

Unit 1 Answers

1.1 Indices

- 1 a i 64
 ii 64
 iii The answers are the same; $2^3 \times 2^3 = 2^6$
 b i 128
 ii 128
 iii The answers are the same; $2^5 \times 2^2 = 2^7$

c

x	5³	5⁴	5⁵
5²	5 ⁵	5 ⁶	5 ⁷
5³	5 ⁶	5 ⁷	5 ⁸
5⁴	5 ⁷	5 ⁸	5 ⁹

- 2 a 3^{10}
 b 4^8
 3 a 2^7
 b 3^5
 c 3^6
 4 a 2^3
 b 5^4
 5 a 144
 b 9
 c 2
 6 a 9
 b -9
 c 12
 d -5
 7 a $(-2)^7$
 b $(-6)^9$
 c $(-3)^2$
 d $(-8)^3$

1.2 Calculations and estimates

- 1 a 3
 b 4
 c -3
 d -4
 2 a 10 cm
 b 600 cm^2
 c 150 cm^2

3 a 4

b 3.3

4 a 58.48 cm

b No; e.g. they are both equally accurate, since $5000 \times 40 = 200\,000$.

5 a i 5

ii 2

b i 4.6

ii 2.2

6 a 100

b 36

7 8

1.3 More indices

1

Prefix	Letter	Power	Number
tera	T	10^{12}	1 000 000 000 000
giga	G	10^9	1 000 000 000
mega	M	10^6	1 000 000
kilo	k	10^3	1000
deci	d	10^{-1}	0.1

Prefix	Letter	Power	Number
centi	c	10^{-2}	0.01
milli	m	10^{-3}	0.001
micro	μ	10^{-6}	0.000 001
nano	n	10^{-9}	0.000 000 001
pico	p	10^{-12}	0.000 000 000 001

2 a 1 000 000 tonnes

b 1000 m

c 0.001 g

d 0.000 000 001 m

3 1000 ms

4 a i $\frac{1}{10^3}$

ii $\frac{1}{10^5}$

b $\frac{1}{10^x}$

5 500 transistors

6 a 27, 9, 3, 1, $\frac{1}{3}$, $\frac{1}{9}$

b 1

c 1

d The answers are both 1.

e 1

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

b 1

c 4

d 4

1.4 STEM: Standard form

- 1 a 500
 b 25 000
 c 0.04
 d 0.000 029
- 2 a i 5^6
 ii $(5^2)^3$
 b i 6^{15}
 ii $(6^3)^5$
 c p^{ab}
- 3 numbers A, B and D
- 4 a 6×10^3
 b 7.5×10^6
 c 7×10^{-5}
 d 8×10^{-1}
- 5 a 4.1×10^{16} m
 b 3.3×10^{-22} g
- 6 a Yes
 b 602 000 000 000 000 000 000 000
 c Student's own explanation

1 Strengthen

Indices and powers of 10

- 1 a 5^6
 b 8^7
 c 10^5
 d 2^9
- 2 a 3^2
 b 9^3
 c 4^6
 d 2^3
- 3 a 630 m
 b 708 000 μm
 c 0.000 008 2 m
 d 0.053 km
- 4 a i $\frac{9}{9} = 1$
 ii $3^{2-2} = 3^0$
 iii 1

b i 3^{-2}

ii $3^{-2} = \frac{1}{3^2}$

5 a 2^3

b 5^{-7}

c 3^{-5}

d 7^{-3}

e 10^{-5}

f 10^5

6 a 3^3

b i 3^5

ii 3^8

ii 3^6

Powers and roots

7 a 9

b 81

c 16

d 121

8 a i -25

ii 25

b e.g. $-5^2 = -(5 \times 5)$, but $(-5)^2 = (-5) \times (-5)$

c i 75

ii 25

iii -20

9 a e.g. Because the 8.1 would be rounded down and because $24 \div 8$ is easier than $25 \div 8$.

b e.g. $\frac{20}{4} - 3.5 = 1.5$

Standard form

10270 000 000 kg

11a 0.052

b 0.000 007 6

12a 8.2×10^3

b 7.2×10^5

13a 3.5×10^{-4}

b 2.8×10^{-6}

146.6×10^{-5} , 1.1×10^{-2} , 9.9×10^3 , 5.5×10^6

1 Extend

1 a i 1

ii -1

iii 1

iv -1

- b i** e.g. Even powers of -1 are all 1, and odd powers of -1 are all -1 .
ii e.g. (negative number)^{even} is always positive; (negative number)^{odd} is always negative.

c Student's own answer

d Yes

2 a $10 \times (2 + 4)^2$

b $[9 - (4 - 2)]^2$

c $5(\sqrt{64} - \sqrt{16})$

3 e.g. $500 \div 24 = 20.8$ and $300 \div 18 = 16.7$ so need 21 by 17 = 357 tiles; an overestimate.

$500 \div 18 = 27.7$ and $300 \div 24 = 12.5$, so need 28 by 13 = 364 tiles; an overestimate.

The first way is better, unless the half tiles (from the 12.5) can be used, in which case the second way would use only 350 tiles and would then be better. (It would still be an overestimate, but only just).

4 a e.g. £378 (63% of £600) or £360 (60% of £600)

b 20 m

5 about 9

6 a 4.8 mm

b 2.5 Mt

c 3 TW

d 1.25 μ g

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

b $2^8 \times 5^5$

8 $x = \pm 3$

9 a 3.6×10^5

b 2.25×10^5

c 1.69×10^{-1}

d 1.6×10^{-12}

10a 5^{44}

b 7^{24}

c 10^{60}

11a 8×10^2

b 1.9×10^{-1}

c 1.4×10^4

d 1.47×10^{-1}

e 2.5×10^5

f 7.2×10^{-8}

12250 minutes

1 Unit test

1 a 10^8

b 5^7

c 8^6

2 9 m^2

3 a 3^3

b 2^7

4 0

5 75

6 a e.g. 20 or 24

b e.g. 20

7 $\frac{25}{2.5}$; both numbers have been rounded up. However, even though this is the closest estimate, it is an underestimate. If Liam uses it, he will not have enough flooring.

8 a 8 200 000 000 W

b 8200 MW

9 a 5 100 000

b 0.000 09

10a 4

b 12.5

11a 5.3 megatonnes

b 5.3×10^6 tonnes

12a 8.2×10^{-11}

b 2.4×10^8

Unit 2 Answers

2.1 Substituting into expressions

1 a 5

b t

c 20

2 a 20

b 16

c 100

3 a 19

b 45

c 24

d 250

e 144

f 14

4 a 72

b 78

c 3

5 a -12

b -120

c 3

d 19

6 a C

b B

c A

d A

2.2 Writing expressions and formulae

1 a £60

b $wh + \frac{e}{n}$

c $P = wh + \frac{e}{n}$

d £70

2 a 210 minutes

b $30x + 60$

c $M = 30x + 60$

d 186

e 11 am

3 $C = 2200h + 1000$

2.3 STEM: Using formulae

- 1 a 100 N/m^2
b 6000 N/m^2
- 2 a 225 J
b 1000 J
- 3 a 3
b 4
- 4 a $b = \frac{A}{h}$
b $s = \frac{s}{y}$
c $p = t - 5y$
d $t = 10u$
e $x = \frac{y}{v}$

2.4 Rules of indices and brackets

- 1 a $t^3 - 2t^2 + 3t$
b $4a^3 + 6a^2 + 8a$
c $5x^4 - 4x^3 - 3x^2$
- 2 a $6p^3 + 15p^2$
b $21r + 10r^2 + 5r^3$
- 3 LHS = $5n^3 + 4n^2 =$ RHS
- 4 a $9a^2$
b $8x^3$
c $\frac{c^3}{8}$
d $\frac{a^2}{25}$
- 5 a F
b T
c F
d T
- 6 a $x^{-3} = \frac{1}{x^3}$
b $\frac{1}{a^5}$
c $\frac{1}{h^6}$
- 7 a $4(2x + 1)$
b $5x^2(x - 2)$
c $4x^3(3x^3 + 1)$

- 8 a $5(a + 2b + 3c)$
 b $2x(x + 2x^2 - 3y)$

2.5 Expanding double brackets

- 1 $x^2 + 8x + 12$
 2 $x^2 + 15x + 50$
 3 a $p^2 + 7p + 12$
 b $r^2 + 9r + 20$
 c $y^2 - y - 12$
 d $x^2 - 7x + 10$
 4 Phoebe is correct; Millie thought that $3h - 5h = 2h$.
 5 a $4x^2 - 8x - 12$
 b $a^2 - 14a + 39$
 6 LHS = $x^2 + 2x - 12$ = RHS

2 Strengthen

Substituting into expressions

- 1 $5(14 - 6) = 40$, $5^2 + 2 \times 10 = 45$, $16 + \frac{4^3}{2} = 48$, $(3 \times 4 - 10 \div 2)^2 = 49$
 2 a 100
 b 1000
 c 7
 d 210
 3 a 4
 b -2
 c -15
 d 4
 4 a 8
 b 18
 c 42
 d 0.6
 e 2

Writing and using formulae

- 5 a 35
 b 2.2
 6 a £50
 b $ch + s$
 c $T = ch + s$
 d £38
 7 8

Expanding, factorising and indices

8 a $t^3 - 2t^2 + 9t$

b $6a^3 + 10a^2 + 22a$

9 a $8t^3$

b $25a^2$

c $\frac{b^2}{16}$

d $\frac{x^3}{8}$

10a $\frac{1}{5^2}$

b $\frac{1}{5^4}$

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

11a i 4

ii $3y^2$

b i $4(x - 3)$

ii $3y^2(2y + 1)$

iii $2(3a + 4b + 6c)$

iv $5p(p + 2q - 4x)$

12a $x^2 + 8x + 15$

b $x^2 + 2x - 15$

c $x^2 - 8x + 15$

2 Extend

1 a 3 m/s

b 9 m/s

2 a $10x + 20$

b $x = 4.5$

c 40 m

3 $6x + 34$

4 a LHS = $26 - 2t$ = RHS

b e.g. Expand and simplify each side separately, then compare.

5 a $x = P - h$

b $x = \frac{A - c}{2}$

c $x = T + 5y$

d $x = \frac{B + p}{3}$

e $x = \frac{H + ak}{t}$

6 a i $\frac{4}{7}$

ii $\frac{4x}{7}$

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

ii $1\frac{1}{3}x$ or $\frac{4x}{3}$

7 a x^6

b x^{12}

c x^{4u}

8 a $x^2 + 4x + 3$

b $x^3 + 4x^2 + 3x + 2x^2 + 8x + 6$

c $x^3 + 6x^2 + 11x + 6$

2 Unit test

1 92

2 a 37

b 47

3 a £39

b $ap + bm$

c $T = ap + bm$

d £76

4 $16a^3 + 2a^2$

5 80

6 a $4(4t + 1)$

b $2t^3(7 - 2t^2)$

c $t(t + 8u + 12s)$

d $2t(3t - 5w - wy)$

7 a 20

b 10

8 a $x^2 + 9x + 20$

b $x^2 - 4x - 12$

9 $x = \frac{P - y}{2}$

10a x^{p+q}

b x^{p-q}

c x^{pq}

Unit 3 Answers

3.1 Planning a survey

- 1 A
- 2 a i primary data
 ii Ask students, using a questionnaire or survey.
- b i secondary data
 ii Look on a website showing average car ownership per household in the UK.
- 3 a i e.g. 90 students
 ii e.g. to the nearest minute or the nearest 5 minutes
- b **A** Art club members may tend to spend more (or less) time on maths homework than students who are not art club members.
B Maths club members may tend to spend more (or less) time on maths homework than students who are not maths club members.
C Top set maths students may tend to spend more (or less) time on maths homework than students in lower sets.
D Year 11 students may tend to spend more (or less) time on maths homework than students who are younger or who are in the sixth form.
- 4 a Method 2; Alfie asks the most people and it is a random sample.
 b Method 1: only asking young people
 Method 3: only asking people she knows
 c e.g. Ask more people, ask at different locations, ask on different days at different times.

3.2 Collecting data

- 1 c Student's own question, e.g.
 Flying to a holiday instead of holidaying in the UK is not a good idea.
 Do you agree? Yes No Don't know

2 a e.g.

Age, a (years)	Tally	Frequency
$20 \leq a < 30$		
$30 \leq a < 40$		
$40 \leq a < 50$		
$50 \leq a < 60$		
$60 \leq a < 70$		

b i

		Number of fillings		
		1-5	6-10	11+
Age, a (years)	$20 \leq a \leq 39$	1	3	1
	$40 \leq a \leq 59$	3	2	2
	60+		2	

ii 4 patients

iii $\frac{1}{2}$

3 Student's own questionnaire, e.g.

Are you in Year 8? Yes No

Approximately what time did you go to sleep last night?

Approximately what time did you wake up this morning?

3.3 Calculating averages

1 a 82.308

b i 0.2, 9.8, 0.04, 1, 0.5

ii 2.308

iii 82.308

2 4, 4, 8, 10, 14

3 a

Height, h (cm)	Frequency	Midpoint of class	Midpoint \times Frequency
$0 \leq h < 50$	4	25	100
$50 \leq h < 100$	13	75	975
$100 \leq h < 150$	26	125	3250
$150 \leq h < 200$	7	175	1225
Total	50	-	5550

b $100 \leq h < 150$

c 200 cm

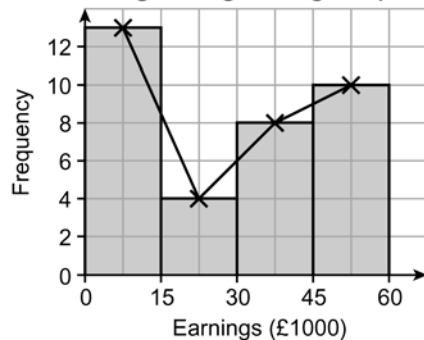
d 111 cm

4 a 48.6 cm

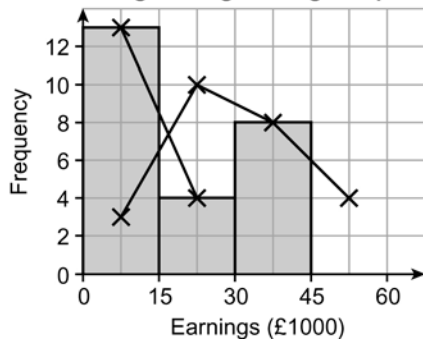
b e.g. Possibly, but only by 0.1 cm. Could depend on how many stems she recorded last year.

3.4 Display and analyse data

1 a Earnings at engineering companies



b Earnings at engineering companies

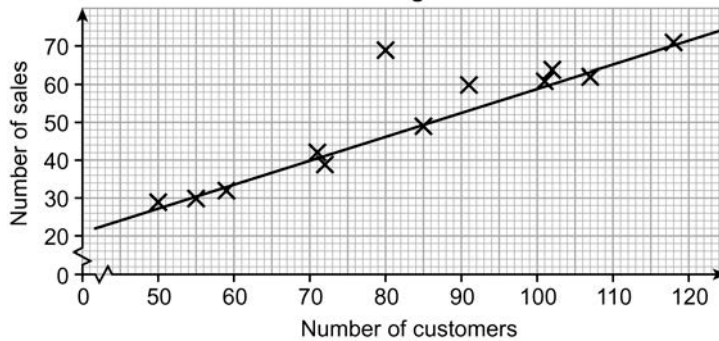


c e.g. In the first firm, most employees earn less than £15 000 or more than £45 000. The second firm has fewer employees, and most of them earn between £15 000 and £45 000.

d e.g. Make the class intervals for wages smaller, to be more accurate. Ask the employees their ages, to investigate whether that make a difference to earnings. Look to see whether product prices and sales volumes are different between the two companies.

2 a positive correlation

b Number of customers against number of sales



c Data point at (80, 70) circled

d 36 to 38 sales

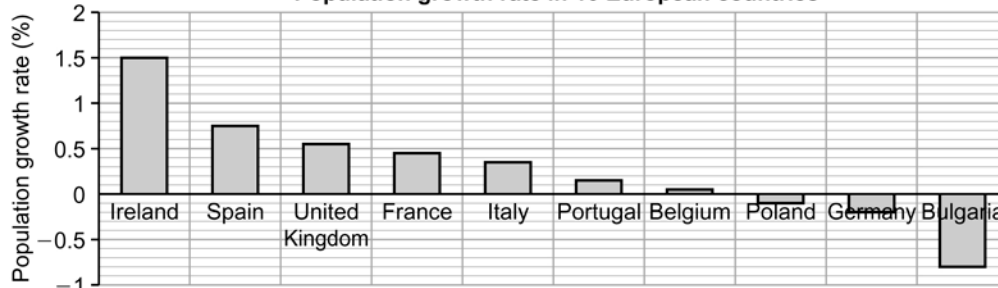
e 86 to 88 customers

f e.g. 'Yes, it's 'about' half' or 'No, it's slightly more than half'

g e.g. Collect more data, by collecting similar data for a longer time.

3.5 Writing a report

1 Population growth rate in 10 European countries

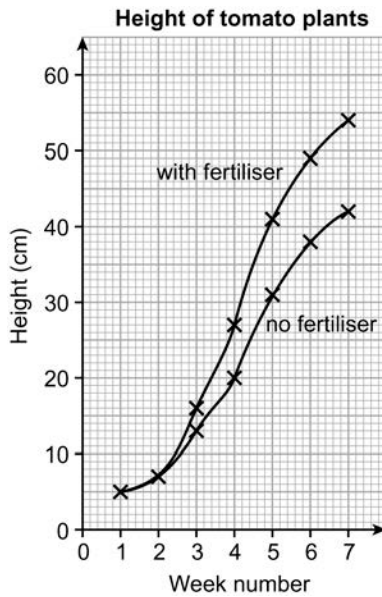


b e.g. Ireland has the highest population growth rate. 30% of the countries shown have a declining population.

c e.g. No, because the information only relates to Europe, not the whole world.

d e.g. Find similar information (on the internet etc.) for countries outside of Europe.

2 a



b Student's own report, e.g.

The results show that for the first 2 weeks fertiliser made no difference to plant growth, but from the 3rd week onwards the fertilised plants grew more than the non-fertilised plants. By the 7th week, the fertilised plants were almost 30% taller than the non-fertilised plants.

To improve these results and give more a reliable conclusion, we could use more plants in both groups and measure for a longer period of time and also record the numbers and masses of tomatoes picked from the mature plants.

c No fertiliser: median = 20 cm, range = 37 cm, mean = 22.3 cm

With fertiliser: median = 27 cm, range = 49 cm, mean = 28.4 cm

d e.g. The medians show that halfway through the test, adding fertiliser has increased a tomato plant's height by 7 cm. The ranges show that adding fertiliser increased a tomato plant's height by 12 cm over a 7-week period. The means show that adding fertiliser increased a tomato plant's mean height by about 6 cm over the 7-week period.

e e.g. No, because the increase from 42 to 54 at 7 weeks is an increase of nearly 30%.

3 Strengthen

Surveys

1 a primary

b secondary

2 a A or B

b either of the groups 10–20 cm or 20–30 cm

c The groups overlap.

d 0–9 cm, 10–19 cm, 20–29 cm

Calculating averages

3 a $40 \leq t < 60$

b

Time, t (minutes)	Midpoint	Frequency	Midpoint \times Frequency
$0 \leq t < 20$	10	12	120

$20 \leq t < 40$	30	15	450
$40 \leq t < 60$	50	30	1500
$60 \leq t < 80$	70	3	210
	Total	60	2280

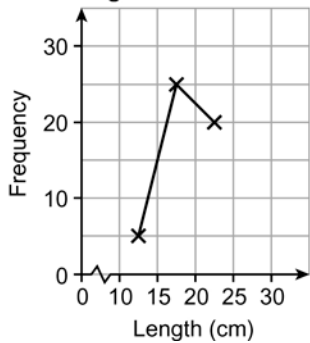
- c Frequency
- d Midpoint \times Frequency
- e 38 minutes

Display and analyse

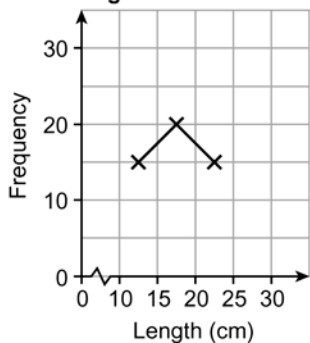
4 a

Length, l (cm)	Midpoint	Frequency
$10 \leq l < 15$	12.5	5
$15 \leq l < 20$	17.5	25
$20 \leq l < 25$	22.5	20

b Length of runner beans



c Length of runner beans



d e.g. Mildred had more short ($10 \text{ cm} \leq l < 15 \text{ cm}$) beans than George. George had more long ($15 \text{ cm} \leq l < 20 \text{ cm}$ and $20 \text{ cm} \leq l < 25 \text{ cm}$) beans than Mildred.

5 a positive correlation

b Data point at (22, 0.5) circled

c e.g. 'It's too low' or 'It should have half of the points above the line; this shows almost all of the points above the line.'

d Line of best fit drawn

e between 1600 and 1900 visitors

f 22.5 °C to 23 °C

3 Extend

1 Student's own explanations, e.g.

- A No; people will be more honest if the survey is anonymous.
- B Possibly; if the age bands are quite wide, people may not mind too much.
- C Possibly; if the survey is anonymous, they may be truthful about this.
- D Yes; it is important to know how long, as it may indicate whether or not they have knowledge of the local police.
- E Yes; that is the point of the survey.
- F Yes; if people want the police force to improve, the police need to know what people want them to do.

2 e.g. Each day, count the number of shoppers and the total spent.

3 e.g. http://en.wikipedia.org/wiki/Geocentric_orbit or <http://satellites.findthebest.com>

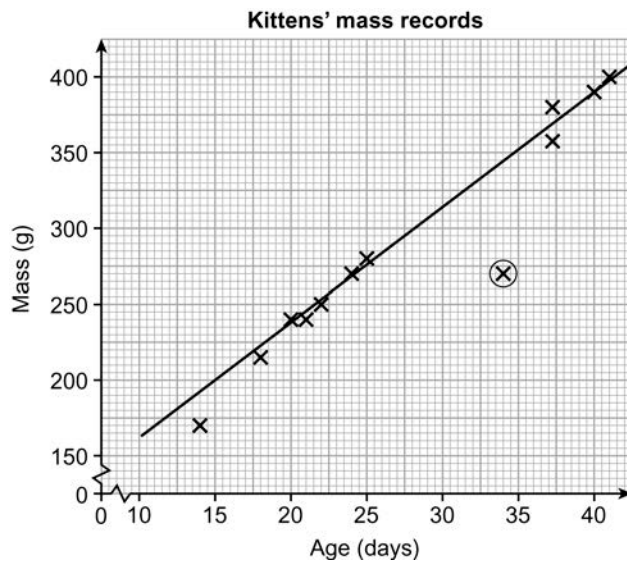
4 a

	Did warm up	Did not warm up	Total
Injured	9	3	12
Not injured	58	20	78
Total	67	23	90

b e.g. The athletes might not be clear as to what is a 'proper warm up'.

5 -9, -5, -5, -5, -1 or -10, -5, -5, -3, -2

6 a



b Data point at (34, 270) circled; e.g. this kitten was not healthy.

c Line of best fit drawn

- i 310–320 g
- ii about 10 days

d e.g. Not very accurate, there is no data for very young kittens.

7 a i $40 \leq a < 60$

ii $20 \leq a < 40$

b i 40.6 years

ii 43.3 years

c e.g. The projection estimates that there will be 10.8 million more people in the UK in 2035 than in 2010. The number of people over 80 years of age is predicted to go up by 2.9 million. The

percentage of people over 80 years of age is predicted to rise from 4.65% in 2010 to 7.93% in 2035.

3 Unit test

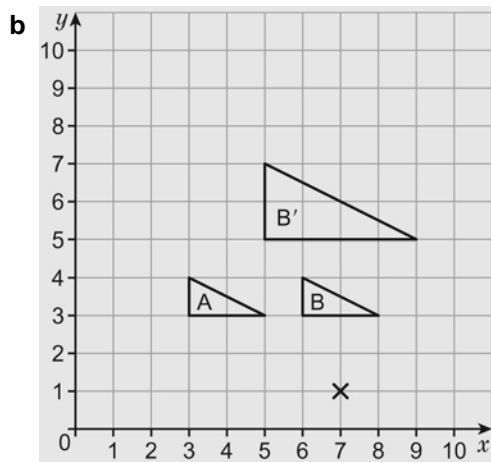
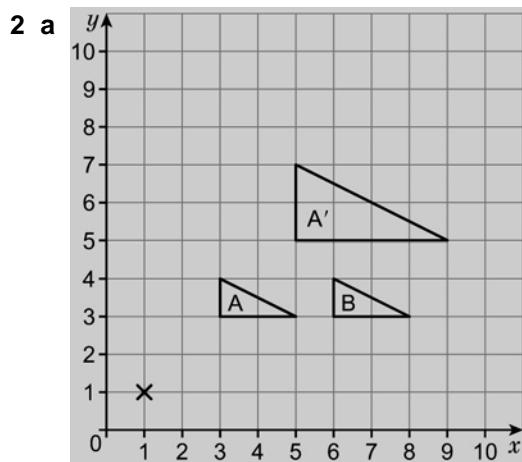
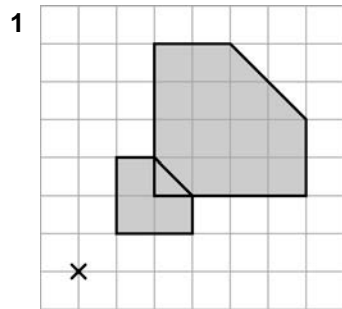
- 1 100 times
- 2 a The answer boxes overlap.
b e.g. 0 1–3 4–6 7–9 10+
- 3 a primary data – individual times that male and female students can stand on one leg
b e.g. 80 students
c No, because she collected the data herself.
d e.g.

Males		Females	
Time (s)	Frequency	Time (s)	Frequency
0–9		0–9	
10–19		10–19	
20–29		20–29	
30–39		30–39	
40+		40+	

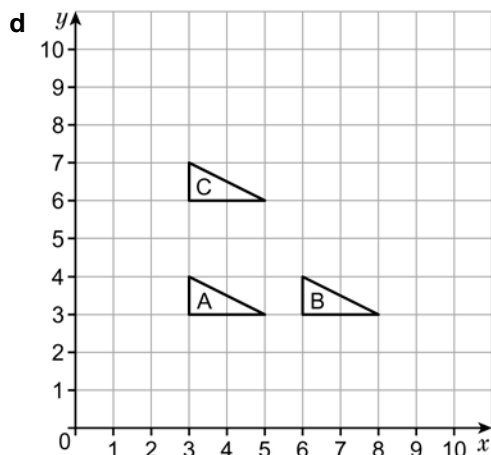
- 4 a positive correlation
b Data point at (1.68, 82) circled
c Line of best fit drawn
d between 70 kg and 73 kg
- 5 a i 108 cars
ii 168 cars
b e.g. Mike only did the survey for 22 hours. Sam had lots more hours with fewer cars passing. Sam and Mike had the same number of hours with $100 \leq n < 200$ cars passing.

Unit 4 Answers

4.1 Enlargement



c They are the same size and shape and are in the same position.

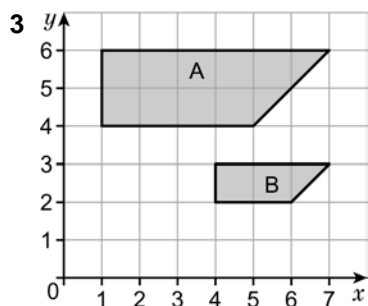
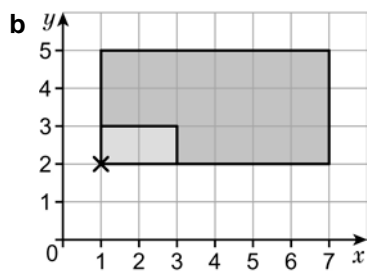
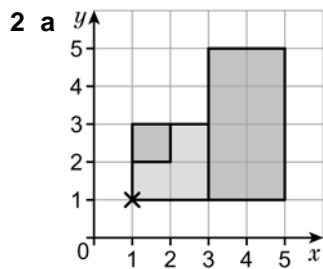
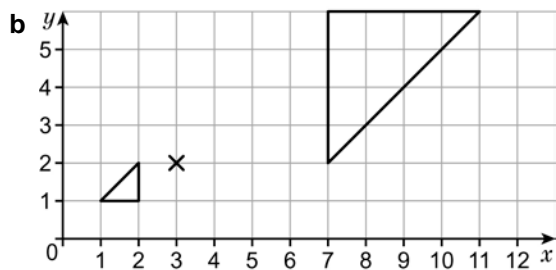
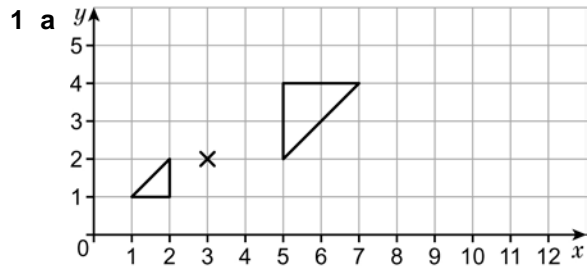


e No; the sizes and shapes are the same, but the triangle is 1 square to the left of the other triangles.

3 a scale factor 2, centre of enlargement at (7, 1)

b scale factor 3, centre of enlargement at (4, 3)

4.2 Negative and fractional scale factors



b 2 : 1

- c scale factor 2, centre of enlargement (7, 0)

4.3 FINANCE: Percentage change

- 1 £6500
 2 a £65
 b Di saved more money (£13 > £12).
 3 6%
 4 22%
 5 4%

4.4 Rates of change

- 1 a 50 km/h
 b 20 m/s
 c 90 m
 d 3 hours
 e 8.333... m/s
 f 14 45

2 a

	Mass	Volume (cm ³)	Density (g/cm ³)
i	312.5 g	25	12.5
ii	170 g	40	4.25
iii	15 kg	1250	12

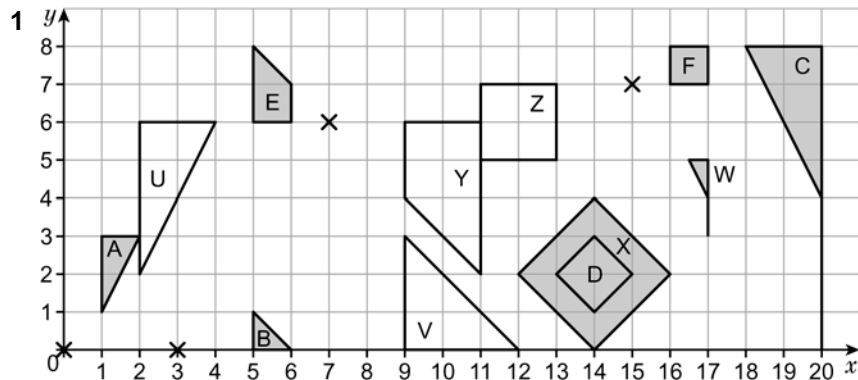
- b metal i
 3 40 N/m²
 4 a A 6p, B 5p, C 5.5p
 b Bottle B; it is the cheapest per 10 ml.

4.5 Problem-solving

- 1 £82.5 million
 2 c 63.35
 d 40 000
 e 0.0043
 3 0.04 N/cm²
 4 a 40 m
 b 0.2 m
 c Marshall; $800 \text{ m} \div 4000 = 0.2 \text{ m}$
 5 a 13%
 b i 2012 and 2013
 ii 2.1%
 c 56%

4 Strengthen

Enlargement



- a Shape U drawn correctly
- b Shape V drawn correctly
- c scale factor $\frac{1}{4}$, centre of enlargement (16, 4)
- d scale factor 2, centre of enlargement (14, 2)
- e Shape Y drawn correctly
- f Shape Z drawn correctly

- 2 a 126 000 mm
- b 126 m

Compound measures

- 3 a 0.4
- b 0.005
- c 38 000
- d 6.28

4

Distance	Time (hours)	Speed
50 miles	2	25 mph
30 miles	3	10 mph
250 km	5	50 km/h
75 km	2.5	30 km/h

5

Substance	Mass (g)	Volume (cm ³)	Density (g/cm ³)
Aluminium	67.5	25	2.7
Beeswax	62.4	65	0.96
Carbon	14.04	4	3.51

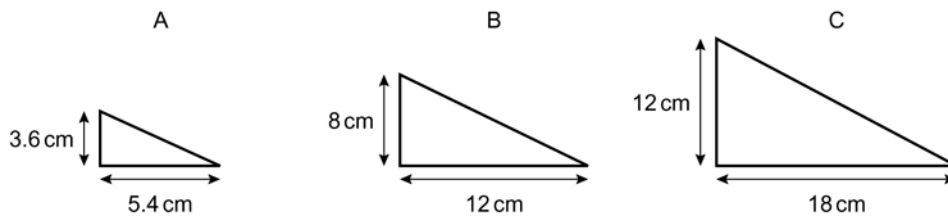
- 6 3.5 N/cm²
- 7 a 17.5p, £1.57(.5)
- b the pack of 6 bottles

Percentage change

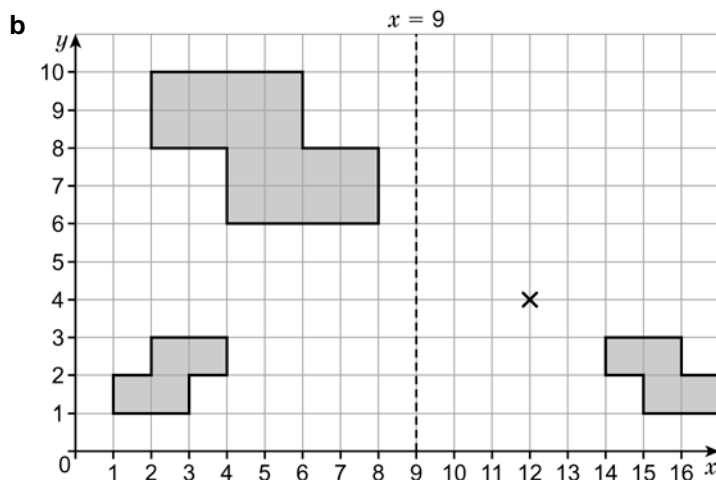
- 8 a 35 members
- b 120 members
- c 50 members
- d 80 members
- 9 a 3%
- b Yes

4 Extend

- 1 a scale factor -3 , centre of enlargement $(2, 3)$
- b scale factor -2 , centre of enlargement $(3, 4)$
- 2 10.5 m
- 3 £22 600
- 4 1 hour 47 minutes
- 5 844 g
- 6

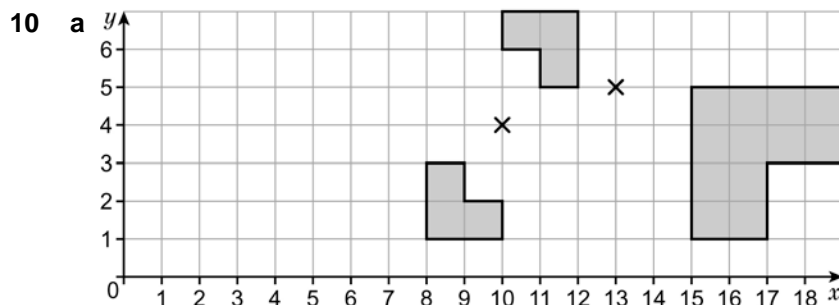


- 7 a 20



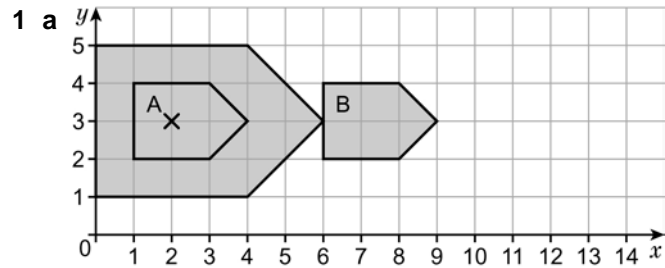
- c 10

- 8 2691 N
- 9 12.2 cm

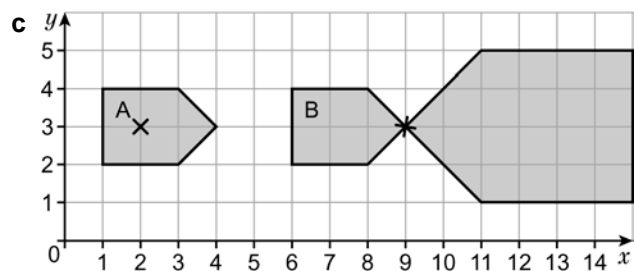


- b** scale factor $\frac{1}{2}$, centre of enlargement (1, 1)

4 Unit test



- b** scale factor 2, centre of enlargement (12, 3)



- 2 a** 45 000
b 0.07
c 26.8
- 3** 20 members
- 4 a** 18 km/h
b 9 miles
c 48 minutes
- 5** 3.5 N/cm²
- 6** pack B (81p each, others are 82p each and 81.5p each)
- 7** 60%

Unit 5 Answers

5.1 Using scales

- 1 Floor plan drawn accurately
- 2 **a** **i** 5.5 km
ii 11.75 km
- b** 6 km
- c** **i** 6.6 km
ii 14.1 km
- 3 **a** 4 cm
- b** 20 cm
- c** 26 cm

5.2 Basic constructions

- 1 Perpendicular bisector constructed
- 2 Angle bisector of 40° constructed
- 3 Perpendicular from the point to the line constructed

5.3 Constructing triangles

- 1 Triangle constructed
- 2 Triangle constructed
- 3 Right-angled triangle constructed
- 4 Any working net of the equilateral triangle constructed

5.4 Loci

- 1 **a** Points equidistant from A and B marked accurately
b perpendicular bisector
- 2 Locus constructed (angle bisector or 80°)
- 3 **a** 10 cm line drawn with a circle of radius 6 cm centred on each end
b Intersection of the two circles shaded
c 5 km

5 Strengthen

Using scales

- 1 Scale drawing drawn accurately
- 2 16 m, 32 m, 36 m
- 3 **a** 14 km
b 6.4 km

Basic constructions

- 4 Perpendicular bisector constructed
- 5 Angle bisector of 50° constructed
- 6 Angle bisector constructed
- 7 Perpendicular from point A to the line constructed

Constructing triangles

- 8 Triangle constructed

Loci

- 9 Accurate drawing of a circle radius 3 cm centred on X
- 10 Perpendicular bisector of 4 cm line constructed

5 Extend

- 1 a Scale drawing constructed
b 39 m
- 2 No; 5 cm represents $5 \times 125\,000 = 625\,000$ cm = 6250 m = 6.25 km.
- 3 Right-angled triangle constructed; 10.7–10.8 km
- 4 Right angle constructed and bisected twice to give angles of 45° and then 22.5°
- 5 Equilateral triangle constructed
- 6 6 cm line drawn with circles of radius 4 cm centred on one end and radius 3 cm centred on the other end
- 7 15.1 m
- 8 250 cm

5 Unit test

- 1 Perpendicular bisector of 7 cm line segment constructed
- 2 Angle bisector constructed
- 3 Perpendicular from point A to the line constructed
- 4 a 1.4 km
b 40 cm
- 5 a Right-angled triangle constructed
b 2.5 m
- 6 9 cm line drawn with circles of radius 5 cm centred on one end and radius 3 cm centred on the other end; the circles do not intersect, so there is a 'dead spot'.

Unit 6 Answers

6.1 Solving equations

- 1 a $x = 7$
 b $x = 12$
- 2 5
- 3 $x = \pm 8$
- 4 a $x = 12$
 b $x = 9$
- 5 a $x = -3$
 b $t = 5$

6.2 Using equations

- 1 a Fo
 b Ex
 c Fu
 d Eq
- 2 a i one
 ii all
 iii one
 iv all
 v all
 vi some
- b $2x + 5 \equiv 5 + 2x$, $4x + 12 \equiv 4(x + 3)$ or $16x^2 \equiv (4x)^2$
- 3 a $x + x + x \equiv 3x$
 b $6x + 3 = 9^2$
 c $5t + 6 \equiv 2 + 7t + 4 - 2t$
- 4 a $\frac{4}{9}$
 b $\frac{5}{9}$
- 5 a $\frac{79}{99}$
 b $\frac{22}{90} = \frac{11}{45}$
 c $\frac{68}{90} = \frac{34}{45}$
 d $\frac{311}{900}$

6.3 Trial and improvement

- 1 $x = 4$
- 2 a $x = 3.7$

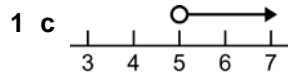
b $x = 2.2$

3 a $x = 6.4$

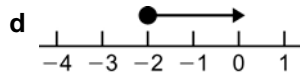
b $x = 4.1$

c $x = 5.1$

6.4 Using and solving inequalities

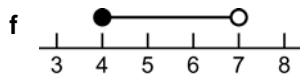


integers: 6, 7, 8, ...



integers: -2, -1, 0, ...

e integers: 4, 5, 6

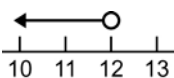


integers: 4, 5, 6

2 a $x > 4$



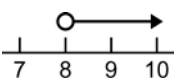
b $x < 12$



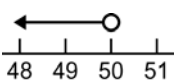
c $x \geq 4$



d $x > 8$



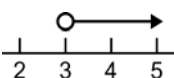
e $x < 50$



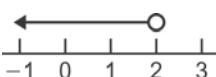
3 b $x > -5$

c $x < -10$

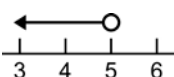
4 a $x > 3$



b $x < 2$



c $x < 5$



6.5 STEM: Proportion

1 a Yes

b $e = \frac{m}{5}$

c 30 cm

2 a Yes

b Yes

c No

3 A = 40.5, B = 36, C = 8, D = 10

4 50 000 Russian roubles

5 85 000 Japanese yen

6.6 Simultaneous equations

1 a $x = 3, y = 12$

b $x = 5, y = 15$

2 a $x = 3, y = 1$

b $x = 4, y = 3$

3 a $x = 3, y = 0$

b $x = 2, y = 5$

4 T-shirt £5, jumper £12.50

6 Strengthen

Solving equations and inequalities

1 a i 9

ii 9

iii 16

iv 16

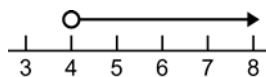
b i $x = \pm 8$

ii $x = \pm 5$

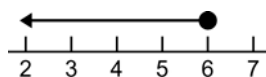
2 a $x = 6$

b $x = -2$

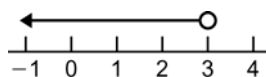
3 a $x > 4$



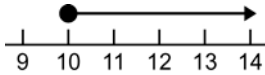
b $x \leq 6$



c $x < 3$



d $x \geq 10$



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

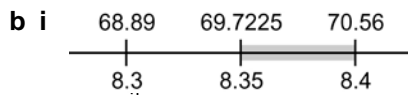
b $\frac{31}{99}$

Trial and improvement

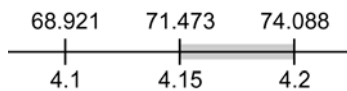
5 a i 68.69, too small; 69.7227, too small

ii

x	$x^3 (= 73)$	Comment
4	64	too small
5	125	too big
4.1	68.921	too small
4.2	74.088	too big
4.15	71.473...	too small



ii For $x^3 = 73$



c i 8.4

ii 4.2

Proportion

6 P = 10, Q = 36

Simultaneous equations

7 a $x = 2, y = 6$

b $x = 3, y = 5$

c $x = 5, y = 6$

6 Extend

1 a $x = 2$

b $x = -3$

2 a $x = \frac{4}{15}$

b $x = 4$

3 a A = 376 km, B = 75 miles

b i 36 mph

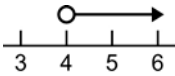
ii 16 m/s

4 10 m/s

5 a $x = 3.84$

- b** $x = 4.23$
- 6 a** $y = 12.00$
b $y = 9.88$
- 7 a** $7x = 28$
b The y terms disappear.
c $x = 4$
d $y = 1$
- 8** 28 and 37 years old

6 Unit test

- 1 a** Fo
b Fu
c Eq
d Ex
- 2 a** $4x + 3 = 9$
b $6x + 2x \equiv 8x$
c $5(x - 2) \equiv 5x - 10$
- 3 a** $x = 10$
b $x = \pm 9$
- 4** $A = 5, B = 120$
- 5** $x > 4$
- 
- 6** $x = 5, y = 2$
- 7** $\frac{29}{99}$
- 8 a** $k = 12$
b $A = 432, B = 10$

Unit 7 Answers

7.1 Circumference of a circle

1 a 24 cm

b 26 cm

2 a

Diameter, d (mm)	Circumference, C (mm)	$\frac{C}{d}$
35	110	3.14
56	176	3.14
86	270	3.14

b The values are the same; e.g. C is directly proportional to d .

c $C = 3.14 \times d$

d 125.6 mm

3 39.3 m

4 a 9.5 cm

b 32 m

5 179 m (to the nearest mm)

7.2 Area of a circle

1 b $80\,425\text{ mm}^2$ or 804 cm^2 (to the nearest mm^2 or cm^2)

2 421 cm^2

3 a $32\pi\text{ cm}^2$

b $36\pi\text{ cm}^2$

4 43 m^2 (to the nearest m^2)

5 a 1.13 m^2 (2 d.p.)

b 37.85 km^2 (2 d.p.)

6 a 73.56 km^2 (2 d.p.)

b Not very accurate; e.g. the land might have mountains, valleys, buildings or forests that might get in the way of the signal.

7.3 Pythagoras' theorem

1 13 mm

2 a 7 mm

b 14 mm

3 a 6.7 cm

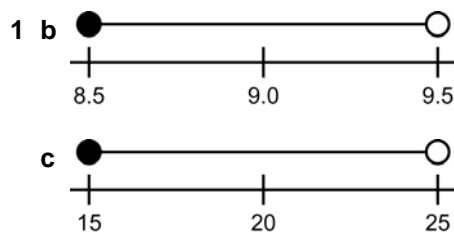
b 2.3 cm

4 0.46 km^2 (2 d.p.)

7.4 Prisms and cylinders

- 1 a 16 cm^2
 b 80 cm^3
 c 80 cm^3
- 2 a i 4500 cm^3
 ii 1890 cm^2
 b i 2800 mm^3
 ii 1448.7 mm^2
- 3 a $318\,086 \text{ mm}^3$ or 318 cm^3 (to the nearest mm^3 or cm^3)
 b $14\,137 \text{ mm}^2$ or 141 cm^2 (to the nearest mm^2 or cm^2)

7.5 STEM: Errors and bounds



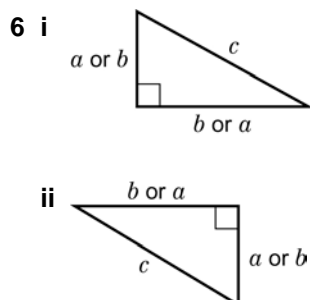
- 2 a lower bound 39.5 cm , upper bound 40.5 cm
 b lower bound 65 cm , upper bound 75 cm
 c lower bound 2570 cm^2 , upper bound 3040 cm^2
- 3 $475 \text{ g} \leq m < 525 \text{ g}$
- 4 $800\,000 \text{ g}$
- 5 $42\,663 \text{ mm}^2$ (to the nearest mm^2)

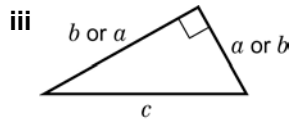
7 Strengthen

Circles

- 1 a 4 cm
 b 12.6 cm
- 2 31.4 cm
- 3 a 3 m
 b 28.3 m^2
- 4 50.3 cm^2 (1 d.p.)
- 5 4.0 cm

Pythagoras' theorem





- 7 a 10.3 cm
 b 10.4 cm
 8 a 10.2 cm
 b 10.9 cm
 9 198.4 cm²

Prisms

- 10a 5 faces
 Faces of prism sketched
 c 30 cm², 30 cm², 130 cm², 120 cm², 50 cm²
 d 360 cm²
 11a 4 m
 b 50.3 m²
 c 402.1 m³

Measurements

- 12a lower bound 75 cm, upper bound 85 cm
 b lower bound 25 cm, upper bound 35 cm
 c 1875 cm²
 d 2975 cm²
 e 1875 cm² ≤ A < 2975 cm²

7 Extend

- 1 area = 279 cm², perimeter = 71 cm (to the nearest cm² or cm)
 2 a 287 cm
 b 287 km (to the nearest km)
 c 697 turns (to the nearest whole number)
 3 a 499 coins
 b 123 020 cm² (to the nearest cm²)
 4 a 63 cm (to the nearest cm)
 b 101 cm (to the nearest cm)
 5 136 cm
 6 5.4 units
 7 a 583.333... m/s
 b 0.022 seconds
 8 13 953.6 g ≤ m < 23 133.6 g
 9 a 0.58 cm³ (2 d.p.)
 b 13.75 g/cm³ (2 d.p.)
 10a 25.20 cm (2 d.p.)
 b 93.55 seconds (2 d.p.)

7 Unit test

- 1 a** 4.3 cm
b 27.0 cm
- 2 a** 19 m (to the nearest m)
b 10 m (to the nearest m)
c 287 m^2 (to the nearest m^2)
- 3 a** $x = 8.06 \text{ cm}$ (2 d.p.)
b $y = 6.71 \text{ cm}$ (2 d.p.)
- 4 a** minimum 45 matches, maximum 55 matches
b $45 \leq m < 55$
- 5 a** 18 cm^2
b 8.49 cm (2 d.p.)
c 117.94 cm^3 (2 d.p.)
- 6 a** 226 m^3
b 207 m^2

Unit 8 Answers

8.1 n th term of arithmetic sequences

1 5, 10, 15

2 a 2, 4, 6, 8

b 5, 7, 9, 11

c $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4

d 7, 4, 1, -2

3 a $5n - 1$

b $2n + 4$

c $40 - 5n$

4 a i 49

ii 499

b i 24

ii 204

c i -10

ii -460

5 a $\frac{3n-2}{4n+1}$

b e.g. Find the common difference between the terms, and the difference between the multiples of the common difference and the terms in the sequence.

8.2 Non-linear sequences

1 a 2, 16

b 10, 10 000

c $\frac{1}{4}$, 2.5

2 0.32

3 a multiply by -2; 32, -64

b multiply by -10; -50 000, 500 000

4 Yes, because the next four terms are 2560, 20 480, 163 840, 1 310 720.

5 a 1, 4, 9, 16, 25

b 11, 14, 19, 26, 35

6 a e.g. The difference increases by 2 each time.

b 39

7 a

A i 5, 8, 13, 20

ii +3, +5, +7

iii +2, +2

B i -1, 2, 7, 14

ii +3, +5, +7

iii +2, +2

b e.g. The 2nd difference is always +2.

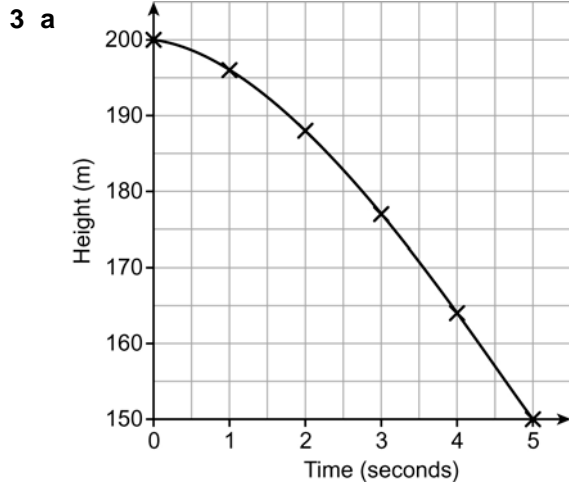
8.3 Graphing rates of change

1 a 7:30 am and 8 am

b 18 mph

2 a 100 miles

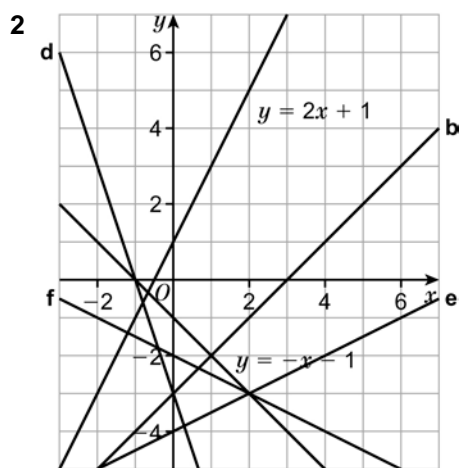
b Car A



b No, because the line is not straight.

8.4 Using $y = mx + c$

1 $y = 4x$, because it has the larger number by the x .



3 equations A and E, equations B and D, equations C and F

4 a $y = 2x - 4$

b $y = \frac{1}{2}x + 7$

5 a 5

b (5, 13)

6 a No

b football

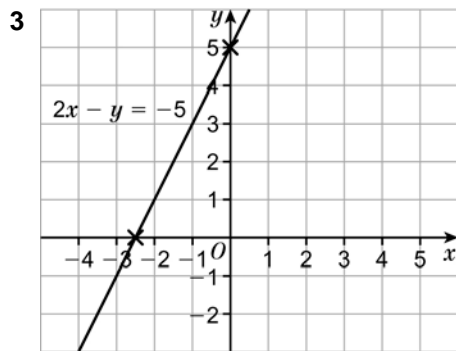
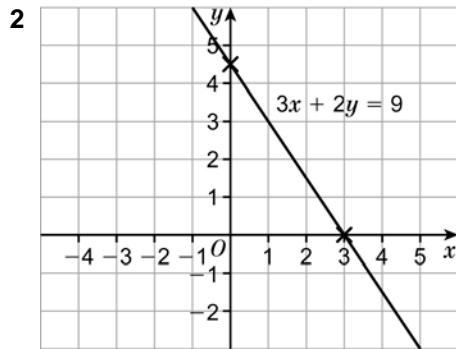
8.5 More straight-line graphs

1 a 0

b 0

c i 0

ii 0



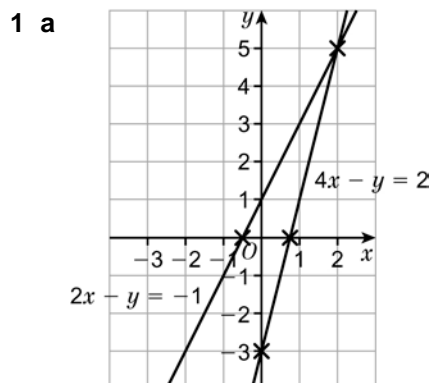
4 line C

5 lines B and C (as $5x + 2y = -8$ can be rearranged to $y = -2.5x - 4$)

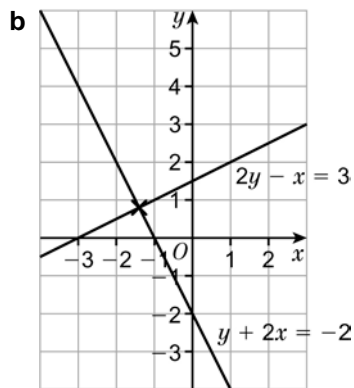
6 a ii $\frac{y-5}{2}$

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

8.6 More simultaneous equations

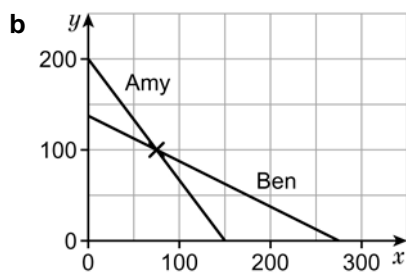


(2, 5); $x = 2, y = 5$



(-1.4, 0.8); $x = -1.4, y = 0.8$

2 a $4x + 3y = 600; 2x + 4y = 550$



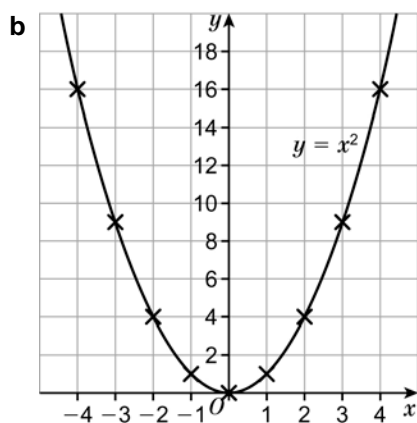
c £1

3 b $y = 3x + 1$

8.7 Graphs of quadratic functions

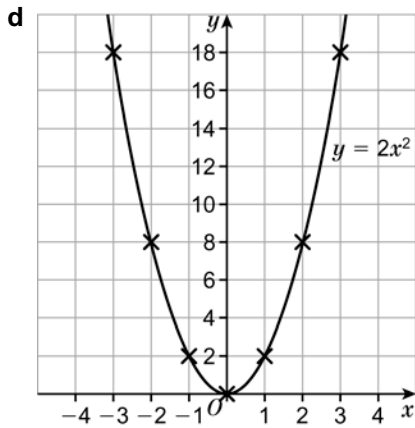
1 a

x	-4	-3	-2	-1	0	1	2	3	4
$y = x^2$	16	9	4	1	0	1	4	9	16



c

x	-4	-3	-2	-1	0	1	2	3	4
$y = 2x^2$	32	18	8	2	0	2	8	18	32

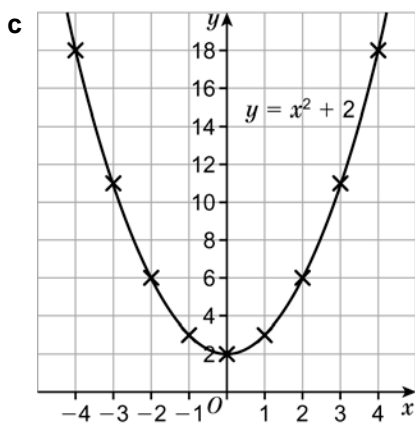
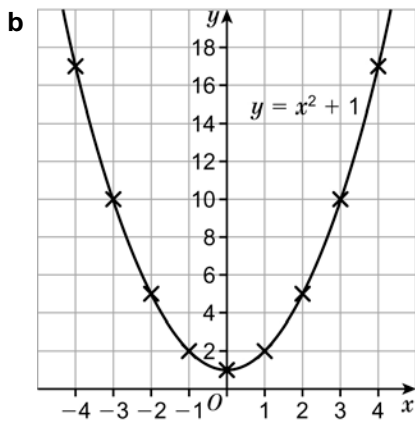


e e.g. They are basically the same shape; $y = 2x^2$ is 'thinner' than $y = x^2$; both get to zero but are not negative; they both have one line of symmetry.

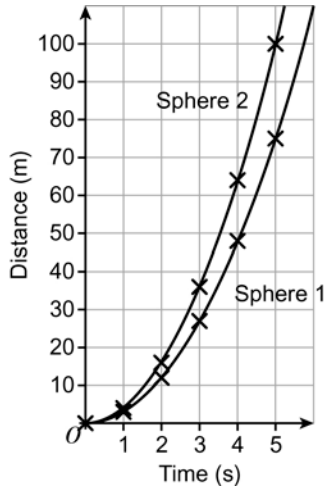
f They both have one line of symmetry; the mirror line is $x = 0$ (the y -axis).

2 a

x	-3	-2	-1	0	1	2	3
x^2	9	4	1	0	1	4	9
+1	+1	+1	+1	+1	+1	+1	+1
y	10	5	2	1	2	5	10



3 a



b e.g. graphs involving x^2

c The lower graph; e.g. it has fallen a shorter distance in each time so there is more resistance.

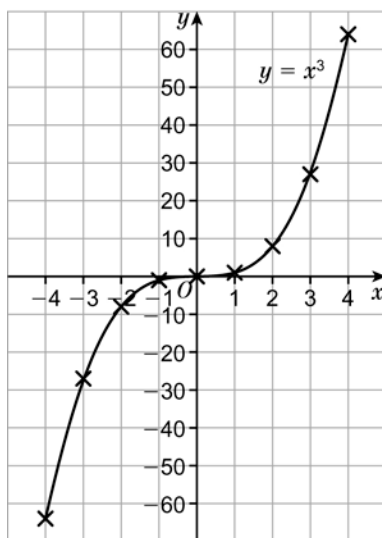
d as it gets to 5 seconds

8.8 Non-linear graphs

1 a

x	-4	-3	-2	-1	0	1	2	3	4
$y = x^3$	-64	-27	-8	-1	0	1	8	27	64

b

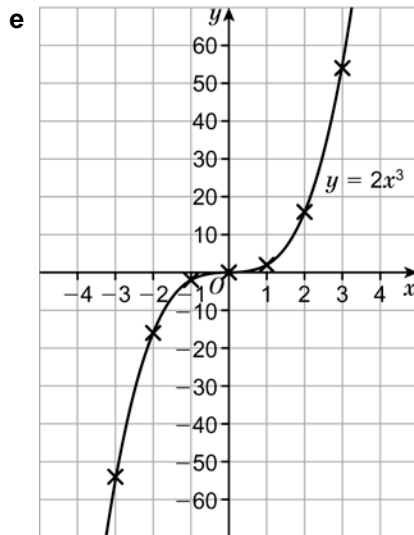


c i 15 to 16

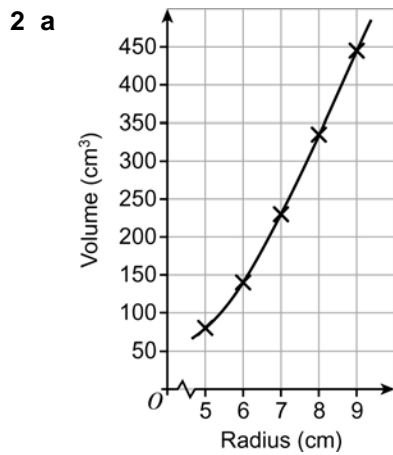
ii 3.7 (± 0.1)

d

x	-4	-3	-2	-1	0	1	2	3	4
$y = 2x^3$	-128	-54	-16	-2	0	2	16	54	128



f e.g. They are the same basic shape; both pass through the origin; $y = 2x^3$ is 'thinner' than $y = x^3$ and is also mostly steeper.



b $375 \pm 5 \text{ cm}^3$

c 6.70 to 6.85 cm

3 a £1250

b 75%

c £2800 to £2850

d $5 \frac{1}{2}$ years

8 Strengthen

Sequences

1 a

n	1	2	3	4	5
$3n$	3	6	9	12	15
$3n - 2$	1	4	7	10	13

b 1, 4, 7, 10, 13

2 a 6, 9, 12, 15, 18

b 7, 12, 17, 22, 27

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

d 18, 16, 14, 12, 10

3	Sequence	7	10	13	16
	Differences				
	Multiples of 3 (3n)	3	6	9	12

*n*th term is $3n + 4$.

4 a $5n + 4$

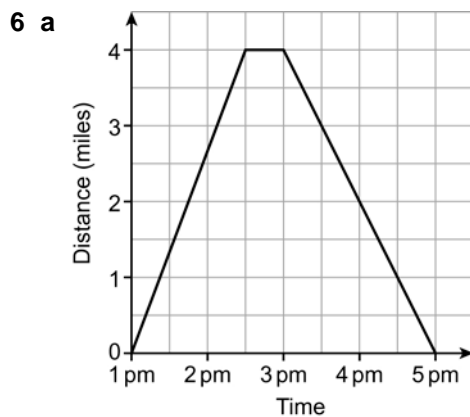
b $2n - 1$

c $15 - 2n$

5 a Yes; e.g. the term-to-term rule is always '-3'.

b No; e.g. the term-to-term rule is not a multiplication, the rule is $-1, -2, -3, -4, \dots$

Straight-line graphs



b 2 mph

c 2 mph

7 a

$y = mx + c$	Gradient m	y -intercept $(0, c)$
$y = 2x + 6$	2	(0, 6)
$y = -4x + 1$	-4	(0, 1)
$y = 2x + 1$	2	(0, 1)
$y = \frac{1}{4}x - 7$	$\frac{1}{4}$	(0, -7)

b $y = 2x + 6$ and $y = 2x + 1$

c $y = -4x + 1$ and $y = 2x + 1$

d $y = -4x + 1$

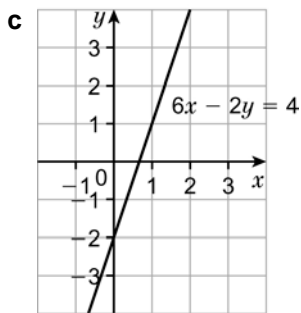
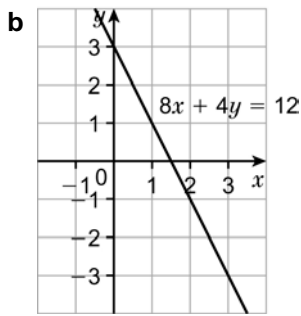
8 a i their gradient; they are parallel

ii their y -intercept

b equations A and D

9 a i (0, 3)

ii $(1\frac{1}{2}, 0)$



d $(1, 1)$

10 a $y \leftarrow \left(\div 3 \right) \leftarrow \left(-9x \right) \leftarrow 15$

b i $y = -\frac{1}{3}x + \frac{2}{3}$

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

Non-linear graphs

- 11** i graph A
 ii graph C
 iii graph D
 iv graph B

12 a 35 cm

b week 7

c e.g. Probably shorter than average, as the growth is slowing down; last week it only grew 2 cm and it would need to grow 6 cm this week to become average height.

8 Extend

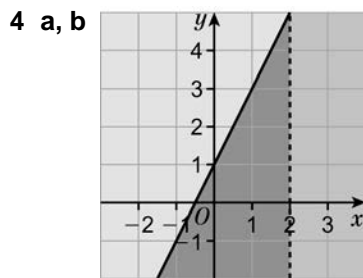
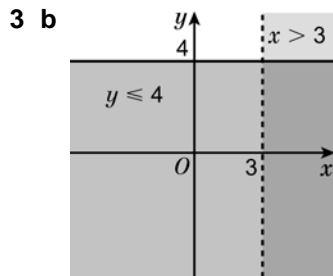
1 30, 38, 47

2 a

Pattern number	1	2	3	4	5
Number of white tiles	10	11	12	13	14
Number of grey tiles	2	4	6	8	10

b $2n$

- c $n + 9$
- d 20
- e 109
- f 41st pattern



- c any one of (1, 1), (1, 2) or (1, 3)
 - d either $(-1, -1)$ or $(-1, -2)$ (or any other point which would satisfy both inequalities, but is below the region shown)
- 5 a +2
- b +4
 - c +4
 - d $2n^2$
 - e $2n^2 + 3$
- 6 i graph A
- ii graph C
 - iii graph D
 - iv graph B
- 7 a 28 million
- b 2006 and 2007
 - c during 2009
 - d Accurate; e.g. 2009 started at just under 34 million and ended up at 35.5 million.
 - e 4.4 million
 - f 69%
 - g e.g. Eventually everyone may do this.

8 Unit test

- 1 $9n - 2$
- 2 a 6, 11, 16

 - b 8, 6, 4
 - c 4, 7, 12

3 equations A, B and D

4 a

Pattern number	1	2	3	4	5
White counters	3	6	9	12	15
Black counters	3	6	11	18	27

b $3n$

c arithmetic; the rule is +3

d $n^2 + 2$

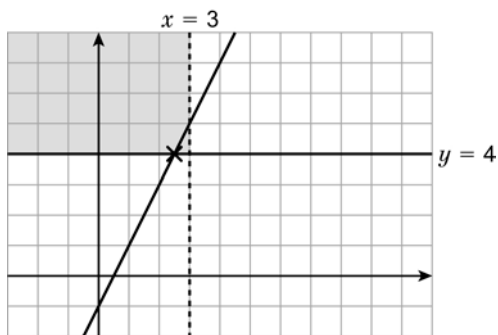
5 a about £7400

b 2012 to 2013

c during 2011

6 $x < 3, y \geq 4$

7 a



b $(2\frac{1}{2}, 4)$

8 i graph B

ii graph D

iii graph A

iv graph C

Unit 9 Answers

9.1 Calculating probabilities

1 a $\frac{53}{100}$

b $\frac{101}{400}$

c $\frac{147}{400}$

d Female; of the students with pets, there are more females ($\frac{152}{299}$) than males ($\frac{147}{299}$).

2 a i $\frac{23}{520}$

ii $\frac{93}{520}$

b Parent; $\frac{25}{520} < \frac{93}{520}$

c $\frac{44}{261}$

3 b 9 balls

c 16 balls

9.2 Experimental probability

1 a 100

b 0.24

c 280

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

b 85 times (using Jason's experimental probability)

3 a 0.3

b 0.7

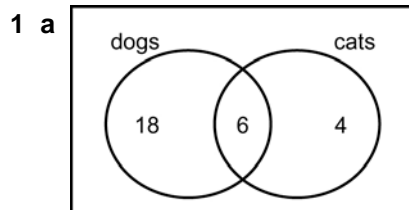
4 a i 4926 cars

ii 11 061.2 cars

b Weekday; 11 061.2 > 4926

c $\frac{87\,796}{260\,632} \times 12\,000 = 4042$ cars

9.3 Probability diagrams



b i $\frac{24}{28} = \frac{6}{7}$

ii $\frac{18}{28} = \frac{9}{14}$

2 a 3 students

b 9 students

c $\frac{17}{39}$

3 a

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

b 24 outcomes

c e.g. $P(\text{Fays wins}) = \frac{14}{24}$, which is greater than $\frac{1}{2}$.

d 35 times

e e.g. If the total is more than 6, Fay wins; if the score is exactly 6, it is a draw.

4 There might be more players of one sex at the bingo competition.

9.4 Independent events

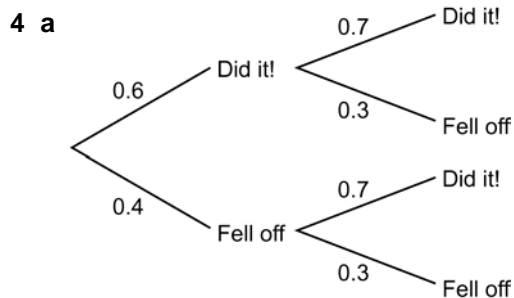
1 a $\frac{3}{5}$

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

2 events A and D

3 b $\frac{9}{49}$

c $\frac{24}{49}$



b 0.42

9 Strengthen

Probability from tables and diagrams

1 b $\frac{21\,700}{69\,400}$ or 0.31

c $\frac{11\,500}{33\,700}$ or 0.34

2 a

Jodi's bag	C	S, C	C, C	T, C
	S	S, S	C, S	T, S
		S	C	T

Rick's bag

b 6 outcomes

c $\frac{1}{6}$

d $\frac{4}{6} = \frac{2}{3}$

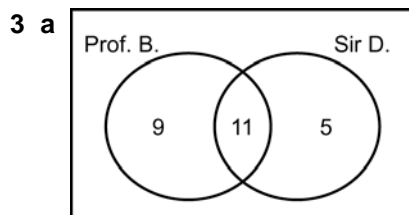
e

Jodi's bag	H	S, H	C, H	T, H	H, H
	C	S, C	C, C	T, C	H, C
	S	S, S	C, S	T, S	H, S
		S	C	T	H

Rick's bag

f at least one hexagon

g $\frac{6}{12} = \frac{1}{2}$



b 25 students

c $\frac{11}{25}$

Mutually exclusive events

4 10%

Independent events and experimental probability

5 a $\frac{18}{120} = \frac{3}{20}$

b No; e.g. the probabilities aren't even close to being the same.

c $\frac{1}{6}$

d 20

6 a 0.64

b i 0.16

ii 0.16

iii 0.32

9 Extend

1

3	4	5	6	7	8
2	3	4	5	6	7
1	2	3	4	5	6
	1	2	3	4	5

Even; 7 of the possible outcomes are odd and 8 are even.

2 a 9%

b 8.333...%

c 50 times

d No; e.g. all of the probabilities are close to what would be expected.

3 a Box B; $P(\text{nut from A}) = 0.285\dots$, $P(\text{nut from B}) = 0.363\dots$, $P(\text{nut from C}) = 0.314\dots$

b Box B; $P(\text{nut from A}) = 0.285\dots$, $P(\text{nut from B}) = 0.0.333\dots$, $P(\text{nut from C}) = 0.314\dots$

4 a e.g. If there were 10 sweets, there would be 1.5 blackberry and 2.5 lemon flavoured sweets.

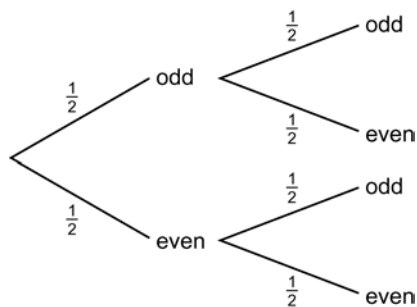
b 20 sweets

5 a 0.43

b 17 counters

6 $\frac{1}{8}$

7 a



b $\frac{3}{4}$

c $\frac{1}{4}$

d Take it away from 1.

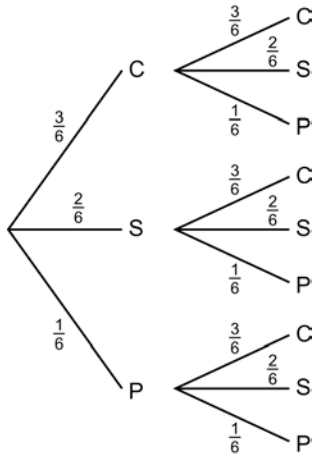
8 a $\frac{1}{8}$

b $\frac{1}{8}$

c $\frac{1}{8}$

d $\frac{7}{8}$

9 a



b i $\frac{4}{36} = \frac{1}{9}$

ii $\frac{27}{36} = \frac{3}{4}$

9 Unit test

1 a 0.21

b 0.15

c male

2 a

C	S, C	C, C	T, C
S	S, S	C, S	T, S
	S	C	T

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

3 a i 2 boys or 2 girls

ii 1 boy and 1 girl

b 77%

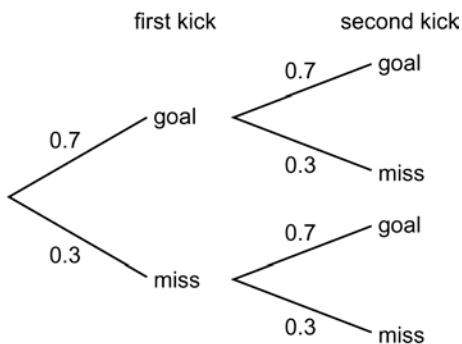
4 a 0.3

b 0.5

c 0.2

d Yes; 0.5 chance for each.

5 a

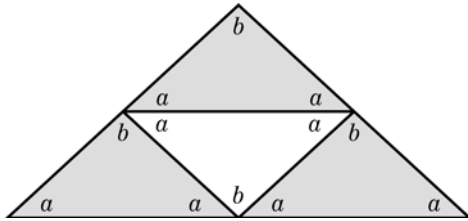


b $P(M, G) + P(G, M) = 0.7 \times 0.3 + 0.3 \times 0.7 = 0.42$

Unit 10 Answers

10.1 Congruent and similar shapes

1



2 Congruent to shape A: shape G (exactly the same size)

Similar to shape A: shape B (exactly half size)

Neither of these: shapes C, D, E and F (not an exact multiple of size)

3 a e.g. They are vertically opposite angles and so are the same size.

b $\angle ACB = \angle DCE$ and $\angle ABC = \angle CDE$ (so $\angle BAC = \angle CED$), and $AC = CE$
because the reason for congruency is AAS.

4 $a = 60^\circ$

$b = 6$

$c = 7$

$d = 60^\circ$

$e = 6.5$

$f = 6$

$g = 60^\circ$

$h = 55^\circ$

$i = 65^\circ$

10.2 Ratios in triangles

1 a $p = 9, q = 5.333\dots$

b $r = 8, s = 12.5$

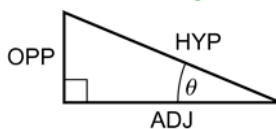
2 Yes

3 b 3.75

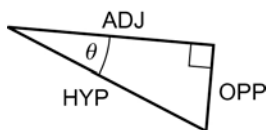
4 3

10.3 The tangent ratio

1 i



ii



2 a 0.1

b 28.6

3 a $\tan \theta = \frac{8}{12}$

b $\tan \theta = \frac{18}{5}$

4 a 14.0 cm

b 7.2 cm

5 4.28 m

10.4 The sine ratio

1 a 0.1

b 1.0

2 a $\sin \theta = \frac{6}{10}$

b $\sin \theta = \frac{2.4}{2.6}$

3 a 7.5 cm

b 5.4 m

4 4.53 m

5 47 m

10.5 The cosine ratio

1 a 1.0

b 0.4

2 a $\cos \theta = \frac{48}{52}$

b $\cos \theta = \frac{9}{15}$

3 a 5.9 cm

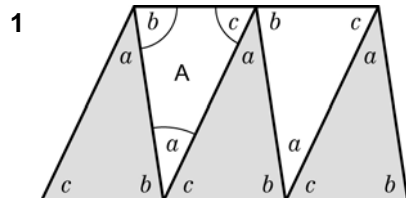
b 0.2 m

4 18.58 m

5 69 km

10 Strengthen

Congruence and similarity



2 b ii Yes

c shapes A and F; shapes B, D and G; shapes C, E and H

3 a

Shape	A	B
Height	6	12
Width	8	x
Hypotenuse	10	y

b 2

c $x = 16, y = 20$

4 a e.g. They are both at the same angle (90°) from the base.

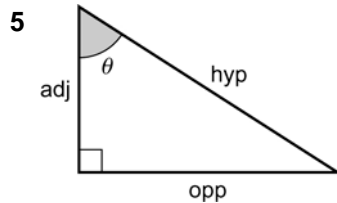
b e.g. $\angle PRQ$, because the triangles PRQ and PTS are similar.

c AAA

d 1.5

e 13.5 cm

Sine, cosine and tangent



6 a $\tan 20^\circ = \frac{x}{12}$

b $x = 12 \times \tan 20^\circ$

c 4.4 cm

7 a $\sin 25^\circ = \frac{x}{15}$

b $x = 15 \times \sin 25^\circ$

c 6.3 cm

8 a $\cos 30^\circ = \frac{x}{18}$

b $x = 18 \times \cos 30^\circ$

c 15.6 cm

10 Extend

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

b AAA

c 5

d $x = 1, y = 4$

e (1, 4)

2 (10, 15)

3 a $\angle AED = \angle ABC$ (symmetry)

$$\angle EDC = \angle BCD \text{ (symmetry)} = \frac{540 - 40 - 150 - 150}{2} = 100^\circ$$

$\angle PTS = \angle PQR$ (symmetry)

$\angle TSR = \angle QRS$ (symmetry)

$\angle TPQ = 540 - 150 - 150 - 100 - 100 = 40^\circ$

$\angle BAE = \angle QPT, \angle ABC = \angle PQR, \angle BCD = \angle QRS, \angle CDE = \angle RST, \angle AED = \angle PTS$

b 9.3 cm

4 2.02 m

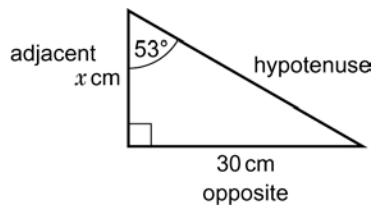
5 99.5 cm^2

6 a $\sin 25^\circ = \frac{9}{x}$

b $x = \frac{9}{\sin 25^\circ}$

c 21.3 cm

7 a



b tangent

c 22.61 cm (2 d.p.)

8 a 5 m

b 4.67 m (2 d.p.)

c 3.58 m (2 d.p.)

d No; e.g. $4.667^2 + 5^2 \neq 7.575^2$

9 38.5 m

10 Unit test

1 Yes; e.g. one white shape and one grey shape are two halves of a parallelogram.

2 shapes B, D and G

3 a $a = 35^\circ, b = 9 \text{ cm}$

b $c = 45^\circ, d = 7 \text{ cm}$

c $e = 9 \text{ cm}, f = 7.5 \text{ cm}, g = 100^\circ, h = 45^\circ$

4 a 3

b $x = 5 \text{ cm} \times 3 = 15 \text{ cm}$

5 (3, 1)

6 5.6 cm

7 67.3 cm

8 9.8 cm