

Unit 1 Analysing and displaying data

1.1 Averages and range

- 1 a 44 b 21
- 2 a 9 b 6
- 3 e.g. 1, 1, 2, 3, 3
- 4 Any five different numbers
- 5 Mode 15, range 5, median 15
- 6 Any value less than or equal to 150
- 7 Company A: Mode = 200, Median = 200, Mean = 202, Range = 15
Company B: Mode = 250, Median = 210, Mean = 206, Range = 130
Either, providing the student justifies it sensibly.
For example:
Company A because it is more reliable as it has a small range of speeds and the same mode and median.
or
Company B because its mode, median and mean internet speeds are faster than Company A's.

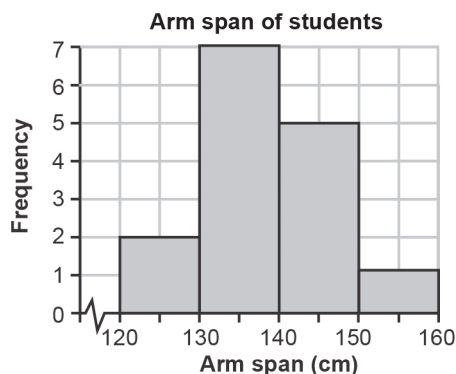
1.2 More averages and range

- 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
$120 \leq s < 130$	2
$130 \leq s < 140$	7
$140 \leq s < 150$	5
$150 \leq s < 160$	1

- b $130 \text{ cm} \leq s < 140 \text{ cm}$

- 4 a



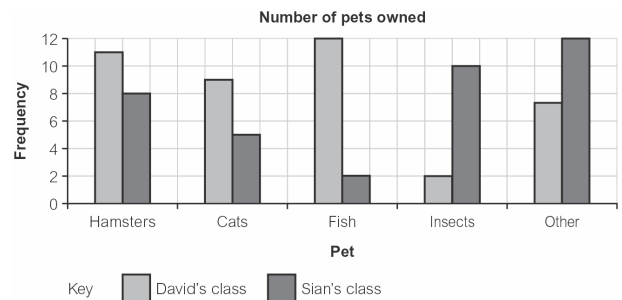
- b 6 students

1.3 Two-way tables and bar charts

- 1 a–d

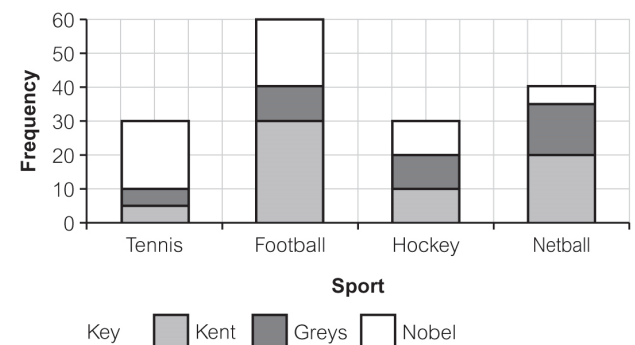
	mp3	mp4	Total
Mahoud	17	12	29
Fahid	34	8	42
Total	51	20	71

- 2 a



- b 8 hamsters c Fish d David's class

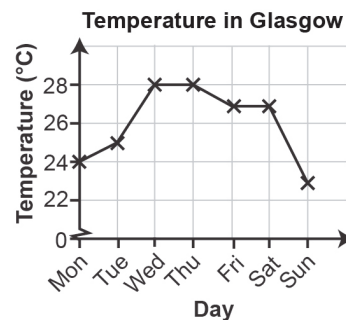
- 3



- b 40 girls
- c e.g. hockey; although fewer people chose it overall, all three schools have roughly equal numbers so they will be equally able to send teams.

1.4 More graphs and tables 1

- 1 a



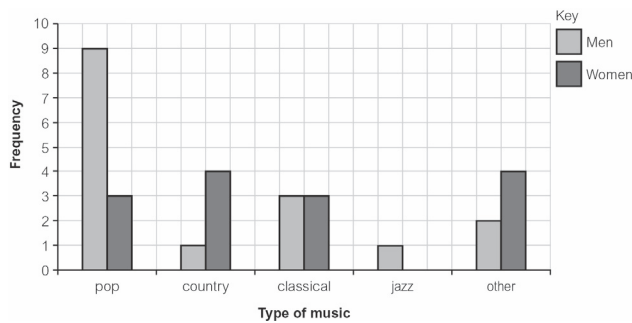
- b This data only covers one week; over the course of the next few months the season will change.

- 2 a 90°C b 5°C
 c e.g. 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 scale on the vertical axis does not go up by a constant amount.
 c The horizontal axis steps are not equal, i.e. there is no data for 2006 to 2012.

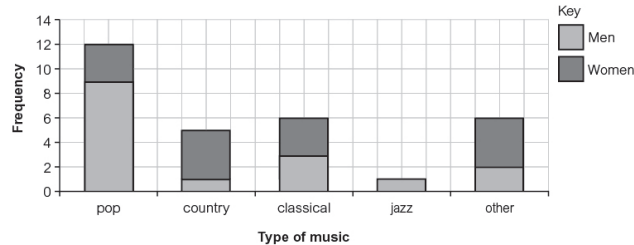
1.5 More graphs and tables 2

- 1 b iv 2 pets
 c ii =median(iii Enter, A13
 iv 2 pets
- 2 b Cell B9 has the largest data value, and cell B5 has the (joint) lowest.
 c B8
 d iv 2.22....

3 a, b



c



- d Compound because it is easy to identify the tallest bar.

1 Strengthen Averages and range

- 1 a i $6 - 0 = 6$ ii 2.8
 b i 1 ii 2.4
- 2 a 1, 5, 5, 7, 8, 9, 11 b 7 circled
 c 7 d 5

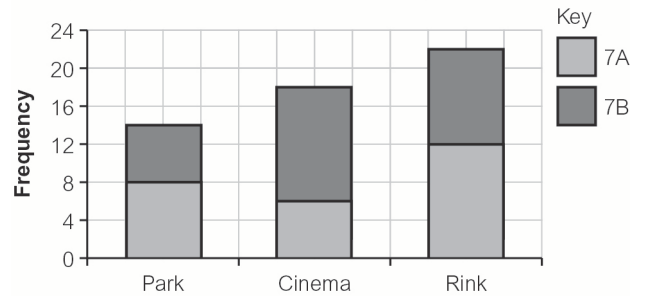
Charts and tables

3 a, b

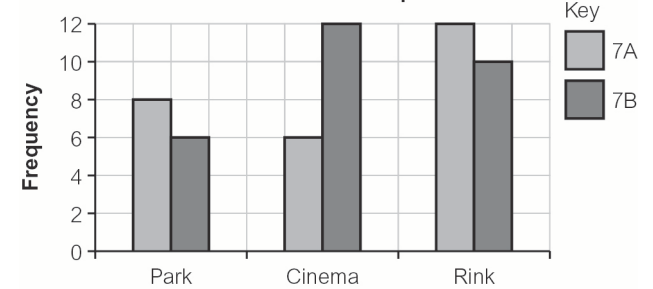
	7A	7B
Park	8	6
Cinema	6	12
Rink	12	10

c

Compound bar chart of students' preferences



Dual bar chart of students' preferences



d Rink

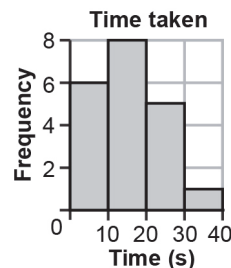
e Cinema

4 a, b

Time, t (s)	Tally	Frequency
$0 \leq t < 10$		6
$10 \leq t < 20$		8
$20 \leq t < 30$		5
$30 \leq t < 40$		1

c $10 \leq t < 20$ s

d



Line graphs and spreadsheets

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

6 a B4 (60 minutes)

b i 235 minutes

ii Total number of minutes

iii 47 minutes

iv Mean length of time spent playing sports

1 Extend

1 a Bryony

b 50%

c 40

d

	Unsure	No	Yes
Aaron	40	100	60
Bryony	4	1	5

2 a 18 000 people b 705 000 houses

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

3 a i 79 kg ii 20 kg

iii 80.7 kg (3 s.f.)

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 compared with those of the 100 m runners.

4 a

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

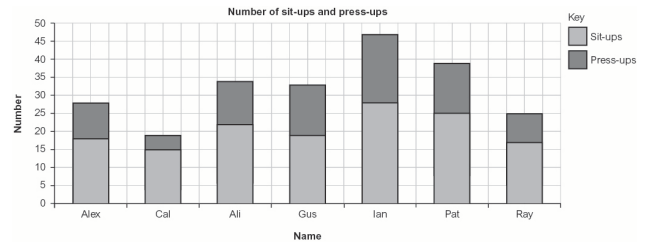
b 9 males

c The modal mass for females is $35 \leq m < 45$, whereas the modal mass for males is lighter, at $25 \leq m < 35$. You can only estimate the mean because the data is grouped.

5 a 30.8 g

b 160.8 g

6 a



b Ian

d i 20.6 (3 s.f.)

ii 10.9 (3 s.f.)

iii 31.4 (3 s.f.)

e $120 \leq s < 140$

f 140

1 Unit test

1 a 70 items

b 50 mugs

c 150 items

d 70 mugs

2 Mode = 7 bullseyes; Median = 8 bullseyes; Mean = 11.2 bullseyes; Range = 35

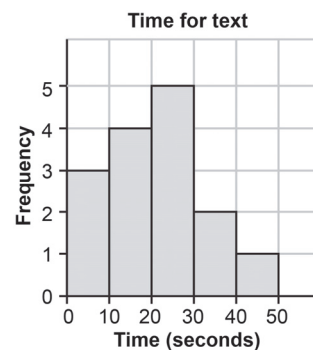
3 290.5 miles

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 $20 \leq t < 30$ s

c

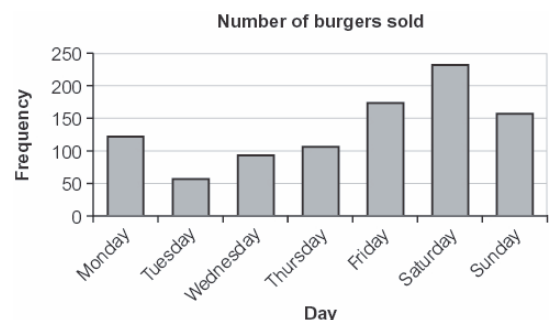


5 b i 134 (3 s.f.)

ii 123

iii 176

c



Unit 2 Number

2.1 Rules of divisibility

1 a-c

26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45

d They end in a zero (0).

- 2 a 32, 36 b 33, 36, 39
c 36
- 3 a Yes b Yes c Yes
d No e Yes
- 4 a Numbers divisible by 4 can also be divided by 2.
b Numbers divisible by 10 can also be divided by 5.
c Numbers divisible by 9 can also be divided by 3.

5 Yes, 6

2.2 Factors, multiples and primes

- 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 3 turns of the larger cog and 5 turns of the smaller cog.

2.3 Positive and negative numbers

- 1 -11, -7, -5, -1, 4, 11
- 2 a -2 b 4
c -9 d -6
- 3 -8 °C
- 4 a 2 b -2
c -4 d -6
- 5 a i 5, 4, 3, 2 ii 3, 4, 5, 6
b i 4 - 2 ii 4 + 2
c replace - + with -, replace - - with +
- 6 a 5 b 4
c -17 d 1

2.4 Squares and square roots

1 a

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

b i 3 ii 7 iii 12

- 2 8 cm; Tammy because you can't have a negative length.
- 3 a $\sqrt{361} = 19$
b $\sqrt{30.25} = 5.5$
c $4.9^2 = 24.01$
- 4 a i 5.3 ii 6.9; almost $\sqrt{49}$
iii 10.5; almost exactly half way 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.)
- 5 a 9 b 900
c 90 000 d 0.09
- 6 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 9
g 10 h 14
- 5 a 500 b 1000 c 3600
d 50 e 5
- 6 a 4.42 km (3 s.f.)
b 11.4 km (3 s.f.)
c 16.1 km (3 s.f.)

2.6 Calculations

- 1 a i 260 ii 1000
iii 43 iv 21
b i 268.6 ii 562
iii 46.8 (3 s.f.) iv 22.8 (3 s.f.)
- 2 a 100 b 36 c 81
d 6 e -64 f 12
- 3 a 35 b 1764 c 71
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 i 4, 10
ii All the numbers divisible by 2 end in 0, 2, 4, 6 or 8.
b i 10, 15
ii All the numbers divisible by 5 end in 0 or 5.
c i 10
ii All the numbers divisible by 10 end in 0.
- 2 a Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24
Common factors are 1, 2, 4, 8
b 8
- 3 9
- 4 a 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33
b 5, 10, 15, 20, 25, 30
c 15, 30
d 15
- 5 a 4 b 6 c 7
d 9 e 11 f 13
- 6 a 13 b 3
c -2 d -10
- 7 a About 6 b About 8
c About 19

Powers and roots

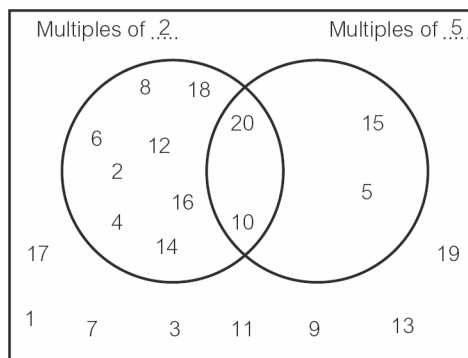
- 8 a 8 b 64
c $5^2 = 5 \times 5 = 25$
d $10^2 = 10 \times 10 = 100$
- 9 a $\sqrt{16}, \sqrt{25}, \sqrt{36}, \sqrt{49}, \sqrt{64}, \sqrt{81}, \sqrt{100}$
b i e.g. 3.7 ii e.g. 5.5
iii e.g. 9.2
- 10 a $3 \times 4 \times 4 = 3 \times 16 = 48$
b $\frac{9}{3} + 8 \times 8 = 3 + 64 = 67$
c $12 + 2 \times 2 \times 2 = 12 + 8 = 20$
d 10
- 11 32

Working with brackets

- 12 a $9, 9^2 = 81$ b 125 c 15
- 13 a 8 b 5
- 14 a 2 b 5 c 2
d 20 e 2

2 Extend

- 1 a They are all multiples of 6.
b



- 2 a i 10 ii 60 iii 180
b No, 4 is a multiple of 2 and 9 is a multiple of 3; 10 is a multiple of 5 and 2 but since you are already have a multiple of 2 you only need to work out:
 $4 \times 5 \times 9$
- 3 $5^2, 3^3, 11^2, 5^3$
- 4 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
- 5 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

- 6 30 seconds
- 7 6^2 is 36, so the square root of 40 must be larger than 6.
- 8 10 A
- 9 a 60 b 240
- 10 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

11 2

12 a

Car	A	B	C
Acceleration (m/s ²)	15	10	15
Time (seconds)	20	15	40
Distance (m)	3000	1125	12 000

- b No, since time is squared it has travelled 4 times as far.

2 Unit test

- 1 a 42 b 45 c 50
- 2 a 2 b Yes
- 3 a 21 b No
- 4 a 10 b 7
- 5 a 6 b -11 c 15
- 6 e.g. 4.2
- 7 a 128 b 2 c 30
- 8 18
- 9 a 3 b 2

Unit 3 Equations, functions and formulas

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 8 N/m^2
- 6 a 212°F b 32°F
c -148°F d -40°F

3.4 Writing formulae

- 1 a The number of minutes of talk time
b The number of GB of downloads
c £30
- 2 a £60 b £105
c $15d$ d $C = 15d$
- 3 $b = g + 5$
- 4 a $\frac{a+b+c+d}{4}$ b $m = \frac{a+b+c+d}{4}$
c 5
- 5 $T = \frac{p+q+r}{3}$
- 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 formulae

- 1 a $3y + 15$ b $7h - 14$
c $2d + 20$ d $5p - 25$
e $4 + 2k$ f $15 - 5a$
g $8 - 4c$ h $9 - 3n$
i $24 + 4t$ j $5x + 30$
- 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 x^2 b $x^2 + 10$
c $2x^2 + x + 10$ d £65

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 $b^2 + 9b$

Substitution

- 8 300 km
 9 a 10 b 3 c 12
 d 40 e 35 f 4
 10 32
 11 a 2 b 0

Writing expressions and formulae

- 12 $x + 5 \rightarrow 5$ more than x
 $x - 5 \rightarrow 5$ less than x
 $5 - x \rightarrow x$ less than 5
 $5x \rightarrow 5$ times x
 $\frac{x}{5} \rightarrow$ one fifth of x

- 13 a 5 more than a
 b r multiplied by 2
 c 4 less than x
 14 a b more than a
 b a multiplied by b
 c a less than b
 d a divided by b

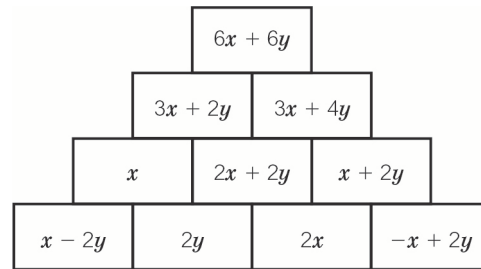
15 $I = \frac{4C}{10}$

- 16 a 3 b $+12, \div 9$
 c $y = \frac{x+12}{9}$

3 Extend

- 1 $6x$
 2 a 16 cm^2 b 96 cm^2
 c $A = e^2$ d $A = 6e^2$
 3 a £150 b £180
 4 $15y + 14$

5



- 6 e.g. You multiply your number by 10 (double then multiply by 5) having added 2. Taking away 10 leaves the original number times 10, which divided by 10 gives the original number, i.e.
 $5(2x + 2) = 10x + 10$, $10x + 10 - 10 = 10x$,
 $\frac{10x}{10} = x$

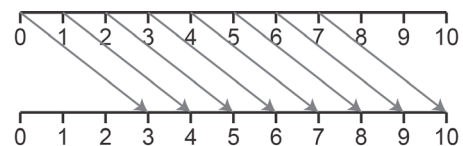
7 $8 - 2x$

- 8 a e.g. 12, x^2
 b e.g. 4 and $3x^2$, $3x$ and $4x$, 3 and $4x^2$, 6 and $2x^2$, $6x$ and $2x$, 2 and $6x^2$, 1 and $12x^2$

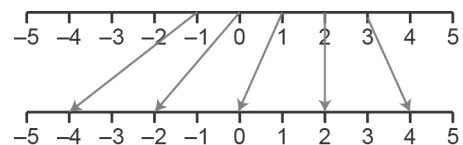
9 $6x, 4x$

10 a $5w^2$ b $12w$

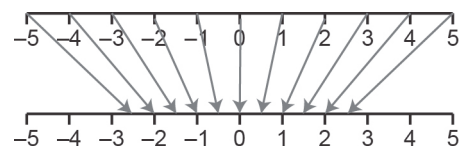
11 For all numbers



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 $x = 0, x = 3$
 b $x > 3$ or $x < 0$
 c $0 < x < 3$

3 Unit test

1 120 hours

2 39

3 4 325 000

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 9

b 13

c 18

d 21

e 5

Unit 4 Fractions

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/
d 60 m/ e £24

6 100 m/

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 $\frac{1}{7}$
d $\frac{2}{3}$ e $\frac{1}{2}$

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

4.3 Fractions, decimals and percentages

1

F	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{3}{10}$	$\frac{2}{5}$	$\frac{1}{2}$	$\frac{3}{5}$	$\frac{7}{10}$	$\frac{3}{4}$
D	0.1	0.2	0.25	0.3	0.4	0.5	0.6	0.7	0.75
P (%)	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 $\frac{22}{25}$, D $\frac{9}{10}$, E $\frac{4}{5}$
b Yes, because 38.0°C produces the highest fraction of successful hatchings.

6 a 0.002 b 0.04 c 0.004

4.4 Multiplying by a fraction

1 a 9 b 15
c 15 d 32

2 a 4 m² b $1\frac{3}{5}$ cm² c 7 m²

3 a $\frac{1}{10}$ b $\frac{6}{21} = \frac{2}{7}$
c $\frac{2}{9}$ d $\frac{9}{25}$

4 a $\frac{7}{18}$ m² b $\frac{1}{24}$ m²

5 $\frac{5}{8}$

4.5 Working with mixed numbers

1 a $4\frac{1}{5} = 4.2$ b $2\frac{3}{4} = 2.75$

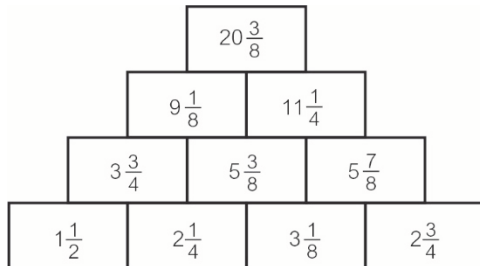
2 a $3 + \frac{3}{8} + \frac{4}{8} = 3\frac{7}{8}$ b $12\frac{8}{9}$
c $14\frac{1}{12}$

3 a $\frac{65}{10} - \frac{24}{10} = \frac{41}{10} = 4\frac{1}{10}$

b $1\frac{5}{6}$ c $4\frac{7}{9}$

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

5



6 a $\frac{27}{2} = 13\frac{1}{2}$

b $18\frac{2}{3}$ c $3\frac{3}{5}$

4 Strengthen Equivalence

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

2 $\frac{2}{7}$

3 a 48 birds b $\frac{3}{4}$

4 a $\frac{7}{8}$ b $\frac{1}{30}$

5 a 0.2, 20 % b $\times 7$, 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 $0.8\bar{3}$

Multiplying by a fraction

8 a 5 b $30 \div 6 = 5$
c $28 \div 7 = 4$

9 a 8
b i 16 ii 24 iii 32

10 a £15 b 15 kg

11 a 14 b 14

12 a 12 r 3, $12\frac{3}{4}$ m b 5, $9\frac{1}{5}$ g

13 a $\frac{6}{28} = \frac{3}{14}$ b $\frac{1}{4}$

Working with mixed numbers

14 a $\frac{7}{3}$ b $\frac{11}{2}$ c $\frac{33}{10}$

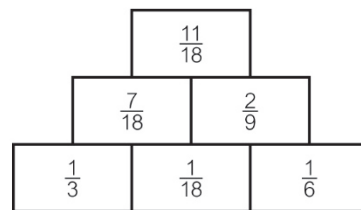
15 a $1\frac{3}{5}$ b 3 c $2\frac{3}{8}$

16 a $4\frac{1}{8}$ b $\frac{1}{2}$ c $11\frac{2}{3}$

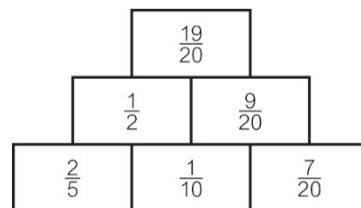
4 Extend

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

2 a



b



3 Protein 15 g, moisture 91 g.

4 a He has calculated 18 divided by 11.

b $0.6\bar{1} = 0.61$ (2 d.p.)

5 a $4\frac{5}{6}$ b $1\frac{1}{20}$

6 $\frac{1}{5}$

7 a 2 b 4 c 6

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

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

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

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

e Dividing by $\frac{1}{2}$ is the same as multiplying by 2.

8 12; dividing by $\frac{1}{3}$ is the same as multiplying by 3.

9 $14\frac{7}{10}$ cm

10 $2\frac{3}{4}$ and $2\frac{1}{4}$

11 $\frac{26}{45}$

4 Unit test

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

2 $\frac{3}{5}$

3 a 2 b 14 c 20

4 $\frac{1}{3}$ of £69 (£23), $\frac{2}{5}$ of £60 (£24), $\frac{5}{6}$ of £30 (£25)

5 a $\frac{2}{3}$ b $\frac{2}{5}$

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

7 $\frac{38}{7}$

8 15

9

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%

10 a $6\frac{1}{3}$ b $\frac{4}{9}$

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

12 $\frac{2}{3}$

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

Unit 5 Angles and shapes

5.1 Working with angles

- 1 a Students' own estimates
b i 35° ii 145°
- 2 a 30° angle drawn accurately.
b 220° angle drawn accurately.
- 3 $a = 30^\circ$ (vertically opposite angles are equal)
 $b = 150^\circ$ (angles on a straight line add up to 180°)
 $c = 150^\circ$ (vertically opposite angles are equal)
- 4 $d = 60^\circ$ (angles on a straight line add up to 180°)
 $e = 50^\circ$ (vertically opposite angles are equal)
 $f = 130^\circ$ (angles on a straight line add up to 180°)
 $g = 50^\circ$ (angles in a right angle add up to 90°)
 $h = 40^\circ$ (vertically opposite angles are equal)
 $i = 140^\circ$ (angles on a straight line add up to 180°)

5.2 Triangles

1

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

- 2 60° (angles in a triangle add up to 180°)
- 3 a 45° (angles in a triangle add up to 180° and base angles in an isosceles triangle are equal)
b 70° (angles in a triangle add up to 180° and base angles in an isosceles triangle are equal)
- 4 $a = 80^\circ$ (angles on a straight line add up to 180° and angles in a triangle add up to 180°)
 $b = 35^\circ$ (angles in a triangle add up to 180°)
 $c = 145^\circ$ (angles on a straight line add up to 180°)
 $d = 70^\circ$ (angles in a triangle add up to 180° and angles at the base of an isosceles triangle are equal)
 $e = 110^\circ$ (angles on a straight line add up to 180°)
- 5 $x = 60^\circ$ (angles in a triangle add up to 180° and angles in an equilateral triangle are equal)
 $y = 120^\circ$ (angles on a straight line add up to 180°)

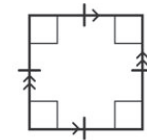
- 6 $e + x = 180^\circ$ because they lie on a straight line.
 $x + y + z = 180^\circ$ because angles in a triangle sum to 180° .
This proves that $e = y + z$

5.3 Quadrilaterals

1

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

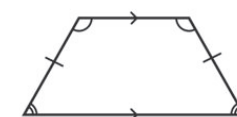
2 a



c



e



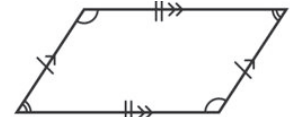
g



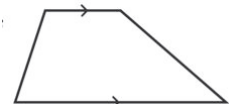
b



d



f



- 3 a $e = 90^\circ, f = 9^\circ$
b $q = 50^\circ, r = 130^\circ, s = 50^\circ, p = 5^\circ$
c $x = 105^\circ, y = 130^\circ, w = 7^\circ$
d $a = 50^\circ, b = 130^\circ, d = 50^\circ, c = 5^\circ$
- 4 130° (angles in a quadrilateral sum to 360°)

5.4 Construction

- 1 a Triangle XYZ drawn accurately.
b Triangle XYZ drawn accurately.
- 2 a Scale diagram drawn accurately.
b 67° c 6 cm d 6 m
- 3 Students' accurate scale drawings; 19.5 m.

5 Strengthen

Working with angles

- 1 No, the angle is acute (less than 90°).
- 2 a 70° b 40°
- 3 a 360° b 150°
- 4 angle $x = 40^\circ$ Vertically opposite angles are equal.
angle $y = 180^\circ - 40^\circ = 140^\circ$ Angles on a straight line add up to 180°

Triangles and quadrilaterals

- 5 a 20° (angles in a triangle sum to 180°)
b 120° (angles in a triangle sum to 180°)
- 6 a 110° b 130°
- 7 a $a = 50^\circ$ (base angles of an isosceles triangle are equal)
 $b = 80^\circ$ (angles in a triangle sum to 180°)
b $e = 70^\circ$ (base angles of an isosceles triangle are equal and angles in a triangle sum to 180°)
- 8 a h
b 30° (angles in a triangle sum to 180°)
c 150° (angles on a straight line sum to 180°)
- 9 Kite, arrowhead and isosceles trapezium
- 10 $a = 40^\circ$ (angles on a straight line add up to 180°)
 $b = 140^\circ$ (the sum of the interior angles of a quadrilateral is 360°)

Accurate drawings

- 11 a, b, c Students' own accurate scale drawings
- 12 a, b Students' own accurate scale drawings
- 13 a i 4 cm ii 6.5 cm
b Students' own accurate scale drawings
c 5.6 cm (accept 5.5–5.7 cm)
d 56 cm (accept 55–57 cm)

5 Extend

- 1 a $a = 30^\circ$ (angles on a straight line add up to 180°)
 $b = 60^\circ$ (angles on a straight line add up to 180° or angles at a point add up to 360°)
b $c = 20^\circ$ (vertically opposite angles are equal)
c $d = 30^\circ$ (vertically opposite angles are equal)
 $e = 70^\circ$ (vertically opposite angles are equal)
 $f = 80^\circ$ (angles on a straight line add up to 180°)
- 2 Triangle ABC accurately drawn.
- 3 $a = 60^\circ$, $b = 120^\circ$, $c = 30^\circ$
- 4 a 45° b 80° c 260° d 140°
- 5 $p = 70^\circ$, $q = 120^\circ$, $r = 30^\circ$, $s = 140^\circ$; sum = 360°
- 6 a Triangle drawn accurately.
b 14° to 19° (16.7°)
- 7 130° Triangle PSQ is equilateral, angles in a triangle sum to 180° and angles in an equilateral triangle are equal; hence angle PQS = 60° .
Triangle QRS is isosceles, angles in a triangle sum to 180° and base angles in an isosceles triangle are equal; hence angle RQS = 70° .
 $a = \text{angle PQS} + \text{angle RQS} = 60^\circ + 70^\circ = 130^\circ$
- 8 Square, kite and rhombus

5 Unit test

- 1 $a = 90^\circ$ (angles on a straight line add up to 180°)
 $b = 50^\circ$ (vertically opposite angles are equal)
- 2 25°
- 3 No, the angles do not add to 180° .
- 4 $a = 70^\circ$, $b = 110^\circ$
- 5 Students' own accurate drawings
- 6 $b = 100^\circ$
- 7 $a = 50^\circ$, $b = 130^\circ$, $c = 20^\circ$, $d = 60^\circ$
- 8 Students' scale diagrams drawn accurately.
Height = 5.6 m

Unit 6 Decimals and percentages

6.1 Place value and rounding

1

	H	T	O	H	T	O			
Billions	Millions			Thousands			Hundreds	Tens	Ones
			3	2	6	0	0	0	0
		1	4	0	7	5	8	0	0
2	1	3	0	4	7	3	0	0	0
3	2	0	0	5	1	0	6	0	0

6.6 Decimals, fractions 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	20	20	10	75	80	190	25

2 a 22% b 3% c 404%

3 a 0.17 b 3.45 c 0.038

4 a $\frac{2}{5}$ b $\frac{11}{25}$ c $1\frac{7}{20}$

5 6.75%, 0.608, 0.65, 66%, $\frac{2}{3}$

6 a $\frac{17}{100}$ b $\frac{1}{50}$ c $\frac{17}{20}$

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

8 a i 72% ii 80% iii 60%
b ICT

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

6.7 Calculating percentages

1 a $40 \div 10 = 4$ g b 45 m

c £6, $20\% = £6 \times 2 = £12$

d 27 t e £7.50

2 a $18 \div 2 = 9$ kg b £3.50

c 75 m d 1.5 litres

3 a $£80 \div 4 = £20$, $£20 \times 3 = £60$

b £225

4 a $10\% \rightarrow 30 \div 10 = 3$ m/, $5\% \rightarrow 3 \div 2 = 1.5$ m/,
 $15\% = 10\% + 5\% = 3 + 1.5 = 4.5$ m/

b 21 g

5 a 2.6 b 26 c 109.2

6 £38.25

7 486 g

6 Strengthen

Place value, ordering decimals and rounding

1 a 8.3, 8.4, 9.2, 9.5

b 0.006, 0.055, 0.06, 0.55, 0.606

2 a Thirty million b Three hundred million

c Three billion

3 a 5.8 b 15.7

c 9.0 d 23.5

Adding and subtracting 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

Multiplying and dividing 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

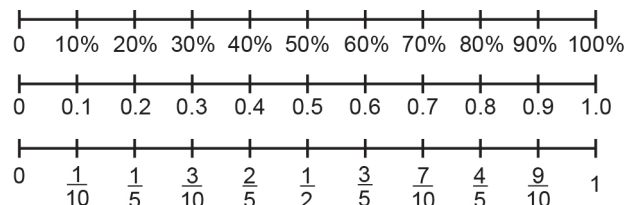
10 a 45 b 42

c 96.6 d 86.4

11 a 14.1 b 7.23

Decimals, fractions and percentages

12



13 1.2

14 a 6 g b £0.50 or 50p

15 a 8 t b \$640

c 100 m/ d 49 kg

16 78%, 0.786, $\frac{4}{5}$, 0.82, 84%, $\frac{17}{20}$

6 Extend

1 a $40 + 35 + 15 + 30 = 120$

b $\frac{30}{120} = \frac{1}{4}$

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 0.9 b 5.2 c 3.4

7 a £110 b £198 c £1122

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 140

b 1400

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 $\frac{4}{5}$ b 80%

5 a 11.514 b 11 514 c 30.3

6 1.08, 1.083, 1.183, 1.38, 1.8

7 12.6

8 a 3.2 b 2.1 c 7

9 a £1360 b £1410

10 30

11 $-8.23 > -8.32$

Unit 7 Ratio and proportion

7.1 Writing ratios

- 1 14 buckets
- 2 **b** and **c** ticked
- 3 **a** 2 : 1 **b** 100 m/ **c** 150 m/
- 4 **a** 1 : 2 **b** 10 : 1 **c** 3 : 7
- 5 Yes, because $20 \text{ m/} \times 50 = 1000 \text{ m/}$
- 6 **a** 1 : 2 : 4 **b** 2 : 4 : 3 **c** 2 : 4 : 25
- 7 **a** 50 : 7 **b** 24 : 5 **c** 3 : 4
- 8 **a** 6 : 7 **b** 3 : 4 **c** 10 : 3

7.2 Sharing in a given ratio

- 1 **a** £8 : £32 **b** £9 : £12
c \$24 : \$64 **d** \$70 : \$30
- 2 Akram receives \$60 and Zainab receives \$90
- 3 They both have 20 kg of body fat.

7.3 Proportion

- 1 **a** 3 : 2
b **i** $\frac{3}{5}$ **ii** 60%
- 2 **a** $\frac{11}{25}$, 44% **b** $\frac{11}{50}$, 22%
- 3 Player A: 29 : 1; Player B: 28 : 1
 So Player A had the better ratio.
- 4 Gill's green; $\frac{3}{5}$ is greater than $\frac{7}{10}$.
- 5 13 : 5 : 2
- 6 3 : 2

7.4 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 but has enough cement and waterproofer.
- 4 **a** 3 hours **b** 24 hours
- 5 **a** **i** 50 minutes **ii** 200 minutes
iii 60 minutes
b 50 mph

7.5 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 Ali's car
- 6 **a** **i** \$0.50 **ii** \$0.47 **iii** \$0.45
b The large multipack because each can costs the least.

7 Strengthen Ratio

- 1 3 : 2
- 2 **a** 1 : 3 **b** 1 : 3
c Because $\frac{1}{3} = \frac{2}{6}$
- 3 **a** 1 : 5 **b** 1 : 11
- 4 **a** 1 : 3 **b** 1 : 3
c 1 : 2 **d** 1 : 4
e 2 : 3 **f** 1 : 3
- 5 **a** £10 : £30 **b** £28 : £7
c £24 : £32
- 6 200 g

Direct and inverse proportion

- 7 **a** 10 animals **b** $\frac{4}{10}$
c $\frac{2}{5}$ **d** 60%
- 8 **a** 10% **b** 60% **c** Ben
- 9 **a** £5 **b** £25 **c** £55
- 10 **a** 24p **b** 25p **c** Shop A
- 11 **a** Red 10 km : 1 litre, blue 12 km : 1 litre
b Red 0.1 litres : 1 km, blue 0.08 $\bar{3}$ litres : 1 km
c The blue car
- 12 **a** 6 hours **b** 4 hours
- 13 **a** 8 hours **b** 2 hours
c 40 hours

7 Extend

- 1 3 : 4
- 2 $\frac{3}{5}$, 60%
- 3 **a** Team A 30%, team B 33. $\bar{3}$ %
b Team B
- 4 **a** 9 : 1
b It contains 111.1 g tin, so the total weight is 211 g (3 s.f.).

- 5 a** 3 : 1
b Neal 60 kg, Zander 20 kg
- 6** 30 carrots
- 7 a** 2 : 1 : 2 **b** 150 people
- 8 a** 48.3p (1 d.p.), 47.5p
b The 10-pack
- 9** 3 : 1 : 2
- 10** 3 : 1
- 11 a** 3 : 17 **b** £51
- 12** Car A 1 : 800, car B 1 : 124
- 13 a** 120 hours **b** 12 artists

7 Unit test

- 1** 3 : 4
- 2** £12 : £18
- 3 a** 3 : 4 : 6 **b** 12 : 5 **c** 5 : 1
- 4** 25
- 5 a** $\frac{1}{5} : \frac{4}{5}$ **b** 20% : 80%
- 6** £7.50
- 7** Offer 2
- 8** 2 : 3
- 9** 1 : 2
- 10 a** 65% **b** 260
- 11 a i** 16 hours **ii** 4 hours
b 32 students

Unit 8 Measures and shapes

8.1 STEM: Metric measures

- 1 a 30 b 4 c 70 d 8000
- 2 a 3500 b 0.45 c 5.5 d 65
- 3 a 13 cm b 1.15 m
c No, because the increase in height seems to be less each year.
- 4 a 3000 g b 4 litres
- 5 a 200 cm, 2.5 m, 3000 mm, 3.5 m
b 2.75 m c 2000 mm or 200 cm or 2 m
- 6 5 g

8.2 Perimeter

- 1 a 24 cm b 24 cm
- 2 a 6.8 cm b 22.12 m
- 3 80 cm
- 4 32 cm
- 5 10 cm
- 6 22 m

8.3 Area

- 1 a 8 cm^2 b 9 cm^2
- 2 a 12.96 cm^2 b 95.58 m^2
- 3 a 38 m^2 b 18 m^2
- 4 a 6 cm b 2 cm c 4 cm
- 5 28 cm

8.4 3D solids

- 1 a Faces: 6, edges: 12, vertices: 8
b Faces: 5, edges: 9, vertices: 6
- 2 a 3 b 5 c 7
- 3 Octagonal prism
- 4 Cube
- 5 a Faces: 5, edges: 9, vertices: 6
b 2

8 Strengthen Metric measures

- 1 a 4000 b 800
c 10; 50 d 1000, 6000
- 2 a 220 b 8.75
c 0.8 d 500
- 3 a 50 cm, 32 cm, 120 cm, 45 cm, 78 cm
b 65 cm

Perimeter and area

- 4 24 cm
- 5 a Perimeter: 20 m, area: 25 m^2
b Perimeter: 20 cm, area: 21 cm^2
- 6 a 32 cm b 43 cm^2
- 7 36 cm^2
- 8 a 300 cm b 75 cm

3D solids

- 9 Faces: 6, edges: 12, vertices: 8
- 10 4

8 Extend

- 1 a 50 cm^2 b 50 cm^2 ($80 - 30 = 50 \text{ cm}^2$)
- 2 38 cm
- 3 a 6 cm b 2 cm
- 4 6.1 cm
- 5 64 cm^2
- 6 A triangular-based pyramid or square-based pyramid (any based pyramid would work where the base is a polygon).
- 7 a 2 b 3
- 8 3 cm
- 9 a 24 cm^2 b 100 mm
- 10 a Perimeter: $16 + 2x \text{ cm}$, area: $8x \text{ cm}^2$
b Perimeter: $18 + 2x \text{ cm}$, area: $20 + 2x \text{ cm}^2$

8 Unit test

- 1 30 cm
- 2 a i 26 cm ii 30 cm^2
b i 80 cm ii 400 cm^2
- 3 a 300 cm b 2 litres
c 4000 g d 25 cm
e 500 ml f 0.35 km
- 4 100 cm^2
- 5 Edges: 8, faces: 5, vertices: 5
- 6 Perimeter: 36.8 cm, area: 46.9 cm^2
- 7 5

Unit 9 Sequences and graphs

9.1 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

9.2 The n th 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 $10n - 9$ | |

9.3 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

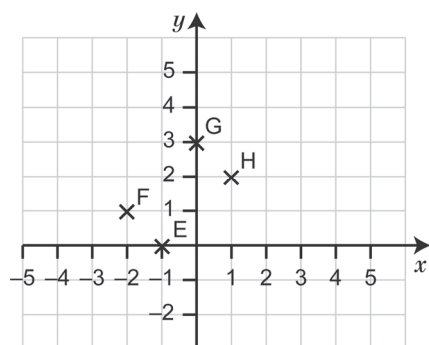
- iii 1st term 3, rule 'add the next odd number each time'

- 2** 5, 10, 20, 40, 80
- 3** **a** 1st term 1, rule $\times 2$
b 1st term 32, rule $\div 2$
c 1st term 81, rule $\div 3$
d 1st term 0.02, rule $\times 10$
- 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

9.4 Coordinates and line segments

- 1 a 8 units
b A (3, 4), B (-5, 4), C (-5, -2), D (5, -2)

2 a



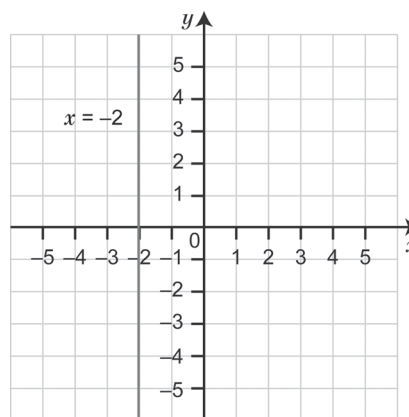
b Rectangle

- 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)

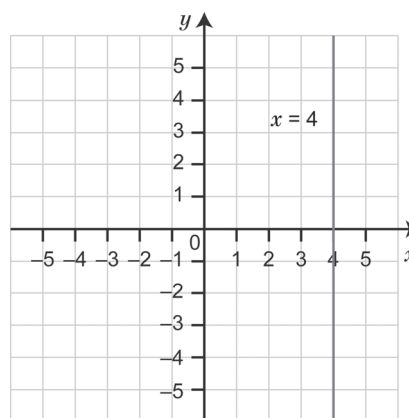
9.5 Graphs

- 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 $x = -5$

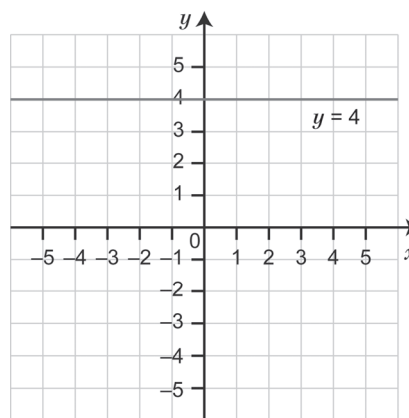
d i



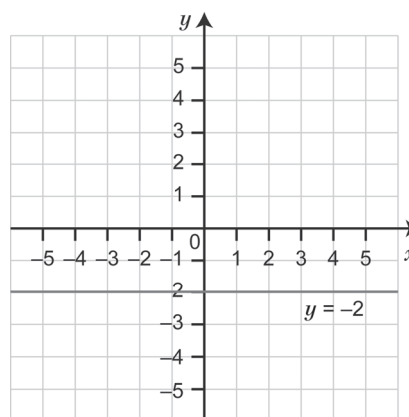
ii



iii



iv



2 a Points W, Y, Z

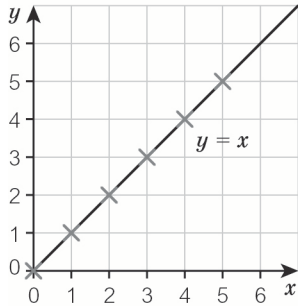
b Points V, X, Z

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

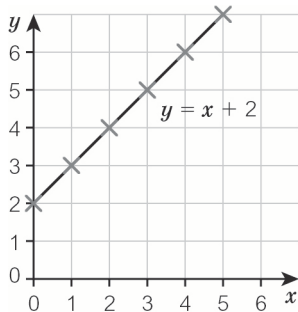


d

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

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

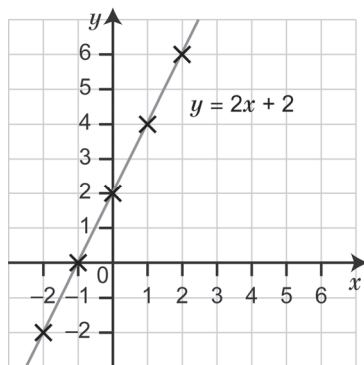
f



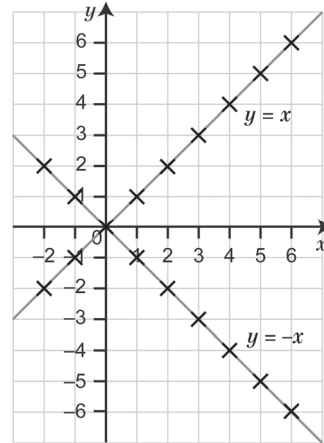
4 a

x	-2	-1	0	1	2
y	-2	0	2	4	6

b



5 a, b

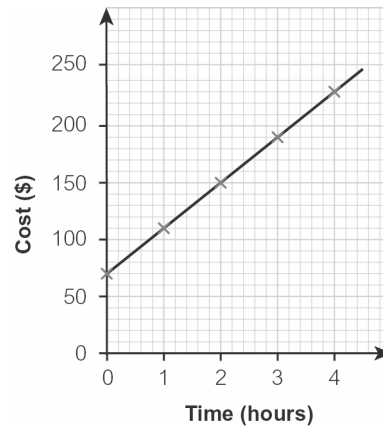


9.6 Working with graphs

1 a

Time (hours)	0	1	2	3	4
Cost (\$)	70	110	150	190	230

b

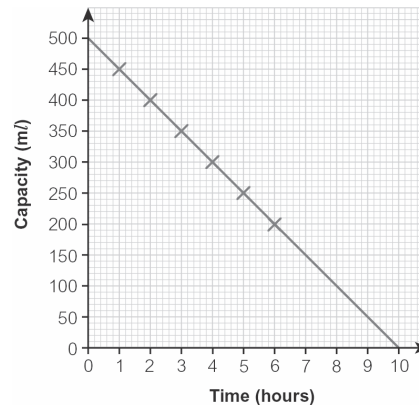


c \$130

2 a

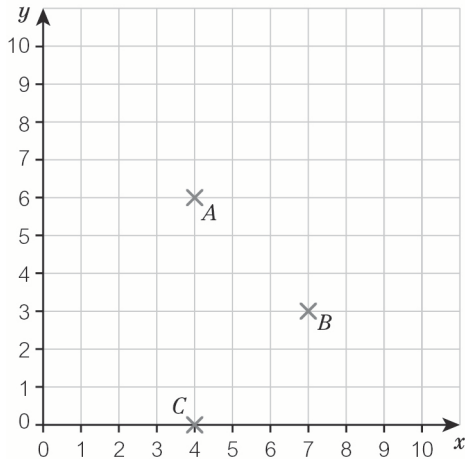
Time (hours)	0	1	2	3	4	5	6
Vol. of water in the bottle (ml)	500	450	400	350	300	250	200

b, c



d 10 hours

3 a

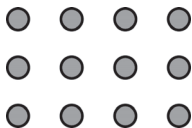


- b i D (1, 3)
 ii E (0, 3), or E (2, 3) or E (3, 3)
 iii F (5, 3) or F (6, 3) (Also (8, 3), etc.)
 iv G (3, 5) or G (2, 4) or G (0, 2)
 c There is no way of making four right angles unless the fourth vertex is at (1, 3), which makes a square.

9 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 7, 9, 11, 13, 15

10 a No

b Yes

c No

d Yes

11 a i 81, 243

ii $\times 3$

b i 1250, 6250

ii $\times 5$

c i 24, 29

ii $+5$

d i 405, 1215

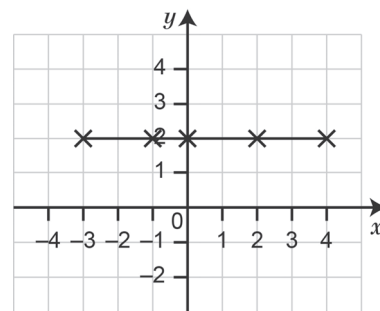
ii $\times 3$

e i 12, 10

ii -2

Coordinates

12 a



b The y -coordinates are all 2.

c $y = 2$, x -axis

13 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)

14 a

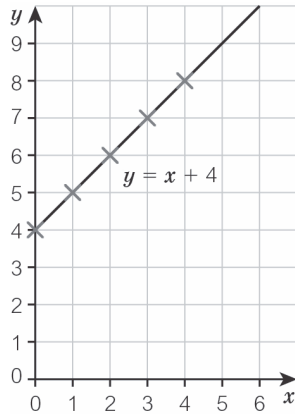
x	0	1	2	3	4
y	0	4	8	12	16

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

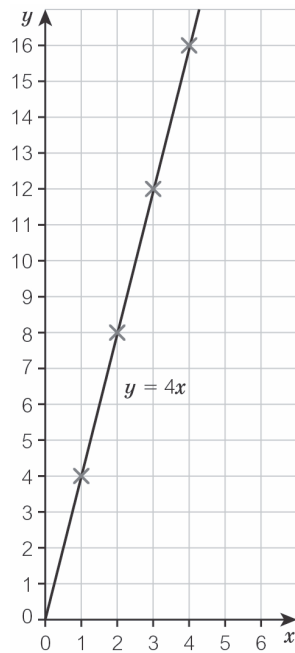
15

x	0	1	2	3	4
y	-2	2	6	10	14

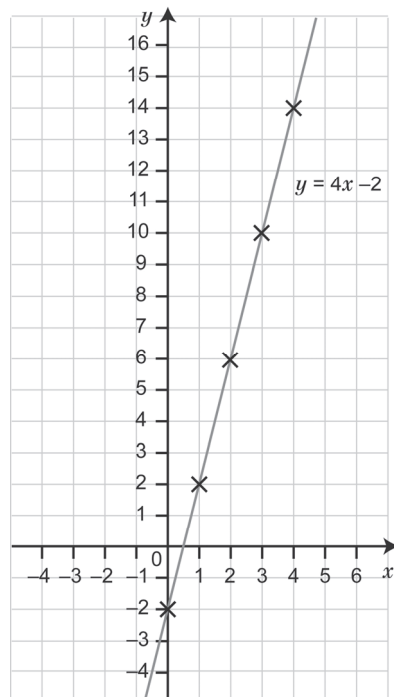
16 a



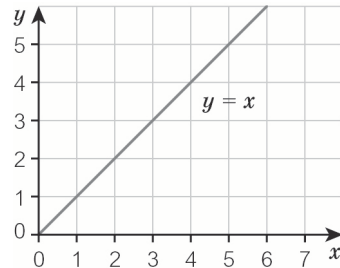
b



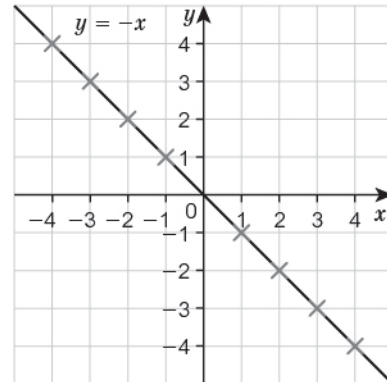
c



d



e



17 a i 5 ii 3

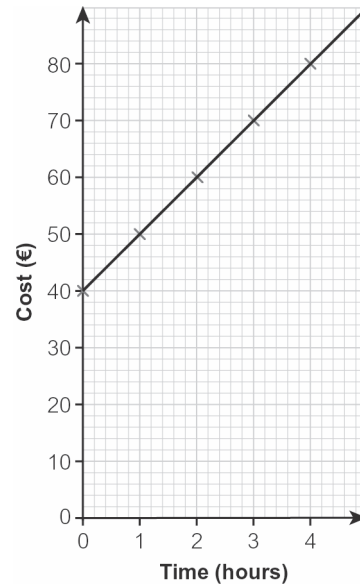
b (5, 3)

c i (6.5, 11.5) ii (4.5, 4.5)

18 a

Time (hours)	0	1	2	3	4
Cost (€)	40	50	60	70	80

b



c €75

19 a i arrowhead ii parallelogram

iii ACFD

b (2, 7) and (6, 7) or (2, -1) and (6, -1)

9 Extend

- 1 a $(-3, 5), (1, 5)$
b $(-3, -3), (1, -3)$

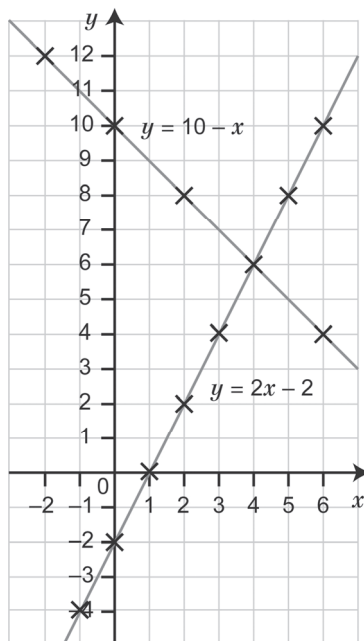
2 a

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 people

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 $(2, 5)$
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, $n = (672 - 2) \div 5 = 134$.
iv No, because n would be negative.

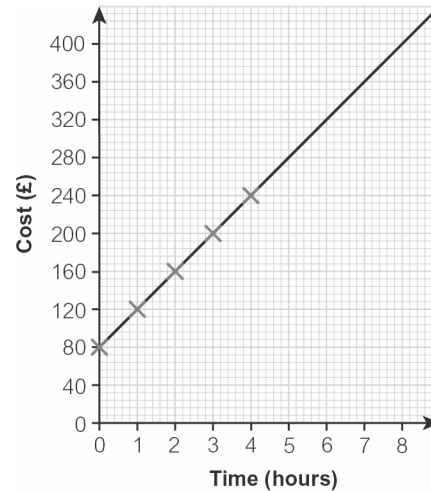
b 32 c 402

- 7 a Infinite b $n = 1, -8.5$

- 8 a i 9, 13 ii $4n - 3$
b i 25, 125 ii 1st term 1, rule $\times 5$

- 9 a £80 b £40 per hour

c



- d 5.5 hours
e i £200
ii The new rate because he gets £300, whereas with the old rate he gets £200.

9 Unit test

1 a



b

Term number	1	2	3	4	5	6
Number of dots	1	4	9	16	25	36

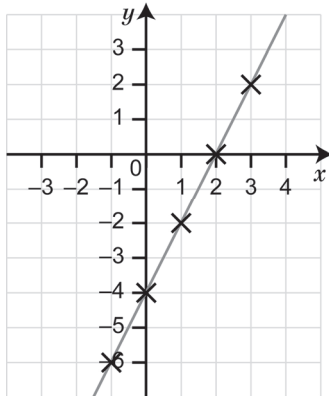
- 2 32
3 Geometric, because there is no common difference and each term is double the previous one.
4 a $11n$
b $4n + 7$
5 AB $(2, 2)$, CD $(-2, -1)$, EF $(2, -4)$

6 a -2, 0, 2

b

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

c



7 a A (4,0), B (4,4), C (0,4) and D (0,0)

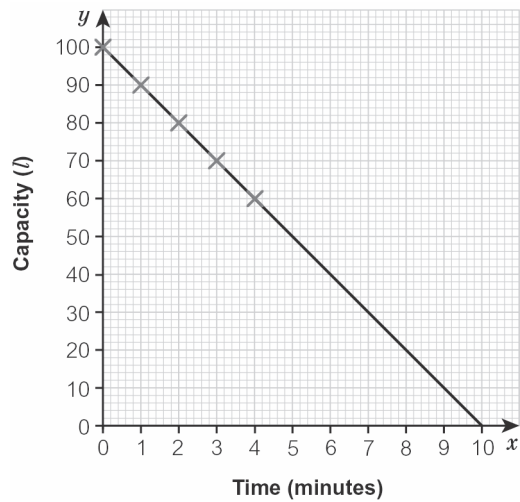
b C (3,2)

c Rectangle

8 a

Time (minutes)	0	1	2	3	4
Volume of water in the bath (litres)	100	90	80	70	60

b



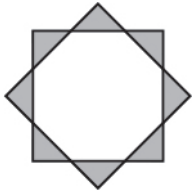
c 40 litres

d 10 minutes

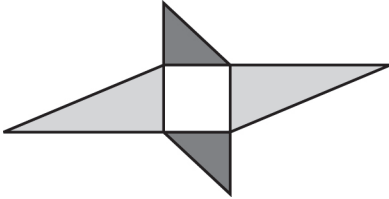
Unit 10 Transformations

10.1 Congruency and enlargements

1 a



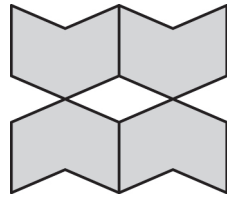
b



c

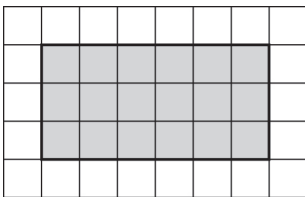


d

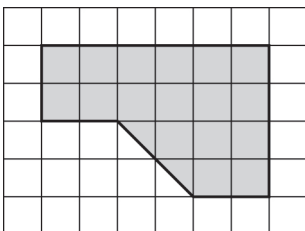


- 2 a Length y is the same as length v .
 b Length z is the same as length w .
 c Angle A is the same size as angle D.
 d Angle B is the same size as angle F.

3 a



b

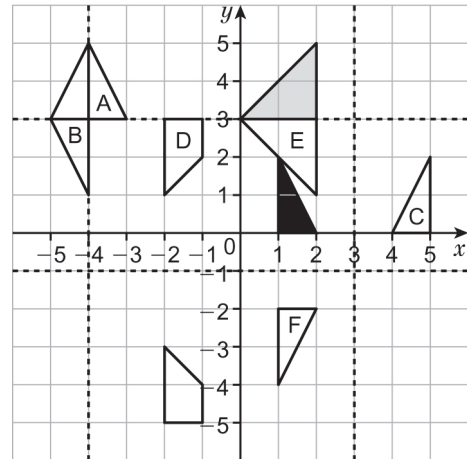


- 4 a i 1 : 2 ii 2
 b i 1 : 3 ii 3

10.2 Reflection

- 1 a No, the reflection should be upside down.
 b Yes
 c No, it's not a mirror image.

2



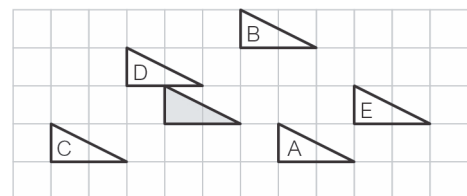
- 3 Yes; student's own explanation
 4 a $y = -1$ b $x = 1$
 c $x = -1$ d $x = 0$ or the y -axis
 e $y = -x$

10.3 Rotation

- 1 a 180° b 90° clockwise
 c 90° anticlockwise
 2 a (0, 1), (-2, 1), (-2, 0)
 b (3, 0), (3, 2), (2, 2)
 c (1, -2), (1, -4), (2, -4)
 3 Rotation clockwise through 90° about (2, 1)
 4 a 90° rotation anticlockwise about (-1, -1)
 b 180° rotation about (-1, 1)
 c 180° rotation about (2, 1)
 d 90° rotation clockwise about (4, 1)

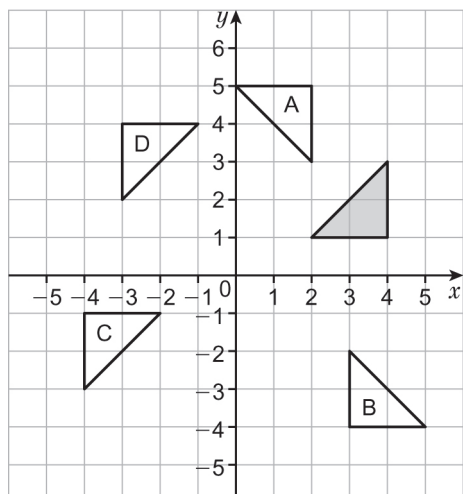
10.4 Translations and combinations of transformations

1



- 2 a 3 squares right, 1 square up
 b 3 squares left, 2 squares up
 c 8 squares left, 1 square down

3

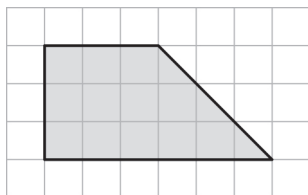


- 4 a True
b False; e.g. the triangles are not equilateral.
c True

10 Strengthen Congruency and enlargements

1 Pairs A and C

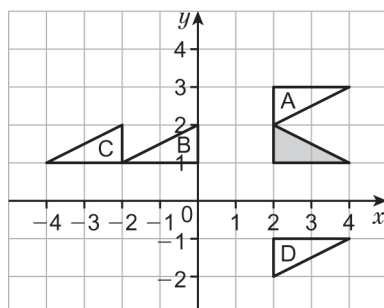
2



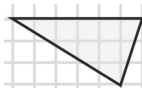
Reflections and rotations

3 Reflections b and d

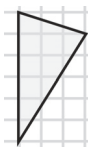
4



5 a



b

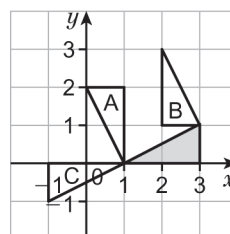


c



d They are the same.

6

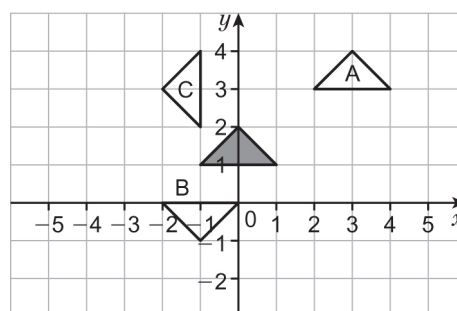


Translations and combinations of transformations

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

8 $(-1, 1)$, $(1, 1)$, $(1, 2)$

9



10 Extend

- 1 Shapes A and I, D and F, B and H
2 a Rotation 90° clockwise about $(2, -4)$
b Rotation 90° clockwise about $(3, 2)$
c Rotation 90° anticlockwise about $(2, -2)$
d Rotation 180° about $(2.5, 2)$
3 Reflection in the line $x = -2$, or translation 7 squares right and no squares down.

- 4 a 3 squares right and 1 square down
 b 3 squares left + 6 squares right = 3 squares right;
 and 2 squares up + 3 squares down = 1 square down

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

d

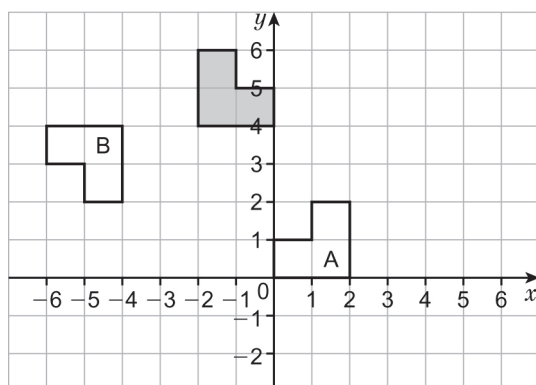
Square	Perimeter (cm)	Area (cm ²)
A	8	4
B	16	16
C	24	36

e

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

- f The ratios of the side lengths and the perimeters are the same, but each ratio of areas is the square of the other two ratios.

6 a, b i



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

10 Unit test

1 Shapes A and G

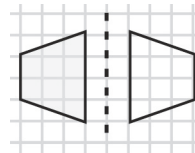
2 Image D

3 a Shape D

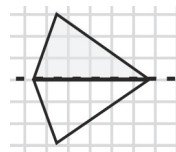
b Shape B

c Shape A

4 a



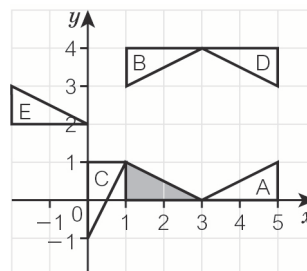
b



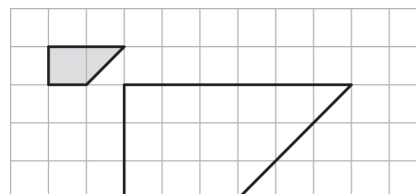
c



5



6 a



b 1 : 3

Unit 11 Probability

11.1 Comparing and calculating probabilities

- 1 a i 1, 2, 3 ii 3 outcomes
b i A, B, C, D, E ii 5 outcomes
c i 1, 2, 3, 4, 5, 6 ii 6 outcomes

- 2 a i $\frac{1}{2}$ ii $\frac{3}{10}$ iii $\frac{1}{10}$
b i 0.5 ii 0.3 iii 0.1
c i 50% ii 30% iii 10%

- 3 a Yellow b bag B

- 4 Statements A and B

11.2 More probability calculations

- 1 a $\frac{4}{9}$ b $\frac{2}{3}$ c 0 d 1

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

- 3 a

Outcome	1	2	3	4
Probability	0.2	0.3	0.25	0.25

- b Yes, $P(\text{not } 3) = 0.2 + 0.3 + 0.25 = 0.75 = \frac{3}{4}$

- 4 a 0.45 b 0.65 c 0.35

- 5 0.97

- 6 52%

11 Strengthen Comparing and calculating probabilities

- 1 a i $\frac{1}{10}$ ii 0.1

- b $\frac{9}{10}$ or 0.9

- 2 a i $\frac{1}{2}$ ii $\frac{5}{8}$

- b Yes. The probability of grey on spinner A is $\frac{1}{4}$ and on spinner B it is $\frac{2}{8}$, which simplifies to $\frac{1}{4}$.

- 3 a 10 b 4 c $\frac{2}{5}$

- d i $\frac{2}{5}$ ii 0 iii $\frac{3}{10}$ iv $\frac{4}{5}$

- 4 a 6

- b i $\frac{1}{6}$ ii $\frac{1}{2}$ iii $\frac{2}{3}$
iv $\frac{5}{6}$ v $\frac{5}{6}$ vi $\frac{1}{2}$

- 5 A – unlikely
B – even chance
C – impossible
D – even chance
E – certain

Probability problems

- 6 0.9

- 7 65%

- 8 93%

- 9 a $\frac{7}{9}$ b $\frac{5}{9}$ c 0 d 1

- 10 No, the chance of picking a yellow is $\frac{9}{20}$ but the chance of picking a green is $\frac{5}{20}$.

11 Extend

- 1 Students' own answers

- 2 70%

- 3 a $\frac{1}{800}$ b Unlikely c $\frac{799}{800}$

- 4 B, A, C, D

- 5 Students' designs with red taking up $\frac{2}{5}$ of the circumference of the spinner and the other two colours equal, e.g. a spinner with 10 sections: 4 red, 3 blue and 3 green.

- 6 a $\frac{1}{5}$ b $\frac{1}{40}$ c $\frac{3}{4}$

- 7 a 0.4 b 0.6

- 8 a 9% b 39%

- 9 No, because there is a 60% chance of showers so it is more likely to rain than not.

11 Unit test

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

2 a $\frac{1}{4}$ **b** $\frac{5}{8}$ **c** Abdullah

3 a 1, 1, 1, 2, 2, 4, 4, 5, 5, 6

b i $\frac{1}{10}$ **ii** $\frac{1}{2}$ **iii** 1

4 a 0.4

b 0.3

5 No. The probability that Nazeer rolls a multiple of 3 is $\frac{3}{10}$ and the probability that Rekha rolls a multiple of 3 is $\frac{6}{20}$, which cancels to $\frac{3}{10}$, so the probabilities are the same.