

Chapter 1

Number 1

1A Fractions, ratios and simplifying

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

2 1 : 3

3 a 4 : 7 b 9 : 4

4 a 1000 : 1 b 1 : 15

5 32 : 5 6 32 km

7 a 5 : 6 b 1 : 5

8 21

Puzzle

24 coins

1B Using ratios to find quantities

1 a $x = 21$ b $x = 18$ c $x = 12.5$

2 208 3 5010 litres (3 sf)

4 5

5 a 24 m, 40 m b \$160, \$240

c \$270, \$180, \$90

6 900 mL 7 36°, 72°, 108°, 144°

8 Adrian should get \$80.75;

Belinda should get \$59.25

Puzzle: Thirsty work

Stockman 1: 3 full, 1 half

Stockman 2: 2 full, 3 half

Stockman 3: 2 full, 3 half

Number 2

1C Changing quantities in a given ratio

1 a 135 kg b 18 hours

c \$1011 d 76.8 cm

2 a 16 kg b 4.8 hours

c \$206.40 d 12.24 L

1D Rates of change

1 a 0.4 kg/m² b 22.4 kg

c 50 m² d 9

2 a 210 per hour b 4.5 hours

c 17 seconds

1E Rates and units

1 a 166.7 m/s b 30 m/h

c 3.6 km/h

2 \$3.50 per hour

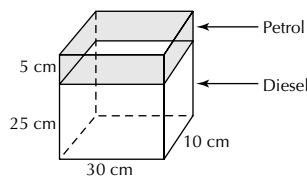
3 a 2.325 L b 51.15 L

1F Density

1 a 4800 g = 4.8 kg b 64 000 g = 64 kg

2 a 9.5 g/cm³ b 0.9 g/cm³

3



Mass = 7.965 kg (7965 g)

Number 3

1G Using rates: Distance, time, speed

1 a 600 seconds b 900 m

2 96 km/h 3 5 minutes 38.3 seconds

4 a

Vessel	Distance	Average speed	Time
<i>Spirit of Tasmania</i>	232 km	23.2 km/h	10 hours
<i>Devil Cat</i>	232 km	80 km/h	2.9 hours

b 6496 km

5 a 925 seconds or 15 minutes 25 seconds

b 4.3 m/s (1 dp)

6 a Multiply by 1000 and then divide by 3600

b 27.8 m (1 dp) c 7.2 seconds

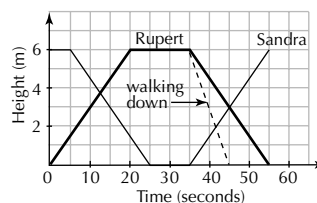
d 25 m e 30 m

f Cars measure about 5 m in length, so 30 m ÷ 5 m = 6 car lengths

1I Rates and graphs

1 a The lines for the up and down movements have the same (but opposite) slope. Each way takes the same time—20 seconds.

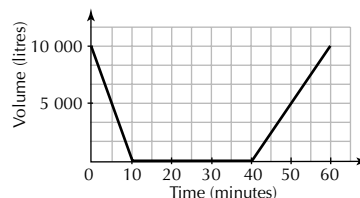
b & c



2 a 15 minutes b More hot water may have been added to the bath. c 5 minutes

d No—the graph is steeper between 30 and 35 minutes than between 0 and 10 minutes.

3



4 a \$40 000 b 4.5 years

c The price of a common model of new car in average condition falls quickly after purchase.

Number 4

1K Operations using integers

1 a -4 b -5 c 20 d -29

e 7 f 30 g -8 h -23

Homework Book Answers

- i -3 j 24 k 1 l 13
m 2 n -72

1L Prime factors

- 1 23
2 a $2 \times 2 \times 7$
b $2 \times 2 \times 5 \times 5 \times 5$

	Pair of numbers	HCF	LCM
a	4 and 18	2	36
b	7 and 25	1	175
c	54 and 81	27	162

- 4 The \$6 stamp is best because 6 is the highest common factor of 18 and 48 fewer stamps are required than if \$1, \$2 or \$3 stamps were chosen.

1M Number systems

- 1 a $\frac{4}{5}$ b $\frac{4}{13}$
2 When both fractions are written as equivalents with the same denominator, it is seen that $\frac{5}{9}, \frac{25}{45}$ is less than $\frac{3}{5}, \frac{27}{45}$.
3 a $\frac{1}{50}$ b $\frac{2}{3}$ c $\frac{7}{10}$
d $\frac{1}{20}$ e $\frac{2}{9}$ f $\frac{43}{72}$
4 a $\frac{3}{4}$ b $20\frac{1}{4}$ c $2\frac{7}{10}$
5 $\frac{1}{4}$ 6 $\frac{2}{25}$
7 \$4795.20
8 20 litres

Number 5

1N Rounding and significant figures

- 1 a 3 b 1 c 4
d 3 e 2 f 1
2 a 47.4 b 65 000
c 0.0052 d 10
e 19 000 f 100
3 $6 \times 50 = 300$
4 a $45 \div 3 = 15$ b $\$100 \times 6 = \600

1O Scientific notation

- 1 a 0.036 b 65 010
c 0.000 0021 d 6.98
2 a 6.23×10^2 b 4.7×10^4
c 8.23×10^7 d 1.98×10^{-1}
e 6.2×10^{-5} f 2.5×10^{-12}
3 a 2.4×10^{13} b $2.284\ 84 \times 10^{11}$
c $3.908\ 77 \times 10^{20}$ d 6.25×10^{-12}
4 8.2×10^{-4}
5 0.000 039, 0.01032, 50, 21 800
6 0.000 000 01 cm,
0.000 000 000 000 000 000 000 0017 g

- 7 a 2.4×10^{10} b 2.262×10^{-4}
c 5.979×10^{65} d 4.417×10^{12}
e 2.382×10^{-11} f 9.396×10^{12}
8 a 9.064×10^{192} b 1.547×10^{101}
c 2.304×10^{105} d 2.445×10^{113}
e 2.520×10^{67}

- 9 a 60 seconds in a minute
60 minutes in an hour
24 hours in a day
100 years in a century
b 365.25 days is the average number of days in a year when taking account of leap years that occur every 4 years.
c $3.155\ 76 \times 10^9$

Number 6

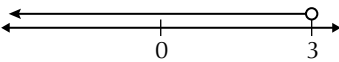
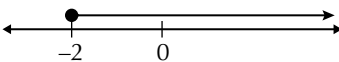
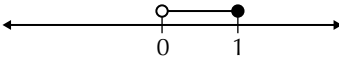
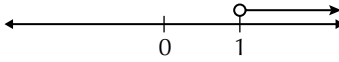
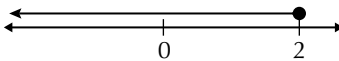
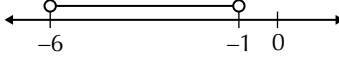
1P Finite and recurring decimals

- 1 a 0.6 b 0.3125 c 0.0693
2 C is correct
A is wrong because it represents 0.373 737 where the pair 37 recurs.
B is wrong because the dot should appear above the first occurrence of the repeating digit.
3 a $\frac{2}{9}$ b $\frac{47}{99}$
c $\frac{62}{333}$ d $\frac{7}{30}$

Investigation: Terminating decimals

- 1 $\left\{ \frac{1}{2}, \frac{1}{4}, \frac{1}{5}, \frac{1}{8}, \frac{1}{10}, \frac{1}{16} \right\}$
2 No—only the denominator has an effect.
3 true
4 2 and 5
5 10, 16, 20, 25, 32, 40, 50, 64, 80, 100
6 If a fraction has a denominator that has 2, 5 or 2 and 5 only as prime factors the fraction has a finite decimal representation.

1Q Real numbers on the number line

- 1 a 
b 
c 
2 a 
b 
c 
3 a $\{x : x \geq 2\}$ b $\{x : x < -4\}$
c $\{x : -2 \leq x < 3\}$ d $\{x : 1 < x \leq 5\}$

Chapter 2

Business Maths 1

2A Business calculations

- 1 a Total income = \$50 170
Total expenditure = \$35 333.93
- b Profit
- c \$14 836.07 (profit)
- 2 3.25, 1.15, 19.70, 17.80, 32.20

3 a

	Area (km ²)	Population	Area in km ² per person (to 3 sf)	Area in m ² per person (to 3 sf)
ACT	2 400	312 000	0.007 69	7 690
NSW	801 400	6 372 000	0.126	126 000
NT	1 340 000	211 000	6.35	6 350 000
Qld	1 727 200	3 655 000	0.473	473 000
SA	984 400	1 467 000	0.671	671 000
Tas	68 300	457 000	0.149	149 000
Vic.	227 600	4 645 000	0.0490	49 000
WA	2 525 500	1 851 000	1.36	1 360 000
Total	7 676 800	18 970 000	0.405	405 000

- b South Australia
- c Queensland
- d ACT has the smallest area of land per person —only 7690 m². It is the most crowded state or territory.

2B Reviewing percentages

- 1 a 41% b 15% c 0.7% d 66.6%
- 2 0.375
- 3 a $\frac{18}{25}$ b $\frac{5}{8}$
- 4 a \$15 b 71.92 L or 71 920 mL
- 5 a 8% b 2.3%
- 6 \$4500
- 7 a 11.9% b 9 bags
- 8 \$1142.50 9 \$193.30

Business Maths 2

2C Percentage change

- 1 a 200 b \$2500
- 2 \$15 000
- 3 a 218.2 m³ b 98.2 m³
- 4 a 1.25 b 1.5
c 1.37 d 1.07
- 5 a 0.8 b 0.625
c 0 d 0.995
- 6 a \$173.60 b 1071 m
c \$17 000 d 36 660 L
- 7 a A = 78 b B = 7000
- 8 300 g 9 56.25%
- 10 9.26% 11 \$11 200

2D Profit and loss

- 1 a \$6 b 50%
- 2 a \$1400 b 28%
- 3 a \$2.80 each b \$9.80 each

4

	Cost	Sold for	Profit or loss?	Profit/Loss	Profit/Loss %
Table	\$60	\$90	Profit	\$30	50%
TV set	\$420	\$399	Loss	\$21	5%
Fridge	\$1000	\$909	Loss	\$91	9.1%
Coffee table	\$64	\$80	Profit	\$16	25%

Business Maths 3

2E Commission

- 1 a \$7230 b \$72 c \$520
- 2 a \$2465 b \$3290
- 3 \$12 000

2F Simple interest

- 1 SI = simple interest, P = principal, R = rate of interest, and T = time invested (expressed in years).
- 2 a \$150 b \$2100
- 3 a \$2970 b \$562.50
- 4 a \$2400 b 7.5% c 9 years

2G Compound interest

- 1 a \$50 b \$550
c \$55 d \$605
e \$105
- 2 a \$6708.40 b \$234 371.69
- 3 \$19 933.79
- 4 Alphabank: $4000(1.025)^{10} = \$5120.34$
Betabank: $4000(1.05)^5 = \$5105.13$
Difference between Alphabank and Betabank = \$15.21

Homework Book Answers

Chapter 3

Measurement 1

3A Perimeter

- 1 a 48 m b 33.6 m
c 18 m d 42 cm
- 2 a 188.5 cm b 1100 times
- 3 The perimeter of the garden is 18.85 m.

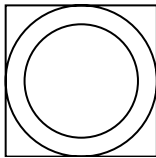
3B Area

- 1 a 133 cm² b 21 m²
c 420 m² d 176.7 cm²
- 2 250 m²

3C Area of sectors

- 1 a 244.3 cm² b 1162 cm²
- 2 a 188.5 cm²

b



The minimum possible area for these squares is 1296 cm².

Measurement 2

3F Total surface area of solids

- 1 a 52 cm² b 74 cm²
- 2 a trapezium b 1952 cm²
- 3 a 1407 cm² b 144.5 m²
- 4 a 125.7 cm² b 84.95 cm²

3H Volume

- 1 a 1020 m³ b 80 cm³
c 140 cm³ d 200 m³
e 2601 cm³ f 1527 cm³
- 2 232.5 m³

3I Capacity and concentration

- 1 a 40 mL b 6 litres
c 8000 cm³ d 49 700 cm³
e 800 cm³ f 45 cm³
- 2 a 3 cups b 8 cups
c 100 cups
- 3 2.5 g/L 4 15 cm

Measurement 3

3J Pythagoras' Theorem

- 1 a 8.062 cm b 20 m
- 2 a yes b no
c no d yes
- 3 a 15.49 cm b 4.861 km
- 4 a 32 cm² b 12 cm²
- 5 7.36 m 6 1.64 m
- 7 244 cm

- 8 a 96 cm (2 sf) b 186 cm (2 sf)
- 9 2090 mm or 2.09 m

Extensions of Pythagoras' Theorem

- 10 a 12.5 cm b 10.15 cm

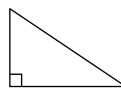
Chapter 4

Space 1

4A Angles review

- 1 a Angles in a full circle add to 360°.
b Vertically opposite angles are equal.
c The angle sum is 180° and the base angles of an isosceles triangle are equal.
d The exterior angle of a triangle is the sum of the two interior opposite angles.
- 2 a $x^\circ = 90^\circ$ (\angle sum of Δ);
 $y^\circ = 90^\circ$ (\angle s on line) or (ext. \angle of Δ)
b $x^\circ = 56^\circ$ (base \angle s isos. Δ);
 $y^\circ = 68^\circ$ (\angle sum of Δ); $z^\circ = 68^\circ$ (vert. opp. \angle s)
- 3 $w^\circ = 54^\circ$, $x^\circ = 72^\circ$, $y^\circ = 306^\circ$, $z^\circ = 27^\circ$

4 a



- b 90°, 53°
- 5 {48°, 84°} and {66°, 66°}
- 6 a obtuse b reflex c acute d reflex
- 7 a false b true c false
- 8 a corresponding b alternate
c vertically opposite d corresponding
e co-interior
- 9 a $x^\circ = 38^\circ$ (alt. \angle s, || lines);
 $y^\circ = 57^\circ$ (\angle sum of Δ) or (co-int. \angle s, || lines)
b $x^\circ = 50^\circ$ (alt. \angle s, || lines);
 $y^\circ = 67^\circ$ (corresp. \angle s, || lines)

Space 2

4B Polygon facts

- 1 1080°
- 2 360°
- 3 a 20° b 160°
c They are adjacent angles on a straight line.
- 4 a 84° b 46°
- 5 To be regular a polygon must not only have equal angles but also equal sides, and a rectangle does not necessarily have equal sides.
- 6 1800°, 150°
- 7 a 12 b 9 c 20
- 8 15
- 9 6
- 10 No—the exterior angle would be 35°, and 360 is not a multiple of 35.
- 11 The interior angle of a regular pentagon is 108°. When three pentagons meet at one point, the total angle is 324°, leaving a gap of 36°, which is not enough for another pentagon to fit.

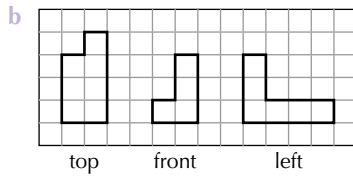
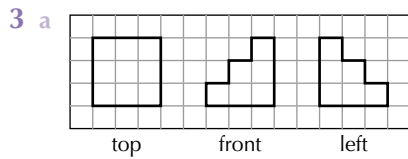
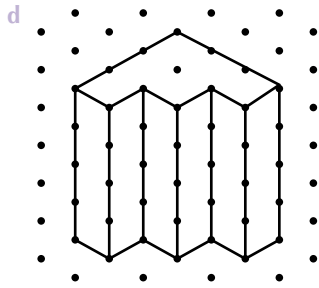
4C Drawing in three dimensions

1 185

2 a 88 cm

b $255\,552\text{ cm}^3$ or $0.255\,552\text{ m}^3$

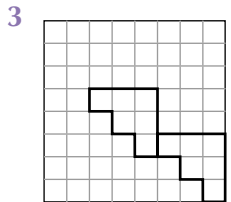
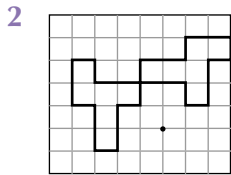
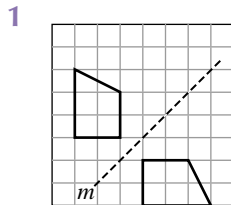
c $36 \times 22 \times 22 = 17\,424\text{ cm}^2$ or 1.7424 m^2



4 10

Space 3

4D Transformations 1: Congruent transformations



4 a Rotation of 180° about R

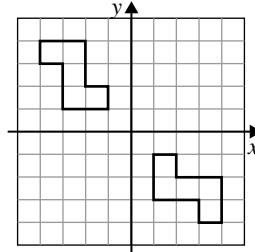
b Reflection in m

c Translation by 5L, 5D

d Rotation of 270° anti-clockwise (or 90° clockwise) about Q

e Rotation of 90° anti-clockwise about S

5 a

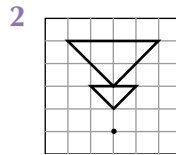
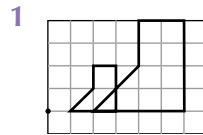


b Reflection in the line $y = x$

6 a 36°

b l

4D Transformations 2: Dilations



3 18 square units

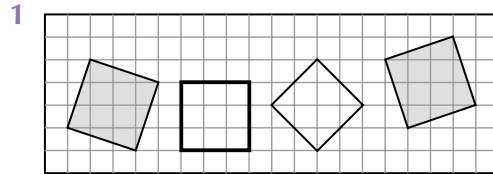
4 240 cm^2

5

	Small	Large
Diameter	8 cm	12 cm
Area of glass used (same thickness for both shapes)	800 cm^2	1800 cm^2
Volume of neon inside	2133 cm^3	7200 cm^3

Space 4

4E Congruent shapes



2 A , B and C

3 a SAS

$EF = GF$ (given)

$\angle EFH = \angle GFH$ (both are 90°)

$FH = FH$ (common)

b $\angle GHF$

c 44°

d 7 m

4 $\angle PRQ = \angle SQT$ (both are 90°)

$PQ = ST$

$QR = TQ$

This fits the test RHS.

5 a SSS

b $x^\circ = 80^\circ$, $y^\circ = 63^\circ$

6 a More than one test can be used. ASA is one test which fits as:

$\angle BAC = \angle ABD$ ($= 120^\circ$)

$AB = AB$ (common)

$\angle ABC = \angle BAD$ ($= 30^\circ$)

Homework Book Answers

b Triangles ACE and BDE or triangles ACD and BDC .

4F Similar triangles

1 Triangles JKL and PQR

2 i and iii 3 $x = 36$

4 a alternate angles, \parallel lines

b vert. opp. \angle s

c alternate angles, \parallel lines

d They have the same angle measurements.

e $\frac{PQ}{ST} = \frac{PR}{TR} = \frac{QR}{SR}$ f 20

5 15.7 cm

4G Applying similar triangles

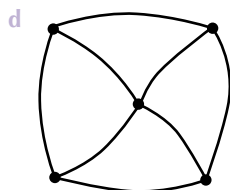
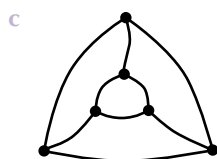
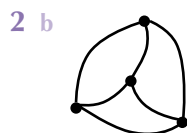
1 14.4 m

2 20 m

3 6.4 m

4H Using networks

	Number of edges (E)	Number of vertices (V)	Number of regions (R)
a	8	5	5
b	12	8	6
c	12	9	5



3

Network	Number of even vertices	Number of odd vertices	Is the network traversable?	Is it traversable starting from and returning to the same vertex?
a	4	0	yes	yes
b	4	2	yes	no
c	1	4	no	no
d	2	4	no	no
e	9	0	yes	yes
f	5	4	no	no

4 a 0 or 2

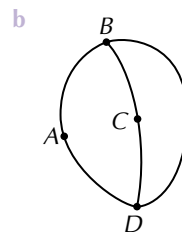
b 0

c more than 2

5 a not possible

b Yes, by starting at R and finishing at S (or vice versa)

6 a 65 km

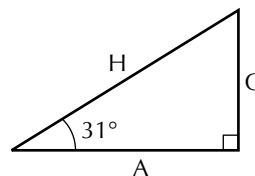


Chapter 5

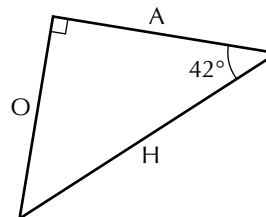
Trigonometry 1

5A Right-angled triangles

1 a



b



2 a $\sin\theta = \frac{e}{d}$, $\cos\theta = \frac{c}{d}$, $\tan\theta = \frac{e}{c}$

b $\sin\theta = \frac{y}{x}$, $\cos\theta = \frac{z}{x}$, $\tan\theta = \frac{y}{z}$

Homework Book Answers

5B Using the tangent ratio

- 1 a 2.038 m b 69.30 m
2 15.4 m

5D Finding the length of the opposite side

- 1 a 0.7314 b 0.1045
2 a 3.01 cm b 5.35 m
c 28.38 cm d 477.11 mm
3 2.16 m 4 93.9 m
5 13.4 cm

Trigonometry 2

5F Finding the length of the adjacent side

- 1 a 0.1045 b 0.5000 c 0.9994 d 0.8526
2 a 4.49 cm b 6.78 cm c 11.33 cm d 19.32 m
3 5.96 m 4 36.96 m

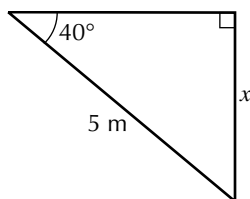
5G Trigonometry rules

- 1 a cos b sin
2 a 2.309 cm b 22.69 cm
c 10.04 cm d 17.11 cm
3 2.76 m 4 2.81 m

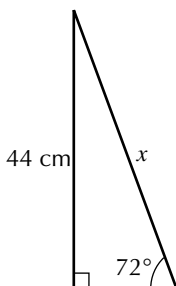
Trigonometry 3

5H Finding the third side

- 1 a 27.0 b 19.0
c 26.9 d 4.65
2 a 16.52 m b 4.129 cm
3 a



- b 3.2 m
4 a



- b 46.3 cm

5I Finding angles in right-angled triangles

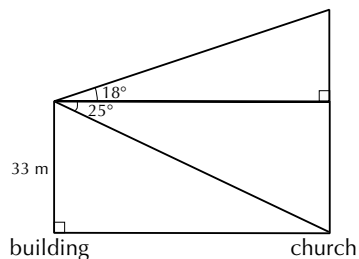
- 1 a sin b tan
2 a 53.1° b 60.9°
c 22.0° d 64.8°
3 a 36.9° b 44.9°

- 4 44.4° 5 106°, 89°, 76°, 89°
6 27.8°

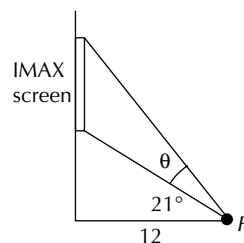
Trigonometry 4

5J Angles of elevation and depression

- 1 a i 3 ii 7 iii 4 iv 6
b 1
2 a



- b 56 m
3 a



- b 34° c 12.53 m
4 4.69 m

5K Exploring exact values of some angles

- 1 0.7071 2 0.7071 3 true
4 a base ∠ of right-angle isosceles Δ
b Pythagoras: $AB = \sqrt{1^2 + 1^2} = \sqrt{2}$
c $\cos 45^\circ = \frac{1}{\sqrt{2}}$
5 a 60° b 30°
c 1 d $\sqrt{3}$
6 $\frac{1}{2}$
7

	30°	45°	60°
sin	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$
cos	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$
tan	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$

Puzzle: The five jewellery boxes

\$1, \$2, \$4, \$8, \$16

Trigonometry 5

5L Finding lengths in special triangles

- 1 a $4\sqrt{3}$ cm b $6\sqrt{3}$ cm
2 a $12\sqrt{3}$ cm b $10\sqrt{2}$ cm
c $25\sqrt{3}$ cm d $\frac{7\sqrt{2}}{2}$ cm

Homework Book Answers

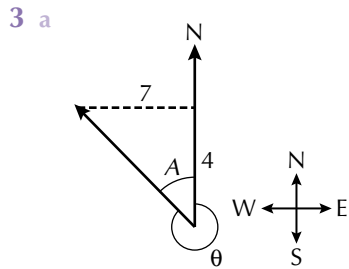
3 a $\sin 75^\circ = \sin 30^\circ \cos 45^\circ + \cos 30^\circ \sin 45^\circ$
 $= 0.5 \times 0.7071 + 0.8660 \times 0.7071$
 $= 0.9659$

b 0.9659 c 0, they are the same

d $\sin 75^\circ = \sin 30^\circ \cos 45^\circ + \cos 30^\circ \sin 45^\circ$
 $= \frac{1}{2} \times \frac{1}{\sqrt{2}} + \frac{\sqrt{3}}{2} \times \frac{1}{\sqrt{2}}$
 $= \frac{1 + \sqrt{3}}{2\sqrt{2}}$
 $= \frac{1 + \sqrt{3}}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$
 $= \frac{\sqrt{2} + \sqrt{6}}{4}$

5M Trigonometry and bearings

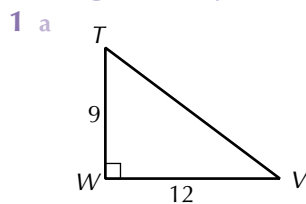
- 1 a 315° b 135°
 2 $A = 067^\circ = N 67^\circ E$ $B = 203^\circ = S 23^\circ W$
 $C = 308^\circ = N 52^\circ W$ $D = 130^\circ = S 50^\circ E$



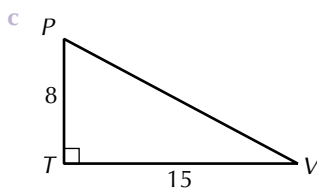
- b 8.062 km
 c average speed = $\frac{\text{distance}}{\text{time}} = \frac{8.062 \text{ km}}{0.25 \text{ h}}$
 $= 32.25 \text{ km/h}$
 d 60.3° e 300°

Trigonometry 6

5N Trigonometry in three dimensions 1



b 15 cm



d 17 cm

- 2 a 14.14 cm b 17.32 cm
 3 a 25 cm b 60 cm
 4 a 7.5 m b 20.6° c 21.36 m
 5 a $\angle AEC$ b 13 cm c 24.8°

Trigonometry 7

5N Trigonometry in three dimensions 2

1 a $\angle PST$ or $\angle QRU$ b $\angle TPU$ or $\angle WSV$

2 28.3° 3 53.1°

4 a TP b $\angle TPM$

c 71.6°

5 a $AF^2 = AB^2 + BF^2$

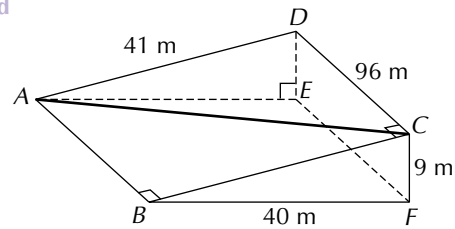
$$= 40^2 + 96^2$$

$$= 10\,816$$

$$AC = \sqrt{10\,816} = 104 \text{ (4 sf)}$$

b AD or BC c 12.7°

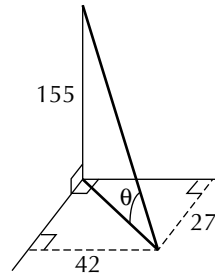
d



BD is the other possible answer.

e 4.9°

6 a



b 72.1° c 163 cm

Investigation: Beads on an abacus

- 1 30, 21, 12, 3 2 5
 3 300, 210, 201, 120, 111, 21, 12, 3

Puzzle: The missing dollar

There is no missing dollar. The \$2 stolen by the porter should be subtracted from \$27 to get \$25, not added to what the three men have paid.

The men have actually only paid \$27 after the refund. The porter has \$2 of this amount, and the other \$25 is with the manager.

As far as the original \$30 is concerned, the three men have \$3, the porter has \$2 and the manager has \$25.

Chapter 6

Algebra Techniques 1

6A Expanding a simple bracket

- 1 a $5x - 10$ b $-24x + 42$
 c $-p - q$ d $12x^2 - 36x$
 2 a $30x - 18$ b $x^2 - 3x$
 c $-24x^2 - 24x - 16$

6B Expanding double brackets

- 1 a $x^2 + 3x + 2$ b $x^2 - 3x - 4$
 c $-x^2 + 8x - 15$ d $3x^2 - x - 2$
 e $8x^2 + 6x - 35$
- 2 a $x^2 + 12x + 36$ b $25x^2 - 30x + 9$
 c $9x^4 + 12x^2 + 4$ d $4x^4 + 28x^2y^2 + 49y^4$
- 3 a $x^2 - 36$ b $1 - 16x^2$
 c $9p^2 - 16q^2$ d $16x^4 - 9y^4$
 e $x^{10} - 4$
- 4 a $2x^2 + 16x + 12$ b $13x + 14$
 c $7x^2 - 8x - 2$
- 5 a $x^3 + 10x^2 + 27x + 18$
 b $x^3 - 4x^2 - 4x + 16$ c $8x^3 - 2x^2 - 13x - 3$
 d $x^3 + 15x^2 + 75x + 125$
 e $15x^2 + 15x + 35$

6C Factorisation

- 1 a $5x(3 - 4x)$ b $3p(10qr + 6q - 3r)$
 c $5x(x^2 + 2x + 5)$ d $4y(4x^2y - 3)$
 e $(p - q)(p + r)$
- 2 a $(a + d)(b - c)$ b $(3 + a)(x - y)$
 c $2(c + d)(2a - 3b)$ d $(r - 2s)(2p - 3q)$

Algebra Techniques 2

6D Difference of perfect squares

- 1 a $(x - 8)(x + 8)$ b $(4 - x)(4 + x)$
 c $(3x - 5)(3x + 5)$
 d $(9x - 3y)(9x + 3y)$ or $9(3x - y)(3x + y)$
- 2 a $3(x - 3)(x + 3)$ b $2(2x - 3y^2)(2x + 3y^2)$
- 3 a $(x - 2)(x + 8)$ b $(x - 8)(x + 6)$
- 4 a $3x(1 - 2x)(1 + 2x)$ b $(4x - 9y^2)(4x + 9y^2)$
 c $5(2x + 1)$ d $(2x + 5)(1 - 2y)$
 e $(a - b + c + d)(a - b - c - d)$

6E Simple quadratic trinomials

- 1 a $(x + 4)(x + 3)$ b $(x - 7)(x + 2)$
 c $(x + 11)(x - 4)$ d $(x + 21)(x - 5)$
 e $(x - 8)(x + 8)$ f $(x + 6)^2$
 g $(x - 7)^2$ h $(x - 32)(x - 20)$
- 2 a $6(x - 3)(x + 2)$ b $15(x - 3)(x - 1)$
 c $2(x + 13)(x - 7)$ d $4(12 - x)(3 + x)$
 e $2(x - 5)^2$ f $4(x - 2)(x - 3)$

6F Other quadratic trinomials

- a $(3x - 2)(x + 1)$ b $(3x - 2)(2x + 3)$
 c $(4x + 7)(2x - 1)$ d $(5x - 2)(2x - 3)$
 e $(5x - 6)^2$ f $18(2x - y)(2x + y)$

Investigation: Cubes and the difference of two squares

- 1 $2^3 = 8 = 3^2 - 1^2$
 $3^3 = 27 = 6^2 - 3^2$
 $4^3 = 64 = 10^2 - 6^2$
 $5^3 = 125 = 15^2 - 10^2$
 $6^3 = 216 = 21^2 - 15^2$

2 $91^2 - 78^2 = (91 - 78)(91 + 78)$
 $= 13 \times 169$
 $= 13 \times 13^2$
 $= 13^3$

3 a $\frac{n(n \cdot 1)}{2}$
 b $\left(\frac{n(n+1)}{2}\right)^2 - \left(\frac{n(n-1)}{2}\right)^2$
 $= \frac{n^2(n+1)^2}{4} - \frac{n^2(n-1)^2}{4}$
 $= \frac{n^2}{4}[(n+1)^2 - (n-1)^2]$
 $= \frac{n^2}{4}[n^2 + 2n + 1 - n^2 + 2n - 1]$
 $= \frac{n^2}{4} \times 4n$
 $= n^3$

Algebra Techniques 3

6G Algebraic fractions

- 1 a x b $\frac{4y}{3}$
 c $\frac{3x+16}{4}$ d $\frac{4x}{5}$
- 2 a $\frac{7x}{10}$ b $\frac{5x+3}{6}$
 c $\frac{19x+28}{20}$ d $\frac{11x+11}{30}$
 e $\frac{-x+6}{4}$ f $\frac{7x-13}{6}$
- 3 a $\frac{2x+3}{(x+4)(x-1)}$ b $\frac{16x-6}{(2x+1)(5x-1)}$
 c $\frac{10}{x(x+2)}$ d $\frac{5x-30-x^2}{(x+1)(x-5)}$
- 4 a $\frac{4}{3}$ b -2
- 5 a $x - 4$ b $\frac{1}{x+5}$
 c $\frac{x+3}{x+4}$ d $\frac{2}{x-5}$
- 6 a $\frac{x+4}{3x+5}$ b $\frac{(x+3)(x+1)}{2x}$
 c $\frac{2(x+3)}{(x-2)(x+6)}$

Investigation: Three squares in a row

- 1 36 2 121 3 400

Homework Book Answers

$$\begin{aligned}
 4 \quad & \frac{n^2 + (n+1)^2 + (n+2)^2 - 2}{3} \\
 &= \frac{n^2 + n^2 + 2n + 1 + n^2 + 4n + 4 - 2}{3} \\
 &= \frac{3n^2 + 6n + 3}{3} \\
 &= \frac{3(n^2 + 2n + 1)}{3} \\
 &= n^2 + 2n + 1 \\
 &= (n+1)^2
 \end{aligned}$$

Puzzle: The shoemaker's will

The executor shared the shoes in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{1}{9} = 9 : 6 : 2$, which is probably what the shoemaker intended. The problem with the will is that the three given fractions do not add to 1.

In fact $\frac{1}{2} + \frac{1}{3} + \frac{1}{9} = \frac{17}{18}$ so if there were a large number of shoes $\frac{1}{18}$ would be unallocated.

Algebra Techniques 4

6H Basic linear equations

- | | |
|---------------------------------------|--------------------------------------|
| 1 $x = 3$ | 2 $\frac{-8}{5} = -1\frac{3}{5}$ |
| 3 $x = 12$ | 4 $x = -28$ |
| 5 $x = \frac{25}{21} = 1\frac{4}{21}$ | 6 $x = -6$ |
| 7 $x = 13$ | 8 $x = \frac{-5}{2} = -2\frac{1}{2}$ |
| 9 $x = -18$ | |
- 10 a \$115.67
 b $0.19(x - 500) + 79 = 212$
 $x = 1200$ MB
- 11 a $10 - 2x = 3 \cdot 6$
 $x = 3 \cdot 2$ hours (3 hours 12 minutes)
 b Value of card = $100 - 0.6x$
 The range of possible values for x is 0 to $166\frac{2}{3}$.

6I Equations involving brackets

- | | |
|---------------------------------------|---------------------------------------|
| 1 $x = 11$ | 2 $x = -9$ |
| 3 $x = \frac{-13}{2} = -6\frac{1}{2}$ | 4 $x = \frac{-7}{18}$ |
| 5 $x = \frac{-7}{5} = -1\frac{2}{5}$ | 6 $x = \frac{26}{21} = 1\frac{5}{21}$ |

6J Further equations 1

- | | |
|--------------------------------------|------------|
| 1 $x = 2$ | 2 $x = 0$ |
| 3 $x = -6$ | 4 $x = -2$ |
| 5 $x = \frac{-8}{3} = -2\frac{2}{3}$ | 6 $x = -6$ |

$$7 \quad x = \frac{11}{4} = 2\frac{3}{4} \qquad 8 \quad x = -46$$

Algebra Techniques 5

6J Further equations 2

- | | |
|--------------------------------------|---------------------------------------|
| 1 $x = \frac{30}{7} = 4\frac{2}{7}$ | 2 $x = \frac{30}{11} = 2\frac{8}{11}$ |
| 3 $x = \frac{72}{7} = 10\frac{2}{7}$ | 4 $x = \frac{1}{2}$ |
| 5 $x = 0$ | 6 $x = \frac{10}{7}$ |
| 7 $x = \frac{-6}{7}$ | 8 $x = \frac{1}{3}$ |

- 9 a $x = 3$. Shapsight charged a fee of \$93, which means the job took three-quarters of an hour.
 b $20x + 30 = 190$, $x = 8$, so installation took 2 hours.
 c Shapsight
 d $16x + 45 = 20x + 30$
 $x = \frac{15}{4} = 3\frac{3}{4}$
 i.e. 56.25 minutes

6K Inequations

- | | |
|----------------------------|--|
| 1 $x > -3$ | 2 $x \geq \frac{9}{2}$ |
| 3 $x < -2$ | 4 $x \leq 11$ |
| 5 $x \geq 12$ | 6 $x > \frac{-3}{17}$ |
| 7 $x \geq \frac{-3}{5}$ | 8 $x > \frac{-12}{5}$ |
| 9 $\{ \}$ (no solution) | 10 $x < -59$ |
| 11 $x \geq \frac{231}{13}$ | 12 a $C = 0.5k + 30$ |
| b $0.5k + 30 < 90$ | c $0 \text{ km} \leq k < 120 \text{ km}$ |

Algebra Techniques 6

6L Transposing formulas

- | | |
|---|--------------------------|
| 1 a $p = \frac{8-q}{6}$ | b $p = \frac{q}{4} + 3$ |
| c $p = \frac{1-5q}{8}$ | d $p = \frac{3q}{2} + 6$ |
| e $p = \frac{2q-6}{5}$ | |
| 2 $y = \frac{-c-ax}{b}$ or $y = \frac{-a}{b}x + \frac{-c}{b}$ | |
| 3 a $l = 4p + 1$ | b $p = \frac{l-1}{4}$ |
| c 54 | |
| 4 a $y = \frac{5x}{18}$ | b $x = \frac{18y}{5}$ |
| 5 $r = \sqrt{\frac{SA}{3\pi}}$ | |

Homework Book Answers

6 a $a = \frac{v^2 - u^2}{2s}$

b $u = \sqrt{v^2 - 2as}$

7 a $d = \frac{ay}{y+12}$

b $y = \frac{12d}{a-d}$

c 3 years old

8 a $f = \frac{uv}{u+v}$

b $u = \frac{fv}{v-f}$

9 a $A = \frac{1}{2}r^2(\theta - \sin\theta)$

b $r = \sqrt{\frac{2A}{\theta - \sin\theta}}$

Investigation

1 $ab + a + b = 10a + b$, which simplifies to $a(b+1) = 10a$.

2 It is not possible to make a the subject because a 'cancels' out.

If making b the subject you get $b = 9$.

3 19, 29, 39, 49, 59, 69, 79, 89, 99

Algebra Techniques 7

6M Index numbers

1 a 256

b 132·651

c 2401

d -512

e -8

f 216

2 a $\frac{9}{64}$

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

c $3\frac{3}{8}$

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

3 a $12p^2qr$

b $-180x^3y^3$

c $\frac{e^2f}{g^2h}$

d $\frac{80bd^2}{9ac^3}$

Puzzle: Professor Gordon's children

3, 3 and 8

6O Index laws

1 a x^9

b x^{10}

c $12x^6$

d $-40x^{11}$

e $24x^{13}$

f x^5y^{11}

g $-80x^9y^6$

h y^{10p}

i $6x^4y^5$

2 a x^4

b x^4

c $4x^3$

d $\frac{7}{9y}$

e $\frac{9}{2x^2}$

f $\frac{8}{9x}$

g $\frac{11}{x^3}$

h $\frac{p^2}{5q}$

i $\frac{7x^2z^3}{4}$

j p^{2q-3r}

3 a x^{14}

b $32x^5$

c $-64x^{21}$

d $4a^8b^{12}c^2$

e 1

4 a b^3

b $\frac{b^6c}{a^3}$

5 a $\frac{256x^5}{3y}$

b $5625x^{18}$

c x^3

d $\frac{144x^3y}{125}$

Puzzle

Rude numbers are of the form 2^n where n is a whole number.

Algebra Techniques 8

6P Negative indices

1 a $\frac{1}{9}$

b $\frac{1}{125}$

c $\frac{1}{6}$

d $\frac{1}{64}$

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

b $\frac{1}{y^7}$

3 a 81

b 256

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

b 16

c $3\frac{3}{8}$

d $\frac{25}{81}$

e $\frac{2}{9}$

f $\frac{16}{25}$

5 a $3y^{-1}$

b $\frac{1}{2}x^{-1}$

c $\frac{4}{3}x^{-2}$

6 a $\frac{1}{x}$

b $\frac{1}{x^{16}}$

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

d $\frac{1}{3x}$

e $\frac{1}{xy^6}$

f $\frac{x^3}{y^6}$

g $\frac{x^4}{4y^2}$

h $\frac{3x^2y^5}{4}$

7 a x^2y^{10}

b $\frac{8y^2}{3x^5}$

6Q Fractional indices

1 a i 2

ii 7

iii 14·14

b An index of $\frac{1}{4}$ or 0·25 gives the fourth root of a number—that is, $\sqrt[4]{\quad}$.

2 a 6

b 2

c 2

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

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

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

4 a 4

b 216

c 32

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

b $\frac{1}{4}$

c $\frac{81}{16} = 5\frac{1}{16}$

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

b $\frac{1}{16}$

c $\frac{1}{243}$

Homework Book Answers

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

8 a $x^{\frac{-1}{5}}$ b $x^{\frac{-21}{8}}$

c $x^{-3}y^{-4}$ d $16x^{-2} = \frac{16}{3x^2}$

e $\frac{1}{27}x$ f $\frac{1}{16x^2y}$

g $\frac{1}{9x^3y^{\frac{3}{2}}}$ h $\frac{z^{18}}{x^{15}y^{10}}$

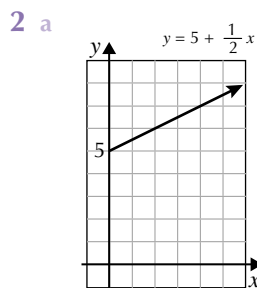
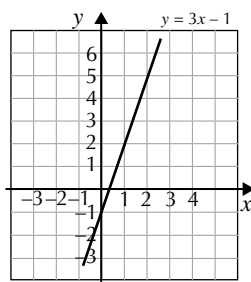
Chapter 7

Linear Functions 1

7A Graphing linear relations

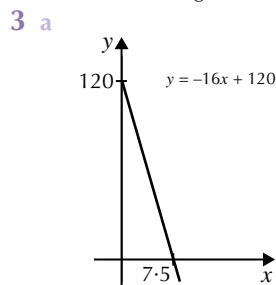
1

x	-1	0	1	2	3
y	-4	-1	2	5	8



b The y-intercept represents the length when there is no mass attached.

c A mass of 8 kg will cause the spring to break.



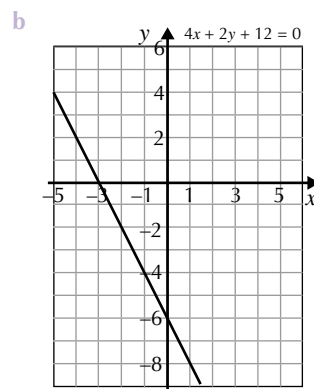
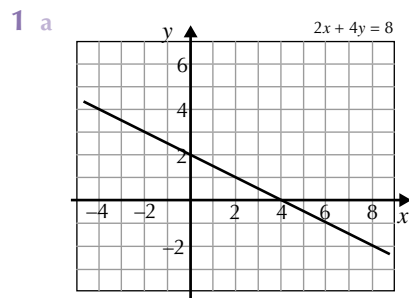
b No. Time is measured from time 0 at which time alcohol was consumed!

c No. The alcohol level obviously cannot be negative.

d $y = 120$. This represents the level immediately after the six-pack has been consumed

e 7.5 hours (the x-intercept)

7B Sketching lines using the x- and y- intercepts

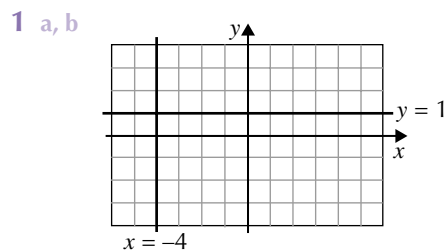


2 a $x = 22\ 500$ —this gives the number of rabbits produced when no hollow eggs are made

b 52 000

Linear Functions 2

7C Horizontal and vertical lines



2 A ($x = 4$)

3 a $y = -2$ b $x = -5$ c $x = 1$

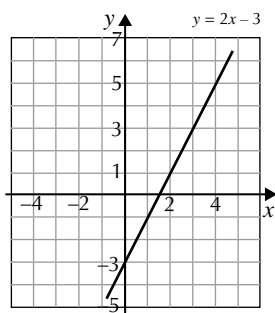
7D Gradients of straight lines

1 a $-\frac{1}{3}$ b 11

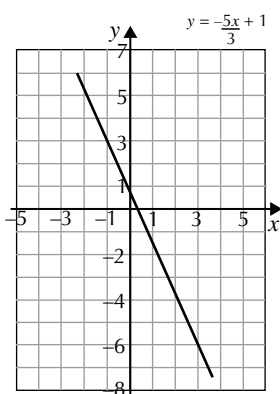
2 a $\frac{3}{5}$ b -1

7E Using the gradient and y-intercept 1

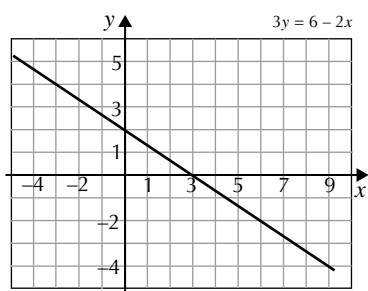
1 a



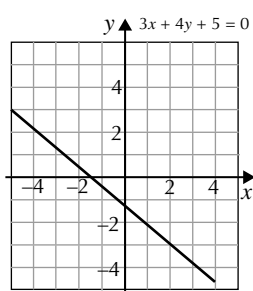
b



2 a



b

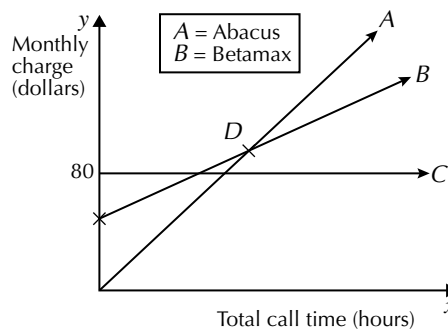


Linear Functions 3

7E Using the gradient and y-intercept 2—Applications

- 1 a Betamax Linecall
 b The charge per hour spent on calls is \$15.
 c $y = 20x$
 d At point D the monthly charge is the same for both companies. $D = (5, 100)$
 e $y = 80$

f



The line lies below D .

7F Finding the equation of a line

- 1 a $y = 2x + 12$ b $y = -3x + 11$
 2 $y = -2x + 8$ 3 $y = x + 1$

7G Simultaneous equations: Graphing

- a (5, 11) b (1, 2)

7H Simultaneous equations:

Substitution 1

- a $x = 6, y = 7$ b $x = 4, y = 1$
 c $x = -4, y = \frac{2}{3}$

Linear Functions 4

7H Simultaneous equations:

Substitution 2—Applications

- 1 a $x + y = 90, y = 5x$
 b The two numbers are 15 and 75.
 2 a When $x = 40, y = 2 \times 40 - 50 = 30$
 b $y = 1.5x$ c $20 < x < 100$

7I Simultaneous equations:

Elimination 1

- 1 a $x = 1, y = 4$ b $x = 14, y = 2$
 c $x = 11, y = 5$
 2 a $x = -4, y = 7$ b $x = 1, \frac{1}{3}$
 c $x = \frac{1}{2}, y = -5$ d $a = 2, b = 3$
 e $x = \frac{9}{13}, y = \frac{-85}{13}$

Puzzle

14 servers, 1 dishwasher and 5 chefs

Linear Functions 5

7I Simultaneous equations:

Elimination 2—Applications

- 1 a $2.4y$ represents the total amount charged for coffee.
 b $x + y = 53$
 c 17 cups of tea and 36 cups of coffee were sold.

Homework Book Answers

- 2 a x = number of Airbus 320 flights each week
 y = number of Boeing 777 flights per week
 $180x + 385y = 14\ 000$

b $x = 35, y = 20$

- 3 a x = number of cars
 y = number of buses
 $x + y = 38$
 $5x + 20y = 280$

b 32 cars and 6 buses

Puzzle: Spiders and flies

5 spiders

7J Exploring parallel and perpendicular lines

1 A and C

2 A and C

3 $y = 2x - 9$

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

5 $y = \frac{-4}{3}x + 4$

6 $y = \frac{-2}{3}x - 1$

Linear Functions 6

7K Midpoints and distances between points

1 a (2, 3) b (-1, 2)
 c $(0, \frac{-1}{2})$ or (0, -0.5) d $(0, \frac{1}{2})$ or (0, 0.5)

2 a (9, 8) b $(\frac{1}{2}, 5\frac{1}{2})$ or (0.5, 5.5)

3 (-5, 18)

4 a 5 units

b 9.220 units

5 17 units

6 $AB = BC = \sqrt{8} = 2.828$

7 $QS = 9.899$ (4 sf)

7L Absolute values

1 a 2 b 17 c 30 d 1
 e 2 f 4 g 11 h 2
 i 13 j -5 k -2 l 33
 m 28

2 a $x = 20$ or $x = -20$ b $x = 3$ or $x = -3$

c no solution d $x = 8$ or $x = -2$

e $x = 4$ or $x = -18$ f $x = 3$ or $x = -2$

g $x = 3$ or $x = \frac{-19}{3}$

Chapter 8

Quadratic Functions 1

8A What is a quadratic equation?

1 a yes b no c yes

d no e no

2 a $x^2 - 6x - 2 = 0$ b $x^2 - 6x - 30 = 0$

c $x^2 - 9x - 3 = 0$

3

	Coefficient of x^2	Coefficient of x	Constant term	
a	$x^2 + x - 3$	1	1	-3
b	$2x^2 + 1$	2	0	1
c	$3x - 4x^2$	-4	3	0

8B Using the null factor law

1 a $x = 2, x = -5$ b $x = 0, x = 6$

c $x = \frac{-1}{2}, x = \frac{2}{3}$ d $x = \frac{1}{3}, x = -4$

e $x = -20$ f $x = \frac{1}{3}, x = 2$

2 a $x = 6, x = -4$ b $x = -6, x = -5$

c $x = 3, x = -8$ d $x = 0, x = 3$

e $x = -7, x = -6$

f $x = 0, x = \frac{-3}{2}$ or $x = -1\frac{1}{2}$

g $x = \frac{1}{5}, x = -2$

h $x = \frac{-3}{2}$ or $x = -1\frac{1}{2}, x = \frac{4}{5}$

8C Solving further quadratic equations

1 a $x = 3, x = -1$ b $x = -2, x = 8$

c $x = 0, x = 6$ d $x = -3, x = 10$

2 a $x = 8, x = -6$ b $x = 2, x = -2$

3 a $x = 3, x = -3$ b $x = 9, x = -3$

c $x = \frac{5}{4}, x = \frac{-5}{4}$ d $x = 10, x = -2$

4 a $x = -4, x = 3$ b $x = 5, x = -4$

8D The quadratic formula

a $x = 0.22, x = -18.22$ b $x = 4.30, x = 0.70$

c $x = 2.91, x = -0.57$ d $x = 3.07, x = -0.57$

Quadratic Functions 2

8E Worded problems using quadratics

1 a $h = 21 - x$

b $54 = \frac{1}{2}x(21 - x)$
 $x = 9$ cm or $x = 12$ cm

2 $x = 7$

3 Lyn's age = 14, Michelle's age = 8

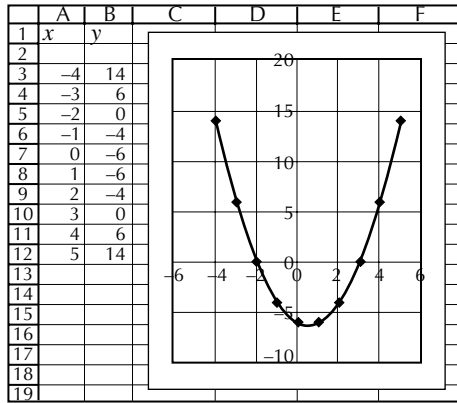
4 a 9 m b 6 m

c The solution is $x = \pm\sqrt{5}$ (2.236) and represents the half widths of the arch 4 m above ground level. The float must have a width of less than 4.47 m to fit through the arch.

Homework Book Answers

8F Plotting points

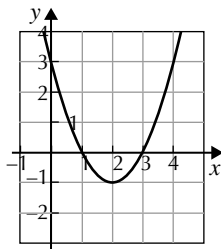
1 a



b $x = -2, x = 3$ c $y = -6$

2 a $y = x^2 - 4x + 3$

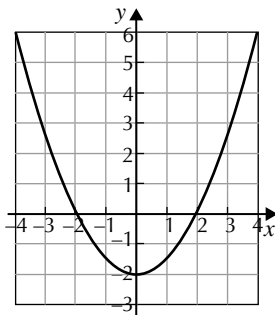
x	-1	0	1	2	3	4	5
y	8	3	0	-1	0	3	8



The x-intercepts are 1 and 3 and the y-intercept is 3.

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

x	-1	0	1	2	3	4	5
y	-1.5	-2	-1.5	0	2.5	6	10.5



The x-intercepts are -2 and 2 and the y-intercept is -2.

Quadratic Functions 3

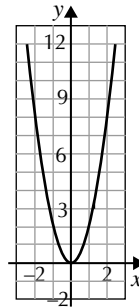
8H Key features of quadratic functions

- 1 a x-intercepts = -4, 2
 y-intercept = -8
 axis of symmetry is $x = -1$
 turning point is (-1, -9), which is a minimum
- b x-intercepts = -2, 2
 y-intercept = 4
 axis of symmetry is $x = 0$
 turning point is (0, 4), which is a maximum

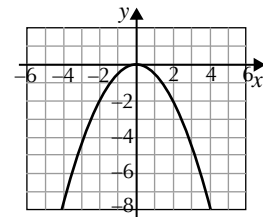
- c x-intercepts = -3, 0
 y-intercept = 0
 axis of symmetry is $x = -1\frac{1}{2}$
 turning point is $(-1\frac{1}{2}, -2\frac{1}{4})$, which is a minimum
- d x-intercept = 1
 y-intercept = 0.5
 axis of symmetry is $x = 1$
 turning point is (1, 0), which is a minimum
- e x-intercepts = -3, 1
 y-intercept = 3
 axis of symmetry is $x = -1$
 turning point is (-1, 4), which is a maximum
 x-intercepts = $-\frac{1}{2}, 2$
- f y-intercept = -2
 axis of symmetry is $x = \frac{3}{4}$
 turning point is $(\frac{3}{4}, -3\frac{1}{8})$, which is a minimum

8I-K Exploring parabolas

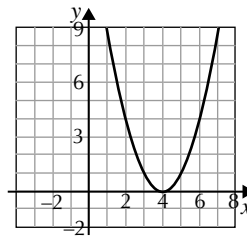
1 a



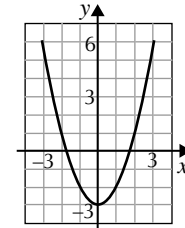
b



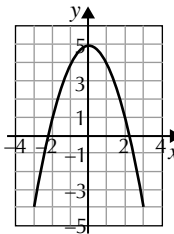
c



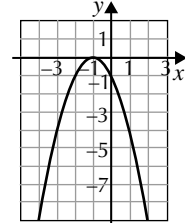
d



e



f



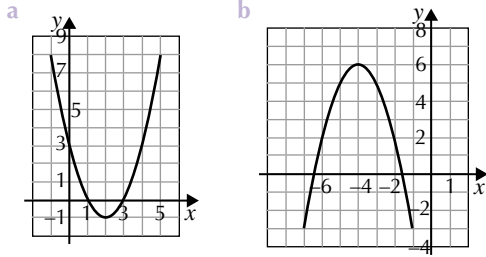
2 a $y = x^2 + 2$

b $y = (x - 2)^2$

Homework Book Answers

Quadratic Functions 4

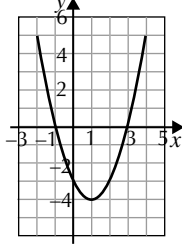
8L Exploring turning point



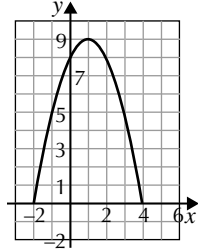
8M Parabolas of the form

$$y = ax^2 + bx + c$$

1 a vertex = (1, -4)



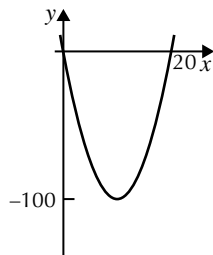
b vertex = (1, 9)



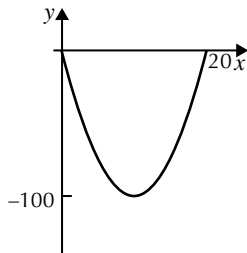
2 a $y = (x - 2)(x - 5)$ b $y = x(2 - x)$

8N Solving worded problems

1 a i



ii



b (0, 0) and (20, 0)

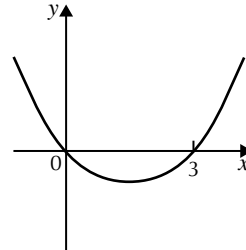
c i At a point that is 5 cm from one rim of the cooker the depth is 75 mm.

ii The negative sign means points inside the cooker are below the edge. In other words, it is showing a depth rather than a height.

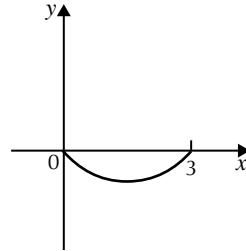
d (10, -100)

e The cooker is 100 mm, 10 cm deep in the middle.

2 a i



ii



b (0, 0) and (3, 0)

c 1 metre out from one end of the rod there is a sag of 2 cm. The negative sign shows the rod is below where it would be if there was no sag.

d (1.5, -2.25)

e The lowest point of the rod is 1.5 m from each end, and here the sag is 2.25 cm.

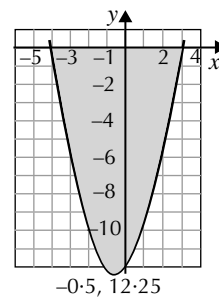
Quadratic Functions 5

8O Solving quadratic inequations

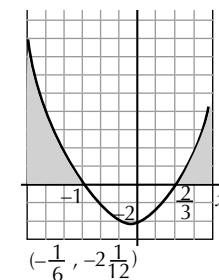
1 a $x < -1$ or $x > 3$ b $-1 < x < 2$

2 $1 < x < 4$

3 a $-4 < x < 3$



b $x < -1$ or $x > \frac{2}{3}$



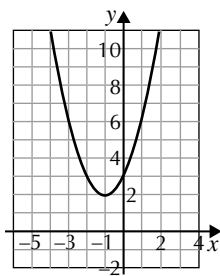
4 a $-3 \leq x \leq 5$

b $x < 2$ or $x > 3$

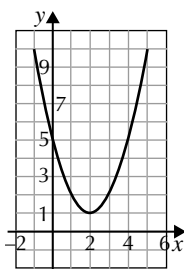
5 The width is between 0 m and 2 m.

8P Completing the square

1 a $y = (x + 1)^2 + 2$



b $y = (x - 2)^2 + 1$



- 2 a (-1, 2) b (2, 1)
 3 a moved 1 unit to the left and up 2 units
 b moved 2 units to the right and up 1 unit

Chapter 9

Probability 1

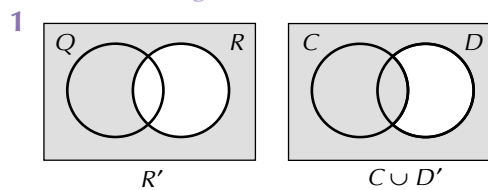
9A Theoretical probability

- 1 a $\frac{1}{10}$ b $\frac{11}{20}$
 c $\frac{9}{20}$ d 0
 2 a $\frac{1}{4}$ b $\frac{1}{2}$
 c 0 d $\frac{3}{4}$
 e 1 3 0.15
 4 a $\frac{1}{2}$ b $\frac{4}{13}$
 c $\frac{2}{13}$
 5 a $\frac{1}{6}$ b $\frac{1}{3}$

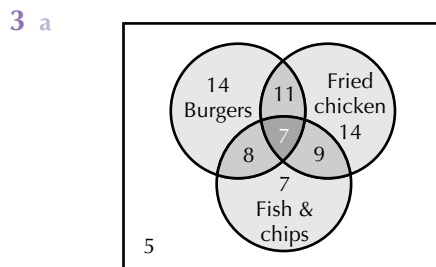
Puzzle: The white marbles

Put one white marble in one bag, and in the other bag put five white and six black marbles. Your probability of choosing white will be $\frac{8}{11} = 0.72$.

9B Venn diagrams



2 a $\frac{21}{40} = 0.525$ b $\frac{11}{21} = 0.55$



b $\frac{8}{15}$ c $\frac{1}{15}$ d $\frac{7}{15}$

Probability 2

9C Mutually exclusive events

- 1 0.8
 2 a 0.73 b 0.71
 3 0.25 4 0.02
 5 0.35 6 0.17

9D Two-way tables

1 a

	C	C'	Totals
D	29	7	36
D'	14	25	39
totals	43	32	75

b

	P(E)	Pr(E')	Totals
P(F)	0.23	0.36	0.59
P(F')	0.33	0.08	0.41
totals	0.56	0.44	1

- 2 a $P(A \cup B)$ b $P(A \cap B)$
 3 a i 0.85 ii 0.35
 iii 0.3
 b $\frac{6}{7} = 0.86$ (2 dp) c $\frac{1}{3} = 0.33$ (2 dp)

4

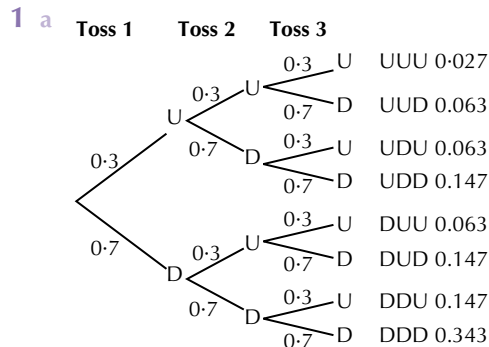
	Height under 175 cm	Height over 175 cm	
Male	22%	63%	85%
Female	7%	8%	15%
	29%	71%	100%

- a 71% b 63%

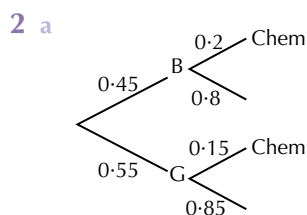
Homework Book Answers

Probability 3

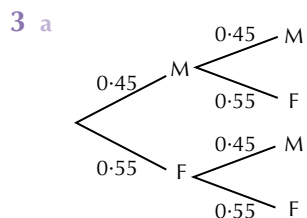
9E Tree diagrams



b 0.189



b i 0.0825 **ii** 0.4675



b i 0.3025 **ii** 0.4950

9F Sampling without replacement

1 $\frac{8}{15}$

2 a $\frac{1}{11}$ **b** $\frac{10}{33}$

3 a $\frac{7}{24} = 0.291\bar{6}$ **b** $\frac{21}{40} = 0.525$

c $\frac{119}{120} = 0.991\bar{6}$

Puzzle

45

Probability 4

9G Conditional probability

1 0.5

2 $\frac{1}{7} = 0.14$ (2 dp)

3 a 0.7 **b** 0.46
c 0.3 **d** 0.8696
e 0.5714 **f** 0.5556

4 0.32 **5** 0.6

6 a 0.09 **b** 0.3
c 0.69

9H Odds 1

1 a $\frac{1}{4}$ **b** $\frac{2}{13}$

c $\frac{4}{7}$ **d** $\frac{11}{13}$

e $\frac{1}{101}$

2 a 4 : 1 against **b** 5 : 3 against

c 2 : 1 on **d** 9 : 1 on

e 17 : 3 against

Probability 5

9H Odds 2—Applications

1 a \$8 **b** \$50

c \$187.50 **d** \$1500

2 \$180

3 a 7 **b** 4:5

4 \$100

5 a \$25 **b** 3 : 2 against

Investigation: Tricky dice

1 A has the greater probability of success, that is,

$$P(A \text{ wins}) = \frac{5}{9}, P(B \text{ wins}) = \frac{4}{9}$$

2 B is more likely to win.

$$P(B \text{ wins}) = \frac{5}{9}, P(C \text{ wins}) = \frac{4}{9}$$

3 C is more likely to win.

$$P(C \text{ wins}) = \frac{5}{9}, P(A \text{ wins}) = \frac{4}{9}$$

4 B or C are most likely to win. $P(A \text{ wins}) = \frac{7}{27}$

$$P(B \text{ wins}) = \frac{10}{27}, P(C \text{ wins}) = \frac{10}{27}$$

9I Long run proportion

1 a H, T, H, H, T, T

b The percentage is getting closer to 65%

c 50%

d No—percentage of heads is not 50%.

2 a

Day	No. correct answers	(No. correct answers) ÷ (total no. of calls)
1	0	$\frac{0}{12} = 0$
2	1	$\frac{1}{24}$
3	2	$\frac{3}{36} = \frac{1}{12}$
4	1	$\frac{4}{48} = \frac{1}{12}$
5	0	$\frac{4}{60} = \frac{1}{15}$
6	3	$\frac{7}{72}$
7	0	$\frac{7}{84}$
8	1	$\frac{8}{96} = \frac{1}{12}$

Homework Book Answers

Day	No. correct answers	(No. correct answers) ÷ (total no. of calls)
9	2	$\frac{10}{108} = \frac{1}{12}$
10	1	$\frac{11}{120}$
11	1	$\frac{12}{132} = \frac{1}{11}$

b 0.09 or 0.08

Probability 6

9J Using experience to find probabilities

1 a 0.40 b 0.15 c 0.09 d 0.97 e 0.75

2 a 0.26 b 0.08 c 0.8

3 0.56 4 $\frac{32}{100} \approx 0.32$

9K Exploring simulations

Investigation: The four seasons

1 4

2 There is no maximum. A collector may never get all the plates.

Type of plate	Random decimal
Summer	0.00 to 0.24
Spring	0.25 to 0.49
Winter	0.50 to 0.74
Autumn	0.75 to 0.99

4 6

5 The ten simulations give: 6, 4, 4, 9, 12, 6, 8, 5, 9, 5. The mean is 6.8.

6 The collector could allocate a throw of 1 to summer, a throw of 2 to spring, a throw of 3 to winter, a throw of 4 to autumn and ignore throws of 5 and 6.

7 No, because many people would buy the plates in sets of 4.

Chapter 10

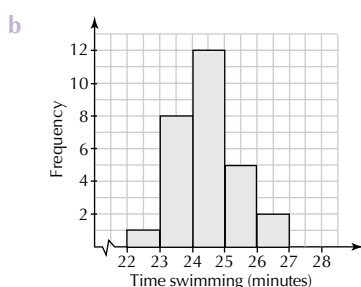
Statistics 1

10A Histograms

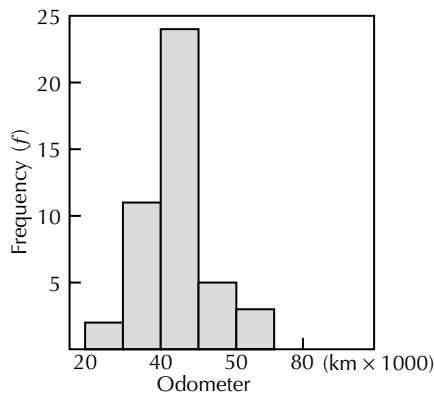
1 a 70 b 20 c $\frac{1}{4}$

d Because the weight of each individual avocado is different—the weights have been grouped into intervals.

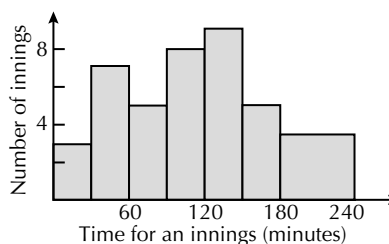
2 a 28



3



4 a



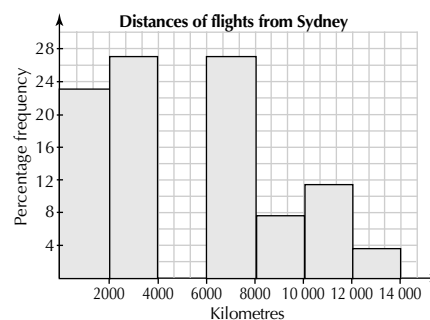
b The histogram is fairly symmetrical and values near the centre are more common than others.

5 a

Distance (in km)	Frequency	Percentage Frequency
0 –	6	23.1%
2 000 –	7	26.9%
4 000 –	0	0%
6 000 –	7	26.9%
8 000 –	2	7.7%
10 000 –	3	11.5%
12 000 –	1	3.8%

b $\frac{7}{26} \times \frac{100}{1} \% = \frac{700}{26} \% = 26.9\%$

c



Statistics 2

10B The mean

1 10 2 \$148.84 3 1.65 kg

4 a

No. of passengers per trip	Frequency	$x \times f$
1	2	2
2	1	2
3	3	9
4	4	16
5	4	20
6	6	36

Homework Book Answers

No. of passengers per trip	Frequency	$x \times f$
7	3	21
8	2	16
Total	25	122

b 122

c Mean = $\frac{122}{25} = 4.88$

5 a

Time (minutes)	Midpoint of interval (m)	Frequency (f)	$m \times f$
0–60	30	8	240
–120	90	19	1710
–180	150	5	750
Total		32	2700

b 27

c 84 minutes (nearest whole number)

6 a

Volume of orange juice (to nearest mL)	246	247	248	249	250	251
Frequency	1	4	6	7	3	2

b 23

c 248.6 ml

d 78.3%

7 a 3

b 25

c 28

Puzzle

56

Statistics 3

10C Mean and standard deviation

1 mean = 5, standard deviation = 2.828 or 2.646 depending on which key is used

2 a Hillary: mean = 55.8, sd = 7.244

Barbara: mean = 55.8, sd = 19.8

b Hillary's marks are more consistent than Barbara's marks, because the standard deviation is smaller—this means they are less spread out

3 a D, A, B, F, E, C

b standard deviation of A = 0.6325

standard deviation of B = 0.8944

standard deviation of C = 1.789

standard deviation of D = 0

standard deviation of E = 1.414

standard deviation of F = 1.265

c The standard deviations increase as the scores become more spread out.

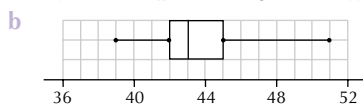
4 a decrease

b decrease

10D and 10E Boxplots 1

1 a $x_L = 39$

$Q_1 = 42$ $Q_2 = 43$ $Q_3 = 45$ $x_H = 51$



2 a 76 km/h

b 59 km/h

c 50 km/h

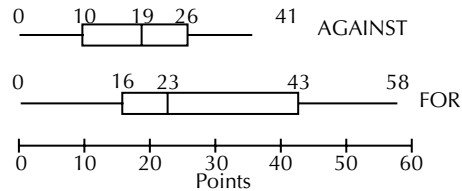
d 90

Statistics 4

10D and 10E Boxplots 2

1 a points for: median = 23, $Q_1 = 16$, $Q_3 = 43$
points against: median = 19, $Q_1 = 10$, $Q_3 = 26$

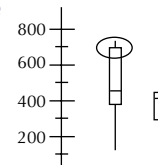
b



c Each of the top score, Q_3 , median and Q_1 for points for were higher than the corresponding values for points against.

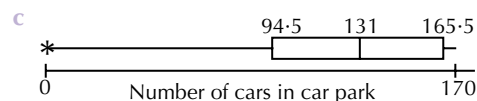
2 a 25% b 460 c $730 - 150 = 580$

d, e



3 a median = 131, $Q_3 = 165.5$, $Q_1 = 94.5$

b Zero appears to be an outlier. It probably represents the number of cars in the car park when it first opened, so would have been recorded correctly.



10F Back-to-back stemplots

1 a

October	January
	2
	3
9 9 8 8 7 7 0	4 9
9 9 8 8 7 7 4 4	5 6
9 8 6 1	6 7 8 8 8 9
5 3 1	7 1 7 9
9	8 1 4 6 7 8 8
	9 5 7 8 9 9
	10 1 1 9
	11
	12 3

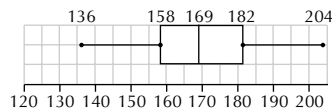
b The graph shows an increase of about \$40 in room rates from October to January. The January rates have a greater spread.

2 a 57 g

b 176 g

c 169 g

d



Statistics 5

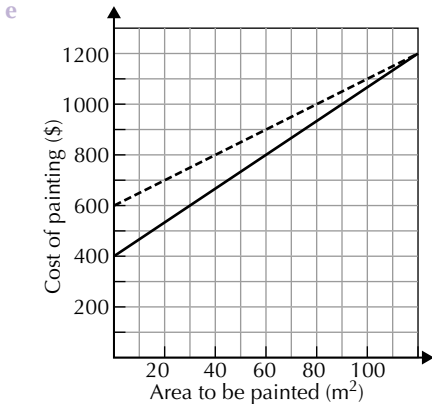
10I Sampling

1 a population—the whole group of items or people under consideration

b sample—a subgroup of the population

c sampling frame—a complete list of the whole population

Homework Book Answers



f The point where the two graphs intersect gives the area for which the quotes are the same.

2 a $h = 71 + 2 \cdot 9l$

b

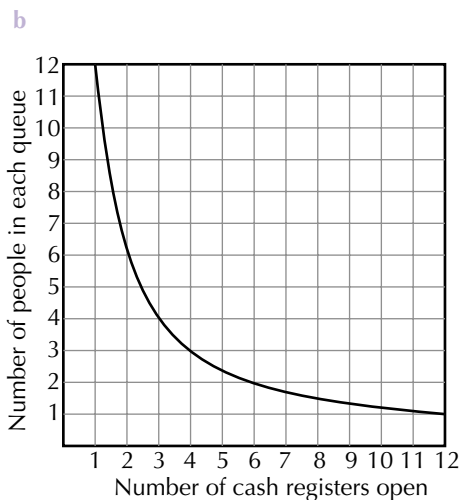
Length l (cm)	30	34	38	42
Height h (cm)	158	170	181	193

11D Exploring reciprocal relationships

Investigation: Checkout queues

1 a

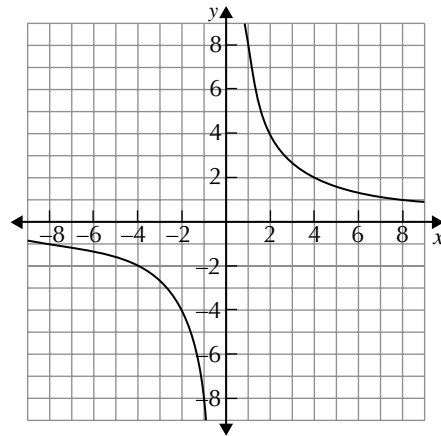
Number of cash registers open (x)	Number of people in queue (y)
12	1
6	2
4	3
3	4
2	6
1	12



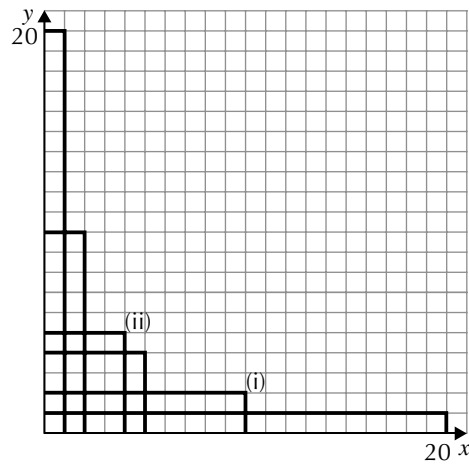
c The numbers in each pair multiply to 12.

2

x	8	4	2	1	-1	-2	-4	-8
y	1	2	4	8	-8	-4	-2	-1



3 a,b



c $xy = 20$

d The area of the rectangle is 20. It would only touch the y -axis if the value of x were zero, but then the area would be 0 too.

Variation, Exponential and Reciprocal Functions 3

11E Inverse variation and reciprocal functions

1 a $P \propto \frac{1}{n}$ b $P = \frac{k}{n}$

c $k = 4000$; $P = \frac{4000}{n}$

d i \$4 ii \$16

e $n = \frac{4000}{P}$

f i 500 tickets ii 20 000 tickets

2 87.5 minutes 3 18 days

11H Direct and inverse variation using powers

1 a $y = kx^3$ b $k = 8$

c i 13 824 ii 1

Homework Book Answers

- 2 a The distance in kilometres to the horizon is proportional to the square root of the height in metres.
- b i 43 km ii 336 km
- 3 a $h = kw^2$ b $k = \frac{1}{200}$
- c 2 mm
- 4 a $x = k\sqrt{A}$ b $k = 1.52$

Variation, Exponential and Reciprocal Functions 4

11I Joint variation

- 1 a $p = kxy$ b $p = \frac{kx}{y}$
- c $p = \frac{kx^3}{\sqrt{y}}$
- 2 a $p = \frac{6\,000\,000\,000}{my}$ b \$3750
- 3 a $l = \frac{w}{h^2}$
- b 21.5 c 19.4
- d Ah-Chee e Rob
- 4 20 bushes

11J–L Exponential functions

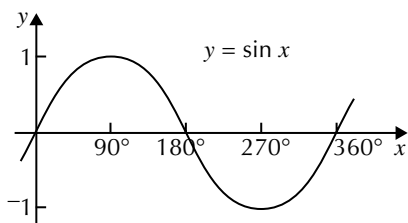
- 1 a 173 b 7950 c 100
- d 3.8 hours (or 4 hours approximately)
- 2 a 8.6%, 23.3%
- b 44 months
- c The upper limit on the percentage of doctors who prescribe the drug—the graph approaches the line $y = 90$ but does not go beyond it.
- d Over the first 30–40 months the percentage increases at a fairly steady rate of about 1–3% per month, but after then the rate of increase becomes very slow.

Chapter 12

Trigonometric and Cubic Functions 1

12A Exploring trigonometric graphs

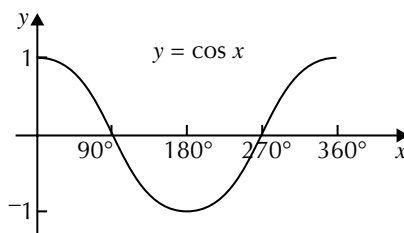
- 1 A 0 B 180° C -1
- D 45° E $225^\circ, 1$
- 2 The graph of $y = \sin x$ is below the x -axis for these values.
- 3 a 4 m b 8 m
- c



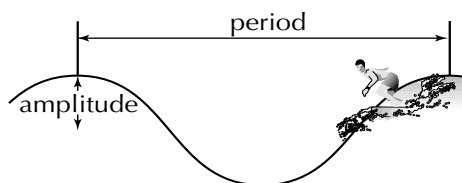
- d 80 seconds
- e i 7 mii 6.828 m

12B–D Transformations of the sin, cos and tan graphs

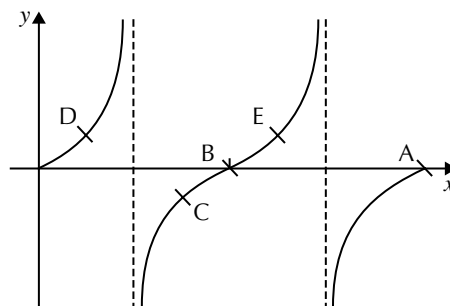
1 a



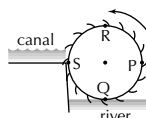
b



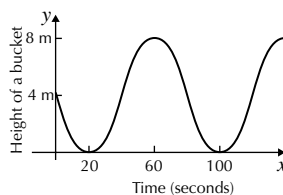
c



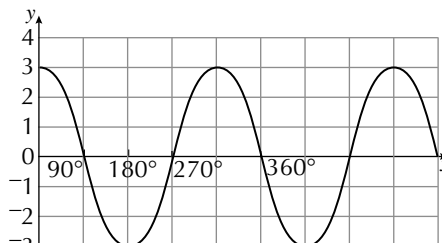
d



e



f



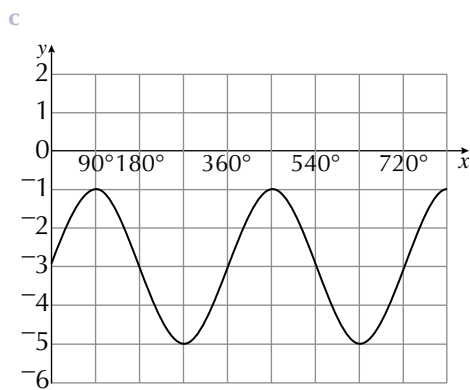
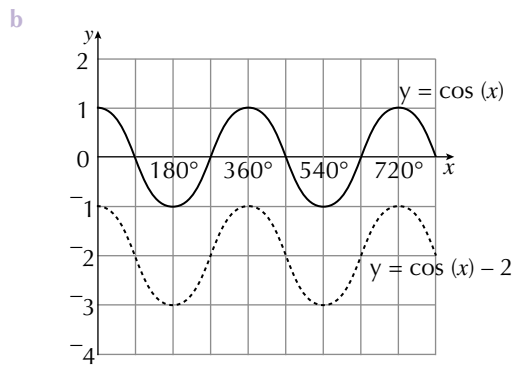
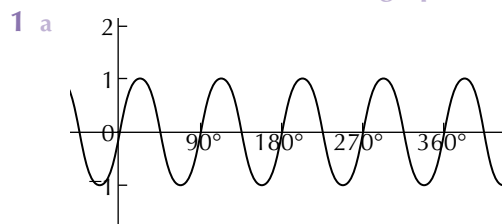
Trigonometric and Cubic Functions 2

12E Trigonometric functions—Applications

- 1 a between 12 and 13 b the period
- c 3 m d 6 m
- e low tide f 10 p.m.

Homework Book Answers

12F-M Cubic functions and graphs



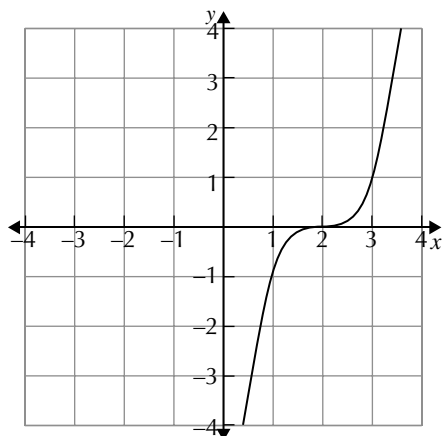
2 a x -intercepts are at 4, 3 and -6

b x -intercepts are at 0, and -10

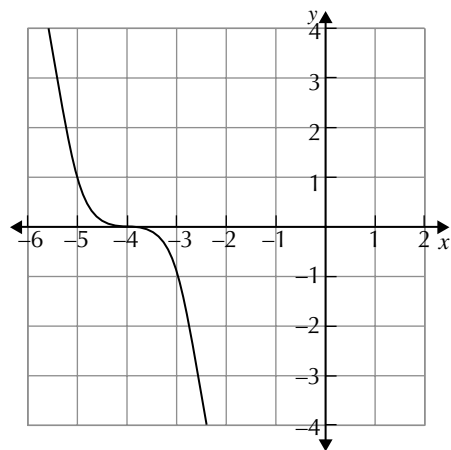
3 a y -intercept is at 72

b y -intercept is at 0

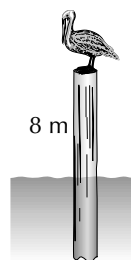
4 a



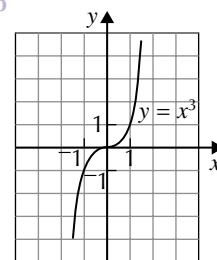
b



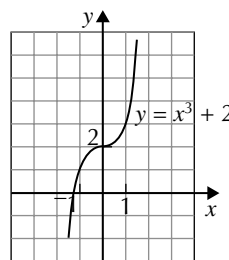
5 a



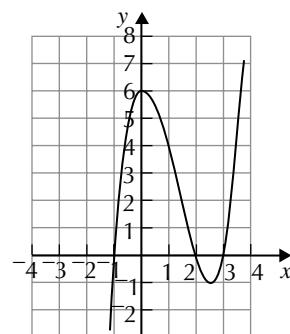
b



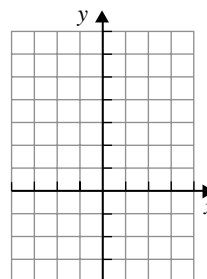
c



6 a



b

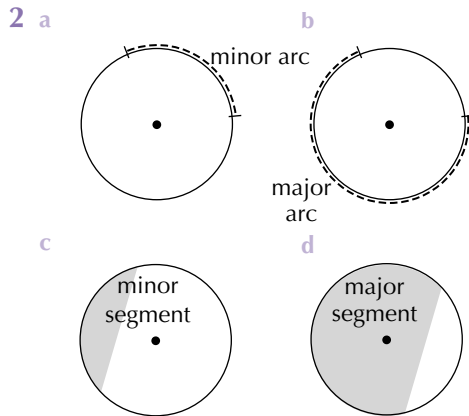


Chapter 13

Circle Geometry 1

13A Circle definitions

- 1 a segment b tangent
 c chord d sector
 e radius f arc
 g diameter



- 3 diameter
 4 Yes, a semi-circle is both a sector and a segment.

13C Angles in a circle

- 1 $x^\circ = 132^\circ$ 2 $x^\circ = 81^\circ$ 3 $x^\circ = 102^\circ$
 4 $x^\circ = 142^\circ, y^\circ = 218^\circ, z^\circ = 109^\circ$
 5 $x^\circ = 47^\circ, y^\circ = 43^\circ$ 6 $x^\circ = 27^\circ$
 7 $x^\circ = 73^\circ, y^\circ = 61^\circ$ 8 $x^\circ = 27^\circ, y^\circ = 25^\circ$
 9 $x^\circ = 25^\circ, y^\circ = 130^\circ$ 10 $x^\circ = 32^\circ$
 11 $x^\circ = 91^\circ$ 12 $x^\circ = 72^\circ, y^\circ = 78^\circ$
 13 $x^\circ = 96^\circ$ 14 $x^\circ = 86^\circ, y^\circ = 94^\circ$
 15 $x^\circ = 87^\circ, y^\circ = 91^\circ$ 16 $x^\circ = 94^\circ, y^\circ = 86^\circ$
 17 $x^\circ = 82^\circ, y^\circ = 49^\circ, z^\circ = 49^\circ$ 18 $x^\circ = 31^\circ, y^\circ = 118^\circ$

Circle Geometry 2

13F Tangent to a circle

- 1 $x^\circ = 49^\circ$
 2 $x^\circ = 64^\circ$
 3 $x^\circ = 26^\circ, y^\circ = 128^\circ, z^\circ = 52^\circ$
 4 $x^\circ = 38^\circ$
 5 $x^\circ = 35^\circ, y^\circ = 35^\circ, z^\circ = 110^\circ$
 6 $x^\circ = 63^\circ, y^\circ = 63^\circ, z^\circ = 117^\circ$

13G Using all circle properties

- 1 $x^\circ = 55^\circ, y^\circ = 70^\circ, z^\circ = 70^\circ$
 2 $x^\circ = 60^\circ, y^\circ = 30^\circ$
 3 $x^\circ = 23^\circ, y^\circ = 23^\circ, z^\circ = 23^\circ$
 4 $x^\circ = 26^\circ, y^\circ = 26^\circ, z^\circ = 49^\circ$
 5 $x^\circ = 114^\circ$
 6 $x^\circ = 100^\circ$
 7 $x^\circ = 104^\circ, y^\circ = 76^\circ$
 8 $x^\circ = 58^\circ, y^\circ = 28^\circ, z^\circ = 67^\circ$
 9 $x^\circ = 57^\circ, y^\circ = 33^\circ, z^\circ = 57^\circ$

10 $x^\circ = 41^\circ, y^\circ = 38^\circ$

11 $x^\circ = 66^\circ, y^\circ = 57^\circ$

12 $x^\circ = 97^\circ$

13J Circumference of circles and arc length 1

- 1 a radius b arc c diameter
 2 a 50.27 cm b 32.04 m c 37.70 mm
 3 6.685 cm
 4 a 9 cm b 10.66 m
 5 33.33 cm
 6 a 8.73 cm b 91.1 m

Circle Geometry 3

13J Circumference and arc length 2

- 1 a 14.28 m b 37.13 m
 2 No, the paper is not large enough if the tube is placed at right angles to the paper before wrapping. To cover the ends of the container, the paper would need to be at least $(4 + 25 + 4)$ cm long—i.e. 33 cm in length, but the longest measurement of the paper is only 32 cm. If the tube is placed on a diagonal (41.2 cm long) and then rolled, there will be overlap leaving some parts of the container uncovered. Although the area of the paper (832 cm^2) is larger than the surface of the container, the paper would have to be cut to cover the surface.

- 3 a 31 m
 b because the radius/diameter would steadily get larger as more loops of hose were added.

13K and 13L Great and small circles

- 1 a 1452 km b 7931 km
 2 a 2681 km b 8042 km
 3 6086 km
 4 2549 km