Unit 1 Answers

Exercise 1.1

1 a 1923

b 987

2 a 25

b 90

3 a 12 ÷ 4 = 3

b 9 × 20 = 180

c 22 + 18 = 40 or 22.5 + 17.5 = 40

d 50 × 50 = 2500

e 180 ÷ 60 = 3

4 a 320

b 320

c 320

5 a 180

b 2300

c 280

6 a 39

b 63

c 180

7 a 1687

b 3117

c 52 009

8 18 155

9 a 25.64

b 103.83

c 6.31

10 0.37 m

11a £23.80

b £387.20

c £0.34

12a £60 ÷ 15 = £4

b £4.15

13a 50 + 6 × 25 = 200

b (350 + 250 + 1200) ÷ 3 = 1800 ÷ 3 = 600

c $\frac{1}{2}$ × (7 + 9) × 2 = 16

14 £8000 − £2000 − 6 × £500 = £3000

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Unit 1 Answers

Exercise 1.2

1 **a** −4

b −6

c −6

d 15

2 **a** 6

b −3

c 3

d −5

e −7

f −9

3 **a, b**

Calculation	Answer
3 + 3	6
3 + 2	**5**
3 + 1	**4**
3 + 0	**3**
3 + −1	**2**
3 + −2	**1**
3 + −3	**0**
3 + −4	**−1**
3 + −5	**−2**

Calculation	Answer
3 − 3	**0**
3 − 2	**1**
3 − 1	**2**
3 − 0	**3**
3 − −1	**4**
3 − −2	**5**
3 − −3	**6**
3 − −4	**7**
3 − −5	**8**

c **i** 3 **−** 5

ii 3 **+** 5

d + − is the same as **−**

− − is the same as **+**

4 **a** 8

b 11

c −2

d −4

e −5

f −2

g −11

h 5

5 **a** 7

b 9

c 10

d 6

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e 14

f 10

6 a solid

b 273 °C

7 a

Date in May	1	2	13	19	20	25	31
Deposit/Withdrawal (£)		+20	−37	+200	−12	+55	−25
Balance (£)	−128	**−108**	**−145**	**+55**	**+43**	**+98**	**+73**

b £201

8 a

Calculation	**Answer**
3 × 4	12
3 × 3	9
3 × 2	**6**
3 × 1	**3**
3 × 0	**0**
3 × −1	**−3**
3 × −2	**−6**
3 × −3	**−9**

Calculation	**Answer**
4 × −3	**−12**
3 × −3	**−9**
2 × −3	**−6**
1 × −3	**−3**
0 × −3	**0**
−1 × −3	**3**
−2 × −3	**6**
−3 × −3	**9**

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

9 a 8

b −24

c −36

d −45

e 9

f −120

g 36

h −60

i −5

j −10

k −24

l −40

10a ii −3 × −4 = 12 so 12 ÷ −3 = −4 and 12 ÷ **−4** = **−3**

iii −2 × 5 = −10 so −10 ÷ −2 = **5** and −10 ÷ 5 = **−2**

b positive ÷ positive = **positive**
positive ÷ negative = **negative**
negative ÷ positive = **negative**

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negative ÷ negative = **positive**

11a 4
b −5
c −3
d −4
e −5
f 1
g 100
h −12
i −8
j −0.4
k −6.2
l −4

12a −210 W
b 2205 W
c −420 W

13a −15
b −68
c 14
d −18
e 2

14a –18
b –4
c –4
d 15
e 5
f –10

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Unit 1 Answers

Exercise 1.3

1 **a** 81

b 7

c 10

d 1

2 $\sqrt{64} = 8$

$\sqrt{1} = 1$

$\sqrt{100} = 10$

$\sqrt{144} = 12$

$\sqrt{9} = 3$

$\sqrt{196} = 14$

$\sqrt{225} = 15$

$\sqrt{4} = 2$

$\sqrt{81} = 9$

$\sqrt{121} = 11$

$\sqrt{16} = 4$

3 **a** 121

b 144

c 169

d 196

e 225

f 400

g 10 000

4 **a** 18

b 12

c 32

d 51

e 30

f 25

g 6

h 9

5 **a** 2 and 3

b 6 and 7

c 9 and 10

d 13 and 14

6 **a** between 7 cm and 8 cm

b 7.75 cm (2 d.p.)

7 **a** 1

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b 8
c 27
d 64
e 125
f 1000

8 a 5
b 1000
c 4
d 27
e 1
f 5

9 a not true
b true
c true
d not true

10a 9
b 4096
c 17
d 6.32 (2 d.p.)
e 62 500
f 3.11 (2 d.p.)

11a 8
b 16
c 13
d 12
e 0
f 52

12a 4
b 49
c 16

13a 5, −5
b 9, −9
c 1, −1
d 12, −12

14a −8
b −27
c −64

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Unit 1 Answers

Exercise 1.4

1 **a** 18
b 5
c 66
d 16

2 **a** 10 000
b 1 000 000
c 1 000 000

3 **a** **i** 36
ii 36
b same answer
c **i** 100
ii 16
iii 225

4 **a** 900
b 8100
c 40 000
d 250 000
e 1 440 000
f 64 000 000

5 $1400^2 = 1\,960\,000\ \text{cm}^2$

6 **a** 28
b 61
c 121
d 125
e 6
f 117

7 **a** **i** 6
ii 6
b same answer
c Find the product of the square roots.
d 24
e 99

8 **a** 8
b 5
c 7
d 4
e 2
f 5
g 4

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h 5

9 a 5

b 11

c 7

d 3

e 3

f 4

g 6

h 13

10a 125

b 21

c 10

d 16

11 20 m

12a 17.576

b 22.36 (2 d.p.)

c 37.5

d 2.12 (2 d.p.)

e 4.32 (2 d.p.)

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Unit 1 Answers

Exercise 1.5

1 a 6

b i 4

ii 14

iii 3

iv 15

2 a, b

Multiples of 6: 6, 12, 18, **24**, 30, 36, 42, **48**, 54, 60

Multiples of 8: 8, 16, **24**, 32, 40, **48**, 56, 64, **72**, 80

c 24

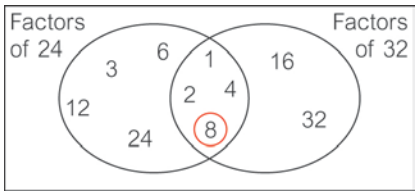
d i 36

ii 56

iii 48

iv 42

3



4 a i 16

ii 1 000 000

iii 243

iv 16 384

5 a 2^6

b 10^4

c $3^2 \times 4^3$

d $10^3 \times 2^5$

e 2×3^4

f $2^4 \times 5^3$

6 a $3 \times 6^2 + 8^2$

b 172 m^2

7 a 2 and 3

b 2 and 7

c 2 and 3

d 2

e 13

f 2 and 23

g 2, 3 and 7

h 3, 11

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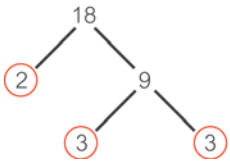
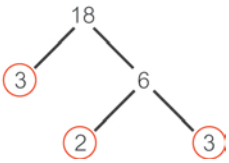
8 a





b 2×3^2

9 a 2^5

b 2×5^2

c $2^2 \times 3 \times 7$

d $2^3 \times 3 \times 5$

e $2^3 \times 5^2$

f $2^2 \times 3^2 \times 5^2$

g 2×13^2

h $2^6 \times 3^2$

10a 6

b 16

c 14

d 10

11 £24

12a 60

b 96

c 140

d 900

13a 126 hours

b 9pm on Saturday

14 a $2 \times 2 \times 3 \times 3 \times 3 \times 5$ or $2^2 \times 3^3 \times 5$

b $2 \times 2 \times 3 \times 3$ or $2^2 \times 3^2$

c Yes, because $540 = 2 \times 2 \times 3 \times 3 \times 3 \times 5 = 36 \times 3 \times 5$, which is a multiple of 36.

d i Yes

ii No

iii Yes

iv Yes

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Unit 1 Answers

1 Check up

Calculating with positive and negative numbers

1 a £1275

b £106.25

2 a 24.44

b 24.95

c 30.22

3 a 400

b 90

c 36

4 a 2 + 4 − 3 = 3

b 48 ÷ 10 = 4.8 or 50 ÷ 10 = 5

c 3 × (7.5 − 1.5) = 18

d 56 ÷ 8 = 7

5 a 8

b −8

c 4

d −6

e −8

f −3

g −11

h 15

Powers and roots

6 a 64

b 48

c 40

d 16

e 2

f 5

7 3.09

8 4 and 5

9 25

10a 1

b 11

c 3

d 3600

e 4

f 9

11 18

12 8 and −8

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Factors and multiples

13 $2^3 \times 3$

14 $3^2 \times 5$

15a 4

b 385

16 8

Challenge

18a Lowers it by 1.8 °C; changes it to −1.8 °C.

b 6 × −1.8 °C = −10.48 °C

c Salt lowers the freezing point, so the water on the road is less likely to freeze.

19a 4

b Answers will vary.

c 2 and 99

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Unit 1 Answers

1 Strengthen

Calculating with positive and negative numbers

1 a 4015
b 3641

2 a 259
b 755
c 8096
d £2845

3 £14 339

4 a 18.43
b 36.73
c 36.64
d 43.16
e 38.25
f 35.56

5 a £27.25
b £326.36

6 a i 10
ii 24
iii 240
b i 160
ii 130
iii 27
iv 40
v 84
vi 350

7 a 180
b 360
c 450
d 300

8 a i 30
ii 8
iii 240
b i 120
ii 2200
iii 600

9 72 litres

10a 40 + 50 = 90
b 200 + 400 = 600
c 6 + 12 = 18

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d 6 + 12 + 20 = 38

e 18 − 11 = 7 or (better) 18.5 − 10.5 = 8 (rounding to nearest 0.5)

f 18 − 11 + 15 = 22 or (better) 18.5 − 10.5 + 15 = 23

g 13 + 7 – 9 = 11

11a 150 ÷ 50 + 11 = 14

b 99 − 30 × 3 = 9

c (30 + 30) ÷ 6 = 10

d 5^2 + 3.5 = 28.5

12a 3 × 4 = 12 m^2

b 10 × 10 = 100 m^2

c 100 − 12 = 88 m^2

13a 5

b 12

c 6

d −7

14a 6

b 24

c −12

d −24

e 70

f −6

15a −9

b −17

c −2

d 10

e −12

f 5

Powers and roots

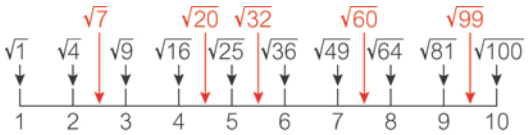
1 a 2^3 = 2 × **2** × **2** = **8**

b $\mathbf{5^3}$ = 5 × 5 × 5 = **125**

c $\mathbf{10^3}$ = 10 × **10** × **10** = **1000**

d $\mathbf{3^3}$ = **3** × **3** × **3** = 27

2 a, b



b ii 7 and 8

iii 4 and 5

iv 9 and 10

v 5 and 6

3 a i $\sqrt[3]{8}$ = 2 because 2^3 = 2 × 2 × 2 = **8**

ii $\sqrt[3]{1000}$ = **10** because 10^3 = **10** × **10** × **10** = 1000

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iii $\sqrt[3]{125}$ = 5 because 5^3 = **125**

iv The cube root of 27 is **3**.

b i 4

ii 6

iii 1

iv 11

4 a i 9

ii 9

b same answer

c The two square roots of 9 are 3 and −3.

d i 4 and −4

ii 10 and −10

iii 13 and −13

5 a i 1600

ii 1600

b same answer

c i 2500

ii 8100

iii 14 400

iv 90 000

v 160 000

vi 640 000

6 b 3

c 5

d 3

e 2

7 a −4

b 20

c 1

d 15

e 32

f 35

g 8

h 2

8 b 5

c 2

d 3

Factors and multiples

1 b 2^6

c 5^5

d 3^4

2 b $2^3 \times 5^3$

c $2 \times 3^2 \times 5^3$

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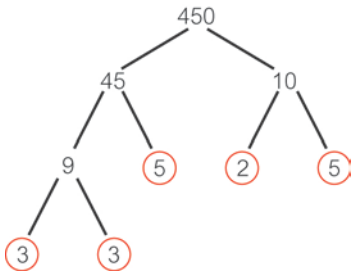
d $2^4 \times 3 \times 11$

e 2×3^5

3 a



b $2 \times 3^2 \times 5^2$

c i $2 \times 5^2 \times 7$

ii $2^2 \times 3 \times 7$

iii 2×7^2

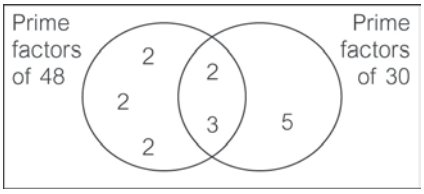
iv $2^3 \times 3^3$

v $3^2 \times 5^2$

4 a i $30 = 2 \times 3 \times 5$

$48 = 2 \times 2 \times 2 \times 2 \times 3$

ii



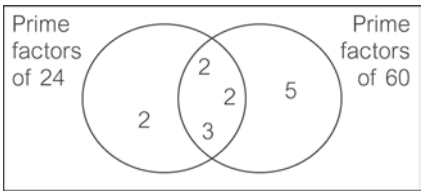
HCF = 6

iii 240

b i $24 = 2 \times 2 \times 2 \times 3$

$16 = 2 \times 2 \times 3 \times 5$

ii



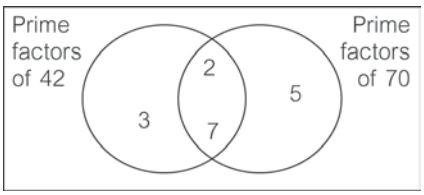
HCF = 12

iii 120

c i $42 = 2 \times 3 \times 7$

$70 = 2 \times 5 \times 7$

ii



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HCF = 14

iii 210

Enrichment

1 **a** 8 23 pm

b 39 minutes

2 Answers will vary, e.g. 255 = 3 × 5 × 17

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Unit 1 Answers

1 Extend

1 a i 0.8
ii 1.2
iii 16
iv 22
v 30
vi 90
b i 15
ii 15
iii 50
iv 24

2 a \$40
b £30

3 4 : 9

4 a 1470
b 2673
c 1133
d 6993
e 118
f 105
g 86
h 594

5 Calculation A is incorrect.

6 side of playground = $\sqrt{115} \approx \sqrt{121} = 11$

side of garden $\approx \sqrt{11} \approx \sqrt{9} = 3$ m

7 a £6715
b £559.58

8 a A = 56 cm, B = 64 cm, C = 60 cm; B has the greatest perimeter.
b A = 196 cm^2, B = 256 cm^2, C = 225 cm^2; A has the smallest area.

9 a, b

Pattern number	Calculation	Estimate
1	1980 × 198	**400 000**
2	1980 × 198 × 19.8	**8 000 000**
3	1980 × 198 × 19.8 × 1.98	**16 000 000**
4	**1980 × 198 × 19.8 × 1.98 × 0.198**	**3 200 000**
5	**1980 × 198 × 19.8 × 1.98 × 0.198 × 0.0198**	**64 000**
6	**1980 × 198 × 19.8 × 1.98 × 0.198 × 0.0198 × 0.00198**	**128**
7	**1980 × 198 × 19.8 × 1.98 × 0.198 × 0.0198 × 0.00198 × 0.000198**	**0.0256**

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10a 1.05 °C

b 1.5 °C (rounding each temperature to the nearest whole number)

c 18.5 °C

11 300 × 2.5 = 750 km

12 0.5(−12 − 32) = −22 °C; calculator check: −24.528 °C

13a 0.01 W/m^2

b 0.0083 W/m^2

14a 4, −8, 16, −32, 64

b 24

c 2^6

15a −23

b −12

c −3

d −10 000

e −3

f 48

16a 11 and −11

b i 12 544

ii 13 824

17a 108 mm^2

b 2700 mm^2

18a i 4

ii 14

b i 315

ii 144

c HCF = $2^2 \times 3^4$ = 324; LCM = $2^3 \times 3^5$ = 1944

19 $3 \times 5 \times 11^2$

20a 18 980 days

b 52 years

c ≈ 99

21 12 floors

22a 2.0736

b 34

c 625

23a 40

b 50

c 110

d 300

e 2000

f 600

24a 8

b 4

c 12

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d 5

e 7

f 12

25a 5

b 10

26 0.28 (2 d.p.)

27a 40 410 080

b 22 871 839

c 23 128 480

28a 9×36

b $\sqrt{9 \times 36} = 3 \times 6 = 18$ m

29a 12

b 20

30a $\sqrt{800} \approx \sqrt{900} = 30$ m

b **i** No, because he rounded the side length of the plot down to 28 m and so will not have enough fencing.

ii $4 \times \sqrt{800}$ m = 113.14 m (2 d.p.), so he should have ordered 114 m.

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Unit 1 Answers

1 Unit test

1 a 10 °C

b i −12 °C

ii 4 °C

c −10

2 a 36

b 7 calculators

3 a −19

b 81

c 5

d 125

e 50

f 20

g 7

h 4

4 8565 tonnes

5 £2.55

6 a i 70

ii 792

iii 90

iv 800

b 16

7 92.73

8 8 and 9

9 a 6

b 45

c 60 seconds

10a $6 \times 6 = 36$ cm^2

b i $3 \times (180 - 100) = 240$

ii $140 \div 7 = 20$

11a 6 and −6

b 4900

c 16

12a 13

b −24

c −2

d 1

e 36

f 72

g −1

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h 50

13a **i** 24

ii $2^3 \times 3$

b $2 \times 3^2 \times 5$

14a 19

b 3

15 122.2 cm

16 1323 mm

17a 126

b 4.8

18a 36

b 15

Challenge

19 Answers will vary.

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Unit 2 Answers

Exercise 2.1

1 **a** 2 squares

b 8 squares

c 9 squares

2 **a** 48 cm

b 120 cm^2

3 **a** **i** Area A = 6 cm^2, Area B = 24 cm^2

ii 2

iii Area A = 3 cm^2, Area B = 12 cm^2

b **i** 30 cm^2

ii half

c e.g. Multiply the base by the perpendicular height and divide by 2.

d $A = \frac{1}{2}bh$

4 **a** 20 cm^2

b 39 cm^2

c 36 cm^2

5 27 000 cm^2 (or 2.7 m^2) of each colour

6 **a** 2.1 m^2

b £321.30

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Unit 2 Answers

Exercise 2.2

1 **a** 15 cm^2

b 120 mm^2

2 **a** 23

b 45

c 56

d 7

3 **a** 20 cm^2

b 6 cm^2

c 32 cm^2

4 **c** 24 squares

d e.g. Multiply the base by the perpendicular height.

e $A = bh$

5 **a** 32 cm^2

b 1875 mm^2

6 **a** 15 cm^2

b 2640 mm^2

7 **a** £170.10

b e.g. It might be ok for some cars, but others are rectangular and most are curved.

8 **a** **i** = 80 cm^2, **ii** = 76 cm^2, **iii** = 96 cm^2, **iv** = 90 cm^2

b Students' own answer. Any shape that has an area of 100 cm^2.

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Unit 2 Answers

Exercise 2.3

1 **a** 1, 8, 27, 64, 125

b 1000

2 **a** 8

b 15

c 25

d 22

3 **a** 8 cm^3

b 27 cm^3

4 **a** 125 cm^3

b 74.088 cm^3

c 1728 mm^3

d 42.875 m^3

5 **a** 18 cm^3

b 30 cm^3

6 **a** area of top = length × width

b volume = area of top × height = length × width × height

7 **a** 105 cm^3

b 152 cm^3

c 0.125 m^3

8 **a** 7 500 000 m^3

b e.g. A lake is unlikely to have vertical sides, so a cuboid is not a good model.

9 **a** cube A = 216 cm^3, cuboid B = 360 cm^3

b shape C = 648 cm^3 (3 cubes) or 864 cm^3 (if interpreted as 4 cubes), shape D = 792 cm^3

10 90 cm^3

11 165 984 cm^3

12 120

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Unit 2 Answers

Exercise 2.4

1 A sphere

B cube

C triangle-based pyramid

D square-based pyramid

E cuboid

F cylinder

G triangular prism

2 **a** 3 faces that are rectangles, 2 faces that are equilateral triangles

b 1 face that is a square, 4 faces that are isosceles (or equilateral) triangles

3 **a** cuboid

b square-based pyramid

4 C, D and F are nets of a square-based pyramid.

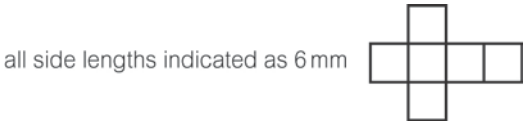
A, B and E are not.

A - triangles not big enough to meet

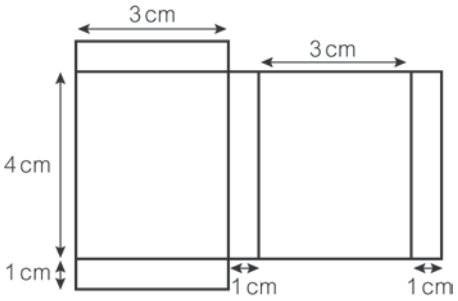
B - the bases of the triangles do not all touch the square

E - two of the bases of the triangles do not touch the square

5 **a** e.g.



b e.g.



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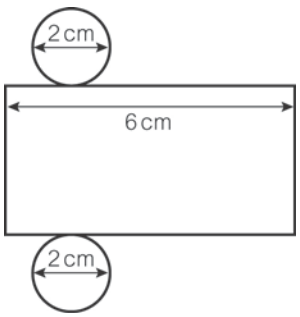

d e.g.

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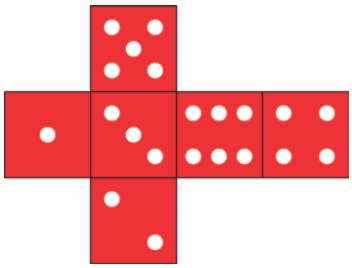
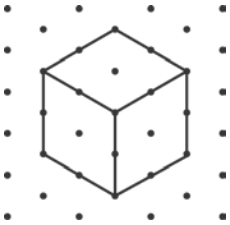
6 e.g.



7 **a**



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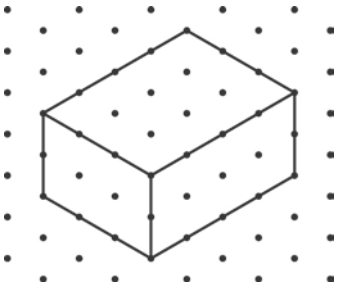
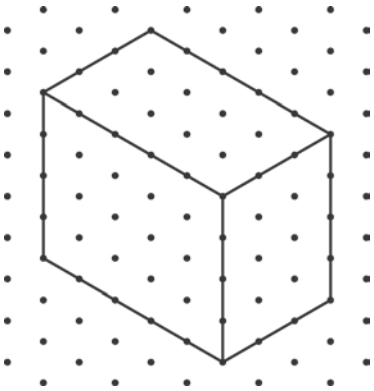


c



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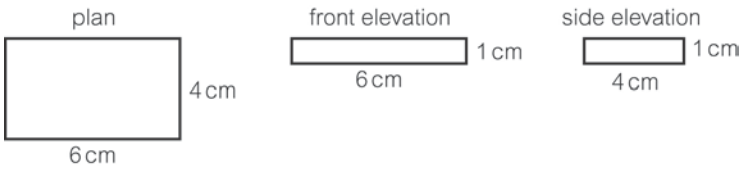
8 a



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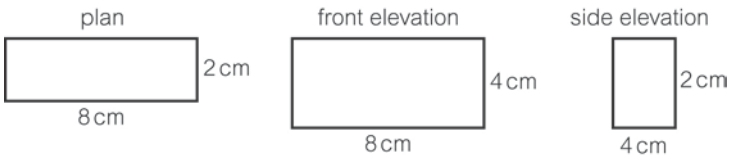

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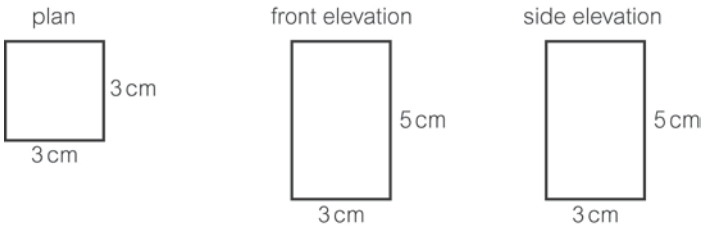

9 a cube, cuboid

b sphere

c triangular prism

d square-based pyramid

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Unit 2 Answers

Exercise 2.5

1 **a** 21.16 cm^2

b 20.08 cm^2

2 **a** e.g. A and I, or F and G, etc

b e.g. A and E, or L and K, etc

c e.g. A and H, or B and L, etc

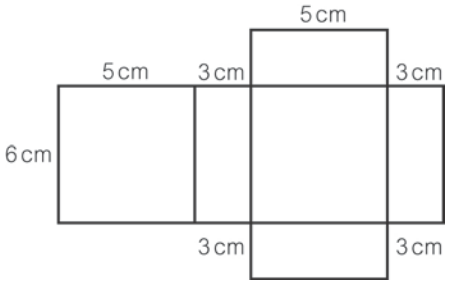
d e.g. A, F and L; or D, E and K; etc

3 **a** 64 cm^2

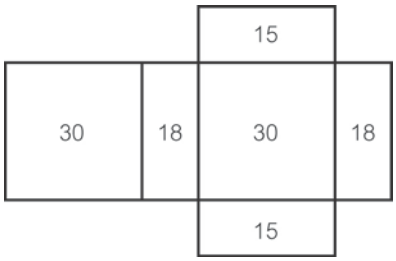
b 384 cm^2

4 2000 cm^2

5 **a**



b All answers are in cm^2



c 126 cm^2

6 **a** x^2

b $6x^2$

7 **a** 112 cm^2

b 190 cm^2

c 26 m^2

d 4298 mm^2

8 **a** 46 200 m^2

b £5 913 600

Check: 50 000 m^2 × £100 = 5 000 000

9 69.24 m^2

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Unit 2 Answers

Exercise 2.6

1 **a** 1 m = 100 cm

b 1 km = 1000 m

c 1 kg = 1000 g

2 **a** 650 cm = 6.5 m

b 4500 ml = 4.5 l

c 0.8 kg = 800 g

3 No. She needs 160 ml of medicine but the bottle only contains 150 ml.

4 **a** 2 litres = 2000 cm^3

b 3.5 litres = 3500 cm^3

c 4200 cm^3 = 4.2 litres

d 750 cm^3 = 0.75 litres

5 120 kg

6 **a** B 2.04

b A 5.25

c B 0.95

7 **a** length 5000cm, width 2500cm, depth 200cm

b 2 500 000 litres

8 **a** 1 cm^2

b 100 mm^2

c 1 cm^2 = 100 mm^2

d 1 m^2 = 10 000 cm^2

9 **a** 8 cm^2 = 8 × 100 = 800 mm^2

b 9.5 m^2 = 9.5 × 10 000 = 95 000 cm^2

c 700 mm^2 = 700 ÷ 100 = 7 cm^2

d 940 mm^2 = 940 ÷ 100 = 9.4 cm^2

e 30 000 cm^2 = 30 000 ÷ 10 000 = 3 m^2

f 420 000 cm^2 = 420 000 ÷ 10 000 = 42 m^2

10 **a** Trapezium

b 32 500 m^2

c No, it should be 3.25 hectares. She has divided 32 500 by 1000 and not 10 000.

11 **a** 8 gallons = 36 litres

b 7 lbs (pounds) = 3.18 kg

c 4 litres = 7 pints

d 15 litres = 3.3 gallons

e 6 kg = 13.2 lbs

f 8 pints = 4.57 litres

12 Yes, 5 × 30 cm = 150 cm = 1.5 m, 1.5 m > 1.4 m

13 Yes, 104 lb × 0.5 = 52 kg, 52 kg < 85 kg

14 Earth to the Sun is approximately 148 800 000 km.

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Mars to the Sun is approximately 227 000 000 km.
Earth is closer to the Sun.

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Unit 2 Answers

2 Check up

Areas of shapes

1 **a** 42 cm^2

b 80 mm^2

c 24 cm^2

2 No, the base of the triangle is 8cm, because half of 8 is 4, then 4 × 4 = 16

3 144 mm^2

4 10.5 cm^2

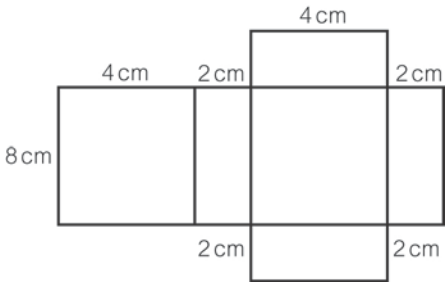
5 40 cm^2

6 **a** He has forgotten the brackets. He needs to add the 9 and 13 first, then halve the total and multiply by 8.

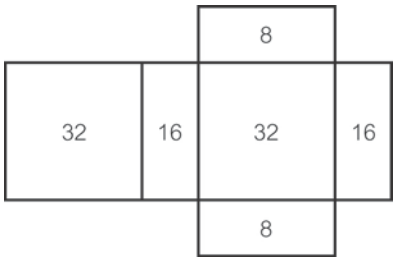
b 88 m^2

Surface area and volume

7 **a**



b All areas are in cm^2



c 112 cm^2

8 54 cm^2

9 1868.5 cm^2

10 3.375 cm^3

11 972 cm^3

12 40

Metric and imperial measures

13 **a** 5 litres = 5000 cm^3

b 2.7 litres = 2700 cm^3

c 3600 cm^3 = 3.6 litres

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d 240 cm^3 = 0.24 litres

14 a 5 kg

b 12.8 km

c 200 gallons

d 4.5 litres

e 3 metres

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Unit 2 Answers

2 Strengthen

Areas of shapes

1 **a** base length = 8 cm; perpendicular height = 6 cm

b base length = 24 mm; perpendicular height = 5 mm

c base length = 4.2 mm; perpendicular height = 6.7 mm

2 **a** 24 cm^2

b 60 mm^2

c 14.07 mm^2

3 area of rectangle = length × width

= 9 × 3

= 27 cm^2

area of triangle = $\frac{1}{2}$ × base × height

= $\frac{1}{2}$ × 9 × 4

= 18 cm^2

total area = area of rectangle + area of triangle

= 27 + 18

= 45 cm^2

4 **a** 42.5 cm^2

b 936 mm^2

5 base length = 9 cm

perpendicular height = 5 cm

area = base × height

= 9 × 5

= 45 cm^2

6 **a** 65.1 cm^2

b 315 mm^2

7 **a** a = 4 cm, b = 6 cm, h = 3 cm

b Area = $\frac{1}{2}(a + b)h$

= $\frac{1}{2}$ × (4 + 6) × 3

= $\frac{1}{2}$ × 10 × 3

= 5 × 3

= 15 cm^2

8 **a** 70 cm^2

b 19.2 m^2

Surface area and volume

1 none

2 area of one face = 7 × 7 = 49 cm^2

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surface area of cube = 6 × 49 = 294 cm^2

3 864 mm^2

4 area of top face = 8 × 5 = 40 cm^2

total surface area = 16 + 16 + 10 + 10 + 40 + 40 = 132 cm^2

5 **a** 358 cm^2

b 920 mm^2

6 **a** 420 cm^3

b 1500 mm^3

7 **a** 2325 cm^2

b 7425 cm^3

Metric and imperial measures

1 **a** 3 litres = 3000 cm^3

b 7 litres = 7000 cm^3

c 4000 cm^3 = 4 litres

d 9000 cm^3 = 9 litres

2 **a** 4.5 litres = 4500 cm^3

b 8.7 litres = 8700 cm^3

c 2600 cm^3 = 2.6 litres

d 840 cm^3 = 0.84 litres

3 **a** 3 feet ≈ 90 cm

b 600 cm ≈ 20 feet

c 2.5 feet ≈ 75 cm

d 4 litres ≈ 7 pints

e 7 pints ≈ 3.5 litres

f 22.5 litres ≈ 5 gallons

g 6.2 gallons ≈ 27.9 litres

4 **a** 7.2 miles ≈ 11.52 km

b 22.4 km ≈ 14 miles

c 11 pounds ≈ 5 kg

d 7.2 kg ≈ 14.4 lb

Enrichment

1 **a** **i** 9 squares

ii each triangle 1 square

iii 5 squares

b 4 × 4 grid

i 16 squares

ii each triangle 1.5 squares

iii 10 squares

5 × 5 grid

i 25 squares

ii each triangle 2 squares

iii 17 squares

c

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Grid size	Base of triangle	Height of triangle	Area of white square
3 × 3	2	1	5
4 × 4	3	1	10
5 × 5	4	1	17

d The sum of the square of the base and the square of the height of the triangle is equal to the area of the white square.

2 a 1500 m

b 90 km

c 90 miles × 1.6 = 144 km. Her car battery may run out as 90 miles is about 144 km and her car can do 140 km. However, she may make it. It depends on how she drives.

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Unit 2 Answers

2 Extend

1 **a** 1.44 cm^2

b 1.2 cm

2 **a** 24 cm^2

b 2 cm

3 2 cm

4 585 mm^2

5 Dave is correct.

area of this trapezium = 10.54 cm^2

area of trapezium with double height = 21.08 cm^2

10.54 × 2 = 21.08

6 Students' own answer, e.g.

2 × 10 ≠ 16

7 2 cm or 20 mm

8 369 cm^2

9 **a** length 150 cm, width 70 cm, height 80 cm

b 630 000 cm^3

c 630 litres

10 **a** No, it will only hold another 936 litres.

b 806 litres

c £565.81

11 163.2 cm^2

12 6016 mm^2

13 73 mm

14 175

15 **a** The first at 140mph (224 km/h)

b The second 190 at litres (42.2 gallons)

16 22 hours and 40 minutes

17 **a** 90 litres

b 2166.75 litres

18 3.5 cm

19 **b** 30 square units

c 15 square units

d $A = \frac{1}{2}(a + b)h$ [or $\frac{1}{2} \times (a + b) \times h$]

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20 64 cm^2

21 base cuboid

area front and back = $2 \times 9 \times 4 = 72$ cm^2

area right and left ends = $2 \times 7 \times 4 = 56$ cm^2

area bottom = $9 \times 7 = 63$ cm^2

area top = $9 \times 4 + 3 \times 3 = 45$ cm^2

top cuboid

area front and back = $2 \times 6 \times 5 = 60$ cm^2

area right and left ends = $2 \times 3 \times 5 = 30$ cm^2

area top = $6 \times 3 = 18$ cm^2

total surface area = 344 cm^2

22 a 140 cm^2

b 162 cm^2

c 294 cm^2

23 a 1.6 cm

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Unit 2 Answers

2 Unit test

1 **a** 9 litres = 9000 cm^3

b 0.8 litres = 800 cm^3

c 12 000 cm^3 = 12 litres

d 950 cm^3 = 0.95 litres

2 216 cm^2

3 172 m^2

4 320 mm^2

5 **a** 60 cm^2

b 8 cm

6 270 cm^2

7 **a** 850 mm^2

b 6 m^2

8 **a** 105 cm^2

b 230 mm^2

9 5250 mm^3

10 **a** 1 foot (ft) ≈ 30 cm

b 1 mile ≈ 1.6 km

c 1 pound (lb) ≈ 0.5 kg

d 1 pint ≈ 0.5 litres

e 1 gallon ≈ 4.5 litres

11 about 19.2 km

12 about 2 litres

13 Volume = 320 cm^3, surface area = 352 cm^2

14 46.656 cm^3

15 519.86 cm^2

16 7875 litres

17 15 mm

Challenge

18 **a** 160

b 10240 cm^3

c e.g. 60 cm by 15 cm by 48 cm. There are many options.

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Unit 3 Answers

Exercise 3.1

1 Students' own accurate drawings

2 **a** 90

b 60

c 90

d 108

3 **a** Spanish; it is the biggest proportion of the pie chart.

b **i** $\frac{1}{2}$

ii $\frac{1}{4}$

iii $\frac{1}{8}$

iv $\frac{1}{8}$

c 140 Spanish, 70 German, 35 French, 35 Mandarin

4 **a** 600 g

b $\frac{6}{100} = \frac{3}{50}$

c £240

5 **a** **i** 180°

ii 36°

iii 72°

b

6 **a** 90

b 90 students is 360°, so one student is 360° ÷ 90 = 4°

c cricket 144°, tennis 96°, rounders 120°.

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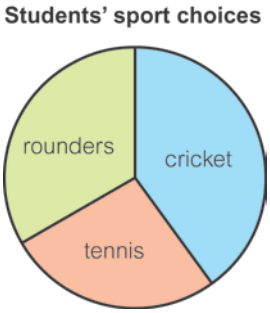
d



7 a

b i $3 \leqslant d < 6$ miles

ii 6 miles

iii 9 miles

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Unit 3 Answers

Exercise 3.2

1 **a** 32

b 25

c 2

d 4

2 1.55

3 **a** 5

b 6

c 3.45

4 Mean is 3070 ÷ 97 = 31.65, or 31 rounded down to a whole number
Mode is 32
So the label is accurate if they are using the mode; but strictly speaking if they are using the mean, they should say 31.

5 **a** 42

b 24

c 96

d $\frac{24}{96} = \frac{1}{4}$

6 **a**

	Beginners	Intermediate	Advanced	Total
Men	33	36	21	90
Women	32	40	38	110
Total	65	76	59	200

b 21

c 57

d advanced

e 19%

7 **a** **i** sandwiches

ii cakes

b fish and chips

c He should cut salads as they make the lowest profit on Sundays.

8 **a** $2 \leq l < 4$

b

Length, l cm	Tally	Frequency
$0 \leq l < 2$		0
$2 \leq l < 4$	IIII	4
$4 \leq l < 6$	~~IIII~~ II	7
$6 \leq l < 8$	~~IIII~~	5

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c $4 \leq l < 6$

9 Students' own answers; must have between 3 and 5 classes of equal spread.

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Unit 3 Answers

Exercise 3.3

1 No; the median will be the 5.5th value (halfway between the 5th and 6th).

2 **a** **i** 9

ii 18

b **i** 5th

ii 9.5th

c **i** 8

ii 10.5

3 **a**

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

Key: 5 | 2 means 52 visitors

b **i** 21

ii 13

iii 76%

4 **a** 155 and 165 cm

b 174 – 146 = 28 cm

c 162.5 cm

5 Before special offer, median = £2.95 and mean = £2.72
After special offer, median = £3.30 and mean = £3.04
So no, it has not increased the average spend by £1.

6 **a** Most of the composition scores are between 30 and 39.

b **i** median = 33.5 range = 26

ii median = 44.5 range = 29

c e.g. The median score for transcription is higher than the median score for composition.
The range for composition is lower than the range for transcription.

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Unit 3 Answers

Exercise 3.4

1 a i Business A = £8636.50, Business B = £9258.25

ii Business A = £9551, Business B = £1874

b e.g. Business A has a lower mean than Business B.
Business A has a much greater range of quarterly profit, whereas Business B's profits are more even throughout the year.

c Business A; its profits are much higher in April to September than in the colder months.

2 a blue

b i week 4 and 12 (175 marks)

ii week 7 (5 marks)

c No, she is not correct; some losing scores are higher than winning ones e.g. week 7 losing is higher than week 3 winning.

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

b Between 6 and $6\frac{1}{2}$ (77.5th value)

c Order most of $6\frac{1}{2}$, use the mode

4 a Alex

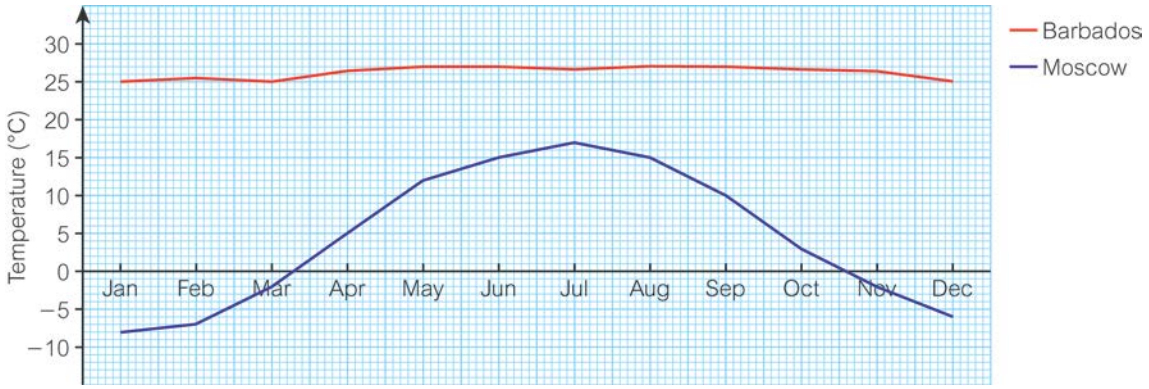
b Alex = 4.66 m, Dan = 5.09

c Alex = 5.23 m, Dan = 5.10 m

d median

e It did not affect the median because the median comes only from the middle value(s), and the 3rd jump was not one of these; it was the lowest value, but exactly how low makes no difference to the median.

5 a



b Students' own answers, comparing temperature ranges and values

6 a i Loxley Dental surgery

ii Deerfield Dental surgery

b i Deerfield Dental surgery

ii Loxley Dental surgery

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7 **a** £75 000

b **i** £28 175

ii £21 350

c 6

d 4

e median

f **i** mean

ii median

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Unit 3 Answers

Exercise 3.5

1 Students' own graphs, with scales of e.g. up to 30 on the x-axis and up to 25 on the y-axis

2 **a** 14

b 10

c more

3 **a** no correlation

b negative correlation

c Class size and maths scores do not appear to be related.

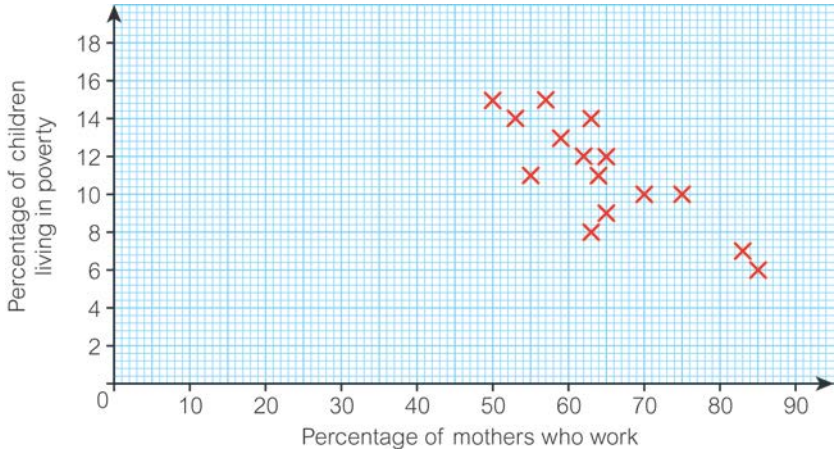
d As laptops get older, their value/price falls/decreases.

4 **a** negative correlation

b (50, 5); it is an outlier – a long way from all the other points.

c Yes; as alcoholic handrub use increases, the number of patient infections falls.

5 **a**



b negative correlation

c e.g. As the proportion of mothers who work increases, the proportion of children living in poverty falls/decreases.

6 Lucy's is best; it has the same number of points on either side and it follows the shape of the data.

7

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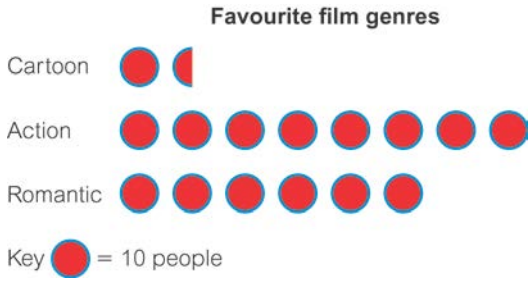
Unit 3 Answers

Exercise 3.6

1 **a** No; more people said that action films were their favourite (80 people) than romantic films (60 people).

b She has used different symbols, of different sizes, representing different quantities.

c



2 **a** The scale doubles for every square of graph paper, rather than going up by the same amount each time.

b Students' own answers

c the graph drawn in part **b**

3 **a** graph 1

b graph 2

c £700

d 12%

4 **a** the second graph

b the first graph

5 Students' own reasons, e.g.

The percentages do not add up to 100%.

The 40% sector looks far smaller than 40%

The pie chart has no title

The pie chart has no key

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Unit 3 Answers

3 Check up

Averages and range

1 a 2 merit points

b 4 merit points

c 1.83 (to 2 d.p.)

2 a e.g. Ali's mean was higher than Hetty's, so he got more merit points on average. Hetty's range was smaller than Ali's, so her numbers of points were more consistent.

b Hetty; her results are more consistent and her mean is not much lower than Ali's.

Tables

3 a 55

b 30

c

	Under 18s	18-40 years	Over 40	Total
Male	10	30	55	95
Female	30	38	37	105
Total	40	68	92	200

d 92

e 20%

4 a 41

b $40 \leq w < 50$

c 60 − 0 = 60 g

d No; the frequency of the $30 \leq w < 40$ class will increase to 14, but the frequency of the $40 \leq w < 50$ class will increase to 16, so the modal class will still be $40 \leq w < 50$.

Charts and graphs

5 a silver

b Yes; the silver sector is more than half, which is therefore larger than all the others put together.

c 72

6

7 a 26

b 52

c 59

d 53

e 4

8 a positive correlation

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b higher/better

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Unit 3 Answers

3 Strengthen

Averages and range

1 a 2 children

b 5 children

c 1 + 3 + 5 + 2 + 3 + 2 + 0 + 2 + 2 +3 = 23

d 2.3

2 a 3

b 5

c 24

d 2 children

e 4

f

Number of children	Frequency	Total number of children
0	3	0 × 3 = 0
1	6	1 × 6 = 6
2	10	2 × 10 = 20
3	4	3 × 4 = 12
4	1	4 × 1 = 4
	Total number of families 24	**Total number of children** 42

g 1.75

3 a Flo

b Flo

c Flo 1, Jim 10

d smaller

e Students' own answers, with sensible explanation

4 a i median 7, range 9

ii median 7, range 2

b The median marks for Pat and Sam are the same.

c The range of Pat's marks is greater than the range of Sam's marks, so Sam's marks are more consistent.

d Sam; his marks show that he has a fairly good understanding of all the different topics.

Tables

1 a 13

b 12

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c, f

	Flute	Violin	Trumpet	Total
Year 8	13	10	6	29
Year 9	12	8	4	24
Total	25	18	10	53

d 6 students in Year 8 play the trumpet

e 18 students in Years 8 and 9 play the violin

g 4

h 53

2 a

	Male	Female	Total
Rabbit	4	6	10
Cat	5	8	13
Dog	6	7	13
Total	15	21	36

b 13

c 36

d $\frac{13}{36}$

e $\frac{6}{36} = \frac{1}{6}$

f Yes; there were 13 cats and 13 dogs.

3 e.g.

	Margherita	Pepperoni	Four cheese	Total
9"				
12"				
Total				

4 6 km, 6.5 km, 9 km, 5 km

5 a Masses that are greater than or equal to 10 kg, but less than 12 kg.

b

Mass, m (kg)	Tally	Frequency
$10 \leq m < 12$	III	3
$12 \leq m < 14$	I	1
$14 \leq m < 16$	IIII	4
$16 \leq m < 18$	II	2

c $14 \leq m < 16$ kg

Charts and graphs

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

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b $\frac{1}{4}$

c $\frac{1}{8}$

d $\frac{1}{8}$

e $\frac{3}{4}$

2 a 80

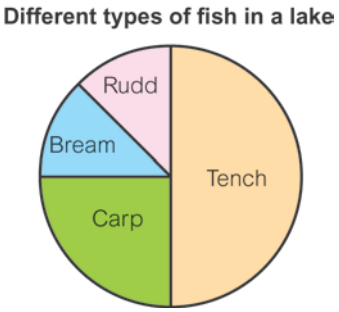
b $\frac{20}{80} = \frac{1}{4}$

c i $\frac{10}{80} = \frac{1}{8}$

ii $\frac{40}{80} = \frac{1}{2}$

iii $\frac{10}{80} = \frac{1}{8}$

d



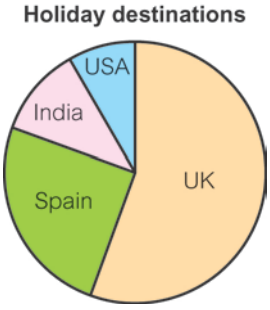
3 a 2°

b 2° for 1 person

200° for 100 people

c 90°, 60 °, 30°

d



4 a

	Number on middle counter	(number of counters + 1) ÷ 2
① ② ③ ④ ⑤	3	(5 + 1) ÷ 2 = 6 ÷ 2 = 3
① ② ③ ④ ⑤ ⑥ ⑦	4	(7 + 1) ÷ 2 = 8 ÷ 2 = 4
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪	6	(11 + 1) ÷ 2 = 12 ÷ 2 = 6

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b (25 + 1) ÷ 2 = 26 ÷ 2 = 13

5 a age 40

b 5

c 22

d age 51

e 25

f 13

g 51

6 A positive correlation

B negative correlation

C positive correlation

D no correlation

E negative correlation

Enrichment

1 a 365

b 54

c 880

d 12%

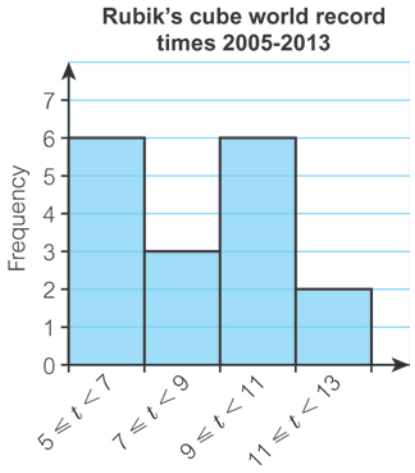
e No; 15% of the boys are left-handed.

2 a 5.55 seconds

b

Time, *t* (seconds)	Tally	Frequency
$5 \leq t < 7$	𝍸 I	6
$7 \leq t < 9$	III	3
$9 \leq t < 11$	𝍸 I	6
$11 \leq t < 13$	II	2

c



d 9

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Unit 3 Answers

3 Extend

1 a e.g.

	Comedy	Musical	Drama	Other	Total
Under 16					
16–25					
26–45					
Over 45					
Total					

b modal class for age, mode of theatre choices, median class for age

2 a 288

b 800

c 450

d 990

3 101cm (using e.g. 100 cm as assumed mean)

4 a 500

b 498.75

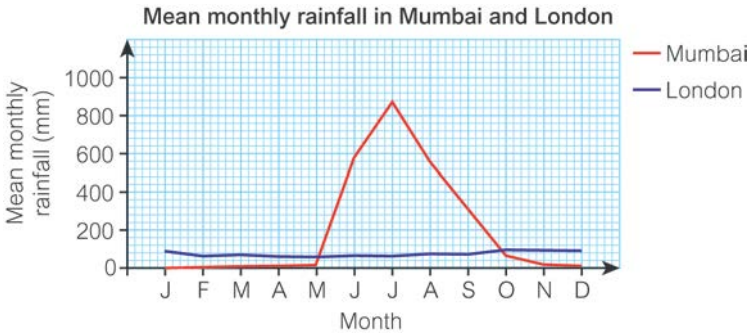
c 502

d The mean best represents the data; the mode is too high – 10 of the 16 data values are lower than the modal value.

5 a 20

b Yes, she is correct; 20 year 8 students and 22 year 9 students go home for lunch.
(Working: $\frac{36}{360} = \frac{1}{10}$; $\frac{1}{10} \times 220 = 22$)

6 a



b 8

c Huge increase, maximum in July.

d Mumbai: mean 200.1 mm, range 868.2 mm

London: mean 71.2 mm (1 d.p.), range 33.3 mm

e.g. The mean monthy rainfall in Mumbai is nearly three times higher than in London.
The range for rainfall in Mumbai is much greater than for London – the rainfall in London is a lot more consistent/less variable, whereas the rainfall in Mumbai is more extreme.

7 a Students' own answers; three sentences including, e.g.

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The percentage of visitors going to wildlife parks and zoos more than doubled.
The percentage going to theme parks increased slightly.
The percentage visiting houses and monuments remained the same.
The percentage visiting museums and gardens fell by about a quarter.

b Although the percentage is larger in 1981, this might represent fewer people than in 1999 (i.e. if the overall visitor numbers were higher in 1999); we are not told how many people each pie chart represents, so we cannot work out the numbers of visitors to compare them.

8 a 15 minutes, 4.25 seconds

b Men's mean 13:43.57 seconds is less than mean time for women 15:09.10 seconds.
The men were faster, on average.
Men's range is 3.71 seconds, which is smaller than the women's 13.63 seconds – the men's times were all closer together, and less varied.

9 a

1	25, 37, 96
2	00, 56, 94
3	16, 27, 58, 67, 76, 82
4	12, 20, 46, 64, 88, 96
5	17, 34, 62, 78, 84
6	27

Key: 1|25 means 125 pages

b 24

c 25%

d

Number of pages, p	Frequency
$100 \leq p < 200$	3
$200 \leq p < 300$	3
$300 \leq p < 400$	6
$400 \leq p < 500$	6
$500 \leq p < 600$	5
$600 \leq p < 700$	1

e i 397

ii 394.25

iii 502

iv $300 \leq p < 400$ and $400 \leq p < 500$ pages

10a positive correlation

b As the temperature increases, the length of the bar increases.

c i answers near to 10.02 m

ii answers near to 10.07 m

d 0.05 m

11 a, b

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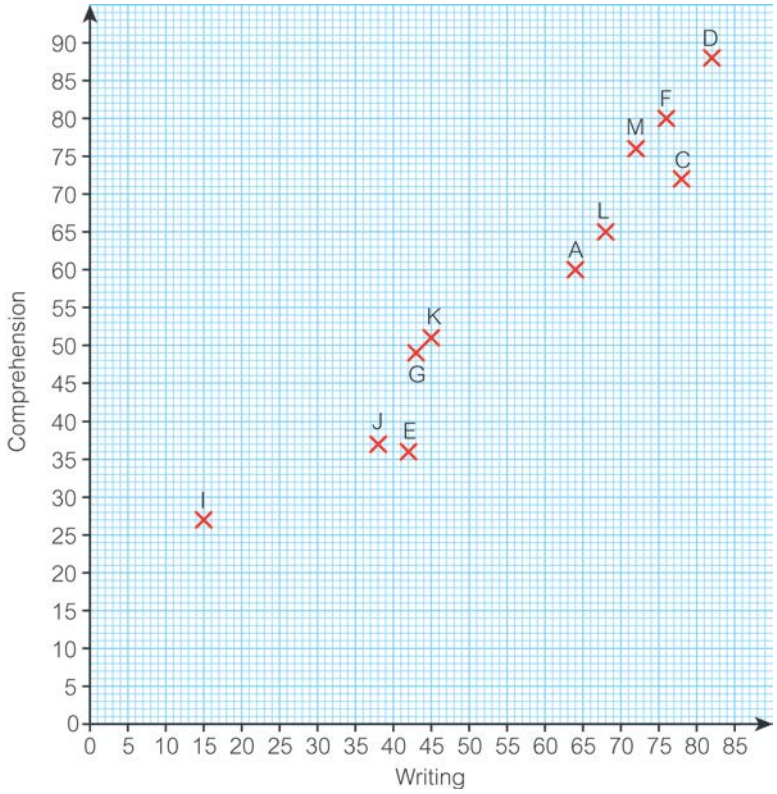

c Positive correlation. Students with higher writing marks tend to get higher comprehension marks.

d Values need to be read from graph when it is drawn.

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Unit 3 Answers

3 Unit test

1 a 36

b 9

c 6

2 a 5 items

b 2 items

c 2.3 (1 d.p.)

3 a Students' own answers, e.g.

The Smith family have a higher mean and median, so they spend more on average.
The Smith family also have a higher range, so the amount they spend each week varies more, whereas the Jones family have a smaller range, so their spending is more consistent.

b They are unlikely to spend exactly the same amount twice.

4

5 a mean £153.48 (nearest penny), median £118.95, no mode

b Median; the mean is higher than four of the five prices.

6

Mass, m (g)	Tally	Frequency
$45 \leq m < 50$	II	2
$50 \leq m < 55$		0
$55 \leq m < 60$	~~IIII~~	5
$60 \leq m < 65$	III	3

7 a 3.8 seconds

b 12.9 seconds

8 a negative correlation

b The price of a car decreases as it gets older.

c Draw a line of best fit and read the price on the y-axis when the age on the x-axis is 7 years.

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Unit 4 Answers

Exercise 4.1

1 a 2^5

b $2^3 \times 10^2$

c $3^3 \times 10$

d $5^2 \times 10^3$

2 a $4p$

b $6v$

c $3x + 3y$

d $5u + 3$

e $4t + 4s + 5$

f $2st$

g $12pq$

h $24bcd$

3 a d^2

b m^3

c c^4

d t^6

4 a $n \times n \times n$

b $x \times x$

c $w \times w \times w \times w \times w$

d $u \times u \times u \times u \times u \times u \times u \times u \times u \times u$

e $10 \times 10 \times 10 \times 10$

f $2 \times 2 \times 2 \times 2 \times 2 \times 2$

5 a $3f^2$

b $7e^3$

c $30n^4$

d c^3d^2

e mn^2

f r^3s^2

g $24m^2n^2$

h $24e^3fg^2$

6 a

n	1	3	4	**7**	9	**11**	**12**	**30**
$2n$	**2**	**6**	**8**	**14**	**18**	**22**	24	60
n^2	**1**	**9**	**16**	49	**81**	121	**144**	**900**

b Yes; $2n$ means $2 \times n$ and n^2 means $n \times n$.

c Not in the table, but $2n = n^2$ when $n = 2$.

7 a s^2

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b i $10s^2$

ii ns^2

iii $2ns^2$

c i $50s^2$

ii $10ns^2$

d i 36 000 cm^2

ii 405 000 cm^2

8 a A = $15m^2$ B = $8a^3$ C = $6t^3$

b 384 cm^3

9 a 4 983 576 ≈ 5 000 000

b 18 447 ≈ 18 500

10a $3a^2$

b $5m^3$

c $2a^2 + 3b^2$

d $2e^2 + e^4$

e $2y^3 + 2y^5$

f $3a^3$

g $9p + 8p^2$

h $6b^3 + 8h^2$

11a p^7

b k^5

c a^6

d $3m^5$

e $4c^4$

f $10e^5$

g $18s^3$

h $10g^2$

12a e^5

b a^5

c $3d^3$

d $8m$

e $4t^3$

f 6

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Unit 4 Answers

Exercise 4.2

1 a $a + 2$

b $s + 6$

c $2m$

d $e - 4$

2 a $7a + 4b$

b $7p + 3$

c $-3m$

d $-4d + 2$

3 a $2m - 14$

b $15s + 6$

c $6h + 6$

d $12e - 1$

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

b $8 \div d$

c $\frac{2e}{3}$

d $(u - 3) \div 3$

5 a $t + f$

b $n(t + f) = nt + nf$

6 a $m - 3$

b $8(m - 3) = 8m - 24$

7 a $T = 3x + 2$

b $T = 8x + 3$

c $T = 2(3x + 2) = 6x + 4$

d $T = 3(8x + 3) = 24x + 9$

e $T = 2(3x + 2) + 3(8x + 3) = 30x + 13$

8 a i $\frac{x}{100}$ or $x \div 100$

ii $\frac{3x}{100}$ or $3x \div 100$

b $\frac{600}{d}$ or $600 \div d$

9 a $-6c + 15$

b $-8t - 6$

c $-10 + 5s$

d $10 + 10x$

e $-y - 2$

f $-3m + 5$

10a $4 - 2c$

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b $4 - 2b$

c $15 - 3n$

d $5f + 6$

e $7u + 2$

f $p + 6$

g $4b + 14$

h $3i - 15$

11a $v - 50$

b $2000 - 8(v - 50)$

c $2400 - 8v$

d 400 ml

12a $p^2 + 4p$

b $3d^2 - 6d$

c $8a^2 + 12a$

d $-6g + 10g^2$

e $3m^2 + m$

f $11d^2 - 12d$

g $2s^2 + 14s - 6$

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Unit 4 Answers

Exercise 4.3

1 **a** $6a = \mathbf{3} \times 2a$

b $12p = \mathbf{4} \times 3p$

c $18u = 6 \times \mathbf{3}u$

d $100i = 4 \times \mathbf{25}i$

e $-8m = \mathbf{-2} \times 4m$

f $-14w = 7 \times \mathbf{-2}w$

2 **a** 3

b 4

c 10

d 6

3 **a** 2

b 5

c 7

d 3

e 2

f p

4 **a** $12 + 15m = 3(\mathbf{4} + 5m)$

b $8 + 10c = 2(\mathbf{4} + 5c)$

c $14 - 21a = 7(\mathbf{2} - \mathbf{3}a)$

d $6 + 9w = \mathbf{3}(2 + 3w)$

e $20h - 10 = 10(\mathbf{2}h - \mathbf{1})$

f $12n + 6 = 6(\mathbf{2}\boldsymbol{n} + \mathbf{1})$

g $5a - 10 = \mathbf{5}(\boldsymbol{a} - \mathbf{2})$

h $14u + 7v = \mathbf{7}(\mathbf{2}\boldsymbol{u} + \boldsymbol{v})$

5 **a** $5(3 + 2h)$

b $3(i + 2)$

c $2(2c - 5)$

d $2(3m - 4)$

e $7(d + 1)$

f $2(m - 1)$

g $3(s - 3t)$

h $5(1 + k)$

6 $5(e - 7)$

7 **a** 6

b 10

c 4

d 9

e 4

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f 8

g 15

8 **a** $4(3 + 4h)$

b $15(2m - 1)$

c $6(s + 3)$

d $20(m - 5)$

e $9(3p + 4)$

f $4(2c + 3d)$

g $15(k - 3t)$

h $12(2r + 3s)$

i $40(n - 3p)$

9 **a** $p(2 + p)$

b $g(g - 1)$

c $h(1 + h)$

d $m(1 - 3m)$

e $2d(2 + 3d)$

f $3v(4v - 3)$

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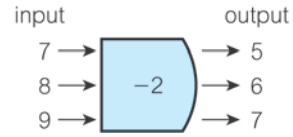
Unit 4 Answers

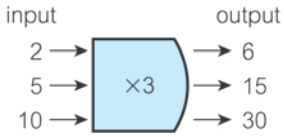
Exercise 4.4

1

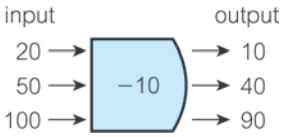
a



b



c



2 a i +

ii −

b i −

ii −

c i ÷

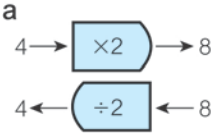
ii ÷

d i ×

ii ÷

3

a



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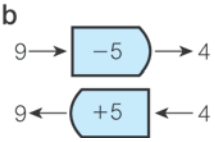

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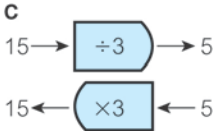
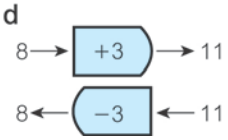
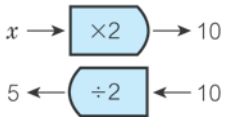


d

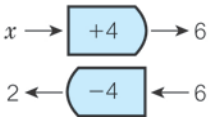


4

a



b



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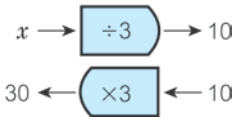

5 a $x = 5$

b $b = 9$

c $u = 14$

d $m = 12$

e $g = 4$

f $a = 6$

6 a 4

b 12

c 11

d 6

e 220

7 a $a = 4$

b $d = 0$

c $e = -2$

d $n = -5$

e $r = 6$

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f $h = -1.5$

8 a $t + 12$

b $t + 12 = 122$

c $t = 110$, so the original length was 110 characters.

9 a $3h = 12$

b $h = 4$, so a pair of hiking socks costs £4.

10a $\frac{j}{8} = 150$ or $j \div 8 = 150$

b $j = 1200$, so the total volume is 1200 ml.

11a $m - 12 = 35$

b $m = 47$, so the original collection was 47 CDs.

12a $5d = 20$, $d = 4$

b $10a = 60$, $a = 6$

c $8c = 16$, $c = 2$

d $4g = 18$, $g = 4.5$

13a $6x = 24$, $x = 4$

b $8y = 40$, $y = 5$

c $6a = 180°$, $a = 30°$

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Unit 4 Answers

Exercise 4.5

1 a 9, 23

b 2, 9

c 0, 15, 30

2 a 26

b 4

c 28

3 a −5, ÷2

b +1, ×4,

c −5, ÷10

4 a $x = 7$

b $b = 10$

c $n = 7$

d $d = 7$

e $w = -4$

f $u = -6$

g $k = 8$

h $h = 1.8$

i $m = 5$

5 a $2n + 3 = 15$

b $n = 6$

6 a $7f + 2$

b $7f + 2 = 30$

c $f = 4$, so a rocket costs £4.

7 a $12c + 2 = 38$

b $c = 3$, so the length of a plank is 3 m.

8 a $5d + 8 = 23$, $d = 3$

b $6p + 4 = 28$, $p = 4$

c $8a + 2 = 18$, $a = 2$

d $7b - 6 = 22$, $b = 4$

e $2m + 6 = 8$, $m = 1$

f $10s - 5 = 25$, $s = 3$

g $6w + 4 = 16$, $w = 2$

h $20h - 12 = 48$, $h = 3$

i $2 + 6t = 32$, $t = 5$

j $3n + 7 = 16$, $n = 3$

k $7g - 8 = 34$, $g = 6$

l $8u + 25 = 65$, $u = 5$

9 a i $6(a + 5)$

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ii $6(a + 5) = 48$, $a = 3$

iii 8 m

b **i** $7b$

ii $9(b + 2) - 7b = 2b + 18$

iii $2b + 18 = 26$, $b = 4$

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Unit 4 Answers

Exercise 4.6

1 **a** $8c + 3$

b $5z + 15$

c $4k - 12$

d $6t$

e $11r + 4$

f $3p + 14$

2 **a** $m = 2$

b $d = 13$

c $a = 7$

d $k = 4$

e $g = -3$

f $n = 24$

g $t = 30$

h $d = 3$

i $p = -8$

3 $180 = 20n$, $n = 9$, so 9 pencils can be bought.

4 **a** $m = 3$

b $t = 6$

c $k = 20$

d $h = 7$

e $w = 9$

f $p = 4$

5 **a** **i** $50 = 6x + 8$

ii $x = 7$, so there are 7 carriages.

b **i** 7

ii $20 = 6x + 8$, $x = 2$

c 8 m, the engine, the number 8

d x carriages of length 6 m

6 **a** $x = 2$

b $u = 4$

c $m = 8$

d $c = 5$

e $d = 2$

f $6n + 9 = 2n + 21$, $n = 3$

g $10s - 2 = 4s + 28$, $s = 5$

h $6v + 2 = 5v + 10$, $v = 8$

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Unit 4 Answers

4 Check up

Powers, expressions and formulae

1 a m^4

b $b \times b \times b \times b \times b \times b$

c i a^3c^2

ii $24n^3$

2 337.5 cm^2

3 a w^5

b y^3

c $12g^6$

d c^4

e v^2

f $5e$

4 a $4s^2$

b $3a^2 + 3b^2$

c $6p^3 + 3p$

5 a $A = 10a^2$

b $A = 160$ cm^2

6 a $A = 6b^2$, $B = 27s^3$, $C = 15k^3$

b 405 cm^3

7 a $V = w \div 15$ or $V = \frac{w}{15}$

b $V = 30$ ml

c $V = w \div n$ or $V = \frac{w}{n}$

8 $120 \div n$ or $\frac{120}{n}$

Brackets

9 a $2m + 2n$

b $2b^2 - 6b$

c $-8t - 20$

d $3u + 6$

e $2r - 8$

f $4c^2 + 2c$

10a 4

b $4(2n + 3m)$

11a $8(s - 1)$

b $4(3 + m)$

c $3(h + 3)$

d $50(2 - t)$

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e $9(6p + 2r)$

f $6(5j - 7q)$

g $k(1 - k)$

h $4v(4v - 1)$

i $5a(3a + 5)$

Equations

12a $h = 19$

b $w = 20$

c $m = -6$

d $a = 6$

e $d = 1$

f $r = 5$

g $c = 4$

h $x = 7$

i $n = \frac{1}{2}$

13 $t = 10$ seconds

14a $x = 1$

b $x = 5$

c $x = 2$

15a $5(n + 2)0$

b $5n + 100 = 125$, $n = 5$, so a nut weighs 5 g.

Challenge

17a $2x + 2$

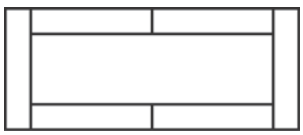
b $8x + 2$

c **i** $6x + 4$

ii $6x - 4$

iii $12x$

Alternative diagram:



Same answers

d **i** $8x + 4$

ii $8x - 4$

iii $16x$

e $P = 2n$, where n = number of slabs, P m = perimeter

f $8x - 4 = 8$, $x = 1.5$, so the length of a slab is 1.5 m.

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Unit 4 Answers

4 Strengthen

Powers, expressions and formulae

1 a $4c$

b c^4

c $3h$

d h^3

e m^5

f $5m$

2 a $3c^2$

b $2m^3$

c $5n^2$

d $5a^2 + 4b^2$

e $2u^2 + 7w^3$

f $2n^5 + d^2$

g $2a^2 + 4a$

h $3g^2 + 2g^3$

3 a $u \times u \times u \times u \times u$

b $a \times a$

c $d \times d \times d$

4 a $4t^2$

b $5a^3$

c $2g^5$

d $6e^2$

e $10m^3$

f $8n^2$

g $12d^3$

h $-15t^2$

5 a e^3d^2

b s^2t^3

c e^2f

d p^4q

6 a $4d^8$

b $3p^3$

c $-10n^4$

d $6g^2n^2$

7 a i $m^2 = \boldsymbol{m} \times \boldsymbol{m}$

ii $m^3 = \boldsymbol{m} \times \boldsymbol{m} \times \boldsymbol{m}$

iii $m^2 \times m^3 = m^{\mathbf{2+3}} = m^{\mathbf{5}}$

b i $b^3 = \boldsymbol{b} \times \boldsymbol{b} \times \boldsymbol{b}$

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ii $b^4 = \boldsymbol{b} \times \boldsymbol{b} \times \boldsymbol{b} \times \boldsymbol{b}$

iii $b^3 \times b^4 = b^{\mathbf{3+4}} = b^{\mathbf{7}}$

c a^4

d c^6

8 a $m^{7-4} = m^3$

b h^4

c $3s^2$

d $7m^3$

Brackets

1 b $-12d - 6$

c $-2n - 6$

d $-12c + 8$

e $-10p + 15q$

2 a $8a + 11$

b $14m - 3$

c $2c + 4$

d $2n - 10$

e $4t - 6$

f $5m + 6$

3 a $a \times \boldsymbol{b} + a \times \mathbf{2} = a\boldsymbol{b} + \mathbf{2}a$

b $u \times v + u \times 4 = uv + 4u$

c $m \times \boldsymbol{n} + m \times \mathbf{3}\boldsymbol{p} = m\boldsymbol{n} + 3\boldsymbol{mp}$

d $g \times 5h + g \times d = 5gh + dg$

e $2e \times \mathbf{3}\boldsymbol{f} + 2e \times \boldsymbol{-g} = 6\boldsymbol{ef} - 2\boldsymbol{eg}$

f $4t \times 2u + 4t \times -3w = 8tu - 12tw$

4 a $a^2 + 5a$

b $3p^2 - 12p$

c $6d^2 + 9d$

5 a $4(2a - 3b)$

b $5(m + 2)$

c $7(p - q)$

d $3(w - 4t)$

e $2(5p + 2k)$

f $4(3r + 4s)$

g $10(t - 2u)$

h $12(2a + 3b)$

6 a $3m(2m + 5)$

b $2a(2a - 3)$

c $7u(u + 2)$

d $8d(2d - 3)$

Equations

1 a $x = 5$

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b $x = 8$

c $x = 4$

d $x = 15$

2 a $x = 8$

b $x = 9$

c $a = 5$

d $c = 6$

e $p = 3$

f $t = 6$

g $m = 14$

h $e = 12$

3 a $x = 4$

b $y = 4$

c $a = 5$

d $c = 3$

e $t = 3$

f $d = 3$

4 a $s = 4$

b $r = 3$

c $p = 2$

d $f = 2$

5 a $g = 2$

b $v = 3$

c $n = 10$

d $h = 0$

Enrichment

1 a $10n$

b $5n + 30$

c i $5n + 30 = 10n$

ii $n = 6$, so they live on the 6th floor.

2 a 80 miles

b $60 = 20x$, $x = 3$, so it used 3 gallons.

c i A(4, 80), B(2, 40), C(3 60)

ii A

iii C; it represents 3 gallons and 60 miles, or $60 = 20x$ when $x = 3$.

d miles per gallon

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Unit 4 Answers

4 Extend

1 25 m

2 **a** $12h = 60$, $h = 5$

b $8x = 24$, $x = 3$

c $\frac{1}{2} \times 10h = 30$, $h = 6$

d $\frac{1}{2}(5 + 3)h = 48$, $h = 12$

3 **a** **i** $110 = 20x + 30$

ii $x = 4$, so the repair took 4 hours.

b **i** A (110, 4) represents 4 hours costing £110, as in part **a**.

ii $20x + 30 = 60$

c 20x + 30 = 115, x = 4.25, so the repair takes 4 hours 15 mins.

d £30 call-out fee

e £20 hourly rate

4 **a** **i** £10 cost of one umbrella

ii £5 postage and packing

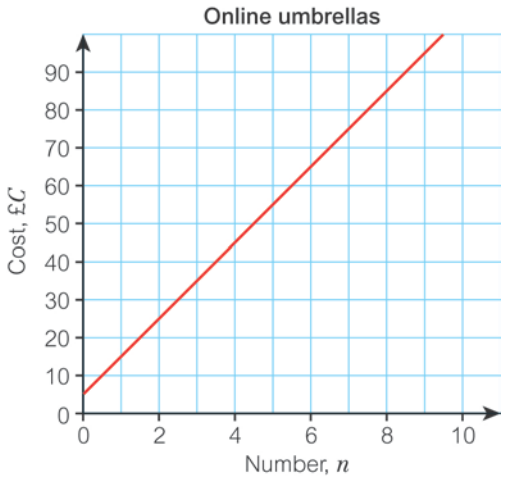
b **i** $35 = 10n + 5$

ii $n = 3$, so he ordered 3 umbrellas.

c **i**

n	0	2	4	6	8
C	**5**	**25**	**45**	**65**	**85**

ii



d **i** See graph.

ii (3, 35) represents 3 umbrellas costing £35 in total, as in part **b**.

e (7, 75) marked on graph, $n = 7$

5 **a** $8(a + 3)$

b $8(a + 3) = 180$, $a = 19.5$

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

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b $12a + 6 = 2(6a + 3)$, so the length of the rectangle is $6a + 3$.

7 a i a^3

ii $8a^3$

b Volume of cube B = **8** × Volume of cube A

c i $27a^3$

ii Volume of cube C = 27 × Volume of cube A

iii 2460.375 cm^3

d i n^3a^3

ii Volume of cube D = n^3 × Volume of cube A

iii 5 359 375 cm^3

8 a $d + 2d + 1 = 2(d + 2)$

b $3d + 1 = 2d + 4$, $d = 3$

c A = 3 litres, B = 5 litres, C = 7 litres

9 a $m = 20$

b $t = 10$

c $u = 250$

d $x = 8$

10a $n = 20$

b $x = 8$

c $u = 9$

d $n = 1000$

11a $20 = \frac{r \times 250}{100}$

b $r = 8$, so the rate of interest is 8%.

c $A = 425$, so his investment was £425.

12 $\frac{3V}{40} = 6$, $V = 80$

13 $24 = \frac{60x}{15}$, $x = 6$ m

14a $-30t^4$

b $6a^3$

c m

d c^4

e u^5

f p^4

g r^6

h s^6

i $8w^4$

j $-d^{10}$

k $24b^{10}$

l $60x^7$

15a $125m^3$

b $100a^2$

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c $16c^4$

d $9p^2q^2$

16a $a^3 + 2a^2 - 3a$

b $4b^3 + 20b^2 + 8b$

c $6c^3 + 4c^2 - 10c$

d $12p^3 + p^2 - 3p$

e $10m^3 + 35m^2 + 4m$

f $11s + 23t$

g $11m + 6n$

h $3de$

17a $4(m + 2n + 3)$

b $5(3a - 2b + 4c)$

c $6(2p + 4q - 5)$

d $-7(2k + j + 4f)$

e $m(n + a + s)$

f $2a(4b - 5c + 5e)$

g $3(2d^2 - 3d - 4)$

h $a(a^2 + a + 1)$

18 $n \div 4 - 3 = 2$ or $\frac{n}{4} - 3 = 2$, $n = 20$, so there were 20 paintballs in the bag.

19a $h = 13$

b $m = 13$

c $b = 8$

d $k = 4$

20a $(3x + 11) \div 2$ or $\frac{3x+11}{2}$

b $\frac{3x+11}{2} = 16$, $x = 7$

21a $e = 4$

b $b = 6$

c $m = 2$

d $m = 4$

e $p = 3$

f $n = 4$

g $s = 1$

h $a = 2$

i $d = 3$

j $z = 2$

22 $2(6a - 1) = 5a + 5$, $a = 1$

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Unit 4 Answers

4 Unit test

1 a $t = 8$

b $y = 21$

c $a = -4$

2 $60 = 4t$, $t = 15$ seconds

3 £$P \div 4$ or £$\frac{P}{4}$

4 $d = 10$

5 a $4t$

b $3(t + 1)$

c $4t = 3(t + 1)$, $t = 3$, so a SportsPlus sweatband costs £3.

6 a $m = 5$

b $r = 3$

c $b = 2$

7 $c = 4$

8 a $2bc + 5c$

b $3u^2 + 3u$

c $-2t + 6$

d $2m + 16$

e $3u^2 + 4u$

f $4a + 4b$

9 a $2w^3$

b $5h^2 + 4h$

c $3a^2 + 2ab$

10 $a^3 + a^2 + 4a$

11a i a^2

ii $3a^2$

b 48 cm^2

c i $A = 4a^2$

ii $A = 5a^2$

iii $A = na^2$

12a c^5

b $m \times m \times m \times m$

c i p^2t^3

ii $10a^3$

13a d^5

b c^5

c s^5

d $9c^2$

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14a i 8

ii $8(a + 2)$

b i $4(3s + 2t)$

ii $2w(2w - 3)$

iii $3p(2e + 4c - 3t)$

15a $x = 14$

b $g = 15$

c $b = 15$

d $h = -6$

16a $p = 12$

b $s = 9$

c $x = 1$

d $t = 3$

17 $1000 = \frac{100I}{0.2}$, $I = 2$

18a $\frac{36}{n}$

b $\frac{36}{n} = 2$, $n = 18$

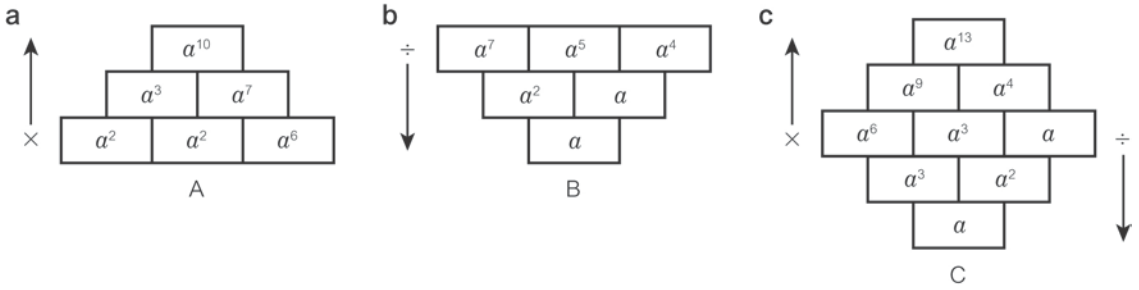
19a $\frac{2b + 600}{10}$, where b ml is the number of ml in a bottle

b $\frac{2b + 600}{10} = 300$, so a bottle contains 1200 ml of juice.

Challenge

20

Typical answers shown.



d Students' own answers

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Unit 5 Answers

Exercise 5.1

1 a 1 cm = 10 mm

b 1 kg = 1000 g

c 1 m = 100 cm

d 1 l = 1000 ml

e 1 km = 1000 m

2 a 400 g

b 5 mm

c 0.5 litres or 500 ml

d 0.25 m or 25 cm

3 a 4 inches

b 14 inches

c 15 cm

d about 27.5 cm

4 a i $8

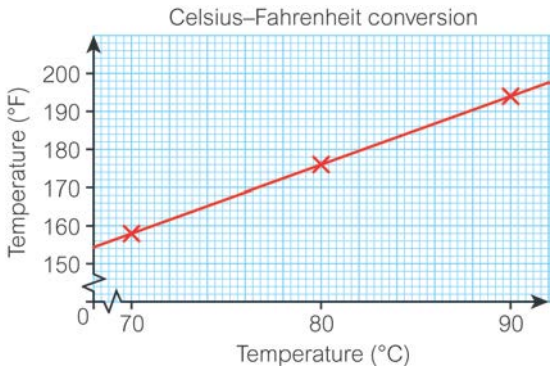
ii £2.50

iii £7.50

b i £25

ii €24

5 a,b



c about 71°C

d about 181°F

e nitric acid

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Unit 5 Answers

Exercise 5.2

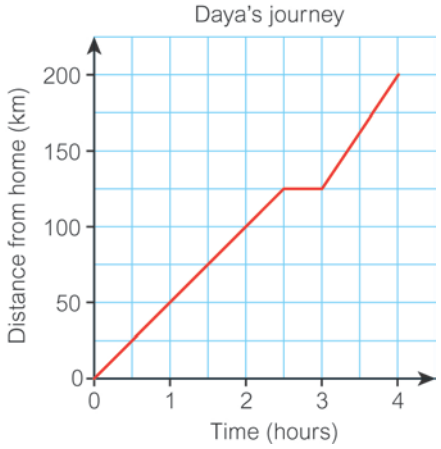
1 **a** 30 minutes
b 20 minutes
c 15 minutes
d 12 minutes
e 10 minutes

2 **a** 100 miles
b 25 miles

3 **a** 20 km
b 1:30 pm
c 30 minutes
d 1 hour 30 minutes
e 45 minutes
f on the way to the shopping centre; steepest line

4 **a** 2.4 km
b 20 minutes
c 10 minutes
d 20 minutes
e 45 minutes
f on the way to the post office

5 **a**



b after her break (or between 3 and 4 hours)

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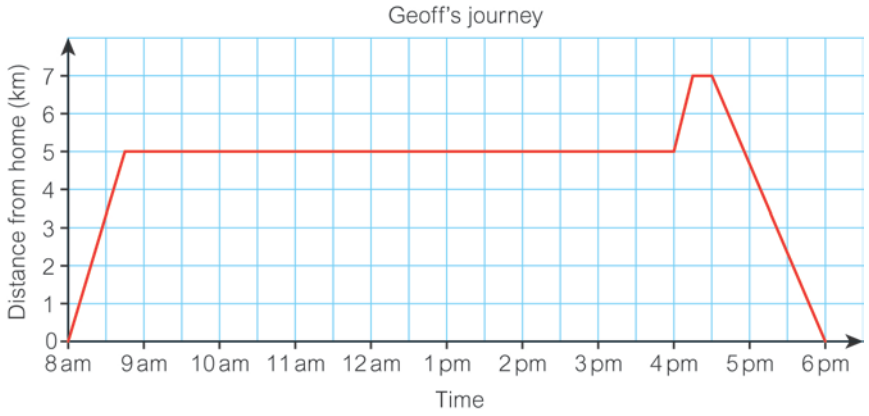
6 a



b from work to see his friend; steepest line

7 a 800 m

b 1600 m

8 a red line

b Bath to Newport arrives at 1200; Newport to Bath arrives at 1145

c Newport to Bath

9 a 24 miles

b 4 hours

c 9:40 am

d 2 hours

e 10:20 am

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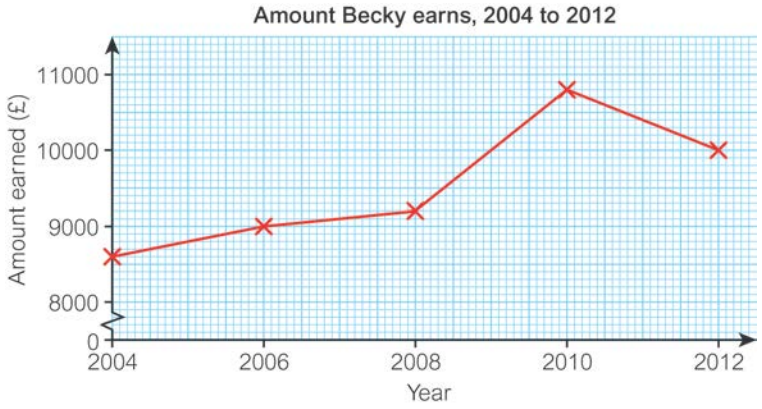
Unit 5 Answers

Exercise 5.3

1

Inches	1	5	3.2	2	4.8
Millimetres	25	125	80	50	120

2 a,b



c £10 400; the pattern of the graph is quite irregular, so the actual 2011 figure might have been higher or lower than the graph suggests.

3 a $20 per ounce

b i $5 per ounce

ii $5 per ounce

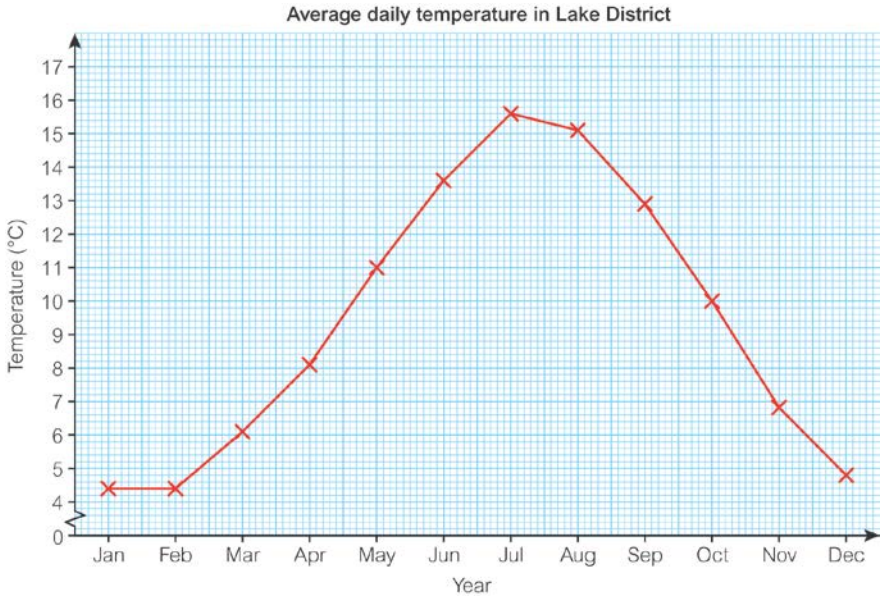
c 2010 to 2012; steepest line

d $9 per ounce

e Students' own answers

e.g. The price decreased from 2000 to 2002. This was the only decrease. Between the other years the price increased. The smallest increase was between 2002 and 2004, and the biggest increase was between 2010 and 2012.

4 a



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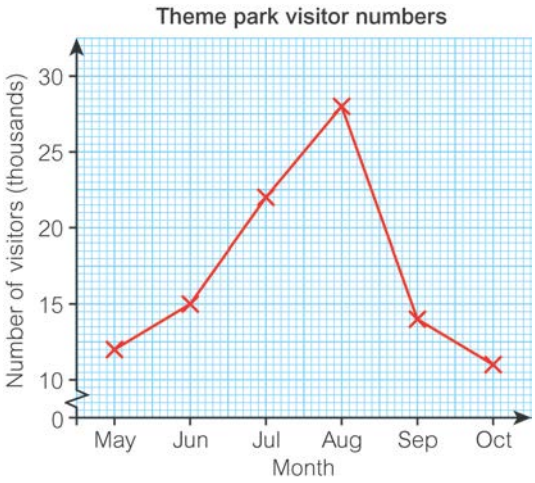
b June, July and August

c May, June and July

d Students' own answers

e.g. May; it is one of the driest months and the temperature won't be too cold or too hot for taking part in activities.

5 a,b



c i August and September

ii 14 000

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Unit 5 Answers

Exercise 5.4

1 a Art

b Maths

c Computing

2 1E, 2G, 3I, 4B, 5A, 6C, 7D, 8F,9H

3 a 2000

b 2012

c 2004

d e.g. CD singles sales will stay near zero and digital singles sales will level off.

4 a Dinosaur Isle = 74 000, Felbrigg Hall = 75 000, Framlingham Castle = 68 000

b e.g. The trend is increasing: visitor numbers are going up (quickly at first, then the increase slows down).

c e.g. The trend is decreasing: visitor numbers are going down overall (after a small increase to begin with).

e e.g.

Dinosaur Isle = 60 000; numbers dropping by the same amount as last year
Felbrigg Hall = 100 000; only a small increase as the graph is flattening off
Framlingham Castle = 69 000; maybe a small increase again this year but the pattern is less clear

5 a e.g.

Bicycle – increased at first, but after 1980 has decreased and levelled off

Motorbike – has stayed fairly similar

Air – increased over the first 30 years, then levelled off

Rail – decreased slightly over the first 10 years, then increased after that (steep rise between 2000 and 2010)

Bus/coach – started as the most popular, then overall has decreased over the years

b i 4 billion km

ii 60 billion km

c 73.7%

d 83.6%

e e.g. In 2010 the distance travelled by cars, vans and taxis has more than doubled. The percentage of the total distance travelled, that is by cars, vans and taxis, has increased by almost 10%, showing that this type of transport has become more popular.

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Unit 5 Answers

Exercise 5.5

1 a 2 am

b e.g. The cat is at home from midnight to 2 am, then sets off. It goes about 125 m away, then turns back for a little towards the house, then goes off further again, to about 440 m away by 6.30 am. Then the cat turns back towards the house, with a short stop on the way, arriving back about 8.30 am. It sleeps till just after 5pm, when it goes out again, reaching its furthest point of 340 m from the house at about 11 pm. At about 11.45 pm it turns back in the direction of home.

2 a 35 newtons

b answers between 0.56 and 0.59 cm

c 2 cm; the tension has changed to 0 indicating there is no tension, so the line has broken.

d 50 newtons

e After; the packet said 11 lb, which is 50 newtons, but the line broke at 70 newtons.

3 a 8 °C

b 15°C and 33°C

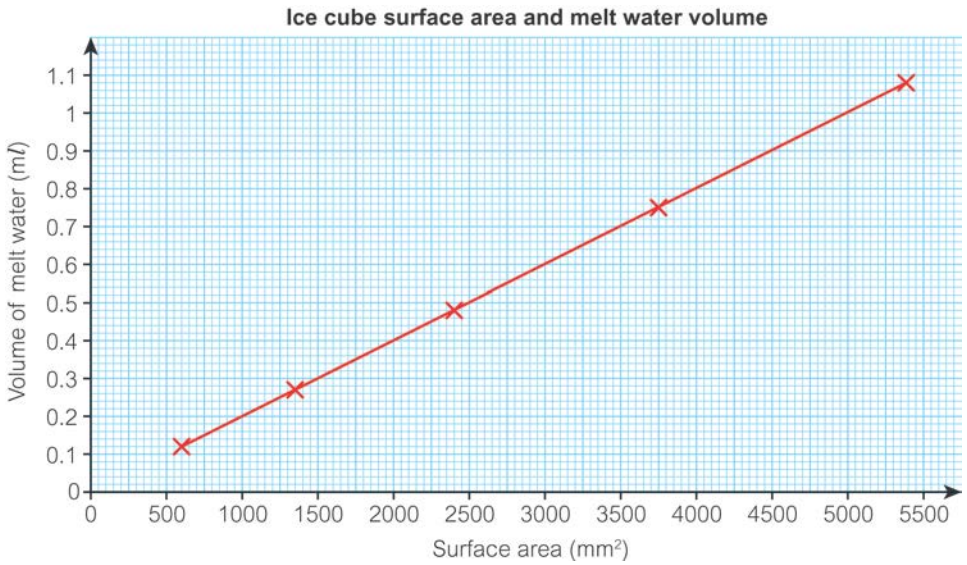
c i It reaches 100%, which means it is growing as fast as it can. It then slows down.

ii It reaches 0%, which means it has stopped growing.

4 a

Ice cube	Side length (mm)	Surface area (mm^2)	Melt water (m*l*)
1	10	600	0.12
2	15	1350	0.27
3	20	2400	0.48
4	25	3750	0.75
5	30	5400	1.08

b



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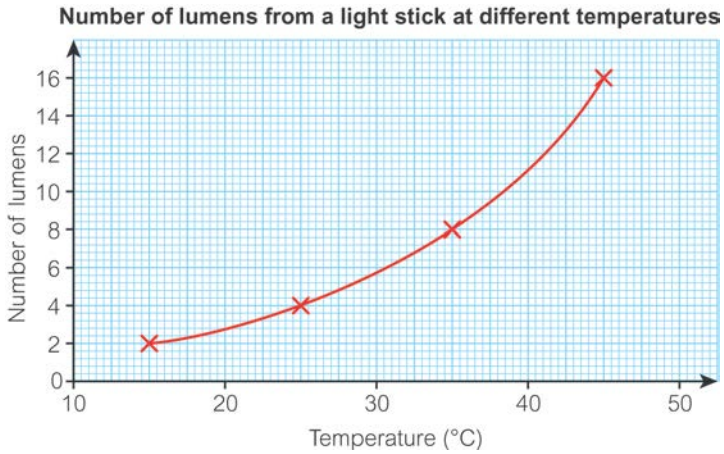
c i answers between 0.35 and 0.4 (accurate answer 0.39, 2 d.p.)

ii 27 mm

5 a

Temperature (°C)	15	25	35	45
Number of lumens	2	4	8	16

b



c i answers between 5.5 and 5.8

ii answers between 37.5 °C and 38 °C

6 a 90 cm^3

b 60 cm^3

c i answers between 38 and 40 seconds

ii answers between 23 and 24 seconds

iii answers between 13 and 15 seconds

d Increasing the temperature makes the reaction happen faster.

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Unit 5 Answers

Exercise 5.6

1 a i 6

ii 12

b £13 (or £12.95, nearest penny)

2 a i £46

ii £80

b Call-out fee (or students' own explanations of this concept)

c £12

d £15

e £97

f £110

3 a i £45

ii £160

b i £40

ii 45 minutes

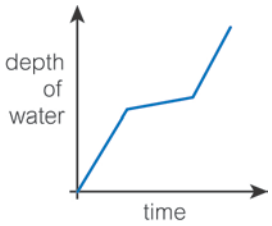
iii £20

4 a the narrow part

b the line is steepest

c A2, B4, C3, E1

d D



5 a i 14.4 m

ii 10.8 m

b 17 m

c Fielder throws it and wicket keeper catches it at a height of 1.6 m (about their shoulder height).

d 0.8 and 2.2 seconds; on the way up and on the way down

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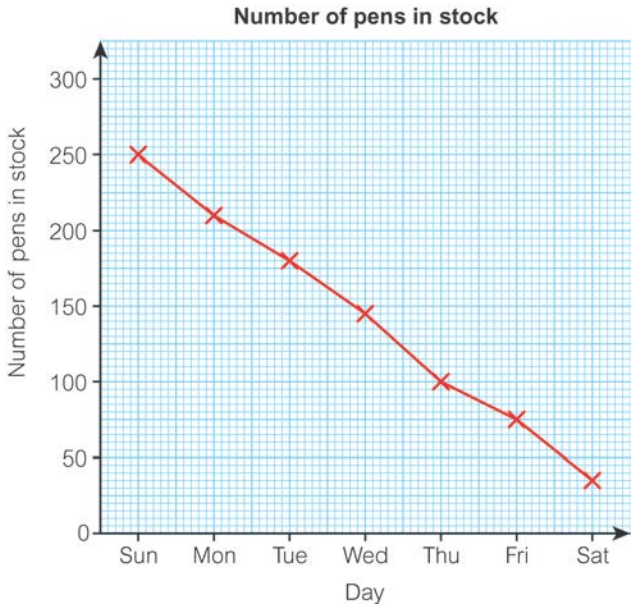
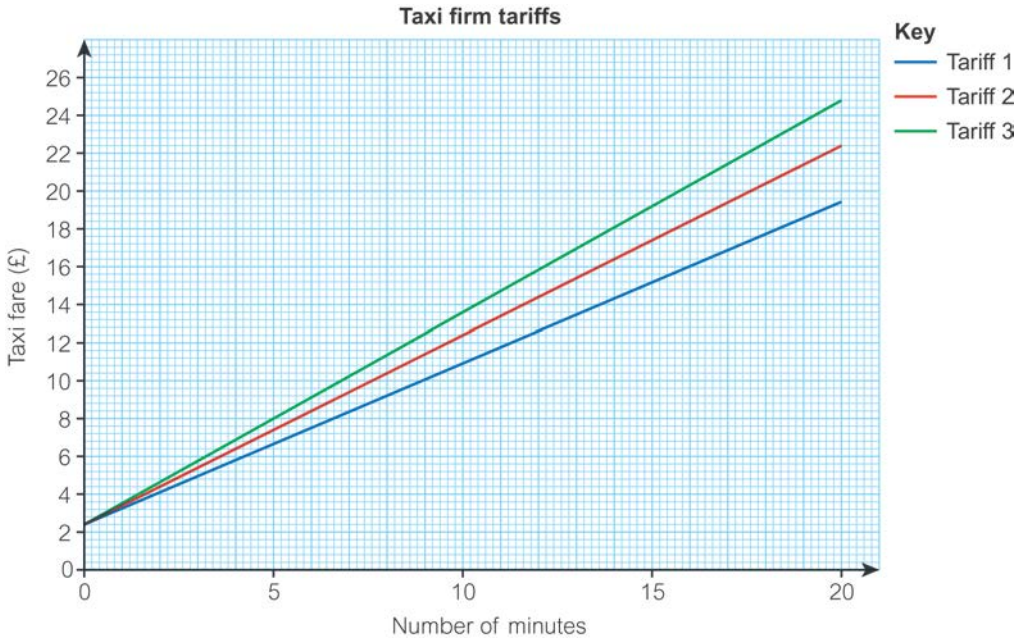
6 a



b 135 pens

c No; they have 135 in stock ready for the next week, but this week they sold 215 altogether, so if they sell anywhere near the same number next week, they won't have enough.

7 a



b £6.65

c £1.80

d from 15 minutes onwards

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Unit 5 Answers

5 Check up

Line graphs

1 a i 110 million

ii answers between 132 million and 133 million

b 2005, 2009

c about 128 million

2 a No, she has misread the scale; about 70% were occupied.

b 2008

c 2003

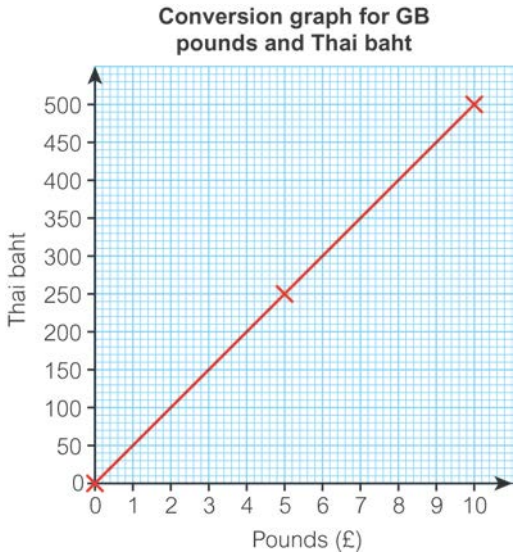
d The trend is increasing: the percentage of international flight seats occupied is going up.

Conversion and distance–time graphs

3 a

£	Baht
0	0
5	250
10	500

b



c i 175 baht

ii £9.20

4 a 25 miles

b 5 minutes

c 45 minutes

d 35 minutes

e on her way home

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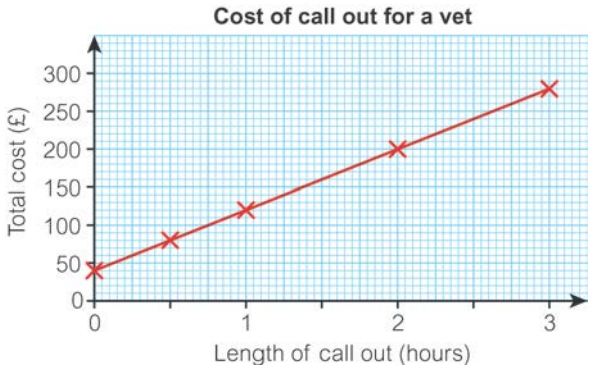
Real-life graphs and graphs of functions

5 a

Length of call out (hours)	Total cost (£)
0	40
$\frac{1}{2}$	80
1	120
2	200
3	280

b



c £260

6 a answers in the range 61 to 62 cm

b 12 months

c shorter than average

d 0–6 months; the graph is steepest.

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Unit 5 Answers

5 Strengthen

Line graphs

1 a i 1

ii 400

b i 10 000

ii 21 000

c 2009

d 2004, 2005 and 2006; the graph is flat.

2 a i 2

ii 8000 km

iii 200 km

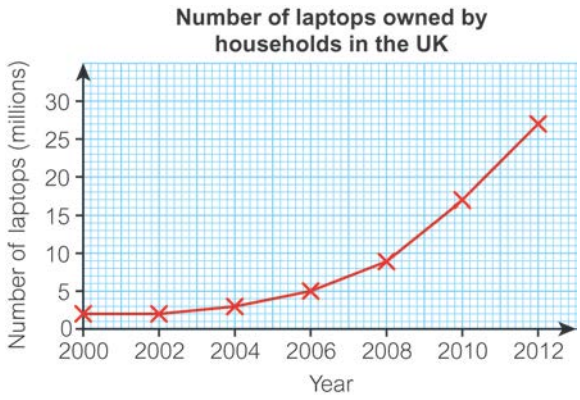
b i 8000 km

ii 11200 km

c 1975

d 2005

3 a



b The trend is increasing: the number of laptops is going up, and the speed of the increase is rising.

c i about 7000

ii about 22 000

4 a September

b July

c January, February and December

d i 13 °C

ii 6 °C

e December

Conversion and distance–time graphs

1 a i 1 foot

ii 0.5 or $\frac{1}{2}$ metre

b i 3 feet ≈ 1 metre

ii 25 feet ≈ 8.3 to 8.5 metres

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iii 12 metres ≈ 36 feet

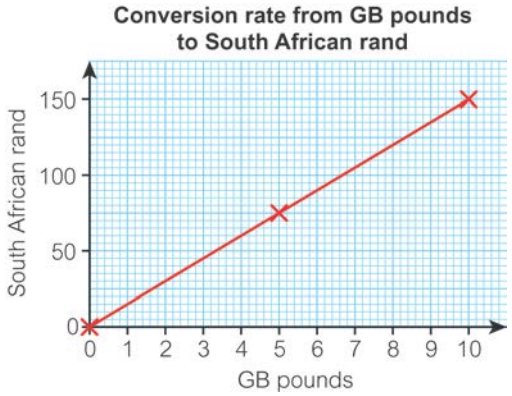
iv 4.5 metres ≈ 13.5 feet

c 25 metres

2 a

£	0	5	10
Rand	0	75	150

b



c i £3 = 45 rand

ii 120 rand = £8

3 a The graph is flat; he's not moving away from or towards home.

b 10 minutes

c 20 minutes

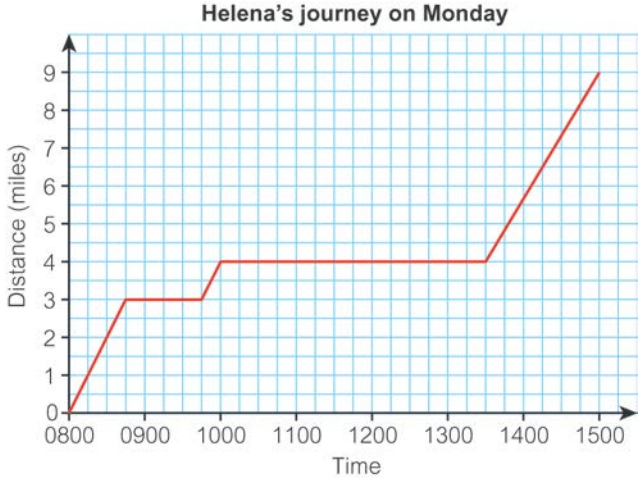
d 15 minutes

e to the shop

f 10:45 a.m.

4 a 9 miles

b



Real-life graphs and graphs of functions

1 a 61%

b 4%

c 2008 and 2009

d The trend is increasing: more and more UK adults use internet shopping.

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e answer between 68% and 71%

2 a i 35%

ii 68%

b Yes; the percentage has gone from 35% to 68%, almost double.

c Yes; the percentage has gone from 35% to 15% – half would be 17.5% so it has more than halved.

d i The trend is increasing.

ii The trend is decreasing.

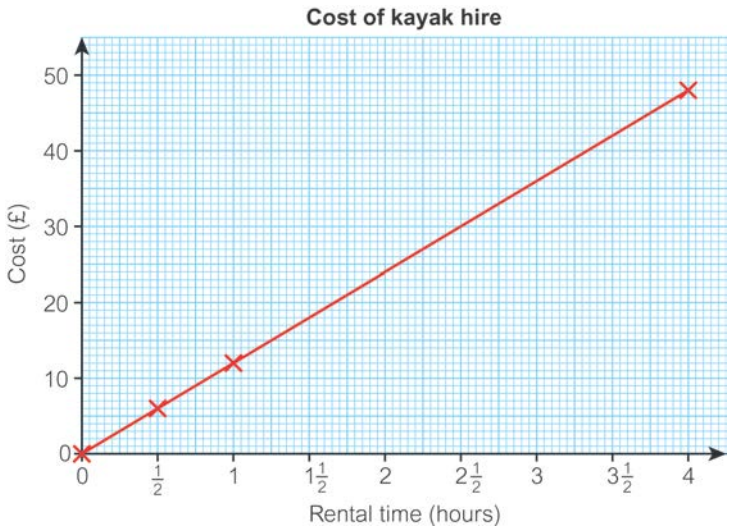
e i about 72%

ii about 13%

3 a

Rental time (hours)	0	$\frac{1}{2}$	1	4
Cost (£)	0	6	12	48

b



c i £36

ii £18

Enrichment

1 a £750

b 1.7 ounces

2 a False; it looks like double, but it is just 10 more T-shirts.

b True; it is the highest part of the graph, showing 170 sold.

c False; the greatest increase in sales was between April and May, the steepest upward part of the graph.

d True; this is the steepest downward part of the graph.

e False; the mean is $\frac{120+130+150+140+170+150}{6} = \frac{860}{6} = 143$ (nearest whole number).

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Unit 5 Answers

5 Extend

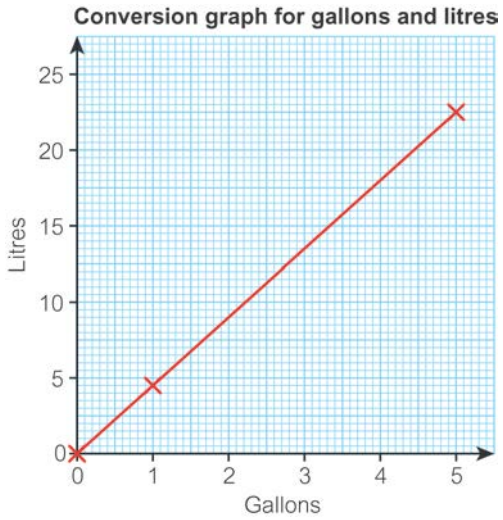
1 a The first day after the operation the patient is at pain level 9, the worst pain, where they can't do any activities because of the pain. The pain level drops to 8 on day 2 and stays there for day 3. It then drops to 7 on day 4 and stays there for days 5 and 6. The pain level drops to 6 on day 7 and stays there for day 8. It drops to 5 on day 9 and 4 on day 10, which is mild pain where they are unable to do some activities because of pain.

b e.g. Yes; the graph shows a decreasing trend: the pain is getting less, so their pain level should go down to 3 and then 2.

OR

e.g. No; the graph shows that the pain level might stay the same or go down to 3 or even 2, but it could also go up again if something unexpected happens.

2 a



b i 3.5 gallons ≈ 15.75 litres

ii 0.2 gallons ≈ 0.9 litres

iii 1 litre ≈ 0.2 gallons

iv 12.5 litres ≈ 2.8 gallons

3 a

Dropped from	2 m
1st bounce	0.6 × 2 = 1.2 m
2nd bounce	0.6 × 1.2 = 0.72 m
3rd bounce	0.6 × 0.72 = 0.432 m
4th bounce	0.6 × 0.432 = 0.259 m

b

Number of bounces	0	1	2	3	4
Height (m)	10	8	6.4	5.12	4.096

4 a i Said

ii Chan

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iii Said

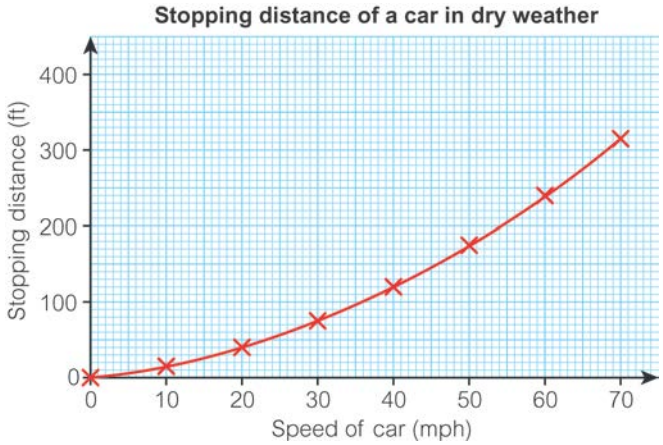
b,c

	Distance (km)	Said's time (minutes)	Chan's time (minutes)
Swim	1.5	20	25
Cycle	40	70	60
Run	10	30	40
Total	51.5	120	125

5 a

Speed of car (x miles per hour)	0	10	20	30	40	50	60	70
Stopping distance (d feet)	0	15	40	75	120	175	240	315

b



. **c** 206 feet (± 3 feet)

d approximately 12 mph

e 35 feet

f No; e.g. it will be further in rain, even further in snow, as both stop the tyres gripping the road so well.

6 a 29 seconds (± 1 second)

b 31 m/s or 32 m/s

c 21 seconds (± 1 second)

d 54 seconds

e 4 seconds

7 a i C

ii A

iii B

b About 60 m; the graph is not so steep, showing that his speed of falling slows.

c 3 seconds; e.g. it takes 6 seconds (7 to 13 seconds on the graph) to drop 40 m (60 to 20 m on the graph), half of 40 m is 20 m so half of 6 seconds is 3 seconds.

d 16 seconds; e.g. he has another 20 m to drop, so another 3 seconds on the graph is 13 + 3 = 16 seconds; OR if you extend the line of the graph, it gets to 0 m at 16 seconds.

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8

Section	Distance (miles)	Time taken	Speed (miles per hour)
A	25 – 0 = 25	30 minutes	50
B	60 – 25 = 35	30 minutes	70
C	180 − 60 = 120	2 hours	60
D	190 − 180 = 10	15 minutes	40
E	205 − 190 = 15	45 minutes	20

9 a vase A

b Red = vase A and blue = vase B; vase A fills fastest to begin with, and it is the red line that shows the fastest increase in depth of water at the start.

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Unit 5 Answers

5 Unit test

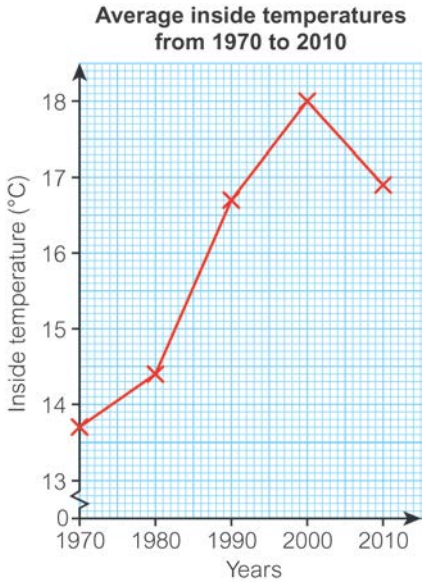
1 a i 8.9 million

ii 11.2 million

b 2006

c about 8.75 million

2 a

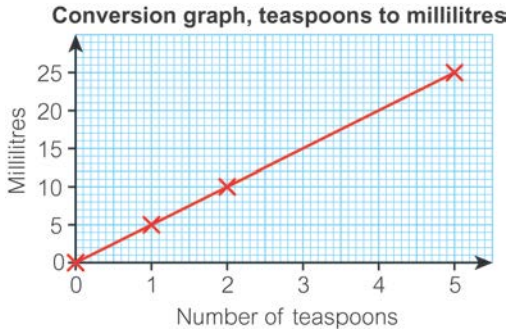


b The overall trend is increasing: average inside temperatures rose until 2000 and then dropped slightly in 2010.

3 a

Teaspoons	0	1	2	5
m*l*	0	5	10	25

b, c



d i 17.5 m*l*

ii 4.2 teaspoons

4 a 09:15

b 2 hours 30 minutes

c 1 mile

d the cycle home

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5 **a** 600 g

b between 10.5 and 11 weeks

c less than average

d 10 to 15 weeks; steepest part of the graph

6 **a** The trend is increasing: the swallow population has risen, but the speed of increase is slowing.

b 30 %

c 40% to 42%

d The trend is decreasing: the starling population has dropped, and the speed of decrease is getting faster.

e about −54%

f –65% to −70%

7 **a** 1 hour 15 minutes

b the return journey

c **i** 40 km/h

ii 80 km/h

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Unit 6 Answers

Exercise 6.1

1 **a** 200
b 900
c 500
d 500
e 1400
f 100

2 **a** four thousand and thirteen
b twenty-three thousand, five hundred and twenty-seven
c one hundred and forty-six thousand and five
d one million, five hundred and twenty-nine thousand, four hundred

3 −11, −10.1, 10.1, 14, 27, 38.9, 83, 103

4 **a** 2000
b 5000
c 13 000
d 46 000
e 547 000
f 623 000

5 **a** 80 000
b 50 000
c 10 000
d 50 000
e 750 000
f 870 000

6

Arsenal	1 100 000
Aston Villa	800 000
Chelsea	800 000
Everton	700 000
Liverpool	800 000

7 **a** 2.54
b 7.49
c 5.08
d 6.20
e 45.16
f 23.01

8 **a** 0.08666, 0.1258, 0.20071, 1.093, 1.232
b 3.292, 4.051, 4.227, 4.234, 4.735
c 0.0732, 0.7113, 0.7499, 7.001, 7.0932

9 25.645, 25.622, 24.833, 24.457, 22.961

10a −8.12, −5.76, −3.11, −1.88, −0.89

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b −0.845, −0.149, −0.135, −0.125, −0.0122

c −0.0342, −0.033, −0.0325, −0.0324, −0.0309

11

Moscow	11.5 million
London	8.2 million
Berlin	3.5 million
Madrid	3.2 million
Rome	2.8 million
Paris	2.3 million
Budapest	1.7 million
Vienna	1.6 million
Prague	1.2 million
Dublin	1.0 million

12a 4.539

b 29.797

c 69.085

d 85.801

e 72.758

f 3.257

13 Mon £9.16*

Tue £9.71

Wed £11.83

Thu £10.81

Fri £13.42*

Sat £10.37*

Sun £11.11

**Need to round down, otherwise there will not be enough money for all the workers. For example, on Monday, there isn't enough money to give everyone £9.17.*

14a increased steadily

b 60 million

c 2006, 2007 and 2008

15a 1.064 **>** 1.022

b 6.242 **>** 6.224

c 7.737 **<** 7.739

d 0.06852 **>** 0.06812

16 −0.0205, −0.0209, −0.029, −0.052, −0.0529, −0.0592, −0.092, −0.0925, −0.095

17a −2.078 **>** −2.087

b −8.27 **>** −8.72

c −6.26 **<** −6.25

d −0.0532 **<** −0.0530

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Unit 6 Answers

Exercise 6.2

1 **a** 315
b 1484
c 544
d 4005

2 **a** 630
b 18 200
c 43
d 43

3 **a** 50 × 1 = 50
b 5 × 7 = 35
c 20 × 0.5 = 10
d 130 × 10 = 1300

4 685 (137 × 5)
5480 (137 × 40)
27 400 (137 × 200)
33 565 (total)

5 **a** 8.14
b 10.5
c 22.382
d 30.794
e 2.8608
f 33.128

6 121.44 km

7 **a** 3 × 5 = **15**
b 166912
c 16.6912

8 **a** 2.04
b 0.504
c 0.432
d 2.592

9 **a** 3.6
b 3.6
c 4.5
d 4.5
e 10.7
f 10.7

10a 0.86
b 1.16
c 0.053

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11a $29 \times 1 =$ **29**

$29 \times 0.1 =$ **2.9**

$29 \times 0.01 =$ **0.29**

b ÷ 100

12a 36.21

b 45.68

c 0.886

d 0.116

e 5.34

f 6.83

13a 126.63 m

b 89.375 m

14a 0.01 m^2

b 280.8 cm^2

c 52.14 cm^2

d 136.88 m^2

e 0.24 m^2

f 50.32 cm^2

15 3.0265 litres

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Unit 6 Answers

Exercise 6.3

1 £335.40

2 **a** 13.041

b 8.134

3 **a** 98

b 41

4 **a** 3 and 3

b 9 and 9

c 121 and 121

d 25 and 25

5 **a** 9

b 8

c 11

d 4

e 30

f 120

6 **a** 210

b 52

c 356

d 60

e 144.4

f 13.2 (1 d.p.)

g 152.9 (1 d.p.)

h 0.2 (1 d.p.)

i 103.6 (1 d.p.)

7 11.625 rounded to 12 dishes

8 **a** 3549.5 or 3549.500

b 784.22

c 3088.7431

d 3201.764

9 **a** 34.535 m*l*

b 29.004 m*l*

10a 12.86 m^2

b 5.23 m^2

11a 8.853

b 12.68676

c 45.67266

d 67.38208

e 2.933775

f 168.72966

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12a 145.152 cm^2

b 3.7 m

13a 150

b 26

c 8530

d 57200

e 760

f 3

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Unit 6 Answers

Exercise 6.4

1 **a** 2 : 1

b 4 : 1

c 3 : 5

d 2 : 9

e 1 : 7

f 2 : 3

2 **a** £8 and £12

b £16 and £20

c 15 m and 9 m

3 **a** £24, £36, £48

b £54, £162, £270

c £85, £170, £255

d £22, £44, £66, £110

e 78 m, 117 m, 234 m

f 87.75 kg, 175.5 kg, 204.75 kg

g 49.25 km, 98.5 km, 197 km, 246.25 km

h £182.12, £303.53, £546.35

4 **a** 80 : 57

b 175 : 128

c 51 : 34

d 572 : 103

5 **a** 6.65 g copper, 0.245 g tin, 0.105 g zinc

b 350 g

6

Size	Blue	Green	Yellow
1 litre	**0.625 *l***	**0.35 *l***	**0.025 *l***
1.5 litre	**0.9375 *l***	**0.525 *l***	**0.0375 *l***
2.5 litre	**1.5625 *l***	**0.875 *l***	**0.0625 *l***

7 6 × 4 inches and 12 × 8 inches

8 **a** 18 cm

b 17.2 cm (1 d.p.)

c 23.5 cm (1 d.p.)

d 24.9 cm (1 d.p.)

e 48 cm

f 31.1 cm (1 d.p.)

g 46.9 cm (1 d.p.)

h 62.6 cm (1 d.p.)

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9 **a** $\frac{20}{103}$ (or 19.4%)

b Ironman is 79.66% cycling.

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Unit 6 Answers

Exercise 6.5

1 **a** 472.5 kg, 94.5 kg

b 291.6 m, 194.4 m

c £1563.20, £2344.80, £3908

2 **a** 52 : 45

b 82 : 63

c 34 : 9

d 256 : 137

3 bismuth 1250 g

lead 625 g

tin 312.5 g

cadmium 312.5 g

4 **a** 1.8 : 1

b 2.75 : 1

c 1 : 1.94

d 1 : 2.09

5 **a** **i** 1.67 : 1

ii 1.5 : 1

iii 1.6 : 1

iv 1.33 : 1

v 1.85 : 1

vi 2.4 : 1

b cinema widescreen

6 Caparo T1 913 : 1

Caterham Superlight R500 384 : 1

Ariel Atom 500 678 : 1

Ferrari F12 334 : 1

Porsche GT2RS 333 : 1

7

Front cog teeth	53	53	53	53	53
Gear	1	2	3	4	5
Rear cog teeth	32	25	19	14	11
Ratio of front teeth to rear teeth	**53 : 32**	**53 : 25**	**53 : 19**	**53 : 14**	**53 : 11**
Unit ratio	**1.66 : 1**	**2.12 : 1**	**2.79 : 1**	**3.79 : 1**	**4.82 : 1**
Number of rear wheel turns per turn of the pedals	**1.66**	**2.12**	**2.79**	**3.79**	**4.82**

8 **a** 2.5 : 1

b 2.5 times

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c 205 times

9 **a** 6th is the fastest gear because it only takes 0.56 turns of the engine to turn the wheels once.

b 280

10 60 : 1

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Unit 6 Answers

6 Check up

1 **a** 7.152 **<** 7.251

b 4.0531 **>** 4.0501

c 0.6091 **<** 0.6901

2 **a** 7.5 million

b 4.3 million

c 85.7 million

3 5.0982, 5.90113, 5.9281, 5.9408

4 −30.01 °C, −30.5 °C, −31.03 °C, −31.3 °C

5 **a** 7.134

b 108.450

6 **a** 453.6

b 453.6

c 453 600

7 **a** 70.8

b 0.41

c 0.0611

8 4.03 × 10

9 **a** 7340

b 17 400

c 25 300

10 10 m^2

11 £8.29

12 £461.13

13a 463.233

b 5199.747

14a 29.24

b 10.75

c 7.5428

15a 80

b 15.2

c 148

16a 4 : 1

b 8 : 5

17a 2.6 kg and 3.9 kg

b 82 litres, 164 litres and 205 litres

c £111.11, £333.33 and £555.56

18a 25% or $\frac{1}{4}$

b 11.55 g

19a 1.4 : 1

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b 1 : 3.6

21a 240 balls

b 1202 balls

22 1 ÷ 0.7 = 1.428571

2 ÷ 0.7 = 2.857143

3 ÷ 0.7 = 4.285714

4 ÷ 0.7 = 5.714286

The digits appear in the same order in the answers.

1 ÷ 1.4 = 0.714286

2 ÷ 1.4 = 1.428571

A similar pattern emerges.

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Unit 6 Answers

6 Strengthen

Ordering and rounding

1 **a** 15 000

b 48 000

c 39 000

d 84 000

2 Mon 170 000

Tue 160 000

Wed 160 000

Thu 140 000

Fri 140 000

Sat 170 000

Sun 120 000

3 **a** 3.7

b 14.6

c 2.1

d 3.7

4 **a** 5.13

b 4.87

c 12.48

d 26.05

5 first G, second D, third B

6 **b** **8** million

c **12** million

e **7.4** million

f **15.7** million

7

Downton Abbey	9.6 million
By Any Means	3.5 million
Countryfile	6.3 million
The Crane Gang	0.9 million
X Factor	9.5 million

8 7.22, 7.29, 7.292, 7.325, 7.4, 7.50, 7.52, 7.605, 7.61, 7.88

9 −0.98, −1.48, −1.62, −2.18, −4.2, −4.80, −5.05, −6.68, −7.13, −7.3

10

Distance A	18.818 km
Distance B	17.226 km
Distance C	15.819 km
Distance D	15.094 km
Distance E	12.602 km

11a 6.6 **>** 6.13

b 4.4 **<** 4.51

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c 6.5 **>** 6.405

d 5.1 **<** 5.368

e 5.21 **>** 5.201

f 15.45 **>** 15.445

12a 2.5 × 4

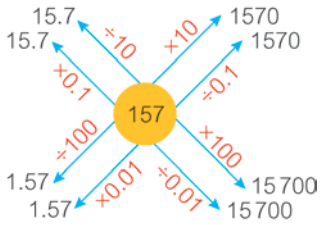
b 1025

c 10.25 m^2

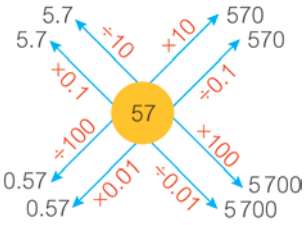
13 £33.57 (2 d.p.)

Place-value calculations

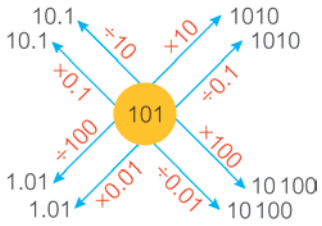
1



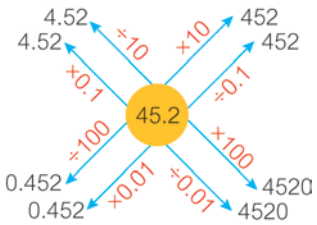
2 a



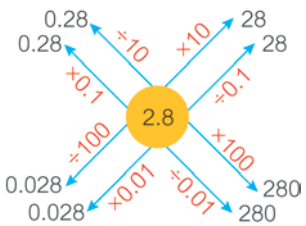
b



c



d



3 a 0.906

b 0.473

c 0.643

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4 **a** 0.0342
b 0.0114
c 0.0736
d 0.06214
e 0.57972
f 0.6103

5 **a** 0.0528
b 0.0975
c 75.1
d 98
e 0.0043

6 **a** 147.2
b 1472
c 1.472
d 0.1472

7 **a** 14.5
b 1450

Decimal calculations

1 **a** 15.78
b 22.15
c 3.275
d 794.302

2 **a** 11.63
b 28.385
c 1234.155
d 5.1403

3 **a** 7.6
b 290.8 (1 d.p.)
c 46 395
d 12.5 (1 d.p.)

Ratio and proportion with decimals

1 5.1 m and 3.4 m

2 6.3 m, 4.725 m and 1.575 m

3 Saturday: receptionists £16.50, porters £33, cleaners £41.25
Sunday: receptionists £50.72, porters £101.44, cleaners £126.80

4 **a** 13 : 6
b 17 : 6
c 12 : 5
d 9 : 11

5

flour	312.5 g
eggs	5
sugar	250 g
butter	218.75 g

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milk 187.5 m*l*

6

Width	Height
6 cm	**4 cm**
15 cm	10 cm
22.5 cm	15 cm
36 cm	24 cm
18.5 cm	**12.3 cm**
16.4 cm	**10.9 cm**
53.4 cm	35.6 cm

Enrichment

1 a medium picture 5.14 cm, large picture 10.5 cm

b 15.75 cm^2, 20.56 cm^2, 141.75 cm^2

c 9 times bigger

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Unit 6 Answers

6 Extend

1

Mountain	Height (nearest thousand feet)
Everest	29 000
K2	28 000
Kangchenjunga	28 000
Lhotse	28 000
Makalu	28 000
Cho Oyu	27 000
Dhaulagiri	27 000
Manaslu	27 000
Nanga Parbat	27 000
Annapurna	27 000

2 **a** £47.40

b No (£15.35)

c £4.74

d £2.31

e 77p

3

River basin	Drainage area (km^2)
Nile	3.3 million
Amazon	6.1 million
Yangtse	1.7 million
Mississippi	3.2 million
Yenisei	2.6 million
Yellow River	0.9 million
Ob	3.0 million
Parana	2.6 million
Congo	3.7 million
Amur	1.9 million

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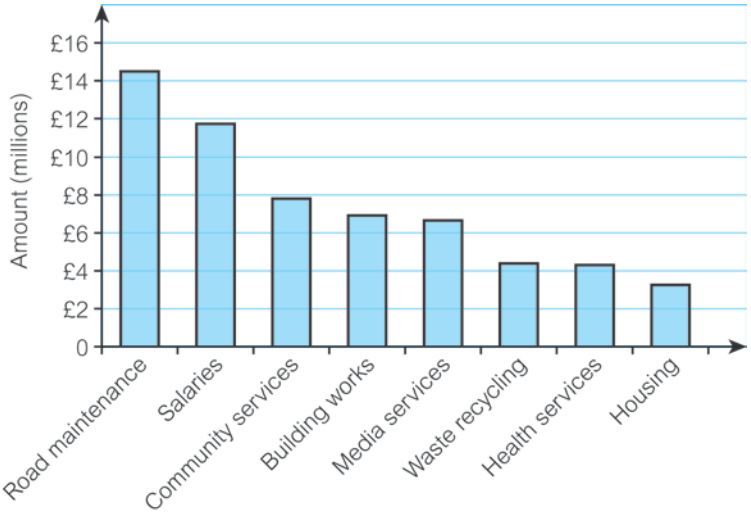
4 **a**

Item	Amount
road maintenance	£14.5 million
salaries	£11.8 million
community services	£7.9 million
building works	£7.0 million
media services	£6.7 million
waste recycling	£4.4 million
health services	£4.3 million
housing	£3.3 million

b



5 3982.75 m^2

6 **a** 38 million km

b 261 million km

7 **a** any balance lower than −72.31

b any balance greater than −5.82

8 **a** **i** 2.5 c*l*

ii 5 c*l*

iii 6 c*l*

iv 12.5 c*l*

b **i** 40 doses

ii 20 doses

iii 16 doses

iv 8 doses

9 **a** 0.6 g

b 1.8 g

10 16 m*l*

11a 21

b 21

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c 85

d 85

e ÷5 is equivalent to **×0.2**
÷0.2 is equivalent to **×5**
÷2 is equivalent to **×0.5**
÷4 is equivalent to **×0.25**

12a 100 m^2

b 330 g

13a £1082.15

b £108.22

c new bike, £40.37 cheaper

14a 3880.8 cm^3

b 1 : 8

15a 0.625 miles

b 1.6 km

16a **i** €1.15

ii £0.87

b **i** $1.58

ii £0.63

17a 217

b 200

c 1908

d 7023

e 7623

f 3050

18a 89.964

b 78.435

c 235.65

d 117.635716

19a £6400

b £196 200

20a −30.58 **>** −33.9

b −23.69 **<** −18.93

c −85.93 **<** −66.47

d −13.87 **>** −82.57

e −66.43 **<** −25.07

f −40.02 **<** −25.83

g −39.93 **<** −39.929

h −4.59 **<** 4.61

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Unit 6 Answers

6 Unit test

1 **a** £66.26

b £134.09

c £236.63

2

London to Auckland	18 000 km
London to Tokyo	10 000 km
London to Buenos Aires	11 000 km
London to Los Angeles	9000 km

3 **a** 4.791

b 37.000

c 21.490

4 **a** 35.75

b 8.28

c 4.51

5 **a** 213.9

b 0.525

c 0.032

6 30 m

7 45.18, 45.275, 45.33, 45.39, 66.39, 66.5

8 **a** 360

b 41 900

c 8

d 600

e 42

f 2.1

9 −9.9, −9.78, −9.57, −9.53, −9.511, −9.31, −9.3

10a 5 : 7

b 1 : 5

11 80 ml and 208 ml

12 800 ml, 640 ml and 60 ml

13a 1.6014

b 16.014

c 1.6014

d 0.16014

14 1 : 2.54

15a 363.006

b 45.9

16a 40.43 **<** 58.57

b 68.6 **>** 66.79

c 87.62 **>** 87.43

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d −7.62 **>** −7.7

e −6.145 **<** −6.154

f −9.803 **<** −9.088

17 £12.50

Challenge

18a e.g.

0.12 = 0.3 × 0.4

0.86 = 0.3 + 0.4 × 1.4

1.188 = 0.3 × 0.4 × 9.9

12.5 = 3.6 ÷ 0.3 + 6.2 − 5.7

5.04 = 1.4 × 3.6

27.5 = 0.3 + 0.4 + 1.4 + 9.9 + 3.6 + 6.2 + 5.7

9 = 3.6 ÷ 0.4

0.7 = 0.3 + 0.4

11.3 = 9.9 + 1.4

6.3 = 9.9 − 3.6

0.1 = 0.4 − 0.3

33 = 9.9 ÷ 0.3

51.3 = 6.2 × (9.9 + 0.4 − 0.3) − 5.7 − 3.6 − 1.4

2.97 = 0.3 × 9.9

10.7 = 1.4 + 3.6 + 5.7

10.8 = 0.4 + 1.4 + 3.6 + 5.7 − 0.3

b Highest: 1.4 × 9.9 × 3.6 × 6.2 × 5.7 ÷ (0.4 − 0.3) = 17 633.2464

Lowest: −1.4 × 9.9 × 3.6 × 6.2 × 5.7 ÷ (0.4 − 0.3) = −17 633.2464

Closest to zero: (0.4 − 0.3) ÷ 1.4 ÷ 9.9 ÷ 3.6 ÷ 6.2 ÷ 5.7 = 0.0000567...

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Unit 7 Answers

Exercise 7.1

1

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

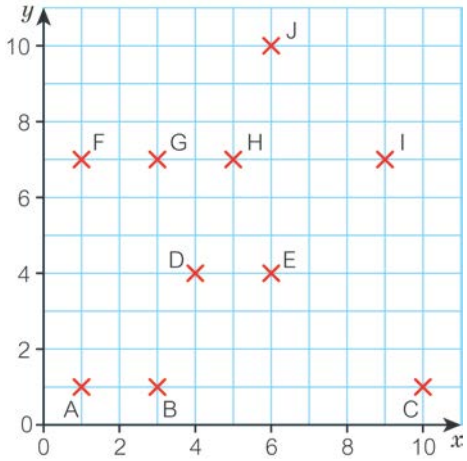
2 **a** parallelogram

b isosceles trapezium

c kite

d rectangle

3



a ABGF

b There are many possibilities, e.g. ADEC or BDEC or FDEI or FDEH.

c ADEB or DEGF or DEHG or ABHG

d EIJG

e EIJH or EIJF

4 a = 65° (angles in a right angle sum to 90°)

b = 25° (same as 25°)

c = 65° (angles in a right angle)

5 **a** $a = b$ = 140° (angles in a quadrilateral add to 360° and opposite angles of a rhombus are equal)

c = 40° (opposite angles of a rhombus are equal)

$d = e$ = 70° (angles in a quadrilateral add to 360° and opposite angles of a parallelogram are equal)

f = 110° (opposite angles of a parallelogram are equal)

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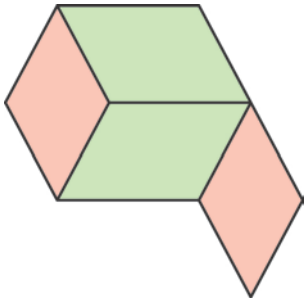
b



6 a = 65° (angles in quadrilateral = 360°, so 2a = 360 − 90 − 90 − 50 = 130°)

b = 25° (angles in a triangle = 180°, so b = 180 – 90 – 65)

c = 65° (b + c = 90°)

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Unit 7 Answers

Exercise 7.2

1 **a** $y = 50°$

b $s = 55°$, $t = 55°$, $u = 125°$

c $x = 96°$

2 **a** 135°

b 50°

c 102°

3 u and y, x and v

4 **a** Angle r and angle $\boldsymbol{p}$ are alternate angles.

b Angle r and angle $\boldsymbol{q}$ are alternate angles.

c Angle $\boldsymbol{t}$ is the same size as angle q.

d Angle $\boldsymbol{r}$ is the same size as angle p.

5 **a** $a = 80°$ (alternate angles)

b $b = 112°$ (alternate angles)

$c = 68°$ (angles on a straight line)

c $x = 38°$ (alternate angles)

$y = 65°$ (alternate angles)

$z = 77°$ (angles on a straight line)

d $p = 125°$ (alternate angles)

$q = 55°$ (angles on a straight line)

$r = 55°$ (angles on a straight line)

$s = 125°$ (opposite angles of a parallelogram are equal)

6 $c = 105°$

7 **a** Angle x is equal to angle $\boldsymbol{a}$ as they are alternate angles.

b Angle y is equal to angle $\boldsymbol{c}$ as they are **alternate** angles.

c $x + b + y =$ **180°** because they lie on a **straight** line.

d Since $x = a$ and $y = \boldsymbol{c}$

$x + b + y = \boldsymbol{a} + b + \boldsymbol{c}$

so $a + b + c =$ **180°**

e This proves that the angles in a triangle sum to **180°**.

8 $x + y + z =$ **180°** because the sum of the angles in a triangle is **180°**.

$a + b + c =$ **180°** because the sum of the angles in a triangle is **180°**.

$x + y + z + a + b + c =$ **360°**

This proves that the angles in a quadrilateral sum to **360°**.

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Unit 7 Answers

Exercise 7.3

1 **a** $x = 25°$, $y = 155°$, $z = 155°$

b $a = 72°$

c $b = 105°$, $c = 105°$

2 **a** rhombus or square

b trapezium

c square

d kite

3 **a** $w = 105°$

b $x = 45°$, $y = 45°$, $z = 135°$

c $a = 95°$, $b = 125°$

d $c = 62°$, $d = 62°$, $e = 118°$

4 $x = 120°$, $y = 60°$

5 $a = 80°$, $b = 100°$, $c = 40°$, $d = 80°$

6 **a** **i** AD is equal in length to **CD**.

ii AB is equal in length to **BC**.

iii $\angle$ BAD = $\angle$ **BCD**

iv ABCD has **1** line of symmetry and rotational symmetry of order **1**.

b **i** 40°

ii 105°

iii 150°

7 270°

8 **a** $a = 115°$ (corresponding angles)

b $b = 95°$ (corresponding angles)

$c = 85°$ (angles on a straight line)

c $d = 85°$ (corresponding angles)

$e = 85°$ (vertically opposite angles)

d $f = 112°$ (alternate angles)

$g = 112°$ (corresponding angles)

$h = 68°$ (angles on a straight line)

$i = 112°$ (vertically opposite angles)

9 **a** $w = 42°$ (alternate angles)

$x = 42°$ (vertically opposite angles)

$y = 75°$ (corresponding angles)

b $a = 132°$ (angles on a straight line)

$b = 48°$ (corresponding angles)

$c = 120°$ (corresponding angles)

$d = 60°$ (angles on a straight line)

c $p = 42°$ (alternate angles)

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q = 76° (118 – 42, corresponding angles)

r = 118° (vertically opposite angles)

s = 118° (corresponding angles)

10 Angles 125° and 120° would be the same if the lines were parallel (or angles 60° and 55° would be the same).

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Unit 7 Answers

Exercise 7.4

1 a $a = 130°$, $b = 50°$

b $y = 64°$, $z = 116°$

c $d = 20°$, $e = 35°$, $f = 145°$

2 a i 360°

ii $x = 163°$

b i 540°

ii $y = 160°$

c i 720°

ii $z = 129°$

3 a i $a = b = c = d = 90°$

sum = 360°

ii $e = 75°$, $f = 45°$, $g = 113°$, $h = 40°$, $i = 87°$

sum = 360°

iii $j = 60°$, $k = 85°$, $l = 53°$, $m = 38°$, $n = 109°$, $p = 15°$

sum = 360°

iv $q = 100°$, $r = s = 130°$

sum = 360°

b The sum is always the same.

c The sum of the exterior angles of a polygon is **360**°.

4 a i $v = 65°$

ii $w = 118°$

iii $x = 72°$

iv $y = 60°$

b Divide 360° by the number of sides.

c exterior angle = $\frac{360°}{n}$

d interior angle = 180° − exterior angle

5 a i 120°

ii 60°

b i 36°

ii 144°

c i 22.5°

ii 157.5°

6 $a = 45°$, $b = 135°$, $c = 67.5°$

7 a 30°

b 40°

8 15 sides

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Unit 7 Answers

Exercise 7.5

1 **a** $x = 30$

b $x = 50$

c $x = 7.5$

2 **a** $y + 30°$

b $2y + 30°$

3 **a** $8x + 140 = 180$

$x = 5°$

Check: $8 \times 5 = 40$, $40 + 140 = 180$

b $5x + 90 = 180$

$x = 18°$

Check: $2 \times 18 + 3 \times 18 + 90 = 180$

c $3x + 21 = 180$

$x = 53°$

Check: $53 + 7 = 60$, $3 \times 60 = 180$

4 **a** $6x + 90 = 360$

b $x = 45°$

c 40°, 90°, 110°, 120°

5 $\angle BAC = 30°$, $\angle ABC = 60°$, $\angle BCA = 90°$

6 $\angle ADC = \angle BCD = 45°$, $\angle BAD = \angle ABC = 135°$

7 $\angle ADC =$ **112°** (symmetry of kite)

$112 +$ **112** $+$ **36** $+ \angle BAD = 360°$ (angles in a quadrilateral)

$\angle BAD =$ **100°**

$\angle ABX = \angle ADX = y$ (ABD is isosceles triangle)

$y + y +$ **100** $= 180°$ (angles in a triangle)

$y =$ **40°**

8 $\angle EBD = 90°$ One example of reasoning is:

$\angle ABE = 22°$ (angles in a triangle)

$\angle DBC = 38°$ (angles in a triangle)

$\angle EBD = 90 - 22 - 38 = 30°$ (90° in a right angle)

9 $a = 60°$ (opposite angles in a parallelogram)

$b = 75°$ (alternate angles)

$c = 105°$ (angles on a straight line)

$d = 120°$ (angles in a quadrilateral)

10 $x = 93°$, $y = 62°$

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Unit 7 Answers

7 Check up

Solving geometrical problems

1 **a** $a = 55°$ (angles in a triangle)

$b = 125°$ (angles on a straight line)

b $c = 95°$ (angles on a straight line)

$d = 95°$ (angles in a quadrilateral)

c $e = 115°$ (opposite angles in a parallelogram are equal)

$f = 65°$ (angles in a quadrilateral)

d $g = 132°$ (angles in a quadrilateral)

e $h = 66°$ (angles in a quadrilateral)

2 **a** $2x + 3x + 4x = 180$ or $9x = 180$

b $x = 20°$

c 40°, 60°, 80°

3 **a** $3x + x + 5 + 95 = 180$ or $4x + 100 = 180$

b $x = 20°$

c 25°, 60°, 95°

4 $\angle$DEA = 180 – 90 – 32 = 58° (angles in a triangle)

$\angle$CEB = 180 – 86 – 58 = 36° (angles on a straight line)

$\angle$BCE = 180 – 90 – 36 = 54° (angles in a triangle)

5 $a = 110°$ (angles in a isosceles triangle)

$b = 70°$ (angles on a straight line)

$c = 110°$ (angles in a quadrilateral)

Parallel lines

6 **a** $x = 70°$ (alternate angles)

b $x = 125°$ (corresponding angles and angles on a straight line)

c $x = 142°$ (corresponding angles)

d $x = 95°$ (corresponding angles and angles on a straight line)

7 **a** $p = 82°$ (corresponding angles)

$q = 82°$ (vertically opposite angles)

b $r = 78°$ (alternate angles)

$s = 78°$ (vertically opposite angles)

c $a = 40°$ (alternate angles)

$b = 40°$ (vertically opposite angles)

$c = 75°$ (corresponding angles)

d $x = 60°$ (angles on a straight line)

$y = 60°$ (alternate angles)

$z = 125°$ (corresponding angles and angles on a straight line)

e $a = 110°$ (corresponding angles)

$b = 110°$ (vertically opposite angles)

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c = 30° (angles on a straight line)

d = 150° (alternate angles)

Interior and exterior angles

8 540°

9 **a** 720°

b 135°

10 x = 60°, y = 120°

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Unit 7 Answers

7 Strengthen

Solving geometrical problems

1 a The sum of the angles in any quadrilateral is **360°**.

b i $a = 145°$

ii $b = 72°$, $c = 108°$

iii $d = 55°$

iv $e = 95°$

2 $q = 23°$

3 a LM and MN

b $\angle$MLN and $\angle$LNM are equal.

c isosceles and right-angled

d $p = 45°$

4 a $z = 15°$

b $z = 50°$

5 a $a = 25°$ (angles on a straight line)

$b = 65°$ (angles in a triangle)

b $c = 40°$ (angles in a triangle)

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

c $e = 93°$ (angles in a quadrilateral)

$f = 83°$ (angles on a straight line)

6 a $x = 24°$

b $x = 20°$

7 a $x + 20 + 3x + x = 180°$

b $5x + 20 = 180$

c $x = 32°$

d 32°, 52°, 96°

8 a $2x + x - 10 + 135 + x + 15 = 360°$

b $4x + 140 = 360$

c $x = 55°$

d 45°, 70°, 110°, 135°

9 a $a = 42°$

b $b = 138°$

c $c = 42°$

d $d = 96°$

10a $x = 35°$

b $y = 55°$

c $z = 110°$

11 $\angle$BCA = 48° (angles in a triangle)

$\angle$ECD = 42° (angles in a right angle)

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$\angle$CDE = 37° (angles in a right angle)

$\angle$CED = 180 – 42 − 37 = 101° (angles in a triangle)

Parallel lines

1 a a and b are **vertically opposite** angles.

b a and d are **alternate** angles.

c a and c are **corresponding** angles.

d b and d are **corresponding** angles.

e c and d are **vertically opposite** angles.

2 a x = 118° (alternate angles)

b x = 138° (corresponding angles)

d x = 78° (corresponding angles)

e x = 80° (alternate angles)

3 a c = 57° (alternate angles)

d = 45° (alternate angles)

b c = 65° (corresponding angles)

d = 131° (alternate angles)

c c = 52° (alternate angles)

d = 52° (vertically opposite angles)

4 a x = 85° (vertically opposite angles)

y = 85° (corresponding angles)

b x = 63° (angles on a straight line)

y = 63° (alternate angles)

z = 117° (angles on a straight line or corresponding angles)

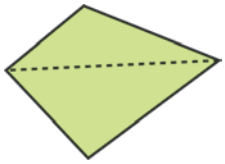
c x = 45° (angles on a straight line)

y = 45° (corresponding angles)

z = 45° (vertically opposite angles)

Interior and exterior angles

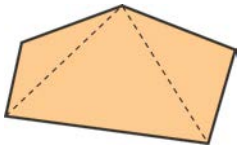
1 a i and ii e.g.



iii 360°

iv x = 86°

b i and ii e.g.



iii 540°

iv x = 119°

c i and ii e.g.

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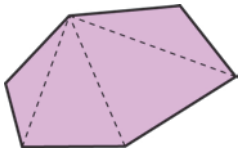

iii 720°

iv $x = 85°$

2 $x = 102°$

3 **a** They are all equal to each other.

b $x = 72°$

c $y = 108°$

4 **a** $a = 60°$

b $b = 120°$

Enrichment

1 **a** Sometimes true; e.g. a triangle could have the angles 60°, 60°, 60° (when it would be true) or 100°, 40° and 40° (when it would be untrue).

b Never true; if two angles are greater than 90° then the total is already greater than 180°, and the sum of the three angles in a triangle is 180°.

c Never true; if all four angles are less than 90°, then the total of the four angles is less than 360°, but the sum of the four angles in a quadrilateral is 360°.

2 **a** $x = 90 - 60 = 30°$

b $y = 108 - 90 = 18°$

c $z = 120 - 108 = 12°$

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Unit 7 Answers

7 Extend

1 **a** $x = 16°$

b $2x = 32°$, $3x + 10 = 58°$, $32 + 58 + 90 = 180°$

c $y = 122°$

2 $\angle CDE = 135°$

3 20°

4 24°, 48°, 96°, 192°

5 **a** $k = 9°$

b yes

6 $z = 125°$

7 **a** $a = 30°$, $b = 15°$

b $c = 45 - 15 = 30°$

c

Number of rhombuses	1	2	3	4	5
Total angle	45°	75°	105°	135°	165°

d add 30 each time

e 12 rhombuses

8 **a** A pentagon can be divided into three triangles, so the total sum of the angles is $3 \times 180° = 540°$.

b $y = 30°$

c 45°, 120°, 95°, 30°, 250°

d $45 + 120 + 95 + 30 + 250 = 540$

9 **a** $x = 135°$

b $y = 45°$

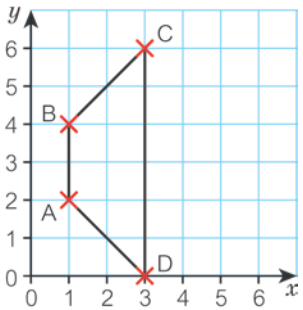
10 $y = 48°$

11 A trapezium has one pair of parallel sides, so angle a is a corresponding angle with the angle at the centre.

The angle at the centre $= 360 \div 6 = 60°$.

$a = 60°$

12a, b



c $\angle ADC = 45°$, $\angle DAB = 135°$

13 $a = 40°$ (corresponding angles with 40°)

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b = 50° (angles on a straight line with 90° and 40°)

c = 50° (alternate angles with angle b)

d = 140° (angles on a straight line with angle a)

e = 140° (vertically opposite angle d)

f = 50° (vertically opposite angle c)

g = 130° (angles on a straight line with angle f)

14a x = 15°

b x = 50°

c x = 45°

15 $\angle$BAD = 40° (angles in a triangle)

$\angle$BAC = 10° ($\angle$BAC = $\frac{1}{4}$ $\angle$BAD)

$\angle$CAD = 30° (40 – 10 = 30)

$\angle$ACD = 180 – 30 – 50 = 100° (angles in a triangle)

16 $x + y + 90 + 90 = 360$ (angles in a quadrilateral)

$x + y = 180$

x = 120°, y = 60° (angle x is double angle y)

17 Angles with the horizontal are:

stage 1 – 3.5°, stage 2 – 6.5°, stage 3 – 4°

Stages 1 and 2 are OK, but stage 3 isn't, so the ramp does not meet the recommendations.

18a **i** 20 sides

ii 162°

b 30 sides

19 Callie is correct. 1500 is not a multiple of 180.

A 10-sided polygon has total interior angles of 8 × 180 = 1440°.

An 11-sided polygon has total interior angles of 9 × 180 = 1620°.

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Unit 7 Answers

7 Unit test

1 a $y = 22°$

b $y = 30°$

2 a $a = 35°$ (angles on a straight line)

$b = 55°$ (angles in a triangle)

b $a = 40°$ (angles on a straight line)

$b = 75°$ (angles on a straight line)

$c = 150°$ (angles in a quadrilateral)

3 a $a = 120°$ (opposite angles in a parallelogram)

$b = 60°$ (angles in a quadrilateral)

b $c = 75°$ (opposite angles in a parallelogram)

$d = 105°$(angles in a quadrilateral)

c $e = 50°$ (isosceles trapezium has two pairs of equal angles)

4 $x = 15°$

5 a $x = 30°$

b 140°, 90°, 75°, 55°

6 $w = 140°$

7 a i The angles in a triangle add up to **180**°.

ii The angles in a quadrilateral add up to **360**°.

iii The angles in a pentagon add up to **540**°.

iv The angles in a hexagon add up to **720**°.

b $m = 60°$

8 a $a = 85°$ (alternate angles)

b $b = 76°$ (corresponding angles)

c $c = 37°$ (corresponding angles)

9 $\angle CDB = 90 - 68 = 22°$ (angles in a right angle)

$\angle DBC = 180 - 22 - 36 = 122°$ (angles in a triangle)

10a $x = 45°$

b $y = 135°$

11a i 10 sides

ii 144°

b 24 sides

Challenge

12a yes

b yes

c equilateral triangle, square, regular hexagon

d Octagons will tessellate with squares.

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Unit 8 Answers

Exercise 8.1

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

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

c 4

d $2\frac{8}{9}$

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

2 a $\frac{1}{8}=\frac{2}{16}$

b $\frac{2}{5}=\frac{4}{10}$

c $\frac{5}{6}=\frac{20}{24}$

d $\frac{2}{9}=\frac{6}{27}$

3 a 30

b 6

c 40

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

b 1

c 1

5 a $\frac{5}{12}+\frac{4}{12}=\frac{9}{12}=\frac{3}{4}$

b $\frac{3}{4}$

c $\frac{1}{6}$

d $\frac{1}{2}$

e $\frac{2}{9}$

f $\frac{2}{9}$

6 a The coloured bars show that $\frac{2}{3}+\frac{2}{5}\neq\frac{4}{8}$; Kieran has made the mistake of adding the numerators together and the denominators together.

b $1\frac{1}{15}$

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

b $\frac{13}{15}$

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c $\frac{9}{14}$

d $\frac{7}{12}$

e $\frac{17}{20}$

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

b $\frac{2}{7}$

c $-\frac{2}{7}$

d 0

9 a $1\frac{7}{20}$

b $-1\frac{1}{10}$

c $8\frac{5}{8}$

d $8\frac{2}{5}$

10 Students' own answers, e.g. $1\frac{1}{12}$ and $3\frac{1}{4}$

11a $1\frac{1}{4}$ hours

b $\frac{11}{12}$ of an hour

c $2\frac{1}{6}$ hours

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Unit 8 Answers

Exercise 8.2

1 **a** 75 kg

b 20 cm

c 21 m*l*

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

b $\frac{3}{5}$

c $\frac{2}{9}$

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

e $12\frac{1}{2}$

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

3 **a** 24

b 60

c 12

d 3

e 4

f 5

g 14

h 8

4 **a** $3\frac{1}{3}$ cm^2

b $\frac{2}{3}$ cm^2

c 5 cm^2

d $7\frac{1}{2}$ cm^2

5 **a** Yes; $0.1 = \frac{1}{10}$, so $50 \times 0.1 = 50 \times \frac{1}{10}$.

b 10

c purple

6 **a** $\frac{1}{4}$

b $\frac{1}{6}$

c $\frac{1}{12}$

d $\frac{3}{8}$

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

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f $-\frac{5}{12}$

7 a area = $\frac{1}{4}$ m^2; perimeter = 2 m

b area = $\frac{9}{16}$ cm^2; perimeter = 3 cm

c area = $\frac{1}{16}$ m^2, perimeter = 1 m

8 $\frac{1}{60}$

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

b $\frac{1}{6}$

c $\frac{1}{2}$

d $\frac{2}{7}$

e $\frac{1}{7}$

f $\frac{1}{6}$

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

b The writer gets £1000, the singer gets £250 and the guitarist gets £250.

11a $\frac{7}{12}$

b $-\frac{1}{4}$

c $\frac{8}{81}$

d $-\frac{5}{27}$

e $\frac{3}{10}$

f $\frac{3}{32}$

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Unit 8 Answers

Exercise 8.3

1 **a** 15

b 12

c 20

2 **a** $\frac{1}{24}$

b $\frac{6}{35}$

c $\frac{1}{12}$

d $\frac{1}{14}$

3 **a** 4.3

b 1.1

c 5.3

d 0.9

4 **a** 1 hour 12 minutes

b 4 hours 30 minutes

c 9 hours 6 minutes

d 8 hours 36 minutes

5 **a** 5 hours 30 minutes

b 4 hours 45 minutes

6 **a** $\frac{1}{14}$

b $\frac{1}{5}$

c $\frac{3}{16}$

7 **a** $\frac{1}{5}$

b $\frac{4}{5}$

8 **a** written method showing 0.4

b written method showing 0.3

c written method showing 0.375

d written method showing 1.4

e written method showing 2.25

9 $0.\dot{3}$, $0.8\dot{3}$, $2.1\dot{6}$, $0.\dot{6}$, $0.\dot{1}42857\dot{}$, $1.\dot{6}$

10a 1

b 1

c 1

11 Students' own answers

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12a $\frac{7}{2}$

b $\frac{1}{5}$

c 10

d $\frac{1}{8}$

13 $\frac{1}{f} = \frac{1}{20}$, f = 20 mm

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Unit 8 Answers

Exercise 8.4

1 **a** 1 and 3

b 1 and 2

c 1, 3 and 9

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

b $\frac{1}{6}$

c $\frac{6}{35}$

d $\frac{1}{2}$

e $\frac{1}{6}$

f -2

g $\frac{2}{15}$

h $\frac{2}{15}$

3 **b** $1 \div \frac{1}{4} = 4$

c $1 \div \frac{1}{3} = 3$

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

e $2 \div \frac{1}{4} = 8$

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

b $\frac{1}{6}$

c 9

d 4

5 **a** 18

b 7

c 225

d 60

e -50

f -45

g -36

h -50

6 8 mugs

7 **a** Students' own answers, e.g. $1 \div \frac{1}{2} = 2$, and $2 > 1$

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

b $\frac{8}{9}$

c $\frac{3}{5}$

d $-\frac{5}{32}$

9 a $\frac{2}{3}$

b $\frac{3}{4}$

c $\frac{6}{7}$

d $-\frac{8}{9}$

10 6 or 7

11 6

12 8

13a 4, 2, 1, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$

b $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 4

c e.g. Each answer in part **a** is half of the previous answer. Each answer in part **b** is double the previous answer.

14a $\frac{5}{12}$

b 4

c $\frac{4}{11}$

d $1\frac{5}{7}$ or $\frac{12}{7}$

e $\frac{1}{4}$

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Unit 8 Answers

Exercise 8.5

1 a $1\frac{1}{6}$

b $\frac{7}{8}$

c $\frac{3}{20}$

d $\frac{1}{10}$

e $\frac{2}{3}$

f $2\frac{2}{3}$

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

b 13 cm

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

b $6\frac{5}{6}$

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

d $8\frac{7}{15}$

e $8\frac{11}{72}$

f $1\frac{1}{4}$

g $6\frac{1}{40}$

4 a $6\frac{1}{4}$ hours or 6 hours 15 minutes

b 22:30

5 a $\frac{11}{2}$

b $\frac{19}{8}$

c $\frac{55}{6}$

d $\frac{43}{4}$

6 a $\frac{11}{12}$

b $\frac{1}{10}$

c $3\frac{9}{10}$

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d $-2\frac{1}{2}$

e $4\frac{1}{16}$

f $1\frac{2}{21}$

g $-3\frac{5}{12}$

h $-2\frac{2}{9}$

7 $9\frac{1}{21}$ miles

8 **a** $7\frac{1}{2}$ kg

b $24\frac{3}{5}$ m

c 16

d $12\frac{1}{2}$

e 45

f $233\frac{4}{5}$

9 25 seconds

10 $15\frac{5}{16}$ cm^2

11a $3\frac{1}{8}$

b $3\frac{2}{15}$

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

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

e $26\frac{1}{24}$

f $5\frac{19}{25}$

12 $\frac{5}{12}$ of a mile

13 $\frac{7}{8}$ of a pint

14a $8\frac{4}{9}$ m

b $7\frac{1}{3}$ m

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Unit 8 Answers

8 Check up

Adding and subtracting fractions

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

b $\frac{1}{5}$

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

d $\frac{1}{2}$

e 2

f $-\frac{5}{11}$

g $\frac{7}{50}$

h $1\frac{1}{4}$

2 $\frac{2}{6}=\frac{1}{3}$; Theo has made the mistake of adding the numerators together and the denominators together.

3 **a** $\frac{11}{15}$

b $\frac{31}{42}$

c $\frac{1}{2}$

d $\frac{1}{2}$

e $\frac{1}{30}$

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

g $-\frac{16}{75}$

4 $\frac{26}{63}$

Multiplying and dividing fractions

5 **a** 5

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

c 21

6 **a** 12

b 25

c $8\frac{2}{5}$

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

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b $\frac{1}{2}$

c $\frac{4}{45}$

d $\frac{2}{11}$

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

b 5

c $\frac{7}{2}$

9 a $\frac{1}{24}$

b $\frac{4}{27}$

c 10

d $2\frac{21}{52}$

e $\frac{1}{2}$

f $\frac{2}{7}$

10a $2\frac{1}{5}$ m or $\frac{11}{5}$ m

b $\frac{6}{25}$ m^2

Calculating with mixed numbers and decimals

11a written method showing 2.75

b written method showing 1.8

c written method showing 0.625

12 $0.7 = \frac{7}{10}$

$0.8 = \frac{4}{5}$

$0.\dot{6} = \frac{2}{3}$

$0.\dot{3} = \frac{1}{3}$

$0.75 = \frac{3}{4}$

13 $\frac{17}{5}$

14a $3\frac{7}{10}$

b $8\frac{7}{12}$

c $-\frac{2}{5}$

d $1\frac{2}{15}$

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15 Because there are 60 minutes in an hour, not 100; and 0.4 of an hour is 0.4 × 60 = 24, so 4.4 hours is 4 hours 24 minutes.

16a $1\frac{2}{3}$

b $-1\frac{1}{9}$

c $\frac{1}{3}$

d 3

e $16\frac{1}{2}$

f $-1\frac{2}{5}$

h $\frac{105}{122}$

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Unit 8 Answers

8 Strengthen

Adding and subtracting fractions

1 a D, 1

b C, $\frac{2}{3}$

c A,1

d E, $\frac{1}{2}$

e B, $\frac{3}{4}$

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

b $\frac{1}{4}$

c $\frac{1}{3}$

3 $\frac{5}{6}$

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

b $\frac{7}{10}$

c $\frac{7}{8}$

d 1

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

b $\frac{1}{10}$

c $\frac{1}{2}$

d $\frac{1}{9}$

6 a $\frac{6}{14}+\frac{7}{14}=\frac{13}{14}$

b $\frac{4}{12}+\frac{3}{12}=\frac{7}{12}$

c LCM is **30**; $\frac{9}{30}+\frac{20}{30}=\frac{29}{30}$

7 a $\frac{19}{24}$

b $\frac{19}{60}$

c $-\frac{4}{33}$

8 a Marie has made the mistake of adding the numerators together and the denominators together.

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b $\frac{3}{20}$

9 a $\frac{8}{15}$

b $\frac{23}{60}$

c $\frac{1}{4}$ of the prize money

Multiplying and dividing fractions

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

b $\frac{2}{7}$

c $2\frac{2}{5}$

d $1\frac{7}{11}$

e $1\frac{3}{7}$

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

g 36

2 a $\frac{5\times3}{6\times5}=\frac{3\times5}{6\times5}=\frac{1}{2}$

b 1

c $\frac{1}{9}$

d $\frac{4}{5}$

e $\frac{2}{7}$

3 a 24 ÷ 12 = **2**

24 ÷ 8 = **3**

24 ÷ 2 = **12**

24 ÷ 1 = **24**

24 ÷ $\frac{1}{2}$ = **48**

24 ÷ $\frac{1}{3}$ = **72**

24 ÷ $\frac{1}{4}$ = 96

b When the numbers you divide by get smaller, the answer gets **bigger**.

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

b $\frac{4}{3}$

c $\frac{1}{5}$

d $\frac{1}{12}$

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e 3

f 2

g 8

h $\frac{1}{6}$

5 a $\frac{3}{5} \times \frac{7}{2} = \frac{21}{10} = 2\frac{1}{10}$

b $\frac{8}{9} \times \frac{5}{1} = \frac{40}{9} = 4\frac{4}{9}$

c $\frac{3}{20}$

d $2\frac{4}{7}$

e $\frac{25}{51}$

f $3\frac{1}{2}$

6 $8\frac{4}{7}$ miles per hour

Calculating with mixed numbers and decimals

1 $\frac{1}{2}$ and 0.5, $\frac{1}{8}$ and 0.125, $\frac{5}{8}$ and 0.625, $\frac{3}{5}$ and 0.6, $\frac{7}{10}$ and 0.7

2 a 0.33333

b 0.16666

c 0.83333

3 a $0.\dot{1}$

b $0.\dot{4}$

c $1.\dot{2}$

d $1.\dot{6}$

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

b $\frac{7}{2}$

c $\frac{17}{6}$

d $\frac{43}{8}$

e $\frac{11}{10}$

f $\frac{123}{10}$

5 a 4

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

c 8

6 a $4\frac{1}{12}$

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b $6\frac{1}{2}$

c $4\frac{3}{70}$

d $14\frac{7}{30}$

e $12\frac{1}{16}$

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

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

c $8\frac{1}{2}$

d $3\frac{7}{10}$

e $\frac{3}{4}$

f $\frac{51}{70}$

8 a 3 hours 15 minutes

b 1 hour 45 minutes or $1\frac{3}{4}$ hours

9 a $\frac{4}{5} \times \frac{7}{3} = \frac{4 \times 7}{5 \times 3} = \frac{28}{15} = 1\frac{13}{15}$

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

c $\frac{1}{6}$

d $\frac{35}{54}$

e $7\frac{16}{33}$

10a 11

b $3\frac{43}{44}$

c $6\frac{1}{6}$

d 50

e $3\frac{25}{33}$

Enrichment

1 $\frac{9}{20}$

2 a 15 hours

b $\frac{1}{3}$

c $\frac{7}{24}$

3 a 12.5 cents

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b 37.5 cents

c 310

d $3\frac{3}{16}$ of a dollar

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Unit 8 Answers

8 Extend

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

b $\frac{193}{430}$

c $\frac{4}{27}$

d $\frac{3}{20}$

2 $\frac{1}{18}$

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

b $\frac{1}{2}$

c £35 001–£55 000

d e.g. The wage categories are different sizes.

4 a 10 cakes cut into sevenths gives 70 pieces, which is not enough for 75 people.

b 8

c 5

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

b $\frac{1}{16}$

c $\frac{4}{9}$

d $\frac{4}{5}$

e $\frac{1}{8}$

f $\frac{3}{4}$

6 a $3\frac{17}{24}$ (or 3.708)

b $8\frac{19}{32}$ (or 8.59375)

c $-\frac{8}{21}$ (or -0.381)

d $11\frac{9}{100}$ (or 11.09)

e $11\frac{3}{8}$ (or 11.375)

f $6\frac{39}{100}$ (or 6.39)

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7 a

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

b Students' own answers

8 a 14 : 1

b 22 : 3

c 21 : 26

9 20

10a $\frac{29}{75}$

b 2.2

11a $\frac{9}{5}$

b $\frac{2}{3}$

c $\frac{2}{9}$

d $\frac{5}{13}$

e $-\frac{2}{3}$

f −10

12a 1

b No; you cannot divide by 0.

13a $\frac{1}{64}$

b $\frac{8}{27}$

c $\frac{1}{3}$

d $\frac{2}{5}$

14a $\frac{1}{3}$ cm

b $\frac{8}{27}$ cm^3

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

14a $\frac{1}{2}$ km

b 2 km

c $\frac{1}{8}m^3$

15a $\frac{1}{4}$

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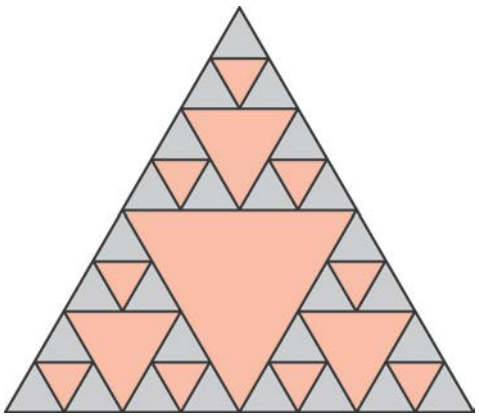
b $\frac{7}{16}$

c



$\frac{1}{4} + \frac{3}{16} + \frac{9}{64}$

d The numerator sequence increases by ×3.

The denominator sequence increases by ×4.

16a ii $\frac{1}{110}$

iii $\frac{1}{22}$

iv $\frac{1}{111}$

b i

ii

iii

iv

17a

Fraction	Decimal
$\frac{1}{3}$	0.333…
$\frac{2}{4}$	0.5

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Fraction	Decimal
$\frac{3}{5}$	0.6
$\frac{4}{6}$	0.666…
$\frac{5}{7}$	0.714…
and so on	

The size of the fraction is increasing; the denominator *increases* each time as a proportion of the numerator.

b

Fraction	Decimal
$\frac{6}{5}$	1.2
$\frac{7}{6}$	1.166…
$\frac{8}{7}$	1.142…
$\frac{9}{8}$	1.125
$\frac{10}{9}$	1.111…
and so on	

The size of the fraction is decreasing; the denominator decreases each time as a proportion of the numerator.

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Unit 8 Answers

8 Unit test

1 **a** 7

b −12

c 15

d 10

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

b $\frac{7}{8}$

c $\frac{1}{4}$

d $\frac{21}{22}$

e $\frac{21}{40}$

f $-\frac{7}{55}$

3 $\frac{1}{3}$

4 $8\frac{15}{28}$

5 **a** 0.75

b 0.9

c 0.8

d 0.625

6 **a** $7\frac{11}{15}$

b $11\frac{11}{12}$

c $13\frac{1}{2}$

d $-2\frac{27}{40}$

7 **a** $\frac{3}{20}$

b $-\frac{5}{18}$

c $\frac{7}{15}$

d $\frac{4}{55}$

8 **a** 20

b 15

c 20

d $-5\frac{5}{8}$

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9 $2\frac{2}{5}$

10a $2\frac{3}{4}$

b $\frac{17}{20}$

c $-6\frac{1}{5}$

d $-2\frac{4}{21}$

11 44 minutes

12 a $\frac{1}{18}$

b $\frac{1}{12}$

c $\frac{2}{5}$

d $\frac{11}{48}$

13 a $\frac{2}{3}$

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

c $-\frac{27}{28}$

d $1\frac{1}{24}$

14a $3\frac{2}{5}$

b $4\frac{3}{7}$

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

15a $\frac{1}{5}$

b $\frac{1}{10}$

c 2

d $1\frac{5}{6}$

e $\frac{2}{3}$

f $\frac{5}{19}$

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

b $\frac{3}{4}$

c $5\frac{1}{60}$

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d $6\frac{1}{2}$

17a $\frac{1}{2}$ cm

b $\frac{2}{5}$cm

18a $\frac{1}{3}$ cm

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

19 a e.g. $\frac{1}{4}+\frac{1}{12}$

b e.g. $\frac{1}{6}+\frac{1}{30}$

Challenge

20a eighths

b Students' own answers

c 128

d Not by folding the paper in half each time, but you could do it by folding the paper into five, then folding this in half.

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Unit 9 Answers

Exercise 9.1

1 a £6

b £1.50

c 720 roubles

2 B and C

3 a £1.50

b 500g

c £5.25

d 240g

e £22.50

f £1.50

g Yes

4 a Yes; straight line through the origin

b i 0.04 ohms

ii 0.15 ohms

iii 0.3 ohms

c i 1 m

ii 25 m

5 a 20 feet

b 9 m

c 4 m (13 feet)

d Stuart (6 feet is 1.8 m)

e 5 rolls (75 feet ≈ 23 m)

6 a graph through (10,50), (15,59), (30,86)

b No; the line does not go through the origin.

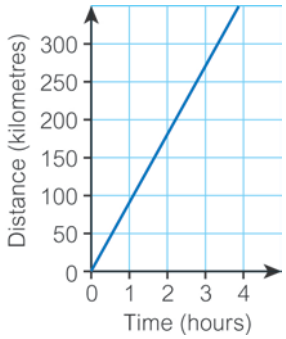
c 32°

d 70 °F; 64 °F

7 a

Time (hours)	0	1	2
Distance (km)	**0**	**90**	**180**

b



c

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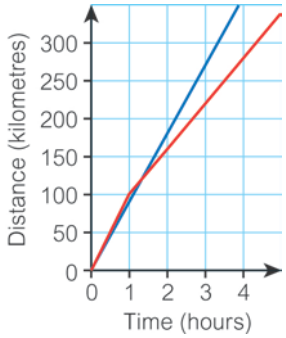


d the graph for the first car

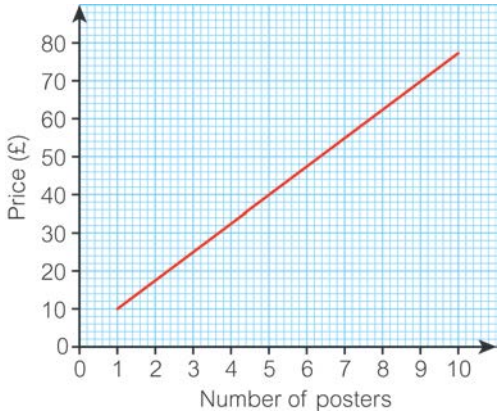
8 **a** graph through (0,0), (50,75), (100, 150)

b Yes; graph is a straight line through the origin.

9 **a**

Number of posters	1	2	10
Price	£10	£17.50	£77.50

b



c £40

d No

e No; the line does not go through the origin.

10 A, C, D

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Unit 9 Answers

Exercise 9.2

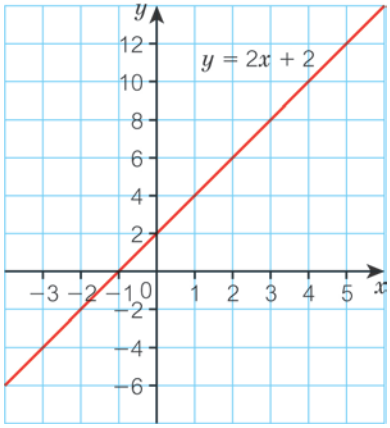
1 B, D, C, A

2 **a** $y = 2x + 2$

x	1	2	3	4	5
y	4	**6**	**8**	**10**	**12**

b (1, 4) (2, **6**) (3, **8**) (4, **10**) (5,**12**)

c

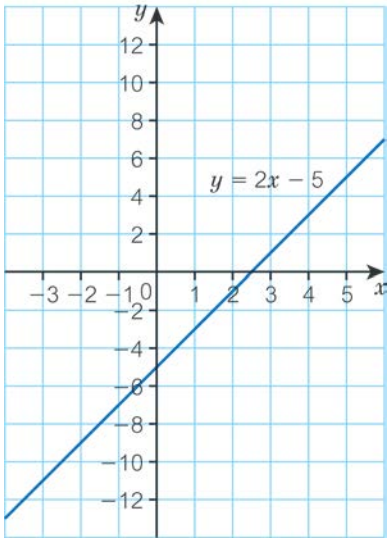


d −4

3 **a**

x	−2	−1	0	1	2
y	−9	**−7**	**−5**	**−3**	**−1**

b



c The two lines are parallel.

4 **a** 2 squares

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b 4 squares

c 6 squares

d positive

e negative

f 3 squares

5 A 2

B −3

6 line 1: −1

line 2: −2

line 3: 1

line 4: $\frac{2}{7}$

line 5: $\frac{2}{7}$

line 6: $-\frac{5}{3}$

7 **a** 1

b 3

c 1, 6

d 1

e 2, 5

f $\frac{3}{4}$ as it is the largest fraction

8 **a** **i** $\frac{1}{5}$

ii $\frac{1}{10}$

iii $\frac{1}{4}$

iv $\frac{1}{3}$

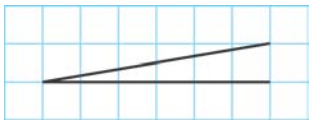
b **i** 20%

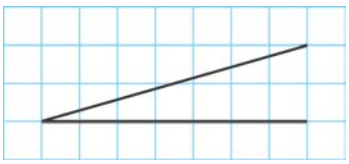
ii 10%

iii 25%

iv 33.3%

c





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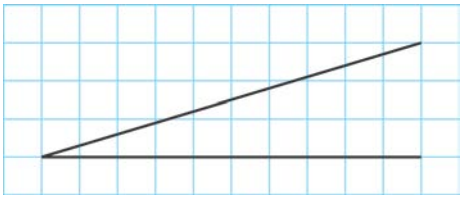
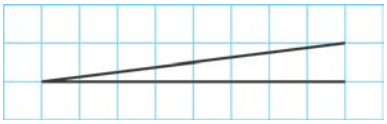




9 a i

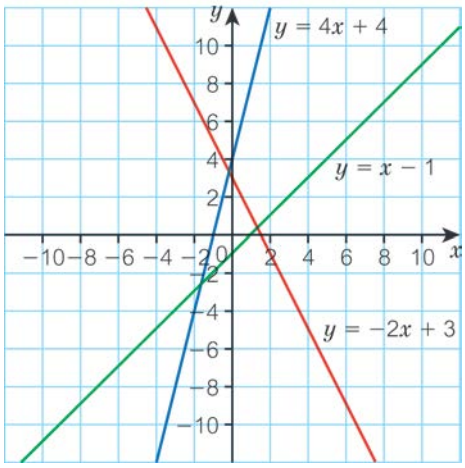
x	−2	−1	0	1	2	3
y	−3	−2	−1	**0**	**1**	**2**

ii

x	−3	−2	−1	0	1
y	**−8**	**−4**	0	4	**8**

iii

x	−2	−1	0	1	2	3
y	7	**5**	**3**	**1**	**−1**	**−3**



b i 1

ii 4

iii −2

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Unit 9 Answers

Exercise 9.3

1 Line AB has midpoint (5, 3)

Line CD has midpoint (−2,−3)

Line EF has midpoint (3.5,−3)

Line GH has midpoint (0, 3.5)

2 Line GH has positive gradient; Line EF has negative gradient

3 **a** (2, 6)

b (4, −2)

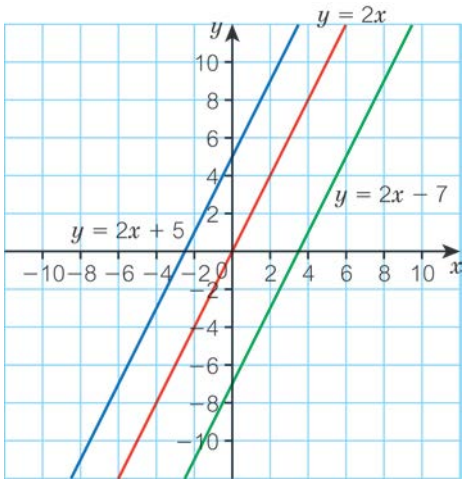
c (−0.5, 2)

d (2.5, −4)

4 **a**

x	−2	−1	0	1	2
$y = 2x$	−4	−2	0	2	4
$y = 2x + 5$	1	3	5	7	9
$y = 2x - 7$	−11	−9	−7	−5	−3

b



c parallel

d 2

e Lines with the same gradient are **parallel**.

Parallel lines have the same **gradient.**

5 **a** gradient = 1; y-intercept = 0

b $y = x$

c B $y = x + 2$

C $y = x - 4$

6 **a** A $y = 2x + 4$

B $y = 3x$

C $y = 2x - 1$

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D $y = x$

b B and D

c B

d $y = 2x - 1$ (line C) and $y = 2x + 4$ (line A)

7 A $y = x + 3$

B $y = 2x - 2$

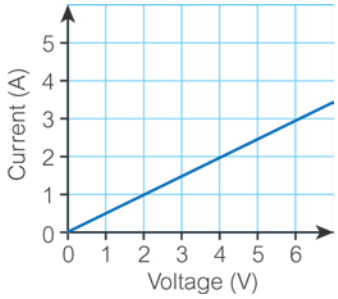
C $y = 3x + 2$

D $y = -2x - 2$

E $y = -2x + 3$

F $y = 2x + 4$

8 a



b 2.5 A

c $y = \frac{1}{2}x$ or $C = \frac{1}{2}V$

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Unit 9 Answers

Exercise 9.4

1 **a** 900 g

b 340 cm^3

2 **a** Yes; straight line through the origin

b $y = 10x$

c $F = 10M$

d **i** 300 N

ii 600 N

iii 900 N

3 **a** Yes; when height is 0, temperature drop is 0; when height doubles, temperature drop doubles.

b 9.7 °C

4 **a** 60.96 cm (shows direct proportion)

b **i** £2

ii £3

c £65 (shows direct proportion)

d £324 (shows direct proportion)

e 120 miles

5 **a** A and D

b No; the sequences do not start at zero.

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Unit 9 Answers

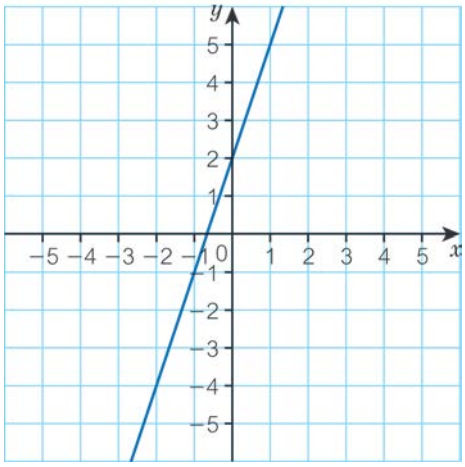
9 Check up

Straight-line graphs

1 a

x	−2	−1	0	1	2
y	**−4**	**−1**	**2**	**5**	**8**

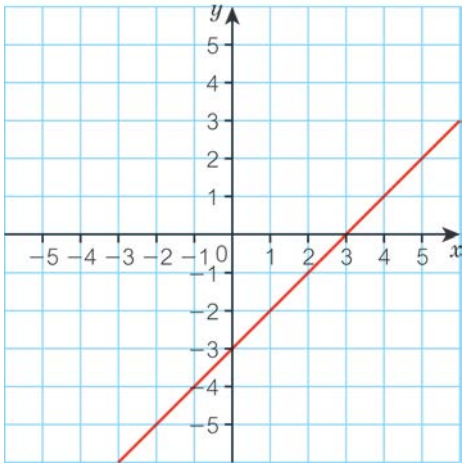
b



2 a

x	−2	−1	0	1	2
y	**−5**	**−4**	**−3**	**−2**	**−1**

b



c $y = 3x + 2$

d (0,−3)

3 A 4

B −4

C $\frac{2}{3}$

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Finding equations of graphs

4 A $y = 2x$

B $y = x - 2$

C $-\frac{1}{4}x + 1$

5 **a** D

b B

c A

d C

Midpoints

6 **a** (5, 4)

b (−1, 2.5)

Direct proportion

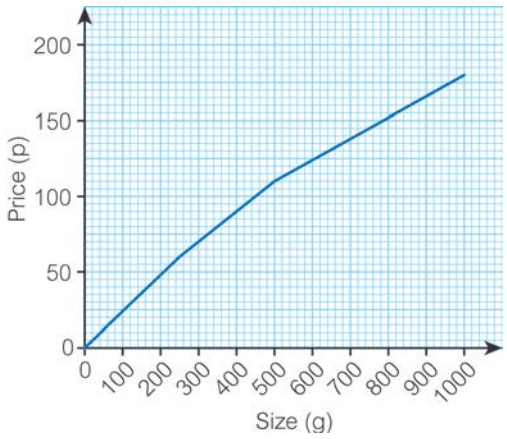
7 **a** filling

b Yes; straight line through the origin

c **i** 1.25 hours

ii 4 hours

8 **a**



b No; graph is not a straight line.

9 Yes; when mass is 0, stretch is 0; when mass doubles, stretch doubles.

Challenge

11 The fewer euros to the pound, the steeper the line. 2013 rate is steeper.

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Unit 9 Answers

9 Strengthen

Straight-line graphs

1 a B

b B

2 The steepness of the graph is called the **gradient.**

A positive gradient goes **up** from left to right.

A negative gradient goes **down** from left to right.

3 a positive

b 2

c B 3

C 1

D 5

4 a negative

b −4

c F −2

G −1

5 A 3

B 1

C −4

D −2

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

b $\frac{1}{4}$

c $\frac{1}{3}$

7 $\frac{1}{2}, \frac{1}{4}, \frac{1}{3}, -\frac{1}{2}$

Finding equations of graphs

1 a The gradients are all the same; gradient = 3.

b

Line	*y*-intercept
$y = 3x + 3$	3
$y = 3x + 1$	1
$y = 3x$	0
$y = 3x - 2$	−2
$y = 3x - 4$	−4

c (0, 5)

d $y = 3x + 2$

2 a 2

b 4

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c $y = 2x + 4$

3 A $y = 4x + 1$

B $y = 2x - 2$

C $y = x + 3$

D $y = \frac{1}{2}x - 1$

4 E $y = -2x + 3$

F $y = \frac{1}{3}x + 1$

G $y = -3x - 2$

H $y = 4x$

5 a $y = -2x + 1$ and $y = -\frac{1}{2}x - 2$

b B $y = -2x + 1$

D $y = -\frac{1}{2}x - 2$

c $y = x + 3$ and $y = 3x + 3$

d No; both have the same y-intercept.

e and f

A $y = x + 3$

C $y = 3x + 3$

6 a F $y = -4x + 2$

G $y = 3x$

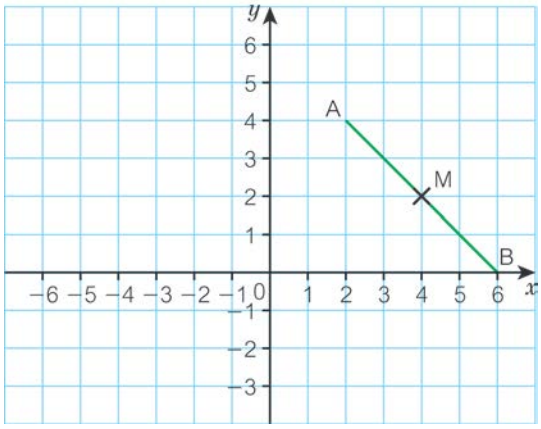
H $y = 3x + 4$

I $y = -\frac{1}{4}x + 2$

b G and H

Midpoints

1 a–c



d M (4, 2)

2 a (3, 6)

b (4, 3)

c (1, 3)

d (2, 2)

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e (2.5, 6)

f (1.5, −2.5)

Direct proportion

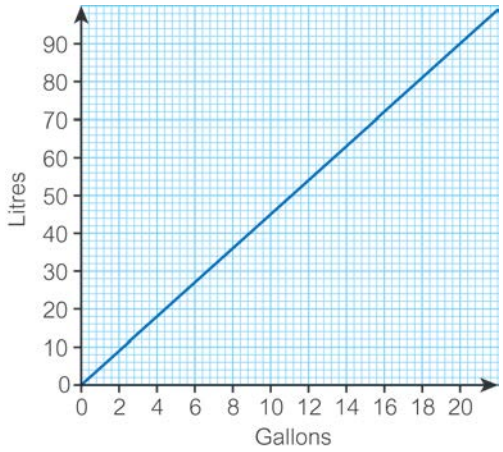
1 d When two quantities are in direct proportion their graph is a **straight line** through **(0, 0)**.

2 A and C

3 a

Gallons	Litres
0	0
1	4.5
2	9.0
5	22.5
10	45.0
20	90.0

b



c i 36 litres

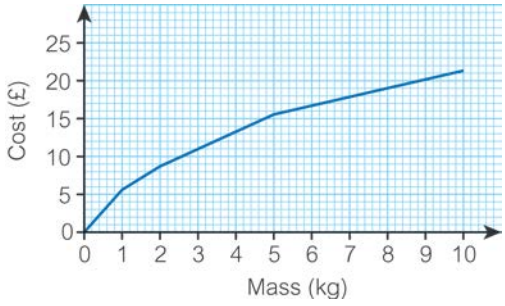
ii 4 gallons

iii 162 litres

iv 17 gallons

d Yes; straight line through the origin.

4



Gradient of line is not constant; cost for 2 kg is not double cost for 1 kg.

5 a No; cost for 2 hours is not double the cost for 1 hour

b Yes; when one texts sent is 0, cost is zero; when texts sent doubles, cost doubles.

Enrichment

1 Students' own answers

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2 **a** scalene

b AB $y = x - 1$

BC $y = -x + 11$

CA $y = -\frac{11}{3}x + \frac{25}{3}$ (y-intercept from graph between 8 and 9)

3 $y = x + 13$

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Unit 9 Answers

9 Extend

1 280 km

2 $1\frac{1}{4}$ hours (assuming it's a conventional oven, not a microwave)

3 4 days

4 2 days

5 **a** 3

b 3, same answer

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

B 2

C $-\frac{1}{2}$

D $\frac{3}{4}$

E $-\frac{2}{3}$

7 **a** yes

b $\frac{1}{30}$

c $y = \frac{1}{30}x$

d The gradient is $\frac{1}{30}$.

8 **a** $y = x$

b $y = \frac{x}{2.2}$

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

d $y = \frac{x}{1.6}$

9 **b** $p = 6k$

c $E = 37y$

d $m = 3.5y$

10b The perimeter of an octagon with sides of length s.

c The wage received for h hours work at a rate of £9 per hour.

d Weekly earnings for 30 hours work at £w per hour

e The number of miles travelled at a speed of 60mph for h hours

11 Students' own answers

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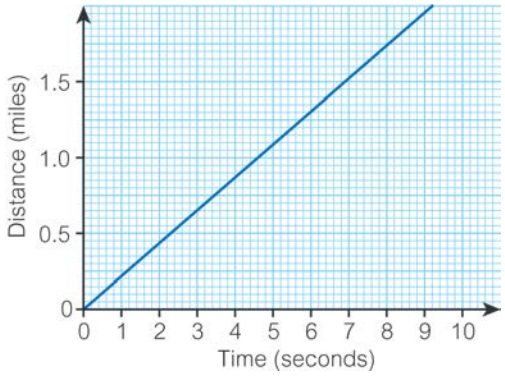
12



Yes, the distances is in direct proportion with the time (within the bounds of accuracy of the measurements).

13a 6

b yes

c yes

14a **i** B

ii A

iii D

iv C

15a £2x

b £5x

c £10x

16a 625 g flour

25 g yeast

5 tablespoons oil

450 ml water

b 750 g = 25 ounces of flour

3 teaspoons salt

3 tablespoons caster sugar

30 g = 1ounce yeast

6 tablespoons oil

540 ml = 18 fluid ounces water

17 a 50 seconds

b 1.25 cm

18 quantities c and d

19 Force and mass; perimeter and side

20 Students' own answers

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Unit 9 Answers

9 Unit test

1 £21

2 **a** (8, 5)

b (−1, −1.5)

3 **a** A 2

B $\frac{1}{3}$

C $-\frac{1}{2}$

D $\frac{2}{3}$

b A $y = 2x - 3$

B $y = \frac{1}{3}x + 4$

C $y = -\frac{1}{2}x + 1$

D $y = \frac{2}{3}x$

4 **a** Graph showing this data:

Mass (tonnes)	1.5	2.1	2.6
Price (£)	45	63	78

b Yes; straight line through the origin

c £30

d $P = 30m$, where P is price in £ and m is mass in tonnes.

5 4 hours

6 (4, 11)

7 No; when the units used doubles from 50 to 100, the cost does not double. £21.50 is not double £19.25.

8 **a** D

b B

c C

d A

9 **a** No; $y \div x$ is not the same for each pair.

b Yes; $y = 3.8x$

10 **a** 2 oz = 54 g; 3 oz = 84 g; 4 oz = 108 g

People use 25 g or 30 g because it is easier to divide and multiply by 25 or 30 than by 28.

b *Using 1 oz = 25 g*

8 oz plain flour

3 oz caster sugar

4 oz butter

1 egg

2 oz currants

1 oz candied peels

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$\frac{1}{2}$ teaspoon ground cinnamon

c *Using 1 oz = 30 g*

270 g self raising flour

60 g soft margarine

90 g caster sugar

180 g fresh blueberries

grated rind of one lemon

2 eggs

240 m*l* milk

d eggs, ground cinnamon, grated rind of one lemon

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Unit 10 Answers

Exercise 10.1

1 **a** 1.6

b 1.333333333

c 2.5

2

Fraction	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{\mathbf{3}}{\mathbf{5}}$	$\frac{\mathbf{2}}{\mathbf{3}}$	$\frac{3}{4}$	$\frac{4}{5}$	$\frac{9}{10}$
Decimal	**0.1**	**0.2**	0.25	$\mathbf{0.\dot{3}}$	0.4	**0.5**	0.6	$0.\dot{6}$	**0.75**	**0.8**	0.9

3 the parallelogram

4 Deefa has a mass of 7.6 kg and so is heavier.

5 **a** $\frac{49}{100}$

b $\frac{39}{50}$

c $\frac{181}{500}$

d $\frac{32}{125}$

e $3\frac{6}{25}$

f $7\frac{1}{8}$

6 **a** Shelly has put the denominator as 1000 when it should be 10 000.

b You can divide Shelly's answer by 10 to get the correct conversion.

7 Jayne is not correct because 48 minutes is not 0.48 hours, it is 0.8 hours.

8 **a** 3.5 hours

b 1.25 hours

c 10.2 hours

d 6.75 hours

9 **a** $0.\dot{8}$

b $0.\dot{3}\dot{6}$

c $0.4\dot{2}$

d $0.\dot{3}0\dot{5}$

e $0.\dot{1}234\dot{}$

f $0.6\dot{3}$

10 $\frac{5}{9} = 0.\dot{5}$

$\frac{2}{11} = 0.\dot{1}\dot{8}$

$\frac{4}{15} = 0.2\dot{6}$

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$\frac{5}{12} = 0.41\dot{6}$

11a $5.1\dot{6}$ hours

b $3.\dot{3}$ hours

c $7.\dot{6}$ hours

d $6.0\dot{6}$ hours

12a 2.13 mph

b 56.25 minutes

13 2 hours 48 minutes

14 $\frac{5}{8}, \frac{3}{5}, \frac{1}{2}, \frac{5}{12}, \frac{1}{3}$

15a $\frac{2}{5}, \frac{7}{10}, \frac{7}{8}, \frac{19}{20}$

b $\frac{3}{7}, \frac{1}{2}, \frac{3}{4}, \frac{11}{14}$

c $\frac{3}{5}, \frac{4}{6}, \frac{7}{10}, \frac{11}{15}$

16a $\frac{11}{15}$, 0.7, $\frac{19}{30}$, 0.6, $\frac{7}{12}, \frac{8}{15}$, 0.55

b 0.9, $\frac{17}{20}$, 0.84, $\frac{8}{10}$, 0.72, 0.625, $\frac{3}{5}$

17a 0.125

b 0.0625

18a 0.005

b 0.02

c 0.04

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Unit 10 Answers

Exercise 10.2

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

b $\frac{1}{2}$

c $\frac{2}{5}$

d $\frac{2}{3}$

e $\frac{2}{7}$

f $\frac{4}{9}$

2

Fraction	$\frac{1}{4}$	**$\frac{1}{2}$**	**$\frac{3}{4}$**	**$\frac{1}{5}$**	$\frac{3}{5}$	**$\frac{3}{10}$**	**$\frac{1}{1}$**
Decimal	**0.25**	0.5	**0.75**	0.2	**0.6**	0.3	**1.0**
Percentage	**25%**	**50%**	75%	**20%**	**60%**	**30%**	100%

3

Mixed number	$1\frac{1}{2}$	**$1\frac{7}{10}$**	**$1\frac{4}{5}$**	**$1\frac{1}{10}$**	**$1\frac{1}{20}$**
Decimal	**1.5**	1.7	**1.8**	**1.1**	1.05
Percentage	**150%**	**170%**	180%	110%	**105%**

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

b 2.5

5 a $\frac{2}{25}$

b i 0.08

ii 8%

6 a i $\frac{3}{50}$, 0.06 , 6%

ii $\frac{261}{500}$, 0.522, 52.2%

iii $\frac{17}{250}$, 0.068, 6.8%

b Brand B

c Brand A

7 b 0.475 = 47.5%

c 0.345 = 34.5%

d 0.375 = 37.5%

8 b 0.125 = $\frac{1}{8}$

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c $0.425 = \frac{17}{40}$

d $0.095 = \frac{19}{200}$

9 a $\frac{24}{25}$

b 96%

10b 0.124 = 12.4%

c 0.034 = 3.4%

d 0.024 = 2.4%

11 Sumaya's team

12b $0.624 = \frac{78}{125}$

c $0.028 = \frac{7}{250}$

d $0.953 = \frac{953}{1000}$

13 Method A

14a $\frac{71}{125}$

b 56.8%

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Unit 10 Answers

Exercise 10.3

1 **a** 0.667

b 0.625

c 0.429

2 **a** 75%

b 24%

c 60%

d 75%

3 **a** 30% of students use a smartphone.

b 28% of people are vegetarian.

c 37.5% of residents own their home.

d 80% of items sold cost more than £35.

e $13.\dot{3}$ % of students drink coffee.

4 **a** 27.5%

b 17.5%

c 25%

5 66%

6 **a** 25%

b 10%

c 75%

7 **a** £3

b £18

8 £25 500

9 £540

10a £2.50

b £22.50

11a £1020

b £1206

12 £232 800

13 £18.30

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Unit 10 Answers

Exercise 10.4

1 **a** £15.40
b 264 g
c 22p
d 121 mm

2 **a** 42.5 m*l*
b 37.4 kg
c $272
d £178.50

3 **a** £11.20
b 22.4 kg
c 54 m*l*
d 60 g

4 105 000 readers

5 £25

6 **a** £50
b £6
c £400
d £48

7 **a** £13.50
b £31.50
c £31.50
d The answers are the same. 100% − 30% is the same as 70%.

8 **a** £0.35 (or 35p)
b £1.75
c £1.75
d The answers are the same. 100% + 25% is the same as 125%.

9 **a** £135
b 45 m*l*
c 92 kg
d 156 km

10 $1976.25

11a £10
b £30
c £430

12 £15 875

13a £600
b 400 kg
c 300 litres
d 600 km

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e 50 cm

14 £9

15 £3.79 million (2 d.p.)

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Unit 10 Answers

Exercise 10.5

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

b $\frac{1}{5}$

c $\frac{3}{4}$

d $\frac{4}{5}$

e $\frac{1}{4}$

f $\frac{2}{5}$

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

b $\frac{3}{10}$

c $\frac{1}{10}$

d $\frac{6}{25}$

e $\frac{9}{20}$

f $\frac{1}{20}$

3 a £72

b £48

c £72 + £48 = £120

4 £4000

5 £22.50

6 a £300

b £1320

c £120

d 10%

7 a i Transport, Clothing and footwear

ii We cannot tell, as we do not know whether the average weekly household expenditure was the same in 2004 and 2010.

b Housing and household goods

c £107.50

d £24

e £27.20

f The amount spent in 2004 was £107.50 and the amount spent in 2010 was £110.40, so the actual amount of money spent has increased by £2.90.

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Unit 10 Answers

10 Check up

Fractions, decimals and percentages

1

Fraction	$\mathbf{\frac{1}{10}}$	$\mathbf{\frac{1}{5}}$	$\frac{2}{5}$	$\mathbf{\frac{3}{10}}$	$\mathbf{\frac{7}{10}}$	$\mathbf{1\frac{3}{5}}$	$1\frac{3}{4}$	$\mathbf{1\frac{1}{2}}$
Decimal	0.1	**0.2**	**0.4**	0.3	**0.7**	1.6	**1.75**	**1.5**
Percentage	**10%**	20%	**40%**	**30%**	70%	**160%**	**175%**	150%

2 **a** $\frac{27}{50}$

b $\frac{133}{200}$

c $2\frac{9}{25}$

3 **a** **i** Elm Street $\frac{7}{25}$

Oak Street $\frac{13}{50}$

Ash Street $\frac{1}{4}$

ii Elm Street 28%

Oak Street 26%

Ash Street 25%

b Elm Street

4 0.75, 0.4, $\frac{3}{8}$, $\frac{7}{20}$, $\frac{1}{3}$, 30%, $\frac{1}{4}$, 4%

5

Fraction	**Decimal**	**Percentage**
$\frac{9}{40}$	**0.225**	**22.5%**
$\mathbf{\frac{27}{200}}$	0.135	**13.5%**
$\mathbf{\frac{31}{200}}$	**0.155**	15.5%

Percentage problems

6 98%

7 **a** £3.60

b £21.60

8 £25.50

9 **a** £115.20

b 180 g

c 411.6 ml

d 49.95 kg

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10a £19.50

b £78

c £728

11a £240

b £840

c Cash price is cheaper by £40.

12 £55

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Unit 10 Answers

10 Strengthen

Fractions, decimals and percentages

1

Fraction	0	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{10}$	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{3}{5}$	$\frac{7}{10}$	$\frac{4}{5}$	$\frac{9}{10}$	1
Decimal	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Percentage	0	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

2 **a** 2.8, 280%

b 1.3, 130%

c 5.75, 575%

d 7.2, 720%

3 **a** $3\frac{7}{10}$, 370%

b $9\frac{1}{2}$, 950%

c $4\frac{1}{10}$, 4.1

d $9\frac{2}{5}$, 9.4

4 **a** $\frac{16}{25}$

b $\frac{41}{50}$

c $8\frac{11}{25}$

d $\frac{29}{40}$

e $\frac{121}{250}$

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

b 66.7% (1 d.p.)

6 **a** 7 members

b 36 members

c **i** Perfect Pooches $\frac{4}{5}$

Cool K9s $\frac{7}{10}$

Delightful Dogs $\frac{21}{25}$

ii Perfect Pooches 80%

Cool K9s 70%

Delightful Dogs 84%

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d Delightful Dogs

7 a 0.43

b 0.67

c 2.22

d 3.18

8 a $\frac{7}{8}, \frac{3}{4}, \frac{11}{15}, \frac{13}{20}, \frac{3}{5}$

b $\frac{2}{15}, \frac{1}{3}, \frac{3}{8}, \frac{15}{22}, \frac{7}{10}$

c 0.25, 30%, 35%, $\frac{3}{8}, \frac{2}{5}$

d $\frac{3}{5}$, 0.55, $\frac{8}{15}$, 50%, 47%

9 a i $\frac{185}{1000}$, 0.185, 18.5%

ii $\frac{860}{1000}$, 0.86, 86%

iii $\frac{275}{1000}$, 0.275, 27.5%

iv $\frac{575}{1000}$, 0.575, 57.5%

b i 43.5%

ii 65%

10a i 0.54

ii 0.29

iii 1.0

iv 0.445

b i $\frac{13}{100}$

ii $\frac{3}{25}$

iii $\frac{19}{20}$

iv $\frac{37}{40}$

c i 0.16, $\frac{4}{25}$

ii 0.75, $\frac{3}{4}$

iii 0.3, $\frac{3}{10}$

iv 0.725, $\frac{29}{40}$

Percentage problems

1 a 60% of students like PE.

b 52% of members of a judo club are girls.

c 64% of members of a boxing club are boys.

d 20% of students have a cat.

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e 80% of DVD purchases are made online.

2 a 48%

b 30%

c 15%

d 25%

e 26%

3 a £55.20

b £66

c £92

d £70

4 a £80.75

b £81

c £14

d £61.20

5 a 0.4 × £150 = £60

b 0.65 × 550 g = 357.5 g

c 0.08 × 560 ml = 44.8 ml

d 1.2 × 68 litres = 81.6 litres

6 a 0.03

b 0.045

c 0.062

d 0.0475

7 interest after 1 year = 4% of £800 = 0.04 × £800 = **£32**

interest after 3 years = 3 × **£32** = **£96**

total value of investment = £800 + **£96** = **£896**

8 a £456

b £786.50

c £1617.60

9 a £3200

b Paying the deposit and monthly payments is more expensive by £800.

10a £1.20

b £120

11a 6 g

b 600 g

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Unit 10 Answers

10 Extend

1

Year	Value at start of year	Percentage change	Value at end of year
1st	£5000	20% increase	£6000
2nd	£6000	8% increase	**£6480**
3rd	**£6480**	12% decrease	**£5702.40**
4th	**£5702.40**	10% increase	**£6272.64**
5th	**£6272.64**	3% decrease	**£6084.46**

b i £84.46

ii 1.4% (1 d.p.)

2 Supermarket C gives the best offer.

Supermarket A: 1 biscuit costs 12p

Supermarket B: 1 biscuit costs 12.5p

Supermarket C: 1 biscuit costs 11.25p

3 a

	Gold	Silver	Copper	Cadmium
Percentage	75%	**15%**	**6%**	**4%**

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

ii $\frac{3}{20}$

iii $\frac{3}{50}$

iv $\frac{1}{25}$

4 a 294 cm^2

b 95 mm

5 a

Production line	Number of perfect scooters	Number of defective scooters	Fraction of scooters that are defective
A	460	40	$\frac{2}{25}$
B	543	57	$\frac{19}{200}$
C	370	30	$\frac{3}{40}$
D	279	21	$\frac{7}{100}$

b $\frac{7}{100}$, $\frac{3}{40}$, $\frac{2}{25}$, $\frac{19}{200}$

c i Production line D

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ii No. Although it has the lowest proportion of defective scooters, it also has the lowest number of perfect scooters.

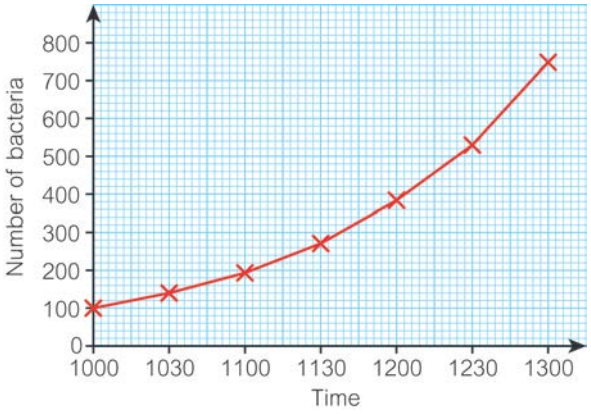
d Yes. The proportion of defective scooters is the mean of the proportions for the four lines, and the total number of scooters produced (460) isn't too far from the actual mean (413).

6 0.7%, 1.1%, 1.4%, $\frac{1}{68}$, $\frac{3}{85}$, 4.1%, $\frac{1}{20}$, $\frac{4}{5}$

7 a

Time	10 00	10 30	11 00	11 30	12 00	12 30	13 00
Number of bacteria	100	140	**196**	**274**	**384**	**538**	**753**

b



c i answers between 160 and 180

ii answers between 12 20 and 12 25

d It might not be accurate as a faulty fridge might slowly increase in temperature until it reached room temperature.

8 a 4% more visitors

b 198 000 visitors

c 174 000 visitors

9 £1507.66

10 2.75%

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

ii $\frac{1}{4}$

b i £450

ii £150

c £36

12 any values that give the area of the blue triangle as 80 cm^2,
e.g. base = 10 cm, height = 16 cm, area = 0.5 × 10 × 16 = 80 cm^2

13 5.3 cm

14a i 400, 120, 36, 10.8

ii 80, 96, 115.2, 138.24

b i The term-by-term rule is 'multiply by **0.6**'.

ii Each term in the sequence is **60**% of the previous term.

c i multiply by 0.5

ii multiply by 0.7

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iii multiply by 1.6

iv multiply by 1.25

d **500**, 550, 605, **665.5**, 732.05, ...

15a 30 people

b **i** 240 people

ii 84 people

c **i** 54 people

ii 180%

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Unit 10 Answers

10 Unit test

1

Fraction	$\frac{3}{4}$	$\frac{9}{10}$	$\frac{1}{4}$	$2\frac{3}{4}$	$1\frac{3}{10}$	$1\frac{3}{5}$
Decimal	0.75	**0.9**	**0.25**	**2.75**	1.3	**1.6**
Percentage	**75%**	**90%**	25%	275%	**130%**	**160%**

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

b $\frac{51}{200}$

c $4\frac{21}{50}$

2 a i Group A $\frac{18}{25}$

Group B $\frac{37}{50}$

Group C $\frac{71}{100}$

ii Group A 72%

Group B 74%

Group C 71%

b Group B

c Group C

4 a 35%

b 40%

c 25%

5 a £64

b £384

6 $\frac{7}{8}, \frac{9}{11}, \frac{13}{16}, \frac{4}{5}, \frac{3}{4}$

7

Fraction	**Decimal**	**Percentage**
$\frac{131}{200}$	**0.655**	**65.5%**
$\frac{\mathbf{21}}{\mathbf{40}}$	0.525	**52.5%**
$\frac{\mathbf{1}}{\mathbf{40}}$	**0.025**	2.5%

8 £39

9 £23 760

10a 62 kg

b 240 m

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11a £550

b £561

c £11

12a **i** $\frac{3}{4}$

ii $\frac{1}{5}$

iii $\frac{1}{20}$

b 15 : 4 : 1

13 £2367

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