

Unit 1 Number

1.1 Calculating with negative numbers

- 1 a 5 b 13 c -3 d -1
e -8 f -3 g -8
- 2 a 3 b 13 c 13 d 3
- 3 a 15 b -10 c -64 d 16
e -22 f -8 g -27 h 1
- 4 a -5 b -4 c -5
d -4 e -3 f 1
- 5 a 12 b -35
- 6 a -4 b -12 c 30 d -7
- 7 a 9 b 25 c 64

1.2 Prime factor decomposition

- 1 a 25, 5, 5
b $100 = 2 \times 2 \times 5 \times 5$
- 2 a $60 = 2 \times 2 \times 3 \times 5$
b $84 = 2 \times 2 \times 3 \times 7$
c $250 = 2 \times 5 \times 5 \times 5$
d $360 = 2 \times 2 \times 2 \times 3 \times 3 \times 5$
- 3 HCF = 24 LCM = 360
- 4 a 36 b 330

1.3 Using indices

- 1 You add the indices.
- 2 a 5^7 b 7^4 c 9^8
- 3 a 3^2 b 3^2
c You subtract the indices.
- 4 a 8^4 b 5^3 c 4^5
- 5 a 2^6 b 10^4 c 2^{10}
- 6 a a^{m+n} b a^{m-n} c $a^{m \times n}$
- 7 a The answer is always 1.
b $5^2, 5^1, 5^0$
c 1
- 8 a 3^6 b 8^3 c 2^2

1.4 Priority of operations

- 1 a 108 b 16 c 150
d 2 e 14
- 2 a 6 b 24 c 20 d 13
- 3 a 26 b 38 c 7 d 44
- 4 a 16 b 24 c 9 d 48
e 8 f 32 g 23 h 2
- 5 a 21 b 31 c 13 d -1

- 6 a 16 b 757
- 7 a 52 b 512 c 53

1 Strengthen Calculating with negative numbers

- 1 a 2 b 16 c 2 d -16
- 2 a -45 b 5 c 16 d -4

Prime factors

- 3 a $7^3 \times 5^4 \times 2 = 2 \times 5^4 \times 7^3$
b $3 \times 11^5 \times 13^2$
c $2^4 \times 5^3 \times 7^2 \times 11$
- 4 a Factor trees drawn
b i $660 = 2^2 \times 3 \times 5 \times 11$
ii $76 = 2^2 \times 19$
iii $468 = 2^2 \times 3^2 \times 13$

- 5 a 8 b 15
- 6 a 160 b 180

Indices and priority of operations

- 7 a 2^7 b 5^{10} c 6^4
- 8 a 3^3 b 4^3 c 10^5
- 9 a 5^6 b 3^8 c 7^{15}
- 10 a 4 b 17 c 9
- 11 a 16 b 1 c 5
d 3 e 63 f 9

1 Extend

- 1 a 0.5°C
b Student's own estimate, e.g. 0.5°C
c 9.9°C
- 2 The number is 90.
The next possible prime factor after $2 \times 3^2 \times \dots$ is 5, and $2 \times 3^2 \times 5 = 90$.
The next possible prime factor after 5 is 7; this gives 126, which is more than 100.
- 3 3^4 cm
- 4 a 6 b 210
c HCF = 432, LCM = 2592
- 5 a 5 b 4 c 3 d 7
- 6 a i $2^5 \times 5$
ii $2^2 \times 3^2 \times 5$
iii $2^4 \times 3 \times 5$
b 20
c 1440

7 a $3^5 \times 5^7$ b $2^7 \times 7^5$ c $2^7 \times 3^2 \times 5^9$

8 a $\frac{2}{25}$ b $\frac{5}{3}$ c $\frac{4}{5}$

9 a 33 b 65

10 a $3^8 \times 5^9$, $3^3 \times 5^6$, $3^5 \times 5^3$

b $2^{12} \times 7^6$, $2^9 \times 7^4$

11 a $a^{p+r} \times b^{q+s}$ b $a^{p-r} \times b^{q-s}$

1 Unit test

1 a 22°C b -22°C

2 a $2^2 \times 5 \times 7$ b $2^3 \times 3^2 \times 7$

3 a 7^8 b 5^{12} c 10^4 d 3^{20}

4 a 28 b 2520

5 a 13 b 4 c 8

d 45 e 10 f 3

6 a 13 b -15 c 10

d 25 e 100 f 0

7 A and E

B and F

C and D

Unit 2 Equations and formulae

2.1 Solving one-step equations

- 1 a 7 b 17
 2 a 8 b 6
 3 a 32 b 14
 4 a $180 = 6t$
 b 30°
 5 £12

2.2 Solving two-step equations

- 1 a $x = 4$ b $p = 7$ c $d = 6$
 2 a 4 b 8
 3 a 7 b 4
 4 6
 5 a $4n + 5 = 49$
 b 11
 6 a $40^\circ, 40^\circ, 80^\circ$
 b $52^\circ, 78^\circ, 52^\circ, 78^\circ$

2.3 More complex equations

- 1 a 3 b 2 c 4
 d 2 e 10
 2 a $10n - 6, 2n + 12$
 b $10n - 6 = 2n + 12$
 c 2.25
 3 a 3 b 2 c 4
 4 $x = 20$, angles are 72°

2.4 Working with formulae

- 1 a $b = 2$
 b $a = 9, b = 4$
 $a = 8, b = 3$
 $a = 7, b = 2$
 $a = 6, b = 1$
 2 a $x = 5, y = 10$
 $x = 10, y = 15$
 $x = 5, y = 15$ etc.
 b x and y are multiples of 5.
 3 a $s = 60m$
 b $m = \frac{s}{60}$
 c $m = 60h$
 d $h = \frac{m}{60}$

- 4 a $P = 6x$
 b i 66 ii 4.2
 c i 4 ii 2.5
 5 a 3.5 hours
 b $T = 0.5r + 1$
 c 14 rooms

2 Strengthen Solving equations

- 1 a 4 b 5 c 8
 2 a 13 b 9 c 18
 3 a 5 b -7 c 220
 4 a 2 b 4 c 8
 5 a 6 b 2 c -2

More complex equations and working with formulae

- 6 2
 7 a 8 b 3
 8 a $3n + 30 = 180$
 b 50°
 c 100°
 9 $x = 6$, so sides are 6 cm and 27 cm
 10 a i 100 cm
 ii 500 cm
 iii 1200 cm
 b Length in cm = length in $m \times 100$
 c $c = 100m$
 11 a 10 b 19 c $s = 3c + 4$

2 Extend

- 1 $n = 6$
 2 a length = $2w$



- b length 10 cm, width 5 cm
 3 82, 83
 4 25, 26, 27
 5 a $2t + t - 11$
 b $3t - 11 = 34: t = 15$
 c 4 years
 6 75 years, 79 years

7 $a = 11, b = 7$

8 2

9 $4\frac{1}{2}$

2 Unit test

1 a 7 b 9 c 32

2 a 3 b 20 c 8

3 $20^\circ, 50^\circ, 110^\circ$

4 42

5 1

6 24

7 $x = 4, y = 1; x = 5, y = 3; x = 6, y = 5$ etc.

8 $m = 12y$

Unit 3 Simplifying expressions

3.1 Simplifying expressions

- 1 a $6x^2 + 14y^2$
b $7p^2 + 2q^2$
- 2 a Any of $4x - 6y^2 + 6x^2$, $5x^2 + y^2 - 2x$, $3x^2 - 3y^2$
b The other two expressions from part a
c $7x^2 - 4y^2 + x$
- 3 a $7x + 1$ b $a - 4$ c $5y + 1$
d $3c + 11$ e $h - 10$
- 4 a $3y + 12$ b $2y - 6$ c $y + 18$
- 5 a $\equiv$ b $=$ c $\equiv$
d $=$ e $\equiv$ f $\equiv$
- 6 a LHS = $8 + 8 = 16 =$ RHS
b No, e.g. when $x = 1$, $2x^3 = 2$ and $x^4 = 1$;
 $2x^3 \neq x^4$

3.2 More simplifying

- 1 a i 3^7 ii 5^7 iii x^7
b When you multiply powers of the same variable, you add the indices.
c i 4^2 ii x^2
d When you divide powers of the same variable, you subtract the indices.
e i 3^{10} ii 4^{10} iii x^{10}
f When you raise a power of a variable to another power, you multiply the indices.
- 2 a p^{11} b r^6 c e^{20}
- 3 a $5x^3$ b $15y$ c $3a^2$
d $5t^5$ e $6p^2$
- 4 a $\frac{5y^4 \times 8y^3}{4y^2} = 10y^5$
b $\frac{6y^6 \times 12y^5}{8y^8} = 9y^3$
- 5 a $25y^4$ b $8y^6$ c $16y^{10}$

3.3 Factorising expressions

- 1 b 1, 2 c 1, 3
- 2 a 6 b 7
- 3 a $5(x + 3)$ b $7(2x + 1)$ c $3(2x - 3)$
d $5(2x - 3)$ e $6(3x + 1)$ f $5(5x - 1)$
g $4(x + 3)$ h $9(3 - x)$
- 4 a $5(x + 4)$ b $3(x - 4)$ c $10(2x - 1)$
d $5(x - 5)$ e $6(2 + x)$ f $9(1 - 4x)$
- 5 3 ways: $6(x + 2)$, $3(2x + 4)$ and $2(3x + 6)$

- 6 a $2(2x + 3)$ b $3(3t + 4)$ c $16(g + 2)$
d $5(4d - 1)$ e $4(2 - w)$ f $2(4 + 9x)$
g $40(3q + 1)$
h $22(2 + y)$
- 7 a $2(3a + b + 4)$
b $5(4 + 6p + 3q)$
c $a(b + 12)$

3.4 Expanding and factorising expressions

- 1 a $x^3 + 3x^2$
b $10y^5 - 6y^4$
c $12x^3 + 6x^2 + 15x$
- 2 a $7x + 8y$
b $6a^3 + 2a$
- 3 a y^3 b a
c $4x^3$ d ab
- 4 b $5x(5x^2 - 2)$
c $7x(3 - 2x)$
d $6y(4 + 3y)$
e $4y^3(5y^2 + 3)$
- 5 a i LHS = $2x^3 + 4x^3 + 4x^2 = 6x^3 + 4x^2$
 $= 2x^2(3x + 2) =$ RHS
ii LHS = $5y^3 + 10y^2 - 2y^3 - 4y^2 = 3y^3 + 6y^2$
 $= 2y^3 + 6y^2 + y^3 = 2y^2(y + 3) + y^3 =$ RHS
b $3p(p^3 - 2) - p(2p^3 - 7)$

3.5 Substituting and solving

- 1 a 4 b 38 c 6
- 2 a 36 b 243 c 75
- 3 a $p = 2$ b $q = 5$ c $m = 3$
- 4 $x = 12$
- 5 a $x = 12$
b The paper measures 7 cm by 20 cm.
The photograph measures 5 cm by 18 cm.

3 Strengthen Simplifying and substituting into expressions

- 1 a $7x^2$ b $3p^2$ c $5y^2$
- 2 a 22 b 13 c 64
- More simplifying
- 3 a p^8 b r^9 c t^{14}
- 4 a p^2 b r^6 c t^2
- 5 a p^6 b r^{15} c t^{20}

- 6 a $12t^8$ b $28n^{11}$ c $24f^{13}$
 d $5a^2$ e $8c^4$ f $3b^8$
 7 a $16a^{10}$ b $8b^{12}$ c $81c^{20}$
 d $4d^6$ e $\frac{r^8}{9}$ f $\frac{n^{12}}{8}$

Expanding and factorising

- 8 a 2 b $2(a + 3)$
 9 $3(a + 5)$
 10 a $q^3 + 6q^2$
 b $k^3 - 2k^2$
 c $5n^3 + 4n^2$
 d $3h^3 - 6h^4$
 11 LHS $= 5p^3 + 9p^3 - 6p^2$
 $= 14p^3 - 6p^2$
 RHS $= 14p^3 - 7p^2 + p^2$
 $= 14p^3 - 6p^2$
 12 a $2x^2(1 + 3x)$
 b $5y(3y^2 - 2)$
 c $4p(2p + 5)$
 d $10r^2(2r - 5)$
 e $9a^2(2a^2 - 3)$
 f $2bc(7bc + 9)$

Solving equations

- 13 a $x = 3$ b $x = 5$
 c $x = 2$ d $x = 7$

3 Extend

- 1 a 75 m b 40 m
 2 a i $3(2a^2 + 3ab - 4b^2)$
 ii $4(4b^2 - ab - 3a^2)$
 b i $18a^2 + 13ab - 28b^2$
 ii $-18a^2 - 13ab + 28b^2$
 c The answer to part b ii is the answer to part b i multiplied by -1 .
 3 a $3x(4x^2 + 5x + 7)$
 b $5a(2a - 3b + 5)$
 c $9x^2y^2z^2(2z + 4xy^2 - 5x^2yz^3)$
 4 a $10pq + 20p^2 - 15p^2q = 5p(2q + 4p - 3pq)$
 b $6x^3y + 15x^2y - 21x^3y^2 = 3x^2y(2x + 5 - 7xy)$
 5 a 69 b 5 c 2
 6 a $\frac{7}{36}$ b $\frac{4}{9}$

- 7 a i $7x + 1$
 ii $179 - 7x$
 b $4(3x + 2) = 179 - 7x$
 c $x = 9$
 d angle ADC = angle ABC = 64°
 angle BCD = angle BAD = 116°
 e.g. $2(64 + 116) = 360$
 8 $16x^{18}, 16x^{25} \div x^3 \div x^4, (2x^2)^3 \times 2(x^6)^2, (2x^3)^4 \times x^6,$
 $4x^{14} \times 4x^7 \div x^3, 16x^{30} \div (x^3)^4$
 9 a A3, B6, C1, D7, E4, F8, G2
 b $\frac{(x^p)^r}{x^q}$

3 Unit test

- 1 a $3x^2$ b $3y^2 + 2y$
 2 a p^8 b q^8 c r^{15}
 d e^{16} e a^4 f n^8
 3 a $x^3 - 6x^2$ b $6f^4 + 3f^3 - 12f^2$
 4 a $11x^2 + 16x$
 b $7y^2 - 15xy + 11y$
 5 a $3(d - 4)$
 b $4(3e + 4)$
 c $5(3 - 2f)$
 6 a yes b no c yes
 7 a $6x(x + 3)$
 b $5y(5 - 3y + 2y^2)$
 8 a 6 b 34
 c 14 d 4
 9 $x = 5$
 10 a $10x^7$ b $4y^4$ c $9z^{10}$
 d $8z^{12}$ e $\frac{r^4}{4}$ f c^6

Unit 4 2D shapes and 3D solids

4.1 Area of triangles, parallelograms and trapezia

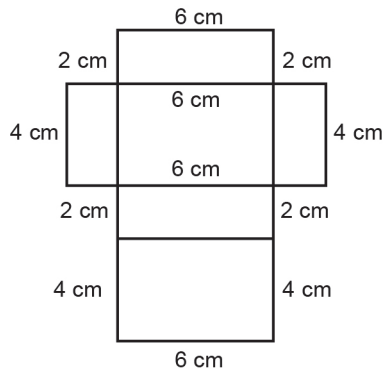
- 1 a 50 cm^2 b 6.5 m^2
 2 4 mm
 3 a 20 cm^2 b 36 cm^2 c 0.8 m^2
 4 7 cm
 5 540 cm^2
 6 a 80 cm^2 b 255 mm^2

4.2 Area of compound shapes

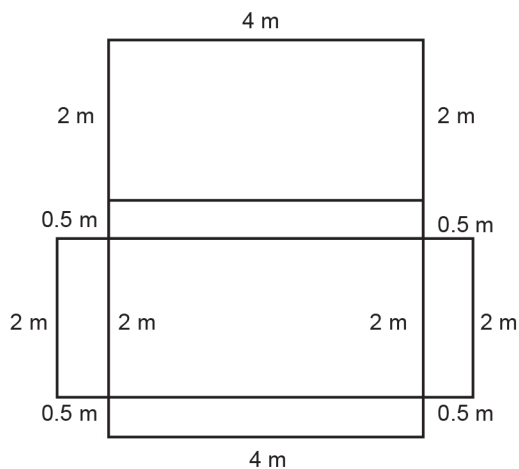
- 1 a 5.4 m^2 b 66 cm^2
 2 a 49 cm^2 b 91 mm^2
 3 a 55 m^2 b $\$247.50$
 4 a 140 cm^2 b 150 m^2
 5 1500 mm^2

4.3 Properties of 3D solids

1 a

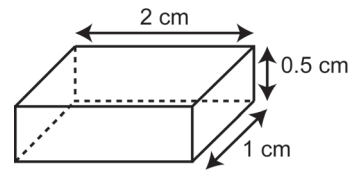


b

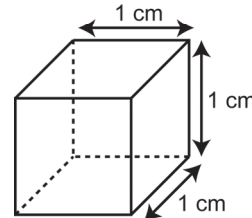


- 2 a C b A c B
 3 6 faces, 12 edges, 8 vertices

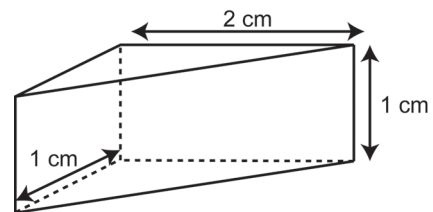
4 a



b



c



4.4 Surface area

- 1 600 cm^2
 2 a 150 m^2 b 24 mm^2 c 6 cm^2
 3 a 72 cm^2 b 3400 mm^2
 4 a 16 cm^2 b 4 cm
 5 No. Surface area of outside of box = 95 m^2

4.5 Volume

- 1 125 cm^3
 2 a 25 cm^2 b 5 cm c 125 cm^3
 3 a 48 cm^3 b 30 m^3 c 54 cm^3
 4 a 250 cm^3 b 5 m^3 c 5.125 litres
 5 a $15\,000 \text{ cm}^3$
 b 15 litres
 c It depends on the shape of the bottles. Round bottles won't pack together closely enough to fit.

6 750 cm^3

4.6 STEM: Measures of area and volume

- 1 a cm^2 b km^2 c m^2
 2 60 ha
 3 a 10 mm, 10 mm
 b i 1 cm^2
 ii 100 mm^2
 c i multiply, 100
 ii divide, 100

- 4 a 800 mm^2
 b 5.75 m^2
 c 9.5 cm^2
 d $8\,500\,000 \text{ m}^2$
 e 2000 cm^2
 f 0.0045 km^2

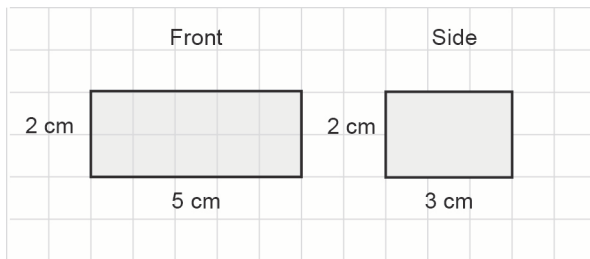
5 120 000 tiles

- 6 a $12\,000 \text{ mm}^3$
 b 0.066 cm^3
 c $1\,750\,000 \text{ cm}^3$
 d 0.125 m^3

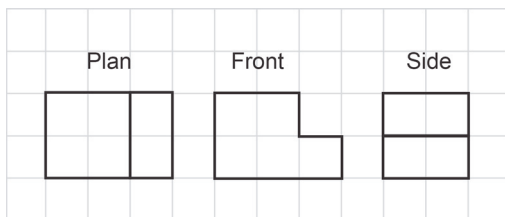
7 9 containers

4.7 Plans and elevations

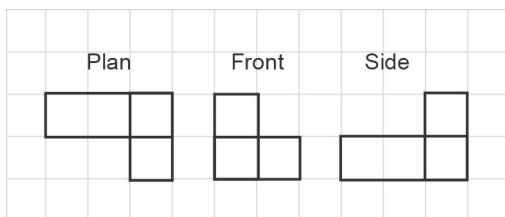
1



2 a



b



3



4.8 Solving problems with 3D solids and measures

1 There is not enough.

He needs $3 \times 5 \text{ m/ spoons} \times 3 \text{ times a day} \times 5 \text{ days} = 225 \text{ m/}$

The bottle contains $0.2 \times 1000 = 200 \text{ m/}$

- 2 a Value B b Value B c Value C
 d Value C e Value A

3 320 cm^3

4 160 small boxes

5 462 cm^2

6 0.8 cm

4 Strengthen Area of shapes

- 1 a 6 m^2 b 108 mm^2

2 24 cm^2

3 264 m^2

4 80 cm^2

Working with 3D solids

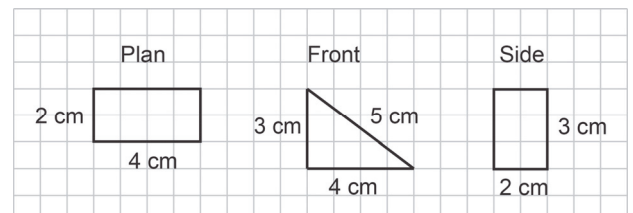
5 Nets a, c and d

6

Face	Area
Top	$5 \times 2 = 10 \text{ cm}^2$
Bottom	$5 \times 2 = 10 \text{ cm}^2$
Front	$5 \times 3 = 15 \text{ cm}^2$
Back	$5 \times 3 = 15 \text{ cm}^2$
Left	$2 \times 3 = 6 \text{ cm}^2$
Right	$2 \times 3 = 6 \text{ cm}^2$
Total surface area	62 cm^2

7 30 cm^3

8



Measures of area and volume

- 9 a** 36 m²
b 360 000 cm²
- 10 a i** 8000 mm²
ii 22.5 cm³
b i 30 000 cm³
ii 6.5 m³

- 11 a** 3 cm **b** 27 cm³

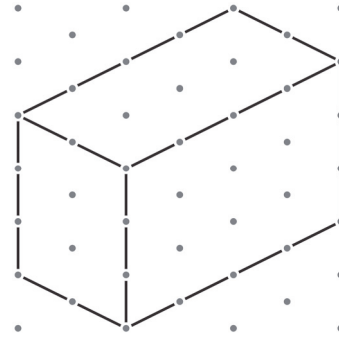
4 Extend

- 1 a** 1.6 m **b** 7.5 m³
- 2** 44%
- 3** 1.8 cm
- 4 a** 12 m² **b** 68 cm² **c** 50 cm²
- 5 a** 8 cm³ **b** 28 cm²
c By stacking them with the 4 cm by 2 cm faces together
- 6** 30 cm²
- 7 a** 1550 cm³ **b** 108 cm³
- 8** 360 cm²

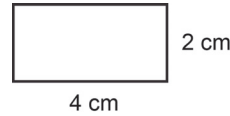
4 Unit test

- 1** 44 cm²
- 2 a i** 1000 cm³ **ii** 600 cm²
b i 20 cm³ **ii** 58 cm²
- 3 a** 6 cm² **b** 60 cm² **c** 120 cm²

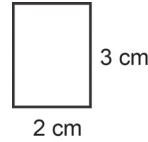
4 a



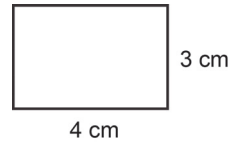
b



c



d



- 5 a** 7 200 000 cm³ **b** 9.9 cm³ **c** 630 cm³
- 6 a** 48 cm³ **b** 90 cm²

Unit 5 Graphs

5.1 Direct proportion

- 1 a Yes
b About 1.6 kilograms
c About 8.8 pounds
d 1 kilogram
- 2 a No, because the line does not go through the origin.
b About £20.60
c About 20 minutes
d £16
- 3 a Graph through points from table correctly drawn
b No, because the line does not go through the origin.
- 4 a Yes b No
c No d Yes

5.2 STEM: Interpreting graphs

- 1 a There was a slight decrease in the share price from February to April and then a gradual increase.
b £1.75
c April
d £240
- 2 a £21.90 b £21.90
c Heavier than 10 kg, but no more than 20 kg

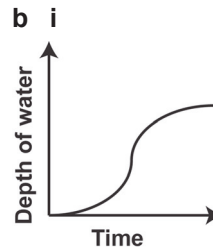
5.3 Distance–time graphs

- 1 a 900 m b 30 minutes
c 5 minutes d 10 minutes
e 5 minutes
- 2 a Graph through points from table correctly drawn
b 11.30 am
c About 1 pm
d i 65 mph
ii 20 mph

5.4 Rates of change

- 1 a About £7300
b Between 0 and 2 years
c Between 10 and 12 years
d About $5\frac{1}{2}$ years
e No
- 2 a The narrow part
b The right-hand graph

- 3 a ii Graph 1 iii Graph 4
iv Graph 3 v Graph 2



5.5 Misleading graphs

- 1 a It doesn't go up in equal steps.
b Graph through points from table correctly drawn
c e.g. The price of petrol gradually increased, at an increasing rate.
- 2 a Graph A b Graph B
c About £45 000

5 Strengthen Direct proportion

- 1 Graphs a and d
- 2 a About £5 b About £10
c About €14.40

Distance–time graphs

- 3 a Graph through (1, 0), (1.45, 60), (3.15, 60), (4.15, 0) correctly drawn
b e.g. Ian's journey
- 4 a 2 times b 10 miles
c 180 miles d 15 minutes
e 3 hours
f Between 11.15am and 12pm
g 60 mph

Real-life graphs

- 5 a 10p
b i about 20p
ii about £2.45
c 1980
- 6 a Graph 3 b Graph 2
c Graph 1 d Graph 4
- 7 a Graph B
b Graph A
c 1.4p per litre
d 0.85%

5 Extend

- 1 a i July ii April
b i 13°C ii 12.2°C
c i 53 mm ii 97 mm
d April
- 2 125 mph
- 3 a Graph through (0, 0), (3.5, 210), (6, 210), (9, 0) correctly drawn
b 64.6 mph
- 4 a 172.8 mph
b 0.058 m/s (or 0.13 mph)
- 5 a i About 5 million litres
ii About 21 million litres
b The amount of diesel delivered in the UK has gradually increased since 1970.
c The amount of petrol delivered in the UK gradually increased to 1990 and then gradually decreased.
d More, on the whole, because between 1970 and 2012, the volume of motor fuel delivered in the UK increased.
- 6 a i 26.5°C ii 28°C
b i 80 mm ii 28 mm
c The scales are not the same; it would be easier to compare the weather if the temperature scales were the same as each other and the rainfall scales were the same as each other.
d No, because Rome is warmer than New York in all months apart from June, July and August, and is wetter than New York from October through to December.
- 7 a 100 000 people
b The first square represents 1000 people and the second represents 9000 people. The third square represents 10 000 people and, after that, each square represents twice as many people as the previous square.
c 2004
d i 1000 people
ii 320 000 people
e The right-hand graph

5 Unit test

- 1 a 2 hours
b Between leaving the shopping centre and stopping to buy lunch
c 15 km/h
- 2 a Graph 2 b Graph 1
c Graph 4 d Graph 3
- 3 a Graph through points from table correctly drawn.
b £30
c £25
d No, because the line does not go through the origin.
- 4 Graphs b and d
- 5 a i £37 000
ii £15 000
iii £7500
b Salaries increased slowly up to 40 years ago and then increased more quickly in the last 40 years.

Unit 6 Fractions and decimals

6.1 Rounding decimals

- 1 a 4.7 b 8.4
c 83.0 d 56.8
- 2 18.8 runs
- 3 $8.65 \leq x < 8.75$
- 4 a 12.37 b 48.46
c 30.30 d 9.00
- 5 a 0.14 b 0.13 c 0.11
- 6 a She has removed all the decimal places.
b 33.00
- 7 40p
- 8 3.873
- 9 7.475, 7.484
- 10 a Any number in the interval $5.650 \leq x < 5.750$
b Numbers in the interval $5.545 \leq x < 5.555$

6.2 Multiplying and dividing decimals

- 1 a 45.25 b 0.224 c 7.77
- 2 a 370 b 234 000 c 620
- 3 a 11.18 b 24.7 c 22.747
- 4 a 13.2 b 30
- 5 a 17.15 m b 56.25 m

6.3 Converting fractions to decimals

- 1 a 0.6 b 0.875 c 0.85
- 2 a $\frac{1}{9} = 0.11111\dots$; $\frac{2}{9} = 0.22222\dots$
b $\frac{3}{9} = 0.33333\dots$; $\frac{4}{9} = 0.44444\dots$
 $\frac{5}{9} = 0.55555\dots$; $\frac{6}{9} = 0.66666\dots$
 $\frac{7}{9} = 0.77777\dots$; $\frac{8}{9} = 0.88888\dots$
- 3 59p
- 4 a $\frac{5}{9}$ b $\frac{8}{9}$
- 5 a $\frac{29}{99}$ b $\frac{318}{999} = \frac{106}{333}$ c $\frac{574}{999}$
- 6 a $\frac{2}{15}$ b $\frac{26}{45}$
- 7 a $5\frac{2}{9}$ b $4\frac{2}{11}$

6.4 Multiplying fractions

- 1 a 9 b 15
- 2 $2\frac{2}{5} \text{ m}^2$
- 3 a $\frac{1}{6}$ b $\frac{1}{6}$ c $-\frac{1}{6}$
- 4 a $2\frac{1}{2} \text{ m}$ b $\frac{25}{64} \text{ m}^2$
- 5 a $\frac{6}{11}$ b $\frac{7}{8}$ c $\frac{1}{10}$
d $\frac{1}{6}$ e $\frac{1}{27}$

6.5 Dividing by fractions

- 1 a $1\frac{1}{3}$ b $\frac{1}{6}$
c 8 d $\frac{1}{9}$
- 2 a $\frac{2}{7}$ b $\frac{3}{4}$
c $\frac{5}{23}$ d $\frac{7}{19}$
- 3 a 10 b 7 c $10\frac{2}{3}$
d $10\frac{1}{2}$ e $\frac{9}{20}$
- 4 a $\frac{7}{3} = 2\frac{1}{3}$ b $\frac{5}{6}$ c $\frac{65}{132}$
- 5 $26\frac{1}{4}$ (or 26.25)
- 6 a 14 b $\frac{1}{6}$ of an inch

6.6 Adding and subtracting fractions

- 1 $\frac{4}{10}, \frac{9}{10}$
- 2 a $\frac{11}{15}$ b $\frac{5}{12}$
- 3 a She has added the numerators and the denominators. You can only add the numerators when the denominators are the same, and you don't add denominators. She didn't convert the fractions so that they had common denominators.
b $\frac{2}{6} + \frac{3}{6} = \frac{5}{6}$
- 4 a $\frac{10}{21}$ b $\frac{7}{20}$

5 a $1\frac{11}{12}$ b $2\frac{5}{12}$

6 e.g. $1\frac{1}{2}$ and $2\frac{3}{4}$

6.7 Calculating with mixed numbers

1 a $\frac{17}{5}$ b $\frac{21}{4}$

2 a $7\frac{3}{4}$ b $6\frac{7}{20}$

c $3\frac{1}{2}$ d $6\frac{4}{15}$

3 a $5\frac{1}{4}$ hours b 8.30pm (or 20 30)

4 a $1\frac{1}{2}$ b $1\frac{7}{12}$

5 a $13\frac{1}{3}$ cm b $7\frac{7}{10}$

6 a $1\frac{5}{8}$ b $\frac{14}{15}$ c $4\frac{1}{16}$

7 $5\frac{7}{25}$ m

6.8 Solving problems with fractions and decimals

1 a 8 b 14

2 a 270 km b 5 hours

3 $32\frac{7}{12}$ cm

4 531.16 cm²

5 3.5 kg

6 $\frac{23}{60}$

6 Strengthen Rounding decimals

1 a 0.75 b 0.77

c 0.75 d 0.75

2 £1.43

Multiplying and dividing decimals

3 a 8.478 b 33.618

4 a 7.6 b 37.864

Converting fractions to decimals

5 a $\frac{53}{99}$ b $\frac{28}{99}$ c $\frac{35}{99}$

6 a $\frac{43}{90}$ b $\frac{11}{45}$ c $\frac{1}{5}$

Multiplying fractions

7 a $1\frac{1}{5}$ b $\frac{1}{2}$ c $3\frac{3}{4}$

8 a $\frac{1}{2}$ b $\frac{2}{9}$

Dividing by fractions

9 a $\frac{5}{4} = 1\frac{1}{4}$ b $\frac{14}{15}$

Adding and subtracting fractions

10 a $\frac{12}{20} + \frac{5}{20} = \frac{17}{20}$ b $\frac{8}{24} + \frac{9}{24} = \frac{17}{24}$

11 a $\frac{41}{45}$ b $\frac{13}{55}$

Calculating with mixed numbers

12 a $3\frac{2}{3}$ b 9 c $3\frac{1}{2}$

d $2\frac{3}{5}$ e 14 f $1\frac{5}{6}$

Solving problems with fractions and decimals

13 Leena gets \$13.13, Shika gets \$12.50 and Jing gets \$11.87.

6 Extend

1 a 34.665 b 34.674

2 a 522.72 cm³ b 240

3 94

4 $\frac{1}{7} = 0.1428571428...; \frac{2}{7} = 0.285714285...$

$\frac{3}{7} = 0.428571428...; \frac{4}{7} = 0.571428571...$

$\frac{5}{7} = 0.714285714...; \frac{6}{7} = 0.857142857...$

This set of decimals are all recurring decimals and they all use the digits 142857142857... in the same order.

5 a $\frac{184}{495}$ b $\frac{167}{180}$

6 a $\frac{291}{370}$ b $\frac{291}{460}$

7 138

8

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

9 His brother gets \$57.80 and his sister gets \$70.64.

10 97 cm²

11 30 helmets

12 a $\frac{1}{8000}$ m³ b $\frac{1}{4}$ m

c $\frac{1}{500} \times \frac{1}{16} = \frac{1}{8000}$

6 Unit test

1 a 3.57 b 3.569

2 15.755

3 a $\frac{5}{12}$ b $-\frac{9}{20}$

4 a $1\frac{1}{15}$ b $\frac{11}{14}$

5 0. $\dot{5}$

6 a $7\frac{83}{132}$ b $\frac{1}{15}$

7 $3\frac{56}{111}$

7 Probability

7.1 Experimental probability

1 a, b

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

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

2 a No

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

3 a 0.888

b No, as weather varies according to the time of year and no dates are given. Tomorrow could be in winter.

4 a i $\frac{8}{25}$ ii $\frac{11}{25}$

b He has not accounted for those who bought both.

7.2 Estimating probability

1 a $\frac{24}{80}, \frac{13}{80}, \frac{6}{80}, \frac{4}{80}, \frac{1}{80}, 0, \frac{1}{80}$; total 1

b About $\frac{24}{80} = \frac{3}{10}$

c About 65 matches

2 a i About $\frac{11}{50}$ ii About $\frac{7}{50}$

b About 42 patients

c No, because some patients may have had a filling and an X-ray, so they are not mutually exclusive events.

3 a About $\frac{7}{20}$

b About $\frac{35}{80} = \frac{7}{16}$

c Adam's estimate because he asked more people.

d i About $\frac{21}{50}$

ii About 84 fans

7 Strengthen

Experimental probability

1 a i 16, 14 ii 50

b $\frac{7}{50}, \frac{13}{50}, \frac{16}{50}, \frac{14}{50}$

c 14

2 a 70

b $\frac{3}{14}$

c No as boys are probably not out as late as men and the data doesn't show times.

3 a $\frac{5}{42}$

b $\frac{53}{84}$

Estimating probability

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

b $P(\text{parrot}) = \frac{7}{20}$; $P(\text{other}) = \frac{2}{20} = \frac{1}{10}$

c i 44 cats

ii 28 parrots

iii 8 other pets

5 a i $\frac{47}{128}$ ii $\frac{63}{128}$

b The estimates are accurate based on the collected data.

6 a 0.06

b 27

7 Extend

1 a i $\frac{28}{129}$ ii $\frac{26}{117} = \frac{2}{9}$

b Player A: The probability that player A pots 7 balls is $\frac{14}{129} \approx 0.109$; the probability that player B pots 7 balls is $\frac{8}{117} \approx 0.068$.

c Player A, as her sample includes more data.

d $\frac{4}{129} \times 150 \approx 4.65$

2 a $\frac{54}{181}$ b $\frac{28}{181} \times 1000 \approx 155$

3 a $\frac{41}{88}$

b Yes, as most of the data lies between 50 $\mu\text{g/dl}$ and 175 $\mu\text{g/dl}$.

c Students' own answers

- 4 No, as the probability of being faulty is then 0.0003, which is three times more likely than it should be.
- 5 Students' own answers
- 6 40%

7 Unit test

1 a

Specimen	Frequency	Experimental probability
tadpole	146	$\frac{146}{200}$
pondskater	38	$\frac{38}{200}$
newtpole	16	$\frac{16}{200}$
Total frequency	200	

- b Yes, as the experimental probability is $\frac{16}{200} = 0.08$ or 8%, which is much less than 50%.

2 75

3 a

Number of siblings	Frequency	Experimental probability
0	18	$\frac{18}{50}$
1	16	$\frac{18}{50}$
2	12	$\frac{12}{50}$
3	3	$\frac{3}{50}$
4	1	$\frac{1}{50}$

- b The experimental probability that the next student has two siblings is $\frac{12}{50} = 0.24$ or 24%, which is less than 50%. So Erin is correct, it is unlikely.

4 a $\frac{6}{125}$

b 557

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

- b The probability that a professional golfer drives the ball less than 225 m is $\frac{62}{90} \approx 0.69$

Therefore, Rajan can drive the ball further than 69% of the golfers, so he is incorrect.

Unit 8 Percentages and ratio

8.1 Equivalent fractions, decimals and percentages

- 1 a $1\frac{11}{20}$ b $1\frac{3}{20}$
c $2\frac{19}{20}$ d $3\frac{9}{20}$

2

Mixed number	$1\frac{3}{20}$	$1\frac{3}{20}$	$2\frac{7}{20}$	$2\frac{17}{20}$	$3\frac{3}{20}$
Decimal	1.15	1.65	2.35	2.85	3.15
Percentage (%)	115	165	235	285	315

- 3 a $1\frac{6}{25}$ b $2.08 = 2\frac{2}{25}$
c $2.32 = 2\frac{8}{25}$ d $3.56 = 3\frac{14}{25}$
4 a $\frac{9}{40}$ b $0.025, \frac{1}{40}$
5 Website A; 98% vs 97.5%

8.2 Writing percentages

- 1 a 94% b 30% c 80%
2 a 6% b 2%
3 a £8 b £48
4 a £3.50 b £31.50
5 £42 780 million
6 £368

8.3 Percentages of amounts

- 1 £100 000
2 £120
3 a £52.50 b £22.50 c £22.50
d They are the same; e.g. $100\% - 70\% = 30\%$
4 a 198 kg b 182 kg
5 £18 240
6 a £300 b 600 g c 400 cm
7 £8

8.4 Compound interest

1

Bank	Interest rate	Start balance	End of Year 1 balance	End of Year 2 balance	End of Year 3 balance
A	1.35%	\$4000	\$4054	\$4108.73	\$4164.20
B	1.4%	\$4000	\$4056	\$4112.78	\$4170.36

- 2 \$25 706.01
3 a \$771.75 b \$840.86 c \$1056.93
4 \$11 596.93
5 8 years

8.5 Ratios

- 1 a 1 : 4 b 3 : 1
c 1 : 5 d 4 : 1
2 a 8 : 7 b 48 : 101
3 a i 57.1% ii $\frac{3}{7}$ b 4 : 3
4 a 2.2 : 1 b 1.38 : 1 c 1 : 3.14
5 a 0.47 : 1, 1.66 : 1, 1.38 : 1, 5.99 : 1
b F15 fighter jet

8.6 Working with ratios

- 1 a \$22, \$44, \$66 b \$22, \$33, \$77
2 \$62.50
3 a 8 : 3 b 100 : 1 c 1 : 2
4 Gold 60 g, copper 17.8 g, silver 2.2 g

5

Mass	Steel	Chromium	Nickel
1 kg	730 g	180 g	90 g
2.5 kg	1825 g	450 g	225 g

- 6 $\frac{2}{5}$

8 Strengthen
Fractions, decimals and percentages

1

Mixed number	$2\frac{1}{5}$	$3\frac{1}{2}$	$4\frac{1}{5}$	$2\frac{1}{4}$	$7\frac{3}{4}$	$5\frac{3}{10}$	$3\frac{4}{5}$
Decimal	2.2	3.5	4.2	2.25	7.75	5.3	3.8
Percentage (%)	220	350	420	225	775	530	380

2 a 35% b 88% c 20%

3

Fraction in simplest terms	$\frac{31}{200}$	$\frac{21}{500}$	$\frac{9}{40}$	$\frac{41}{200}$	$\frac{7}{40}$	$\frac{7}{8}$
Fraction with denominator of 1000	$\frac{155}{1000}$	$\frac{42}{1000}$	$\frac{225}{1000}$	$\frac{205}{1000}$	$\frac{175}{1000}$	$\frac{875}{1000}$
Decimal	0.155	0.042	0.225	0.205	0.175	0.875
Percentage (%)	15.5	4.2	22.5	20.5	17.5	87.5

Using percentages

4 a \$48 b \$23

5 a \$38 b \$42

6 \$672

7 \$937.60

8 \$36

9 \$45

10 \$663 at the end of year 1
\$676.26 at the end of year 2
\$689.79 at the end of year 3

11 \$3037.13

Ratio

12 0.5 m, 2 m

13 a 1 : 1.2 b 1 : 1.5 c 2.25 : 1

14 \$85, \$42.50, \$21.25

15 a 11 : 8 b 1 : 6

8 Extend

1 a

Year	Value at start of year	Percentage change	Value at end of year
1st	£8000	10% increase	£8800
2nd	£8800	10% increase	£9680
3rd	£9680	5% decrease	£9196
4th	£9196	3% increase	£9471.88

b i \$1471.88 ii 18.40%

2 2.2%, $\frac{3}{75}$, $\frac{1}{22}$, $\frac{2}{42}$, $\frac{1}{4}$, 0.6

3 a No

b e.g. An item originally costing £60 would be £48 in the sale with 20% off.
An increase from £48 to £60 is an increase of £12, which is 25% of £48, not 20%.

4 Earth : Mercury is 1 : 0.38;
Earth : Venus is 1 : 0.94
Earth : Jupiter is 1 : 11.14
Earth : Saturn is 1 : 9.39

5 235

6 a 88 687.5 cm³ b 11 085.9375 cm³
c 1 : 8 d 8 small boxes

7 a i £20 400 ii £24 000
b No, because $£17\,340 \div 0.7 = £24\,771.43$, which is not the same as $£17\,340 \div 0.85 \div 0.85$.

8 a 8.68 billion b During 2043

8 Unit test

1

Fraction or mixed number	$\frac{7}{10}$	$\frac{1}{4}$	$1\frac{3}{5}$	$\frac{3}{4}$	$2\frac{1}{2}$	$1\frac{2}{5}$
Decimal	0.7	0.25	1.6	0.75	2.5	1.4
Percentage	70%	25%	160%	75%	250%	140%

2 36 m

3 a 1 : 2 b 3 : 5 c 5 : 6

4 1 : 1.6

5 \$68

6 21 g

7 \$5039.60

8 £5899.26

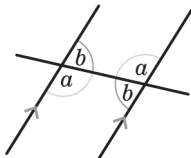
Unit 9 Shapes and angles

9.1 Quadrilaterals

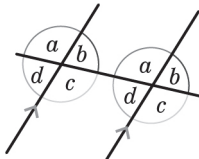
- a** Trapezium **b** Square
- $x = 60^\circ$ (angles at a right angle sum to 90°)
 $y = 30^\circ$ (alternate angles)
 $z = 60^\circ$ (angles in a triangle sum to 180°)
- a i** PS is equal in length to SR
ii PQ is equal in length to QR
iii $\angle QPS = \angle QRS$
b i 35° **ii** 105° **iii** 150°

9.2 Angles and parallel lines

- a** Two pairs of alternate angles marked



- b** Four pairs of corresponding angles marked



- $a = 115^\circ$
 $b = 180 - 115 = 65^\circ$
 $c = 65^\circ$
- $a = 75^\circ$ (corresponding angle with 75°)
 $b = 80^\circ$ (corresponding angles are equal)
 $c = 80^\circ$ (vertically opposite angles are equal)
 $d = 100^\circ$ (angles on a straight line sum to 180°)
 $e = 80^\circ$ (vertically opposite angles are equal)
 $f = 120^\circ$ (vertically opposite angles are equal)
 $g = 45^\circ$ (alternate angles are equal)
 $h = 120 - 45 = 75^\circ$ (corresponding angles are equal, so $45^\circ + h = 120^\circ$)
 $i = 120^\circ$ (alternate angles are equal)

9.3 Angles in polygons

- 9 sides $= 7 \times 180 = 1260^\circ$
- $540 \div 5 = 108^\circ$
- a** 360°
b $360 \div 10 = 36^\circ$
c 144°
- a** 162° **b** 20 sides
- a** 6° **b** 174°

9 Strengthen Quadrilaterals

- A – 3 B – 1 C – 2
- $d = 80^\circ$, $e = 70^\circ$, $f = 30^\circ$
- Students' own explanation, e.g.
 $\angle ECF = 60^\circ$ (angles on a straight line sum to 180°)
 $\angle CEF = 90^\circ$ (angles on a straight line sum to 180°)
 $\angle CFE = 30^\circ$ (angles in a triangle sum to 180°)
 $\angle AFB = 60^\circ$, $\angle AFD = 90^\circ$

Angles and parallel lines

- a** Vertically opposite
b Alternate
c Corresponding
d Corresponding
e Vertically opposite
- a** $p = 110^\circ$ (alternate angles are equal)
b $q = 42^\circ$ (corresponding angles are equal)
 $r = 42^\circ$ (vertically opposite angles are equal)
 $s = 72^\circ$ (corresponding angles are equal)
 $t = 66^\circ$ (angles on a straight line sum to 180°)

Angles in polygons

6

Polygon	Angle sum
square	360°
pentagon	540°
hexagon	720°
heptagon	900°
octagon	1080°

- The angles do not sum to 360° .
- a** 18 exterior angles
b 18 sides

9 Extend

- a** 40° **b** 80°
- 65°
- 72°
- a** 120° **b** 60°

- 5** $a = 55^\circ$ (vertically opposite angles are equal)
 $b = 55^\circ$ (alternate angles are equal or corresponding angles are equal)
 $c = 100^\circ$ (vertically opposite angles are equal)
 $d = 25^\circ$ (angles on a straight line sum to 180°)
 $e = 25^\circ$ (corresponding angles are equal)
- 6** $a = 50^\circ$ (angles on a straight line sum to 180° , then corresponding angles)
 $b = 50^\circ$ (vertically opposite angles are equal)
 $c = 40^\circ$ (angles in a right angle sum to 90° and vertically opposite angles)
- 7 a** $a = 120^\circ$ (interior angles of a hexagon sum to 720°)
 $b = 60^\circ$ (angle is bisected)
- b** $c = 135^\circ$ (interior angles of an octagon sum to 1080°)
 $d = 45^\circ$ (angles of an isosceles trapezium are paired and sum to 360°)
 $e = 90^\circ$ (angles must sum to the interior angle)
- c** $f = 144^\circ$ (interior angles of a decagon sum to 1440°)
 $g = 36^\circ$ (angles of an isosceles trapezium are paired and sum to 360°)
 $h = 108^\circ$ (angles must sum to the interior angle)
- 8 a** 0.36° **b** 179.64°
- 9 a** 72° **b** 60° **c** 45°
- 10** 258°

9 Unit test

- 1** Kite
- 2** $a = 44^\circ$ (corresponding angles are equal)
- 3** $\angle ABE = 180^\circ - 90^\circ - 42^\circ = 48^\circ$
 $\angle DBC = 180^\circ - 90^\circ - 38^\circ = 52^\circ$
 $\angle DBE = 180^\circ - 48^\circ - 52^\circ = 80^\circ$
- 4** $f = 100^\circ$ (opposite angles of a parallelogram are equal)
 $g = 60^\circ$ (angles in a triangle sum to 180°)
 $h = 20^\circ$ (alternate angles are equal)
 $i = 60^\circ$ (angles in a triangle sum to 180°)
- 5 a** 50° **b** 720°
- 6 a** 10° **b** 170°
- 7** 12 sides

Unit 10 Charts and diagrams

10.1 Using tables

- 1 1.7 goals
- 2 More; e.g. the mean is 1.83.
- 3 a 719 non-vegetarian meals
b 180 child meals
c 900 meals
d $\frac{720}{900} = \frac{4}{5}$

- 4 a $90 \leq l < 91$

b, c

Length, l (cm)	Tally	Frequency
$89 \leq l < 90$	II	2
$90 \leq l < 91$	IIII I	6
$91 \leq l < 92$	IIII III	9
$92 \leq l < 93$	III	3

- d $91 \leq l < 92$

10.2 Stem and leaf diagrams

- 1 a i 7 ii 4 iii 4
b i 14 ii 7.5 iii 4.5

- 2 a

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

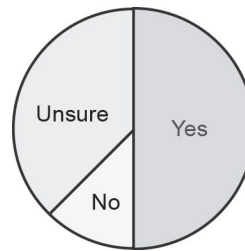
Key: 4 | 8 means 48 g

- b i 21 limes ii 16 limes
iii 52% (52.38...%)

- 3 a 145 cm b 31 cm c 151.5 cm

10.3 Pie charts

- 1 $4 \times 10 = 40^\circ$, 140° , $180^\circ + 40^\circ + 140^\circ = 360^\circ$



- 2 a

Pet	Frequency	Angle
Cat	6	120°
Parrot	10	200°
Other	2	40°

b

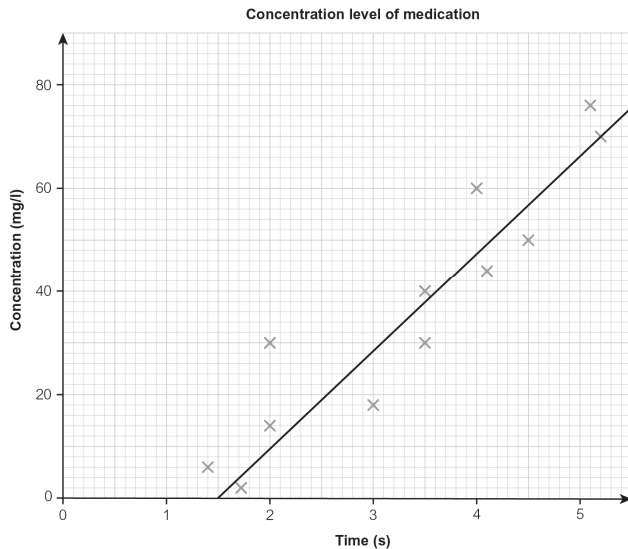
Car	Percentage	Angle
BMW	25%	90°
Ford	25%	90°
Seat	40%	144°
Lotus	10%	36°

10.4 Comparing data

- 1 a Line B. The highest of the two lines.
b i Game 11 (30)
ii Game 10 (3)
c No; e.g. the top line does not touch the bottom line, so there are no draws and each winning team's score is higher than the losing team's score in that game. But some losing teams' scores are occasionally higher than the winning teams' scores in other games.
- 2 a Factory A
b i 6750 cushions
ii 7350 cushions
c i 7625 cushions
ii 7250 cushions
d i Median
ii Mean
e i Monday 21st, 3750 cushions
ii It was the lowest value.
- 3 a 18 seconds
b 112 seconds
c 128.5 seconds
d Median
e Mean

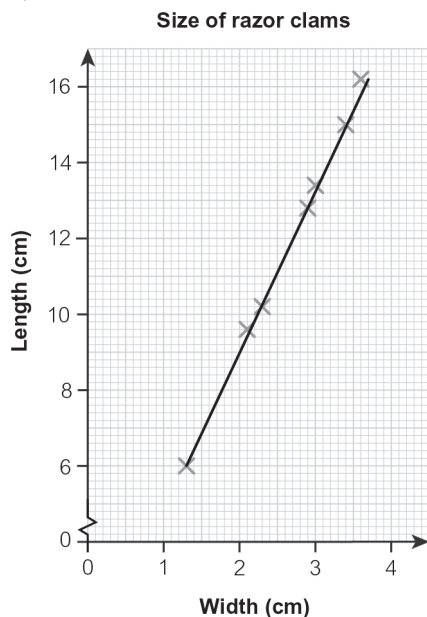
10.5 STEM: Scatter graphs and correlation

1 a, e



- b There is a positive correlation.
 c 60 mg/l
 d The point at 50 mg/l and 2 s. This is a clear outlier where the reaction time is lower than the line of best fit suggests.
 f About 50 mg/l.

2 a, b



- c i About 11 cm ii About 2.6 cm

10 Strengthen Using tables

1 a, b, c, d

	Photos	Videos	Total
Faadl	24	11	35
Maahir	29	5	34
Total	53	16	69

- 2 a 1 student b 4 students
 c 30 students d 4 siblings

e

Number of siblings	Frequency	Siblings × Frequency
0	8	$0 \times 8 = 0$
1	13	$1 \times 13 = 13$
2	5	$2 \times 5 = 10$
3	3	$3 \times 3 = 9$
4	1	$4 \times 1 = 4$
Total	30	36

f 1.2 siblings

- 3 a Heights from 135 cm up to, but not including, 140 cm

b

Height, h (cm)	Tally	Frequency
$135 \leq h < 140$		3
$140 \leq h < 145$		3
$145 \leq h < 150$		1
$150 \leq h < 155$		4

c $150 \text{ cm} \leq h < 155 \text{ cm}$

Presenting and comparing data

- 4 a 65 years old b 9 people
 c 25 people d 52 years old
 e 13 f 58 years old

- 5 a 24° b 1 c 2

d

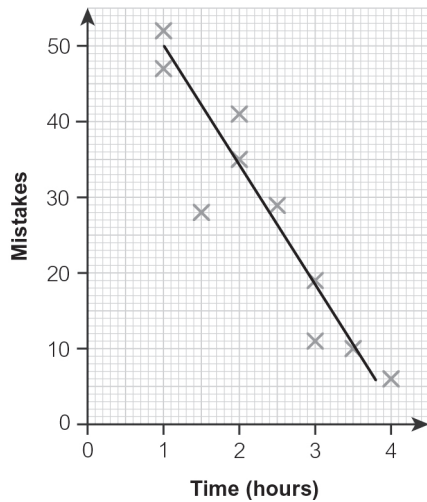
Flavour	Frequency	Angle
Vanilla	5	120
Strawberry	2	48
Lemon	1	24
Toffee	7	168

e Pie chart with 15 sectors: 5 sectors vanilla, 2 sectors strawberry, 1 sector lemon and 7 sectors toffee

- 6 a larger, smaller, more
 b e.g. On average the boys are heavier than the girls.
 The boys' weights are more spread out than the girls' (so the boys' weights are less consistent).

Scatter graphs

7 a, c



b negative d About 35 mistakes

10 Extend

1 a

	$25 \leq m < 35$	$35 \leq m < 45$	$45 \leq m < 55$	Total
Boys	7	6	3	16
Girls	3	7	4	14
Total	10	13	7	30

b 9 boys
c The modal mass for girls is $35 \leq m < 45$, whereas the modal mass for boys is lower, at $25 \leq m < 35$. You can only estimate the mean because the data is grouped.

2 a 20

b Yes; the sectors are the same size, but there are more females represented by their pie chart, so the same sector angle represents more people.

3 a Sophie 3.24, Aidan 2.92

b Sophie, because her mean was higher so on average she got a higher score.

4 a

1	21, 37, 96
2	25, 56, 82, 94
3	19, 20, 27, 67, 76
4	09, 14, 58, 76, 88, 96
5	18, 34, 78, 82, 84
6	26

Key: 1 | 21 means 121 words

b 24 students c 25%

d

Number of words, w	Frequency
$100 \leq w < 200$	3
$200 \leq w < 300$	4
$300 \leq w < 400$	5
$400 \leq w < 500$	6
$500 \leq w < 600$	5
$600 \leq w < 700$	1

e i 392.5 words ii 390.96 words (2 d.p.)
iii 505 words iv $400 \leq w < 500$

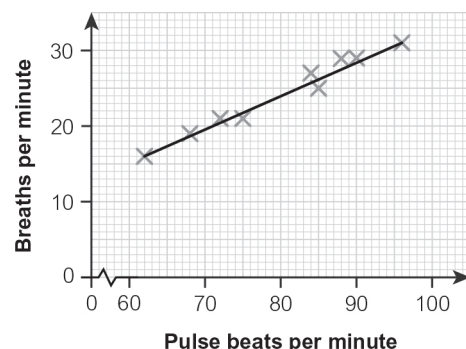
5 a Negative b Boiling point decreases.
c 83°C d 94.5°C e 11.5°C

10 Unit test

- 1 a 54 boards b 18 boards c 6 boards
2 a 3 phones b 1 phone c 1.5 phones
3 a 4.3 s b 7.4 s
4 a Friday in Week 1
b i Week 1 9, Week 2 13
ii Week 1 13, Week 2 13.6
iii Week 1 25, Week 2 3

5 a, c

Pulse beats and breaths per minute



b There is a positive correlation between breathing rate and pulse rate.
d About 24 breaths per minute

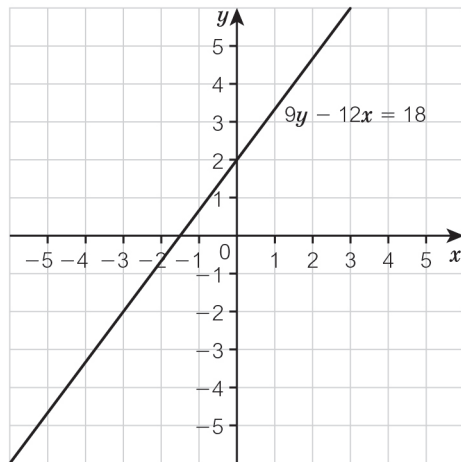
Unit 11 Straight-line graphs

11.1 Plotting linear graphs

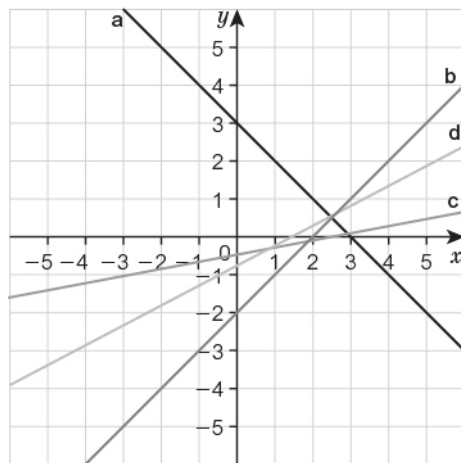
1 a $y = 2$ b $x = -1\frac{1}{2}$

c

x	0	$-1\frac{1}{2}$
y	2	0



2



3 a (0, -5) b (0, 2) c (0, 0)

4 In order: D, B, E, A, F, C

5 Any three equations in the form $y = mx + 2$,
e.g. $y = 3x + 2$, $y = \frac{1}{2}x + 2$, $y = x + 2$

11.2 The gradient

1 A 3; B -1; C 3; D $\frac{1}{2}$

2 a Students' own line with gradient 3

b Students' own line with gradient -2

c Students' own line with has gradient $-\frac{1}{2}$

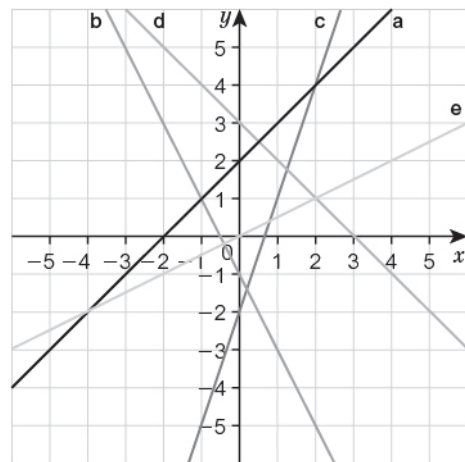
d Students' own line with gradient $\frac{2}{3}$

3 a 2.5 b £2.50

c 0.05 d 5p

4

Equation of line	Gradient	y-intercept
a $y = x + 2$	1	(0, 2)
b $y = -2x - 1$	-2	(0, -1)
c $y = 3x - 2$	3	(0, -2)
d $y = -x + 3$	-1	(0, 3)
e $y = \frac{1}{2}x$	$\frac{1}{2}$	(0, 0)



11.3 $y = mx + c$

1 a Gradient 3, y-intercept (0, -2)

b Gradient 2, y-intercept (0, 0)

c Gradient $-\frac{1}{2}$, y-intercept (0, 1)

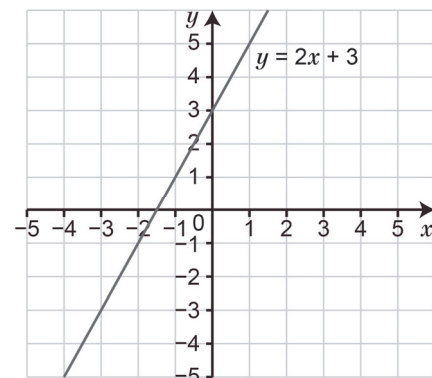
2 In order: A, D, C, E, F, B

3 $y = 0.4x + 15$ (C), $y = x + 10$ (A), $y = 2x - 3$ (B)

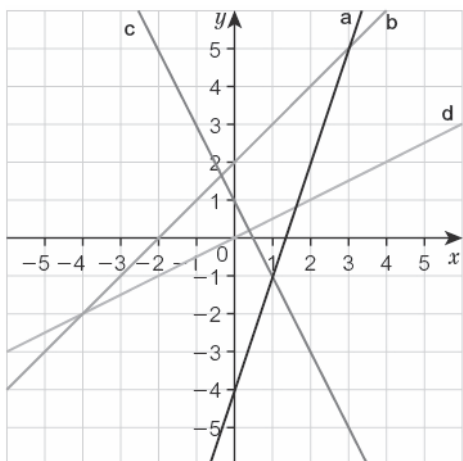
4 a (0, 3)

b 2

c



5



6 a (5, 14) b No

7 a Points C and E

b Point A

c Points B and F

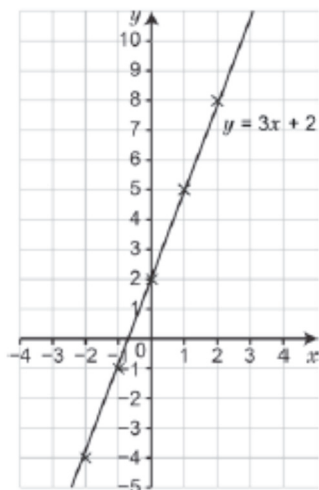
11 Strengthen Straight-line graphs

1 a

x	-2	-1	0	1	2
$3x$	-6	-3	0	3	6
$3x + 2$	-4	-1	2	5	8
y	-4	-1	2	5	8

b (-2, -4), (-1, -1), (0, 2), (1, 5), (2, 8)

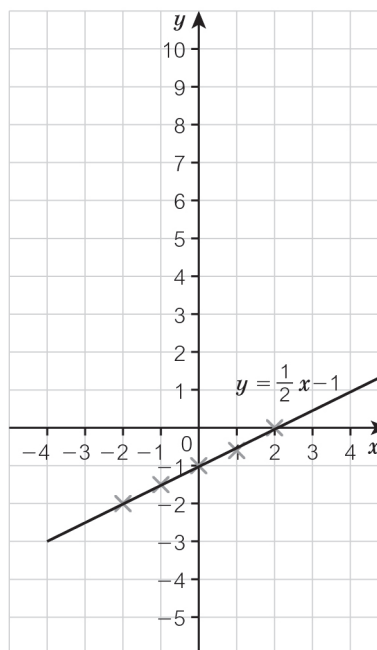
c



2 a

x	-2	-1	0	1	2
$\frac{1}{2}x$	-1	$-\frac{1}{2}$	0	$\frac{1}{2}$	1
$\frac{1}{2}x - 1$	-2	$-1\frac{1}{2}$	-1	$-\frac{1}{2}$	0
y	-2	$-1\frac{1}{2}$	-1	$-\frac{1}{2}$	0

b



Gradients

3 a Lines A and C

b i 2 squares ii 2

c i -1 ii 1 iii -3

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

Finding the equation of a line

5 a (0, 7) b (0, -3) c (0, -5)

6 a 2 b 3 c $y = 2x + 3$

d $y = 3x + (-2)$ (or $y = 3x - 2$)

e i $y = -2x + 4$

ii $y = x + 3$

7

Equation	Gradient	y -intercept
a $y = 2x + 5$	2	(0, 5)
b $y = 5x - 4$	5	(0, -4)
c $y = -4x - 1$	-4	(0, -1)
d $y = 3x$	3	(0, 0)
e $y = -3x + 7$	-3	(0, 7)
f $y = x - 2$	1	(0, -2)
g $y = -4x + 5$	-4	(0, 5)

8 a 3 b 4 c $y = 3x + 4$

9 $y = 5x - 3$

11 Extend

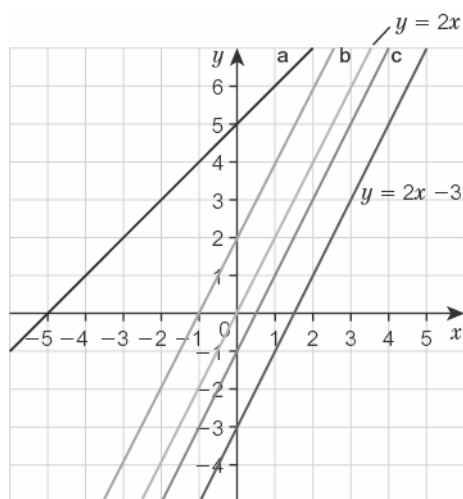
1 a 1 b 5 c $y = x + 5$

d i $y = 2x + 2$

ii $y = 2x - 1$

e They are the same.

f



2 a -3 b $y = -3x$

3 a $y = 5x + c$ b $2 = -10 + c$

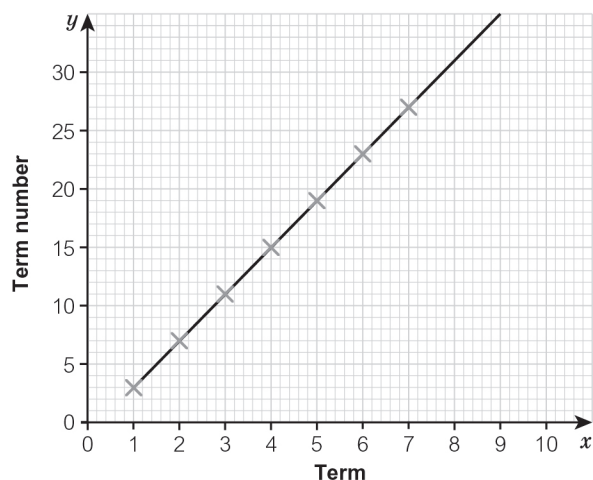
c 12 d $y = 5x + 12$

4 $y = -3x + 10$

5 a 5 b $\frac{6}{11}$

6 $y = 3x + 1$

7 a



b $y = 4x - 1$

c n th term $= 4n - 1$

This has the same form as the equation $y = 4x - 1$.

d 79

8 a A and B; C and D

b A $y = 3x + 4$

B $y = 3x - 2$

C $y = -\frac{1}{3}x + 3$

D $y = -\frac{1}{3}x - 1$

11 Unit test

1 a

x	0	2
y	3	0
Coordinate	(0, 3)	(2, 0)

b Graph plotting coordinates from part a.

2 a $y = 5x + 1$

b $y = 3x + 7$ and $y = 3x - 4$

3 a (0, 5) b -3

4 $y = 5x - 2$

5 A 2

B $\frac{1}{3}$

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

D -1

6 A $y = 2x + 2$

B $y = \frac{1}{3}x + 3$

C $y = -\frac{1}{4}x - 2$

D $y = -x$

7 No, because $3 \times 3 - 10 \neq 1$.