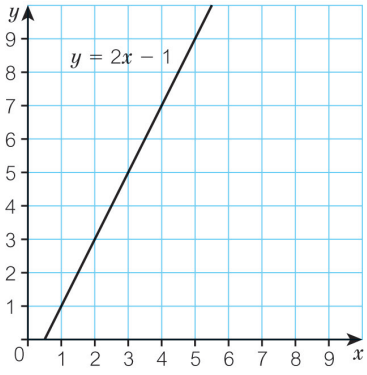


8 a

x	1	2	3	4	5
y	2 × 1 − 1 **= 2** – 1 **= 1**	3	5	7	9

b 9

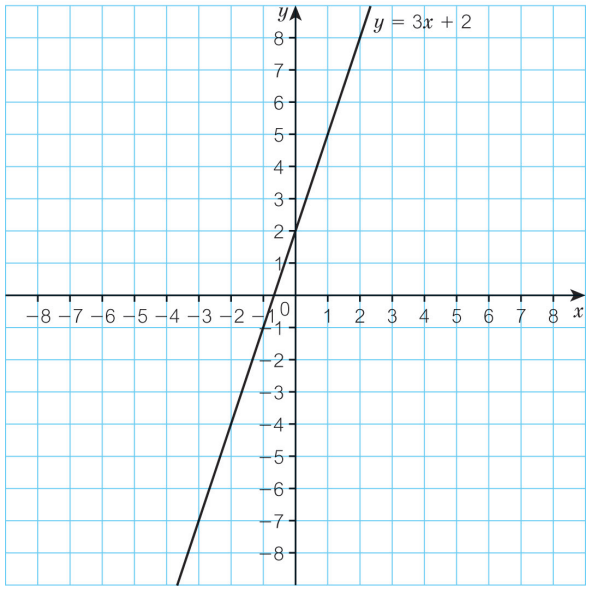
c



9 a

x	–2	–1	0	1	2
y	–4	–1	2	5	8

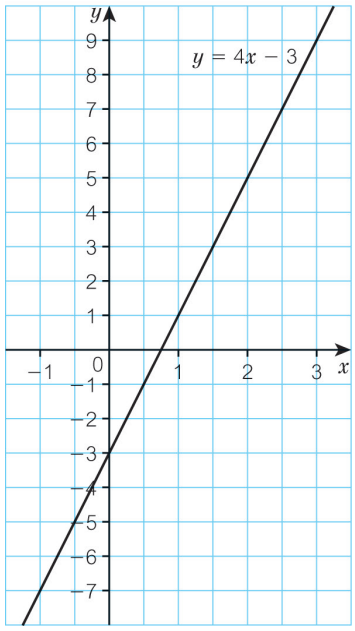
b



10a

x	–1	0	1	2	3
y	–7	–3	1	5	9

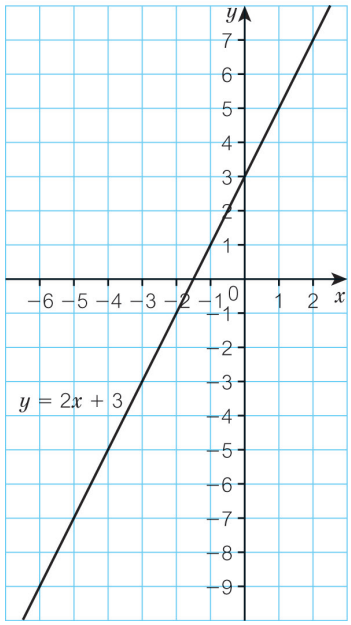
b



11a

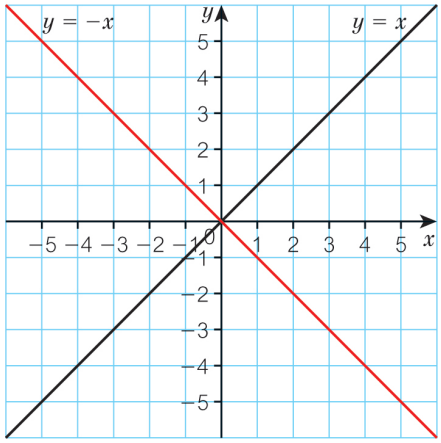
x	–6	–4	–2	0	2
y	–9	–5	–1	3	7

b



c $x = -5$

12a, b



c 90°

13 A $y = x$

B $y = 4$

C $x = -2$

D $y = -x$

E $y = -2$

F $x = 4$

Unit 10 Answers

10 Check up

Sequences

1 a 1st term = 3, term-to-term rule = +2

b 1st term = 2, term-to-term rule = ×10

c 1st term = 20, term-to-term rule = −3

2 a

b

Term number	1	2	3	4	5
Number of lines	6	11	16	21	26

c 1st term = 6, term-to-term rule = +5

3 77

4 a 12, 17, 22, 27, 32

b 8, 2, −4, −10, −16

5 a 3, 6, 9, …, 18

b 8, 9, 10, …,13

c 2, 7, 12, …, 27

6 a $5n$

b $n + 3$

c $2n + 1$

7 a geometric

b arithmetic

c arithmetic

d geometric

8 a ×5

b 125

Graphs

9 A(3, 4), B(0, 5), C (4, −6), D (−2, 5), E (−3, −7), F(−3, 0)

10 A $x = 5$

B $x = -4$

C $y = 2$

D $y = -5$

11a

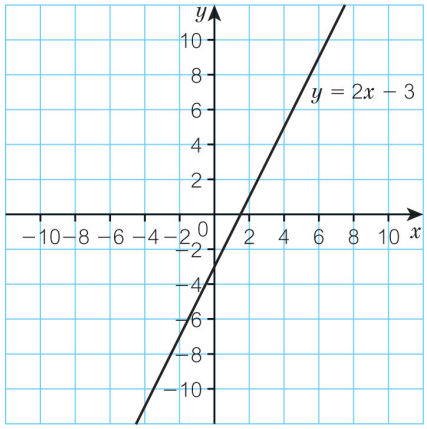
x	0	1	2	3	4
y	2	3	4	5	6

b (0, 2), (1, 3), (2, 4), (3, 5), (4, 6)

12a

x	−2	0	2	4	6
y	−7	−3	1	5	9

b

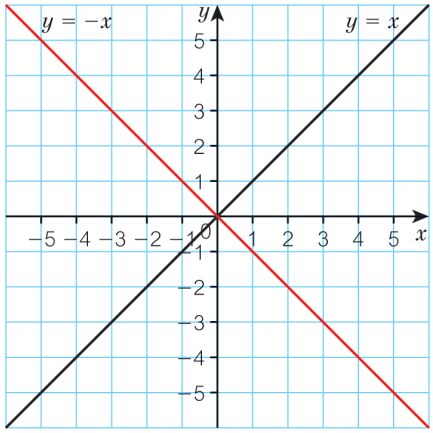


13a (1, 7)

b (5, 3)

c (2, −1)

14



Unit 10 Answers

10 Strengthen

Sequences

1 a i 2

ii 12, 14

b i −6

ii 19, 13

2 a i 26, 31, 36

ii 22, 15, 8

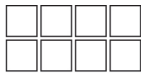
iii 74, 85, 96

b i ascending

ii descending

iii ascending

3 a



4

b

Pattern number	1	2	3	4
Number of blocks	2	4	6	8

c 10

4 a and b

5

Term number	1st	2nd	3rd	4th	5th
Term	3	3 + 4 = 7	7 + 4 = 11	11 + 4 = 15	15 + 4 = 19

6 a 9, 13

b 16, 14

c −8, −6

d 0, −3

7 a 5

b 60

c $5n$

8 a i $4n$ **ii** 40

b i $11n$ **ii** 110

c i $3n$ **ii** 30

d i $12n$ **ii** 120

9 a 2

b $n + 2$

10a $n + 9$

b $n - 1$

c $n + 14$

d $n - 4$

11 6, 7, 8, 9, 10

12 1, 3, 5, 7, 9

13 −5, −3, −1, 1, 3

14a $3n$

b 2

c $3n + 2$

15a $10n + 1$

b $3n + 4$

c $5n + 2$

16a sequence A

b sequence E

17a ×4

b 256, 1024

18a **i** ×10 **ii** 10 000, 100 000

b **i** +5 **ii** 22, 27

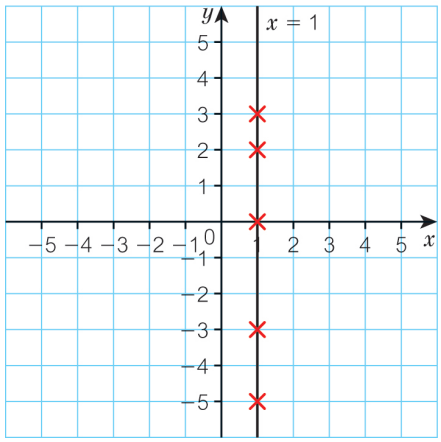
c **i** ×2 **ii** 48, 96

d **i** ×6 **ii** 216, 1296

e **i** −5 **ii** 30, 25

Graphs

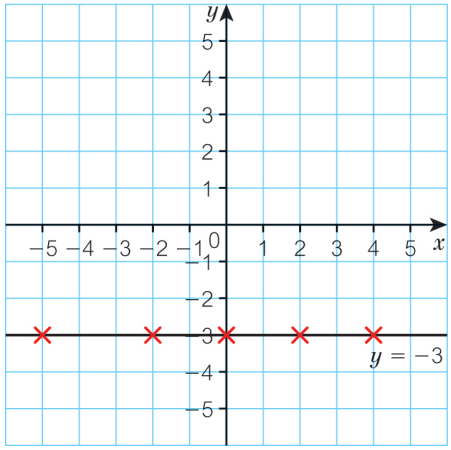
1 a, b



c The x-coordinate is always 1.

d The equation of the line is x = **1**. It is parallel to the y-axis.

2 a, b



c The y-coordinate is always −3.

d The equation of the line is y = **−3**. It is parallel to the x-axis.

3 a Students' own answers, of the form $(a, 3)$

b Students' own answers, of the form $(-2, a)$

c Students' own answers, of the form $(a, -1)$

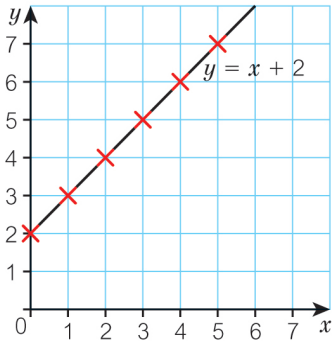
d Students' own answers, of the form $(14, a)$

4 a

x	0	1	2	3	4	5
y	2	3	4	5	6	7

b (0, 2), (1, 3), (2, 4), (3, 5), (4, 6), (5, 7)

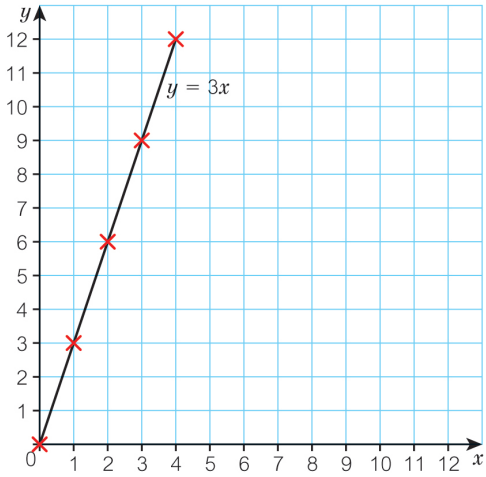
c, d



5 a

x	0	1	2	3	4
y	0	3	6	9	12

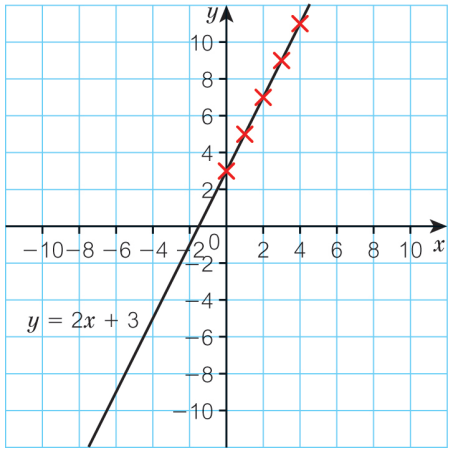
b, c



6 a

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

7



8 a (1, 1), (2, 2), (−3, −3)

b (9, −9), (4, −4), (5, −5), (−6, 6)

9 a i 3

ii 3

b (3, 3)

10a (7, 10)

b (4, 10)

c (6, 7)

Enrichment

1 a i Students' own answers, of the form (a, a)

ii Students' own answers, of the form $(a, -a)$

b (0, 0)

2 a 12

b 15

Unit 10 Answers

10 Extend

1 a £3000

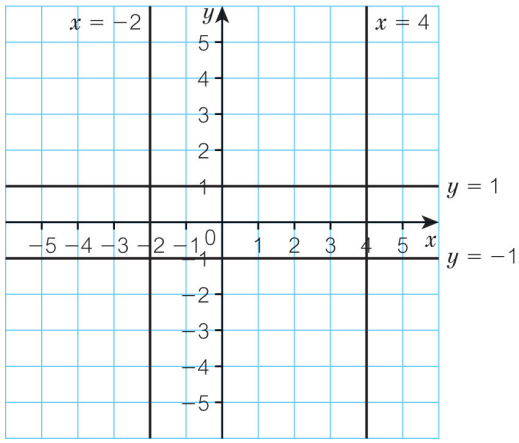
b £5500

c £20 500

2 a £200

b £50

3 a



b 12 square units

4 Students' own answers, probably of the form (–1, a), but other answers are also valid, for example (−4, 7), (−4, −5), (2, 7), (2, −5)

5 a Adds 10 and then divides by 2

b They get closer and closer to 10.

c The sequence still tends to 10.

d The limits increase or decrease as the denominator increases or decreases, unless the denominator is between −1 and 1, in which case the sequence diverges.

e Students' own answers

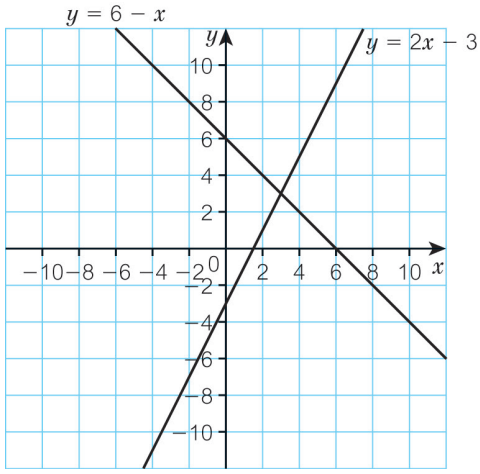
6 a

x	−2	0	2	4	6
y	−7	−3	1	5	9

c

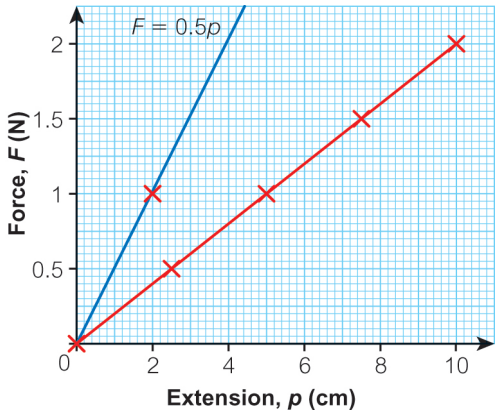
x	−3	−1	0	5	10
y	9	7	6	1	−5

b, d



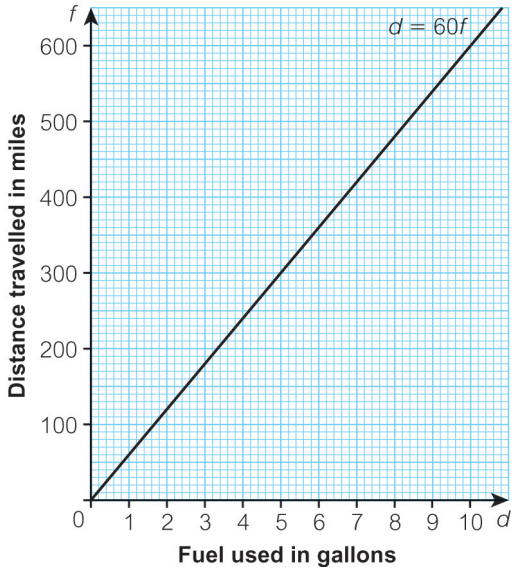
e (3, 3)

7 a, c



b $\frac{1}{5}$

8 a



b i 2.5 gallons

ii 210 miles

9 a 8

b

Number of tables	1	2	3	4	5
Number of seats	4	6	8	10	12

c 22

d 2

e No. 2 seats are lost each time a table is added.

f $2n + 2$

g 14

10a $x = 2$

b $y = 3$

c $y = x$

11a (−1.5, 1.5)

b (9, 17)

12a (5, 5)

b i (5, 2)

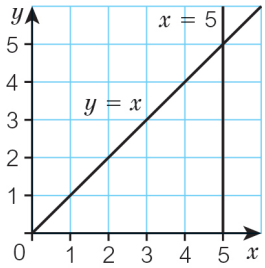
ii (7, 5)

iii (8, 3.5)

iv (4, 3.5)

v (6, 3.5)

13a i, ii



b 12.5 square units

14a 14 and 860. Terms in the sequence must be 5 more than a multiple of 9, and n cannot be negative.

b 42

c 111th

15a infinite

b the 1st term, −17.5

16a 42, 56

b 21, 34

c 26, 37

d $10\frac{1}{2}$, 14

17a −1, 1

b −12, 14

c $-\frac{1}{32}, \frac{1}{64}$

18a 1st term = 1, term-to-term rule = ×4

b 1st term = 1, term-to-term rule = ×10

c 1st term = 200, term-to-term rule = ÷2

d 1st term = 81, term-to-term rule = ÷3

19a 3, 81

b 20

c 50

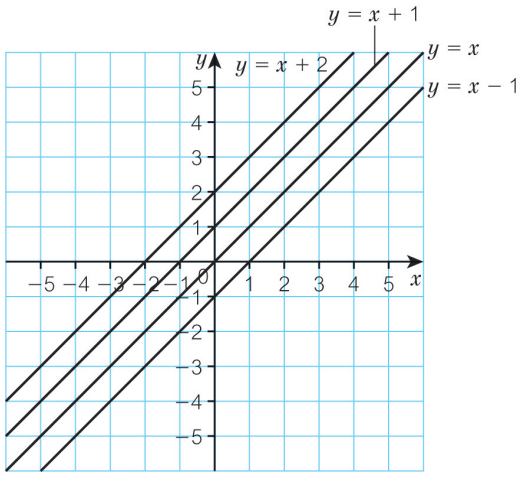
20a i 5, 7

ii $2n - 1$

b i 9, 27

ii 1st term = 1, term-to-term rule = ×3

21a



b i (0, 0) **ii** (0, 1) **iii** (0, 2) **iv** (0, −1)

c i (0, −5) **ii** (0, 12)

22a 32

b

1st term	2nd term	3rd term	4th term	5th term
2	2×2 $= 2^2$	$2 \times 2 \times 2$ $= 2^3$	$2 \times 2 \times 2 \times 2$ $= 2^4$	$2 \times 2 \times 2 \times 2 \times 2$ $= 2^5$

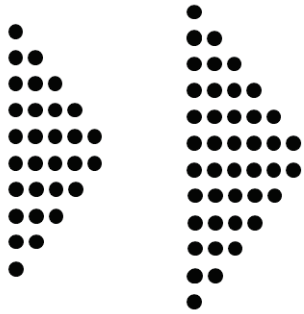
c 1024

d 2^n

Unit 10 Answers

10 Unit test

1 a i



ii

Term number	1	2	3	4	5	6
Number of dots	2	6	12	20	30	42

b i

ii

Term number	1	2	3	4	5	6
Number of dots	36	25	16	9	4	1

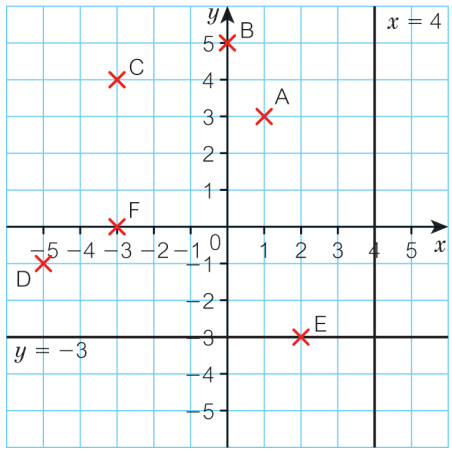
2 64, 32, 16, 8, 4

3 54

4 a 7, 15, 23, 31

b 10, 4, −2, −8

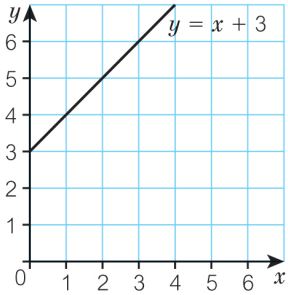
5 a–c



6 a

x	0	1	2	3
y	3	4	5	6

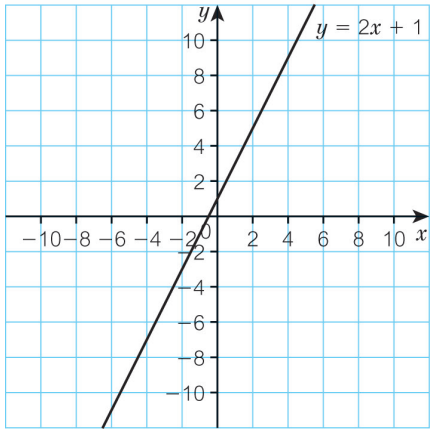
b



7 a

x	−4	−2	0	2	4
y	−7	−3	1	5	9

b



8 a 7, 9, 11

b −5, 0, 5

9 a geometric

b arithmetic

c arithmetic

d geometric

10a $9n$

b $n + 6$

c $5n + 1$

11 Midpoint of AB = (3, 3)

Midpoint of CD = (−2, 1)

Midpoint of EF = (0, −1)

12a C

b (0, 0)

13a 81, 243

b 3^n