Unit 1   Answers

1.1 Two-way tables and bar charts

1 a, b, c, d

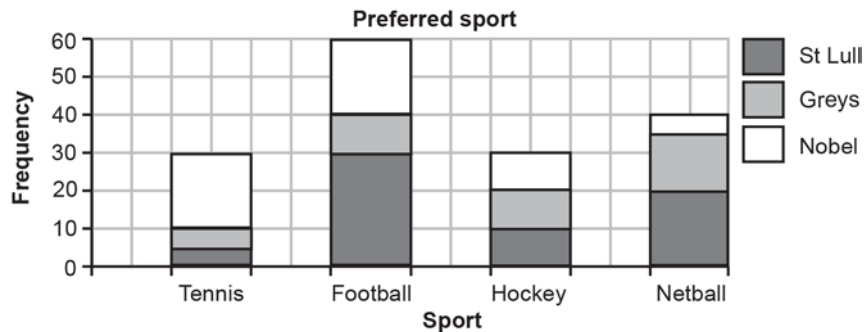|	**mp3**	**mp4**	**Total**
Mahoud	17	12	29
Fahid	34	8	42
Total	51	20	71

2 a
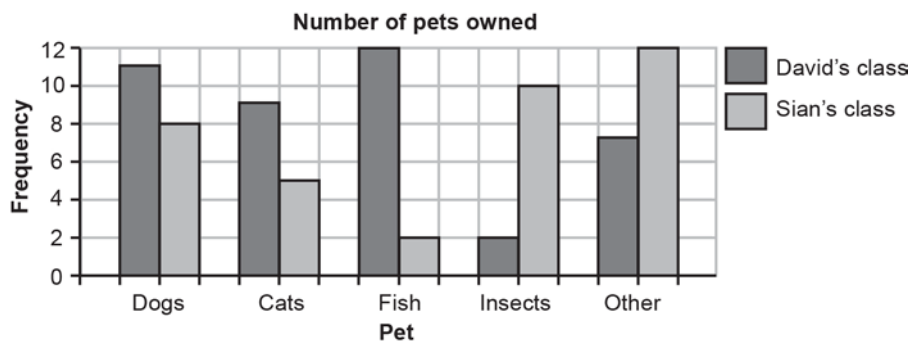
b 8 dogs

c fish

d David's class

3

b 40 students

c e.g. Hockey; while fewer people chose it overall, all three schools have roughly equal numbers so they will be equally able to send teams.

1.2 Averages and range

1 a i 7

ii 2

b John's data

2 2 children

3 2.77 stars

4 e.g. Type A produces plants which are more consistent in height (the range is smaller).

Type A also produces taller plants in general than type B (the mean is larger).

5 a £50

b mean £11.90, median £9.00, mode £10.00

c e.g. The median; the mean is skewed by the extreme value and the mode is higher than the pocket money of half the group.

1.3 Grouped data

1 a 18 weekends

b 25 weekends
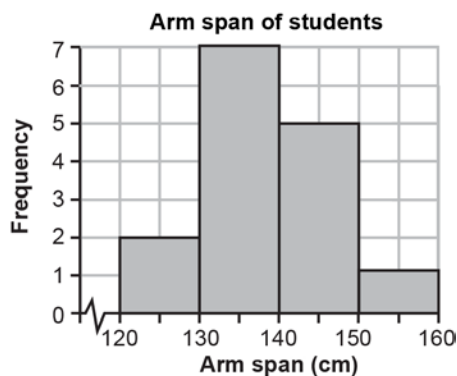
c 300–399

2 a discrete

b continuous

c continuous

d discrete

3 a

Arm span, s (cm)	Frequency
$120 \le s < 130$	2
$130 \le s < 140$	7
$140 \le s < 150$	5
$150 \le s < 160$	1

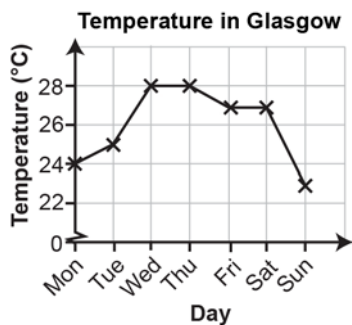**b** 130 cm $\le s <$ 140 cm

4 a

b 6 students

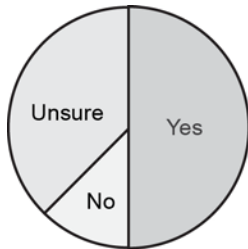# 1.4 More graphs

1 a

b e.g. This data only covers one week; over the course of the next few months the season will change.

2 a 90°C

 b 5°C

 c Pan B takes 30 seconds longer to reach 100°C, this is a quarter longer than pan A.

3 a The vertical axis starts at 90.

 b The vertical axis has a different scale from the horizontal axis.

 c The horizontal axis steps are not all equal.

1.5 Pie charts

1

2 a

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

 b

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

1.6 Scatter graphs and correlation

1 a, e
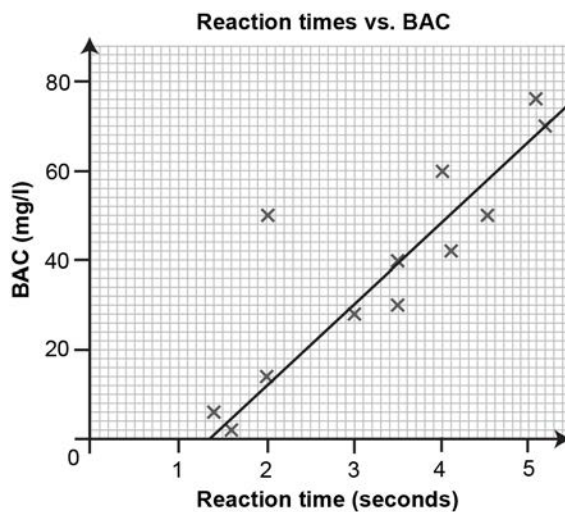
 b There is a positive correlation.

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.

e See graph

f about 50 mg/l.

2 a, b

Size of razor clams
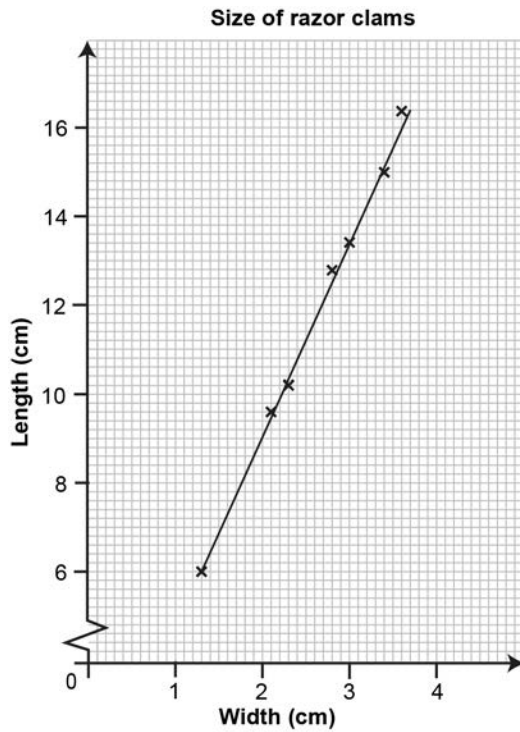
c i about 11 cm

ii about 2.6 cm

1 Strengthen

Averages and range

1 a i 6

ii 2.8

b i 1

ii 2.4

2 a

TVs	Frequency	Total TVs
1	5	5
2	8	16
3	5	15
4	6	24
Total	24	60

b 60 TVs

c 24 friends

d 2.5 TVs

Charts and tables

3 a, b

	7A	**7B**
Park	8	6
Cinema	6	12
Rink	12	10

c

Compound bar chart of students' preferences
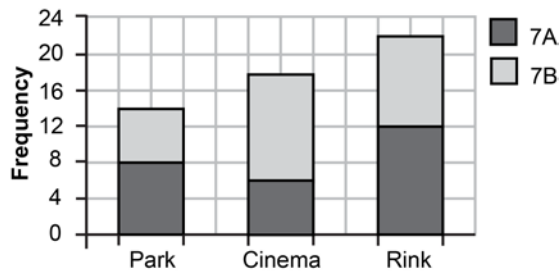
Dual bar chart of students' preferences
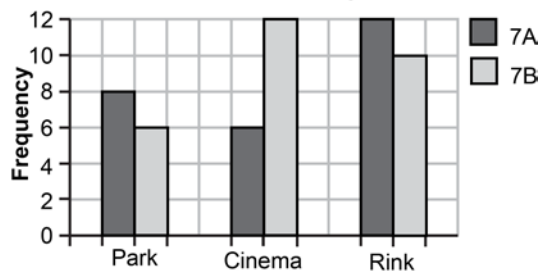
4 a 24°

b 1 sector

c 2 sectors

d

Flavour	**Frequency**	**Sector angle**
Vanilla	5	120°
Strawberry	2	48°
Lemon	1	24°
Toffee	7	168°

e

Yoghurt flavour preference

vanilla
strawberry
lemon
toffee
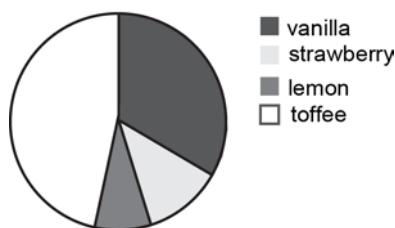
5 a, b

Time, t (s)	Tally	Frequency
0 ≤ t < 10	⊮ ǀ	6
10 ≤ t < 20	⊮ ǀǀǀ	8
20 ≤ t < 30	⊮	5
30 ≤ t < 40	ǀ	1

c 10 s ≤ t < 20 s

d
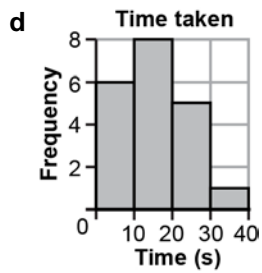
Line graphs, scatter graphs and correlation

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

7 a, c
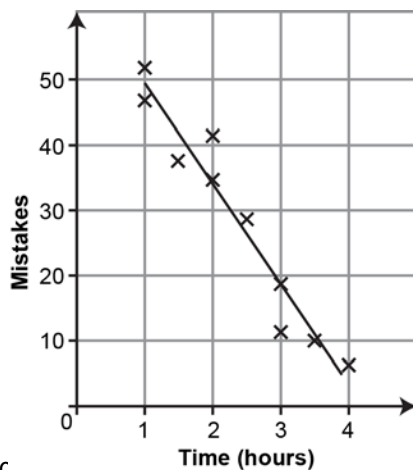
b neg....

d about 33 mistakes

1 Extend

1 a Bryony

b 50%

c 40 replies

d

	Unsure	No	Yes
Aaron	40	100	60
Bryony	4	1	5

2 a 18 000 people

b 705 000 houses

c The scales for homeless people and total housing is different, so they aren't comparable.

3 a i 79 kg

   ii 20 kg

   iii 80.67 kg

b e.g. The 1500 m runners are on average almost 20 kg lighter than the 100 m runners. The masses of the 1500 m runners are more similar than those of the 100 m runners.

4 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 mode mass for girls is $35 \leq m < 45$, whereas the mode mass for boys is lighter, at $25 \leq m < 35$. We can only estimate the mean because the data is grouped.

5 a 30.8 g

b 160.8 g

6 a
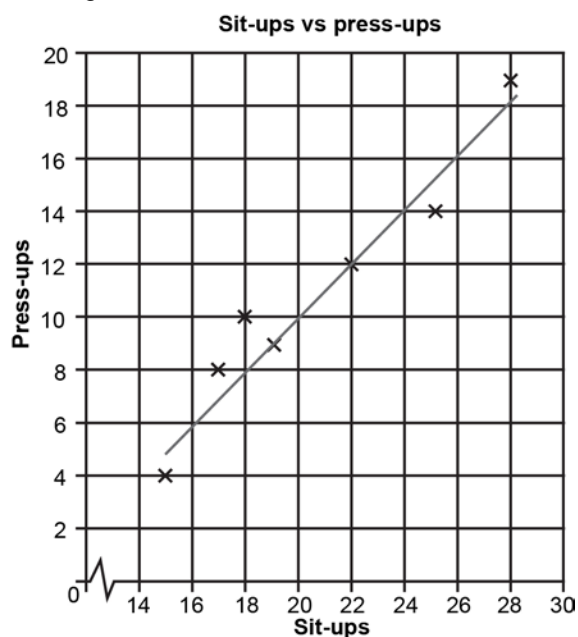
b about 14 press-ups

c
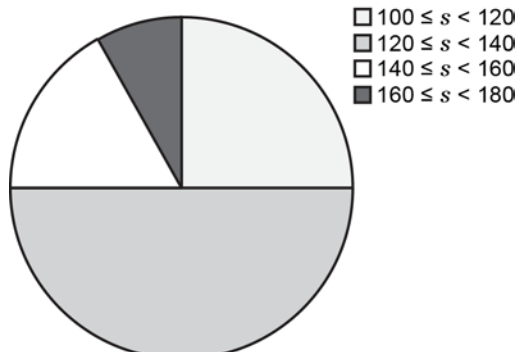
d $120 \leq s < 140$

e 140

1 Unit test

1 a 70 items

  b 50 mugs

  c 150 items

  d 120 mugs

2 a The median; e.g. the mode is low compared to her general scores and the mean is skewed by the extreme value of 39.

3 290.5

4 a

Time, t (s)	Tally	Frequency
$0 \leq t < 10$	|||	3
$10 \leq t < 20$	||||	4
$20 \leq t < 30$	⊮|	5
$30 \leq t < 40$	||	2
$40 \leq t < 50$	|	1

  b 20 s ≤ t < 30 s

  c

5 a
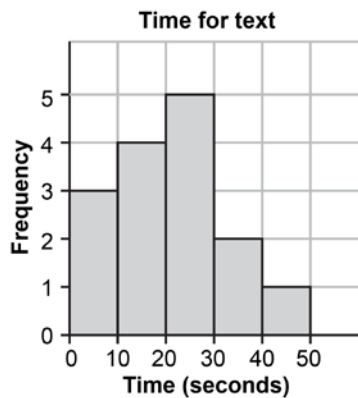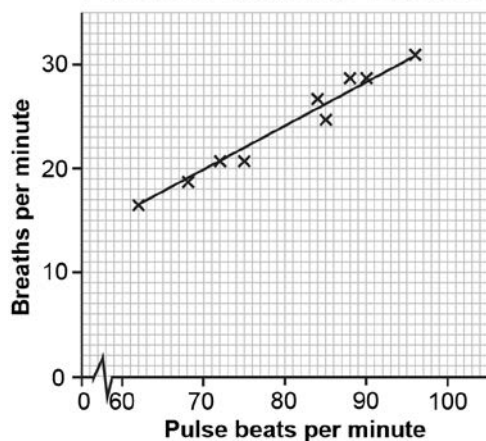
  b There is a positive correlation between breathing rate and pulse rate.

  c about 24 breaths per minute

Unit 2   Answers

2.1 Factors, primes and multiples

1 2, 3, 5, 7, 11, 13, 17, 19, 23

2 a i 1, 2, 3, 4, 6, 12

   ii 1, 2, 3, 6, 9, 18

   iii 1, 5, 25

  b i 2, 3

   ii 2, 3

   iii 5

3 5, 6, 15, 16, 30, 40, 60

4 a 1, 2, 3, 6

  b 1, 3, 5, 15

  c 1, 3

  d 3

  e i 4

   ii 9

5 a 4, 8, 12, 16, 20, 24, 28, 32

  b 8, 16, 24, 32, 40, 48, 56, 64

  c 8, 16, 24, 32

  d 8

6 30 turns

2.2 Using negative numbers

1 a −2

  b 4

  c −9

  d −6

2 a i 5, 4, 3, 2

   ii 3, 4, 5, 6

  b i 4 − 2

   ii 4 + 2

  c −, +

3 a 5

  b 4

  c −17

  d 1

4 a i 0, −5, −10

   ii −5, 0, 5, 10

  b negative, negative, positive

5 a −25

  b −12

   c 36

   d −30

6 a −7

   b −10

   c 3

2.3 Multiplying and dividing

1 a i 30, 600

   ii 2800

  b i 608

   ii 2774

2 a 168

  b 168

  c 168

  d 2 × 84 or 4 × 42 or 7 × 24 or 8 × 21

3 i   **ii**
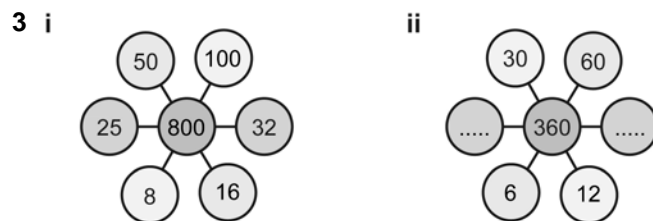
For ii any two numbers that multiply to give 360 other than 30 × 12 and 60 × 6
e.g. 10 × 36, 5 × 71, 20 × 18 etc.

4 47 r 6

5 a 28

  b 32 r 5

  c 19 r 6

2.4 Squares and square roots

1 a

1^2	2^2	3^2	4^2	5^2	6^2	7^2	8^2	9^2	10^2	11^2	12^2	13^2	14^2	15^2
1	4	9	16	25	36	49	64	81	100	121	144	169	196	225

  b i 3

   ii 7

   iii 12

2 a i −5

   ii 100, 100, 10, −10

  b i 4, −4

   ii 15, −15

   iii 2, −2

3 Tammy because you can't have a negative length.

4 a $\sqrt{361} = 19$

  b $\sqrt{30.25} = 5.5$

c $4.9^2 = 24.01$

5 a i 5.3

    iii 6.9 - Almost $\sqrt{49}$

    iv 10.5 – almost exactly between $\sqrt{100}$ and $\sqrt{121}$

  b i 5.29 (2 d.p.)

    ii 6.86 (2 d.p.)

    iii 10.49 (2 d.p.)

6 a 9

  b 900

  c 90 000

  d 0.09

7 a 20

  b 20

  c 30

  d 30

  e 90

  f 63

2.5 More powers and roots

1

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

2 a 2

  b 6

  c 4

  d −3

3 a 30

  b 33

  c 32

  d 30

4 a 40

  b 270

  c 5

  d 50

  e 10

  f 25

  g 10

  h 14

5 a 500

  b 1000

  c 3600

  d 50

e 5

6 a 4.4 km

  b 11.4 km

  c 16.1 km

7 8

2.6 Calculations

1 a i 30, 260

  ii 1000

  iii 43

  iv 21

  b i 268.6

  ii 562

  iii 46.79

  iv 22.79

2 a 100

  b 36

  c 81

  d 6

  e 64

  f 12

3 a 35

  b 225

  c 60

  d 27

  e 189

  f 30

4 a 10

  b 10

  c 5

  d 1

  e 4

  f 18

5 a Working left to right 9, 3, 11, 7

  b Student's own answer, e.g. $\sqrt{100} \div 2 = 5$

2 Strengthen

Working with numbers

1 a 1, 2, 4, 8

  b 8

2 9

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

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

    c 15, 30

    d 15

4 a 52

    b 26

5 a 13

    b 3

    c −2

    d −10

6 a −20

    b 6

    c 21

    d −5

7 a about 6

    b about 8

    c about 18

Powers and roots

8 a 8

    b 64

    c 25

    d 100

9 a $\sqrt{16}$, $\sqrt{25}$, $\sqrt{36}$, $\sqrt{49}$, $\sqrt{64}$, $\sqrt{81}$, $\sqrt{100}$

    b i e.g. 3.7

      ii e.g. 5.5

      iii e.g. 9.2

10 a 48

    b 67

    c 20

    d 10

11 32

Working with brackets

12 a 81

    b 125

    c 15

13 a 8

    b 5

14 a 2

    b 5

    c 2

    d 20

    e 2

2 Extend

1 £310

2 5^2, 3^3, 11^2, 5^3

3 a i 1, 3, 9, 27

    ii 1, 2, 3, 4, 6, 9, 12, 18, 36

    iii 1, 3, 5, 9, 15, 45

  b 9

4 a i 4, 8, 12, 16, 20, 24, 28, 32, 36, 40

    ii 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

    iii 8, 16, 24, 32, 40, 48, 56, 64, 72, 80

  b 40

5 30 seconds

6 6^2 is 36, so the square root of 40 must be larger than 6.

7 10 A

8 5, –5

9 a 25

  b 49

  c 124

  d 4

  e 36

10 a about 60

  b about 240

11 a $\sqrt[3]{27}$, $\sqrt[3]{64}$, $\sqrt[3]{125}$

  b i e.g. 1.8

    ii e.g. 3.5

    iii e.g. 4.1

12 a –27

  b 1250

  c 16

13 a 10

  b 17

14 2

15 Maggie, because $(-5)^2$ is two negatives multiplied, which is a positive number and is the same as 5^2.

16 a A = 3000 m   B = 1125 m   C = 12 000 m

  b No, it has travelled 4 times as far.

2 Unit test

1 a 2

  b Yes

2 a 21

  b No

3 a 62

   b 41 r 9

   c 0.833

4 a 6

   b −11

   c 15

5 e.g. 4.2

6 7, −7

7 a 128

   b 2

   c 30

8 a −30

   b 64

   c 45

   d 250

9 a about 1300

   b about 36

10 a 18

   b −12

11 a 3

   b 2

Unit 3   Answers

3.1 Simplifying algebraic expressions

1 a $3p$

  b $5w$

  c $7p$

  d $3w$

2 a $5t + 5$

  b $2w + 2y$

  c $7h + 5j + 2$

  d $3h + 3$

3 a t^2

  b n^3

  c i^4

4 a $8d^2$

  b $9b^2 + 3b$

  c $9h^3 + 3h$

  d $4c^2 + 8c$

  e $5k^5$

  f $m^3 + 6m^2$

5 a bc

  b a^2c^2

  c $3s$

  d $3cd$

6 a $15c^2$

  b $14d^2$

  c $2b$

  d $3t$

7 a $\equiv$

  b $\neq$

  c $\equiv$

  d $\neq$

3.2 Writing algebraic expressions

1 a $c + 10$

  b $c - 7$

  c $c - 12$

  d $2c$

  e $4c$

  f $\frac{c}{2}$

2 a $f + r$

 b $f - 5 + r + 3$ or $f + r - 2$

3 a $c + d$

 b cd

 c $c - d$

 d $7c + d$

 e $5d + 3c$

 f c^2

 g $9d^2$

 h $c^2 - 1$

 i $\frac{c}{d}$

 j $7 + \frac{9}{c}$

4 a $3a + 5$

 b $\frac{b + 4}{5}$

 c $8c - 2$

 d $\frac{d}{2} + 3$

 e $9e$

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

5 a $w + 2$

 b $w + w + 2 + w + w + 2 = 4w + 4$

 c 36 cm

3.3 STEM: Using formulae

1 a 15

 b 35

 c 12

 d −2

 e 25

 f 4

2 a 12

 b 20

 c 15

 d 18

 e 3

 f 2

3 a 2 g/cm^3

 b 3.5 g/cm^3

 c 1.25 g/cm^3

4 a 80 m

 b 150 m

 c 100 km

d 2 miles

5 a 212°F

  b 32°F

  c −148°F

  d −40°F

6 a 300 000 J

  b 7069.9 J

3.4 Writing formulae

1 a number of minutes talk time

  b number of GB of downloads

  c £30

2 a £60

  b £105

  c $15d$

  d $C = 15d$

3 $b = g + 5$

4 a $\dfrac{a+b+c+d}{4}$

  b $m = \dfrac{a+b+c+d}{4}$

  c 5

5 $T = \dfrac{p+q+r}{3}$

6 a i 17

   ii −1

   iii $2a + 7$

  b $b = 2a + 7$

7 a £7.75

  b $C = 4 + 1.25d$

3.5 Brackets and powers

1 a $3y + 15$

  b $7h - 14$

  c $2d + 20$

  d $5p - 25$

  e $4 + 2k$

2 $P = a(H - 17)$

3 a $t^2 + 2t$

  b $d^2 + 5d$

  c $s^2 - 3s$

  d $5y^2 + 3y$

  e $5j - 7j^2$

   f $6q^2 + 12q$

   g $25t^2 - 5t$

   h $30x - 9x^2$

4 a 4

   b 10

   c 20

   d 40

   e 100

   f 64

   g 80

   h 32

   i 15

   j 18

   k 1

5 a x^2

   b $x^2 + 10$

   c $2x^2 + x + 10$

   d £ 65

6 a 18

   b 105

   c 133

   d 32

   e 1000

   f 64

   g 9

   h 1

   i 2

   j 8

   k 21

3.6 Factorising expressions

1 a 1, 2

   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: $6(x + 2)$ $2(3x + 6)$ $3(2x + 4)$

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 Strengthen

Simplifying expressions

1 a $3t$

  b $4p$

2 a $5n$

  b $9a$

  c $8q$

  d $4b$

  e $7g + 2$

  f $4s + 5t$

3 a $3n + 12$

  b $2p + 10$

  c $4a + 12$

  d $20 - 5b$

4 a 5^3

  b t^5

5 $18p^2$

6 a $n^2 + 2n$

  b $t^2 + 3t$

  c $5p + p^2$

  d $g - g^2$

7 a $2a^2 + 5a$

   b $b^2 + 9b$

8 a 2

   b $2(a + 3)$

9 $3(a + 5)$

Substitution

10 300 km

11 a 10

   b 3

   c 12

   d 40

   e 35

   f 4

12 32

13 a 2

   b 0

14 a 8

   b 9

   c 16

   d 20

Writing expressions and formulae

15 a 5 more than x

   b 5 less than x

   c x less than 5

   d 5 times x

   e one fifth of x

16 a b more than a

   b a multiplied by b

   c a less than b

   d a divided by b

17 $I = \frac{4c}{10}$

18 a 3

   b +12, ÷9

   c $y = \frac{x + 12}{9}$

3 Extend

1 $6x$

2 a 150 cm^2

   b 3 cm

3 a £150

   b £180

4 $15y + 14$

5 Starting at top and working left to right along rows then down: $3x + 4y$, x, $x + 2y$, $x - 2y$, $2x$, $2y - x$

6 e.g. You multiply your number by 10 (double then multiply by 5) having added 2. Taking away ten times your original number will always leave you with this extra 2 × 5.
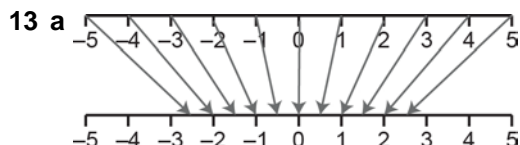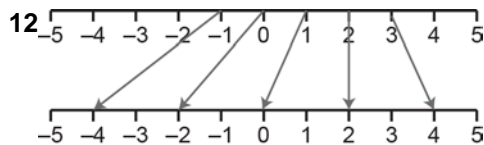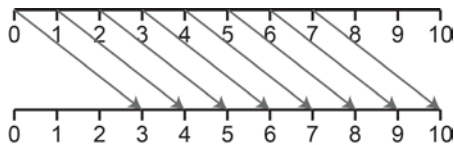
7 $2x - 7$

8 a e.g. 12, x^2

   b 4, $3x^2$ or any other factorisation

9 $6x$, $4x$

10 a $5w^2$

   b $12w$

11 For all numbers

12

13 a

   b 10

14 a $x + 2$, $x + 3$, $x + 4$

   b $5x + 10$

   c $5(x + 2)$

   d $x + 2$, it is the middle one of the five original numbers

15 $x + 2$

16 a $x < 0$

   b $x = 0$, $x = 3$

   c $x > 3$ or $x < 0$

   d $0 < x < 3$

3 Unit test

1 120 hours

2 39

3 10

4 $5p - 15$

5 a $t - 5$

   b $4w$

   c $\frac{p}{3}$

6 $T = j + 3s$

7 a 18

   b 30

8 $5e + 3$

9 a t^4

   b $2p^2$

   c $6y^2$

10 $6v^3 + 3v^2$

11 $15d^2 + 15d$

12 64

13 a 27

    b 46

    c 16

    d 4

14 a $3(d - 4)$

    b $4(3e + 4)$

    c $5(3 - 2f)$

Unit 4   Answers

4.1 Working with fractions

1 $\frac{1}{4}$ and $\frac{3}{12}$, $\frac{4}{8}$ and $\frac{1}{2}$, $\frac{2}{3}$ and $\frac{6}{9}$, $\frac{6}{10}$ and $\frac{3}{5}$

2 $\frac{4}{5}$

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

  b $\frac{1}{5}$

  c $\frac{3}{7}$

4 $\frac{3}{4}$

5 a £5

  b 5 kg

  c 20 m*l*

  d 60 m*l*

  e £24

6 100 m*l*

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

  b $\frac{3}{20}$

  c $\frac{2}{5}$

4.2 Adding and subtracting fractions

1 $\frac{9}{4} > 1\frac{3}{4}$

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

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

  c $13\frac{1}{2}$

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

  b $\frac{2}{3}$

  c $\frac{1}{4}$

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

  b $\frac{1}{2}$

  c $\frac{1}{7}$

5 a $\frac{7}{10}$

  b $\frac{17}{24}$

6 a $1\frac{3}{14}$

  b $1\frac{9}{20}$

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

  d $1\frac{23}{30}$

4.3 Fractions, decimals and percentages

1

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

2

Mixed number	$1\frac{1}{4}$	$1\frac{2}{5}$	$1\frac{3}{4}$	$1\frac{1}{2}$	$1\frac{7}{10}$	$1\frac{4}{5}$
Decimal	1.25	1.4	1.75	1.5	1.7	1.8
Percentage	125%	140%	175%	150%	170%	180%

3 a 0.625

  b 0.15

  c 3.75

  d 0.6

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

  b 0.35

  c 35 %

5 a A $\frac{41}{50}$, B $\frac{21}{25}$, C $\frac{52}{55}$, D $\frac{9}{10}$, E $\frac{23}{28}$

  b No, because 37.5°C produces a higher fraction of successful hatchings.

6 a 0.002

  b 0.04

  c 0.004

4.4 Multiplying and dividing fractions

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

  b $22\frac{2}{9}$ m

2 a 6

  b 10

c $6\frac{2}{3}$

d 32

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

b $\frac{2}{7}$

c $\frac{2}{9}$

d $\frac{9}{25}$

4 $\frac{3}{10}$

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

b $\frac{1}{28}$

6 a $\frac{3}{7}$

b $\frac{1}{3}$

c $\frac{5}{6}$

d $\frac{9}{20}$

4.5 Working with mixed numbers

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

ii $5\frac{1}{6}$ hours

b $6\frac{11}{12}$ hours

2 a 4.2

b 2.75

3 a $3\frac{7}{8}$

b $12\frac{8}{9}$

c $14\frac{7}{24}$

4 a $4\frac{1}{10}$

b $2\frac{11}{30}$

c $2\frac{1}{18}$

5 $2\frac{11}{24}$

6 a $13\frac{1}{2}$

b $18\frac{2}{3}$

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

   b $4\frac{1}{8}$

4 Strengthen

Equivalence

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

   b $\frac{3}{4}$

   c $\frac{1}{3}$

2 $\frac{2}{7}$

3 a 48 dogs

   b $\frac{3}{4}$

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

   b $\frac{1}{30}$

5 a 0.2, 20 %

   b 0.7, 70%

   c 0.6, 60%

6

Fraction	$1\frac{1}{10}$	$1\frac{7}{10}$	$2\frac{1}{5}$	$3\frac{1}{5}$
Decimal	1.1	1.7	2.2	3.2
Percentage	110%	170%	220%	320%

7 a 0.375

   b 0.625

Multiplying and dividing with fractions

8 a £15

   b 15 kg

9 a 14

   b 14

10 a $12\frac{3}{4}$ m

   b $9\frac{1}{5}$ g

11 a $\frac{3}{14}$

   b $\frac{1}{4}$

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

b $\frac{7}{12}$

c $\frac{2}{3}$

Working with mixed numbers

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

   b $\frac{16}{5}$

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

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

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

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

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

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

   b $16\frac{2}{3}$

4 Extend

1 e.g. $\frac{21}{56}$ its simplest form is not a fraction over 7.

2 a

```
        ┌──────┐
        │ 37   │
        │ 72   │
    ┌───┴──┬───┴──┐
    │ 11   │  5   │
    │ 36   │ 24   │
┌───┴──┬───┴──┬───┴──┐
│  2   │  1   │  1   │
│  9   │ 12   │  8   │
└──────┴──────┴──────┘
```

  b

```
        ┌──────┐
        │ 19   │
        │ 25   │
    ┌───┴──┬───┴──┐
    │  1   │ 13   │
    │  2   │ 50   │
┌───┴──┬───┴──┬───┴──┐
│  2   │  1   │  4   │
│  5   │ 10   │ 25   │
└──────┴──────┴──────┘
```
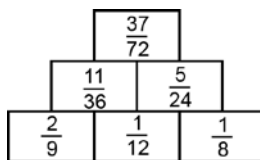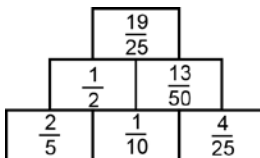
3 protein 15 g, moisture 91 g

4 a He has calculated 18 divided by 11.

  b 0.61 (2 d.p.)

5 a $7\frac{1}{12}$

  b $1\frac{23}{40}$

6 $\frac{1}{5}$

7 $5 \div \frac{5}{12} = 12$, $8 \div \frac{4}{15} = 30$, $12 \div \frac{3}{4} = 16$, $18 \div \frac{9}{10} = 20$

8 a $12\frac{1}{2}$

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

9 a 1500 miles

b 1932 miles

10 a e.g. $4\frac{1}{3} - 1\frac{1}{6}$

b e.g. $9\frac{1}{2} - 6\frac{1}{3}$

11 $\frac{1}{6}$

12 $\frac{3}{4}$

13 $3\frac{14}{15}$ years

4 Unit test

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

b $\frac{1}{4}$

c $\frac{4}{5}$

2 $\frac{1}{3}$ of £69, $\frac{2}{5}$ of £60, $\frac{5}{6}$ of £30

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

b $\frac{2}{5}$

4 $6\frac{2}{5}$

5 $\frac{38}{7}$

6 15

7

Fraction	$\frac{1}{10}$	$\frac{3}{4}$	$\frac{3}{5}$	$1\frac{3}{10}$	$5\frac{1}{2}$
Decimal	0.1	0.75	0.6	1.3	5.5
Percentage	10%	75%	60%	130%	550%

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

b $\frac{7}{18}$

9 40

10 $4\frac{1}{4}$

11 $2\frac{19}{24}$

12 $\frac{1}{12}$

13 $14\frac{2}{5}$

14 $9\frac{5}{7}$

Unit 5   Answers

5.1 Angles and parallel lines

1 a = 30° (vertically opposite angles are equal)

b = 150° (angles on a straight line sum to 180°)

c = 150° (vertically opposite angles are equal)

2 d = 60° (angles on a straight line sum to 180°)

e = 50° (vertically opposite angles are equal)

f = 130° (angles on a straight line sum to 180°)

g = 50° (angles in a right angle sum to 90°)

h = 40° (vertically opposite angles are equal)

i = 140° (angles on a straight line sum to 180°)

3 a two pairs of alternate angles marked
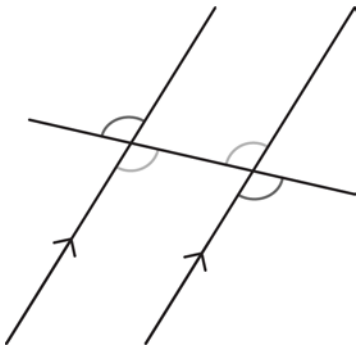
b four pairs of corresponding angles marked
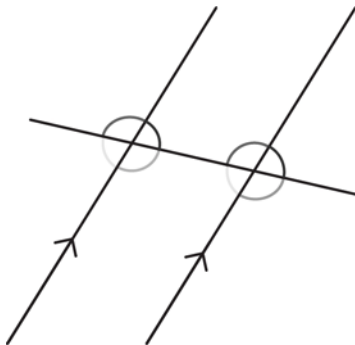
4 a = 50° (alternate angles are equal)

b = 130° (angles on a straight line sum to 180°)

c = 50° (vertically opposite angles are equal)

d = 45° (vertically opposite angles are equal)

e = 135° (angles on a straight line sum to 180°)

f = 45° (corresponding angles are equal)

g = 135° (corresponding angles are equal)

h = 60° (vertically opposite angles are equal)

i = 60° (corresponding angles are equal)

j = 60° (vertically opposite angles are equal)

k = 105° (alternate angles are equal)

5.2 Triangles

1

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

2 x; y, alternate; 180°, straight line; 180°; 180°

3 60° (angles in a triangle add up to 180°)

4 a 45° (base angles in an isosceles triangle are equal)

b 70° (base angles in an isosceles triangle are equal)
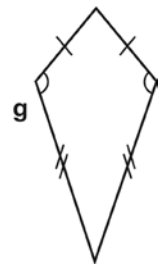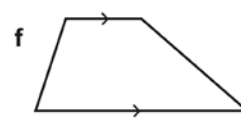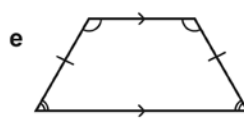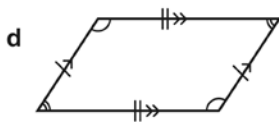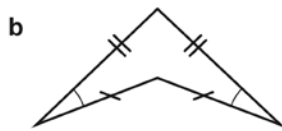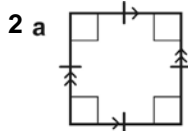
5 x = 60° (equilateral triangle)

y = 120° (angles on a straight line sum to 180°)

6 180°, straight line; 180°, 180°; $y + z$

5.3 Quadrilaterals

1

Quadrilateral	Square	Rectangle	Parallelogram	Rhombus	Kite	Arrow head	Trapezium	Isosceles Trapezium
number of lines of symmetry	4	2	0	2	1	1	0	1
order of rotational symmetry	4	2	2	2	1	1	1	1

2 a

3 a ~~c = 50°, y = 5 cm~~
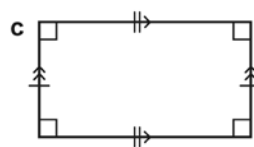
b p = 5 cm, q = 50°, r = 130°

c w = 7 cm, x = 105°

d a = 50°, b = 130°, c = 5 cm

4 130° (angles in a quadrilateral sum to 360°)

5.4 Polygons

1 9 sides

2 108°

3 a 360°

   b 36°

   c 144°

4 a 162°

   b 20 sides

5 a 6°

   b 174°

5 Strengthen

Angles and parallel lines

1 a $e = 60°$ (S), $f = 30°$ (P or S)

   b $g = 20°$ (V)

   c $h = 30°$ (V), $i = 70°$ (V), $j = 80°$ (S)

2 two pairs of alternate angles marked as a and b
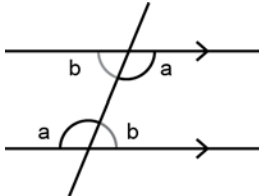
3 a, b two pairs of corresponding angles marked as c and d
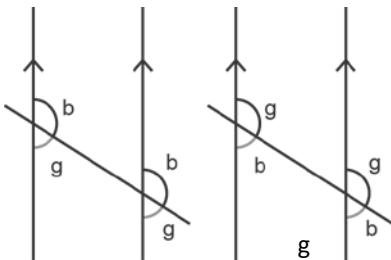
   c yes, 4 pairs

Triangles and quadrilaterals

4 a 20° (angles in a triangle sum to 180°)

   b 120° (angles in a triangle sum to 180°)

5 a 110°

   b 130°

6 a $a = 50°$ (base angles are equal)

     $b = 80°$ (angles in a triangle sum to 180°)

   b $c = 75°$ (base angles are equal)

     $d = 30°$ (angles in a triangle sum to 180°)

   c $e = 70°$ (base angles are equal and angles in a triangle sum to 180°)

7 a h

   b 30° (angles in a triangle sum to 180°)

   c 150° (angles on a straight line sum to 180°)

8 $d = 80°$, $e = 70°$, $f = 30°$

Interior and exterior angles

9

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

10 e.g. The angles do not sum to 360°.

11a 18 exterior angles

b 18 sides

5 Extend

1 a 40°

b 80°

2 290°

3

Angle	Value	Reason
AED	80°	Given
BCD	70°	Given
EAD	70°	Opposite angles in a rhombus are equal
ADE	30°	Angles in a triangle sum to 180°
EBC	110°	Adjacent angles in a rhombus sum to 180°
CDE	90°	Opposite angles in a rhombus are equal, and ADE = 30°
BED	100°	Angles on a straight line sum to 180°
BEF	80°	Angles on a straight line sum to 180°
EBF	70°	Angles on a straight line sum to 180°
EFB	30°	Angles in a triangle sum to 180°

4 18 × 180 = 3240

5 130°

6 $a = 50°$ (angles on a straight line sum to 180°, then corresponding angles)

$b = 50°$ (vertically opposite angles are equal)

$c = 40°$ (angles in a right angle sum to 90°)

7 a, corresponding; 180, a; a, 180 − a, 180°

8 a 50°

b 110°

c 55°

9 a $a = 120°$ (interior angles of hexagon sum to 720°)

$b = 60°$ (angle is bisected)

b $c = 135°$ (interior angles of an octagon sum to 1080°)

$d = 45°$ (angles of an isosceles trapezium are paired and sum to 360°)

$e = 90°$ (angles must sum to the interior angle)

c $f = 144°$ (interior angles of an decagon sum to 1440°)

$g = 36°$ (angles of an isosceles trapezium are paired and sum to 360°)

$h = 108°$ (angles must sum to the interior angle)

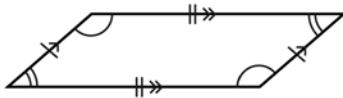**10a** 0.36°

b 179.64°

11a 72°

b 60°

c 45°

12 258°

5 Unit test

1 $a = 90°$ (angles on a straight line sum to 180°)

$b = 50°$ (vertically opposite angles are equal)

2 25°

3 a

b none

c order 2

4 40°

5 kite

6 $f = 100°$ (vertically opposite angles are equal)

$g = 60°$ (angles in a triangle sum to 180°)

$h = 20°$ (alternate angles are equal)

$i = 60°$ (angles in a triangle sum to 180°)

7 a 50°

b 720°

8 110° (angles on a straight line sum to 180°, then alternate angles)

9 a 10°

b 170°

10 12 sides

Unit 6   Answers

6.1 Ordering decimals

1 2.08, 2.39, 2.6

2 a 0.001, 0.01, 0.1

  b 0.005, 0.05, 0.5

3 No: e.g. the 25 represents 25 hundredths and the 4 represents 4 tenths (40 hundredths).

4 a 0.509, 0.515, 0.55

  b 25.7635, 25.764, 25.8, 25.81

  c −0.884, −0.88, −0.85, −0.805, −0.8

  d −1.991, −1.99, −1.97, −1.95, −1.907

5 a 9.47, 9.4516, 9.446, 9.416, 9.4106

  b 77.933, 77.9, 77.3933, 77.39, 77.339

  c −5.02, −5.145, −5.2, −5.323

  d −6.603, −6.63, −6.636, −6.66, −6.663

6 sheets C, D and E

7 a <

  b >

  c >

  d <

  e <

  f >

6.2 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 e.g. She has removed all the decimal places

  b 33.00

7 40p

8 3.873

9 7.475, 7.484

10 a 5.650 ≤ x < 5.750

   b 5.545 ≤ x < 5.555

6.3 Adding and subtracting decimals

1 a 4.3

   b 7.8

   c 5.44

   d 90.01

2 a 6.38

   b 10.88

3 e.g. The "3" in his calculation of the decimal places is in fact a '30' compared to his '25'.

4 a 4.43

   b 24.53

5 £6.51

6 1.38 m

7 a 6.89

   b 1.52

8 7.7 million

6.4 Multiplying decimals

1 a 25.2

   b 33.2

2 £15.75

3 a 45

   b 4.5

   c 4.5

   d 0.45

   e 45

   f 0.0045

4 a i 5.1

    ii 5.1

   b i 8.7

    ii 8.7

5 a i 63

    ii 6.3

    iii 0.63

   b ÷ 100

6 a 55.2

   b 131.2

7 $80

8 a 0.1316

   b 131.6

c 13.16

d e.g. 0.047 × 28, 4.7 × 0.28 (or any other balanced multiples of ten or factorisation of the original)

6.5 Dividing decimals

1 a 21.4

  b 15.1

  c 12.4

2 a 80

  b 370

  c 4

  d 22

3 a 20

  b 250

  c 6000

  d 400

4 a i 4

   ii 4

  b i 4

   ii 4

  c i 71

   ii 71

  d i 30.75

   ii 30.75

5 a 2

  b 0.3

  c 2

  d 4

6 a 6400, 64 000

  b 2.5, 0.25, 0.025

7 a 3.8

  b 62

  c 38

  d 0.38

  e 6.2

6.6 Fractions, decimals and percentages

1

Fraction	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{3}{4}$	$\frac{4}{5}$	$1\frac{9}{10}$	$2\frac{1}{2}$
Decimal	0.5	0.25	0.2	0.1	0.75	0.8	1.9	2.5
Percentage	50%	25%	20%	10%	75%	80%	190%	250%

2 a 22%

   b 3%

   c 404%

3 a 0.17

   b 3.45

   c 0.038

4 a 2.75 hours

   b 5.4 hours

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

   b $\frac{11}{25}$

   c $1\frac{7}{20}$

6 $\frac{1}{6} = 0.1\dot{6}$, $\frac{5}{9} = 0.\dot{5}$, $\frac{5}{11} = 0.\dot{4}\dot{5}$, $\frac{7}{12} = 0.583\dot{3}$, $\frac{14}{27} = 0.\dot{5}1\dot{8}$

7 a $0.\dot{8}$

   b $0.\dot{2}7\dot{5}$

   c $0.005\dot{2}$

8 6.75%, 0.608, 0.65, 66% $\frac{2}{3}$, $\frac{7}{10}$

9 a $\frac{17}{100}$

   b $\frac{1}{50}$

   c $\frac{17}{20}$

10 a 67.5%

   b 68.8%

   c 77.4%

   d English

6.7 FINANCE: Working with percentages

1 a £65.10

   b £49.50

2 £257.50

3 Cycle-on

4 £29.49

5 a £125

   b £625

   c £625

   d The answers are the same.

   e i 1.25

     ii 1.6

6 a 1.28

   b 0.92

c 0.801

7 £300

6 Strengthen

Ordering and rounding decimals

1 a 8.3, 8.4, 9.2, 9.5

b 0.006, 0.055, 0.06, 0.55, 0.606

2 a 0.75

b 0.77

c 0.75

d 0.75

3 £1.43

Add and subtract decimals

4 a 24.7

b 84.9

5 a 8.13

b 13.15

6 a 3.48

b 23.08

c 6.402

Multiply and divide decimals

7 a 5.2

b 64.5

c 40.52

8 a 2.4

b 14

c 0.24

d 1.8

9 a 0.25

b 0.028

c 0.004

10 a 2.132

b 0.6784

11 a 14.1

b 7.23

12 a 40

b 30

c 700

d 20

Fractions decimals and percentages

13
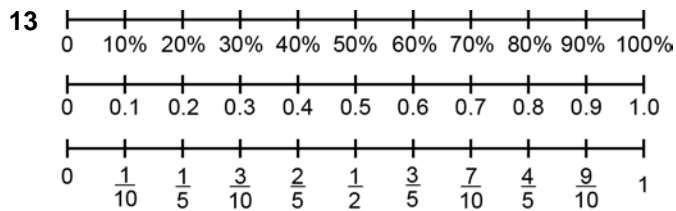
14 1.33

15 a 0.4

    b 4.4

    c £1.40

    d £40.60

16 a £70

    b 52 m*l*

17 60

6 Extend

1 a 110 puddings

    b 27.3%

    c 36.4%

    d $27.\dot{2}\dot{7}$%, $36.\dot{3}\dot{6}$%

2 a 8.25

    b 8.34

3 any height more than $136.\dot{3}\dot{6}$ cm

4 0.042 m or 4.2 cm

5 a 37.41

    b 3.741

    c 3.741

    d 8.7

    e 43

    f 8.7

6 a $0.4\dot{8}$

    b $0.0\dot{5}$

    c $0.\dot{6}$

    d $0.\dot{5}6\dot{7}$

7 a £108.33

    b £194.99

    c £1104.96

8 e.g. Carla has ignored the decimal points: –0.015

9 a £30

    b £1097.50

10 5%

11 $\frac{4}{90}$, $\frac{9}{200}$, 4.52%, 5%, $\frac{5}{99}$, 0.5

12 a i >

　　ii <

　b i <

　　ii >

　c <

13 a any number with 3 d.p.

　b 50.5 ≤ x < 51.5

　c 50.65 ≤ x < 50.75

　d 50.725 ≤ x < 50.735

6 Unit test

1 a 4.5

　b 0.45

　c 14.85

2 7.85 m

3

Fraction	$\frac{7}{10}$	$\frac{3}{4}$	$\frac{3}{5}$	$1\frac{2}{5}$	$1\frac{2}{3}$
Decimal	0.7	0.75	0.6	1.4	1.$\dot{6}$
Percentage	70%	75%	60%	140%	166.$\dot{6}$

4 a 11.514

　b 11 514

　c 30.3

5 1.08, 1.083, 1.183, 1.38, 1.8

6 12.58

7 a 3.2

　b 2.1

　c 7

8 a £1360

　b £1410

9 30

10 a £412

　b £427

11 −8.23 < −8.32

Unit 7   Answers

7.1 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

7.2 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°, 40°, 80°

   b 26°, 78°, 26°, 78°

7.3 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 a $5x + 30 = 3x + 40$, 55°

   b $5y + 20 = 9y - 12$, 60°

7.4 Trial and improvement

1 a 8, –8

  b 3

  c 3, –3

2 a 3.7 (1 d.p.)

  b 7.5 (1 d.p.)

3 15.2 cm (1 d.p.)

4 a 4.7 (1 d.p.)

  b 7.3 (1 d.p.)

7 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

6 2

7 a 8

  b 3

Writing equations

8 a $3n + 30 = 180$

  b 50°

  c 100°

9 22 cm

Trial and improvement

10 a 36, 49

  b
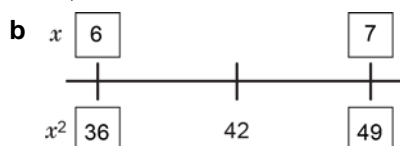
c, e

x	x^2	Comment
6	36	too small
7	49	too big
6.5	42.25	too big
6.3	39.69	too small
6.4	40.96	too small

  f 6.5 (1 d.p.)

7 Extend

1 octagon

2 a length = $2w$
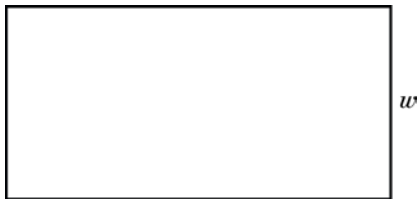
  b length 10 cm, width 5 cm

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 $x^2 - 4 = 60$

  b 8

8 a $3w^2 = 33$

  b 3.3 m

9 3.8 (1 d.p.)

10 5.13 (2 d.p.)

7 Unit test

1 a 7

  b 9

  c 32

2 a 3

  b 20

  c 8

3 20°, 50°, 110°

4 42

5 1

6 13, 14, 15

7 6, –6
8 9.6 (1 d.p.)

Unit 8   Answers

8.1 STEM: Metric and imperial units

1 a 50 000 m^2

  b 5.5 ha

  c 1500 kg

  d 20 t

2 400 trees

3 about 5 g

4 a 16 km

  b 0.4 km, 400 m

  c 150 cm, 1.5 m

  d 7.5 cm

  e 1.8 kg, 1800 g

  f 114 g, 0.114 kg

  g 4.57 litres, 4571 m*l*

  h 0.143 litres, 143 m*l*

  i 13.5 litres

  j 1.125 litres, 1125 m*l*

5 a between 8 and 16 km

  b no

6 no

8.2 Writing ratios

1 14 buckets

2 a no

  b yes

  c yes

  d no

3 a 2 : 1

  b 100 m*l*

  c 150 m*l*

4 a 1 : 2

  b 10 : 1

  c 3 : 7

5 yes

6 a 1 : 2 : 4

  b 2 : 4 : 3

  c 2 : 4 : 25

7 a 50 : 7

  b 24: 5

  c 25: 1

8 a 6 : 7

  b 3 : 4

  c 10 : 3

8.3 Sharing in a given ratio

1 a £8 : £32

  b £9 : £12

2 Mr Jones

3 a £10 : £20 : £30

  b £122 : £244 : £183

4 98 g

5 a i 120 g

    ii 8 g

  b 160 g

6 60 cm

8.4 Proportion

1 a 3 : 2

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

    ii 60%

2 a $\frac{11}{25}$, 44%

  b $\frac{11}{50}$, 22%

3 Michael Jordan

4 Gill's green; e.g. $\frac{3}{5}$ is greater than $\frac{4}{7}$

5 13 : 5 : 2

6 3 : 2

8.5 Proportional reasoning

1 180 g

2 a £2.40

  b £3.60

  c £0.60 or 60p

  d £3.00

3 No, he needs 5 more buckets of sand.

4 a 3 hours

  b 24 hours

5 a i 50 minutes

    ii 200 minutes

    iii 60 minutes

b 50 mph

8.6 Using the unitary method

1 a i £1.20

   ii £4.80

 b 6 pineapples

2 £14.30

3 a £96

 b £132

4 the 10-pack

5 a 1 : 4

 b 1 : 10

 c 1 : 0.4

 d 1: 0.4

6 150 : 1

7 a Olaf 1 : 25, Helga 1 : 24

 b Helga's drink

8 Strengthen

Ratio and measures

1 a 8 km

 b 0.4 km

 c 27 litres

 d 120 cm

 e 9 kg

2 a 1 : 5

 b 1 : 11

3 a 1 : 3

 b 1 : 3

 c 1 : 2

 d 1 : 4

 e 2 : 3

 f 1 : 3

4 a 1: 15

 b 8: 1

 c 3: 10

5 a £10 : £30

 b £28 : £7

 c £24 : £32

6 a £3 : £6 : £12

 b £20 : £80 : £100

7 20°, 60°, 100°

Direct and inverse proportion

8 a 10 students

   b $\frac{4}{10}$

   c $\frac{2}{5}$

   d 60%

9 a 10%

   b 60%

   c Ben

10a £5

   b £25

   c £55

11a 24p

   b 25p

   c shop A

12a red 10 km : 1 litre, blue 12 km : 1 litre

   b red 0.1 litres : 1 km, blue 0.08$\dot{3}$ litres : 1 km

   c the blue car

13a 6 hours

   b 4 hours

14a 8 hours

   b 2 hours

   c 40 hours

8 Extend

1 5 : 6 : 8

2 a 1363 g

   b 180 cm, 1.8 m

   c 6.4 km, 6400 m

   d 40.5 litres, 40 500 m*l*

   e 2.86 litres, 2860 m*l*

   f 75 cm, 0.75 m

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

4 a team A 30%, team B 33.$\dot{3}$%

   b team B

5 a 9 : 1

   b 111.$\dot{1}$ g

6 a 6 : 3 : 1

   b 48 kg, 24 kg, 8 kg

7 8 carrots

8 a 48.3p, 47.5p (1 d.p.)

   b the 10-pack

9 3 : 1 : 2

10 3 : 1

11a 3 : 5 : 12

   b £36

12 car A 1 : 800, car B 1 : 124, car C 1 : 89.3$\dot{9}$

13a 120 hours

   b 12 artists

8 Unit test

1 3 : 4

2 £12 : £18

3 a 3 : 4 : 6

   b 12: 5

   c 5 : 1

4 a 3636 g

   b 32 km

   c 60 cm

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

   b 20%

6 £7.50

7 £40 : £80 : £200

8 offer 2

9 2 : 3

10a 1 : 5

   b 1 : 4

11a 9 : 1

   b 0.2 : 1

12a **i** 16 hours

   ii 4 hours

   b 32 students

Unit 9   Answers

9.1 Triangles, parallelograms and trapeziums

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 3 cm

5 540 cm^2

6 a 80 cm^2

  b 39 mm^2

9.2 Perimeter and area of compound shapes

1 a 5 cm, 10 cm

  b 12 m, 12 m

2 80 cm

3 a 38 m^2

  b 18 m^2

4 a 140 cm^2

  b 150 m^2

5 1500 mm^2

9.3 Properties of 3D solids

1 a

b
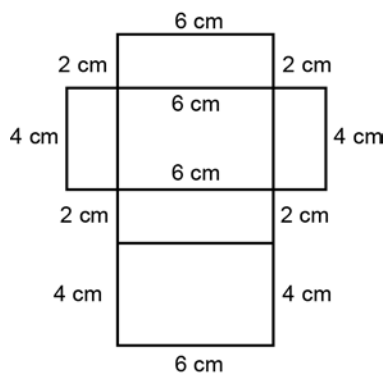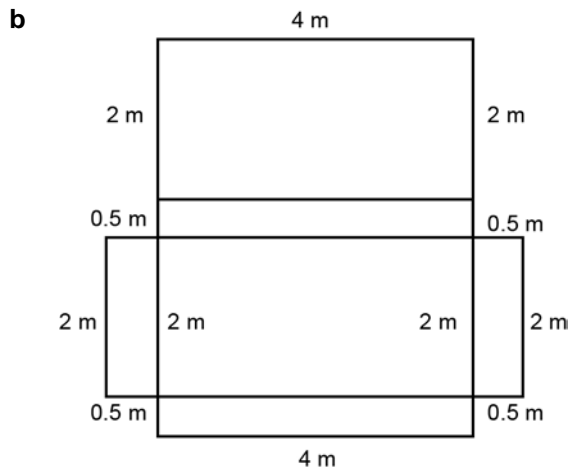
2 a C

   b A

   c B

3 6 faces, 12 edges, 8 vertices

4 a
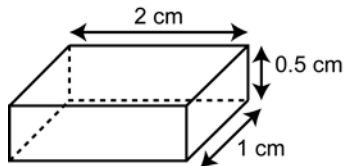
   b
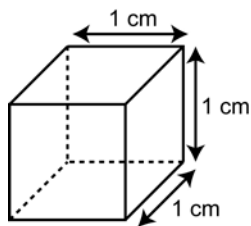
   c
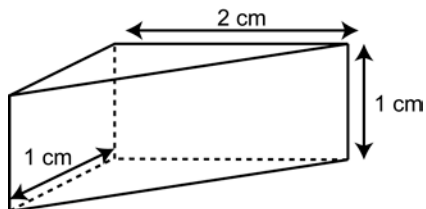
9.4 Surface area

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 Yes. Surface area of outside of box = 65 m^2

9.5 Volume

1 125 cm^3

2 a 16 cm^2

   b 4 cm

   c 64 cm^3

3 a 48 cm^3

   b 30 m^3

   c 54 cm^3

4 a 250 cm^3

   b 5 ml

   c 5.125 litres

5 a 15 000 cm^3

   b 15 litres

   c e.g. It depends on the shape of the bottles. Round bottles won't pack together closely enough to fit.

6 750 cm^3

9.6 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 m^2

   e 2000 cm^2

   f 0.0045 km^2

5 120 000 tiles

6 a 12 000 mm^3

   b 0.066 cm^3

   c 1 750 000 cm^3

   d 0.125 m^3

7 9 containers

9 Strengthen

Area and perimeter of 2D shapes

1 16 cm^2, 8 cm^2

2 a i 20 cm

    ii 5 cm

  b 50 cm^2

3 a 32 cm

  b 43 cm^2

4 24 cm^2

5 80 cm^2

Working with 3D solids

6 6 faces, 12 edges, 8 vertices

7

Face	Area
Top	10 cm^2
Bottom	10 cm^2
Front	15 cm^2
Back	15 cm^2
Left	6 cm^2
Right	6 cm^2
Total surface area	62 cm^2

8 a 80 cm^3

  b 50 cm^3

  c 8 cm^3

Measures of area and volume

9 a 16 cm^2

  b 1600 mm^2

10 a 36 m^2

  b 360 000 cm^2

11 a i 8000 mm^2

    ii 22.5 cm^3

  b i 30 000 cm^3

    ii 6.5 m^3

9 Extend

1 a 50 cm^2

  b 50 cm^2

2 38 cm

3 a 1.6 m

b 7.5 m^3

4 a i any three numbers that multiply to 4500, e.g. 9 m, 50 m, 10 m

    ii e.g. a set of three numbers that are each 3 times the numbers in part **i**

  b 121 500 ft^3

5 a 12 m^2

  b 68 cm^2

  c 50 cm^2

6 a 8 cm^3

  b 28 cm^2

  c by stacking them with the 4 cm by 2 cm faces together

7 a 1550 cm^3

  b 108 cm^3

8 a 6 cm

  b 6 cm

  c 6 cm

  d 2 cm

9 5; 2, 3; 12, 5, 30 cm^2; 12, 5, 30 cm^2; 10, 5, 50 cm^2 130 cm^2; 120 cm^2; 360 cm^2

9 Unit test

1 a 27 cm

  b 44 cm^2

2 a i 1000 cm^3

    ii 600 cm^2

  b i 20 cm^3

    ii 58 cm^2

3 a 6 cm^2

  b 60 cm^2

  c 120 cm^2

4 a 0.04 m^2

  b 400 cm^2

  c 40 000 mm^2

  d 25 cm

5 200 m^3

6 a 7 200 000 cm^3

  b 9.9 cm^3

  c 630 cm^3

Unit 10 Answers

10.1 Sequences

1 a 9
  b ascending
  c infinite
2 a 4, add 2
  b 3, add 5
  c 20, subtract 3
  d 12, add 0.5
3 a yes
  b no
  c no
  d yes
4 a 3, 5, 7, 9, 11
  b 0, 10, 20, 30, 40
  c 20, 10, 0, −10, −20
  d 8, 5, 2, −1, −4
5 a 1st term 100, common difference 5
  b 1st term 7, common difference 3
  c 1st term 50, common difference −20
  d 1st term 20, common difference −9
6 a 1, 3, 5, 7, 9, 11, 13
  b day 16
7 a 40
  b 200
  c 400

10.2 The nth term

1 a 4, 8, 12, 16, 20
  b 80
2 10, 20, 30, 40, 50
3 a 6, 7, 8, 9
  b 25
  c 1st term 6, common difference 1
4 a $n + 4$
  b $n + 11$
5 a 7, 12, 17, 22, 27
  b 0, 2, 4, 6, 8
6 a $2n + 8$
  b $2n + 4$
  c $10n − 9$

10.3 Pattern sequences

1 a i

ii
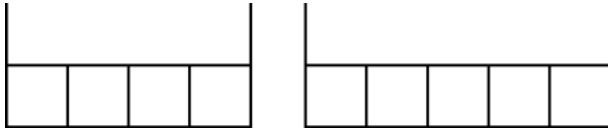
Term number	1	2	3	4	5
Number of lines	6	9	12	15	18

iii 1st term 6, rule 'add 3'

b i

ii
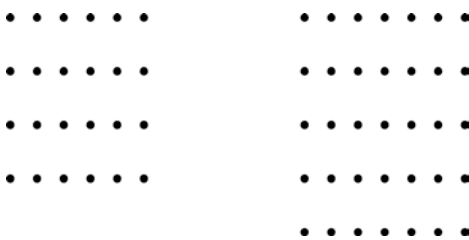
Term number	1	2	3	4	5
Number of dots	3	8	15	24	35

iii 1st term 3, rule 'add the next odd number each time'

2 5, 10, 20, 40, 80

3 a 1st term 1, rule ×2

b 1st term 32, rule ÷2

c 1st term 81, rule ÷3

d 1st term 0.02, rule '×10

4 a geometric

b arithmetic

c geometric

5 a 62.5, 31.25

b 256, 1024

c 0.5, 0.05

d 250, 1250

6 a 11, 14, 19

b 10, 40, 90

c 0.1, 0.4, 0.9

10.4 Coordinates and line segments

1 a 8 units

b A (3, 4), B (–5, 4), C (–5, –2), D (5, –2)

2 a
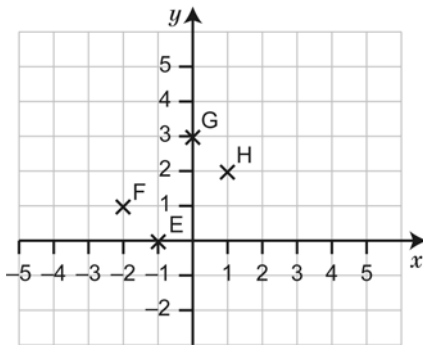
b rectangle

3 a (3.5, 5)

b (–1, 3)

c (5, 2.5)

d (2.5, –2)

4 a (–1, 4)

b (4, 2)

c (–5, 1.5)

5 a (–3, –2)

b (–0.5, –1.5)

c (2, 0.5)

d (2.5, 2.5)

10.5 Graphs

1 a any four of (–5, –4), (–5, –3), (–5, –2), (–5, –1), (–5, 0), (–5, 1), (–5, 2), (–5, 3), (–5, 4)

b The x-coordinates are all –5.

c $x = -5$

d i

ii

iii

iv
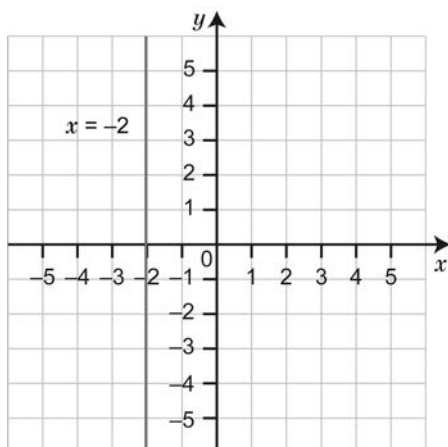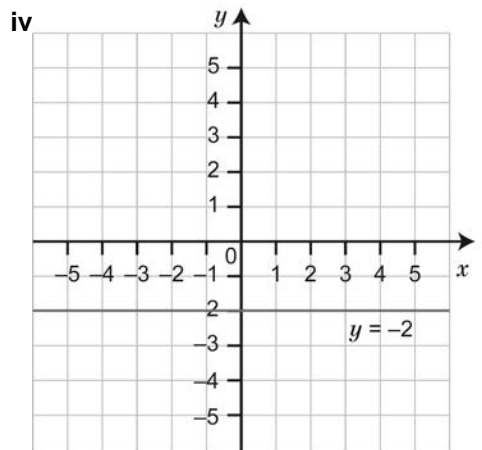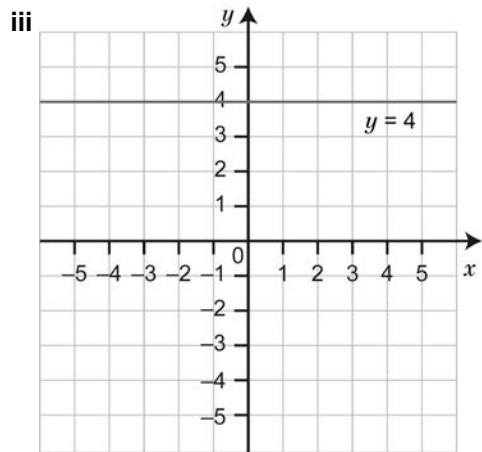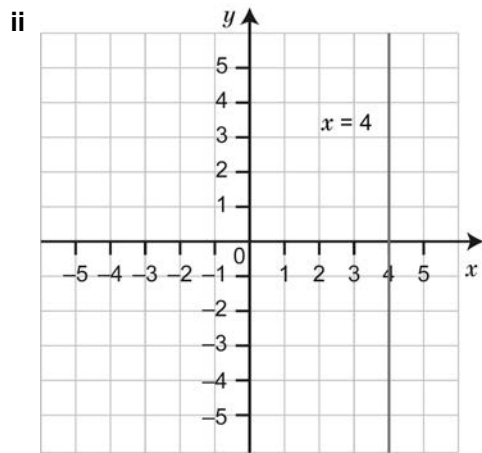
2 a points W, Y, Z

   b points V, X, Z

3 a

x	0	1	2	3	4
y	0	1	2	3	4

   b (0, 0), (1, 1), (2, 2), (3, 3), (4, 4)

c
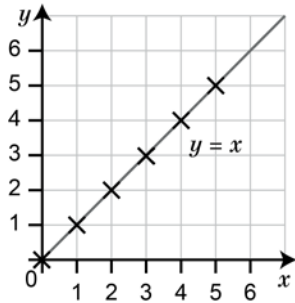
d

x	0	1	2	3	4
y	2	3	4	5	6

e (0, 2), (1, 3), (2, 4), (3, 5), (4, 6)

f
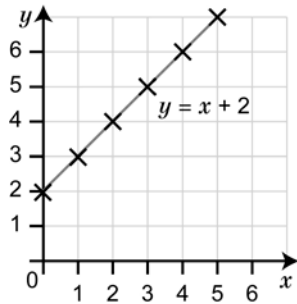
4 a

x	−2	−1	0	1	2
y	−2	0	2	4	6

b
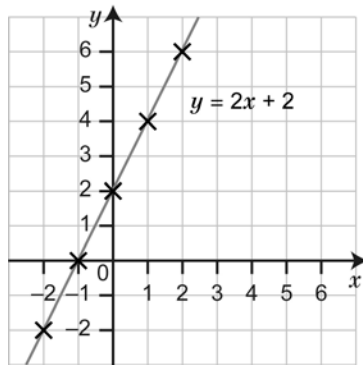
5 a, b
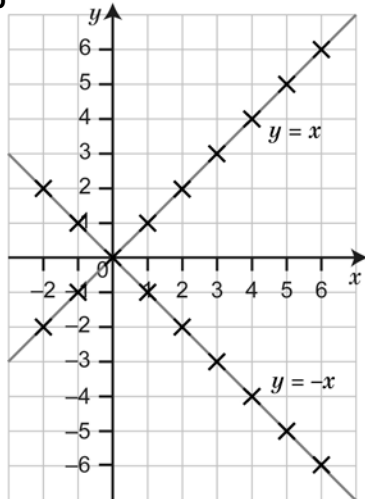
10 Strengthen

Sequences

1 a +3

  b 14, 17

2 a i 9, 5, 1

    ii 32, 37, 42

    iii 44, 53, 62

  b i descending

    ii ascending

    iii ascending

3 a
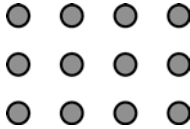
  b

Pattern number	1	2	3	4	5
Number of dots	3	6	9	12	15

  c 18 dots

4

Term number	1	2	3	4	5
Term	2	6	10	14	18

5 a 11, 15, 19

  b 12, 9, 6

6 a i $4n$

    ii 40

  b i $10n$

    ii 100

  c i $7n$

    ii 70

7 a 5

    b $n + 5$

 8 a $n + 12$

    b $n - 2$

 9 12, 13, 14, 15, 16

10 7, 9, 11, 13, 15

11 a $2n$

    b 3

    c $2n + 3$

12 $3n + 2$

13 a no

    b yes

    c no

    d yes

14 a i 81, 243

      ii ×3

    b i 1250, 6250

      ii ×5

    c i 24, 29

      ii +5

    d i 405, 1215

      ii ×3

    e i 12, 10

      ii −2

Graphs

15a
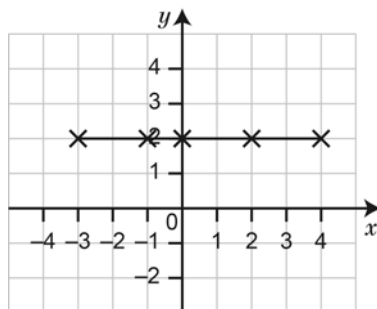
    b The y-coordinates are all 2.

    c $y = 2$, x-axis

16 a any four coordinate pairs with $y = -2$, e.g. (5, −2), (4, −2), (3, −2), (2, −2)

    b any four coordinate pairs with $x = 10$, e.g. (10, 5), (10, 4), (10, 3), (10, 1)

17 a

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

    b (0, 4), (1, 5), (2, 6), (3, 7), (4, 8), (5, 9)

18 a

x	0	1	2	3	4
y	0	4	8	12	16

b (0, 0), (1, 4), (2, 8), (3, 12), (4, 16)

19

x	0	1	2	3	4
y	−2	2	6	10	14

20 a
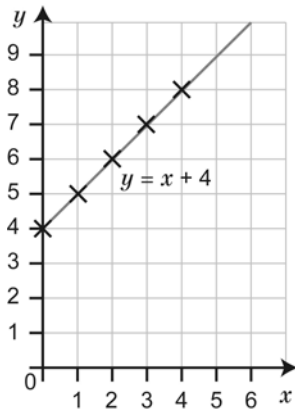
b
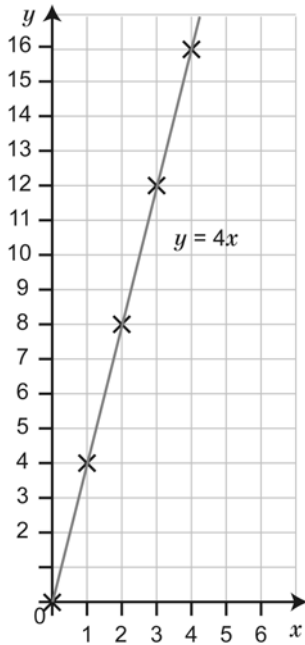
c
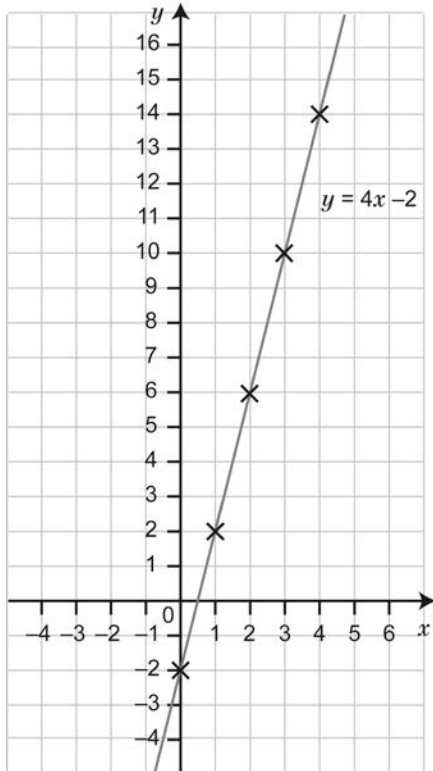
d
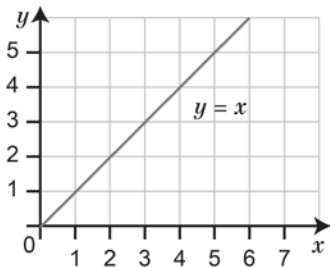
e
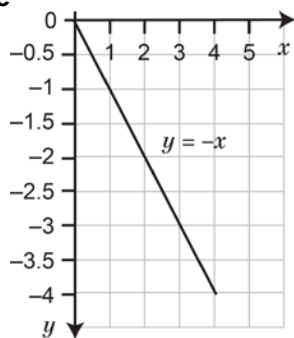
21a i 5

   ii 3

b (5, 3)

c i (6.5, 11.5)

   ii (4.5, 4.5)

10 Extend

1 a e.g. (–3, 5), (1, 5)

b e.g. (–3, –3), (1, –3)

2 a

x	–1	0	1	2	3
y	–4	–2	0	2	4

b

x	–2	0	2	4	6
y	12	10	8	6	4

c
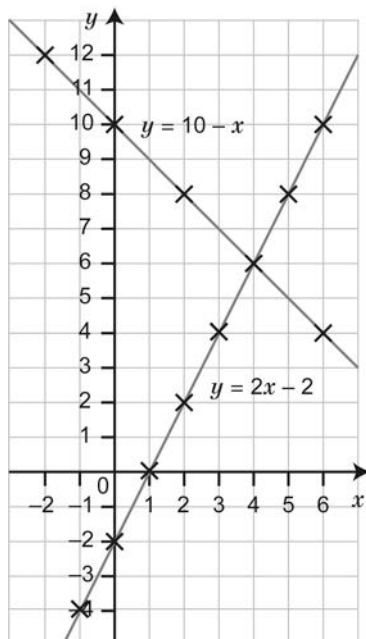
d (4, 6)

3 a 11 tables

b

Number of tables	1	2	3	4	5
Number of seats	5	8	11	14	17

c 32 people

d 3 seats

e No, because each additional table adds 4 seats and removes 1.

f $3n + 2$

g 10 tables

4 a $y = 5$

b $x = -4$

c $y = -x$

d No, because A is at (–4, 5) not (–4, 4).

5 a e.g. (0, –3)

b i (2.5, 1)

ii (4.5, 3)

6 a i Yes, because $7 - 2 = 5$, so $n = 1$.

   ii No, because no integer value of n produces 55.

   iii Yes, as in part **i**, but $n = 134$.

   iv No, because n would be negative.

  b 32

  c 402

7 a infinite

  b $n = 1, -8.5$

8 a 38, 51

  b 1, 2

  c 5, 7

  d $-3, 5$

9 a i 9, 13

   ii $4n - 3$

  b i 25, 125

   ii 1st term 1, rule ×5

10a 243

  b

1st term	2nd term	3rd term	4th term	5th term
3	3^2	3^3	3^4	3^5

  c 59 049

  d 3^n

10 Unit test

1 a
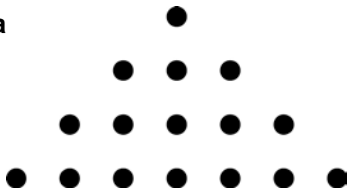
  b

Term number	1	3	3	4	5	6
Number of dots	1	4	9	16	25	26

2 32

3 5, 11, 17, 22

4 Geometric, because there is no common difference and each term is double the previous one.

5 a $11n$

  b $4n + 7$
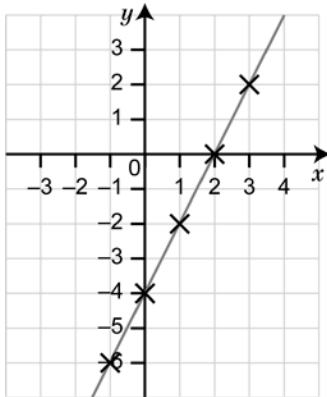
6 AB (2, 2), CD (−2, −1), EF (2, −4)

7 a −2, 0, 2

  b

x	−1	0	1	2	3

y	−6	−4	−2	0	2

c

8 graph B

9 a 10 000, 100 000

  b 10^n