



for **AQA, Edexcel** and **OCR**
two-tier GCSE mathematics

Answers for *Higher transition practice*

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1 Calculation and estimation

A Decimals and place value (p 7)

- 1 (a) 3 000 000 (b) $\frac{3}{10}$ (c) 30
(d) $\frac{3}{100}$ (e) $\frac{3}{1000}$
- 2 (a) 3.1, 3.4, 3.42, 3.5
(b) 0.08, 0.12, 0.2, 0.23
(c) 0.07, 0.079, 0.709, 0.79
(d) 0.0016, 0.016, 0.106, 0.16
- 3 (a) 57 (b) 1.27 (c) 568 (d) 3.482
(e) 79.3 (f) 320 (g) 30.4 (h) 0.12
(i) 5680 (j) 0.0049 (k) 0.0802 (l) 0.000 53

B Multiplying by a decimal (p 7)

- 1 (a) 12 (b) 0.24 (c) 3.5 (d) 30 (e) 140
(f) 200 (g) 0.008 (h) 0.4 (i) 12 (j) 900
- 2 (a) 0.5×40 , 5×4 , 50×0.4 , 500×0.04
(b) 0.5×4 , 5×0.4 , 50×0.04
(c) 0.5×0.4 , 5×0.04
(d) 0.4×0.4 , 4×0.04
(e) 0.5×0.5

C Dividing by a decimal (p 7)

- 1 (a) 50 (b) 5 (c) 20 (d) 7 (e) 400
(f) 20 (g) 400 (h) 6 (i) 50 (j) 15
- 2 $\frac{0.4}{0.08}$ and $\frac{3}{0.6}$, $\frac{0.3}{0.6}$ and $\frac{0.1}{0.2}$, $\frac{5}{0.1}$ and $\frac{1.5}{0.03}$
- 3 (a) 1.6 (b) 0.6 (c) 0.7 (d) 0.3 (e) 15
- 4 (a) 6 (b) 0.2 (c) 4 (d) 0.02

D Rounding whole numbers

E Rounding decimals (p 8)

- 1 (a) 33 000 (b) 1 090 000 (c) 60 500
(d) 85 000 000 (e) 350 000 (f) 61 000 000
- 2 (a) 2.6 (b) 0.75 (c) 0.043
(d) 1.01 (e) 6.805 (f) 14.90
- 3 (a) 1.21 (b) 4.88 (c) 9.91 (d) 2.75
(e) 2.72 (f) 0.59 (g) 3.79 (h) 0.38

F Rounding to one significant figure (p 8)

- 1 (a) 50 000 (b) 8000 (c) 20 000 (d) 800
(e) 4 000 000 (f) 0.07 (g) 0.9 (h) 2
(i) 0.005 (j) 0.1

- 2 (a) 1200 (b) 4800 (c) 12 000 (d) 12 000
(e) 18 000

- 3 (a) 20 (b) 150 (c) 1.8 (d) 0.32
(e) 120 (f) 27 (g) 210 (h) 140

4 £2.40

5 £36

G Rounding to two or more significant figures (p 9)

- 1 (a) 57 000 (b) 2300 (c) 31 000
(d) 4000 (e) 6 000 000 (f) 15
(g) 3.9 (h) 8.0 (i) 0.0052
(j) 0.080
- 2 (a) 242 000 (b) 10 400 (c) 8430
(d) 304 000 (e) 13 300 000 (f) 0.0153
(g) 0.810 (h) 0.502 (i) 0.007 32
(j) 2.01

H Sensible accuracy (p 9)

- 1 (a) 1.65 (b) 29 or 28.6 (c) 630 or 627
- 2 East: 8.10 people per km²
West: 8.14 people per km²

I Mixed questions (p 9)

- 1 (a) 3.51 (b) 0.351 (c) 3510 (d) 13
(e) 27 (f) 1300 (g) 1.3 (h) 270
- 2 (a) 4 100 000 (b) 4 070 000
- 3 (a) 14 m²
(b) It is bigger, because 7 is bigger than 6.79 and 2 is bigger than 1.85.
(c) 12.6 m²

2 Graphing changes over time

A Fairground graphs (p 10)

- 1 (a) Y (b) X (c) Z
- 2 (a) A: S; B: P; C: Q
(b) A description of a situation that matches graph R, e.g. speed (y) against time for a cyclist riding along and then braking to a halt

3 Unitary method

A Problems (p 11)

- 1 (a) 600 g (b) 250 g (c) 60 g (d) 350 ml
2 645 g
3 £4.83

B Cancelling common factors

C Using cancelling (p 11)

- 1 (a) $17 \times 5 = 85$ (b) $21 \times 3 = 63$ (c) $3 \times 3 = 9$
(d) $3 \times 7 = 21$ (e) $5 \times 9 = 45$
2 (a) $\frac{6 \times 20}{24}$ (b) 5
3 45 g
4 20 litres
5 (a) 16 mm (b) 45 days

D Using a calculator (p 12)

- 1 424 miles
2 (a) 10.2 g (b) Chocolate Crisp by 2.5 g
3 (a) 293 g (b) 16 cm³

E Dealing with units of measure (p 12)

- 1 43.48 km
2 (a) \$67.68 (b) €89.15
3 (a) 9.08 kg (b) 92.5 lb (to 1 d.p.)

4 Fractions

A Fractions review (p 13)

- 1 (a) $\frac{4}{5} = \frac{12}{15}$ (b) $\frac{2}{7} = \frac{12}{42}$ (c) $\frac{2}{9} = \frac{8}{36}$
(d) $\frac{7}{8} = \frac{49}{56}$ (e) $\frac{8}{11} = \frac{40}{55}$
2 (a) $\frac{4}{5}$ (b) $\frac{2}{3}$ (c) $\frac{1}{3}$ (d) $\frac{3}{5}$ (e) $\frac{2}{5}$
3 (a) $\frac{13}{4}$ (b) $\frac{8}{3}$ (c) $\frac{15}{4}$ (d) $\frac{19}{8}$ (e) $\frac{7}{5}$
4 (a) $4\frac{1}{2}$ (b) $2\frac{3}{4}$ (c) $3\frac{2}{5}$ (d) $2\frac{5}{6}$ (e) $6\frac{1}{3}$
5 (a) $\frac{1}{7}$ (b) $\frac{2}{5}$ (c) $\frac{16}{35}$
6 (a) 15 (b) 24 (c) 75 (d) 63 (e) 45

B Ordering fractions

C Addition and subtraction (p 13)

- 1 (a) $\frac{4}{5}$ (b) $\frac{4}{7}$ (c) $\frac{1}{4}$ (d) $\frac{5}{6}$ (e) $\frac{5}{12}$

- 2 (a) $\frac{3}{5}, \frac{2}{3}, \frac{7}{10}$ (b) $\frac{3}{4}, \frac{7}{9}, \frac{5}{6}$ (c) $\frac{1}{5}, \frac{2}{9}, \frac{4}{15}$
3 (a) $\frac{11}{24}$ (b) $\frac{19}{20}$ (c) $\frac{14}{15}$ (d) $\frac{13}{24}$ (e) $\frac{41}{60}$
4 (a) $\frac{1}{3}$ (b) $\frac{1}{24}$ (c) $\frac{9}{20}$ (d) $\frac{16}{35}$ (e) $\frac{7}{18}$
5 (a) $2\frac{1}{12}$ (b) $1\frac{5}{6}$ (c) $3\frac{13}{20}$ (d) $1\frac{11}{24}$ (e) $4\frac{13}{40}$
6 (a) $\frac{4}{5}$ (b) $\frac{1}{5}$
(c) $\frac{4}{5}$ and $\frac{3}{10}$ or $\frac{7}{10}$ and $\frac{1}{5}$ (d) $\frac{1}{5}$ and $\frac{2}{3}$

D Multiplying a fraction by a whole number

E Dividing a fraction by a whole number (p 14)

- 1 (a) 6 (b) 2 (c) 3 (d) $1\frac{3}{4}$ (e) $3\frac{1}{3}$
2 (a) $5\frac{1}{4}$ (b) $7\frac{1}{5}$ (c) $6\frac{3}{5}$ (d) $1\frac{1}{4}$ (e) $3\frac{1}{3}$
3 (a) $\frac{1}{4} \times 5 = 1\frac{1}{4}$ (b) $\frac{1}{3} \times 12 = 4$
(c) $\frac{3}{4}$ of 20 = 15 (d) $\frac{2}{3}$ of 5 = $3\frac{1}{3}$
4 (a) $\frac{1}{12}$ (b) $\frac{1}{12}$ (c) $\frac{3}{16}$ (d) $\frac{3}{10}$ (e) $\frac{5}{60} = \frac{1}{12}$
5 $\frac{1}{6}$
6 9 miles
7 $\frac{1}{6}$

F Fractions of fractions

G Multiplying fractions together (p 14)

- 1 (a) $\frac{1}{24}$ (b) $\frac{1}{30}$ (c) $\frac{5}{24}$ (d) $\frac{2}{5}$ (e) $\frac{1}{6}$
(f) $\frac{1}{14}$ (g) $\frac{7}{24}$ (h) $\frac{15}{32}$ (i) $\frac{1}{4}$ (j) $\frac{6}{25}$
2 (a) $\frac{1}{2}$ (b) $\frac{3}{4}$ (c) $2\frac{1}{2}$ (d) $4\frac{1}{5}$ (e) $2\frac{7}{10}$
3 (a) $\frac{1}{2} \times \frac{2}{5} = \frac{1}{5}$ (b) $\frac{3}{4}$ of $\frac{2}{3} = \frac{1}{2}$
(c) $\frac{2}{3} \times 1\frac{1}{2} = 1$ (d) $\frac{2}{3}$ of $2\frac{1}{4} = 1\frac{1}{2}$

H Changing between fractions and decimals

I Recurring decimals (p 15)

- 1 (a) $\frac{7}{10}$ (b) $\frac{18}{25}$ (c) $\frac{77}{100}$ (d) $\frac{3}{4}$ (e) $\frac{29}{40}$
2 (a) 0.26 (b) 0.15 (c) 0.5625
(d) 0.833 333 3... (e) 0.888 888 8...
3 (a) Keyboard (b) Xylophone (c) Trombone

J Mixed questions (p 15)

- 1 (a) $\frac{7}{10}$ (b) $\frac{3}{10}$ (c) $\frac{1}{10}$ (d) $\frac{3}{10}$
2 (a) $\frac{17}{24}$ (b) $\frac{1}{8}$ (c) $\frac{1}{24}$ (d) $3\frac{1}{6}$
3 $\frac{3}{16}$
4 $\frac{5}{24}$

5 Parallel lines and angles

A Angles from parallel lines crossing (p 16)

- 1 (a) a and b , h and g
(b) Any two pairs from a and c , b and d , e and f , and h and f
(c) b and c , f and g
(d) d and e , c and h
- 2 (a) 50° (corresponding angles)
(b) 37° (vertically opposite angles)
(c) 99° (supplementary angles between parallels add up to 180°)
- 3 $a = 66^\circ$ (angles on a straight line add up to 180°)
 $b = 114^\circ$ (alternate angles)
 $c = 58^\circ$ (corresponding angles)
 $d = 70^\circ$ (vertically opposite angles)
 $e = 110^\circ$ (supplementary angles between parallels add up to 180°)
 $f = 48^\circ$ (angles on a straight line add up to 180°)
 $g = 91^\circ$ (corresponding angles)
 $h = 48^\circ$ (supplementary angles between parallels add up to 180° (or alternate angles using the answer for f))
- 4 (a) 119° (b) 43° (c) 144° and 36°

B Finding angles in two or more steps (p 17)

- 1 $\angle CBE = 38^\circ$ (angles on a straight line add up to 180°)
 $a = 38^\circ$ (= CBE, alternate angles)
 $\angle IGH = 88^\circ$ (corresponding angles)
 $b = 92^\circ$ (angles on a straight line add up to 180°)
 $\angle OLQ = 360^\circ - (67^\circ + 80^\circ + 94^\circ) = 119^\circ$ (angles round a point add up to 360°)
 $c = 180^\circ - 119^\circ = 61^\circ$ (supplementary angles between parallels add up to 180°)
- 2 $\angle BCH = 74^\circ$ (= $\angle ABG$, corresponding angles)
 $\angle ECD = 74^\circ$ (= $\angle BCH$, vertically opposite angles)
 $p = 74^\circ - 39^\circ = 35^\circ$
 $\angle IJK = 60^\circ$ (= $\angle JLM$, corresponding angles)
 $\angle IKJ = 180^\circ - 132^\circ = 48^\circ$ (angles on a straight line add up to 180°)
 $q = 72^\circ$ (angles of a triangle add up to 180°)
 $\angle QRP = 152^\circ$ (= $\angle NQO$, corresponding angles)
 $\angle QRS = 180^\circ - 152^\circ = 28^\circ$ (angles on a straight line add up to 180°)
 $\angle QSR = 28^\circ$ (= $\angle QRS$, angles opposite equal sides of an isosceles triangle)
 $r = 360^\circ - 28^\circ = 332^\circ$ (angles round a point add up to 360°)

- 3 With explanations, $x = 35^\circ$, $y = 87^\circ$, $z = 144^\circ$
4 106° , with sketch

6 Percentages

A Percentages, decimals and fractions (p 18)

- 1 (a) $\frac{9}{20}$ (b) $\frac{3}{50}$ (c) $\frac{17}{100}$ (d) $\frac{22}{25}$ (e) $\frac{4}{5}$
- 2 A and G, B and I, C and F, D and H, E and J
- 3 (a) 26% (b) 42% (c) 36% (d) 20% (e) 70%
- 4 (a) 65%, $\frac{7}{10}$, $\frac{3}{4}$, 0.8, 85% (b) $\frac{1}{25}$, $\frac{1}{20}$, 0.08, 15%, 0.2
(c) $\frac{2}{5}$, 42%, $\frac{9}{20}$, $\frac{12}{25}$, 0.5 (d) 0.6, 66%, $\frac{2}{3}$, 0.67, 70%

B Percentage of a quantity (p 18)

- 1 (a) 18.72 (b) 301.5 (c) 2.492
- 2 1000
- 3 (a) 33.75 g (b) 2.29 g (to 2 d.p.)
- 4 (a) £16.98 (b) £3.65 (c) £23.44
- 5 £2437
- 6 £9062.50

C One number as a percentage of another (p 19)

- 1 Oak 15%, beech 25%, chestnut 60%
- 2 $\frac{28}{50} = 56\%$, $\frac{22}{40} = 55\%$, $\frac{39}{75} = 52\%$, so $\frac{28}{50}$ is the best result.
- 3 (a) A: 36.6%, B: 37.4%, C: 21.4%, D: 20.2%, E: 32.4%
(b) D
(c) 4632
(d) 28.5%
- 4 (a) Everlasting 61.9%, Goodlife 60.2%
(b) 61.1%

D Percentage increase and decrease (p 19)

- 1 £64
- 2 75 mm
- 3 600 g

E Increasing using a multiplier

F Decreasing using a multiplier (p 19)

- 1 (a) 1.23 (b) 0.85 (c) 1.04 (d) 0.98
 2 (a) £36.80 (b) £907.20 (c) £255.69 (d) £246.10
 3 (a) £32.40 (b) £460.35 (c) £126.36 (d) £472.41
 4 £18900
 5 3014
 6 69kg
 7 34840
 8 £780
 9 38150
 10 £25529

G Finding an increase as a percentage

H Finding a decrease as a percentage (p 20)

- 1 10%
 2 5%
 3 7.1%
 4 (a) 6% increase (b) 15% decrease
 (c) 19% decrease (d) 10% increase
 (e) 3% decrease (f) 6% increase
 5 27.1%
 6 32.0%

I Mixed questions (p 21)

- 1 (a) 2 200 000 (b) 41%
 2 (a) (i) 85% (ii) 94%
 (b) (i) 24% (ii) 114%
 (c) 10 650
 (d) 13 100

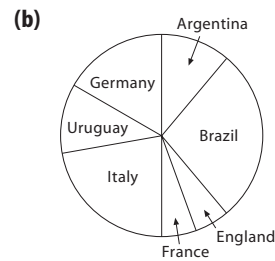
7 Pie charts

A Interpreting pie charts (p 22)

- 1 (a) White bread contains 15 times as much protein as butter contains.
 (b) 20.6 g
 (c) 8.2 g
 2 40 g bread contains 3 g protein, 1.8 g fat and 20.6 g carbohydrate.
 Number of calories = $3 \times 4 + 1.8 \times 9 + 20.6 \times 4 = 110.6$
 10 g butter contains 0.05 g protein, 8.2 g fat and 0.05 g carbohydrate.
 Number of calories = $0.05 \times 4 + 8.2 \times 9 + 0.05 \times 4 = 74.2$
 Total number of calories = $110.6 + 74.2 = 184.8$

B Drawing a pie chart using angles (p 22)

- 1 (a) 20°

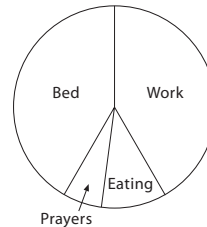


(The angles are: Argentina 40° , Brazil 100° , England 20° , France 20° , Italy 80° , Uruguay 40° , Germany 60° .)

- 2 (a)

Activity	Number of hours	Angle in pie chart
Work	10	150°
Eating	$2\frac{1}{2}$	37.5°
Prayers	$1\frac{1}{2}$	22.5°
Bed	10	150°
Total	24	360°

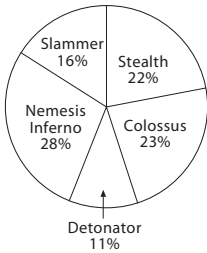
- (b)



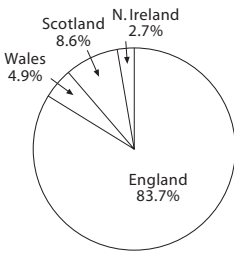
C Drawing a pie chart using a percentage scale

D Mixed questions (p 23)

1

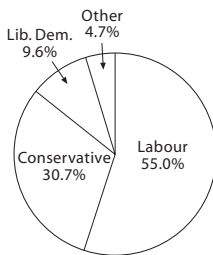


2

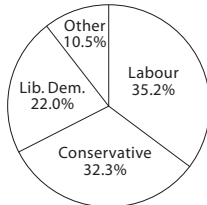


- 3 (a) Labour 55.0%, Conservative 30.7%, Liberal Democrat 9.6%, Others 4.7%

(b) Seats



Votes



- (c) Labour's percentage of seats is much higher than its percentage of votes. It is the other way round for the other parties.

Mixed practice 1 (p 24)

1 4962000

2 (a) 120 (b) 0.0493 (c) 0.004

3 An approximate answer can be obtained using one of these calculations:

$$300 \times 3000 = 900\,000$$

$$300 \times 3200 = 960\,000$$

$$280 \times 3000 = 840\,000$$

4 30

5 (a) 12 (b) $\frac{13}{40}$ (c) $\frac{5}{8}$ (d) $10\frac{2}{3}$ (e) $\frac{4}{15}$
 (f) $\frac{1}{12}$ (g) $3\frac{1}{4}$ (h) $2\frac{1}{2}$ (i) $\frac{3}{8}$ (j) $\frac{2}{11}$

6 $a = 50^\circ$ (corresponding angles)

$b = 130^\circ$ (supplementary angles on a straight line add up to 180°)

$c = 85^\circ$ (vertically opposite angles)

$d = 85^\circ$ (corresponding angles or alternate angles)

$e = 70^\circ$ (supplementary angles between parallel lines add up to 180°)

7 (a) Maia (b) 65% (c) $\frac{7}{20}$

8 (a) 3 (b) 70 (c) 2.1 (d) 6.8

9 0.027, 3%, 0.3, $\frac{33}{100}$, $\frac{1}{3}$

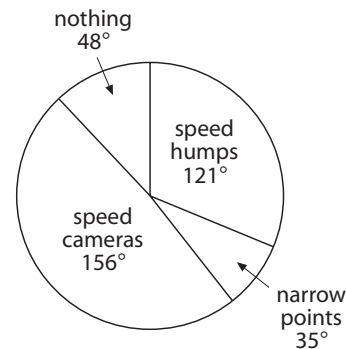
10 (a) 8 (b) 21 days

11 £1.53

12 91 g or 90 g

13 £4648

14 (a)



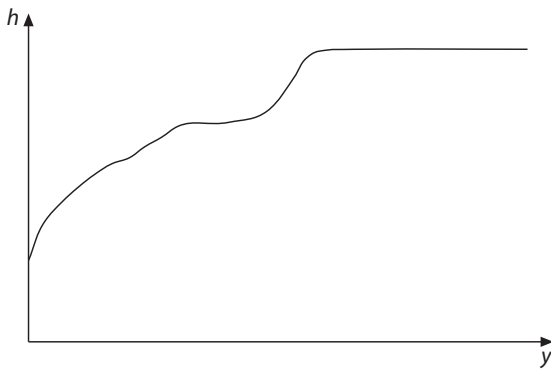
(b) 43% (to the nearest 1%) or 43.4% (to the nearest 0.1%)

15 (a) 25600 (b) 1090000

(c) 3.48 (d) 0.00487

16 1130

17 A sketch graph such as this



18 14% (to the nearest 1%) or 13.7% (to the nearest 0.1%)

19 £3.07

20 One explanation for angle x is
 $\angle HDE = 60^\circ$ (alternate angles)
 $x = 180^\circ - (60^\circ + 70^\circ) = 50^\circ$ (supplementary angles on a straight line add up to 180°)
 One explanation for angle y is
 $\angle QST = 40^\circ$ (supplementary angles between parallel lines add up to 180°)
 $\angle QSV = 60^\circ$ (vertically opposite angles)
 $y = 60^\circ - 40^\circ = 20^\circ$

21 4% (to the nearest 1%) or 4.4% (to the nearest 0.1%)

22 0.888... or $0.\dot{8}$

23 Euros

8 Pythagoras's theorem

B Squares on right-angled triangles (p 26)

1 (a) 15 cm^2 (b) 9 cm^2 (c) 12 cm^2

2 (a) 28 cm^2 (b) 35 m^2 (c) 7 m (d) 6 m

3 (a) 11 cm (b) 17 cm (c) 6 cm

C Square roots – a reminder

D Using Pythagoras (p 26)

1 (a) 8.9 cm (b) 5.8 cm (c) 9.2 cm (d) 15.8 cm

(e) 9.9 cm (f) 17.1 cm

2 (a) 9.5 cm (b) 7.5 cm (c) 13.9 cm (d) 10.7 cm

3 10.5 cm

4 6.4 cm

5 6.3 m (with sketch)

6 (a) 8.66 cm (b) 43.3 cm^2

7 Grid showing points P (-2, 1) and Q (5, 3); 7.28 units

8 (a) 6.32 units (b) 5.00 units (c) 7.62 units

9 14.3 km

10 $a = 37.1 \text{ cm}$, $b = 56.5 \text{ cm}$, $c = 41 \text{ cm}$

9 Working with linear expressions

A Substitution (p 28)

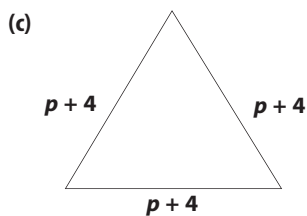
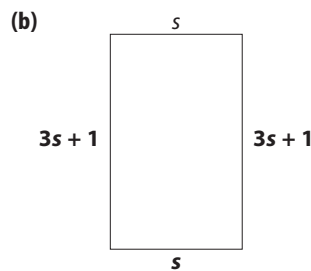
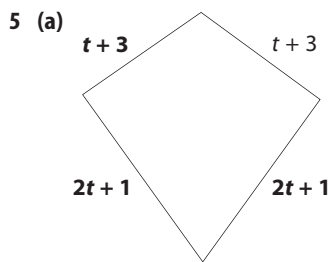
- 1 (a) V: 12; W: 12; X: 3; Y: $4\frac{1}{2}$; Z: 5
 (b) W: $15 - n$
 (c) V: $3(n + 1)$
 (d) Z: $11 - 2n$
- 2 (a) 52 (b) 3 (c) 9
- 3 (a) 15, 15, 20 (b) Isosceles

B Simplifying (p 28)

- 1 (a) $42n$ (b) $16x$ (c) $18a$ (d) $40b$ (e) $63k$
 (f) $2y$ (g) $8c$ (h) $6h$ (i) m (j) $2p$
- 2 (a) $2k + 13$ (b) $3h$ (c) $2g + 7$ (d) $4d + 5$
 (e) $8b - 5$ (f) $a - 3$ (g) 7 (h) $16 - 5x$
 (i) $6y - 7$ (j) $2 - a$ (k) $11 - 5p$ (l) $2 - 4m$
- 3 (a) $3x + 29$ (b) $80 - 2x$ (c) $120 - 6x$

C Brackets (p 29)

- 1 A, E; B, D; C, G; F, H
- 2 (a) $5n - 15$ (b) $3m + 18$ (c) $10 + 5x$ (d) $20 - 4n$
 (e) $6b + 12$ (f) $20n - 4$ (g) $12c + 10$ (h) $6 - 15x$
- 3 $3a + 9$
- 4 (a) $2(x + 4) = 2x + 8$ (b) $3(3p - 5) = 9p - 15$
 (c) $2(3m + 8) = 6m + 16$ (d) $3(4 + n) = 12 + 3n$



- 6 $3(y + 8)$
 7 $3t - 10$

D Dividing by a number (p 30)

- 1 $2n + 4$
 2 $3n - 2$
- 3 (a) $4x - 3$ (b) $2a - 4$ (c) $2 - d$
 (d) $4b + 3$ (e) $9 - 3e$ (f) $2b - 3$
- 4 (a) $2n + 5$ (b) $4n - 3$ (c) $2 - 3n$

E Justifying number puzzles (p 30)

1 Puzzle A

- (a) You always end up with the number you started with.
 (b) An explanation using the expressions
 $n \rightarrow n + 3 \rightarrow 2n + 6 \rightarrow 2n + 12 \rightarrow n + 6 \rightarrow n$

Puzzle B

- (a) You always end up with 0.
 (b) An explanation using the expressions
 $n \rightarrow n - 2 \rightarrow 5n - 10 \rightarrow 5n \rightarrow n \rightarrow 0$

Puzzle C

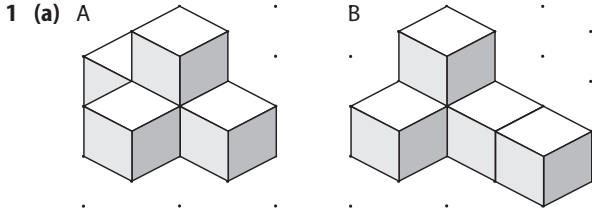
- (a) You always end up with 4.
 (b) An explanation using the expressions
 $n \rightarrow 3n \rightarrow 3n + 12 \rightarrow n + 4 \rightarrow 4$

- 2 A puzzle where the final answer is always 8

10 Representing 3-D objects

A The Soma cube

B Nets (p 31)

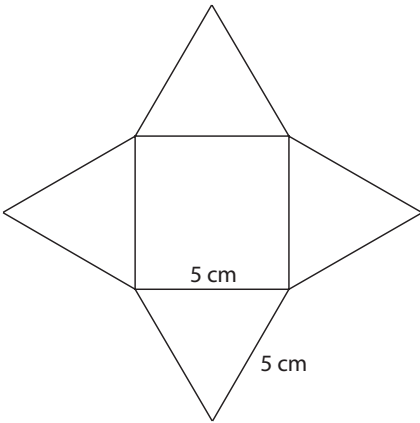


(b) 5 cm^3 , in both cases

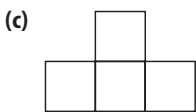
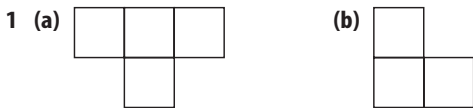
2 A

3 (a) Triangular prism (b) Hexagonal prism

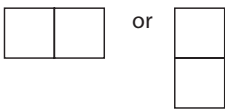
4 A full-size drawing of this net



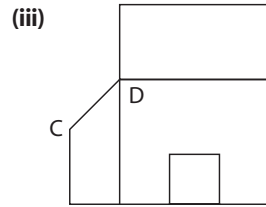
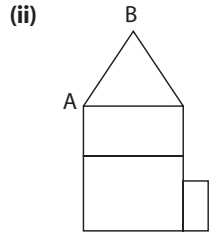
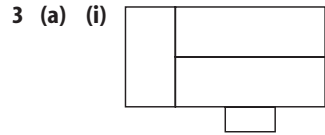
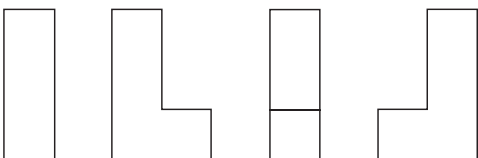
C Plan and elevations (p 32)



2 Plan



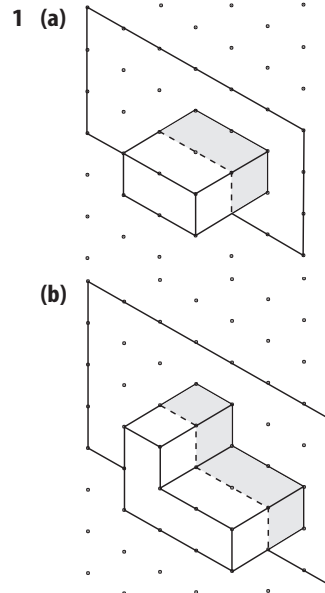
Elevations: the first and last of the following or any adjacent two



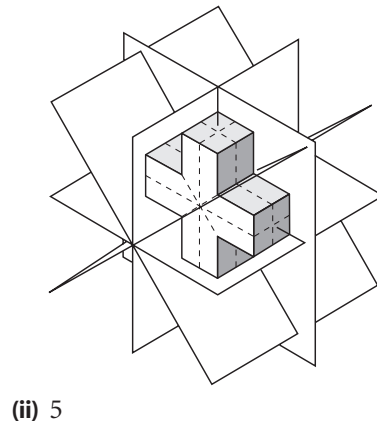
(b) Results close to $AB = 3.6 \text{ m}$, $CD = 2.8 \text{ m}$

(c) $AB = 3.61 \text{ m}$, $CD = 2.83 \text{ m}$

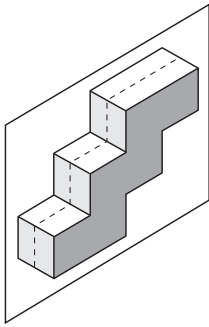
D Reflection symmetry (p 33)



2 (a) (i) Any one of these planes



(b) (i)



(ii) 1

- 3 (a) 3 (b) 5 (c) 9

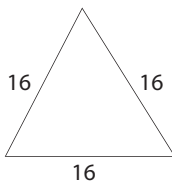
11 Linear equations

A Solving equations (p 34)

- 1 (a) $x = 7$ (b) $h = 3$ (c) $f = 4$
 (d) $y = 5$ (e) $n = 1$ (f) $z = 2$
 (g) $p = 1.5$ (h) $m = 0.5$ (i) $g = 2.5$
- 2 (a) $x = 4$ (b) $x = 1$ (c) $x = 5$
 (d) $x = 3$ (e) $x = 2$ (f) $x = 5$
 (g) $x = 1.5$ (h) $x = 3.5$ (i) $x = 0.5$
- 3 (a) $n = 4$ (b) $n = 1$ (c) $n = 3$
 (d) $n = 7$ (e) $n = 5$ (f) $n = 4$
 (g) $n = 1.5$ (h) $n = 2.5$ (i) $n = 3.5$
- 4 (a) $k = 2.8$ (b) $k = 3.75$ (c) $k = 1.875$
 (d) $k = 0.3125$ (e) $k = 1.75$ (f) $k = 0.475$

B Forming equations from shapes (p 34)

1 (a) (i)



(ii) Equilateral

(iii) 48

- (b) $6x + 12$
 (c) $x = 3$
- 2 6.4
- 3 (a) $20x - 4$ (b) 2
- 4 8

C Solving equations that involve brackets (p 35)

- 1 (a) $x = 4$ (b) $x = 5$ (c) $x = 2$
 (d) $x = 22$ (e) $x = 5$ (f) $x = 4$
 (g) $x = 10$ (h) $x = 4$ (i) $x = 2.5$
- 2 (a) $n = 3$ (b) $n = 4$ (c) $n = 1$
 (d) $n = 3$ (e) $n = 3$ (f) $n = 2.5$
- 3 (a) $k = 0.6$ (b) $k = 2.125$ (c) $k = 3.4$
 (d) $k = 2.75$ (e) $k = 1.2$ (f) $k = 5$

D Solving number puzzles (p 35)

- 1 (a) 12 (b) 4 (c) 8

12 Multiples, factors and powers

A Multiples, factors and primes (p 36)

- 1 (a) Three factors from 1, 2, 3, 4, 6, 12
 (b) Three different multiples of 12 from 12, 24, 36, 48, 60, 72, 84, ...
- 2 (a) 5 (b) 12 (c) 6 (d) 1
- 3 (a) 12 (b) 35 (c) 60 (d) 12
- 4 97
- 5 It ends in a 5 so it is a multiple of 5. But it is not 5 itself so it is not prime.
- 6 An explanation such as:
 Two different primes p_1 and p_2 have factors 1 and p_1 , 1 and p_2 respectively. Since p_1 and p_2 are different, the highest common factor is 1.

B Powers (p 36)

- 1 (a) 2^4 (b) 10^3 (c) 7^5
- 2 (a) 32 (b) 2^5
- 3 (a) 81 (b) 81 (c) 64
 (d) 10 000 (e) 8000
- 4 128
- 5 (a) 3 (b) 2 (c) 5
- 6 (a) = (b) < (c) <
- 7 (a) 2401 (b) 15 625 (c) 1024
 (d) 50 625 (e) 19 683
- 8 3^{12}

- 9 (a) $14^5, 12^6, 6^9, 8^8$ (b) $2^{11}, 3^7, 7^4, 5^5$
 10 (a) $x = 9$ (b) $x = 4$ (c) $x = 7$
 11 $5^8 = 390625$
 12 (a) The end digit of any power of 2 is even.
 The end digit here is 3 which is odd so there must be an error.
 (b) The end digit of any power of 5 is 5.
 The end digit here is 3 so there must be an error.
 (c) The end digit of any power of 4 is 4 or 6.
 The end digit here is 0 so there must be an error.
 (d) The end digit of any power of 6 is 6.
 The end digit here is 4 so there must be an error.

C Multiplying powers (p 37)

- 1 A and D $3^5 \times 3^3 = 3^8$
 B and C $3^9 \times 3 = 3^{10}$
 E and F $3^{10} \times 3^5 = 3^{15}$
 2 (a) 3^{13} (b) 2^{15} (c) 4^9 (d) 9^6
 3 (a) 6 (b) 2 (c) 3
 4 A and D
 5 (a) $3 \times 7^2 \times 3^3 \times 3^4 \times 7 = 3^8 \times 7^3$
 (b) $4^2 \times 5 \times 4^5 \times 5^4 = 4^7 \times 5^5$
 (c) $5^2 \times 4 \times 4^4 \times 5^3 = 4^5 \times 5^5$
 (d) $3^3 \times 9^3 \times 9^2 \times 3 = 3^4 \times 9^5$
 6 (a) $10^3 \times 9^9$ (b) $5^7 \times 6^3$ (c) $4^7 \times 7^6$

D Prime factorisation

E Highest common factor and lowest common multiple (p 38)

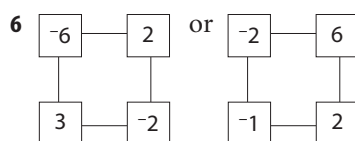
- 1 (a) $2^2 \times 3^2$ (b) $2 \times 3^2 \times 5^2$ (c) $3^2 \times 7^2$
 (d) $2^4 \times 3^2 \times 7$ (e) $2^3 \times 3 \times 5^2$
 2 The following appear in the prime factorisation so each bold number is a factor of 560.
 2 $8 = 2 \times 2 \times 2$
 $10 = 2 \times 5$ $16 = 2 \times 2 \times 2 \times 2$
 $20 = 2 \times 2 \times 5$ $35 = 5 \times 7$
 $70 = 2 \times 5 \times 7$ $14 = 2 \times 7$
 $140 = 2 \times 2 \times 5 \times 7$
 The following do not appear in the prime factorisation so the bold numbers are not factors of 560.
 $6 = 2 \times 3$ $9 = 3 \times 3$
 $60 = 2 \times 2 \times 3 \times 5$ $15 = 3 \times 5$
 3 The prime factorisations show that $13650 = 13 \times 1050$
 so 13650 is a multiple of 1050.

- 4 $r = 3, s = 3, t = 2$
 5 $2, 2^2 \times 7, 3 \times 11, 2 \times 11$
 6 1, 3, 9, 23, 69, 207
 7 (a) (i) $12 = 2^2 \times 3$ (ii) $15 = 3 \times 5$
 (b) (i) $2^2 \times 3 \times 5 = 60$ so 60 is the LCM.
 (ii) 3 appears in both products so 3 is the HCF.
 8 (a) 160 (b) 72 (c) 360 (d) 108
 9 (a) 6 (b) 20 (c) 6 (d) 140
 10 60
 11 28 and 44
 12 336

13 Negative numbers

A Calculating with positive and negative numbers (p 39)

- 1 (a) -7 (b) -5 (c) -2 (d) 10 (e) -5
 (f) -12 (g) 6 (h) -3 (i) -9 (j) 8
 2 (a) $-5 \times -3 \times 4 = 60$ (b) $-5 \times 3 \times 4 = -60$
 3 (a) 1, -2 (b) -1, 4 (c) -0.5, -2
 4 (a) $-2 + 1 = -1, -2 + 2 = 0, -1 + 1 = 0, -1 + 2 = 1$
 (b) $-1 - 2 = -3, -1 - 1 = -2, 0 - 2 = -2, 0 - 1 = -1,$
 $0 - 1 = -1, 0 - 2 = -2, 1 - 1 = 0, 1 - 2 = -1$
 5 (a) 16 (b) -8 (c) -14 (d) 17 (e) -1
 (f) 6 (g) 0 (h) 1



B Substitution (p 40)

- 1 (a) -1 (b) -3 (c) -1 (d) -5 (e) -20
 2 (a) -5 (b) 7 (c) 7 (d) 2 (e) -8
 3 (a) -1 (b) 36 (c) -4 (d) 22 (e) 4

4

p	-3	-2	-1	0	1	2	3	4
$h = 5 - p^2$	-4	1	4	5	4	1	-4	-11

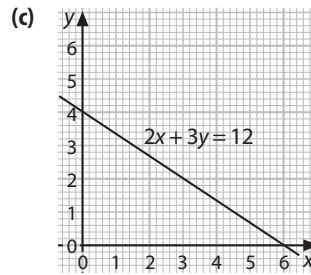
- 5 (a) $2(p + 1), 2p^2 - 10, \frac{p^3}{4}$ (b) $\frac{1-p}{2}, \frac{p^2-5}{-4}, 8-p^2$

C Equations with negative solutions (p 40)

- 1 (a) $k = -2$ (b) A check by substitution
 2 (a) $b = -1$ (b) $t = -4$ (c) $y = -3$
 (d) $p = -2$ (e) $t = -3$ (f) $z = -5$
 3 (a) $h = -2$ (b) $r = -4$ (c) $d = -2$
 (d) $j = -2$ (e) $t = -3$ (f) $z = -4$
 4 (a) $p = -1$ (b) $q = -3$ (c) $r = -10$
 (d) $s = -7$ (e) $t = -1.5$ (f) $v = -2$

5 (a) 4

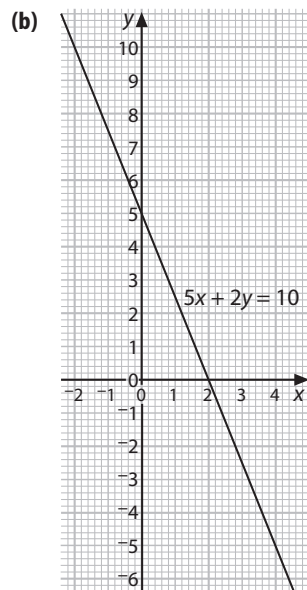
(b) 6



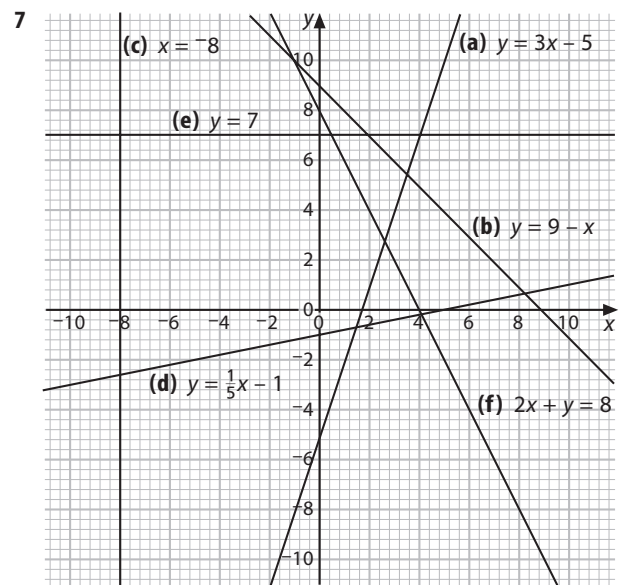
(d) 1.5

6 (a)

x	-2	0	2
y	10	5	0



(c) 2.5



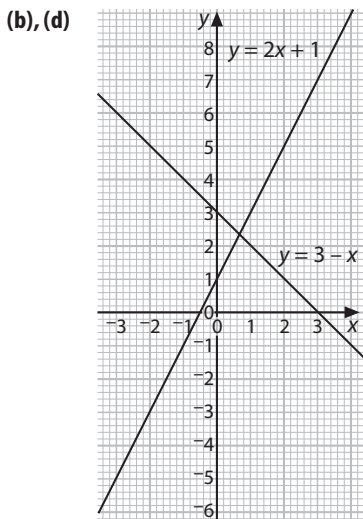
14 Drawing and using linear graphs

A Drawing straight-line graphs (p 41)

- 1 B: $y = 2x + 7$, C: $y = 9 - x$, D: $x = -3$, E: $y = 5$,
 F: $y = 3x + 5$, G: $y = 10 + x$, I: $x + y = 8$

2 (a)

x	-2	0	2
$2x + 1$	-3	1	5

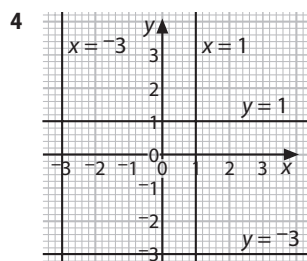


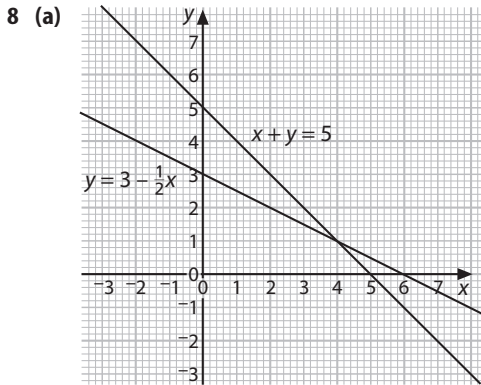
(c)

x	-2	0	2
$3 - x$	5	3	1

(e) (0.7, 2.3)

- 3 (a) No (b) Yes





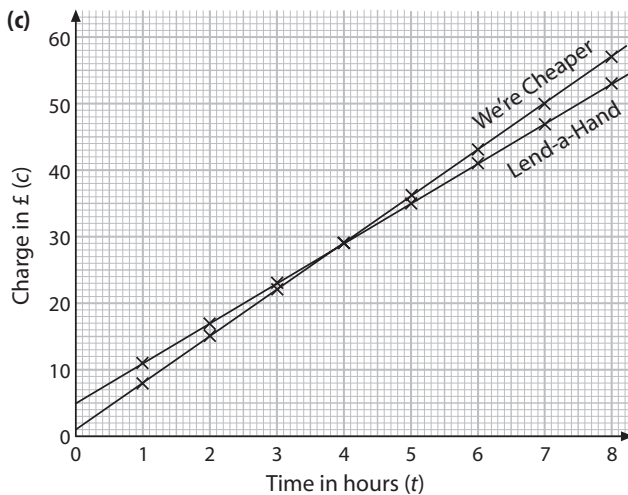
(b) (4, 1)

B Using graphs to solve problems (p 42)

1 (a) £17

(b)

Time in hours (t)	1	2	3	4	5	6	7	8
Charge in £ (c)	11	17	23	29	35	41	47	53



The line for Lend-a-Hand drawn as above

(d) £26

(e) 7.5 hours

2 (a) £15

(b)

Time in hours (t)	1	2	3	4	5	6	7	8
Charge in £ (c)	8	15	22	29	36	43	50	57

(c) The line for We're Cheaper drawn as in the graph of question 1 (c) above

(d) About 3.4 or 3.5 hours

(e) We're Cheaper is cheaper. An explanation such as: At $2\frac{1}{2}$ hours, the line for We're Cheaper is below the line for Lend-a-Hand.

(f) An explanation such as:

The lines cross at the point where the time is 4 hours, so both companies charge the same for this time.

15 Using a calculator

A Brackets and order of operations

B Division (p 43)

- 1 (a) 8.24 (b) 3.21 (c) 7.48 (d) 49.48
 (e) 38.10 (f) 7.13
- 2 (a) 1.82 (b) 23.2 (c) 1.05 (d) 2.36
 (e) 4.56 (f) 3.79

C Checking by rough estimates

D Other keys (p 43)

- 1 (a) (i) $\frac{50 \times 0.4}{0.5}$ (ii) 40
 (b) 35.6
- 2 (a) (i) 5.4 (ii) 4.59
 (b) (i) 9 (ii) 8.09
 (c) (i) 0.5 (ii) 0.520
- 3 (a) 36.48 (b) 117.61 (c) 8.49 (d) 1.63
- 4 (a) 0.656 (b) 1.29 (c) 1.38 (d) 1.05

16 Changing the subject

A Forming and using formulas (p 44)

1 (a)

Number of black tiles (b)	1	2	3	4	5
Number of grey tiles (g)	8	13	18	23	28

(b) An explanation

(c) (i) 53 (ii) 128 (iii) 503

(d) $103 = 5b + 3$, $b = 20$ so he uses 20 black tiles.

2 (a)

Number of black tiles (b)	1	2	3	4	5
Number of grey tiles (g)	4	6	8	10	12

(b) $g = 2b + 2$ or $g = 2(b + 1)$

(c) (i) 26 (ii) 72

(d) $150 = 2b + 2$, $b = 74$ so he uses 74 black tiles.

(e) 499

B Changing the subject of a formula (p 45)

- 1 (a) 93 (b) $b = \frac{g-3}{3}$ (c) 10
 (d) 25
- 2 (a) $b = \frac{g-1}{4}$ (b) 15 (c) 21
- 3 (a) 65 (b) $b = \frac{g-5}{6}$ (c) Check
 (d) 16
- 4 (a) $x = \frac{y-7}{3}$ (b) $g = \frac{f-11}{4}$ (c) $k = \frac{j}{5}$
 (d) $q = \frac{p-15}{7}$ (e) $x = \frac{y-5}{6}$ (f) $d = c - 9$
 (g) $m = \frac{h-25}{9}$ (h) $v = \frac{u-3}{5}$
- 5 D: $b = \frac{y+5}{3}$
- 6 (a) $x = \frac{y+1}{2}$ (b) $g = \frac{f+10}{7}$ (c) $k = j + 5$
 (d) $q = \frac{p+6}{5}$ (e) $x = \frac{y+4}{9}$ (f) $d = c + 8$
 (g) $m = \frac{h+3}{4}$ (h) $v = \frac{u+2}{9}$
- 7 (a) $x = \frac{y-9}{5}$ (b) $g = \frac{f+10}{4}$ (c) $q = \frac{p-12}{3}$
 (d) $s = \frac{t+7}{3}$ (e) $x = \frac{y}{4}$ (f) $v = \frac{u+12}{7}$
 (g) $u = \frac{v-2}{8}$ (h) $g = \frac{h+3}{10}$

17 Grid totals

A Expressions from patterns on a number grid (p 46)

1 (a) (i) A

32	33
42	
52	53

B

77	78
87	
97	98

(ii) A: 212, B: 437

(b) (i)

n	$n + 1$
$n + 10$	
$n + 20$	$n + 21$

(ii) $5n + 52$

(iii) 100, 101, 110, 120 and 121

(iv) An explanation such as:

$5n + 52 = 100$ leads to $n = 48 \div 5$ which is not a whole number. So this C-shape is impossible.

2 (a)

n	$n + 1$
$n + 8$	
$n + 16$	$n + 17$

(b) $5n + 42$

(c) An explanation such as:

$5n$ is a multiple of 5 when n is a whole number but 42 is not. Hence $5n + 42$ can never be a multiple of 5 for any whole number n .

Mixed practice 2 (p 47)

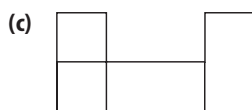
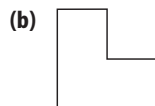
- 1 (a) -7 (b) -2 (c) 11 (d) 4 (e) -24
 (f) 20 (g) -5 (h) 5 (i) -15 (j) -1
 (k) 8 (l) 2

2 5^7

3 $x = 3$

- 4 (a) 29 (b) 8 (c) 14 (d) 8 (e) 2

5 7 cm



- 7 (a) $18x$ (b) $3 - 2p$ (c) $4n + 1$ (d) $4t + 7$

- 8 (a) 1, 5, 7, 35

(b) 7

(c) (i) 245

(ii) $\frac{12}{245}$

9 (a) $3n + 6$

(b) $30 - 5x$

(c) $6m - 2$

(d) $18y + 27$

10 7^8 or 5764801

11 (a) $r = \frac{A-5}{2}$

(b) $k = \frac{h-7}{4}$

(c) $b = a + 10$

(d) $x = \frac{y+1}{6}$

12 0.29 m^2

13 (a) $3^4 = 81$

(b) $1^9 = 1$

(c) $7^2 \times 7^3 = 7^5$

(d) $2^3 \times 5^2 = 200$

(e) $11 \times 11^2 \times 11^3 = 11^6$

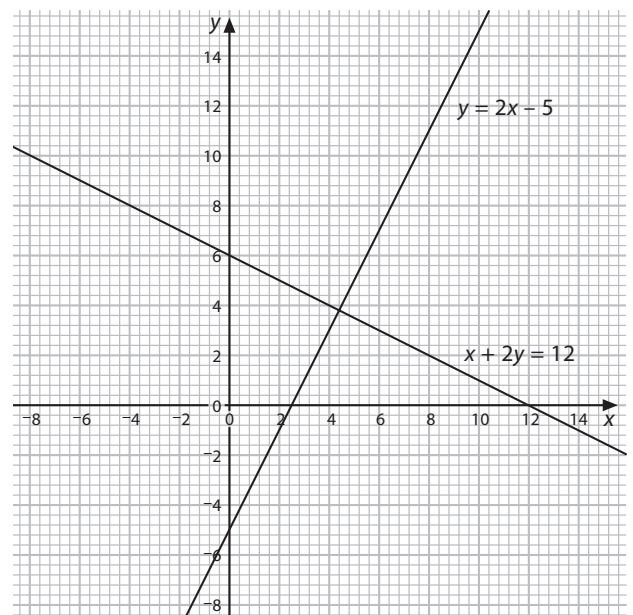
(f) $2^3 \times 3^9 \times 2^7 \times 3 = 2^{10} \times 3^{10}$

14 (a) 5 (b) -9 (c) -15 (d) 18

(e) 2.5 or $2\frac{1}{2}$ (f) -2 (g) 36 (h) 2

15 (a) 28.3 cm (b) 32.8 cm

16 (a)



(b) Coordinates close to (4.4, 3.8)

17 (a) $6x + 26$

(b) 18 units

18 10.4 cm

19 (a) £11.50

(b) $n = \frac{C-150}{50}$

(c) 37

20 $x = 9$

21 (a) 1.70

(b) 0.85

(c) -0.06

(d) 18.59

(e) 9.61

(f) 2.88

22 (a) $x = 3$

(b) $x = 2$

(c) $x = 0.5$

(d) $n = 4.5$

(e) $n = 1.5$

(f) $n = 1.4$

(g) $y = 5$

(h) $y = -2$

(i) $y = -2$

23 (a) A, E

(b) BA

(c) 56.6 cm^2

(d) 2

24 (a) $198 = 2 \times 3^2 \times 11$

(b) 13 is not a factor of 198 as it is a prime but does not appear in the prime factorisation of 198.

(c) (i) 6

(ii) 1386

25 11.7 units (correct to 1 d.p.)

26 (a) (i), (ii), (iii) The result is always 5.

(b) An explanation using the expressions

$$n \rightarrow 2n \rightarrow 2n + 10 \rightarrow 6n + 30 \rightarrow n + 5 \rightarrow 5$$

27 (a) 1

(b) 6

18 Ratio

A Writing a ratio in its simplest form (p 50)

- 1 (a) 7:3 (b) 3:7
 2 (a) 1:4 (b) 1:5 (c) 3:1 (d) 3:4 (e) 7:6
 (f) 6:7 (g) 4:9 (h) 20:7 (i) 8:5 (j) 5:3
 3 1:4
 4 (a) 3:5 (b) 1:4 (c) 1:2 (d) 5:1 (e) 1:5
 (f) 20:1 (g) 2:15 (h) 25:2
 5 1:3:6 and 5:15:30
 25:75:100 and 5:15:20
 10:20:40 and 3:6:12
 6 9:4:3
 7 6:3:2

B Finding a value from a given ratio

C Dividing in a given ratio (p 50)

1

Blue (1 part)	White (4 parts)
2 litres	8 litres
3 litres	12 litres
0.5 litre	2 litres
2.5 litres	10 litres

2 5

3

Yellow (4 parts)	Blue (3 parts)
8 litres	6 litres
12 litres	9 litres
2 litres	1.5 litres
10 litres	7.5 litres

4 Tracy £60, May £90

5 (a) 250 g (b) 500 g

6 180

7

Ratio	Quantities
1:2	200 m :400 m
2:5	10 kg: 25 kg
4:7	16 cm: 28 cm
10:9	50 g :45 g

8 (a) £4, £20 (b) 20 m, 12 m
 (c) 10 kg, 35 kg (d) £7.20, £4.80

9 (a) 20 (b) 27

10 (a) 36 (b) 108

11 15 litres peat, 10 litres sand

12 150 red, 90 blue and 60 yellow

13 (a) £18, £24, £6 (b) £40, £60, £20

14 120

D Converting between ratios, fractions and percentages (p 52)

- 1 (a) $\frac{1}{3}$ (b) $\frac{2}{3}$
 2 1:4
 3 (a) $\frac{1}{4}$ (b) 75%
 4 2:1
 5 40%
 6 A and E, B and H, C and F, D and G

E Writing in the form $k:1$ and $1:k$ (p 52)

- 1 0.75 litre
 2 (a) 2.5:1 (b) 1.8:1 (c) 1.2:1
 (d) 2.25:1 (e) 0.6:1
 3 (a) 1:3.5 (b) 1:2.4 (c) 1:2.5
 (d) 1:0.9 (e) 1:0.8
 4 1:1.25
 5 1.8:1

19 Substitution

A Substitution review (p 53)

- 1 (a) 36 (b) 42 (c) 11 (d) 10
 (e) -20 (f) 6 (g) 6 (h) -4
 (i) 7 (j) 12 (k) 132 (l) -21
- 2 £40.70
- 3 (a) 5.92 (b) 34.04 (c) 5 (d) 21.6
 (e) 226.304 (f) 17.22

B Expressions with more than one letter (p 53)

- 1 (a) 12 (b) 25 (c) 49 (d) 8
 (e) 3 (f) 1 (g) 0.5 (h) 18
- 2 (a) -18 (b) -3 (c) -10 (d) 48
 (e) -4.5 (f) 107 (g) 45 (h) 9
- 3 (a) 50 (b) 20 (c) 49 (d) 100
- 4 (a) $\frac{3}{4}$ (b) $\frac{3}{10}$ (c) $\frac{9}{20}$ (d) $\frac{3}{4}$ (e) $\frac{3}{20}$
- 5 (a) 0.75 (b) 1.64 (c) 8.03 (d) 38.88
 (e) 355.49 (f) 1.64 (g) 53.76 (h) 1.11
- 6 (a) 1.96 (b) 121 (c) 49 (d) 196
 (e) -9.25 (f) 12.95 (g) 20.25 (h) 6

C Units in formulas (p 54)

- 1 (a) 1140 cm or 11.4 m (b) 76 mm or 7.6 cm
- 2 (a) (i) 1365 mm² or 13.65 cm²
 (ii) 6175 mm² or 61.75 cm²
 (iii) 6150 mm² or 61.5 cm²
 (b) 1334 mm² or 13.34 cm²
 (c) 11 050 cm² or 1.105 m²
- 3 (a) 54 cm² (b) 121.5 m² (c) 277.44 mm²
- 4 13 240 mm² or 132.4 cm²

D Mixed questions (p 55)

- 1 17.2 metres
- 2 (a) 303 K (b) 273 K (c) 253 K (d) 23 K
- 3 (a) 350 g or 0.35 kg (b) 3.92 kg
- 4 (a) 45 °C
 (b) (i) -30 °C (ii) -22 °F

20 Scaling and ratio

A Scaling drawings

B Scaling down (p 56)

- 1 A scale factor of 2 has been used.
- 2 (a) 0.2 or $\frac{1}{5}$

(b)

	Length on real bird box	Length on scale drawing
Height of box (h)	24 cm	4.8 cm
Width of box (w)	15 cm	3.0 cm
Diameter of hole (d)	6 cm	1.2 cm
Height of roof (r)	9 cm	1.8 cm
Position of hole (p)	7 cm	1.4 cm

- 3 C (scale factor $\frac{1}{3}$) and D (scale factor $\frac{2}{3}$)

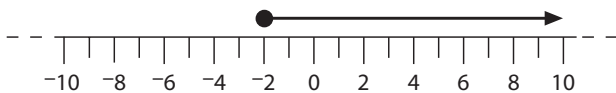
C Proportion within a shape (p 57)

- 1 A, F (required ratio 1.7); B, D (2.5); C, H (1.5); E, G (2)
- 2 (a) 1.25
 (b) 6.5 cm
 (c) No, because the ratio $\frac{\text{width}}{\text{height}}$ is 1.225, not 1.25 as would be needed for a copy.
- 3 (a) 15.3 cm
 (b) 6.9 cm
 (c) It is the right size: like the photograph shown, the ratio $\frac{\text{height}}{\text{width}}$ is 1.375.

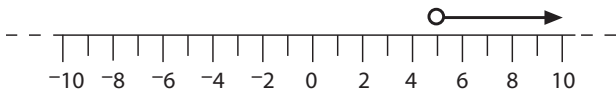
21 Understanding inequalities

A Single inequalities (p 58)

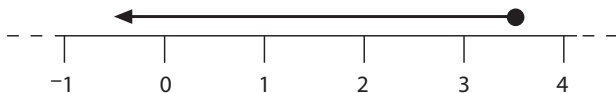
- 1 (a) False (b) False (c) True
 (d) True (e) False (f) False
 (g) True (h) False (i) False
- 2 (a) $\sqrt{7}$, -7, 0.7, 3 (b) $\frac{25}{3}$, $\sqrt{50}$
- 3 (a) $x > -4$ (b) $x < 6$ (c) $x \geq -1$
- 4 (a)



(b)

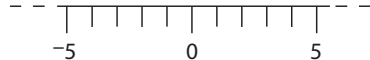


(c)



- 5 (a) $7 \geq n$ and $n \leq 7$; $7 > n$ and $n < 7$; $7 < n$ and $n > 7$

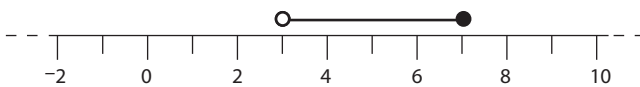
(b)



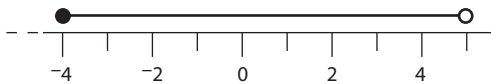
- 6 (a) Always true (b) Sometimes true
 (c) Always true (d) Never true
 (e) Always true (f) Never true

B Combined inequalities (p 59)

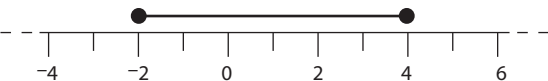
1 (a)



(b)



(c)



- 2 (a) -1, -0.5, 0, $\frac{3}{2}$, $\sqrt{8}$ (b) -6, -1, -0.5, 0
- 3 (a) $-4 \leq x < 6$ (b) $-4 \leq x \leq 8$ (c) $-6 < x < 4$
- 4 Any five numbers between -3 and 1 (including 1 but not -3)

- 5 -3, -2, -1, 0, 1, 2, 3
- 6 Any two of -5, -4, 4, 5
- 7 Any four of -1, 0, 1, 2, 3, 4

C Converting between words and symbols (p 59)

- 1 (a) $p \leq 500$ (b) $s \geq 8$
 (c) $t < 50$ (d) $s \geq 4000$
- 2 (a) A statement for $p > 10$
 (b) A statement for $t \leq 32$
 (c) A statement for $n < 100$

22 Sequences

A Sequences from shapes (p 60)

- 1 (a) 1, 9, 15, 27 (b) 1, 9, 64 (c) 1, 15
 (d) 1, 8, 27, 64
- 2 (a) 144 (b) 10 (c) 125
 (d) 2000 (e) 99 (f) 1, 3, 15, 21

B Continuing linear sequences (p 60)

- 1 (a) (i) 26, 30 (ii) 48, 96 (iii) 28, 33 (iv) 0, -2
 (b) (i), (iii), (iv)
- 2 (a) 6, 5, $4\frac{1}{2}$ (b) No
- 3 (a) 23, 30
 (b) +1, then +2, then +3, and so on
 (c) No
- 4 33, 45
- 5 An explanation such as: $7 + 49 \times 2 = 105$
- 6 (a) 4, 9, 14, 19, 24, 29, ...
 (b) 30, 26, 22, 18, 14, 10, ...
 (c) 1, 7, 13, 19, 25, 31, ...
 (d) 15, 17, 19, 21, 23, 25, ...

C The n th term (p 61)

- 1 (a) 5, 11, 17, 23, 29 (b) 59
- 2 504
- 3 (a) $9 - 2n$ (b) -11

- 4 (a) A: 3, 4, 5, 6, 7 B: 2, 1, 0, -1, -2
 C: 1, 4, 9, 16, 25 D: $\frac{1}{2}$, 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$
 E: 3, 5, 7, 9, 11 F: 120, 60, 40, 30, 24
 (b) A, B, D, E

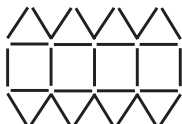
D The n th term of a linear sequence

E The n th term of other sequences (p 61)

- 1 (a) 29 (b) $3n - 1$
 2 (a) $4n + 2$; 82 (b) $10n + 1$; 201 (c) $3n + 2$; 62
 (d) $3n - 2$; 58 (e) $9n + 2$; 182 (f) $8n - 5$; 155
 3 (a) 10, 8 (b) $22 - 2n$
 4 (a) $52 - 2n$ (b) $20 - 3n$ (c) $28 - 6n$ (d) $5 - 3n$
 5 (a) B
 (b) A: 39 B: 27 C: 360
 (c) A: $n^2 + 3$ B: $5n - 3$ C: $10n^2$

F Ways of seeing

G Ways of seeing further (p 62)

- 1 (a) (i)  (ii) 29
 (b) 71
 (c) $s = 7n + 1$, with explanation
 (d) 701
 2 (a) (i) 4 (ii) 12 (iii) 9
 (b) 24
 (c) 100
 (d) Using c , e and m for the numbers of corner, edge and middle pieces,
 (i) $c = 4$
 (ii) $e = 4(n - 2)$ or $e = 4n - 8$
 (iii) $m = (n - 2)^2$

3 Using p for the number of pearls in the n th pattern,

- (a) (i)  19 pearls

- (ii) 28 pearls, 103 pearls
 (iii) $p = n^2 + 3$

- (b) (i)  20 pearls

- (ii) 29 pearls, 104 pearls

- (iii) $p = n^2 + 4$

- (c) (i)  20 pearls

- (ii) 30 pearls, 110 pearls

- (iii) $p = n(n + 1)$ or $p = n^2 + n$

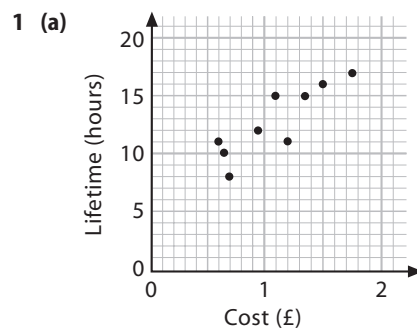
- (d) (i)  10 pearls

- (ii) 15 pearls, 55 pearls

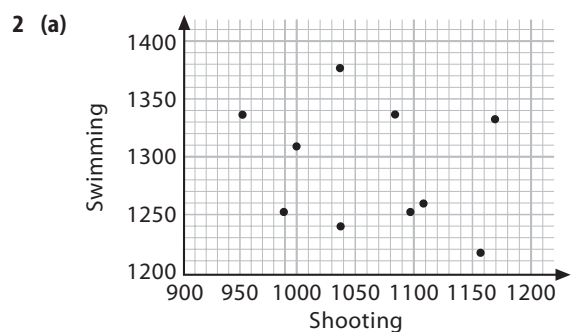
- (iii) $p = \frac{n(n+1)}{2}$ or $p = \frac{n^2+n}{2}$

23 Paired data

A Scatter diagrams and correlation (p 64)



- (b) There is a positive correlation between cost and lifetime.

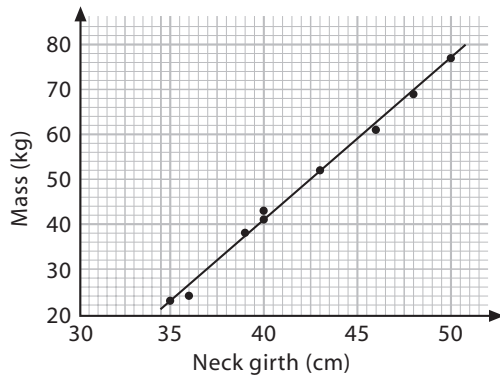


- (b) There is no correlation between the two scores.
 (c) No

B Line of best fit

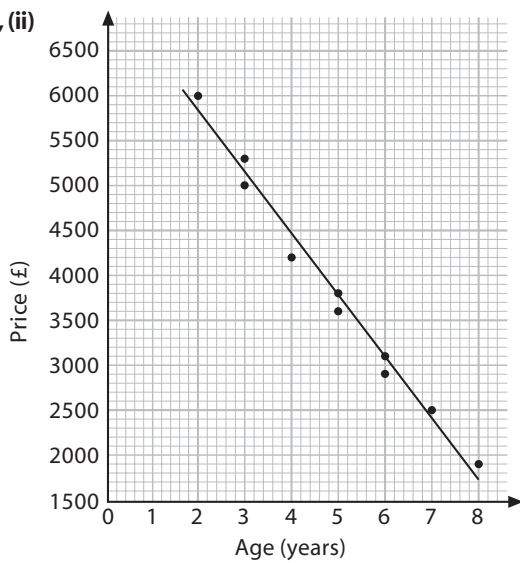
C Interpreting scatter diagrams (p 64)

1 (a), (b)

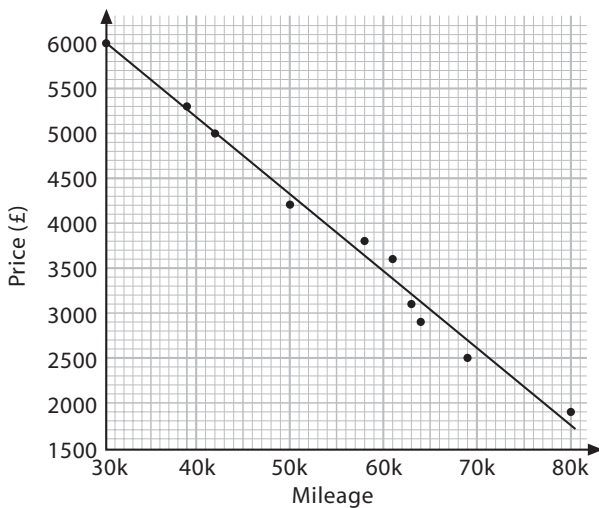


(c) 55 kg

2 (a) (i), (ii)



(b) (i), (ii)



(c) (i) £4400 (ii) £3900

(iii) £4100 or £4200

(Answers will depend on lines of best fit.)

(d) It is not sensible to use a line of best fit outside the range of the data.

3 (a) Most of the points lie on a curve.

(b) (i) About 7.4 or 7.5 metres per second

(ii) About 135 seconds (2 minutes 15 seconds) or 133 seconds (2 minutes 13 seconds)

24 Working with coordinates

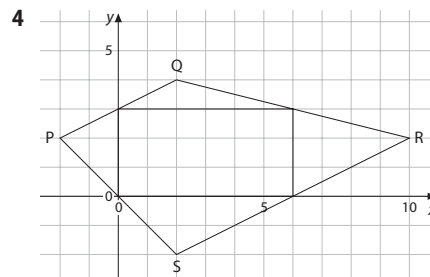
A Shapes on a coordinate grid

B Mid-point of a line segment (p 66)

1 (a) X (b) W (c) Z (and W)

2 (a) (4, -1)
 (b) (1, -1) (or (5, 7) or (-9, -1))
 (c) (5, 4)

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

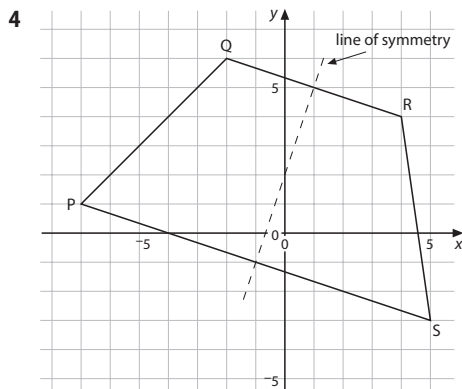


- (a) See diagram above for P, Q, R, S
- (b) (i) They are parallel (and SR is twice as long as PQ).
 (ii) A trapezium
- (c) 36 cm^2
- (d) (i) See the diagram above for the quadrilateral with vertices at the mid-points.
 (ii) A rectangle
 (iii) The area of the new quadrilateral is half that of trapezium PQRS.

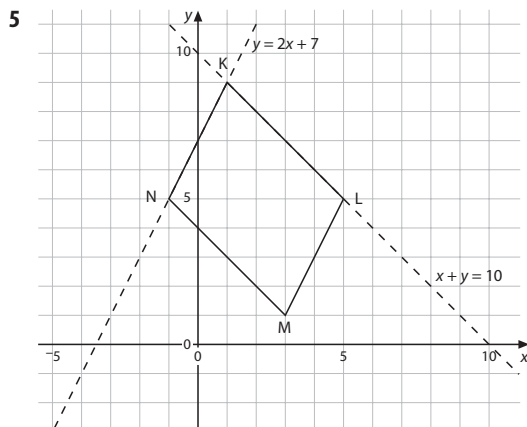
5 (6, 5)

C Mixed questions (p 67)

- 1 (a) 5 cm (b) $\sqrt{29} \approx 5.39$ cm
 (c) $\sqrt{65} \approx 8.06$ cm
- 2 (a) $AB = 3$ cm, $BC = 3$ cm, $CD = \sqrt{34} \approx 5.83$ cm,
 $AD = \sqrt{40} \approx 6.32$ cm
 (b) For a kite, CD would need to be the same length as AD , but this is not the case.
- 3 (a) R is at (3, 2); S is at (-4, 1).
 (b) 30 cm^2

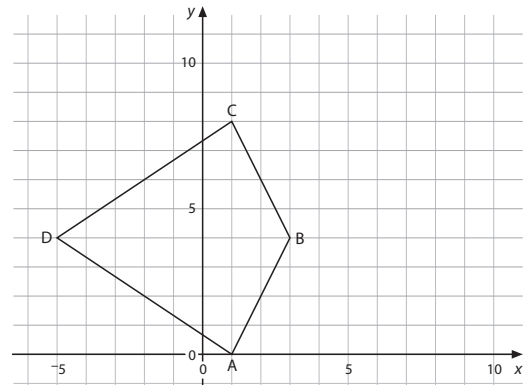


- (a) See diagram above for quadrilateral PQRS.
 (b) They are parallel (and PS is twice as long as QR).
 (c) $PQ = \sqrt{50} \approx 7.07$ cm, $RS = \sqrt{50} \approx 7.07$ cm
 (d) A symmetrical trapezium
 (e) See diagram above.



- (a) See diagram above for lines $x + y = 10$ and $y = 2x + 7$.
 (b) See diagram above for point K, at (1, 9).
 (c) See diagram above for parallelogram KLMN: the coordinates are L, (5, 5), M (3, 1) and N(-1, 5).
 (d) Rotation symmetry of order 2, centre (2, 5)

6 (a)



- (b) $y = 4$
 (c) A square

25 Brackets and equations

A Adding and subtracting expressions in brackets

B Further simplifying (p 68)

- | | | |
|-----------------|----------------|----------------|
| 1 (a) $6a - 2$ | (b) $7a + 3$ | (c) $6a + 3$ |
| (d) $12 - 5p$ | (e) $p - 2$ | (f) $p + 4$ |
| (g) $5x + 7$ | (h) $4 - 6x$ | (i) $6 + 3x$ |
| (j) $3 - 5y$ | (k) $1 - y$ | (l) $7 - 9y$ |
| 2 (a) $13a + 8$ | (b) $11a - 24$ | (c) $5a + 49$ |
| (d) $4n - 12$ | (e) $8n + 3$ | (f) $11n + 32$ |
| (g) $x - 29$ | (h) $2x + 15$ | (i) $10x$ |
| 3 (a) $6x + 19$ | (b) $6y + 16$ | (c) $7 - z$ |
| (d) $3a - 6$ | (e) $6b - 6$ | (f) $c + 18$ |

C Simplifying to solve an equation (p 68)

- | | | | |
|------------------|--------------|---------------|--------------|
| 1 (a) $10n - 21$ | (b) $n = 4$ | | |
| 2 (a) $2x + 27$ | (b) $x = -3$ | | |
| 3 (a) $x = 12$ | (b) $x = 14$ | (c) $x = 2.5$ | (d) $x = -1$ |
| (e) $x = 1.5$ | (f) $x = -3$ | (g) $x = 4$ | (h) $x = -2$ |
| 4 (a) $n = 0.5$ | (b) $n = 2$ | (c) $n = 8$ | (d) $n = 2$ |

26 Roots

A Squares and cubes

B Square and cube roots (p 69)

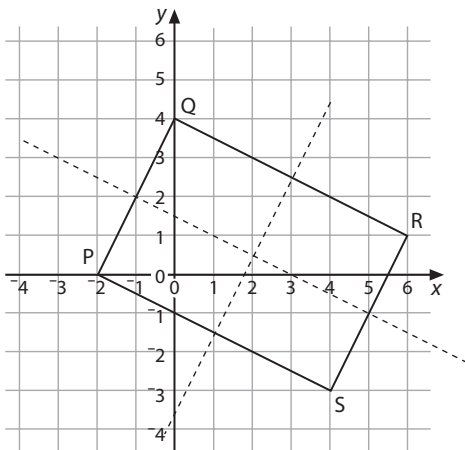
- 1 (a) 100 (b) 27 (c) 125 (d) 144
 2 (a) 16 (b) 9 (c) 64 (d) -64 (e) 25
 3 (a) 9, -9 (b) 10, -10 (c) 7, -7
 (d) 12, -12 (e) 1, -1
 4 (a) 3 (b) -2 (c) 4 (d) -1 (e) 5
 5 (a) $p = 10$ (b) $q = 8$ or -8
 (c) $r = 3$ or -3 (d) $s = 6$
 6 (a) 256, 625
 (b) Digits 1, 6, 9 giving square numbers 169, 196 and 961

D Cube roots on a calculator (p 69)

- 1 (a) 5.85 (b) -5.69 (c) 4.25 (d) 1.55 (e) 6.16
 (f) 2.19 (g) 1.24 (h) 1.46
 2 (a) 4.30 (b) 5.03 cm

Mixed practice 3 (p 70)

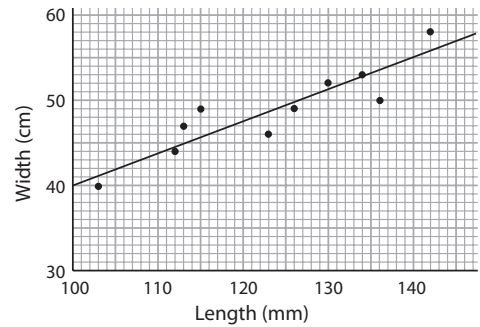
- 1 5:8
 2 69
 3



- (a) P, Q and R plotted on axes as above
 (b) (i) S plotted as above (ii) (4, -3)
 (c) Lines of symmetry shown as above

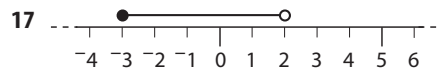
4 100

5 (a), (b)



- (c) 47–48 mm
 (d) No
 6 80°C
 7 961
 8 (a) $4n + 1$ (b) $9n - 2$ (c) $4n - 3$
 9 (-1, 11)
 10 $7n - 2$
 11 (a) True (b) False (c) False (d) False
 12 (a) 32 g (b) 10 g
 13 (a) 39 (b) 5 (c) -30 (d) -4 (e) 4
 14 (a) 64, 81 (b) 5, 7, 11, 13, 17, 19, 23
 15 (a) 0.75 (b) 156 mm

16 13 cm by 13 cm by 13 cm



- 17
 18 (a) Multiply the previous term by 3 and add 1
 (b) 1336
 (c) No
 19 (a) 800 ml (b) 20%
 20 (a) 16
 (b) $3n + 4$ with an explanation
 (c) $n^2 + n$ or $n(n + 1)$
 21 8:1
 22 (a) When $t = 0.5$, $20t - 5t^2 = 20 \times 0.5 - 5 \times 0.5^2$
 $= 10 - 1.25$
 $= 8.75$ as required
 (b) 1.95 metres
 23 An explanation such as:
 The length of the base has been multiplied by 2
 (3 cm \rightarrow 6 cm) but the length of the left-hand edge has
 been multiplied by 1.5 (1 cm \rightarrow 1.5 cm).
 24 (a) 9.97 (b) -45.25 (c) -0.25
 (d) -3.54 (e) 0.05

25 1.38

26 (a) $1\frac{4}{15}$ (b) $2\frac{2}{3}$ (c) $\frac{2}{5}$ (d) $\frac{1}{5}$ (e) $\frac{4}{9}$

27 (a) $x = -5$ or 5 (b) $p = -3$ or 3

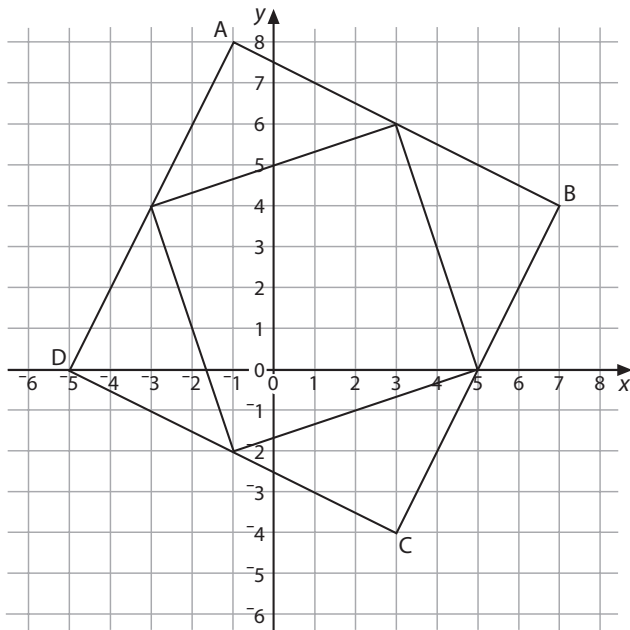
(c) $z = 2$ (d) $t = -4$

28 (a) 20

(b) $n^2 - n$ or $n(n - 1)$ with an explanation

29 (a) $n = 4.5$ (b) $k = 3$ (c) $x = -2$

30



(a) A, B and C plotted on axes as above

(b) (i) D plotted as above (ii) $(-5, 0)$

(c) Mid-points plotted and joined as above

(d) Using Pythagoras, the length of the side of the larger square is $\sqrt{80} = 8.94427191\dots$ and the length of the side of the smaller square is $\sqrt{40} = 6.32455532\dots$

So the ratio is $\frac{8.94427191\dots}{6.32455532\dots} = 1.414$ (to 3 d.p.)

31 $\frac{4}{7}$