Answers

Solutions to Laugh Zones, Language Zones, Speeding Zones, Maths in Actions, Maths@Works, Problem Solving tasks, Investigations, Challenge Maths, Working Mathematically and Diagnostic Tests are located in the Maths Zone 7 Teacher's Resource and Assessment Disk.

Chapter 1

Prep zone (p. 2)

1 **(a)** 56 **(b)** 81 **(c)** 24 **(d)** 132 **(e)** 28
(f) 72 **(g)** 96 **(h)** 63 **(i)** 108
2 **(a)** C **(b)** D **(c)** A
3 **(a)** 512 **(b)** 2063 **(c)** 1698
4 **(a)** 175 **(b)** 627 **(c)** 1157
5 **(a)** 945 **(b)** 6968 **(c)** 22 230
6 **(a)** 211 **(b)** 412 **(c)** 128 rem 1

Exercise 1.1 (p. 5)

1 **(a)** ∩II **(b)** ∩IIIII
(c) 𓍢𓍢𓍢𓍢𓍢𓍢 **(d)** 𓍢𓍢𓍢𓍢𓍢
(e) ∩∩IIIII **(f)** ∩∩∩I
(g) 𓍢∩∩∩∩∩∩II
(h) 𓍢𓍢∩∩∩∩IIII
(i) 𓎆𓎆𓎆𓎆𓏲∩∩ **(j)** 𓎆𓎆𓏲𓍢𓍢𓍢I
(k) 𓆑𓆓𓆓𓎆𓍢𓍢𓍢𓍢∩I
(l) 𓆑𓆓𓆓𓆓𓎆𓎆𓎆𓎆𓎆II

2 **(a)** XIII **(b)** XII **(c)** XX **(d)** XXX **(e)** XIX
(f) XXIX **(g)** MMCCCXLI **(h)** MMMCXXXII
(i) DCXXIX **(j)** CDXXXIX
(k) MMMDCXLVI **(l)** MMCDLXVI
(m) MCMLXXX **(n)** MCMLIX
(o) MCMXCIX **(p)** MDCXCIV

3 **(a)** 𓏺𓏺 **(b)** 𓏺𓏺𓏺𓏺
(c) 𓏺𓏺𓏺𓏺𓏾𓏾𓏾𓏾𓏾 **(d)** 𓏺𓏺𓏺𓏺𓏺𓏾𓏾𓏾𓏾𓏾𓏾
(e) 𓏾𓏾𓏾𓏾 **(f)** 𓏾𓏾𓏾𓏾
(g) 𓏾𓏾𓏺𓏾𓏾𓏾𓏾𓏾 **(h)** 𓏾𓏾𓏺𓏺𓏾𓏾𓏾𓏾𓏾
(i) 𓏾𓏾𓏺𓏺𓏺𓏺𓏾𓏾 **(j)** 𓏾𓏾𓏺𓏺𓏾𓏾𓏾
(k) 𓏾𓏾𓏾𓏺𓏺𓏾𓏾𓏾𓏾𓏾𓏾 **(l)** 𓏾𓏾𓏾𓏺𓏺𓏺𓏺𓏾𓏾𓏾

4 **(a)** 四 **(b)** 三十七 **(c)** 一百二十六 **(d)** 二百七十
(e) 十八 **(f)** 八百二十三 **(g)** 一千五十三 **(h)** 六千四百

5 **(a)** Roman; 11 **(b)** Babylonian; 72
(c) Roman; 143 **(d)** Chinese; 16
(e) Egyptian; 43 **(f)** Chinese; 700
(g) Babylonian; 81 **(h)** Roman; 292
(i) Egyptian; 37 **(j)** Babylonian; 263
(k) Chinese; 82 **(l)** Egyptian; 30 016
(m) Chinese; 4007 **(n)** Egyptian; 408
(o) Roman; 604 **(p)** Babylonian; 316
(q) Roman; 2664 **(r)** Chinese; 1609
(s) Roman; 3428 **(t)** Egyptian; 102 241

6 **(a)** **(i)** ∩IIIIII **(ii)** XV
(iii) 𓏺𓏾𓏾𓏾𓏾𓏾 **(iv)** 十五
(b) **(i)** ∩∩∩∩∩∩IIIIII **(ii)** LXV
(iii) 𓏾𓏾𓏾𓏾𓏾𓏾 **(iv)** 六十五
(c) **(i)** ∩∩∩∩∩∩∩∩∩II **(ii)** XCII
(iii) 𓏾𓏾𓏺𓏺𓏺𓏾𓏾 **(iv)** 九十二
(d) **(i)** 𓍢𓍢𓍢 **(ii)** CCC

(iii)  **(iv)** 三百

(e) (i) 

(ii) CXCIX **(iii)**  **(iv)** 二百九十九

(f) (i) **(ii)** CCXXXVI

(iii)  **(iv)** 二百三十六

7 (a) Roman **(b)** clocks, movie credits, etc.
(c) a zero **(d)** Egyptian **(e)** Hindu–Arabic
(f) Egyptian **(g)** based on fingers **(h)** time
(i) easiest to use, most flexible.
8 Students' own answers.

Exercise 1.2 (p. 9)

1 (a) 1355 m **(b)** 5998 m **(c)** 4643 m
2 (a) 222 km **(b)** 3931 km **(c)** 3709 km
3 (a) 39 years **(b)** 30 years **(c)** 28
(d) 138 years **(e)** Daimler was 53; Benz was 43
(f) 39 **(g)** Lenormand, by 14 years **(h)** Pascal
4 (a) 72 litres **(b)** 96 litres **(c)** 120 litres
(d) 84 litres **(e)** 58 litres
5 36 minutes
6 (a) 3187 m **(b)** Kathy's by 249 m **(c)** 6125 m
(d) 2540 m **(e)** 3622 m
7 96 kg **8** 500 g jar
9 between 30 240 and 40 320 min
10 $11\frac{1}{2}$ weeks **11** 73 cm **12** $1854
13 72
14 (a) 117 **(b)** 99 **(c)** 972 **(d)** 12
15 3310 **16** 11 089

Exercise 1.3 (p. 15)

1 (a)

7	12	5
6	8	10
11	4	9

(b)

14	19	12
13	15	17
18	11	16

(c)

3	8	1
2	4	6
7	0	5

(d)

8	18	4
6	10	14
16	2	12

(e)

8	1	6
3	5	7
4	9	2

(f)

2	9	4
7	5	3
6	1	8

2 (a) 3 **(b)** Add 10. **(c)** Subtract 1.
(d) Multiply by 2. **(e)** Swap first and third rows.
(f) Swap first and third columns. **(g)** 39
(h) 315
3 (a) 1514; 43 **(b)** 34 **(c)** 34
(d) 4 (Did you miss the 'middle' square?)

(e)

18	5	4	15
7	12	13	10
11	8	9	14
6	17	16	3

magic sum = 42

(f) 54

(g)

13	3	2	16
8	10	11	5
12	6	7	9
1	15	14	4

magic sum = 34

(h)

4	9	5	16
15	6	10	3
14	7	11	2
1	12	8	13

The Melancholy square was rotated a quarter turn clockwise.

(i)

8	13	9	20
19	10	14	7
18	11	15	6
5	16	12	17

4 was added to each number in part **(h)**.

4 (a) 260 **(b)** Their sums are all equal to 130.
(c) Their sums equal 130.
(d) No, diagonals not correct.
(e) Their sums all equal 130.
5 New magic squares can be formed by flipping or rotating the magic square and adding or subtracting the same number from every number in the magic square.

Exercise 1.4 (p. 18)

1 (a)

	37	
17		20
5	12	8

(b)

	40	
19		21
10	9	12

(c)

	34	
27		7
21	6	1

(d)

		29		
	14		15	
7		7		8
2	5		2	6

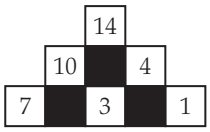
2 (a)

	27	
14		13
5	9	4

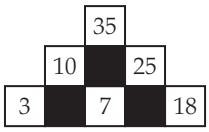
(b)

	32	
15		17
8	7	10

(c)



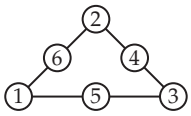
(d)



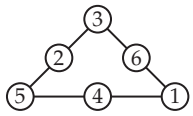
The middle number on the bottom row is half of the difference between the top number and the sum of the end numbers on the bottom row.

*For Questions **4**–**7**, there is more than one correct answer in each case.*

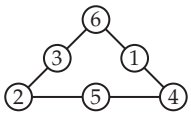
4 (a)



(b)

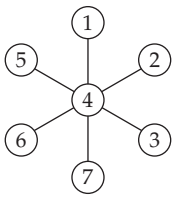


(c)

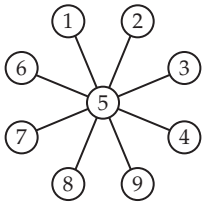


(d) By rotating your answer or by reversing the numbers.

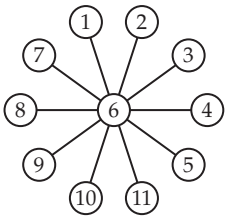
5 (a)



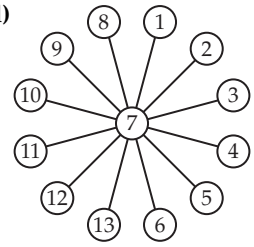
(b)



(c)



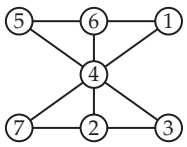
(d)



6 (a) 8; 12 Must add to 21

(b) The number 1 goes opposite the biggest number, the number 2 goes opposite the second biggest number, and so on.

7



Exercise 1.5 (p. 22)

1 (a) 70 **(b)** 70 **(c)** 500 **(d)** 5000 **(e)** 4000
(f) 600 **(g)** 80 000 **(h)** 800 000 **(i)** 1000
(j) 6 **(k)** 700 000 **(l)** 2 000 000 **(m)** 10
(n) 10 000 **(o)** 10 000 **(p)** 700

2 (a) B **(b)** C **(c)** D **(d)** B
(e) **(i)** B **(ii)** Exact number is 120.

3 (a) 28 000 **(b)** 40 000 **(c)** 80 000
(d) 900 000 **(e)** 14 000 **(f)** 48 000
(g) 32 000 000 **(h)** 2 100 000 **(i)** 3 000 000
(j) 70 000 **(k)** 63 000 **(l)** 48 000
(m) 4 900 000 **(n)** 540 000 **(o)** 8 000 000
(p) 10 000 000 **(q)** 300 000 **(r)** 600 000

4 (a) D **(b)** D **(c)** A **(d)** D **(e)** A

5 (a) **(i)** 400 000 **(ii)** 400 000
(b) They are the same.
(c) **(i)** 395 237; 417 088 **(ii)** 4763; 17 088
(iii) The first one, because the two original numbers were very close to numbers they rounded to.

6 (a) **(i)** 280 000 **(ii)** 280 000
(b) **(i)** 280 641; 233 121 **(ii)** 641; 46 879
(iii) The first one; 673 was *below* 700 while 417 was *above* 400 so the two roundings cancelled out to an extent.

7 (a) 75 **(b)** 50 **(c)** 300 **(d)** 25 **(e)** 500
(f) 1250 **(g)** 625 **(h)** 2000 **(i)** 2000
(j) 1000 **(k)** 1500 **(l)** 100 **(m)** 200
(n) 1000 **(o)** 150 000 **(p)** 8000
(q) 5000 **(r)** 30 000

8 (a) D **(b)** A **(c)** B **(d)** D **(e)** B

9 (a) **(i)** 500 **(ii)** 500
(b) It is reasonably easy to divide by 11 or 12.

10 Sample answers: **(a)** 39 and 82 **(b)** 12 and 19
(c) 214 and 487 **(d)** 72 and 573

11 (b) 900 + 70 – 500; 470; 524
(c) 300 – 200 – 40 + 200; 260; 256
(d) 70 × 300 × 80; 1 680 000; 1 764 378
(e) 90 × 700 + 20 000; 83 000; 83 271
(f) 700 × 100 – 40 000; 30 000; 35 917

12 (a) C **(b)** D **(c)** B **(d)** C **(e)** B
(f) A **(g)** D **(h)** B

Exercise 1.6 (p. 27)

1 (a) 11 **(b)** 0 **(c)** 10 **(d)** 25 **(e)** 13
(f) 7 **(g)** 38 **(h)** 3 **(i)** 17 **(j)** 0 **(k)** 13
(l) 9 **(m)** 12 **(n)** 12 **(o)** 18 **(p)** 38
(q) 9 **(r)** 12 **(s)** 5 **(t)** 84 **(u)** 15
(v) 14 **(w)** 12 **(x)** 68

2 (a) False **(b)** False **(c)** True **(d)** True
(e) False **(f)** True **(g)** False **(h)** True

3 (a) **(i)** 4 – 2 then 2 × 2 **(ii)** 15 ÷ 5 then 24 + 3
(iii) 7 + 9 then 16 × 2 **(iv)** 21 – 17 then 4 ÷ 2
(b) **(i)** 3 **(ii)** 9 **(iii)** 8 **(iv)** 11

4 (a) (6 + 6) × 3 = 36 **(b)** (10 – 4) × 5 = 30
(c) 5 + 2 × (3 + 7) = 25
(d) 12 + 6 ÷ (7 – 4) = 14
(e) (9 – 8) × 6 + 4 = 10 **(f)** (3 + 4) × 5 – 10 = 25
(g) (7 + 10 – 5) ÷ 2 = 6 **(h)** 3 × (4 – 2) ÷ 6 = 1
(i) 6 ÷ (3 + 3) × 5 = 5 **(j)** 3 × 6 ÷ (8 – 4 + 5) = 2
(k) (12 + 4) ÷ 8 × 3 – 6 = 0
(l) 8 ÷ (2 + 2) × 7 – 10 = 4
(m) 3 × (10 – 7) ÷ 9 + 12 = 13
(n) 18 ÷ 3 × (5 – 3) + 2 = 14
(o) (7 + 3) ÷ (4 + 1) = 2
(p) (5 – 3) × (8 – 6) ÷ 2 = 2

5 (a) 2 + 21 ÷ 3 = 9 **(b)** 15 – 6 ÷ 2 = 12
(c) 5 × 3 – 8 = 7 **(d)** 9 – 6 + 10 = 13
(e) 14 – 8 – 6 = 0 **(f)** 5 + 15 ÷ 3 = 10
(g) 7 × 5 – 6 = 29 **(h)** 14 + 3 – 2 = 15

(i) $(5 + 9) \div 7 = 2$ **(j)** $(24 + 6) \div 10 = 3$
(k) $8 + 5 \times 2 - 6 = 12$ **(l)** $12 \div 2 + 1 \times 9 = 15$

6 (a) $6 \times (4 \div 2) \times 3 = (6 \times 4) \div 2 \times 3$
(b) $(1 + 4) \times 20 \div 5 > 1 + (4 \times 20) \div 5$
(c) $8 + (5 - 3) \times 2 > 8 + 5 - (3 \times 2)$
(d) $100 + 10 \div 10 > (100 + 10) \div 10$
(e) $9 \times 2 + 0 = 9 \times (2 + 0)$
(f) $36 \div 6 \times (3 - 3) < 36 \div 6 \times 3 - 3$

7 (a) $1 \times 7 - 4 + 3 = 6$
(b) $(7 - 3) \div 4 + 1 = 2$ or $(7 - 4) \div 3 + 1 = 2$
(c) $3 \times (7 - 4) \div 1 = 9$
(d) $3 + 7 \times 1 - 4$ or $7 + 3 \times 1 - 4 = 6$
(e) $(1 + 4) \times (7 - 3) = 20$ **(f)** $(7 - 1) \div (4 - 3) = 6$
(g) $(3 + 4 - 1) \times 7 = 42$ **(h)** $4 \times (7 + 1 - 3) = 20$
(i) $3 \times [(1 + 7) \div 4] = 6$ **(j)** $[(4 - 3) \times 7] + 1 = 8$

Exercise 1.7 (p. 32)

1 (a) 120 **(b)** 150 **(c)** 210 **(d)** 420 **(e)** 280
(f) 120 **(g)** 67 **(h)** 185 **(i)** 183 **(j)** 228
(k) 178 **(l)** 216

2 (a) 153 **(b)** 294 **(c)** 124 **(d)** 152 **(e)** 154
(f) 427 **(g)** 247 **(h)** 152 **(i)** 693 **(j)** 1818
(k) 637 **(l)** 336

3 (a) 14 **(b)** 8 **(c)** 28 **(d)** 6 **(e)** 30
(f) 7 **(g)** 7 **(h)** 14

4 (a) (i) 32 **(ii)** four
(b) (i) 52 **(ii)** 108 **(iii)** 128 **(iv)** 216

5 (a) Double 15 (30), then double your answer (60), then double your answer again to get 120.
(b) Subtract 87 (100) then subtract the remaining 6 to get 94.
(c) Halve 284 (142) then halve your answer to get 71.

6 (a) Multiplying 7 by 20 gives one lot less of 7 than needed, not one lot less of 21. Need to multiply 7 by 20 then add 7 to get 147.
(b) Doubling twice is the same as multiplying by 4 not by 3. You can double 35 to get 70 then add another 35 to get 105.
(c) The remaining 9 should have been subtracted to get 191, not added.
(d) This method should be 20 lots of 12 and 7 lots of 12. This will give 240 plus 84, which is 324.

7 (a) 939 **(b)** 1709 **(c)** 946 **(d)** 2901
(e) 1892 **(f)** 947 **(g)** 623 **(h)** 384
(i) 1474 **(j)** 438 **(k)** 1800 **(l)** 622

Exercise 1.8 (p. 34)

1 (a) 4 **(b)** 6 **(c)** 9 **(d)** 2 **(e)** 5 **(f)** 13
(g) 7 **(h)** 3 **(i)** 12 **(j)** 11 **(k)** 15
(l) 17 **(m)** 26 **(n)** 51 **(o)** 47 **(p)** 63

2 (a) $(1000)_2$ **(b)** $(1111)_2$ **(c)** $(11011)_2$
(d) $(100100)_2$ **(e)** $(101001)_2$ **(f)** $(110101)_2$
(g) $(1000001)_2$ **(h)** $(1011010)_2$

3 $(1)_2$, $(10)_2$, $(11)_2$, $(100)_2$, $(101)_2$, $(110)_2$, $(111)_2$, $(1000)_2$, $(1001)_2$, $(1010)_2$, $(1011)_2$, $(1100)_2$, $(1101)_2$, $(1110)_2$, $(1111)_2$, $(10000)_2$

4 B

5 (a) $1 = (1)_2$, $3 = (11)_2$, $7 = (111)_2$, $15 = (1111)_2$, $31 = (11111)_2$, $63 = (111111)_2$
(b) They have no zeros, only ones.
(c) 9, 99, 999, 9999, 99 999, 999 999

6 (a) 4096, 512, 64, 8, 1
(b) (ii) 1, 8, 2, 2, 12 **(iii)** 81, 1, 2, 16, 1, 1
(iv) 515, 512, 0, 0, 3, 3 **(v)** 1, 64, 4, 32, 1, 141
(vi) 2, 128, 0, 0, 2, 2, 202 **(vii)** 1, 512, 3, 24, 1130

Chapter review (p. 39)

Core

1 (a) (i) ∩∩∩∩IIII **(ii)** LIV
(iii)  **(iv)** 五十四

(b) (i) ୭∩∩∩∩IIIIII **(ii)** CXLVI
(iii)  **(iv)** 一百四十六

(c) (i) ୭୭∩∩∩IIIIIIII
(ii) CCXXXVIII
(iii)  **(iv)** 二百三十八

(d) (i) ୭୭୭IIIIIIII
(ii) CCCIX
(iii)  **(iv)** 三百九

2 (a) 340 **(b)** 2473 **(c)** 20 420 **(d)** 302 010
(e) 53 **(f)** 222 **(g)** 98 **(h)** 1604

3 (a) 500 **(b)** 200 **(c)** 3000 **(d)** 3000

4 (a) 80 000 **(b)** 90 000 **(c)** 40 000

5 (a) 600 **(b)** 5000 **(c)** 50

6 (a) 6040; 368 over **(b)** 160 000; 16 605 over
(c) 700; 663 over

7 (a) 1 **(b)** 13 **(c)** 11 **(d)** 8 **(e)** 5 **(f)** 47

8 B

9 (a) 180 **(b)** 735 **(c)** 120

Extension

10 (a)

13	6	11
8	10	12
9	14	7

(b)

6	17	16	3
7	12	13	10
11	8	9	14
18	5	4	15

11 (a)

	21	
5	■	16
2	■	3	■	13

(b)

		16		
	10	■	6	
10	■	0	■	6

12 (a) $4 \times (2 + 3) \div 5 - 1 = 3$
(b) $(5 + 1) \div 6 + 4 + 2 = 7$

13 **(a)** $9 + 7 \times 3 = 30$ **(b)** $16 - 4 \times 2 \div 2 = 12$
14 **(a)** 6 **(b)** 9 **(c)** 31 **(d)** 45
15 **(a)** $(1011)_2$ **(b)** $(11101)_2$ **(c)** $(100010)_2$
(d) $(1000111)_2$

Replay (p. 41)

1 **(a)** 41 **(b)** 1057 **(c)** 4386
2 30, 39, 48, 57, 66, 75
3 **(a)** $1001 > 982$ **(b)** $3.9 > 3.38$ **(c)** $0.03 < 0.19$
4 **(a)** 9, 15, 22, 30, 39, 49, 60
(b) 1, 3, 7, 15, 31, 63, 127
5 **(a)** 40 **(b)** 300 **(c)** 500
6 **(a)** 17 **(b)** 3 **(c)** 15
7 **(a)** 256 **(b)** 156 **(c)** 1573
8 72, 80, 88, 96, 104, 112, 120, 128, 136, 144
9 **(a)** 47 **(b)** 0 **(c)** 80
10 **(a)** 2 **(b)** 5 **(c)** 38
11 **(a)** $\frac{5}{9}$ **(b)** 1 **(c)** $\frac{5}{6}$
12 $3.50

Chapter 2

Prep zone (p. 44)

1 **(a)** 0, 3, 5, 8, 17 **(b)** 1, 4, 5, 9, 45
2 **(a)** $10 > 7$ **(b)** $3 < 6$ **(c)** $2 > 0$ **(d)** $0 < 5$
3 **(a)** 20 **(b)** 23 **(c)** 41 **(d)** 542 **(e)** 153
(f) 98 697
4 **(a)** 4 **(b)** 9 **(c)** 33 **(d)** 371 **(e)** 653
(f) 35 442
5 **(a)** 16 **(b)** 63 **(c)** 121 **(d)** 228 **(e)** 135
(f) 354 **(g)** 11 040 **(h)** 282 000
6 **(a)** 40 **(b)** 63
7 **(a)** 6 **(b)** 88 **(c)** 6
8 **(a)** 12 **(b)** 43 **(c)** 54 **(d)** 4 **(e)** 43
(f) 12

Exercise 2.1 (p. 46)

1 **(a)** +300 **(b)** +2000 **(c)** −50 000 **(d)** −25
(e) −8 **(f)** −2 **(g)** +5 **(h)** +4 **(i)** +3
(j) +36 **(k)** +45 **(l)** +1000 **(m)** −20
(n) −90 **(o)** +6 **(p)** +12 **(q)** −10 **(r)** −2
(s) +5 **(t)** +3.5 **(u)** −2.4 **(v)** −7 **(w)** +28
(x) −40 000 **(y)** +225 **(z)** −9
2 **(a)** If north is a positive direction, south is a negative direction.
(b) If right is a positive direction, left is a negative direction.
3 **(a)** down 29 steps **(b)** east 300 km
(c) 6 km per hour below the speed limit
(d) 3 days early **(e)** 80 m above ground level
(f) 7°C above zero **(g)** subtract 5 **(h)** add 22
(i) right 3 m **(j)** −4 **(k)** +2 **(l)** +11
(m) −16 **(n)** −20 **(o)** +400 **(p)** +350
(q) +92 **(r)** −87
4 Students' own answers.

Exercise 2.2 (p. 48)

1 **(a)** $+7 < +9$ **(b)** $+8 > +2$ **(c)** $+2 < +11$
(d) $+4 < +9$ **(e)** $+6 > -3$ **(f)** $+3 > -12$
(g) $+1 > -3$ **(h)** $+6 > -4$ **(i)** $-3 < +5$
(j) $-7 < +5$ **(k)** $-6 < +1$ **(l)** $-2 < +6$
(m) $-12 < -4$ **(n)** $-12 < -9$ **(o)** $-7 < -1$
(p) $-2 > -11$ **(q)** $0 > -10$ **(r)** $-9 < 0$
(s) $-5 < 0$ **(t)** $0 > -2$ **(u)** $-35 < +7$
(v) $-88 < +3$ **(w)** $-4 < +67$ **(x)** $-11 < +75$
2 **(a)** −12, −4, −3, −1, 6 **(b)** −6, −4, 1, 2, 9
(c) −11, −10, 2, 9, 10 **(d)** −8, −6, −5, 1, 7
(e) −11, −4, −2, −1, 1 **(f)** −9, −8, −5, −3, 2
(g) −12, −8, −7, −4, −1 **(h)** −9, −8, −7, −6, −3
(i) −79, −56, 0, 6, 23 **(j)** −89, −12, −7, 0, 76
(k) −90, −78, −33, 2, 49 **(l)** −93, −30, −24, −14, 3
3 **(a)** 11, 2, −1, −2, −3 **(b)** 10, 7, 1, −8, −12
(c) 8, 7, 3, −5, −6 **(d)** 9, 4, −4, −8, −10
(e) 1, −4, −6, −8, −9 **(f)** 7, 0, −5, −11, −12
(g) −2, −4, −6, −7, −9 **(h)** −2, −5, −9, −11, −12
(i) 77, 1, −18, −66, −82 **(j)** 6, 0, −55, −60, −81
(k) 4, 0, −9, −54, −79 **(l)** 98, 9, −8, −48, −99
4 **(a)** True **(b)** False **(c)** True **(d)** False
(e) False **(f)** False **(g)** True **(h)** False
(i) True
5 **(a)** −3, −2, −1, 0, 1, 2 **(b)** −1, 0, 1
(c) −6, −5, −4 **(d)** −8, −7, −6, −5
(e) −4, −3, −2, −1 **(f)** −2, −1
(g) −46, −47, −48, −49 **(h)** −38, −39, −40, −41
(i) −119, −118, −117, −116
6 Any three of −7, −6, −5, −4, −3, −2, −1
7 **(a)** −12, −10, −8 **(b)** −5, 0, 5 **(c)** 0, −3, −6
(d) 2, 0, −2 **(e)** −24, −30, −36 **(f)** −28, −35, −42
(g) 0, −10, −20 **(h)** 0, −20, −40 **(i)** −1, 3, 7
(j) −3, −8, −13
8 **(a)** Tuesday **(b)** Friday
9 **(a)** Ben **(b)** Damien
10 **(a)** 156 m **(b)** 154 m **(c)** 310 m

Exercise 2.3 (p. 51)

1 **(a)** +11 **(b)** +8 **(c)** +11 **(d)** +8 **(e)** +10
(f) +4 **(g)** +1 **(h)** +1 **(i)** −8 **(j)** −12
(k) +2 **(l)** −9 **(m)** −11 **(n)** −3 **(o)** −10
(p) −8 **(q)** +9 **(r)** +6 **(s)** −4 **(t)** −5
(u) 0 **(v)** 0 **(w)** −5 **(x)** −6
2 **(a)** B **(b)** B
3 **(a)** −7 **(b)** −11 **(c)** +6 **(d)** +12 **(e)** −13
(f) −13 **(g)** −14 **(h)** −14 **(i)** −15 **(j)** −14
(k) +10 **(l)** +25 **(m)** −24 **(n)** −32 **(o)** +16
(p) +28 **(q)** −31 **(r)** −46 **(s)** +50 **(t)** +20
(u) −30 **(v)** −50 **(w)** −52 **(x)** −19
4 Must be −14 or less, e.g. −15, −18, −25
5 **(a)** +12 **(b)** +11 **(c)** +12 **(d)** 0 **(e)** −6
(f) −7 **(g)** +7 **(h)** −2 **(i)** −3 **(j)** +3
(k) +6 **(l)** −11 **(m)** −10 **(n)** −5
(o) +16 **(p)** +40 **(q)** −18 **(r)** −22
6 +8°C **7** the 11th floor
8 34 m below the surface **9** 5 m **10** $13

Exercise 2.4 (p. 54)

1 **(a)** −2 **(b)** +2 **(c)** +6 **(d)** +5 **(e)** 0
(f) 0 **(g)** −8 **(h)** −12 **(i)** −12 **(j)** −10
(k) +11 **(l)** +6 **(m)** +10 **(n)** +12

(o) +1 **(p)** +8 **(q)** −4 **(r)** +3 **(s)** +7
(t) +9 **(u)** +8 **(v)** −2 **(w)** −18 **(x)** −8

2 **(a)** D **(b)** A

3 **(a)** −8 **(b)** −11 **(c)** −6 **(d)** −4 **(e)** +10
(f) +16 **(g)** +12 **(h)** +8 **(i)** +10 **(j)** +10
(k) −10 **(l)** −20 **(m)** −30 **(n)** −40
(o) −20 **(p)** −30 **(q)** +19 **(r)** +21
(s) +105 **(t)** +147 **(u)** −79 **(v)** −124
(w) +40 **(x)** −17

4 Must be −22 or less, e.g. −25, −30.

5 **(a)** −5 **(b)** −10 **(c)** +9 **(d)** +13
(e) −14 **(f)** −13 **(g)** +5 **(h)** +9 **(i)** −3
(j) −2 **(k)** +4 **(l)** +4 **(m)** −8 **(n)** −5
(o) −6 **(p)** +3 **(q)** +10 **(r)** −1

6 −4°C **7** the third basement floor

8 $3500 in debt **9** 8 m

10 2.5 m **11** 31 m

Exercise 2.5 (p. 57)

1 **(a)** −2 **(b)** 3 **(c)** 7 **(d)** 11 **(e)** −2 **(f)** 9
(g) 6 **(h)** −4 **(i)** −10 **(j)** −12 **(k)** −10
(l) −11 **(m)** 2 **(n)** 4 **(o)** −11 **(p)** −5
(q) 12 **(r)** 2 **(s)** −1 **(t)** 6 **(u)** 5 **(v)** 4
(w) −21 **(x)** −30

2 **(a)** False **(b)** True **(c)** True **(d)** True

3 **(a)** 8 **(b)** 10 **(c)** 4 **(d)** 3 **(e)** −13
(f) −12 **(g)** −7 **(h)** −6 **(i)** −11 **(j)** −10
(k) −5 **(l)** −8 **(m)** 3 **(n)** 8 **(o)** −12
(p) −11 **(q)** −25 **(r)** −36 **(s)** −31 **(t)** −35
(u) −30 **(v)** −31 **(w)** 57 **(x)** 65

4 Ignoring the signs, the numbers will add to 31, e.g. −14 and 17, −10 and 21.

5 **(a)** 12 **(b)** 11 **(c)** 7 **(d)** 6 **(e)** −7
(f) −4 **(g)** 1 **(h)** 7 **(i)** −2 **(j)** −3 **(k)** −6
(l) −8 **(m)** 4 **(n)** 1 **(o)** −12 **(p)** −11
(q) −19 **(r)** −18 **(s)** −9 **(t)** −9 **(u)** 8
(v) 5 **(w)** −29 **(x)** 8

6 −$150

7 **(a)** the 10th floor
(b) the 4th floor below the ground floor
(c) the 8th floor

8 −$350 (a loss of $350)

Exercise 2.6 (p. 61)

1 **(a)** −12 **(b)** 10 **(c)** −10 **(d)** 14 **(e)** 12
(f) −18 **(g)** 15 **(h)** −12

2 −3, −6, −9, −6, −4, −2, 0, 2, 4, 4, 2, 0, −2, −4, −6

3 **(a)** 30 **(b)** 21 **(c)** 77 **(d)** 54 **(e)** −40
(f) −24 **(g)** −27 **(h)** −35 **(i)** −8 **(j)** −16
(k) −25 **(l)** −16 **(m)** 30 **(n)** 8 **(o)** 6
(p) 15

4 **(a)** −60 **(b)** −140 **(c)** −90 **(d)** 132 **(e)** 80
(f) −180 **(g)** −115 **(h)** −468 **(i)** 224
(j) 360 **(k)** −3268 **(l)** −2366 **(m)** 1002
(n) −2612 **(o)** −40 572 **(p)** 26 862

5 **(a)** 24 **(b)** −12 **(c)** 48 **(d)** 15 **(e)** −6
(f) 28 **(g)** −40 **(h)** −18 **(i)** −24 **(j)** −50
(k) 20 **(l)** 32 **(m)** −27 **(n)** −8 **(o)** −1000
(p) 8 **(q)** −24 **(r)** −12 **(s)** 48 **(t)** −30
(u) −72

6 Sample answer: −3 × −4 × 2 × −1 = −24

7 **(a)** 1 **(b)** −1 **(c)** 1 **(d)** −1 **(e)** 1 **(f)** −1
(g) even, odd **(h)** 1 **(i)** −1

8 **(a)** 16 **(b)** −27 **(c)** −16 **(d)** 4 **(e)** 12
(f) −16 **(g)** −48 **(h)** −180 **(i)** 48 **(j)** 120

9 **(a)** −35 **(b)** −9 **(c)** −13 **(d)** 18 **(e)** 2
(f) −8 **(g)** −20 **(h)** −10

Exercise 2.7 (p. 64)

1 **(a)** 4 **(b)** −3 **(c)** −3 **(d)** 9 **(e)** −2 **(f)** −6
(g) −4 **(h)** −3 **(i)** 7 **(j)** 6 **(k)** −9 **(l)** −8
(m) −7 **(n)** −9 **(o)** 9 **(p)** −5

2 **(a)** −25 **(b)** −6 **(c)** 7 **(d)** −7 **(e)** −3
(f) 7 **(g)** −9 **(h)** −4 **(i)** 8 **(j)** −10
(k) −11 **(l)** −8 **(m)** −10 **(n)** −5 **(o)** 10
(p) 11

3 **(a)** −87 **(b)** −342 **(c)** 113 **(d)** −805
(e) 204 **(f)** 187 **(g)** −3432 **(h)** 939
(i) 807 **(j)** −1493 **(k)** −1148 **(l)** −568

4 **(a)** −16 **(b)** −7 **(c)** −5 **(d)** −15 **(e)** −26
(f) 31 **(g)** 21 **(h)** −24 **(i)** 15 **(j)** −20
(k) −9 **(l)** 3 **(m)** −5 **(n)** 50 **(o)** −240
(p) −70

5 Must be a negative multiple of 8, e.g. −8, −24, −80.

6 $40 **7** −4°C

8 **(a)** 19 minutes **(b)** 47 minutes and 30 seconds

9 4 stops between top and bottom levels

Exercise 2.8 (p. 65)

1 **(a)** −2 **(b)** −9 **(c)** −4 **(d)** −2 **(e)** 5 **(f)** 9
(g) −2 **(h)** 3 **(i)** −15 **(j)** 10 **(k)** −27
(l) 20 **(m)** 4 **(n)** −14 **(o)** 15 **(p)** 6
(q) 14 **(r)** −2

2 **(a)** −16 **(b)** 64 **(c)** 55 **(d)** 6 **(e)** −3
(f) −4 **(g)** −26 **(h)** −4 **(i)** 36 **(j)** 9
(k) 48 **(l)** −17 **(m)** 6 **(n)** 14 **(o)** −12

3 Example: −3 − (48 ÷ (−6)) = 5
The brackets must give −8.

4 **(a)** A **(b)** C **(c)** B

5 **(a)** 2 **(b)** 15 **(c)** −1 **(d)** −19 **(e)** 104
(f) 58 **(g)** 0 **(h)** 12 **(i)** −77 **(j)** −7
(k) −5 **(l)** 5

6 $24 million loss

7 **(a)** 12°C **(b)** 0°C **(c)** −4°C
(d) −10°C. This is as low as the freezer goes.

8 **(a)** +11 **(b)** −3

Exercise 2.9 (p. 68)

1 **(a)** −37 **(b)** 39 **(c)** −38 **(d)** −18 **(e)** −53
(f) −47 **(g)** 0 **(h)** 29 **(i)** 100 **(j)** 4
(k) −9 **(l)** −210

2 **(a)** 20.5 **(b)** −339.5 **(c)** −9.03 **(d)** −63
(e) −303 **(f)** 15 **(g)** −23.94 **(h)** 48
(i) 2910.69 **(j)** 52 **(k)** −56.92 **(l)** −51.55

3 **(a)** C **(b)** D **(c)** A **(d)** A

5 **(a)** −157.536 **(b)** −335.5 **(c)** −20.777
(d) −7.963 **(e)** 955.194 **(f)** −327.455
(g) −2859.396 **(h)** −5728.178 **(i)** −1.918
(j) −1.536 **(k)** −13 380.875 **(l)** −7119.009

(m) −12 141.376 **(n)** −306.336 **(o)** −0.561
(p) −304.886 **(q)** −752.184 **(r)** −80.64
(s) 35.155 **(t)** 26.259 **(u)** 0.782 **(v)** −89.668

Chapter review (p. 73)

Core

1 **(a)** −14 **(b)** +200
2 **(a)** south 5 km **(b)** −27
3 **(a)** $-52 < 25$ **(b)** $19 > -20$
4 **(a)** −9, −7, 0, 7, 12 **(b)** −4000, 4, 40, 400
5 **(a)** −3 **(b)** 3 **(c)** 15 **(d)** −10 **(e)** −15
(f) 18 **(g)** −1 **(h)** −7
6 **(a)** −4 **(b)** 8 **(c)** 6 **(d)** −5 **(e)** 0
(f) −32 **(g)** −37 **(h)** 40
7 **(a)** −2 **(b)** 7 **(c)** −6 **(d)** −4 **(e)** 37
(f) 14 **(g)** −11 **(h)** −3
8 **(a)** −28 **(b)** −20 **(c)** 36 **(d)** 84 **(e)** −135
(f) −176 **(g)** −1800 **(h)** 5600
9 **(a)** −12 **(b)** −5 **(c)** 7 **(d)** −9 **(e)** −6
(f) 13 **(g)** −8 **(h)** 9
10 **(a)** −14 **(b)** 44 **(c)** −80 **(d)** 0 **(e)** 35
(f) 14
11 **(a)** C **(b)** D

Extension

12 −$61.90
13 Felicity 0; Georgia 1; Rosalie −4; Doreen −7
14 −1°C
15 **(a)** $70 **(b)** $10 **(c)** $9410

Replay (p. 75)

1 **(a)** 91 **(b)** 3203 **(c)** 4511
2 909, 990, 999, 1001, 1009, 1010, 1101
3 **(a)** 7400 **(b)** 3 990 000 **(c)** 30 000
4 **(a)** $201 < 1999$ **(b)** $2.6 > 2.0$ **(c)** $0.09 < 0.9$
5 **(a)** 11 **(b)** 60 **(c)** 13
6 50, 57, 64, 71, 78, 85, 92, 99
7 **(a)** 12, 16, 20, 24, 28, 32, 36
(b) 1, 2, 4, 8, 16, 32, 64
8 24, 48, 72, 96
9 **(a)** XII **(b)** LXXIX **(c)** CXLV
(d) DCLXXXIII
10 $108
11 **(a)** 30 **(b)** 100 **(c)** 1000 **(d)** 40 000
12 **(a)** 27 **(b)** 0 **(c)** 3

Chapter 3

Prep zone (p. 78)

1 **(a)** 42, 36, 24, 66, 48 **(b)** 77, 49, 35, 14, 21
(c) 56, 48, 32, 80, 64 **(d)** 108, 27, 45, 99, 72
(e) 84, 72, 144, 108, 132
2 **(a)** 0, 2, 4, 6, 8 **(b)** 1, 3, 5, 7, 9
3 **(a)** 0, 12, 74, 567, 602, 4500, 6008, 11 100
(b) 11 011, 10 111, 1101, 1011, 1001, 111, 110, 10
4 **(a)** 18 **(b)** 90 **(c)** 8 **(d)** 10 000
5 **(a)** 56 895 **(b)** 7 025 073

Exercise 3.1 (p. 79)

1 **(a)** 2, 4, 6, 8, 10 **(b)** 3, 6, 9, 12, 15
(c) 4, 8, 12, 16, 20 **(d)** 8, 16, 24, 32, 40
(e) 6, 12, 18, 24, 30 **(f)** 5, 10, 15, 20, 25
(g) 9, 18, 27, 36, 45 **(h)** 11, 22, 33, 44, 55
(i) 14, 28, 42, 56, 70 **(j)** 15, 30, 45, 60, 75
(k) 16, 32, 48, 64, 80 **(l)** 19, 38, 57, 76, 95
(m) 20, 40, 60, 80, 100 **(n)** 50, 100, 150, 200, 250
(o) 100, 200, 300, 400, 500
(p) 2000, 4000, 6000, 8000, 10 000
2 **(a)** 70, 140, 210 **(b)** 75, 150, 225
(c) 86, 172, 258 **(d)** 123, 246, 369
(e) 345, 690, 1035 **(f)** 99, 198, 297
(g) 738, 1476, 2214 **(h)** 815, 1630, 2445
(i) 1250, 2500, 3750 **(j)** 1999, 3998, 5997
(k) 2005, 4010, 6015 **(l)** 3111, 6222, 9333
(m) 8410, 16 820, 25 230 **(n)** 9010, 18 020, 27 030
(o) 10 004, 20 008, 30 012
(p) 10 211, 20 422, 30 633
3 **(a)** B **(b)** D **4** 20 min

Exercise 3.2 (p. 80)

1 **(a)** 65, 10, 234 625, 870
(b) Numbers which end in 5 or 0
2 **(a)** 70, 640, 41 960, 500
(b) Numbers which end in 0
3 **(a)** 2, 56, 27 560, 24, 768
(b) Numbers which end in 0, 2, 4, 6 or 8 (i.e. 0 or an even number)
4 **(a)** 21, 783, 6732, 798
(b) Numbers whose sum of digits is divisible by 3
5 **(a)** 81, 5634, 220 221, 87 984, 16 668
(b) Numbers whose sum of digits is divisible by 9
6 **(a)** 516, 7612, 608, 64, 5364, 500
(b) Numbers whose last two digits form a number which is divisible by 4
7 **(a)** 132, 8760, 3528, 705 630, 11 112
(b) The number must be divisible by both 3 and 4.

8

Number	*Divisibility test*
2	Look at the **last** digit only. If it is **even** or zero then the original number is divisible by 2.
3	**Add** up all the digits and see if the **sum** is divisible by 3. If it is then the original number is divisible by 3.
4	Look at the number formed by the last **2** digits only. If this number is divisible by 4, then the **original** number is divisible by 4.
5	Look at the **last** digit. If it is a **5** or a **0**, then the number is **divisible** by 5.
6	Do two tests. See if the number is divisible by **2** and **3**.
9	**Add** up all the **digits** and see if the **sum** is divisible by 9. If it is then the original number is **divisible** by **9**.
10	Look at the **last digit**. If it is **0** then the number is **divisible by 10**.

9 **(a)** False **(b)** False **(c)** True **(d)** True
(e) True **(f)** False **(g)** False **(h)** True
(i) False **(j)** True

10

202 008	2, 3, 4, 6
12 121 212	2, 3, 4, 6
300 300 300	2, 3, 4, 5, 6, 9, 10
7 500	2, 3, 4, 5, 6, 10
900 090	2, 3, 5, 6, 9, 10
123 456 789	3, 9
2 564	2, 4
3 429	3, 9

11 Sample answers: 11 020, 11 040, 11 060
12 **(b)** difference, 11, 0
13 **(a)** 3 and 4, 6 and 2 **(b)** 3 and 4
(c) 2 already goes into 6 so if a number is divisible by 6 it must be divisible by 2. **(d)** 3, divisible, 4
14 A number is divisible by 18 if it is divisible by both 2 and 9.

Exercise 3.3 (p. 84)

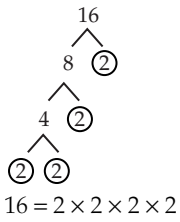
1 **(a)** 1, 2, 4 **(b)** 1, 5 **(c)** 1, 7 **(d)** 1, 2, 4, 8
(e) 1, 2, 5, 10 **(f)** 1, 3, 9 **(g)** 1, 13 **(h)** 1, 11
(i) 1, 2, 4, 8, 16 **(j)** 1, 2, 3, 6, 9, 18 **(k)** 1, 19
(l) 1, 23 **(m)** 1, 2, 4, 5, 10, 20
(n) 1, 2, 3, 4, 6, 8, 12, 24 **(o)** 1, 2, 4, 8, 16, 32
(p) 1, 2, 3, 4, 6, 9, 12, 18, 36
(q) 1, 2, 3, 5, 6, 10, 15, 30
(r) 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60
(s) 1, 7, 11, 77 **(t)** 1, 5, 11, 55
2 **(a)** D **(b)** B **(c)** C **(d)** A
3 **(a)** D **(b)** B **(c)** A **(d)** D **(e)** C
(f) B **(g)** B **(h)** D

Exercise 3.4 (p. 86)

1 **(a)** 1: 1; 2: 1, 2; 3: 1, 3; 4: 1, 2, 4; 5: 1, 5; 6: 1, 2, 3, 6; 7: 1, 7; 8: 1, 2, 4, 8; 9: 1, 3, 9; 10: 1, 2, 5, 10; 11: 1, 11; 12: 1, 2, 3, 4, 6, 12; 13: 1, 13; 14: 1, 2, 7, 14; 15: 1, 3, 5, 15; 16: 1, 2, 4, 8, 16; 17: 1, 17; 18: 1, 2, 3, 6, 9, 18; 19: 1, 19; 20: 1, 2, 4, 5, 10, 20
(b) 2, 3, 5, 7, 11, 13, 17, 19
2 It has only one factor. **3** Four (2, 3, 5, 7)
4 41, 43, 47, 53, 59 **5** One (2)
6 It is even so 2 is a factor.
7 **(a)** 61 **(b)** 62 **(c)** 9, 15 **(d)** 31 **(e)** 32
(f) 41 **(g)** two (23, 29)
8 **(a)** Divisible by 5 **(b)** Divisible by 10, 5 and 2
(c) Divisible by 3 and 9 **(d)** Divisible by 3 and 9
(e) Divisible by 2, 4 and 8
(f) Divisible by 3 and 9 **(g)** Divisible by 5
(h) Divisible by 2 and 4 **(i)** Divisible by 3 and 9
9 (Other answers are possible.) **(a)** 2 + 2
(b) 3 + 3 **(c)** 7 + 3 **(d)** 5 + 7 **(e)** 11 + 7
(f) 13 + 7 **(g)** 11 + 11 **(h)** 47 + 53
10 There are no more even prime numbers.
11 2

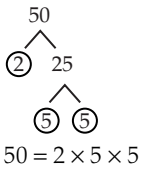
Exercise 3.5 (p. 88)

1 **(a)**



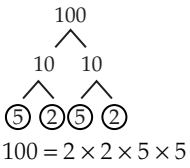
$16 = 2 \times 2 \times 2 \times 2$

(b)



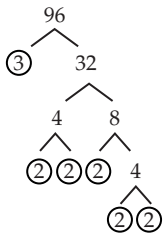
$50 = 2 \times 5 \times 5$

(c)



$100 = 2 \times 2 \times 5 \times 5$

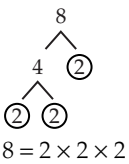
(d)



$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

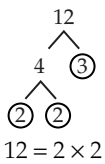
2 The factor trees can differ slightly from these. The factors at the end should be the same.

(a)



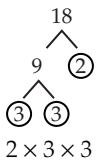
$8 = 2 \times 2 \times 2$

(b)



$12 = 2 \times 2 \times 3$

(c)

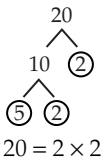


$18 = 2 \times 3 \times 3$

(d)

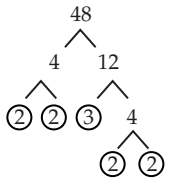
$26 = 2 \times 13$

(e)



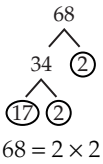
$20 = 2 \times 2 \times 5$

(f)



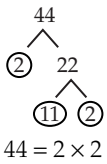
$48 = 2 \times 2 \times 2 \times 2 \times 3$

(g)



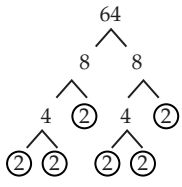
$68 = 2 \times 2 \times 17$

(h)



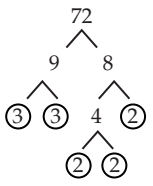
$44 = 2 \times 2 \times 11$

(i)



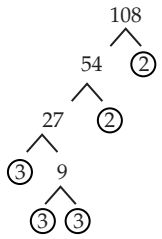
$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$

(j)



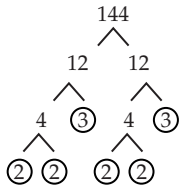
$72 = 2 \times 2 \times 2 \times 3 \times 3$

(k)



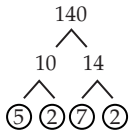
$108 = 2 \times 2 \times 3 \times 3 \times 3$

(l)



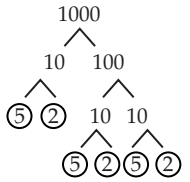
$144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3$

(m)



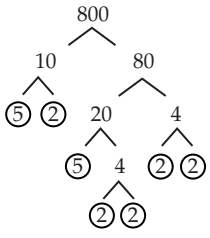
$140 = 2 \times 2 \times 5 \times 7$

(n)



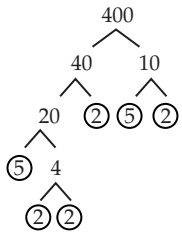
$1000 = 2 \times 2 \times 2 \times 5 \times 5 \times 5$

(o)



$800 = 2 \times 2 \times 2 \times 2 \times 2 \times 5 \times 5$

(p)

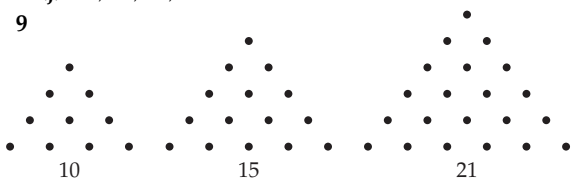


$400 = 2 \times 2 \times 2 \times 2 \times 5 \times 5$

3 17; 510

Exercise 3.6 (p. 92)

1 **(a)** 9; 11, 22, 33, 44, 55, 66, 77, 88, 99 **(b)** 10
2 **(a)** 1991 **(b)** 2002 **(c)** 2112
3 **(a)** Yes **(b)** Yes **(c)** No **(d)** Yes
(e) Yes **(f)** No
4 **(a)** 13, yes **(b)** 5, yes **(c)** 20, no **(d)** 21, yes
(e) 6, no **(f)** 13, yes **(g)** 5, yes **(h)** 21, yes
5 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144, 233, 377, 610
6 **(a)** Even **(b)** 3 **(c)** 5
7 **(a)** 16, 26, 42 **(b)** 13, 21, 34 **(c)** 12, 20, 32
(d) 23, 35, 58 **(e)** 0, 0, 0 **(f)** 50, 80, 130
(g) 2, 10, 28 **(h)** 0, 9, 18, 27 **(i)** 1, 6, 17, 28
(j) 12, 16, 36, 56
9



10 The difference between consecutive numbers is 1 greater each time.
11 **(a)** They are products of identical numbers.
(b) A triangle fitted with the triangle for the previous triangular number forms a square.

Exercise 3.7 (p. 95)

1 **(a)** 25, 36, 49
(b) **(i)** 144 **(ii)** 400 **(iii)** 10 000 **(iv)** 90 000
2 **(a)** 64, 125, 216 **(b)** **(i)** 729 **(ii)** 3375
(iii) 1 000 000 **(iv)** 8 000 000
3 **(a)** 16, 36 **(b)** 49, 81
4 **(a)** **(i)** five squared **(ii)** two squared
(iii) fourteen squared **(iv)** thirty-one squared
(v) three cubed **(vi)** seven cubed
(vii) nineteen cubed **(viii)** twenty-seven cubed
(b) **(i)** 16 **(ii)** 36 **(iii)** 81 **(iv)** 169 **(v)** 900
(vi) 2500 **(vii)** 343 **(viii)** 3375 **(ix)** 289
(x) 64 000 **(xi)** 125 000 **(xii)** 10 000 **(xiii)** 500
(xiv) 400 **(xv)** 103 **(xvi)** 2000 **(xvii)** 993
(xviii) 1011
5 **(a)** **(i)** 25 **(ii)** 100 **(b)** 5^2, 10^2
(c) **(i)** $9^2 + 12^2 = 15^2$ **(ii)** $12^2 + 16^2 = 20^2$
(iii) $30^2 + 40^2 = 50^2$ **(d)** 26^2
6 **(a)** **(i)** 144 **(ii)** 144
(b) **(i)** 25×4; 100 **(ii)** 10^2; 100
(c) $(a \times b)^2 = a^2 \times b^2$
7 **(a)** 3 **(b)** 2 **(c)** 7 **(d)** 8 **(e)** 9 **(f)** 5
(g) 12 **(h)** 100
8 **(a)** 1 **(b)** 3 **(c)** 2 **(d)** 4 **(e)** 20 **(f)** 10
(g) 5 **(h)** 100
9 **(a)** 5 **(b)** 7 **(c)** 6 **(d)** 8 **(e)** 10 **(f)** 11
(g) 14 **(h)** 13 **(i)** 1 **(j)** 0 **(k)** 70
(l) 20 **(m)** 40 **(n)** 50 **(o)** 600 **(p)** 900
10 **(a)** 2 **(b)** 4 **(c)** 10 **(d)** 1 **(e)** 0 **(f)** 5
(g) 20 **(h)** 30
11 **(a)** **(i)** 6 **(ii)** 6
(b) **(i)** $\sqrt{1600}$; 40 **(ii)** 10×4; 40
(c) $\sqrt{a \times b} = \sqrt{a} \times \sqrt{b}$
12 **(a)** No, no number multiplied by itself will give a negative number.
(b) Yes, a negative number cubed gives a negative number.

13 **(a)** 3, 4 **(b)** 2, 3 **(c)** 4, 5 **(d)** 7, 8
(e) 9, 10 **(f)** 1, 2 **(g)** 8, 9 **(h)** 10, 11
14 **(a)** 2, 3 **(b)** 3, 4 **(c)** 10, 11 **(d)** 3, 4
(e) 1, 2 **(f)** 4, 5 **(g)** 4, 5 **(h)** 1, 2
15 Students' own answers.
16 **(a)** mental strategies: should be familiar with the answer and can check easily that $3^2 = 9$
(b) a calculator: answer is not exact
(c) mental strategies: should realise that $100 \times 100 = 10\,000$; may want to double-check with a calculator
(d) a calculator: answer is not exact

Exercise 3.8 (p. 99)

1 **(a)** 8^3 **(b)** 4^6 **(c)** 9^4 **(d)** 7^3 **(e)** 5^6
(f) 9^5 **(g)** 12^5 **(h)** 16^9 **(i)** 6^9 **(j)** 11^8
(k) 17^3 **(l)** 13^7 **(m)** 8^4 **(n)** 9^6 **(o)** 11^7
(p) 9^3
2 **(a)** $4 \times 4 \times 4 \times 4 \times 4$ **(b)** $6 \times 6 \times 6 \times 6 \times 6$
(c) $5 \times 5 \times 5 \times 5$ **(d)** $5 \times 5 \times 5 \times 5 \times 5 \times 5$
(e) $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$
(f) $3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$ **(g)** 7×7
(h) $8 \times 8 \times 8$ **(i)** $9 \times 9 \times 9 \times 9 \times 9 \times 9$
(j) $9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9$
(k) $10 \times 10 \times 10 \times 10$ **(l)** 13×13
(m) $54 \times 54 \times 54 \times 54 \times 54 \times 54 \times 54 \times 54$
(n) $71 \times 71 \times 71 \times 71 \times 71 \times 71$
(o) $111 \times 111 \times 111$
(p) $517 \times 517 \times 517 \times 517$
3 **(a)** $2 \times 2 \times 2 = 8$ **(b)** $2 \times 2 \times 2 \times 2 = 16$
(c) $2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$
(d) $2 \times 2 \times 2 \times 2 \times 2 = 32$
(e) $1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 = 1$
(f) $0 \times 0 \times 0 \times 0 \times 0 \times 0 \times 0 = 0$
(g) $0 \times 0 \times 0 \times 0 \times 0 \times 0 = 0$
(h) $1 \times 1 \times 1 \times 1 \times 1 \times 1 \times 1 = 1$
(i) $10 \times 10 \times 10 = 1000$
(j) $10 \times 10 \times 10 \times 10 \times 10 = 100\,000$
(k) $6 \times 6 \times 6 \times 6 = 1296$ **(l)** $8 \times 8 \times 8 \times 8 = 4096$
(m) $11 \times 11 \times 11 = 1331$
(n) $12 \times 12 \times 12 \times 12 = 20\,736$
(o) $5 \times 5 \times 5 = 125$
(p) $10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1\,000\,000$
4 **(a)** 5 **(b)** 7 **(c)** 65 **(d)** 21 **(e)** 45
(f) 51 **(g)** 32 **(h)** 64 **(i)** 6561 **(j)** 2128
(k) 128 900 **(l)** 147 429 **(m)** 4000
(n) 70 000 **(o)** 900 000 **(p)** 810 000
(q) 36 000 000 **(r)** 40 000 000 **(s)** 27 869
(t) 5 032 974
5 **(a)** 1^{200}, 5^4, 10^3, 4^5, 5^5, 4^6
(b) 10^5, 100^2, 3^2, 2^3, 1^{1000}, 0^{100}
6 **(a)** 2 **(b)** 10 **(c)** 5 **(d)** 8 **(e)** 5 **(f)** 3
(g) 1 **(h)** 10
7 **(a)** $10^4 = 10 \times 10 \times 10 \times 10 = 10\,000$,
$10^5 = 10 \times 10 \times 10 \times 10 \times 10 = 100\,000$
$10^6 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1\,000\,000$
(b) **(i)** one hundred times **(ii)** one hundred
(c) **(i)** 10^{100} times **(ii)** 10^{100}
8 **(a)** 7776 **(b)** 32 768 **(c)** 343 **(d)** 729
(e) 4 826 809 **(f)** 3375 **(g)** 21 952
(h) 15 625 **(i)** 32 768 **(j)** 128 **(k)** 729
(l) 1024 **(m)** 0 **(n)** 190 000 **(o)** 45 000
(p) 2 472 768 **(q)** 537 824 **(r)** 51 998 079
(s) 266 240 **(t)** 79 785 **(u)** 439 291
9 **(a)** **(i)** True **(ii)** True **(iii)** True **(iv)** False
(b) **(i)** False **(ii)** True
10 **(a)** **(i)** 7 **(ii)** 12 **(iii)** 14 **(iv)** 34
(b) 8 **(c)** 11
11 Sample answers: 20, 21, 22, 23

Chapter review (p. 102)

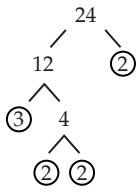
Core

1 **(a)** 7, 14, 21 **(b)** 10, 20, 30 **(c)** 12, 24, 36
(d) 52, 104, 156
2

5301	3, 9
10 000	2, 4, 5, 10
333 333	3, 9
31 700	2, 4, 5, 10
43 521 820	2, 4, 5, 10

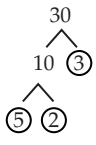
3 **(a)** 1, 5, 7, 35 **(b)** 1, 31 **(c)** 1, 2, 4, 11, 22, 44
(d) 1, 2, 3, 4, 6, 8, 12, 16, 24, 48 **(e)** 1, 3, 17, 51
(f) 1, 2, 4, 5, 10, 20, 25, 50, 100
4 **(a)** Prime, because it has exactly two factors, 1 and 5
(b) Composite, because it has more than two factors, i.e. 1, 2, 4, 8, 16.
(c) Neither. It is a special case because it has only one factor.
(d) Composite, because it has more than two factors, i.e. 1, 7, 11, 77.
(e) Prime, because it has exactly two factors, 1 and 17.
(f) Composite, because it has more than two factors, e.g. 1, 10, 27 635, 276 350.
5 The factor trees can vary but the factors on the last line should be the same even though they may be in a different order.

(a)



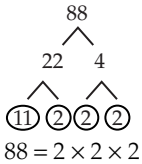
$24 = 2 \times 2 \times 2 \times 3$

(b)



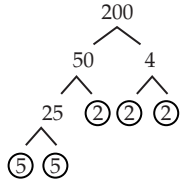
$30 = 2 \times 3 \times 5$

(c)



$88 = 2 \times 2 \times 2 \times 11$

(d)



$200 = 2 \times 2 \times 2 \times 5 \times 5$

6 **(a)** 6, 3, 9, 12, 21, 33, 54, 87 **(b)** 5, 6, 11, 17, 28, 45

7 **(a)** 144 **(b)** 49 **(c)** 400 **(d)** 8 **(e)** 30 **(f)** 15
8 **(a)** 8 **(b)** 1000 **(c)** 125 **(d)** 0 **(e)** 3 **(f)** 4
9 **(a)** 7^5 **(b)** 10^3 **(c)** 5^2 **(d)** 12^8
10 **(a)** $5 \times 5 \times 5 = 125$ **(b)** $8 \times 8 \times 8 \times 8 = 4096$
(c) $(3 \times 3 - 2 \times 2 \times 2) \times 16 \times 16 = 256$

Extension
11 **(a)** **(ii)** 5 **(iii)** 7 **(iv)** 9
(b) To the previous term you need to add one less than twice the current term number.
(c) **(i)** 23 **(ii)** 39
12 larger by 24
13 $\sqrt{121}$, 2^4, 3^3, $4 \times \sqrt{81}$, 10^2

Replay (p. 104)

1 **(a)** 633 **(b)** 2241 **(c)** 2119
2 **(a)** 75 **(b)** 452 **(c)** 842
3 **(a)** 180 **(b)** 600
4 $8.50
5 **(a)** 6 **(b)** 5 **(c)** 4
6 **(a)**

16	2	12
6	10	14
8	18	4

(b)

12	5	10
7	9	11
8	13	6

(c)

17	3	13
7	11	15
9	19	5

7 **(a)** 30 **(b)** 100 **(c)** 1000 **(d)** 10
8 **(a)** 72 **(b)** 47 **(c)** 29
9 **(a)** −6, −4, 0, 3, 10 **(b)** −100, −89, −1, 29, 78
(c) −5, −4, 0, 6, 7
10 **(a)** −20 **(b)** −69 **(c)** 7
11 **(a)** −42 **(b)** 60 **(c)** −63
12 **(a)** −9 **(b)** 10 **(c)** −2

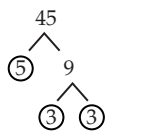
Mixed revision one

Rewind (p. 105)

Core
1 **(a)** XIX **(b)** DCLXLVII **(c)** MCMLXIX
2 3, 8, 13
3 **(a)** 25 **(b)** 8 **(c)** 8 **(d)** 3
4

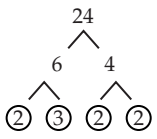
15	20	13
14	16	18
19	12	17

5 **(a)** 8 **(b)** 600 **(c)** 100 000
6 **(a)** −33 **(b)** 35 **(c)** −20
7 **(a)**



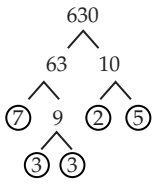
45 = 3 × 3 × 5

(b)



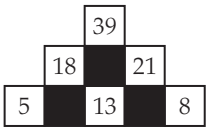
24 = 2 × 2 × 2 × 3

(c)

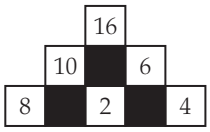


630 = 2 × 3 × 3 × 5 × 7

8 **(a)** Babylonian; 152 **(b)** Roman; 419
(c) Egyptian; 20 314
9 **(a)** −57 **(b)** −18 **(c)** −43
10 **(a)** 15 000 **(b)** 32 000 **(c)** 2000
11 41, 43, 47
12 **(a)** 59 057 **(b)** 5 000 000 **(c)** −656
13 −100, −99, −12, 0, 87
14 **(a)** −5 **(b)** 115 **(c)** −6
15 **(a)**



(b)



16 **(a)** 2 **(b)** 48 **(c)** 19

Extension
17 **(a)** 1, 2, 4, 8, 16 **(b)** 1, 2, 11, 22
(c) 1, 2, 3, 4, 6, 8, 12, 16, 24, 48
18 **(a)** $20 **(b)** $20
19

20	7	6	17
9	14	15	12
13	10	11	16
8	19	18	5

20 96 768
21 **(a)** 6 **(b)** 26 **(c)** 63
22 $\sqrt{144}$, $2 \times \sqrt{81}$, 3^3, $8^2 \div 2$, 6^2
23 **(a)** $5 \times 6 + 8 \div 2 = 34$ **(b)** $5 \times 8 \div (2 + 6) = 5$
(c) $((5 - 2) \times 6) + 8 = 26$
24 Lost $5
25 **(a)** $(111)_2$ **(b)** $(1100)_2$ **(c)** $(101101)_2$

Chapter 4

Prep zone (p. 110)

1 **(a)** **(i)** 59, 60, 61, 62 **(ii)** 2000, 2001, 2002, 2003
(b) **(i)** 78, 80, 82, 84 **(ii)** 96, 98, 100, 102
(c) 45, 47, 49, 51
2 **(a)** **(i)** 41 **(ii)** 107 **(iii)** 2197
(b) **(i)** 10 **(ii)** 94 **(iii)** 58
3 **(a)** $11 + 17 = 28$ **(b)** $9 - 7 = 2$ **(c)** $3 \times 4 = 12$
(d) $16 \div 8 = 2$
4 **(a)** $6 \times 2 - 4$; 8 **(b)** $(10 + 5) \div 5$; 3
(c) $(6 + 5) \times 3$; 33 **(d)** $(23 - 21) \times 12$; 24

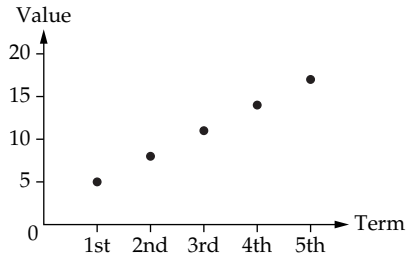
Exercise 4.1 (p. 111)

1 **(a)** 7, 9, 11 **(b)** 2, 5, 2 **(c)** 18, 16, 14
(d) 0, 1, 0 **(e)** −25, −30, −35 **(f)** 16, 32, 64
(g) 8, 4, 2 **(h)** 3, 5, 4 **(i)** 60, 2, 62
(j) 11, 16, 22 **(k)** 24, 19, 13 **(l)** 43, 45, 54
(m) 58, 72, 87 **(n)** 9, 8, 10 **(o)** 8, 13, 21
(p) 14, 23, 37 **(q)** 41, 122, 365 **(r)** 43, 124, 367

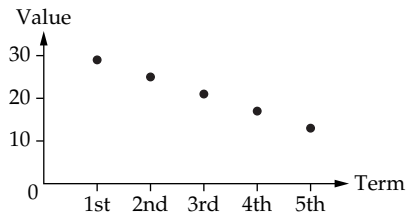
2 **(a)** 44, 38, 36 **(b)** 16, 25, 28 **(c)** 94, 91, 79
(d) 10, 50 **(e)** 9, 81, 243 **(f)** 5, 14, 50
(g) 2, 8, 11 **(h)** 4, 12, 15 or 6, 12, 13 **(i)** 5, 7, 13
(j) 77, 111, 121, 151, 161, 171, 181, 191

3 **(a)** 5, 8, 11, 14, 17 **(b)** 29, 25, 21, 17, 13
(c) 1, 3, 9, 27, 81 **(d)** 80, 40, 20, 10, 5
(e) 3, 7, 15, 31, 63 **(f)** 1, 2, 6, 22, 86

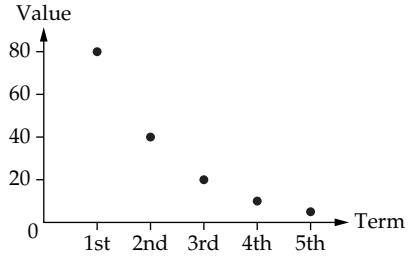
4 **(a)**



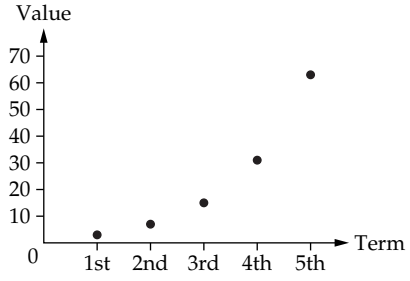
(b)



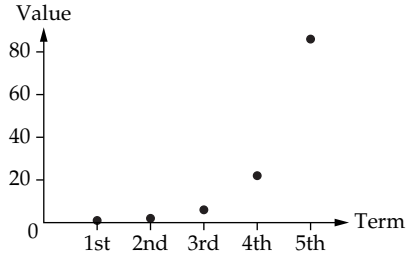
(d)



(e)



(f)



(b) **(i)** In **(a)**, **(c)**, **(e)** and **(f)** the number patterns increase. The pattern increases at a steady rate in **(a)**, but for the other graphs it keeps increasing at a faster rate.
(ii) Graphs **(b)** and **(d)** show the decreasing number patterns. Graph **(b)** increases at a constant rate (straight line) whereas **(d)** decreases at a greater rate.
(iii) Some of the paths are straight, some are curved. The paths are straight if the same number is being added or subtracted. The paths are curved if the pattern is dividing or multiplying.

(c) **(a)** rule should be adding a constant term
(b) rule should be subtracting a constant term
(c) rule should be multiplying by a constant term
(d) rule should be dividing by a constant term

5 Example: 11, 14, 17, 20

6 T. (Further hint: These are the first letters of something.)

7

1	2	3	4	5	6	7	8
7	12	17	22	27	32	37	42

8

1	2	3	4	5	6	7	8
5	9	13	17	21	25	29	33

She will need 64 pieces of wood.

9

1	2	3	4	5	6	7	8
6	11	16	21	26	31	36	41

10

1	2	3	4	5	6	7	8
2	4	7	11	16	22	29	37

11

1st	2nd	3rd	4th	5th	6th
1	4	10	19	31	46

Exercise 4.2 (p. 116)

1 **(a)**

IN	*OUT*
13	15
11	13
7	9
28	30
−1	1
65	67

(b)

IN	*OUT*
6	1
18	13
9	4
85	80
5	0
101	96

(c)

IN	*OUT*
19	11
8	0
15	7
47	39
−52	−60
100	92

(d)

IN	*OUT*
3	30
7	70
20	200
10	100
55	550
87	870

(e)

IN	*OUT*
4	20
−8	−40
2	10
12	60
5	25
1000	5000

(f)

IN	*OUT*
2	4
5	10
10	20
8	16
11	22
101	202

(g)

IN	OUT
12	27
11	25
7	17
9	21
100	203
18	39

(h)

IN	OUT
4	0
5	2
14	20
−6	−20
47	86
79	150

(i)

IN	OUT
2	11
1	8
6	43
12	151
300	90 007
7	56

2 (a)

IN	OUT
45	46
58	59
−9	−8
4	5
11	12
50	51

(b)

IN	OUT
17	8
12	3
21	12
−11	−20
18	9
89	80

(c)

IN	OUT
18	6
−12	−4
15	5
33	11
0	0
60	20

(d)

IN	OUT
3	9
11	121
−7	49
±6	36
±9	81
±10	100

(e)

IN	OUT
7	14
13	26
41	82
−10	−20
45	90
12	24

(f)

IN	OUT
6	13
1	3
13	27
0	1
10	21
50	101

3 (a) OUT = IN − 18 **(b)** OUT = IN × 60
(c) OUT = IN ÷ 7 **(d)** OUT = (IN + 43) × 20
(e) OUT = IN × 100 − 50 **(f)** OUT = IN ÷ 16 + 13
(g) OUT = IN × IN **(h)** OUT = IN ÷ IN
(i) OUT = (IN − 12) ÷ 9 **(j)** OUT = IN × IN − 37
4 (a) C **(b)** A **(c)** C **(d)** D **(e)** B
5 (a) C **(b)** D
6 (a) (i) A, D **(ii)** B, F **(iii)** E **(b)** C
(c) A: OUT = IN − 4; B: OUT = IN ÷ 2; D: OUT = IN + 17; E: OUT = IN ÷ 2 − 1; F: OUT = IN × 3

Exercise 4.3 (p. 120)

1 (a) $y = x - 18$ **(b)** $y = x + 42$ **(c)** $y = 2x$
(d) $y = 9x$ **(e)** $y = 6x$ **(f)** $y = 12x$
(g) $y = 4x - 7$ **(h)** $y = 13x + 50$ **(i)** $y = 7 + 6x$
(j) $y = 100 - 3x$ **(k)** $y = 5x + 7x$ **(l)** $y = 20x - 6x$
(m) $y = 9(x + 20)$ **(n)** $y = 2(x + 100)$
(o) $y = 6(x - 4)$ **(p)** $y = 4(x - 2)$
2 (a) (i) 7 **(ii)** −3 **(iii)** 13 **(iv)** 12
(b) (i) 4 **(ii)** 6 **(iii)** 29 **(iv)** −9
(c) (i) −8 **(ii)** 16 **(iii)** 40 **(iv)** 28
(d) (i) 33 **(ii)** 55 **(iii)** −77 **(iv)** 99
(e) (i) 25 **(ii)** −20 **(iii)** 40 **(iv)** 13
(f) (i) 5 **(ii)** 15 **(iii)** −101 **(iv)** 7
(g) (i) 4 **(ii)** 22 **(iii)** 1 **(iv)** 31
(h) (i) 99 **(ii)** 15 **(iii)** 43 **(iv)** 50
(i) (i) 18 **(ii)** 33 **(iii)** 36 **(iv)** 0
(j) (i) 66 **(ii)** 55 **(iii)** 220 **(iv)** 11
(k) (i) 35 **(ii)** 5 **(iii)** 150 **(iv)** 100
(l) (i) 20 **(ii)** −20 **(iii)** 200 **(iv)** 80
(m) (i) 35 **(ii)** 14 **(iii)** 17 **(iv)** 2
(n) (i) 5 **(ii)** −3 **(iii)** 199 **(iv)** 1
(o) (i) 7 **(ii)** −7 **(iii)** 70 **(iv)** 28
(p) (i) 13 **(ii)** 65 **(iii)** 130 **(iv)** 0

3 (a) True **(b)** True **(c)** False **(d)** False
(e) False **(f)** True **(g)** False **(h)** True

4 (a)

x	y
6	42
4	28
10	70
20	140
−8	−56
101	707

(b)

a	b
11	44
−20	−80
5	20
9	36
100	400
50	200

(c)

m	n
1	6
−2	−12
10	60
6	36
100	600
5	30

(d)

j	k
2	14
−5	−42
11	86
10	78
9	70
100	798

(e)

p	q
11	12
15	20
−10	−30
20	30
50	90
100	190

(f)

r	s
1	11
2	15
3	19
−7	−21
10	47
200	807

(g)

u	v
5	16
3	8
−2	−12
12	44
201	800
6	20

(h)

m	n
5	4
−2	−17
11	22
22	55
102	295
52	145

(i)

x	y
10	90
11	99
3	27
−2	−18
1	9
100	900

5 (g) $v = 4u - 4$ **(h)** $n = 3m - 11$ **(i)** $y = 9x$
6 Students' own answers, e.g. $y = 3x + 5$

x	y
7	26
−20	−55
13	44
101	308

7 (a) $y = x - 3$ **(b)** $d = c + 11$ **(c)** $q = p - 8$
(d) $s = 5r$ **(e)** $n = -3m$ **(f)** $b = 4a$
8 (b) $y = 3x + 5$ is better to use because it involves fewer steps.
9 (a) $q = 5p + 1$ **(b)** $y = 2x - 4$ **(c)** $t = 2s + 8$
(d) $k = 3j + 3$ **(e)** $n = 5m + 10$ **(f)** $d = 3c - 1$
(g) $z = 7d + 7$ **(h)** $q = 10c - 60$
(i) $v = 100f - 100$

Exercise 4.4 (p. 127)

1 (a) number of globes **(b)**

H	G
2	3
3	5
4	7
5	9
6	11
7	13

(c) $G = 2H - 1$
(d) $H = 120$ gives $G = 239$
So 239 globes would be needed.

2 (b)

B	*S*
1	4
2	7
3	10
4	13
5	16

(c) $S = 3B + 1$
(d) $B = 21$ gives $S = 64$
$B = 40$ gives $S = 121$
$B = 111$ gives $S = 334$

3 (b)

A	*B*
1	5
2	9
3	13
4	17

(c) $B = 4A + 1$
(d) $A = 52$ gives $B = 209$
209 bricks would be needed.

4 (b)

T	*P*
1	3
3	7
5	11
7	15
9	19

(c) $P = 2T + 1$
(d) $T = 203$ gives $P = 407$
Clarence would need 407 pieces of wood.

5 (b)

L	*P*
1	8
2	10
3	12
4	14

(c) $P = 2L + 6$ or $P = 2(L + 3)$
(d) $L = 345$ gives $P = 696$
696 paving blocks are needed.
(e) The spa is 7 paving blocks long.

Chapter review (p. 134)

Core

1 (a)

IN	*OUT*
57	60
34	37
-12	-9
4	7
1	4
64	67

(b)

IN	*OUT*
4	7
3	4
2	1
9	22
10	25
12	31

(c)

IN	*OUT*
38	60
9	2
10	4
58	100
-2	-20
408	800

2 (a)

IN	*OUT*
15	3
35	7
100	20
5	1
0	0
30	6

(b)

IN	*OUT*
12	144
-8	-96
3	36
1	12
0	0
5	60

(c)

IN	*OUT*
10	6
14	8
6	4
4	3
20	11
50	26

3 (a) B **(b)** C **(c)** A
4 (a) (i) 54 **(ii)** 74 **(iii)** 194 **(iv)** -106
(b) (i) 15 **(ii)** 11 **(iii)** -9 **(iv)** 31
5 (a) C **(b)** A

6 (a)

x	*y*
7	0
9	2
12	5
20	13
-8	-15
107	100

(b)

x	*y*
4	10
5	20
13	100
-7	-100
78	750
54	510

(c)

x	*y*
0	13
-5	-2
15	58
5	28
4	25
95	298

7 (a) $y = x - 7$ **(b)** $b = 2a + 4$ **(c)** $w = 100v - 1$

Extension

8 (a)

Name of alkane	*No. of carbon atoms*	*No. of hydrogen atoms*
Methane	1	4
Ethane	2	6
Propane	3	8
Butane	4	10
Pentane	5	12
Hexane	6	14
Heptane	7	16
Octane	8	18
Nonane	9	20
Decane	10	22

No. of hydrogen atoms
$= (2 \times$ no. of carbon atoms$) + 2$

9 (a) and **(b)**

C	1	2	3	4	5	6	7	8	9	10
B	4	7	10	13	16	19	22	25	28	31

(c) $B = 3C + 1$
(d) decane: 31 bonds; hectane: 301 bonds

Replay (p. 137)

1 (a) 226 **(b)** 6284 **(c)** 874
2 (a) 2.5, 3, 3.5 **(b)** 0.07, 0.09, 0.11 **(c)** 2.1, 2, 1.9
3 (a) improper fraction **(b)** mixed number
(c) proper fraction **(d)** proper fraction
(e) improper fraction **(f)** mixed number
4 (a)  **(b)**  **(c)** 
5 (a) 8000 **(b)** 600 000 **(c)** 240 000
6 (a) 6 **(b)** 36 **(c)** 100
7 (a) -$500 **(b)** +2.7 kg **(c)** -348 m
8 (a) -7 **(b)** -20 **(c)** 36
9 (a) -7 **(b)** 5 **(c)** -40
10 (a) 4, 8, 12, 16, 20 **(b)** 6, 12, 18, 24, 30
(c) 20, 40, 60, 80, 100
11 4, 9
12 (a) 8 **(b)** 10 **(c)** 70

Chapter 5

Prep zone (p. 140)

1 (a) 55° **(b)** 160° **(c)** 235° **(d)** 339°
2 D, A, B, E, C, F
3 A E; B F; C D

Exercise 5.1 (p. 143)

1 (a) 20° **(b)** 50° **(c)** 15° **(d)** 71° **(e)** 23°
(f) 29° **(g)** 62° **(h)** 83°
2 (a) 110° **(b)** 150° **(c)** 155° **(d)** 176°
(e) 141° **(f)** 126°
3 (a) 190° **(b)** 235° **(c)** 261° **(d)** 233°
(e) 269°
4 (a) 320° **(b)** 345° **(c)** 352° **(d)** 328°
5 (a) 102° **(b)** 350° **(c)** 129° **(d)** 225°
(e) 47° **(f)** 164° **(g)** 255° **(h)** 71°
6 C **7** 12° **8** 21° **9** B **10** 140°

Exercise 5.2 (p. 149)

1 **(a)** B, C, A, D **(b)** C, A, D, B
2 **(a)** C **(b)** A **(c)** B **(d)** D
3 **(a)** D **(b)** A **(c)** C **(d)** B
4 A good estimate is within 5 to 10 degrees of the actual value (given in Question **5**).
5 **(a)** 47° **(b)** 141° **(c)** 209° **(d)** 312°
(e) 150° **(f)** 263° **(g)** 79° **(h)** 125°
(i) 303° **(j)** 8°

Exercise 5.4 (p. 159)

1 **(a)** straight **(b)** reflex **(c)** obtuse **(d)** reflex
(e) reflex **(f)** acute **(g)** acute **(h)** obtuse
(i) obtuse **(j)** revolution **(k)** right
(l) straight **(m)** reflex **(n)** reflex **(o)** acute
(p) right **(q)** revolution **(r)** acute **(s)** right
(t) reflex **(u)** reflex
2 **(a)** acute **(b)** obtuse **(c)** reflex
(d) revolution or perigon **(e)** straight
(f) acute **(g)** right **(h)** obtuse
4 (*Note:* Other forms of notation may be used.)
(a) $\angle QPR$ **(b)** $\angle STD$ **(c)** $\angle BOA$
(d) $\angle KIW$ **(e)** $\angle SHD$ **(f)** $\angle CAT$
5 Angles can be of any size, provided the vertex is labelled with the middle letter.
6 **(a)** $\angle DOC$ (or $\angle COD$), $\angle COB$ (or $\angle BOC$)
(b) $\angle COA$ (or $\angle AOC$) **(c)** O **(d)** BO
7 **(a)** 334° **(b)** 230°
(c) $\angle RMS$ could be an acute angle and $\angle PMS$ could be an obtuse angle.

Exercise 5.5 (p. 163)

1 **(a)** 60° **(b)** 10° **(c)** 14° **(d)** 23° **(e)** 56°
(f) 63° **(g)** 29° **(h)** 31° **(i)** 30°
2 **(a)** 63° **(b)** 45° **(c)** 22° **(d)** 75°
3 **(a)** C **(b)** C **(c)** B **(d)** D
4 **(a)** 150° **(b)** 60° **(c)** 175° **(d)** 155°
(e) 57° **(f)** 143° **(g)** 69° **(h)** 53° **(i)** 38°
5 **(a)** 148° **(b)** 90° **(c)** 56° **(d)** 4°
6 **(a)** 60° **(b)** 45° **(c)** 30° **(d)** 40° **(e)** 50°
(f) 30°
7 **(a)** Answers must add to 90°.
(b) Answers must add to 180°.
8 **(a)** A right angle is 90°. When you place two angles that add to 90° together, with their vertices at the same point, they will form a right angle.
(b) A straight angle is 180°. When you place two angles that add to 180° together, with their vertices at the same point, they will form a straight angle.

Exercise 5.6 (p. 166)

1 **(a)** 270° **(b)** 120° **(c)** 313° **(d)** 50°
(e) 145° **(f)** 202° **(g)** 336° **(h)** 81°
(i) 180°
2 **(a)** 50° **(b)** 245° **(c)** 138° **(d)** 70°
(e) 143° **(f)** 31°
3 **(a)** 120° **(b)** 72° **(c)** 75°
4 The three angles given must add to 360°.
5 A revolution is 360°. When you place two angles that add to 360° together, with their vertices at the same point, they will form a revolution.

Exercise 5.7 (p. 168)

1 **(a)** $a° = 130°$ and $b° = 50°$
(b) $c° = 140°$ and $d° = 40°$
Vertically opposite angles are equal.
2 **(a)** 33° **(b)** 51° **(c)** 172° **(d)** 94° **(e)** 89°
(f) 12°
3 **(a)** $x° = 101°$, $y° = z° = 79°$
(b) $x° = 88°$, $y° = z° = 92°$
(c) $x° = z° = 149°$, $y° = 31°$

Chapter review (p. 171)

Core

1 **(a)** 42° **(b)** 196° **(c)** 157° **(d)** 5°
(e) 293° **(f)** 321°
3 A **4** B
5 **(a)** reflex **(b)** revolution **(c)** straight
(d) acute **(e)** right **(f)** obtuse
6 **(a)** 163° **(b)** 39° **(c)** 24° **(d)** 125°
7 **(a)** 127° **(b)** 40°
8 **(a)** 143° **(b)** 82°

Extension

9 292°
10 **(a)** 4° **(b)** 0.005° per year
11 **(a)** 60° **(b)** 150° **(c)** 150°

Replay (p. 174)

1 **(a)** XII **(b)** XLIX **(c)** CCCLXVIII
(d) MMMLVI
2 **(a)**

18	11	16
13	15	17
14	19	12

(b)

10	5	12
11	9	7
6	13	8

(c)

7	17	15
21	13	5
11	9	19

3 **(a)** 54 **(b)** 31 **(c)** 10
4 **(a)** 2, 5, 8 **(b)** -8, -16, -24 **(c)** -8, -18, -28
5 **(a)** 4 **(b)** -165 **(c)** 21
6 **(a)** -63 **(b)** 360 **(c)** 60
7 **(a)** 7, 14, 21, 28 **(b)** 12, 24, 36, 48
(c) 15, 30, 45, 60
8 108, 4734, 18 999, 28 008
9 **(a)** 33 **(b)** 64 **(c)** 160 000
10 **(a)** 38, 29, 20 **(b)** 16, 25, 36
11 **(a)** $m = 2n$ **(b)** $m = n + 5$ **(c)** $m = (n - 7) \div 2$
12 **(a)** $y = -3$ **(b)** $y = 5$ **(c)** $y = -17$

Chapter 6

Prep zone (p. 178)

1 **(a)** $7 > 2$ **(b)** $4 < 5$ **(c)** $0.008 < 0.09$
(d) $0.7 > 0.07$

2 **(a)** seven tenths **(b)** eight thousandths
(c) three hundredths **(d)** five ten-thousandths

3 **(a)** six **(b)** seventy-two
(c) six hundred and three
(d) two hundred and fifty-one

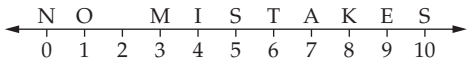
4 **(a)** 110 **(b)** 1535 **(c)** 479 **(d)** 6499

5 **(a)** 49 **(b)** 447 **(c)** 7905 **(d)** 1648

6 **(a)** 34 **(b)** 2400 **(c)** 1461 **(d)** 412 800

7 **(a)** 181 **(b)** 978 **(c)** 1051 **(d)** 135

8



Exercise 6.1 (p. 182)

1 **(a)** 45.462 **(b)** 3.7985 **(c)** 12.519 372
(d) 7.933 547 **(e)** 0.147 437 **(f)** 0.191 634
(g) 0.026 359 **(h)** 0.006 568 **(i)** 1.008 332
(j) 15.072 566 **(k)** 0.786 06 **(l)** 0.607 95
(m) 0.020 03 **(n)** 0.007 05 **(o)** 27.009 07
(p) 8.0305

2 D

3 **(a)** $6 + \frac{6}{10} + \frac{3}{100}$ **(b)** $\frac{9}{10} + \frac{2}{100} + \frac{1}{1000}$
(c) $\frac{7}{10} + \frac{3}{100} + \frac{4}{1000} + \frac{5}{10\,000}$ **(d)** $7 + \frac{8}{10} + \frac{2}{100} + \frac{6}{1000}$
(e) $23 + \frac{9}{10} + \frac{1}{100} + \frac{3}{1000}$
(f) $45 + \frac{6}{10} + \frac{6}{100} + \frac{4}{1000} + \frac{5}{10\,000}$
(g) $5 + \frac{7}{10} + \frac{4}{100} + \frac{6}{1000} + \frac{7}{10\,000} + \frac{8}{100\,000}$
(h) $\frac{5}{100} + \frac{6}{1000} + \frac{5}{10\,000} + \frac{1}{100\,000} + \frac{2}{1\,000\,000}$
(i) $7 + \frac{3}{100} + \frac{6}{1000}$ **(j)** $8 + \frac{4}{1000} + \frac{8}{10\,000}$
(k) $\frac{4}{10} + \frac{5}{10\,000}$ **(l)** $\frac{3}{10} + \frac{9}{1000}$
(m) $3 + \frac{7}{10\,000} + \frac{9}{1\,000\,000}$ **(n)** $7 + \frac{4}{100} + \frac{1}{10\,000} + \frac{1}{1\,000\,000}$
(o) $42 + \frac{3}{10} + \frac{7}{1000} + \frac{1}{100\,000}$ **(p)** $\frac{3}{100\,000} + \frac{8}{1\,000\,000}$

4 B

5 **(a)** 6.5 **(b)** 5.9 **(c)** 0.97 **(d)** 3.28
(e) 0.273 **(f)** 0.394 **(g)** 37.4281
(h) 8.137 47 **(i)** 14.957 623 **(j)** 52.365 144
(k) 70.004 59 **(l)** 90.000 51 **(m)** 0.207
(n) 6.330 08 **(o)** 64.0905 **(p)** 1.803 04
(q) 0.6083 **(r)** 0.100 306

6 Sample answers: 21.506, 12.002, 89.906

7 B

8 **(a)** five units and two tenths **(b)** four units and nine tenths **(c)** three tens, four units, one tenth and seven hundredths **(d)** six tenths and one hundredth **(e)** two units, seven tenths, nine hundredths and four thousandths
(f) four hundredths and two thousandths
(g) one unit, five tenths, eight hundredths, nine thousandths and two ten-thousandths
(h) six units, five tenths, one hundredth, eight thousandths and seven ten-thousandths
(i) three tens, five units, eight tenths, six hundredths, five thousandths, four ten-thousandths and three hundred-thousandths **(j)** three tenths, nine hundredths, four thousandths, five ten-thousandths and two hundred-thousandths
(k) eight tenths, two hundredths, three thousandths, two ten-thousandths, two hundred-thousandths and seven millionths **(l)** three tens, five hundredths, four thousandths, nine ten-thousandths, one hundred-thousandth and two millionths **(m)** nine units, nine hundredths and two thousandths **(n)** six units, one thousandth and five ten-thousandths **(o)** two hundred-thousandths and seven millionths **(p)** four ten-thousandths and eight hundred-thousandths
(q) eight hundredths and six millionths **(r)** six thousandths and five millionths **(s)** three units, two tenths, five ten-thousandths and one millionth **(t)** nine units, two ten-thousandths and seven millionths

9 B

10 **(a)** $\frac{2}{1000}$ **(b)** $\frac{2}{100\,000}$ **(c)** $\frac{2}{10}$ **(d)** 2
(e) $\frac{2}{10\,000}$ **(f)** $\frac{2}{10}$ **(g)** $\frac{2}{1\,000\,000}$ **(h)** $\frac{2}{100}$
(i) $\frac{2}{100}$ **(j)** $\frac{2}{100\,000}$ **(k)** $\frac{2}{100\,000}$ **(l)** $\frac{2}{1\,000\,000}$

11 **(a)** seven tenths **(b)** seven thousandths
(c) seven hundredths **(d)** seven millionths
(e) seven thousandths **(f)** seven tenths
(g) seven hundred-thousandths
(h) seven ten-thousandths
(i) seven ten-thousandths **(j)** seven tens
(k) seven millionths
(l) seven hundred-thousandths

12 **(a)** The 2 is in the thousandths place, not the hundredths place.
(b) Should be 409.67. Al has written the 6 in the hundredths place and the 7 in the thousandths place.
(c) Minh has put the 7 in the tenths place instead of in the tens place. Answer should be 7.0809.
(d) $\frac{9}{10} + \frac{5}{100} + \frac{6}{1000}$ means 0.956. Polly has not realised that the 0 is in the hundredths column. 0.9056 is the same as $\frac{9}{10} + \frac{5}{1000} + \frac{6}{10\,000}$.

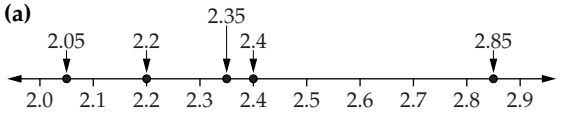
Exercise 6.2 (p. 185)

1 **(a)** $0.65 > 0.57$ **(b)** $2.4 > 0.42$
(c) $0.3003 < 0.333$ **(d)** $2.32 > 1.955$
(e) $4.7038 < 4.7312$ **(f)** $8.251 > 8.2501$
(g) $7.02 > 7.002$ **(h)** $4.7367 < 4.7376$
(i) $0.927 < 0.927\,34$ **(j)** $3.980\,54 < 3.985\,04$
(k) $6.013 < 6.31$ **(l)** $0.005 > 0.000\,055$
(m) $8.737\,65 > 2.737\,66$ **(n)** $3.406 > 0.4063$
(o) $7.2568 < 8.7562$ **(p)** $5.000\,001 < 5.01$
(q) $0.9995 > 0.9986$ **(r)** $2.689\,01 < 2.69$

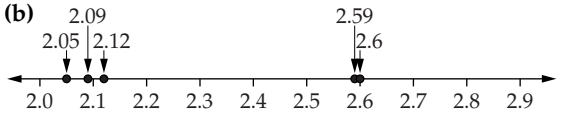
2 **(a)** False **(b)** False **(c)** False **(d)** False
(e) True **(f)** True **(g)** False **(h)** True
(i) True **(j)** True **(k)** True **(l)** False

3 **(a)** 4.6 **(b)** 7.31 **(c)** 7.53 **(d)** 8.523
(e) 0.0084 **(f)** 0.4707 **(g)** 3.972 **(h)** 0.453
(i) 0.005 **(j)** 17.52 **(k)** 0.046 82 **(l)** 3.909

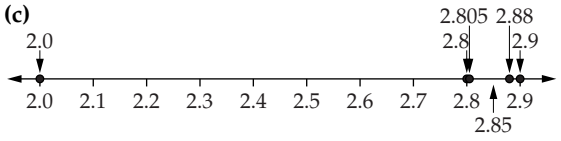
4 (a)



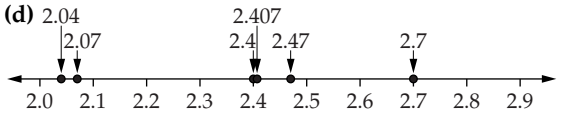
(b)



(c)



(d)



5 (a) 2.03, 2.13, 2.3 **(b)** 8.007, 8.67, 8.7
(c) 6.64, 6.6403, 6.646 **(d)** 0.0095, 0.0509, 0.0905
(e) 5.003 821, 5.3281, 5.38 **(f)** 3.116, 3.616, 3.661
(g) 0.7059, 0.7109, 0.7149 **(h)** 0.092, 0.29, 0.92
(i) 0.086, 0.815, 0.85 **(j)** 4.677, 4.706, 4.71
(k) 3.7, 7.03, 7.3 **(l)** 2.12, 2.21, 21.2

6 (a) 0.12, 0.15, 0.18 **(b)** 2.2, 2.6, 3.0
(c) 8.1, 7.8, 7.5 **(d)** 0.08, 0.06, 0.04
(e) -0.3, -0.6, -0.9 **(f)** 0.7, 1.1, 1.5

7 Karen, Jarryd, Anthea, Brendan

8 (a) 13.08 seconds **(b)** 13.95 seconds

9 25.6 m **10** Wednesday

11 Sample answers: 7.21, 7.205, 7.269 (Must start with 7.2.)

Exercise 6.3 (p. 189)

1 (a) 4.9 **(b)** 6.7 **(c)** 7.64 **(d)** 4.55
(e) 0.642 **(f)** 3.28 **(g)** 6.36 **(h)** 45.623
(i) 8.011 **(j)** 0.3144 **(k)** 11.83 **(l)** 2.92
(m) 0.0052 **(n)** 15.001 **(o)** 5.2010
(p) 0.7070 **(q)** 42.22 **(r)** 5.33 **(s)** 18.500
(t) 90.9000 **(u)** 18.960

2 (a) C **(b)** C **(c)** D

3 Sample answers: 3.7864, 3.7851, 3.7879

4 1.27 m **5** $56.13 **6** 2.767 km

7 352.2 metres per second **8** $5.39 million

9 42°C **10** 99.9

Exercise 6.4 (p. 190)

1 (a) 8.98 **(b)** 1.96 **(c)** 27.691 **(d)** 18.0
(e) 11.0 **(f)** 22.206 **(g)** 4.1667 **(h)** 2.928
(i) 10.41 **(j)** 6.6041 **(k)** 23.842 **(l)** 8.6123
(m) 8.7242 **(n)** 4.0349 **(o)** 40.5634
(p) 36.932 26

2 (a) 6.2 **(b)** 16.2 **(c)** 10.3 **(d)** 12.94
(e) 8.48 **(f)** 0.914 **(g)** 9.145 **(h)** 14.008
(i) 3.302 **(j)** 25.648 **(k)** 39.811 **(l)** 26.418
(m) 22.827 **(n)** 10.259 **(o)** 8.858
(p) 14.0261 **(q)** 43.801 **(r)** 58.197
(s) 23.917 **(t)** 17.595 **(u)** 11.5834

3 D

4 $8.95 **5** 12.70 mm **6** $16.00

7 40.5 **8** $6.50 **9** 196.96 km

10 (a) $165.90
(b) The fourth item (cost $18.48) was added twice.

11 $1337.35 **12** Students' own answers.

Exercise 6.5 (p. 193)

1 (a) 2.2 **(b)** 2.1 **(c)** 1.8 **(d)** 1.9 **(e)** 6.23
(f) 5.21 **(g)** 1.86 **(h)** 4.59 **(i)** 4.80
(j) 0.91 **(k)** 3.315 **(l)** 1.861 **(m)** 15.319
(n) 41.247 **(o)** 2.243 **(p)** 3.802 **(q)** 0.399
(r) 6.576 **(s)** 5.3579 **(t)** 0.9524

2 (a) 3.24 **(b)** 2.03 **(c)** 1.665 **(d)** 3.191
(e) 0.551 **(f)** 48.226 **(g)** 9.2165
(h) 15.1083 **(i)** 10.7998 **(j)** 0.3791
(k) 3.513 **(l)** 5.075

3 (a) 6.4 **(b)** 4.2 **(c)** 1.65 **(d)** 2.03
(e) 11.199 **(f)** 5.661 **(g)** 0.478 **(h)** 0.964
(i) 243.927 **(j)** 308.746 **(k)** 19.317
(l) 49.749

4 (a) 3.4 **(b)** 2.1 **(c)** 1.9 **(d)** 1.54 **(e)** 4.18
(f) 4.12 **(g)** 1.347 **(h)** 12.247 **(i)** 8.943
(j) 0.1878 **(k)** 25.3048 **(l)** 35.989
(m) 6.963 **(n)** 3.184 **(o)** 3.838 **(p)** 7.26
(q) 7.45 **(r)** 2.769 **(s)** 0.56 **(t)** 0.08
(u) 92.302 **(v)** 16.419 **(w)** 21.208
(x) 78.163

5 47.93 kg **6** $295.51 **7** 0.848 kg

8 267.9 km **9** $63.65 **10** 0.375 litres

11 28.153 km **12** $484.25 **13** $140.75

14 Sample answer: 12.462 and 3.752

Exercise 6.6 (p. 199)

1 (a) 30.4 **(b)** 37.1 **(c)** 58.5 **(d)** 23.10
(e) 2.16 **(f)** 73.98 **(g)** 64.376 **(h)** 54.927
(i) 4.333 **(j)** 23.022 **(k)** 76.524 **(l)** 161.728
(m) 377.472 **(n)** 9.426 **(o)** 16.0956
(p) 4.2860 **(q)** 8.1603 **(r)** 36.2276

2 (a) 0.15 **(b)** 0.18 **(c)** 0.24 **(d)** 0.036
(e) 0.040 **(f)** 0.072 **(g)** 0.063 **(h)** 0.04
(i) 0.045 **(j)** 0.064 **(k)** 0.078 **(l)** 0.118
(m) 0.0056 **(n)** 0.0012 **(o)** 0.0020
(p) 0.0087 **(q)** 0.0304 **(r)** 0.0301
(s) 0.000 98 **(t)** 0.005 53 **(u)** 0.00408

3 (a) 144.0 **(b)** 93.6 **(c)** 613.2 **(d)** 572.75
(e) 20.15 **(f)** 220.92 **(g)** 90.24 **(h)** 500.22
(i) 531.84 **(j)** 201.771 **(k)** 439.244
(l) 8.453 **(m)** 104.130 **(n)** 421.693
(o) 960.840 **(p)** 67.5081 **(q)** 87.122
(r) 229.9403

4 A **5** B

6 53.58 grams **7** 10.619 grams

8 $5.20 **9** $18.20 **10** 0.984 metres

11 1.38 grams **12** Sample answer: 257, 0.008

Exercise 6.7 (p. 201)

1 (a) 836.0 **(b)** 39.0 **(c)** 648.0 **(d)** 33 760.0
(e) 71.0 **(f)** 58.0 **(g)** 5.9 **(h)** 27.9
(i) 19 706.0 **(j)** 483.2 **(k)** 281.8 **(l)** 400.3

(m) 921.4 **(n)** 633.1 **(o)** 67.63 **(p)** 71.12
(q) 8454.6 **(r)** 22 531.3 **(s)** 450.04
(t) 830.45 **(u)** 349 965.0 **(v)** 28 582.0
(w) 6353.88 **(x)** 8319.0

2 **(a)** 4500.0 **(b)** 5600.0 **(c)** 210.0 **(d)** 2440.0
(e) 780.0 **(f)** 370.0 **(g)** 9450.0 **(h)** 7100.0
(i) 3510.0 **(j)** 4700.0 **(k)** 89 000.0
(l) 940 000.0 **(m)** 23 000.0 **(n)** 6 080 000.0
(o) 100 700.0

3 C

4 **(a)** 149.4 **(b)** 22 890.0 **(c)** 1196.4
(d) 73 128.0 **(e)** 86.4 **(f)** 434.5 **(g)** 1470.42
(h) 685.59 **(i)** 55 824.0 **(j)** 1140.0
(k) 217 000.0 **(l)** 265 000.0 **(m)** 929 600.0
(n) 8 132 400.0 **(o)** 33 036 000.0

5 **(a)** 257 096.0 **(b)** 27 434.0 **(c)** 29 202.0
(d) 38 828.0 **(e)** 67 201.5 **(f)** 411 576.0
(g) 3 090 250.0 **(h)** 5070.0 **(i)** 96 360.0
(j) 150 800.0 **(k)** 7 055 000.0 **(l)** 766 300.00

6 Any numbers between 19 355 and 23 655 inclusive.

7 $516.00 **8** $12 950 **9** $59.50

10 226.5 kilograms **11** 37.5 litres **12** $621.00

13 $15.60 **14** 1950 kilograms **15** 6.75 metres

Exercise 6.8 (p. 204)

1 **(a)** 0.48 **(b)** 0.24 **(c)** 0.36 **(d)** 0.065
(e) 0.595 **(f)** 0.222 **(g)** 6.524 **(h)** 1.236
(i) 4.208 **(j)** 1.653 **(k)** 2.708 **(l)** 5.5542
(m) 2.28 **(n)** 4.65 **(o)** 4.45 **(p)** 0.822
(q) 7.146 **(r)** 0.1422

2 **(a)** 0.000 30 **(b)** 0.0024 **(c)** 0.036 **(d)** 0.056
(e) 0.000 008 **(f)** 0.000 40 **(g)** 0.006
(h) 0.000 018 **(i)** 0.000 48 **(j)** 0.000 96
(k) 0.224 **(l)** 0.000 052 2 **(m)** 0.003 60
(n) 0.282 **(n)** 0.0117 **(p)** 0.0175
(q) 0.009 24 **(r)** 0.012 06

3 **(a)** 9.72 **(b)** 37.38 **(c)** 41.16 **(d)** 5.535
(e) 50.721 **(f)** 1.8212 **(g)** 2.3994
(h) 2.0812 **(i)** 0.6768 **(j)** 0.024 91
(k) 0.001 952 **(l)** 0.001 872 **(m)** 12.9696
(n) 42.6505 **(o)** 44.9988 **(p)** 41.5581
(q) 4.818 12 **(r)** 1.921 60 **(s)** 11.7880
(t) 1.144 26 **(u)** 0.090 076

4 The number will become smaller.

5 **(a)** D **(b)** C **(c)** C **(d)** A

6 Any numbers, with two decimal places, between 0.19 and 0.29 inclusive.

7 $24.48 **8** $80.60 **9** $7.25 **10** $1.40

11 318.970 kilojoules **12** 1.589 kilograms

13 **(a)** 76.3 **(b)** $9.92

Exercise 6.9 (p. 207)

1 **(a)** 3.2 **(b)** 4.1 **(c)** 4.32 **(d)** 2.12
(e) 6.57 **(f)** 1.58 **(g)** 2.47 **(h)** 7.44
(i) 3.87 **(j)** 3.31 **(k)** 2.67 **(l)** 2.66
(m) 6.59 **(n)** 5.82 **(o)** 8.52 **(p)** 0.0057
(q) 0.0048 **(r)** 0.0082

2 **(a)** 0.6 **(b)** 0.6 **(c)** 0.3 **(d)** 0.56 **(e)** 0.49
(f) 0.74 **(g)** 0.47 **(h)** 0.99 **(i)** 0.69
(j) 0.028 **(k)** 0.0058 **(l)** 0.0082 **(m)** 0.308
(n) 1.054 **(o)** 1.041 **(p)** 0.201 **(q)** 2.702
(r) 0.217

3 **(a)** 1.65 **(b)** 1.25 **(c)** 1.55 **(d)** 2.64
(e) 2.55 **(f)** 1.35 **(g)** 1.0275 **(h)** 2.0625
(i) 1.7875 **(j)** 3.015 **(k)** 1.015 **(l)** 1.816

4 **(a)** 0.65 **(b)** 0.85 **(c)** 0.35 **(d)** 0.35
(e) 0.87 **(f)** 0.875 **(g)** 0.084 **(h)** 0.15
(i) 0.0245 **(j)** 0.003 85 **(k)** 0.050 02
(l) 0.3015 **(m)** 0.7055 **(n)** 0.5045
(o) 0.6285

5 **(a)** 3.125 **(b)** 2.7125 **(c)** 1.3575 **(d)** 0.8775
(e) 0.223 75 **(f)** 0.718 25 **(g)** 3.0175
(h) 0.104 875 **(i)** 0.070 375

6 **(a)** 1.514 **(b)** 1.217 **(c)** 0.052 **(d)** 0.407
(e) 0.402 **(f)** 2.637 **(g)** 0.170 **(h)** 2.350
(i) 0.700 **(j)** 1.005 **(k)** 0.689 **(l)** 1.234

7 Any numbers, with three decimal places, between 2.001 and 3.999 inclusive.

8 21.7 kilojoules **9** 0.289 kg

10 $1.965 million **11** 7.292 litres

12 12.43 kilometres **13** $4.71

Exercise 6.10 (p. 211)

1 **(a)** 0.427 **(b)** 0.89 **(c)** 7.383 **(d)** 0.0244
(e) 0.006 178 **(f)** 0.007 98 **(g)** 0.005 59
(h) 0.008 02 **(i)** 0.006 491 **(j)** 1.2532
(k) 8.032 **(l)** 0.004 **(m)** 0.098 **(n)** 0.0076
(o) 0.005 39 **(p)** 4.5897 **(q)** 0.002 74
(r) 0.000 612 **(s)** 9.120 87 **(t)** 0.0045
(u) 0.000 49 **(v)** 6.7 **(w)** 0.0108 **(x)** 0.008

2 **(a)** 0.09 **(b)** 0.09 **(c)** 0.027 **(d)** 0.039
(e) 0.0778 **(f)** 0.048 29 **(g)** 0.0454
(h) 0.0042 **(i)** 0.0047 **(j)** 0.034 **(k)** 0.0761
(l) 0.008 38 **(m)** 0.005 361 **(n)** 0.136 32
(o) 0.0844 **(p)** 0.005 74 **(q)** 0.005 075
(r) 0.6036 **(s)** 0.010 054 9 **(t)** 0.005 019
(u) 0.0135 **(v)** 0.57 **(w)** 0.029 **(x)** 0.0082

3 **(a)** C **(b)** C

4 $42.99 **5** 63 cents **6** $1.45

7 $0.021 75 **8** $10.43 **9** $0.002 225

10 Bananas $0.002 041 7/gram;
apples $0.002 625/gram: bananas are the better buy.

Exercise 6.11 (p. 214)

1 **(a)** 25.7 **(b)** 10.3 **(c)** 24.8 **(d)** 122.1
(e) 387.0 **(f)** 100.4 **(g)** 20.4 **(h)** 26.8
(i) 397.0 **(j)** 906.0 **(k)** 6.7 **(l)** 44.4
(m) 100.2 **(n)** 8.5 **(o)** 24.5 **(p)** 801.0
(q) 8.3 **(r)** 587.0 **(s)** 115.2 **(t)** 8.81
(u) 0.85 **(v)** 3.5 **(w)** 9.775 **(x)** 21.9375

2 **(a)** 140.0 **(b)** 66.0 **(c)** 1500.0 **(d)** 2400.0
(e) 470.0 **(f)** 580.0 **(g)** 8700.0 **(h)** 670.0
(i) 780.0 **(j)** 1800.0 **(k)** 11 500.0
(l) 16 700.0 **(m)** 4150.0 **(n)** 4520.0
(o) 10 080.0 **(p)** 5580.0 **(q)** 5800.0
(r) 980.0 **(s)** 660.0 **(t)** 5610.0 **(u)** 565.0
(v) 264.0 **(w)** 1712.5 **(x)** 286.25

3 **(a)** 0.467 **(b)** 0.267 **(c)** 11.657 **(d)** 16.9
(e) 10.389 **(f)** 0.971 **(g)** 10.033 **(h)** 59.2
(i) 222.5 **(j)** 2016.667 **(k)** 8431.429
(l) 124.167
4 The number will become larger.
5 **(a)** B **(b)** D
6 Answers should be between 45 and 54.
7 12 tankfuls **8** 1937 worms **9** 259 souvlakis
10 6.5 minutes **11** $4.75 per kilometre

Chapter review (p. 219)

Core

1 **(a)** 6.2302 **(b)** 0.020 705 **(c)** 0.107
2 **(a)** $\frac{9}{10} + \frac{6}{100} + \frac{8}{1000}$ **(b)** $5 + \frac{7}{100} + \frac{2}{10\,000}$
(c) $6 + \frac{5}{1000}$
3 **(a)** 0.6524 **(b)** 0.080 093
4 **(a)** one unit, eight tenths, five hundredths, three thousandths and one ten-thousandth
(b) seven hundredths and six hundred-thousandths
(c) six tens, one unit and nine ten-thousandths
5 **(a)** $\frac{9}{100}$, nine hundredths
(b) $\frac{9}{10\,000}$, nine ten-thousandths
(c) $\frac{9}{100}$, nine hundredths
6 **(a)** $3.0427 > 3.0274$ **(b)** $0.009\,95 < 0.01$
7 **(a)** 0.5506, 0.6055, 0.607 **(b)** 0.071, 0.701, 0.71
8 **(a)** 5.67 **(b)** 3.0 **(c)** 8.01
9 **(a)** 2.98 **(b)** 28.39 **(c)** 15.4585 **(d)** 41.433
10 **(a)** 8.51 **(b)** 7.717 **(c)** 1.688 **(d)** 4.7802
11 **(a)** 24.0 **(b)** 13.504 **(c)** 35.231 **(d)** 104.65
(e) 136.24 **(f)** 200.97
12 **(a)** 518.0 **(b)** 964.0 **(c)** 23 600.0 **(d)** 6120.0
(e) 164.4 **(f)** 3.45
13 **(a)** 0.54 **(b)** 0.000 36 **(c)** 0.003 **(d)** 0.423
(e) 19.76 **(f)** 0.2766
14 **(a)** 3.2 **(b)** 2.58 **(c)** 0.89 **(d)** 1.004
(e) 5.35 **(f)** 0.469 **(g)** 0.911 **(h)** 2.074
15 **(a)** 5.569 **(b)** 0.033 65 **(c)** 0.1268
(d) 0.2403 **(e)** 0.016 46 **(f)** 0.1821
16 **(a)** 12 **(b)** 2.4 **(c)** 809 **(d)** 5950
(e) 1.867 (to 3 decimal places) **(f)** 32
17 **(a)** B **(b)** C **(c)** B **(d)** D

Extension

18 0.124 kg **19** 49.97 km **20** $5.20
21 954 grams **22** $1511.80
23 28.15 grams **24** 11.45 seconds
25 7.5 minutes **26** 0.218 75 litres **27** $6.99

Replay (p. 221)

1 50 kilometres
2 **(a)** 34 **(b)** 8 **(c)** 78
3 **(a)** $-22 < 10$ **(b)** $100 > -25$ **(c)** $-999 > -1001$
4 **(a)** 34 **(b)** −90 **(c)** 24
5 **(a)** 10, 20, 30, 40, 50 **(b)** 8, 16, 24, 32, 40
(c) 15, 30, 45, 60, 75
6 62, 63, 64, 65, 66, 88, 69, 70, 72, 74, 75, 76, 77, 78
7 **(a)** 64 **(b)** 39 **(c)** 0
8 **(a)** 7, 0, −7 **(b)** 30, 38, 47, 56
(c) −16, 32, −64, 128
9 **(a)**

x	y
0	0
9	27
−15	−45
12	36
50	150

(b)

a	b
−17	−25
0	−8
4	−4
100	92
−50	−58

(c)

m	n
−5	−18
200	802
35	142
3	14
−20	−78

10 **(a)** 117° **(b)** 26° **(c)** 327°
11 **(a)** 86° **(b)** 60° **(c)** 2°
12 72°

Mixed revision two

Rewind (p. 223)

Core

1 **(a)** 4.07 **(b)** 5.1 **(c)** 10.900
3 **(a)** acute **(b)** obtuse **(c)** reflex
4 **(a)** 35, 31, 27, 23, 19, 15 **(b)** 0, 20, 40, 60, 80, 100
(c) 1, 2, 4, 8, 16, 32
5 **(a)** 10.44 **(b)** 0.036 **(c)** 984.286
6 **(a)** $y = 4x$ **(b)** $b = a + 12$ **(c)** $n = 3m - 1$
7 **(a)** 3.2 **(b)** 1.7089 **(c)** 7.1772
8 **(a)** 5.0099, 5.098, 5.809 **(b)** 3.212, 3.221, 32.12
9 **(a)** 53° **(b)** 57° **(c)** 149° **(d)** 47°
10 **(a)** 5.237 **(b)** 0.705 06
11 **(a)** 44.04 **(b)** 12 087 **(c)** 32.3284
12 **(a)** 10.75 **(b)** 20.306 **(c)** 19.879
13 **(a)** $\frac{3}{100}$ **(b)** $\frac{3}{10}$ **(c)** $\frac{3}{1\,000\,000}$
14 **(a)** 309° **(b)** 137° **(c)** 29°
15 **(a)** $\angle RST$ **(b)** $\angle ABC$ **(c)** $\angle XYZ$
16 **(a)** 18 **(b)** 8 **(c)** 3 **(d)** −15

Extension

17 $86.52 **18** $2 per kilometre
19 **(a)** 60° **(b)** 21° **(c)** 31°
20 **(a)** $17.61 **(b)** The amount of $3.79 has been added twice instead of once.
21 $1424
22 **(a)**

Side length of square (S)	*Number of blocks in border (N)*
1	8
2	12
3	16
4	20
5	24
6	28

(b) $N = 4S + 4$ or $N = 4(S + 1)$ **(c)** 64
23 Many answers possible; must be decimals with two or more decimal places and starting with 4.5.
24 120°

Chapter 7

Prep zone (p. 230)

1 **(a)** 16.5 **(b)** 40.32 **(c)** 24 **(d)** 92.92
(e) 18 960 **(f)** 27.8

2 **(a)** 50 mm **(b)** 28 mm
3 **(a)** 12 mm **(b)** 18 mm
4 **(a)** length = 40 mm, breadth = 20 mm
(b) length = 44 mm, breadth = 16 mm
5 B

Exercise 7.1 (p. 232)

1 **(a)** cm **(b)** km **(c)** cm **(d)** m **(e)** cm
(f) km **(g)** cm
2 **(a)** C **(b)** B **(c)** D **(d)** B
3 Students' own answers.
4 **(a)** 9 cm **(b)** 5 cm **(c)** 1.6 cm **(d)** 1.3 cm
(e) 3.6 cm **(f)** 1.4 cm **(g)** 2.2 cm
(h) 4.4 cm
5 **(a)** 60 m **(b)** 4–5 m **(c)** 5–6 m **(d)** 25 mm
6 **(a)** The lines are the same length.
(b) The central circles are the same size.
(c) Yes, the hat *is* as wide as it is tall.
(d) The people are the same height.
7 Students' own answers.

Exercise 7.2 (p. 235)

1 **(a)** 5000 m **(b)** 23 000 m **(c)** 20 000 m
(d) 3600 m **(e)** 9700 m **(f)** 10 600 m
(g) 200 m **(h)** 30 m **(i)** 8 m **(j)** 70 000 cm
(k) 900 cm **(l)** 6500 cm **(m)** 300 cm
(n) 55 cm **(o)** 560 cm **(p)** 40 mm
(q) 120 mm **(r)** 800 mm **(s)** 172 mm
(t) 29 mm **(u)** 204 mm
2 **(a)** 470 000 cm **(b)** 905 000 cm **(c)** 300 cm
(d) 700 000 mm **(e)** 342 000 mm **(f)** 2000 mm
(g) 4950 mm **(h)** 3200 mm
3 **(a)** 6.1 cm **(b)** 2 cm **(c)** 10.4 cm
(d) 4.23 cm **(e)** 10.07 cm **(f)** 3.09 cm
(g) 0.09 cm **(h)** 0.007 cm **(i)** 0.01 cm
(j) 8 m **(k)** 12 m **(l)** 0.9 m **(m)** 0.86 m
(n) 7.12 m **(o)** 0.03 m **(p)** 2 km **(q)** 4.2 km
(r) 8.097 km **(s)** 0.009 km **(t)** 0.05 km
4 **(a)** 0.56 m **(b)** 2.4 m **(c)** 0.097 m
(d) 0.09 km **(e)** 0.345 km **(f)** 0.005 67 km
(g) 0.05 km **(h)** 0.0078 km
5 **(a)** 5630 cm **(b)** 28.9 cm **(c)** 4.567 km
(d) 700 000 m **(e)** 87 mm **(f)** 0.309 m
(g) 0.567 km **(h)** 630 mm **(i)** 0.83 m
(j) 0.0078 km **(k)** 192 000 cm **(l)** 6000 mm
6 **(a)** C **(b)** B
7 'milli', one-thousandth; 'cent', one-hundredth; 'kilo', one thousand
8 29.76 m **9** 670 cm
10 length = 8.9 cm, leg-span = 25.4 cm
11 height = 5.48 m, length = 14.33 m
12 Sample answers: 0.01 m, 0.018 m, 0.2 m
13 1070 m, 1.07 km **14** 596 mm, 59.6 cm
15 **(a)** used division instead of multiplication; 2700 cm
(b) divided by 100 instead of 10; 76.5 cm
(c) zero added between 3 and 8; 3.8 km
(d) three zeros added instead of moving decimal point three places; 800 m
(e) zero added between values instead of moving decimal point and adding a zero at the end; 540 mm
(f) divided by 1000 instead of 100; 13.56 m

Exercise 7.3 (p. 239)

1 **(a)** 1322 mm **(b)** 3660 m **(c)** 4.103 m
(d) 10 000 mm **(e)** 1.092 km **(f)** 805 cm
(g) 2305.9 m **(h)** 5700 cm **(i)** 102.8 m
(j) 40.36 km
2 **(a)** C **(b)** D
3 **(a)** 0.4664 km **(b)** 4.235 m **(c)** 72.2 cm
(d) 126 mm **(e)** 23.5 m **(f)** 390 cm
(g) 2.81 km **(h)** 5985 m
4 Possible answers: 2.15 m and 2.09 m; 5.67 m and 5.61 m
5 3.52 m **6** 7.125 m **7** 24.77 km
8 31 mm **9** 1.036 m **10** $104.31
11 2.64 m **12** 0.45 m **13** 7.2 km
14 7.99 km **15** 6 pieces

Exercise 7.4 (p. 241)

1 **(a)** 10 cm **(b)** 8 cm **(c)** 6 cm **(d)** 7 cm
(e) 10 cm **(f)** 4 cm
2 Add the length and breadth and double.
3 C
4 **(a)** 16 cm **(b)** 22 cm **(c)** 24 cm **(d)** 26 cm
(e) 128 mm **(f)** 86 mm **(g)** 100 m
(h) 60 m
5 **(a)** 10 cm **(b)** 8 cm **(c)** 12 cm **(d)** 14 cm
6 **(a)** 10 cm **(b)** 14 cm **(c)** 13 cm **(d)** 13 cm
(e) 16 cm **(f)** 17 cm **(g)** 13 cm **(h)** 15 cm
7 **(a)** 130 mm **(b)** 140 mm **(c)** 114 mm
(d) 156 mm **(e)** 122 mm **(f)** 138 mm
(g) 390 cm **(h)** 555 cm **(i)** 6000 m
(j) 7100 m
8 **(a)** 42 m **(b)** 40 cm **(c)** 24 cm **(d)** 120 mm
9 180 mm **10** 220 m
11 Sample answers: 20 cm by 22 cm; 6 cm by 36 cm (Dimensions must add to 42 cm.)
12 9 cm **13** 6 cm
14 91.5 m **15** 8.1 km **16** 648 m
17 $384 **18** 82 m

Exercise 7.5 (p. 248)

1 **(a)** cm^2 **(b)** mm^2 **(c)** km^2 **(d)** cm^2
(e) m^2 **(f)** m^2 **(g)** km^2 **(h)** mm^2
(i) cm^2 **(j)** m^2
2 **(a)** 50 000 cm^2 **(b)** 120 000 m^2 **(c)** 9400 mm^2
(d) 97.6 mm^2 **(e)** 65 cm^2 **(f)** 10 030 m^2
(g) 5 ha **(h)** 98 cm^2 **(i)** 6.7 m^2 **(j)** 0.095 m^2
(k) 0.236 km^2 **(l)** 0.34 ha **(m)** 0.046 m^2
(n) 34 500 mm^2 **(o)** 900 ha **(p)** 55.7 km^2
(q) 765.6 cm^2 **(r)** 0.986 cm^2
3 **(a)** 12 cm^2 **(b)** 11 cm^2 **(c)** 17 cm^2
(d) 16 cm^2 **(e)** 18 cm^2 **(f)** 24 cm^2
(g) 16 cm^2 **(h)** 16 cm^2 **(i)** 18 cm^2
(j) 16 cm^2
4 B
5 **(a)** 5 cm^2 **(b)** 8 cm^2 **(c)** 12 cm^2 **(d)** 5 cm^2
6 **(a)** **(i)** 20 cm **(ii)** 9 cm^2 **(b)** **(i)** 18 cm
(ii) 8 cm^2 **(c)** **(i)** 28 cm **(ii)** 20 cm^2

(d) **(i)** 24 cm **(ii)** 20 cm^2 **(e)** **(i)** 24 cm **(ii)** 14 cm^2 **(f)** **(i)** 32 cm **(ii)** 20 cm^2
7 Approximate answers are: **(a)** 14 cm^2 **(b)** 19 cm^2
8 **(d)** 7 500 000 km^2 **(e)** 8 cm^2 **(f)** 500 cm^2

Exercise 7.6 (p. 256)

1 **(a)** 5 cm^2 **(b)** 9 cm^2 **(c)** 9 cm^2 **(d)** 4 cm^2 **(e)** 15 cm^2 **(f)** 28 cm^2
2 C
3 **(a)** 27 cm^2 **(b)** 24 cm^2 **(c)** 60 cm^2 **(d)** 22 cm^2 **(e)** 36 m^2 **(f)** 90 mm^2 **(g)** 80 km^2 **(h)** 9 cm^2 **(i)** 18.9 cm^2
4 **(a)** 25 cm^2 **(b)** 16 m^2 **(c)** 36 cm^2 **(d)** 49 cm^2 **(e)** 144 mm^2 **(f)** 81 cm^2 **(g)** 6.25 km^2 **(h)** 12.96 m^2
5 **(a)** 20 cm^2 **(b)** 36 cm^2 **(c)** 21 cm^2 **(d)** 22.5 cm^2 **(e)** 48 cm^2 **(f)** 14 cm^2
6 **(a)** 19 cm^2 **(b)** 36 cm^2 **(c)** 26 cm^2 **(d)** 85 cm^2 **(e)** 92 mm^2 **(f)** 71 m^2 **(g)** 45 cm^2 **(h)** 87 cm^2
7 **(a)** **(i)** 28 km **(ii)** 45 km^2 **(b)** **(i)** 36 m **(ii)** 65 m^2 **(c)** **(i)** 42 cm **(ii)** 80 cm^2 **(d)** **(i)** 58 cm **(ii)** 100 cm^2 **(e)** **(i)** 68 m **(ii)** 156 m^2 **(f)** **(i)** 66 cm **(ii)** 147 cm^2
8 288 cm^2 **9** 2.4 km^2 **10** 3150 cm^2
11 22.4 cm, 31.36 cm^2
12 **(a)** Possible answers: 6 cm by 4 cm; 12 cm by 2 cm **(b)** No, because not all numbers that multiply to give 24 have the same sum.
13 4 cm **14** 5.2 m
15 **(a)** 28 800 cm^2 **(b)** 7.2 m
16 $806.40
17 **(a)** 3519 grams **(b)** 30.8 m
18 **(a)** 10.36 m^2 **(b)** 4.82 m
19 525 bricks
20 **(a)** 24 cm **(b)** No, this perimeter is 18 cm.
21 1.68 m^2 **22** 160 cm^2
23 **(a)** 330 000 m^2 **(b)** 2600 m
24 14 162 cm^2 **25** 486 cm^2

Exercise 7.7 (p. 263)

1 **(a)** 48 cm^2 **(b)** 42 m^2 **(c)** 35 mm^2 **(d)** 114 cm^2 **(e)** 22.5 m^2 **(f)** 45.5 cm^2 **(g)** 88 mm^2 **(h)** 180 m^2 **(i)** 49.8 cm^2 **(j)** 19.2 mm^2 **(k)** 8.04 cm^2 **(l)** 33.88 cm^2
2 **(a)** A **(b)** D **(c)** B
3 Sample answers: 9 cm and 8 cm; 6 cm and 12 cm
4 4.76 m^2 **5** 0.16 m^2 **6** 0.245 m^2
7 162 cm^2 **8** 3
9 **(a)** 51 cm^2 **(b)** 168 cm^2 **(c)** 320 cm^2 **(d)** 180 cm^2 **(e)** 281.65 cm^2 **(f)** 105.5 cm^2

Chapter review (p. 270)

Core

1 **(a)** B **(b)** D
2 **(a)** 45 900 m **(b)** 0.58 km **(c)** 9200 mm **(d)** 4200 cm **(e)** 0.98 km **(f)** 6730 mm **(g)** 5.647 m **(h)** 0.0852 m **(i)** 60.9 cm **(j)** 6.7 km
3 **(a)** 67.5 cm **(b)** 3040 m **(c)** 5.12 km **(d)** 57.8 mm
4 7.6 km
5 **(a)** 92 cm **(b)** 76 cm **(c)** 104 mm **(d)** 16.6 cm **(e)** 40 m **(f)** 80 cm
6 32.3 m
7 **(a)** 420 mm^2 **(b)** 2 ha **(c)** 68.25 m^2 **(d)** 5.28 km^2 **(e)** 807 000 m^2 **(f)** 90 cm^2
8 **(a)** 176 m^2 **(b)** 1.96 cm^2 **(c)** 6800 mm^2 **(d)** 78 cm^2
9 **(a)** 18 cm^2 **(b)** 24 cm^2

Extension

10 **(a)** 54 m^2 **(b)** 113 cm^2
11 60 cm^2 **12** 20 cm **13** 176 m^2

Replay (p. 272)

1 **(a)**

9	19	5
7	11	15
17	3	13

(b)

6	5	10
11	7	3
4	9	8

2 **(a)** 30 **(b)** 7000 **(c)** 5
3 **(a)** −15, −8, −2, 0, 10 **(b)** −156, −56, 78, 102, 110 **(c)** −78, −63, −38, 0, 21
4 **(a)** −1 **(b)** −10 **(c)** −6
5 876, 444, 900 006, 50 784
6 **(a)** 1, 5, 25 **(b)** 1, 101 **(c)** 1, 2, 3, 6, 7, 14, 21, 42 **(d)** 1, 2, 5, 7, 10, 14, 35, 70
7 **(a)** −10, −6, −2, 2, 6, 10 **(b)** 1, 4, 9, 16, 25, 36
8 **(a)** $y = x \div 2$ **(b)** $b = a + 12$ **(c)** $n = 2m - 1$
10 B
11 **(a)** 13.47 **(b)** 8.936 35 **(c)** 40.945
12 **(a)** 0.0031 **(b)** 0.000 42 **(c)** 2121

Chapter 8

Prep zone (p. 276)

1 **(a)** **(i)** 30° **(ii)** 155° **(iii)** 247° **(iv)** 313°
(b) **(i)** $\angle MNP$ or $\angle PNM$ **(ii)** $\angle JSW$ or $\angle WSJ$ **(iii)** $\angle TLS$ or $\angle SLT$ **(iv)** $\angle BTM$ or $\angle MTB$
(c) **(i)** acute **(ii)** obtuse **(iii)** reflex **(iv)** reflex
2 **(a)** 4.5 cm **(b)** 6.7 cm **3** **(a)** 54 **(b)** 21

Exercise 8.1 (p. 279)

1 **(a)** scalene **(b)** isosceles **(c)** equilateral **(d)** isosceles **(e)** scalene **(f)** scalene **(g)** isosceles **(h)** equilateral **(i)** equilateral **(j)** scalene **(k)** isosceles **(l)** equilateral
2 **(a)** scalene **(b)** isosceles **(c)** equilateral **(d)** scalene **(e)** isosceles **(f)** equilateral **(g)** scalene **(h)** isosceles **(i)** isosceles **(j)** scalene **(k)** scalene **(l)** isosceles
3 **(a)** right-angled **(b)** obtuse-angled **(c)** obtuse-angled **(d)** acute-angled **(e)** acute-angled **(f)** right-angled **(g)** obtuse-angled **(h)** obtuse-angled

(i) right-angled **(j)** obtuse-angled
(k) acute-angled **(l)** right-angled

4 (a) isosceles, acute-angled
(b) scalene, right-angled
(c) equilateral, acute-angled
(d) scalene, obtuse-angled
(e) isosceles, right-angled
(f) scalene, acute-angled

5 (a) isosceles; obtuse-angled
(b) scalene; right-angled
(c) equilateral; acute-angled
(d) scalene; obtuse-angled
(e) scalene; right-angled
(f) equilateral; acute-angled

6 smallest side opposite smallest angle; middle side opposite middle angle; largest side opposite largest angle

Exercise 8.2 (p. 285)

1 (a) 60° **(b)** 30° **(c)** 75° **(d)** 35° **(e)** 57°
(f) 83° **(g)** 132° **(h)** 61° **(i)** 22°

2 (a) D **(b)** A **(c)** B

3 (a) 14° **(b)** 56° **(c)** 38° **(d)** 48° **(e)** 39°
(f) 74° **(g)** 70° **(h)** 100° **(i)** 70° **(j)** 120°
(k) 77° **(l)** 45°

4 (a) 21° **(b)** 58° **(c)** 48° **(d)** 130°

5 All angles must be different, one must be 90° and they must add to 180°.

Exercise 8.3 (p. 288)

1 (a) rectangle **(b)** parallelogram **(c)** kite
(d) square **(e)** rhombus **(f)** trapezium
(g) quadrilateral **(h)** rhombus **(i)** square
(j) kite **(k)** trapezium **(l)** rectangle

3 (a) True **(b)** False **(c)** True **(d)** False
(e) True

4 (a) trapezium **(b)** rhombus **(c)** rectangle
(d) kite **(e)** parallelogram **(f)** square

Exercise 8.4 (p. 293)

1 (a) 77° **(b)** 87° **(c)** 54° **(d)** 55° **(e)** 69°
(f) 133° **(g)** 138° **(h)** 115° **(i)** 84°
(j) 125° **(k)** 205° **(l)** 240°

2 (a) C **(b)** B **(c)** B

3 (a) 105° **(b)** 68° **(c)** 40° **(d)** 60° **(e)** 73°
(f) 127° **(g)** 197° **(h)** 19° **(i)** 131°
(j) 78° **(k)** 42° **(l)** 103°

4 (a) 70° **(b)** 97° **(c)** 99° **(d)** 38°

5 The two angles must add to 180°.

Exercise 8.5 (p. 298)

1 (a) pentagon (convex) **(b)** octagon (concave)
(c) heptagon (convex) **(d)** triangle (convex)
(e) dodecagon (concave) **(f)** hexagon (convex)
(g) decagon (concave) **(h)** hexagon (concave)
(i) hexagon (concave) **(j)** nonagon (convex)
(k) octagon (convex) **(l)** undecagon (concave)

2 (a) C **(b)** C

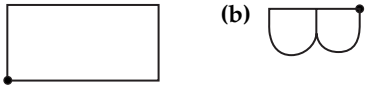
4 (a) octagon **(b)** dodecagon **(c)** pentagon
(d) hexagon

5 (a) The number written next to each vertex is equal to the number of lines that meet there. **(b)** 18
(c) 26 **(d)** The sum of the 'vertex numbers' is the same no matter how a polygon is triangulated.

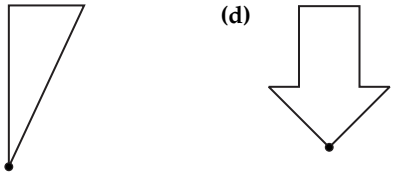
Exercise 8.6 (p. 302)

Note these diagrams are printed smaller than the correct answer size.

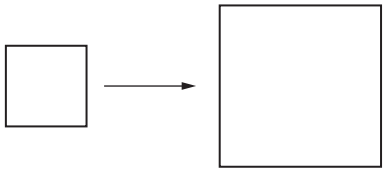
1 (a) **(b)**



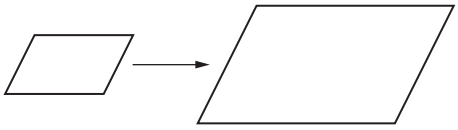
(c) **(d)**



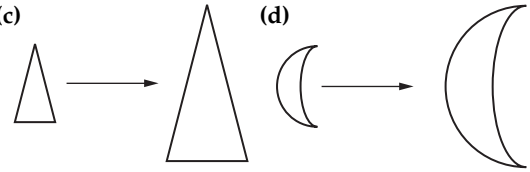
2 (i) (a)



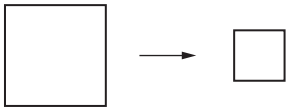
(b)



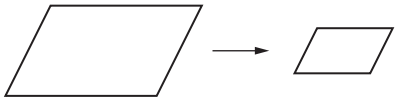
(c) **(d)**



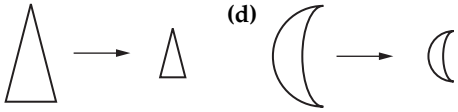
(ii) (a)



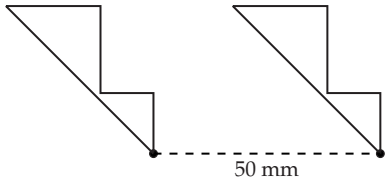
(b)



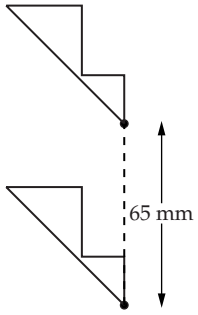
(c) **(d)**



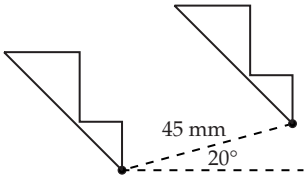
3 (a)



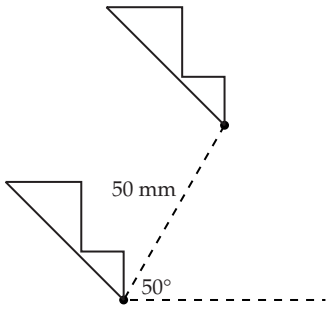
(b)



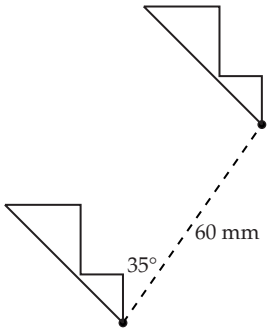
(c)



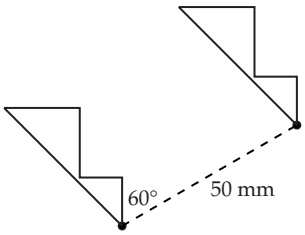
(d)



(e)

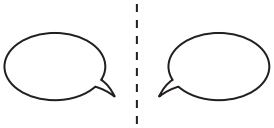


(f)

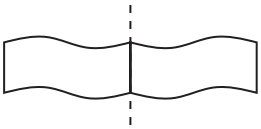


4 (a)

(b)



(c)



(d)

5 **(a)** **(i)** 3 **(ii)** 3 **(b)** **(i)** 1 **(ii)** 1
(c) **(i)** 2 **(ii)** 2 **(d)** **(i)** 1 **(ii)** 1
(e) **(i)** 2 **(ii)** 2 **(f)** **(i)** 1 **(ii)** 0
(g) **(i)** infinite **(ii)** infinite **(h)** **(i)** 1 **(ii)** 0
(i) **(i)** 1 **(ii)** 0 **(j)** **(i)** 4 **(ii)** 4

6 **(a)** **(i)** 1 **(ii)** 1 **(b)** **(i)** 1 **(ii)** 1
(c) **(i)** 1 **(ii)** 1

7 **(a)** H, I, M, O, T, U, V, W, X, Y
(b) B, C, D, E, H, I, K, O, X

8 Students' own answers.

Exercise 8.7 (p. 309)

9 **(a)** False **(b)** False **(c)** False **(d)** False
(e) True **(f)** False

10 The ends of lines *PQ* and *QR* will not meet because *RP* is too long.

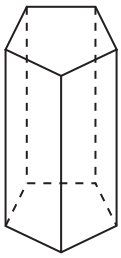
Exercise 8.8 (p. 312)

1 **(a)** sphere **(b)** right cone **(c)** right cylinder
(d) torus **(e)** oblique rectangular prism
(f) right hexagonal pyramid **(g)** oblique cone
(h) right cylinder **(i)** right triangular pyramid
(j) right triangular prism **(k)** torus **(l)** sphere

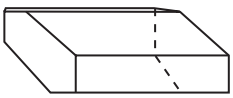
2 **(c)**, **(e)**, **(h)**, **(j)**

3 **(a)** No **(b)** No **(c)** two parallel circular ends
(d) No **(e)** two parallel rectangular ends and two pairs of parallel parallelogram sides **(f)** No
(g) No **(h)** yes, two parallel circular ends
(i) No **(j)** yes, two parallel triangular ends
(k) No **(l)** No

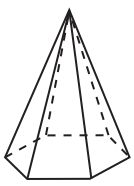
4 **(a)**



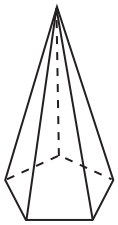
(b)

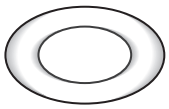


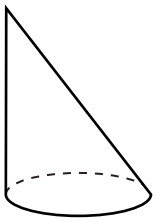
(c)

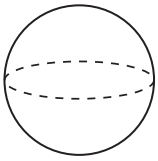


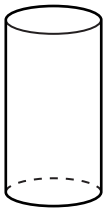
(d)



(e) 

(f) 

(g) 

(h) 

5 **(a)** sphere, cone
(b) triangular prism, rectangular prism, pentagonal prism **(c)** torus **(d)** cylinder
(e) square pyramid **(f)** sphere **(g)** cylinder
(h) square prism or cube

6 **(a)** cone **(b)** prism **(c)** sphere
(d) pyramid **(e)** cylinder

Exercise 8.9 (p. 314)

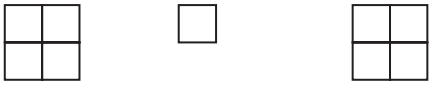
1 **(a)** P **(b)** N **(c)** P **(d)** P **(e)** N **(f)** P
(g) P **(h)** P **(i)** N

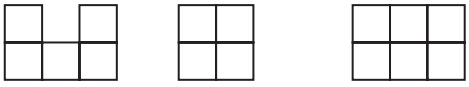
2 **(a)** D **(b)** A **(c)** B **(d)** C **(e)** E

3 cube

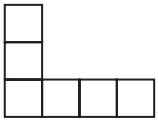
4 triangle, square, pentagon

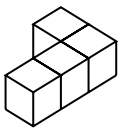
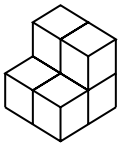
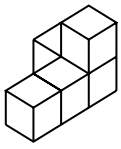
Exercise 8.10 (p. 318)

2 **(a)** 
Front Side Top

(b) 
Front Side Top

(c) 
Front Side


Top

4 **(a)** 
(b) 
(c) 

5 **(a)** 4 **(b)** 12 **(c)** 12 **(d)** 9 **(e)** 8

Chapter review (p. 325)

Core

1 **(a)** scalene, obtuse-angled
(b) isosceles, acute-angled
(c) equilateral, acute-angled
(d) isosceles, right-angled

2 **(a)** 40° **(b)** 59° **(c)** 64° **(d)** 82°

3 **(a)** trapezium **(b)** rhombus **(c)** parallelogram
(d) kite

4 D **5** D

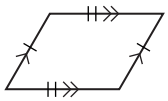
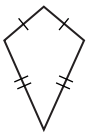
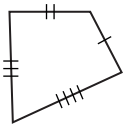
6 **(a)** 75° **(b)** 73° **(c)** 129° **(d)** 115°

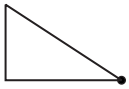
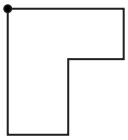
7 **(a)** dodecagon, convex **(b)** heptagon, convex
(c) pentagon, concave **(d)** nonagon, concave

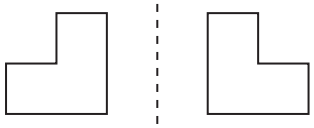
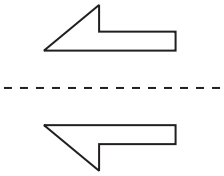
9 **(a)** cone **(b)** pentagonal prism
(c) triangular pyramid **(d)** torus
(e) square pyramid **(f)** sphere

11 **(a)** B **(b)** D **12** 18

Extension

13 **(a)** 
(b) 
(c) 
(d) 

15 **(a)** 
(b) 
(c) 

16 **(a)** 
(b) 
(c) 

Replay (p. 328)

1 **(a)** 12 **(b)** 64 **(c)** 25

2 **(a)** -9 **(b)** -112 **(c)** -30

3 **(a)** -8 **(b)** 9 **(c)** -11

4 **(a)** 13, 26, 39, 52 **(b)** 21, 42, 63, 84
(c) 25, 50, 75, 100

5 **(a)** 7 **(b)** 2700 **(c)** 99 000

6 (a)

m	n
4	12
0	0
−11	−33
25	75
15	45

(b)

s	t
8	−4
−100	−112
12	0
2	−10
312	300

(c)

p	q
15	41
50	111
−11	−11
0	11
−20	−29

8 (a) 145° **(b)** 53° **(c)** 90°
9 (a) 5.65 **(b)** 4.3894 **(c)** 17.515
10 (a) 0.0072 **(b)** 0.232 **(c)** 0.1791
11 (a) 72 mm **(b)** 3.2 m **(c)** 0.057 km
12 (a) 220 cm^2 **(b)** 60 cm^2

Chapter 9

Prep zone (p. 332)

1 (a) $\frac{1}{6}$ **(b)** $\frac{3}{8}$ **(c)** $2\frac{2}{5}$ or $\frac{12}{5}$ **(d)** $\frac{1}{10}$ **(e)** $\frac{3}{5}$
(f) $\frac{2}{3}$ **(g)** $\frac{12}{5}$ **(h)** $\frac{5}{17}$ **(i)** $\frac{7}{1}$ **(j)** $\frac{10}{9}$

2 (a) improper fraction **(b)** proper fraction
(c) proper fraction **(d)** mixed number
(e) improper fraction **(f)** mixed number

3 (a) 0, $\frac{1}{8}$, $\frac{3}{8}$, $\frac{4}{8}$, $\frac{7}{8}$, 1, $\frac{9}{8}$, $\frac{11}{8}$
(b) (i) < **(ii)** > **(iii)** = **(iv)** =

4 (a) $\frac{5}{7}$ **(b)** $\frac{6}{11}$

5 (a) 8, 16, 24, 32, 40 **(b)** 12, 24, 36, 48, 60

Exercise 9.1 (p. 336)

1 (a) 44 **(b)** 1000 **(c)** 200 **(d)** 60 **(e)** 2
(f) 3 **(g)** 10 **(h)** 9 **(i)** 6 **(j)** 3 **(k)** 36
(l) 63 **(m)** 140 **(n)** 35 **(o)** 9 **(p)** 18
(q) 144 **(r)** 36 **(s)** 99 **(t)** 70

2 (a) Sample answers: $\frac{8}{10}$, $\frac{12}{15}$, $\frac{16}{20}$, $\frac{20}{25}$, $\frac{24}{30}$
(b) Sample answers: $\frac{6}{4}$, $\frac{3}{2}$, $\frac{15}{10}$, $\frac{18}{12}$, $\frac{21}{14}$

3 (a) = **(b)** ≠ **(c)** ≠ **(d)** = **(e)** ≠ **(f)** =
(g) ≠ **(h)** ≠ **(i)** = **(j)** = **(k)** = **(l)** =

4 (a) 5 **(b)** 8 **(c)** 1 **(d)** 2 **(e)** 11
(f) 14 **(g)** 22 **(h)** 10 **(i)** 10 **(j)** 4
(k) 35 **(l)** 6

5 (a) $\frac{1}{2}$ **(b)** $\frac{1}{4}$ **(c)** $\frac{1}{3}$ **(d)** $\frac{1}{3}$ **(e)** $\frac{2}{5}$ **(f)** $\frac{4}{11}$
(g) $\frac{5}{8}$ **(h)** $\frac{3}{2}$ **(i)** $\frac{1}{10}$ **(j)** $\frac{1}{3}$ **(k)** $\frac{3}{2}$ **(l)** $\frac{2}{5}$
(m) $\frac{3}{4}$ **(n)** $\frac{11}{6}$ **(o)** $\frac{9}{11}$ **(p)** $\frac{5}{4}$

6 (a) B **(b)** A **(c)** D **(d)** C **(e)** C

7 (a) $6\frac{1}{5}$ **(b)** $4\frac{1}{7}$ **(c)** $2\frac{2}{3}$ **(d)** $3\frac{1}{6}$ **(e)** $1\frac{3}{10}$
(f) $1\frac{6}{11}$ **(g)** $12\frac{4}{5}$ **(h)** $6\frac{1}{3}$ **(i)** $3\frac{1}{4}$ **(j)** $2\frac{3}{10}$
(k) $100\frac{3}{20}$ **(l)** $11\frac{7}{8}$ **(m)** $85\frac{2}{3}$ **(n)** $16\frac{2}{5}$
(o) $32\frac{7}{8}$ **(p)** $201\frac{1}{5}$

8 (a) $\frac{16}{5}$ **(b)** $\frac{9}{5}$ **(c)** $\frac{7}{4}$ **(d)** $\frac{59}{10}$ **(e)** $\frac{53}{10}$
(f) $\frac{20}{3}$ **(g)** $\frac{51}{11}$ **(h)** $\frac{35}{8}$ **(i)** $\frac{72}{7}$ **(j)** $\frac{74}{11}$
(k) $\frac{77}{12}$ **(l)** $\frac{309}{100}$ **(m)** $\frac{79}{9}$ **(n)** $\frac{62}{9}$ **(o)** $\frac{291}{20}$
(p) $\frac{349}{16}$

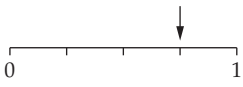
9 (a) $1\frac{2}{5}$ **(b)** $1\frac{3}{7}$ **(c)** $2\frac{1}{6}$ **(d)** $3\frac{2}{11}$ **(e)** $5\frac{3}{4}$
(f) $2\frac{1}{7}$ **(g)** $3\frac{7}{10}$ **(h)** $6\frac{3}{10}$ **(i)** $5\frac{4}{11}$ **(j)** $9\frac{3}{5}$
(k) $6\frac{2}{7}$ **(l)** $7\frac{7}{12}$ **(m)** $8\frac{5}{9}$ **(n)** $1\frac{7}{100}$
(o) $2\frac{3}{23}$ **(p)** $5\frac{13}{15}$

10 (a) Sample answers: $\frac{5}{3}$, $\frac{15}{9}$, $\frac{20}{12}$, $\frac{10}{6}$
(b) Sample answers: $\frac{13}{4}$, $\frac{26}{8}$, $\frac{39}{12}$, $\frac{52}{16}$

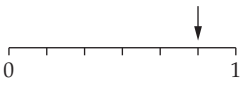
11 (a) = **(b)** ≠ **(c)** = **(d)** ≠ **(e)** ≠ **(f)** =
(g) = **(h)** ≠ **(i)** = **(j)** ≠ **(k)** = **(l)** ≠

Exercise 9.2 (p. 340)

1 (a)



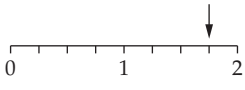
(b)



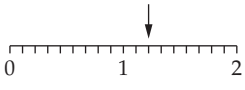
(c)

(d)

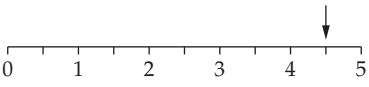
(e)



(f)



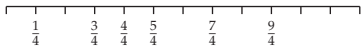
(g)



(h)

2 (a) 1 **(b)** $\frac{7}{9}$ **(c)** $\frac{3}{5}$ **(d)** $\frac{3}{14}$ **(e)** $\frac{7}{6}$ **(f)** $\frac{5}{3}$

3 (a)



(b) $\frac{9}{4}$, $\frac{7}{4}$, $\frac{5}{4}$, $\frac{4}{4}$, $\frac{3}{4}$, $\frac{1}{4}$

4 (a)

(b) $2\frac{3}{7}$, $\frac{13}{7}$, $\frac{7}{7}$, $\frac{4}{7}$, $\frac{3}{7}$, $\frac{1}{7}$

5 These fractions are on the same position on the number line. They are equivalent.

6 (a) 30 **(b)** 10 **(c)** 24 **(d)** 63 **(e)** 60
(f) 9 **(g)** 66 **(h)** 28 **(i)** 25 **(j)** 48
(k) 84 **(l)** 100

7 (a) $\frac{3}{4}$ **(b)** $\frac{3}{4}$ **(c)** $\frac{5}{7}$ **(d)** $\frac{3}{7}$ **(e)** $\frac{5}{12}$ **(f)** $\frac{3}{8}$
(g) $\frac{5}{6}$ **(h)** $\frac{5}{8}$ **(i)** $\frac{3}{5}$ **(j)** $\frac{11}{12}$ **(k)** $\frac{7}{8}$ **(l)** $\frac{2}{11}$

8 (a) > **(b)** < **(c)** < **(d)** > **(e)** >
(f) = **(g)** < **(h)** > **(i)** = **(j)** >
(k) = **(l)** <

9 (a) D **(b)** B **(c)** A **(d)** D **(e)** D

10 **(a)** $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}, \frac{10}{11}$ **(b)** $\frac{1}{3}, \frac{4}{6}, \frac{7}{9}, \frac{8}{10}, \frac{9}{11}, \frac{10}{12}$

(c) $0, \frac{4}{7}, \frac{7}{11}, \frac{6}{7}, \frac{7}{8}, 1$

11 **(a)** $1, \frac{45}{63}, \frac{2}{3}, \frac{4}{7}, \frac{11}{21}, \frac{3}{9}$ **(b)** $1\frac{7}{20}, \frac{21}{16}, 1\frac{3}{10}, \frac{5}{4}, 1\frac{3}{80}, \frac{39}{40}$

(c) $2\frac{69}{70}, 2\frac{6}{7}, 2\frac{14}{28}, \frac{80}{35}, \frac{60}{28}, \frac{84}{42}$

12 To check answers divide the numerator by the denominator. Answer must be between 0.4286 and 0.5714.

Exercise 9.3 (p. 343)

1 **(a)** $4\frac{9}{10}$ **(b)** $6\frac{1}{10}$ **(c)** $4\frac{71}{100}$ **(d)** $9\frac{19}{100}$

(e) $8\frac{13}{100}$ **(f)** $2\frac{37}{100}$ **(g)** $\frac{29}{100}$ **(h)** $2\frac{47}{100}$

(i) $3\frac{171}{1000}$ **(j)** $\frac{883}{1000}$ **(k)** $6\frac{23}{1000}$ **(l)** $5\frac{9}{1000}$

(m) $\frac{901}{1000}$ **(n)** $7\frac{307}{1000}$ **(o)** $7\frac{3151}{10\,000}$ **(p)** $8\frac{2243}{10\,000}$

(q) $2\frac{92\,647}{100\,000}$ **(r)** $1\frac{635\,259}{1\,000\,000}$ **(s)** $1\frac{871}{100\,000}$

(t) $\frac{921}{100\,000}$ **(u)** $\frac{8089}{1\,000\,000}$ **(v)** $6\frac{4003}{100\,000}$

(w) $2\frac{413}{100\,000}$ **(x)** $\frac{1203}{10\,000\,000}$

2 **(a)** $3\frac{4}{5}$ **(b)** $2\frac{1}{5}$ **(c)** $4\frac{11}{50}$ **(d)** $9\frac{3}{20}$ **(e)** $5\frac{7}{20}$

(f) $4\frac{13}{50}$ **(g)** $6\frac{12}{25}$ **(h)** $7\frac{1}{4}$ **(i)** $8\frac{321}{500}$ **(j)** $\frac{273}{500}$

(k) $\frac{1}{8}$ **(l)** $\frac{19}{40}$ **(m)** $\frac{11}{125}$ **(n)** $3\frac{9}{125}$ **(o)** $7\frac{9}{200}$

(p) $6\frac{3}{2000}$ **(q)** $1\frac{3}{400}$ **(r)** $8\frac{1657}{5000}$ **(s)** $4\frac{871}{2500}$

(t) $5\frac{201}{400}$ **(u)** $2\frac{1}{50\,000}$ **(v)** $4\frac{1}{1250}$ **(w)** $\frac{3}{8000}$

(x) $1\frac{3}{40\,000}$

3 D **4** C **5** D

6 **(a)** 0.25 **(b)** 0.875 **(c)** 0.4 **(d)** 0.125

(e) 2.2 **(f)** 1.25 **(g)** 6.5 **(h)** 1.875

7 **(a)** 0.714 **(b)** 0.667 **(c)** 0.556 **(d)** 0.636

(e) 0.68 **(f)** 0.221 **(g)** 0.065 **(h)** 0.988

(i) 1.727 **(j)** 1.103 **(k)** 23.333 **(l)** 1.609

(m) 3.267 **(n)** 7.95 **(o)** 12.122 **(p)** 105.008

8 **(a)** $0.\overline{714\,285}$ **(b)** $0.\dot{6}$ **(c)** $0.\dot{5}$ **(d)** $0.\overline{63}$

(i) $1.\overline{72}$ **(k)** $23.\dot{3}$ **(l)** $1.6\overline{09}$ **(m)** $3.2\dot{6}$

(o) $12.1\dot{2}$ **(p)** $105.00\dot{7}$

9 Most fractions with a denominator of 11 will have two recurring digits.

10 $\frac{67}{1000}$ **11** $2\frac{27}{50}$ **12** 0.000 011 5

13 $5\frac{17}{20}$ per cent, which is higher than $5\frac{4}{5}$ per cent ($= 5\frac{16}{20}$ per cent)

Exercise 9.4 (p. 346)

1 **(a)** $\frac{2}{5}$ **(b)** $1\frac{1}{13}$ **(c)** $\frac{8}{21}$ **(d)** 1 **(e)** $\frac{3}{4}$

(f) $\frac{1}{2}$ **(g)** $1\frac{1}{6}$ **(h)** $\frac{14}{27}$ **(i)** $\frac{1}{21}$ **(j)** $\frac{9}{20}$

(k) $\frac{1}{33}$ **(l)** $\frac{4}{35}$ **(m)** $\frac{14}{55}$ **(n)** $1\frac{2}{5}$ **(o)** $1\frac{1}{49}$

(p) $1\frac{23}{60}$ **(q)** $\frac{7}{40}$ **(r)** $\frac{5}{66}$ **(s)** $\frac{7}{81}$ **(t)** $\frac{8}{45}$

2 **(a)** $\frac{19}{20}$ **(b)** $\frac{1}{30}$ **(c)** $\frac{11}{20}$ **(d)** $\frac{11}{30}$ **(e)** $\frac{19}{20}$

(f) $\frac{7}{24}$ **(g)** $\frac{9}{20}$ **(h)** $\frac{1}{24}$ **(i)** $\frac{7}{18}$ **(j)** $\frac{8}{55}$

(k) $1\frac{3}{8}$ **(l)** $\frac{29}{30}$ **(m)** $\frac{4}{9}$ **(n)** $1\frac{1}{14}$ **(o)** $\frac{43}{50}$

(p) $\frac{23}{66}$ **(q)** $1\frac{5}{24}$ **(r)** $\frac{29}{60}$ **(s)** $\frac{23}{60}$ **(t)** $1\frac{53}{100}$

3 **(a)** A **(b)** C **(c)** B **(d)** A **(e)** C

4 **(a)** $\frac{7}{8}$ **(b)** $\frac{11}{12}$ **(c)** 1 **(d)** $1\frac{5}{24}$ **(e)** $\frac{1}{3}$

(f) $\frac{11}{12}$ **(g)** $\frac{7}{20}$ **(h)** $1\frac{3}{4}$ **(i)** $\frac{1}{24}$ **(j)** $\frac{1}{3}$

(k) $\frac{8}{15}$ **(l)** $\frac{11}{60}$

5 **(a)** $\frac{1}{5}$ **(b)** $-\frac{2}{7}$ **(c)** $-\frac{5}{9}$ **(d)** $-\frac{6}{11}$ **(e)** $-1\frac{3}{4}$

(f) $-2\frac{2}{9}$ **(g)** $-8\frac{3}{7}$ **(h)** $-2\frac{7}{8}$ **(i)** $-\frac{1}{22}$ **(j)** $\frac{5}{12}$

(k) $-\frac{13}{40}$ **(l)** $-\frac{28}{45}$ **(m)** $-\frac{5}{12}$ **(n)** $-\frac{1}{30}$ **(o)** $\frac{3}{20}$

(p) $-\frac{1}{42}$

6 **(a)** Sample answer: $\frac{11}{40}$ and $\frac{19}{40}$.

(b) Sample answer: $1\frac{37}{60}$ and $\frac{47}{60}$.

Exercise 9.5 (p. 348)

1 **(a)** $7\frac{3}{7}$ **(b)** $9\frac{1}{2}$ **(c)** $5\frac{1}{5}$ **(d)** $1\frac{2}{7}$ **(e)** $5\frac{2}{3}$

(f) $\frac{23}{24}$ **(g)** $\frac{17}{20}$ **(h)** $4\frac{11}{18}$ **(i)** $8\frac{1}{8}$ **(j)** $1\frac{7}{12}$

(k) $3\frac{3}{5}$ **(l)** $10\frac{29}{30}$ **(m)** $4\frac{42}{55}$ **(n)** $4\frac{9}{16}$

(o) $7\frac{20}{21}$ **(p)** $\frac{23}{26}$ **(q)** $2\frac{5}{12}$ **(r)** $9\frac{22}{25}$ **(s)** $9\frac{3}{4}$

(t) $22\frac{3}{10}$ **(u)** $4\frac{41}{60}$ **(v)** $3\frac{31}{100}$ **(w)** $1\frac{31}{50}$

(x) $1\frac{29}{50}$

2 **(a)** $6\frac{4}{5}$ **(b)** $4\frac{1}{5}$ **(c)** $5\frac{1}{4}$ **(d)** $4\frac{6}{11}$ **(e)** $9\frac{3}{8}$

(f) $10\frac{5}{7}$ **(g)** $9\frac{10}{11}$ **(h)** $13\frac{3}{13}$ **(i)** $1\frac{5}{7}$ **(j)** $3\frac{3}{4}$

(k) $3\frac{2}{9}$ **(l)** $4\frac{7}{8}$ **(m)** $4\frac{1}{3}$ **(n)** $6\frac{1}{4}$ **(o)** $6\frac{1}{5}$

(p) $2\frac{7}{9}$

3 **(a)** $3\frac{2}{5}$ **(b)** $6\frac{41}{60}$ **(c)** $2\frac{7}{60}$ **(d)** $5\frac{19}{60}$

(e) $11\frac{11}{15}$ **(f)** $9\frac{1}{2}$ **(g)** $4\frac{57}{100}$ **(h)** $2\frac{67}{100}$

(i) $6\frac{5}{16}$

4 **(a)**

$1\frac{1}{2}$	$2\frac{1}{3}$	$1\frac{1}{6}$
$1\frac{1}{3}$	$1\frac{2}{3}$	2
$2\frac{1}{6}$	1	$1\frac{5}{6}$

Total = 5

(b)

$4\frac{1}{5}$	$\frac{7}{10}$	$3\frac{1}{5}$
$1\frac{7}{10}$	$2\frac{7}{10}$	$3\frac{7}{10}$
$2\frac{1}{5}$	$4\frac{7}{10}$	$1\frac{1}{5}$

Total = $8\frac{1}{10}$

5 **(a)** $-1\frac{1}{3}$ **(b)** $-\frac{3}{4}$ **(c)** $-5\frac{2}{5}$ **(d)** $4\frac{2}{3}$ **(e)** $-5\frac{2}{7}$

(f) $3\frac{5}{9}$ **(g)** $-1\frac{1}{20}$ **(h)** $-5\frac{7}{16}$ **(i)** $-2\frac{1}{4}$

(j) $-4\frac{7}{12}$ **(k)** $-1\frac{31}{60}$ **(l)** $-\frac{11}{20}$

6 Sample answer: $1\frac{3}{40}$ and $1\frac{7}{40}$.

7 The denominators and numerators were both added together; only the numerators should be added after a common denominator is found. Answer should be $1\frac{6}{35}$.

Exercise 9.6 (p. 353)

1 **(a)** $\frac{1}{14}$ **(b)** $\frac{6}{11}$ **(c)** $\frac{3}{44}$ **(d)** $\frac{3}{13}$ **(e)** $\frac{4}{9}$
(f) $\frac{1}{9}$ **(g)** $\frac{3}{32}$ **(h)** $\frac{20}{27}$ **(i)** $\frac{5}{24}$ **(j)** $\frac{3}{10}$
(k) $\frac{3}{5}$ **(l)** $\frac{5}{12}$ **(m)** $\frac{1}{3}$ **(n)** $\frac{1}{2}$ **(o)** $3\frac{1}{3}$
(p) 2 **(q)** 10 **(r)** $\frac{3}{28}$ **(s)** $\frac{12}{35}$ **(t)** $2\frac{2}{3}$
(u) 1 **(v)** $1\frac{1}{7}$ **(w)** $2\frac{5}{8}$ **(x)** 1

2 **(a)** $\frac{2}{3}$ **(b)** 6 **(c)** $1\frac{1}{4}$ **(d)** $1\frac{1}{4}$ **(e)** $11\frac{1}{2}$
(f) 14 **(g)** 27 **(h)** $40\frac{2}{3}$ **(i)** $10\frac{1}{2}$ **(j)** $21\frac{1}{5}$
(k) 5 **(l)** $\frac{1}{2}$ **(m)** 2 **(n)** 2 **(o)** 6 **(p)** $9\frac{1}{3}$
(q) 8 **(r)** $6\frac{1}{3}$ **(s)** $8\frac{4}{7}$ **(t)** 3

3 **(a)** $\frac{3}{20}$ **(b)** $\frac{2}{45}$ **(c)** $\frac{5}{14}$ **(d)** $\frac{4}{13}$ **(e)** $1\frac{1}{6}$
(f) $1\frac{1}{3}$ **(g)** $1\frac{5}{7}$ **(h)** $\frac{1}{24}$ **(i)** $\frac{5}{12}$ **(j)** $13\frac{3}{5}$
(k) $\frac{2}{3}$ **(l)** 14

4 **(a)** $\frac{5}{66}$ **(b)** $\frac{8}{21}$ **(c)** $\frac{35}{72}$ **(d)** $\frac{7}{30}$ **(e)** $\frac{35}{54}$
(f) $\frac{2}{21}$ **(g)** $\frac{1}{13}$ **(h)** $\frac{1}{5}$ **(i)** 12 **(j)** 9 **(k)** 8
(l) 15 **(m)** 21 **(n)** 24 **(o)** 48 **(p)** 27

5 **(a)** \$21 **(b)** \$21 **(c)** \$16 **(d)** \$18 **(e)** \$20
(f) \$45 **(g)** $1\frac{1}{2}$ cups of flour
(h) $2\frac{1}{2}$ cups of flour **(i)** 3 cups of flour
(j) $1\frac{3}{4}$ cups of sugar **(k)** 1 cup of sugar
(l) $2\frac{11}{12}$ cups of sugar

6 **(a)** 4 hours **(b)** 1 h 30 min **(c)** 4 h 30 min
(d) 3 h 20 min **(e)** 1 h 15 min **(f)** 30 min
(g) 1 h 20 min **(h)** 45 min **(i)** 2 h 24 min
(j) 2 h 10 min **(k)** 1 h 50 min **(l)** 9 min

7 Sample answer: $\frac{3}{7} \times \frac{7}{4}$

Exercise 9.7 (p. 356)

1 **(a)** **(i)** 2; 2 **(ii)** 2 **(b)** **(i)** 6; 6 **(ii)** 6
(c) **(i)** 4; 4 **(ii)** 4 **(d)** **(i)** 8; 8 **(ii)** 8

2 **(a)** $\frac{11}{2}$ **(b)** $\frac{7}{6}$ **(c)** $\frac{6}{5}$ **(d)** $\frac{15}{11}$ **(e)** $\frac{8}{17}$
(f) $\frac{9}{10}$ **(g)** $\frac{19}{20}$ **(h)** $\frac{21}{26}$ **(i)** 4 **(j)** 8
(k) 71 **(l)** 108 **(m)** $\frac{1}{12}$ **(n)** $\frac{1}{101}$ **(o)** $\frac{1}{156}$
(p) $\frac{1}{80}$

3 **(a)** $11\frac{2}{3}$ **(b)** $15\frac{3}{4}$ **(c)** 22 **(d)** 12 **(e)** 18
(f) 22 **(g)** $\frac{6}{35}$ **(h)** $\frac{9}{70}$ **(i)** $\frac{1}{40}$ **(j)** $\frac{1}{32}$
(k) $\frac{3}{26}$ **(l)** $\frac{4}{39}$

4 **(a)** $\frac{9}{10}$ **(b)** $\frac{19}{81}$ **(c)** 3 **(d)** $\frac{1}{12}$ **(e)** $\frac{3}{22}$
(f) $1\frac{1}{2}$ **(g)** $1\frac{1}{8}$ **(h)** 2 **(i)** $1\frac{1}{2}$ **(j)** $\frac{10}{21}$
(k) $1\frac{1}{14}$ **(l)** $1\frac{1}{13}$

5 **(a)** $1\frac{7}{8}$ **(b)** $1\frac{1}{3}$ **(c)** $\frac{3}{4}$ **(d)** 2 **(e)** $\frac{1}{7}$
(f) $\frac{1}{11}$ **(g)** $1\frac{1}{43}$ **(h)** $\frac{23}{42}$ **(i)** $1\frac{7}{18}$ **(j)** $1\frac{1}{8}$
(k) $1\frac{2}{3}$ **(l)** $\frac{9}{14}$

6 **(a)** $-9\frac{1}{2}$ **(b)** $\frac{4}{11}$ **(c)** $2\frac{2}{3}$ **(d)** $-\frac{4}{49}$ **(e)** $-3\frac{1}{3}$
(f) $-5\frac{3}{5}$ **(g)** $1\frac{1}{3}$ **(h)** $-1\frac{3}{7}$ **(i)** $-1\frac{2}{5}$ **(j)** $-\frac{2}{11}$
(k) $-1\frac{7}{11}$ **(l)** $-\frac{6}{11}$

7 **(a)** $3\frac{1}{2}$ **(b)** $-\frac{3}{4}$ **(c)** $\frac{1}{15}$ **(d)** $-3\frac{1}{2}$ **(e)** $8\frac{3}{4}$
(f) $-1\frac{1}{4}$ **(g)** $1\frac{1}{3}$ **(h)** $1\frac{3}{4}$ **(i)** $-\frac{1}{24}$

8 Sample answers: $\frac{1}{6}$, $\frac{5}{6}$, $\frac{7}{6}$, $\frac{11}{6}$

Exercise 9.8 (p. 361)

1 **(a)** $2\frac{1}{4}$ **(b)** $4\frac{7}{8}$ **(c)** $7\frac{1}{9}$ **(d)** $6\frac{1}{11}$ **(e)** $3\frac{1}{3}$
(f) $6\frac{7}{12}$ **(g)** $1\frac{1}{2}$ **(h)** $5\frac{1}{2}$ **(i)** $12\frac{1}{6}$ **(j)** $1\frac{2}{3}$
(k) $6\frac{3}{4}$ **(l)** $8\frac{13}{14}$

2 **(a)** $\frac{11}{12}$ **(b)** $\frac{1}{4}$ **(c)** $\frac{7}{9}$ **(d)** $\frac{2}{9}$ **(e)** $1\frac{19}{45}$
(f) $\frac{81}{110}$ **(g)** $3\frac{27}{28}$ **(h)** $1\frac{53}{72}$ **(i)** $1\frac{16}{45}$ **(j)** $4\frac{1}{2}$

3 **(a)** **(i)** $\frac{13}{35}$ **(ii)** $\frac{12}{35}$ **(iii)** $1\frac{13}{15}$
(b) **(i)** $\frac{23}{30}$ **(ii)** $1\frac{5}{9}$ **(iii)** $\frac{7}{50}$
(c) **(i)** $\frac{25}{54}$ **(ii)** $\frac{25}{36}$ **(iii)** $2\frac{2}{3}$
(d) **(i)** $\frac{11}{15}$ **(ii)** $\frac{11}{60}$ **(iii)** $\frac{13}{15}$
(e) **(i)** $12\frac{2}{9}$ **(ii)** $7\frac{4}{9}$ **(iii)** $\frac{22}{45}$
(f) **(i)** $\frac{19}{40}$ **(ii)** $1\frac{19}{156}$ **(iii)** $17\frac{1}{16}$

4 **(a)** $\frac{37}{45}$ **(b)** $\frac{7}{80}$ **(c)** $1\frac{3}{11}$ **(d)** $\frac{1}{4}$ **(e)** $2\frac{4}{9}$
(f) $\frac{143}{420}$ **(g)** $2\frac{47}{252}$ **(h)** $20\frac{1}{8}$ **(i)** $\frac{25}{28}$ **(j)** 0
(k) $\frac{1}{2}$ **(l)** $41\frac{17}{24}$

Exercise 9.9 (p. 362)

1 **(a)** \$15 **(b)** \$12 **(c)** \$21 **(d)** \$62.25

2 **(a)** $\frac{2}{3}$ **(b)** $\frac{1}{3}$ **(c)** $\frac{3}{8}$ **(d)** $\frac{5}{8}$ **(e)** 90
(f) 36

3 $8\frac{1}{12}$

4 **(a)** $\frac{1}{75}$ **(b)** 75 **(c)** $\frac{2}{25}$ **(d)** 150 m
(e) 1125 m

5 **(a)** $\frac{1}{30}$ **(b)** $\frac{1}{3}$ **(c)** $\frac{1}{5}$ **(d)** $\frac{3}{20}$

6 $1\frac{11}{17}$ grams **7** $\frac{1}{20}$ kg

8 **(a)** 13 L **(b)** 39 L **9** $\frac{63}{64}$

10 microwave oven

11 **(a)** $1\frac{3}{8}$ km **(b)** $3\frac{23}{24}$ km **(c)** $10\frac{2}{3}$ km

12 Bryce **13** $1\frac{1}{12}$ months

14 **(a)** 16 **(b)** 24

15 **(a)** $\frac{11}{40}$ **(b)** 80 **(c)** 48 **(d)** 10

16 **(a)** 6 rows **(b)** 300 **(c)** $16\frac{1}{2}$ h
(d) 6 h 56 min

Chapter review (p. 366)

Core

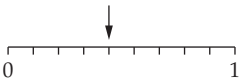
1 **(a)** 42 **(b)** 4 **(c)** 90

2 **(a)** $\frac{5}{9}$ **(b)** $\frac{12}{5}$ or $2\frac{2}{5}$ **(c)** $3\frac{5}{6}$

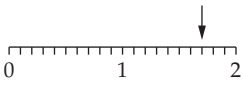
3 **(a)** $\frac{23}{7}$ **(b)** $1\frac{5}{11}$

4 **(a)**

(b)



(c)



5 **(a)** < **(b)** = **(c)** >

6 **(a)** $\frac{1}{3}, \frac{1}{2}, \frac{3}{5}, \frac{3}{4}, 1$ **(b)** $\frac{30}{50}, \frac{5}{4}, 1\frac{2}{5}, 2, \frac{13}{5}$

7 **(a)** $3\frac{87}{1000}$ **(b)** $\frac{9}{20}$ **(c)** $2\frac{3}{4000}$

8 **(a)** 0.375 **(b)** 0.6 **(c)** 2.75

9 **(a)** 0.818 **(b)** 2.571 **(c)** 3.343

10 **(a)** $1\frac{7}{24}$ **(b)** $\frac{1}{18}$ **(c)** $\frac{20}{21}$

11 **(a)** $1\frac{13}{20}$ **(b)** $8\frac{1}{6}$ **(c)** $5\frac{2}{7}$

12 **(a)** $1\frac{2}{3}$ **(b)** $12\frac{2}{9}$ **(c)** $\frac{3}{7}$

13 **(a)** \$12 **(b)** $\frac{1}{6}$

14 **(a)** B **(b)** C

15 **(a)** $5\frac{17}{18}$ **(b)** $4\frac{9}{10}$ **(c)** $3\frac{9}{32}$

16 **(a)** $\frac{1}{40}$ **(b)** 16 **(c)** 10 **(d)** $8\frac{1}{4}$

Extension

17 **(a)** 30 000 L **(b)** 50 000 L **(c)** 12 000 L

18 **(a)** 9 girls **(b)** $\frac{5}{8}$ **19** \$448

20 **(a)** 15 **(b)** $\frac{3}{5}, \frac{1}{3}$ **(c)** $\frac{4}{15}$ **(d)** $1\frac{1}{15}$ blocks

Replay (p. 368)

1 **(a)** 24 **(b)** 478 **(c)** 2749

2 **(a)** −13 **(b)** −20 **(c)** 12

3 **(a)** −24 **(b)** 5 **(c)** −9

4 **(a)** 1, 3, 5, 15 **(b)** 1, 2, 5, 10, 25, 50 **(c)** 1, 2, 4

5 **(a)** 49 **(b)** 6 **(c)** 3

6 **(a)** 23 **(b)** 7 **(c)** 3 **(d)** −7

7 **(a)** obtuse **(b)** acute **(c)** revolution

8 60°

9 **(a)** 279.2 **(b)** 4680 **(c)** 0.025 76

10 **(a)** 16.8 cm **(b)** 29 cm

11 **(a)** 32 cm^2 **(b)** 12 cm^2

12 **(a)** 360° **(b)** 60°

Mixed revision three

Rewind (p. 369)

Core

1 23 **2** **(a)** 720° **(b)** 135°

3 **(a)** 15.6 cm^2 **(b)** 24 cm^2 **(c)** 204 cm^2

4 **(a)** $\frac{1}{10}$ **(b)** $1\frac{1}{5}$ **(c)** \$40 **(d)** 18

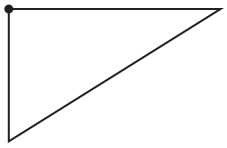
(e) $1\frac{1}{20}$ **(f)** $\frac{25}{42}$

5 **(a)** 147.1 cm **(b)** 5575 m

6 **(a)** $\frac{2}{3}$ **(b)** $\frac{3}{5}$ **(c)** $3\frac{3}{7}$

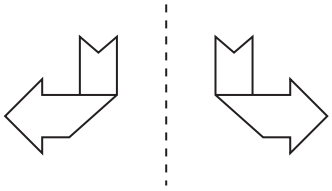
7 **(a)** $\frac{63}{100}$ **(b)** $1\frac{13}{24}$ **(c)** $1\frac{13}{16}$

8 **(a)**



(b) rectangle should measure 6 cm across and 4 cm down

(c)



9 **(a)** 7200 m **(b)** 863 mm **(c)** 0.008 79 km

10 **(a)** kite **(b)** rhombus **(c)** quadrilateral

11 **(a)** 95° **(b)** 55° **(c)** 40°

12 **(a)** scalene, obtuse-angled
(b) scalene, right-angled
(c) isosceles, acute-angled

13 **(a)** 32° **(b)** 58° **(c)** 72°

14 **(a)** N **(b)** P **(c)** P

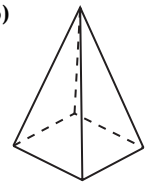
15 **(a)** 33.4 cm **(b)** 203 mm = 20.3 cm **(c)** 54 cm

16 $\frac{38}{7}$

17 **(a)** $2\frac{9}{100}$ **(b)** $\frac{123}{1\,000\,000}$ **(c)** $3\frac{3}{125}$

18 **(a)**

(b)



(c)

19 **(a)** 0.4 **(b)** 3.375 **(c)** 4.714

Extension

20 20.8 m **21** **(a)** $\frac{3}{5}$ **(b)** 10

22 4.5 m^2

23 **(a)** 45 cm^2 **(b)** 66 cm^2

24 8 cm by 13 cm

Chapter 10

Prep zone (p. 374)

1 **(a)** $y = x + 6$ **(b)**

x	y
10	94
−1	−16
5	44
9	84
−12	−126
20	194

2 **(a)** $f = 11$ **(b)** $f = -89$

3 **(a)** 33 **(b)** 8 **(c)** 28

4 **(a)** 4 **(b)** 7 **(c)** 3

5 **(a)** 7 **(b)** 10 **(c)** 5 **(d)** 3
6 **(a)** peregrine falcon **(b)** kodiak bear

Exercise 10.1 (p. 375)

1 **(a)** $4a$ **(b)** $5k$ **(c)** $2pq$ **(d)** $7rst$
(e) $\frac{x}{6}$ **(f)** $\frac{h}{9}$ **(g)** $\frac{7}{m}$ **(h)** $\frac{5}{n}$ **(i)** $\frac{6a}{11}$
(j) $\frac{15}{3r}$ **(k)** $\frac{21}{12v}$ **(l)** $\frac{4s}{19}$ **(m)** $\frac{8}{x}-\frac{u}{6}$
(n) $\frac{h}{5}+\frac{4}{i}$ **(o)** $\frac{7}{g}+\frac{6}{c}-2n$ **(p)** $\frac{5}{w}+\frac{12}{m}+7f$
(q) $\frac{cu}{5}+9y$ **(r)** $\frac{q}{7c}-\frac{gh}{4}$ **(s)** $\frac{vz}{6}-\frac{8}{fs}$
(t) $\frac{3}{tr}+\frac{6w}{yz}$ **(u)** $\frac{4hb}{2r}$ **(v)** $\frac{6ca}{5eu}$
(w) $\frac{21ts}{6f}+db-\frac{2}{7fs}$ **(x)** $\frac{17mn}{hz}+\frac{8c}{r}+4qf$
2 **(a)** True **(b)** False **(c)** False **(d)** True
(e) False **(f)** True **(g)** True **(h)** False
(i) True **(j)** True
3 **(a)** B **(b)** D **(c)** C **(d)** B **(e)** C **(f)** B
(g) B **(h)** A **(i)** D **(j)** D **(k)** B **(l)** D
4 **(a)** $2a+2b$, $2(a+b)$ or $a+a+b+b$ **(b)** ab
5 Sample answers: $2+a$, $3k-2r$

Exercise 10.2 (p. 379)

1 **(a)** 36 **(b)** 21 **(c)** 54 **(d)** 15 **(e)** 24
(f) 15 **(g)** 18 **(h)** 54 **(i)** 177
2 **(a)** 14 **(b)** 9 **(c)** 14 **(d)** 7 **(e)** 32
(f) 13 **(g)** 6 **(h)** 8 **(i)** 3
3 Must be divisible by 3, e.g. 6, 18
4 **(a)** False **(b)** False **(c)** True **(d)** True
(e) True **(f)** False
5 **(a)** 20 **(b)** 200 **(c)** 4 **(d)** 12 **(e)** 9
(f) 10 **(g)** 0 **(h)** 8 **(i)** 14
6 **(a)** 44 **(b)** 2 **(c)** 72 **(d)** 60 **(e)** 120
(f) 200 **(g)** 440 **(h)** 900 **(i)** 600
7 **(a)** 100 **(b)** 100 **(c)** 20 **(d)** 3 **(e)** 40
(f) 42 **(g)** 20 **(h)** 75 **(i)** 900
8 **(a)** −45 **(b)** 3 **(c)** 28 **(d)** −64 **(e)** −1
(f) 20 **(g)** −5 **(h)** −31 **(i)** 34

9 **(a)**

x	y
−5	−9
3	−1
2	−2
−7	−11
−9	−13
1	−3

(b)

x	y
7	−2
−1	−10
−5	−14
−9	−18
2	−7
6	−3

(c)

x	y
4	−3
−8	−15
−5	−12
1	−6
−3	−10
3	−4

(d)

x	y
−3	18
−2	12
2	−12
−5	30
−10	60
1	−6

(e)

x	y
5	−45
−8	72
−5	45
−2	18
2	−18
11	−99

(f)

x	y
−1	2
6	−12
2	−4
−5	10
−11	22
0	0

(g)

x	y
3	−9
−2	11
−5	23
−10	43
2	−5
1	−1

(h)

x	y
2	−13
−1	2
10	−53
−6	27
6	−33
−3	12

(i)

x	y
−5	43
8	−87
−4	33
0	−7
10	−107
−1	3

(j)

x	y
3	2
10	−5
−9	14
100	−95
−20	25
5	0

(k)

x	y
0	2
10	32
−3	−7
−1	−1
50	152
8	26

(l)

x	y
10	−28
−4	0
0	−8
20	−48
5	−18
−8	8

10 **(a)** 150 **(b)** 24 **(c)** −50 **(d)** 2 **(e)** −20
(f) −4 **(g)** −12 **(h)** 12 **(i)** 9

Exercise 10.3 (p. 383)

1 **(a)** True **(b)** False **(c)** False **(d)** True
(e) False **(f)** True **(g)** True **(h)** False
(i) True **(j)** True
2 **(a)** B **(b)** D **(c)** D
3 Different answers are possible, e.g. $0.1xy$, $8xy$, $-3xy$
4 **(a)** False **(b)** True **(c)** True **(d)** False
(e) True **(f)** False **(g)** True **(h)** False
(i) True **(j)** True
5 **(a)** $17a$ **(b)** $5v$ **(c)** $3d$ **(d)** $21f$ **(e)** $-3v$
(f) $-2v$ **(g)** $10w$ **(h)** $3d$ **(i)** $-14j$ **(j)** $-10j$
(k) $3ty$ **(l)** $3ghi$ **(m)** $-7xy$ **(n)** $6pq$
(o) $-20sr$ **(p)** $5jk$ **(q)** $19mn$ **(r)** $8gh$
(s) $-3klm$ **(t)** $-21pqr$ **(u)** $-5abc$
6 **(a)** $15t+7d$ **(b)** $13f+3g$ **(c)** $10y+10q$
(d) $90w+134v$ **(e)** $10a+2b$ **(f)** $2g+8v$
(g) $12d+9$ **(h)** $12f+5$ **(i)** $-4b$ **(j)** $5b$
(k) $7r-3u$ **(l)** $-7m-11n$ **(m)** $jk+5mn$
(n) $9fg-11pq$ **(o)** $9jk$ **(p)** 0 **(q)** $10jkl$
(r) $-16uvw$ **(s)** $-5xyz$ **(t)** 0 **(u)** $-2def$
7 **(a)** $19ab+7$ **(b)** $12+11df$ **(c)** $3f+2fg$
(d) $6ij+20j$ **(e)** $3hdw+2hd+5d+8$
(f) $10x+4xyz+8$ **(g)** $-8x^2-10y+2$
(h) $-5x^3-6y+xy$ **(i)** $10ab+24a+15b+46$
(j) $2s+40st+150stc+20$ **(k)** $3b^3-5ab$
(l) $-5a^3-7a^2-9a-61$

Exercise 10.4 (p. 386)

1 **(a)** $15a$ **(b)** $12a$ **(c)** $24g$ **(d)** $18g$ **(e)** $56z$
(f) $36z$ **(g)** $7xy$ **(h)** $4ab$ **(i)** $3xz$ **(j)** $66ef$
(k) $56ef$ **(l)** $15zu$ **(m)** $40rt$ **(n)** $60rt$
(o) $90pq$ **(p)** $18ghk$ **(q)** $48ghk$ **(r)** $90beh$
(s) $30apq$ **(t)** $320rst$ **(u)** $80mnx$ **(v)** $60ghi$
(w) $63def$ **(x)** $27pqr$
2 **(a)** $-20y$ **(b)** $21y$ **(c)** $16a$ **(d)** $-3xy$
(e) $4wk$ **(f)** $-7pq$ **(g)** $-44ab$ **(h)** $18ruq$
(i) $-56urq$ **(j)** $80jk$ **(k)** $-60jk$ **(l)** $60xy$
(m) $-120pqr$ **(n)** $42stu$ **(o)** $12abc$
(p) $-280pqr$ **(q)** $-18uwx$ **(r)** $56def$ **(s)** $28def$

(t) $24xyz$ **(u)** $48stu$ **(v)** $120rst$ **(w)** $72abc$
(x) $60pqr$

3 **(a)** $2a$ **(b)** $4b$ **(c)** $4c$ **(d)** $10d$ **(e)** 5
(f) 17 **(g)** 3 **(h)** 9 **(i)** 2 **(j)** 6 **(k)** 4
(l) 3 **(m)** $\frac{5}{7}$ **(n)** $\frac{2}{3}$ **(o)** $\frac{3}{8}$ **(p)** $\frac{1}{7}$
(q) $\frac{1}{7}$ **(r)** $\frac{10}{11}$ **(s)** $\frac{5}{6}$ **(t)** $\frac{1}{15}$

4 **(a)** $3ab$ **(b)** $2ab$ **(c)** $2cd$ **(d)** $7cd$ **(e)** $5g$
(f) $9h$ **(g)** $3f$ **(h)** $7e$ **(i)** $5b$ **(j)** 6
(k) 13 **(l)** $16c$ **(m)** $\frac{f}{8}$ **(n)** 4 **(o)** 25
(p) $\frac{h}{3}$

5 **(a)** $-2a$ **(b)** $-2b$ **(c)** $-2d$ **(d)** $-5c$ **(e)** $\frac{-5b}{3}$
(f) $\frac{-3a}{2}$ **(g)** 4 **(h)** $-4j$ **(i)** $\frac{-3c}{2}$ **(j)** $\frac{-7d}{6}$
(k) $\frac{-3f}{4}$ **(l)** $\frac{-8f}{9}$ **(m)** $\frac{1}{6}$ **(n)** 11
(o) $\frac{g}{11}$ **(p)** $\frac{g}{5}$

6 Answer must have ab in it, e.g. $2ab$.

Exercise 10.5 (p. 388)

1 **(a)** $5 + 20$; 25 **(b)** $12 - 10$; 2 **(c)** $5 + 5$ m
(d) $2 \times h - 2 \times 5$; $2h - 10$

2 **(a)** $12a + 60$ **(b)** $28 + 4m$ **(c)** $3h - 24$
(d) $11w - 11v$ **(e)** $9v - 9w$ **(f)** $2y + 2r$
(g) $5a + ab$ **(h)** $4d + dz$ **(i)** $fg - 7f$
(j) $7c - cu$ **(k)** $ac + ab$ **(l)** $mn - mp$

3 **(a)** $6a + 8$ **(b)** $30 + 15m$ **(c)** $10b + 35$
(d) $18h - 15$ **(e)** $56w - 16$ **(f)** $27m - 45$
(g) $9u - 27v$ **(h)** $28b + c$ **(i)** $6k - 42m$
(j) $2ab + 3b$ **(k)** $4m - 3mn$ **(l)** $2pq - 7p$
(m) $2pr - rs$ **(n)** $3ab + ac$ **(o)** $jk + 7km$
(p) $6a + 15b$ **(q)** $20m - 15n$ **(r)** $18s + 45t$

4 **(a)** $12a + 4ab$ **(b)** $2mn - 14m$ **(c)** $6p - 8pq$
(d) $21k + 7jk$ **(e)** $20ab + 35a$ **(f)** $6ms - 27m$
(g) $8pr + 32qr$ **(h)** $30cd - 5ce$ **(i)** $4gh + 28hj$
(j) $10xy + 15xz$ **(k)** $12ce + 66cf$ **(l)** $30km - 40kn$

5 **(a)** $-12a - 60$ **(b)** $-18 - 3x$ **(c)** $-km + kn$
(d) $-2a + 2b$ **(e)** $-4j - jk$ **(f)** $-mn - 8m$
(g) $-6p - 2pq$ **(h)** $-45j - 5jm$ **(i)** $-21p + 3pr$
(j) $-10k - 15m$ **(k)** $-18p + 60r$ **(l)** $-32d + 24f$

6 Sample answers: $4qr$, qr, $100pqr$

Exercise 10.6 (p. 391)

1 **(a)** 3; 3 **(b)** 5; 5 **(c)** 2; 2 **(d)** 4; $4(6 + 5y)$
(e) 6; $6(3 - 2j)$ **(f)** $5g$; $5g$ **(g)** $2t$; $2t$

2 **(a)** $2(h + 7)$ **(b)** $3(e + 5)$ **(c)** $2(d - 7)$
(d) $5(b - 4)$ **(e)** $5(m + 6)$ **(f)** $9(d - 2)$
(g) $2(3f - 1)$ **(h)** $2(4w + 1)$ **(i)** $5(4j + 1)$
(j) $2(12 - 7f)$ **(k)** $4(4 - 3g)$ **(l)** $7(4 + 3v)$
(m) $6(2 - 11q)$ **(n)** $11(3 - 5q)$ **(o)** $20(5 + 3h)$

3 **(a)** $3(hi + 2)$ **(b)** $5(vw + 3)$ **(c)** $6(4 + ab)$
(d) $7(jk - 5)$ **(e)** $9(4 - ab)$ **(f)** $12(mn - 5)$
(g) $d(2 + e)$ **(h)** $n(m - 7)$ **(i)** $x(100 - y)$
(j) $e(5 - 7f)$ **(k)** $p(2q + 5)$ **(l)** $a(7b - 8)$
(m) $4(e + 4g)$ **(n)** $7(2k - 3m)$ **(o)** $3(2r + 5s)$

4 **(a)** $13d(e + 2)$ **(b)** $7n(m + 3)$ **(c)** $8r(4 - s)$
(d) $2w(3v - 1)$ **(e)** $4c(1 + 2d)$ **(f)** $3p(1 - 4q)$
(g) $5z(6 + 5y)$ **(h)** $11k(7 - 6j)$ **(i)** $2j(9i - 7)$
(j) $2u(11v + 7)$ **(k)** $8a(3b + 2)$ **(l)** $12m(2p - 3)$

Exercise 10.7 (p. 394)

1 **(a)** True **(b)** False **(c)** False **(d)** False
(e) False **(f)** True **(g)** True **(h)** False
(i) True **(j)** False **(k)** True **(l)** False

2 **(a)** 21 **(b)** 131 **(c)** 111 **(d)** 141 **(e)** 96
(f) −42 **(g)** 48 **(h)** 76 **(i)** 120 **(j)** 12
(k) 25 **(l)** 30 **(m)** 26 **(n)** 9 **(o)** 20
(p) 6 **(q)** 15 **(r)** 17 **(s)** 7 **(t)** 5 **(u)** 6
(v) 6 **(w)** 35 **(x)** 3

3 **(a)** 6 **(b)** 1 **(c)** 2 **(d)** 5 **(e)** 8 **(f)** 38
(g) 8 **(h)** 3 **(i)** 5 **(j)** 56 **(k)** 4 **(l)** 42
(m) 4 **(n)** 70 **(o)** 4 **(p)** 27 **(q)** 4 **(r)** 2

4 **(a)** $a = 7$ **(b)** $k = 23$ **(c)** $r = 6$ **(d)** $h = 10$
(e) $m = 7$ **(f)** $p = 22$ **(g)** $u = 17$ **(h)** $t = 38$
(i) $r = 35$ **(j)** $f = 20$ **(k)** $s = 16$ **(l)** $v = 22$
(m) $h = 12$ **(n)** $j = 6$ **(o)** $y = 4$ **(p)** $t = 11$
(q) $n = 6$ **(r)** $k = 8$ **(s)** $c = 56$ **(t)** $h = 45$
(u) $w = 28$ **(v)** $q = 8$ **(w)** $p = 7$ **(x)** $j = 7$

5 **(a)** $x + 3 = 19$ **(b)** $6 + x = 15$ **(c)** $20 - x = 5$
(d) $x - 10 = 12$ **(e)** $8x = 24$ **(f)** $6x = 18$
(g) $\frac{x}{5} = 6$ **(h)** $\frac{32}{x} = 4$

6 **(a)** $x = 16$ **(b)** $x = 9$ **(c)** $x = 15$ **(d)** $x = 22$
(e) $x = 3$ **(f)** $x = 3$ **(g)** $x = 30$ **(h)** $x = 8$

7 **(a)** False **(b)** True **(c)** True **(d)** False
(e) False **(f)** False **(g)** True **(h)** False
(i) True **(j)** False **(k)** False **(l)** True
(m) True **(n)** True **(o)** True **(p)** False
(q) False **(r)** False **(s)** True **(t)** False

8 **(a)** $w = 4$ **(b)** $t = 3$ **(c)** $f = 2$ **(d)** $h = 3$
(e) $r = 5$ **(f)** $s = 2$ **(g)** $y = 28$ **(h)** $q = 28$
(i) $p = 20$ **(j)** $a = 42$ **(k)** $w = 27$ **(l)** $c = 35$
(m) $x = -4$ **(n)** $p = -3$ **(o)** $x = -4$ **(p)** $p = -6$
(q) $m = -50$ **(r)** $c = 6$

Exercise 10.8 (p. 399)

1 **(a)** (2, 0) **(b)** (0, 1) **(c)** (4, 1) **(d)** (5, 1)
(e) (3, 2) **(f)** (6, 2) **(g)** (1, 3) **(h)** (2, 3)
(i) (4, 3) **(j)** (2, 4) **(k)** (4, 4) **(l)** (6, 4)
(m) (1, 5) **(n)** (5, 5) **(o)** (3, 6) **(p)** (4, 6)

2 **(a)** A **(b)** H **(c)** P **(d)** D **(e)** J **(f)** M
(g) F **(h)** C **(i)** I **(j)** B **(k)** G **(l)** N
(m) E **(n)** K **(o)** O **(p)** L

3 **(a)** SOLDIER **(b)** STEGOPHILIST

Exercise 10.9 (p. 403)

1 $A(4, 3)$, $B(1, -3)$, $C(-4, 5)$, $D(-2, -1)$, $E(-4, -4)$, $F(3, -2)$, $G(2, 0)$, $H(0, 4)$, $I(-5, 0)$, $J(0, 0)$

2 **(a)** **(i)** A **(ii)** C **(iii)** D, E **(iv)** B, F
(b) **(i)** G, I, J **(ii)** H, J **(iii)** J

3 (3, −3), (−2, −2), (−3, 0), (1, −1), (3, 1), (−1, 1), (−4, 3), (2, 4), (5, 2)

4 **(a)** C **(b)** A **(c)** D **(d)** B
5 **(a)** D **(b)** C **(c)** C **(d)** A
6 The result is a butterfly. **7** The result is a castle.
8 **(a)** Sample answers: positions on the Earth's surface; map references; seating locations
(b) latitude and longitude; grid references (e.g. J5)

Chapter review (p. 407)

Core

1 **(a)** 22 **(b)** 28 **(c)** 20 **(d)** 4
2 **(a)** 120 **(b)** 20 **(c)** 400
3 **(a)** -4 **(b)** 11 **(c)** -2
4 **(a)** $5a$ **(b)** $-a + 23b$ **(c)** Cannot be simplified.
5 **(a)** $30ab$ **(b)** $66abc$ **(c)** $14ab$
6 **(a)** $\frac{6}{5}$ **(b)** $5b$ **(c)** $\frac{b}{11}$
7 **(a)** $14 + 7a$ **(b)** $2ab + 6a$ **(c)** $6xy - 14x$
8 **(a)** $3(a - 5)$ **(b)** $4a(1 + 4b)$ **(c)** $4b(5a + 4)$
9 **(a)** 4 **(b)** 4 **(c)** 36
10 **(a)** $b = 7$ **(b)** $m = 7$ **(c)** $x = 7$
11 **(a)** False **(b)** True **(c)** False
12 **(a)** Gabriel Fahrenheit **(b)** Alfred Nobel
13 **(a)** (1, 2) **(b)** (3, 1) **(c)** (4, 3) **(d)** (2, 5)
14 **(a)** $A(1, 4)$, $B(0, 0)$, $C(-3, 2)$, $D(-2, -4)$, $E(2, -3)$, $F(3, 0)$, $G(0, -2)$ **(b)** B **(c)** D

Extension

15 Students' own answers.
16 **(a)** 40 **(b)** 69 **(c)** 64 **(d)** 7 fewer
17 **(a)** $x = 2$ **(b)** $p = -3$ **(c)** $m = -2$ **(d)** $p = 12$ **(e)** $k = 35$ **(f)** $m = -15$
18 The result is a Christmas tree.
19 The result is a kangaroo.

Replay (p. 411)

1 **(a)** 33 **(b)** 15 **(c)** 1
2 **(a)** -100 **(b)** -108 **(c)** 202
3 **(a)** 7, 14, 21, 28, 35 **(b)** 10, 20, 30, 40, 50 **(c)** 25, 50, 75, 100, 125
4 **(a)** $9 = 3 \times 3$ **(b)** $24 = 2 \times 2 \times 2 \times 3$ **(c)** $60 = 2 \times 2 \times 3 \times 5$
5 **(a)** 2, 3, 5, 8, 12, 17, 23, 30 **(b)** 1, 3, 7, 15, 31, 63, 127 **(c)** 5, 15, 105, 1005, 10 005, 100 005, 1 000 005
6 218° **7** D
8 **(a)** 5.79 **(b)** 3.5 **(c)** 1.421
9 **(a)** 3 **(b)** 130 **(c)** 0.012
10 **(a)** 0.015 ha **(b)** 0.9 mm^2 **(c)** 8 m^2
11 89°
12 **(a)** $24 **(b)** 3 hours 45 minutes **(c)** 36 L

Chapter 11

Prep zone (p. 414)

1 **(a)** 24 **(b)** 80.8 **(c)** 119.68
2 **(a)** 2000 m **(b)** 250 mm **(c)** 0.004 35 km
3 12 cubes
4 **(a)** 7.12 **(b)** 3.15 **(c)** 11.45 **(d)** 9.34
5 **(a)** 3 minutes **(b)** 30 months **(c)** 77 days **(d)** 3000 minutes

Exercise 11.1 (p. 415)

1 **(a)** 6 cm^3 **(b)** 8 cm^3 **(c)** 16 cm^3 **(d)** 18 cm^3 **(e)** 40 cm^3 **(f)** 24 cm^3 **(g)** 54 cm^3 **(h)** 60 cm^3 **(i)** 60 cm^3 **(j)** 72 cm^3 **(k)** 140 cm^3 **(l)** 45 cm^3

2 **(i)**

Solid	*Length l* (cm)	*Breadth b* (cm)	*Height H* (cm)	*Volume V* (cm^3)
(a)	6	1	1	6
(b)	2	2	2	8
(c)	4	2	2	16
(d)	3	2	3	18
(e)	5	4	2	40
(f)	3	4	2	24
(g)	6	3	3	54
(h)	6	5	2	60
(i)	5	3	4	60
(j)	6	4	3	72
(k)	7	5	4	140
(l)	3	3	5	45

(ii) Volume of a rectangular prism may be calculated using the formula $V = lbH$
3 **(a)** 28 cm^3 **(b)** 10 cm^3 **(c)** 24 cm^3 **(d)** 18 cm^3 **(e)** 35 cm^3 **(f)** 20 cm^3
4 Sample answers: 3 cm × 2 cm × 5 cm, 6 cm × 5 cm × 1 cm

Exercise 11.2 (p. 417)

1 **(a)** 60 cm^3 **(b)** 60 cm^3 **(c)** 64 cm^3 **(d)** 48 cm^3 **(e)** 108 cm^3 **(f)** 125 cm^3 **(g)** 120 cm^3 **(h)** 320 cm^3
2 12 m^3 **3** 216 cm^3 **4** C
5 2079 cm^3 **6** 0.69 m^3 **7** 900 cm^3

Exercise 11.3 (p. 421)

1 **(a)** 7000 mL **(b)** 55 L **(c)** 2 L **(d)** 9000 mL **(e)** 0.6 L **(f)** 7100 mL **(g)** 0.8 L **(h)** 0.04 L **(i)** 0.005 L **(j)** 95 000 mL **(k)** 3570 mL **(l)** 0.2 L **(m)** 5 000 000 mL **(n)** 30 mL **(o)** 25 mL **(p)** 0.006 L **(q)** 0.052 L **(r)** 8.75 L
2 D **3** B **4** 143 L **5** 74 000 mL
6 1.5 L **7** 795 mL
8 **(a)** 540 mL **(b)** 176 mL **(c)** 46.5 mL **(d)** 2293.2 mL
9 **(a)** 72 m^3 **(b)** 72 000 L **(c)** $48.96

Exercise 11.4 (p. 424)

1 **(a)** g **(b)** t **(c)** kg **(d)** kg **(e)** g **(f)** t
2 D
3 **(a)** 5000 kg **(b)** 647 000 kg **(c)** 8000 g **(d)** 33 g **(e)** 7 100 000 g **(f)** 350 000 g **(g)** 0.00917 t **(h)** 0.455 kg **(i)** 5 t **(j)** 0.007 t
4 D **5** They both weigh the same.
6 1.408 kg **7** 1.09 t **8** 11.75 kg

9 **(a)** 12.48 t **(b)** 150 t
10 6.65 kg **11** $4.05
12 **(a)** **(i)** 235 g **(ii)** 32.5 g **(iii)** 7.65 kg
(b) **(i)** 1.5 kg **(ii)** 3.75 kg **(iii)** 960 g
(iv) 540 g **(v)** 4.026 kg

Exercise 11.5 (p. 428)

2 **(a)** minutes **(b)** hours **(c)** seconds
(d) seconds **(e)** years **(f)** seconds **(g)** days
(h) minutes **(i)** minutes **(j)** minutes
(k) seconds **(l)** hours **(m)** weeks
3 **(a)** True **(b)** False **(c)** True **(d)** False
(e) True **(f)** False **(g)** True **(h)** True
(i) True **(j)** True **(k)** False **(l)** False
(m) True **(n)** True **(o)** False **(p)** True

Exercise 11.6 (p. 432)

1 **(a)** 2 h 46 min **(b)** 4 h 15 min **(c)** 2 h 46 min
(d) 4 h 51 min **(e)** 2 h 17 min **(f)** 3 h 3 min
(g) 10 h 9 min **(h)** 22 h 41 min
(i) 23 h 53 min **(j)** 23 h 25 min
(k) 14 h 33 min **(l)** 17 h 12 min
2 **(a)** 7.15 a.m. **(b)** 6.23 a.m. **(c)** 2.12 a.m.
(d) 3.59 a.m. **(e)** 3.55 p.m. **(f)** 3.43 a.m.
(g) 7.51 p.m. **(h)** 5.38 a.m. **(i)** 5.04 p.m.
(j) 9.13 p.m.
3 **(b)** **(i)** 0340 **(ii)** 1540 **(c)** **(i)** 1143 **(ii)** 2343
(d) **(i)** 0615 **(ii)** 1815 **(e)** **(i)** 1200 **(ii)** 0000
4 **(a)** 1.54 p.m. **(b)** 8.33 a.m. **(c)** 5.39 a.m.
(d) 4.34 p.m. **(e)** 6.30 p.m. **(f)** 7.02 p.m.
(g) 1.47 a.m. **(h)** 3.20 a.m.
5 **(a)** 2 h 15 min **(b)** 6 h 30 min **(c)** 12 min
(d) 5 h 20 min **(e)** 19 h 24 min
(f) 13 h 45 min **(g)** 1 h 40 min **(h)** 15 h 6 min
6 28 min **7** 9.01 a.m. **8** A
9 **(a)** 8.32 a.m. **(b)** 27 min
10 1245 **11** 2230; 0100 **12** 49 min 55 s

Exercise 11.7 (p. 436)

1 **(a)** 2 min **(b)** 4 min **(c)** 4 min **(d)** 22 min
(e) 36 min **(f)** 11.03 a.m. **(g)** 10.23 a.m.
(h) 11.25 a.m. **(i)** 11.15 a.m.
2 **(a)** 1.09 a.m. and 1.32 p.m.
(b) 9.17 a.m. and 9.11 p.m.
(c) 5.18 a.m. and 6 p.m.
(d) 9.57 a.m. and 10.15 p.m. **(e)** 37 min
(f) 7 h 36 min **(g)** 1–6 September
(h) 2 h 17 min
3 **(a)** 1.00 p.m. **(b)** 3.45 p.m. **(c)** 5.53 a.m.
(d) 12.15 a.m. **(e)** 8.40 a.m. **(f)** 4 h
(g) 4 h 53 min **(h)** 1335 or 1.35 p.m.
4 **(a)** **(i)** 6 p.m. **(ii)** 4 a.m. **(iii)** 2 p.m.
(b) **(i)** 8.30 a.m. **(ii)** 4.30 p.m. **(iii)** 3.30 a.m.
(c) **(i)** 8 a.m. Saturday **(ii)** 10 p.m. Friday
(d) 13 hours

Chapter review (p. 443)

Core

1 **(a)** 210 m^3 **(b)** 225 cm^3
2 **(a)** 5000 mL **(b)** 48 L **(c)** 3570 mL
(d) 0.08 L **(e)** 45 mL **(f)** 0.015 L
3 **(a)** 0.4566 kg **(b)** 760 000 g **(c)** 39 000 kg
(d) 5.001 t **(e)** 4500 g **(f)** 0.23 t
4 0.85 t **5** 900 g
6 **(a)** 10 h 43 min **(b)** 1.44 p.m.
7 **(a)** 1938 hours **(b)** 0122 hours **(c)** 11.21 p.m.

Extension

8 **(a)** 78 cm^3 **(b)** 128 cm^3
9 6750 cm^3
10 **(a)** 3 p.m. Sunday **(b)** 3 a.m. Thursday
(c) 7 p.m. Tuesday

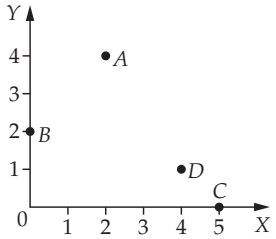
Replay (p. 444)

1 **(a)** 23 **(b)** 34 **(c)** 31
2 **(a)** −33 **(b)** −36 **(c)** −38
3 **(a)** 1, 2, 3, 4, 6, 12 **(b)** 1, 2, 4, 7, 14, 28
(c) 1, 2, 4, 8, 16
4 **(a)** 2, 9, 16, 23, 30, 37
(b) 2, 33, 444, 5555, 66 666, 777 777
(c) 20, 25, 35, 50, 70, 95, 125
5 **(a)** 35° **(b)** 112° **(c)** 32°
6 **(a)** 2.003, 2.3, 2.302, 2.323, 2.33
(b) 0.0199, 0.089, 0.0909, 0.091, 0.129
7 **(a)** 18 cm^2 **(b)** 80 cm^2
8 cube, dodecahedron, pentagonal prism
9 **(a)** $\frac{23}{100}$ **(b)** $\frac{3}{50}$ **(c)** $\frac{101}{200}$
10 **(a)** $\frac{4}{7}$ **(b)** $3\frac{3}{5}$ **(c)** −3
11 **(a)** −6 **(b)** 5 **(c)** −10
12 **(a)** $2(a+3)$ **(b)** $pq(r-1)$ **(c)** $4y(2x+5)$

Chapter 12

Prep zone (p. 448)

1 **(a)** 0, 5, 10, 15, 20, 25, 30
(b) 16, 18, 20, 22, 24, 26, 28
(c) 1300, 1400, 1500, 1600, 1700
(d) 60, 80, 100, 120, 140, 160, 180, 200
2 **(a)** 50, 100, 150, 200, 250
(b) 100, 125, 150, 175, 200
(c) 1400, 1600, 1800, 2000
3 **(a)** 6, 10, 12, 14, 16, 20, 22, 24
(b) 0, 5, 15, 20, 25, 50, 55, 100
(c) 0, $\frac{1}{2}$, 1, $1\frac{1}{2}$, 2, $2\frac{1}{2}$, 3, $3\frac{1}{2}$, 4, 5, $5\frac{1}{2}$, $6\frac{1}{2}$
4 **(a)** 15, 18, 24 **(b)** 140, 160, 180, 200
(c) 250, 275, 325
5



Exercise 12.1 (p. 451)

1

Number of pets owned	*Tally*	*Frequency*
0	𝍸	4
1	𝍸 ||	7
2	|||	3
3	|||	3
4	𝍸	4
5	|	1
6	|	1
7	|	1
8		0
9	|	1
		25

2

Hours of television watched	*Tally*	*Frequency*
0	|||	3
$\frac{1}{2}$	𝍸	4
1	|||	3
$1\frac{1}{2}$	||	2
2	𝍸 |	6
$2\frac{1}{2}$	𝍸	5
3	||	2
$3\frac{1}{2}$		0
4	|	1
$4\frac{1}{2}$	|	1
		27

3

Type of takeaway	*Tally*	*Frequency*
Pizza	𝍸 ||	7
Fish and chips	||	2
Hamburgers	𝍸	4
Chicken	|||	3
Chinese	||	2
None	||	2
		20

4

Amount of money	*Tally*	*Frequency*
\$0.00–\$0.49	𝍸	5
\$0.50–\$0.99	|||	3
\$1.00–\$1.49	|||	3
\$1.50–\$1.99	𝍸	4
\$2.00–\$2.49	|||	3
\$2.50–\$2.99	|||	3
\$3.00–\$3.49		0
\$3.50–\$3.99	|	1
\$4.00–\$4.49	|||	3
		25

5

Number of calls	*Tally*	*Frequency*
0–19	|	1
20–39	|	1
40–59	|||	3
60–79	𝍸 |	6
80–99	𝍸 |	6
100–119	𝍸 |	6
120–139	||	2
140–159	||	2
160–179	||	2
180–199	|	1
		30

Exercise 12.2 (p. 454)

1 **(a)** NSW **(b)** ACT **(c)** 300 **(d)** 340
(e) more **(f)** New South Wales' schools: how they compare **(g)** No **(h)** 50 **(i)** The divisions on the vertical scale aren't small enough and there aren't enough horizontal lines to show the numbers in between.

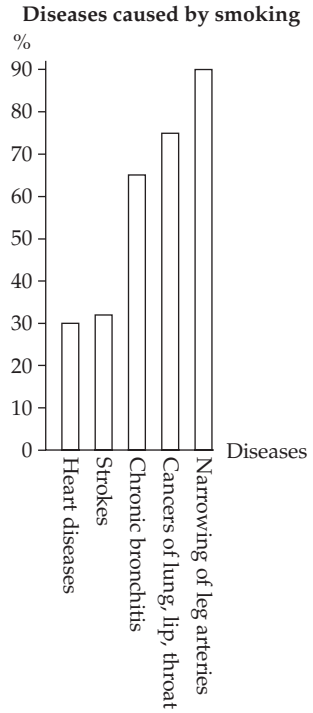
2 **(a)** B **(b)** C **(c)** C **(d)** B

3 **(a)** The columns are horizontal; the scale is at the bottom.
(b) 820 000 000 **(c)** 430 000 000 **(d)** Spanish
(e) It does not go up in even multiples, i.e. the first three numbers are 0, 50, 150. **(f)** Yes

4 **(a)** vertical **(b)** potato, carrot, tomato
(c) 75% **(d)** A scale: the percentages are shown individually for each vegetable, so it is not necessary.

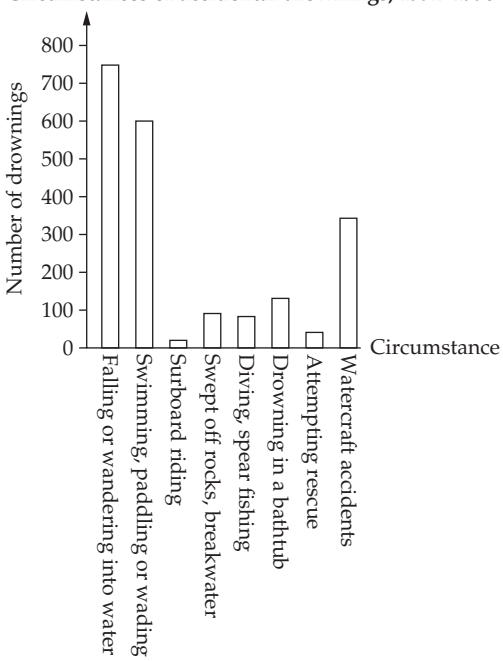
5 **(a)** 75% **(b)** **(i)** narrowing of leg arteries
(ii) 90% **(c)** 90 **(d)** 10

(e)

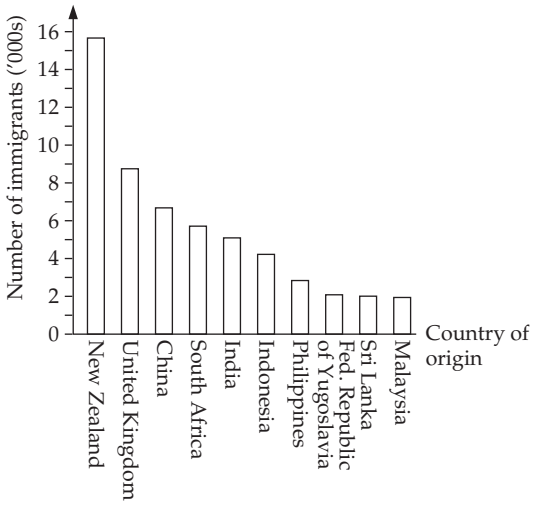


6 **(a)** surfboard riding **(b)** **(i)** 2057 **(ii)** 299 **(c)** 800

(d)



7



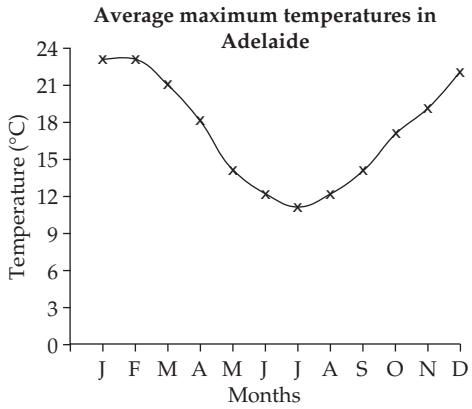
Exercise 12.3 (p. 459)

1 **(a)** **(i)** 32° **(ii)** 16 January **(b)** **(i)** 23° **(ii)** 10 and 17 January **(c)** 24° and 30° **(d)** The temperature steadily increased.

2 **(a)** No **(b)** 1800 **(c)** 2 billion **(d)** 20th century **(e)** **(i)** The scale is not continuous; parts have been left out. **(ii)** The graph would be too long and it would show very little change over most of the time shown. **(f)** It shows what the population will probably be in the future if current trends continue.

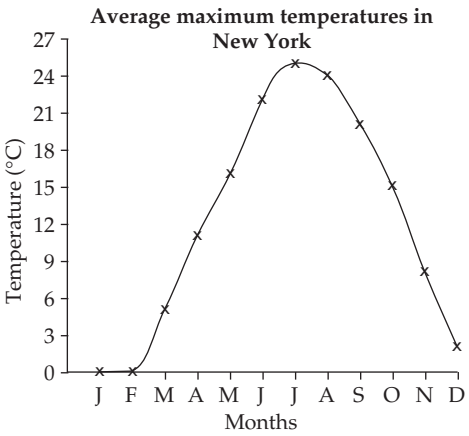
3 **(a)** Yes **(b)** 1.2 m **(c)** 2.6 m **(d)** 2001 **(e)** 1990 **(f)** 1998 or 1999 **(g)** 1992 **(h)** 1992 **(i)** 1993 or 1998 **(j)** September **(k)** August **(l)** No **(m)** The depth changes according to time. You would need over 300 bars, one for each day, or you would need to average information to get a figure for one month.

4 **(a)**



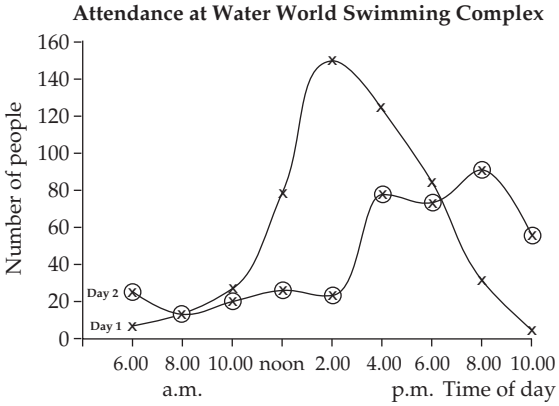
(b) December, January, February **(c)** 23°C **(d)** 11°C

5 **(a)**



(b) It is in the Northern Hemisphere so its summer is in June, July and August. **(c)** 25°C **(d)** 0°C **(e)** New York **(f)** New York

6 **(a)**, **(d)**



(b) 2.00 p.m. **(c)** Weekend. The peak occurs early afternoon. Few people are up early. **(e)** 8.00 p.m. **(f)** Weekday. There is a jump in the attendance at 4.00 p.m., just after school finishes. The peak occurs after people have come home from work. More people are there very early, possibly before they go to work.

Exercise 12.4 (p. 465)

1 **(a)** 3.3% **(b)** 5.2% **(c)** 5–25 minutes
(d) 94.3%.

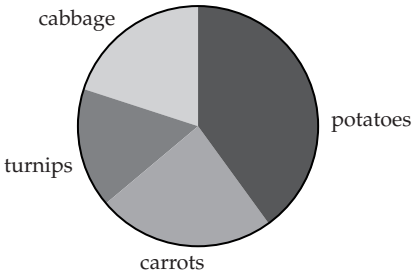
2 **(a)** 4% **(b)** 1% **(c)** 4%
(d) **(i)** non-recyclables **(ii)** 79%
(e) paper **(f)** glass **(g)** No
(h) a vertical scale

3 **(a)** Asia and Oceania **(b)** Northern America
(c) Latin America and the Caribbean
(d) sub-Saharan Africa **(e)** Asia and Oceania
(f) It looks like a pie cut into pieces.

4 **(a)** bags **(b)** sheeting and film
(c) confectionery and wrappers **(d)** percentages
(e) all items not included in the other categories
(f) The survey would not be of much value if only a small number of items had been collected.
(g) They divide something into sections.

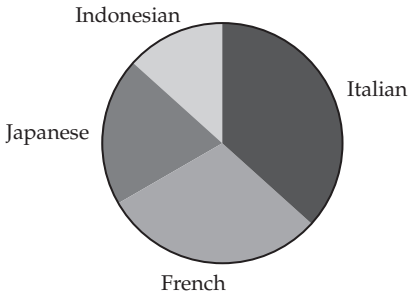
5 **(a)**

Vegetable	*Number of vegetables picked*	*Fraction of whole circle*	*Sector angle*
Potatoes	20	$\frac{20}{50}$	144°
Carrots	12	$\frac{12}{50}$	86°
Turnips	8	$\frac{8}{50}$	58°
Cabbage	10	$\frac{10}{50}$	72°
Total	**50**	**1** $(\frac{50}{50})$	**360°**



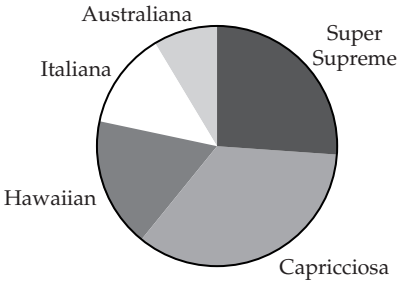
(b)

Language	*Number of people who speak the language*	*Fraction of whole circle*	*Sector angle*
Italian	22	$\frac{22}{60}$	132°
French	18	$\frac{18}{60}$	108°
Japanese	12	$\frac{12}{60}$	72°
Indonesian	8	$\frac{8}{60}$	48°
Total	**60**	**1** $(\frac{60}{60})$	**360°**



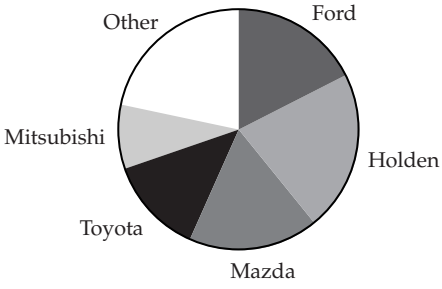
(c)

Pizza	*Number of pizzas ordered*	*Fraction of whole circle*	*Sector angle*
Super Supreme	6	$\frac{6}{23}$	94°
Capricciosa	8	$\frac{8}{23}$	125°
Hawaiian	4	$\frac{4}{23}$	63°
Italiana	3	$\frac{3}{23}$	47°
Australiana	2	$\frac{2}{23}$	31°
Total	**23**	**1** $(\frac{23}{23})$	**360°**



(d)

Car make	*Number of cars*	*Fraction of whole circle*	*Sector angle*
Ford	4	$\frac{4}{23}$	63°
Holden	5	$\frac{5}{23}$	78°
Mazda	4	$\frac{4}{23}$	63°
Toyota	3	$\frac{3}{23}$	47°
Mitsubishi	2	$\frac{2}{23}$	31°
Other	5	$\frac{5}{23}$	78°
Total	**23**	**1** $(\frac{23}{23})$	**360°**



Exercise 12.5 (p. 468)

1 **(a)** line graph
(b) sector graph or divided bar graph
(c) line graph **(d)** column graph

2 **(a)** line graph **(b)** column graph
(c) line graph
(d) sector graph or divided bar graph
(e) column graph
(f) sector graph or divided bar graph

3 Students' own answers.

Exercise 12.6 (p. 471)

1 **(a)**

STEM	LEAF
5	4 4 9
6	0 3 7
7	1 8
8	1 5

(b)

STEM	LEAF
8	0 5
9	1 3 7
10	1 7
11	0 2
12	4

(c)

STEM	LEAF
5	0
5	7
6	0 2
6	5 7 9
7	1 3
7	5 9
8	1 1
8	6 8

2 **(a)**

STEM	LEAF
2	2 3 8
3	0 1 4 7
4	1 2 8
5	2 7

(b)

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

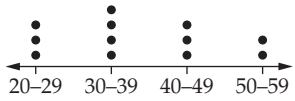
(c)

STEM	LEAF
3	8
4	9
5	5
6	1 1 3 4
7	2 2 5 6 9
8	2 7 8
9	0 6

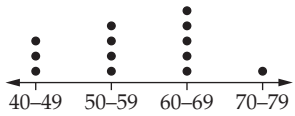
(d)

STEM	LEAF
0	2 3 8
1	4 5 8
2	1 5 6 7 9
3	0 3 4 5 7
4	2 4

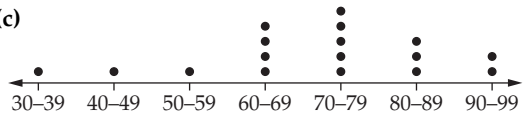
3 **(a)**



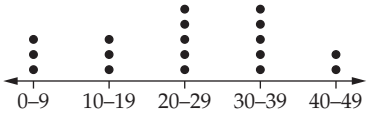
(b)



(c)



(d)



4 **(a)**

STEM	LEAF
2	0 1 2 3
2	7 7 8
3	1 4
3	8
4	2

(b)

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

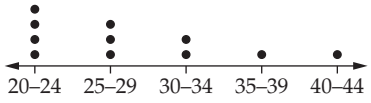
(c)

STEM	LEAF
0	
0	5 6 7 9
1	2 3
1	5 7 9
2	0 1 4
2	6 8

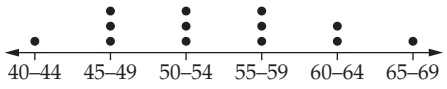
(d)

STEM	LEAF
7	5 6
8	0 2 3 4
8	7 8 9
9	1 1 2
9	5 6 9

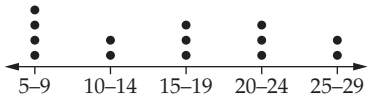
5 **(a)**



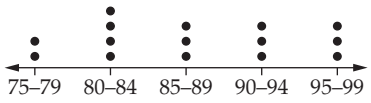
(b)



(c)



(d)



6 Students' own answers.

7

STEM	LEAF
0	2
0	5 5 6 6 6 9
1	1 3 3
1	5 5 6 7 7
2	1

8 **(a)**

STEM	LEAF
12	1
12	5 6 6 8 8 9 9
13	0 3 3 4
13	6 8
14	0 2 2 3
14	6
15	0

(b)

STEM	LEAF
12	1 5 6 6 8 8 9 9
13	0 3 3 4 6 8
14	0 2 2 3 6
15	0

9 **(a)**

STEM	LEAF
6	8
7	
7	5 7 8
8	1 2 4
8	5 6
9	0 2
9	5

(b)

STEM	LEAF
6	80
7	
7	50 70 80
8	10 20 40
8	50 60
9	00 20
9	50

(c)

STEM	LEAF
6	80
7	50 70 80
8	10 20 40 50 60
9	00 20 50

Exercise 12.7 (p. 475)

1 **(a)** False **(b)** True **(c)** True **(d)** True

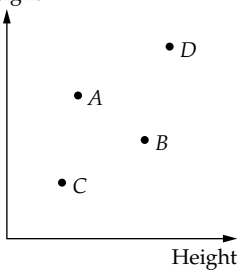
2 **(a)** shoe size; age **(b)** Naomi **(c)** Rachel

3 **(a)** Yiannis **(b)** Meg
(c) Yiannis and Alex take the same shoe size.
(d) Meg and Alex are the same age.

4 **(a)** *D* **(b)** *A* **(c)** *B* **(d)** *C* **(e)** *C, A, D, B*
(f) *D, C, B, A*

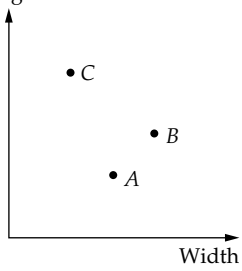
5 **(a)** *A*—elephant; *B*—giraffe

(b) and **(c)**

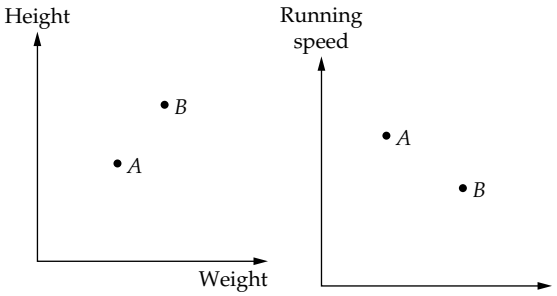


6 **(a)** *A*—salmon; *B*—John Dory; *C*—pike

(b)

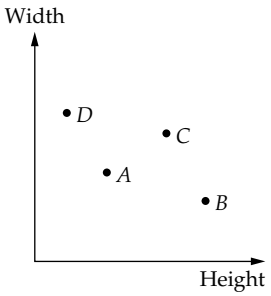


7 **(a)** Birute is older than Amelia. Birute is taller than Amelia.
(b) Birute weighs more than Amelia. Amelia runs faster than Birute.
(c) **(i)** **(ii)**

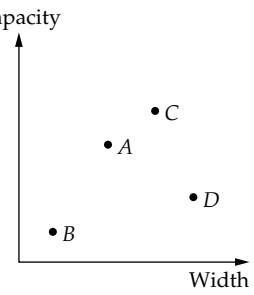


(d) **(i)** The graph compares weight and height. Birute weighs more and is taller than Amelia.
(ii) The graph compares age and running speed. Birute is older than Amelia, but Amelia runs faster than Birute.

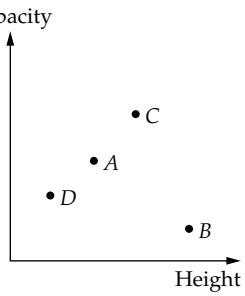
8 **(a)**



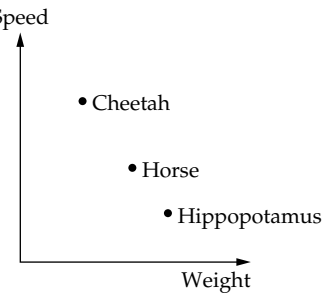
(b)



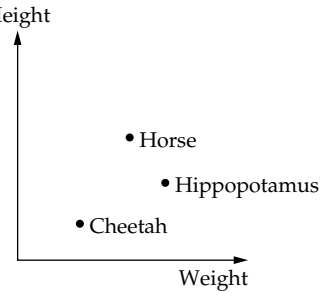
(c)

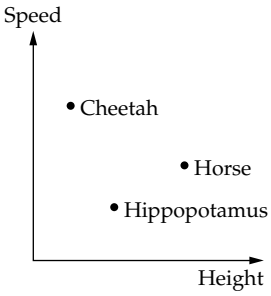


9 **(a)**

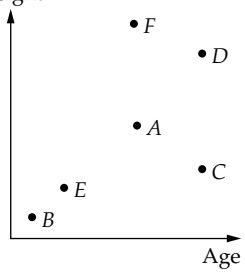


(b)



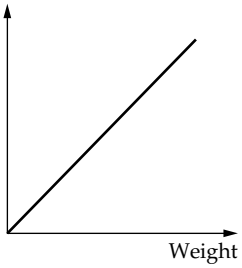


10 Height

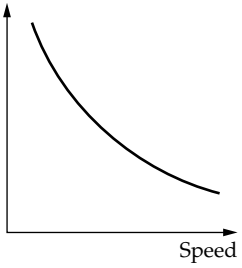


11 **(a)** height and shoe size
(b) There is a trend, as the points form a broad band or line.
(c) The greater the height, the larger the shoe size.

12 **(a)** There is a connection, as the points form a line.
(b) As the weight increases, the cost increases.
(c) Cost



13 **(a)** As the speed increases, the time decreases.
(b) Time



Exercise 12.8 (p. 480)

1 **(a)** *F* **(b)** *D* **(c)** *B* **(d)** *C* **(e)** *E* **(f)** *A*

2 **(a)** The family are starting their journey in Mitta Mitta. They are travelling away from Mitta Mitta (constant speed).
(b) The car is stationary.
(c) The family are travelling back to Mitta Mitta (constant speed).

3 **(a)** No, as the line does not start at zero on the 'Distance from home' axis.
(b) Twice. **(c)** Friend's place.
(d) Yes, as the line finishes at zero distance from home.

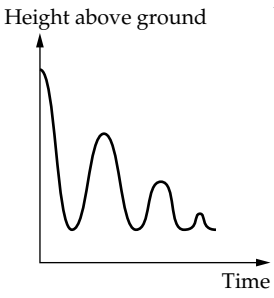
4 At a particular distance from home, a person travels towards home but stops partway. The person stops at this position for a period of time then returns to the original position at the start of the journey. Finally, the person reverses direction and travels directly home.

5 **(a)** *B* **(b)** *C* **(c)** *A*

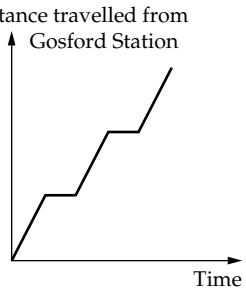
6 A person starts from home, travelling with a constant speed. Then the speed is decreased and the person travels at this speed for another period of time. The person is then stationary for a while before reversing direction to travel home at a constant speed.

7 **(a)** The ball bounces a number of times. At each bounce, the height the ball reaches is lower than the previous bounce. **(b)** six

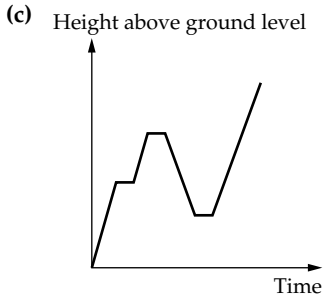
8 These are sample answers only.
(a)



(b)



(c)

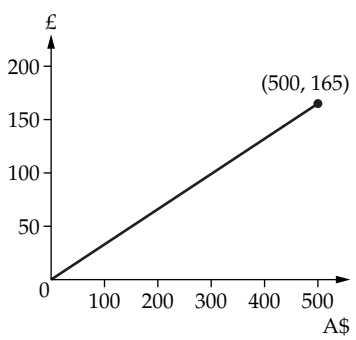


Exercise 12.9 (p. 483)

1 **(a)** **(i)** 0.94 miles **(ii)** 2.5 miles **(iii)** 4 miles
(b) **(i)** 1.6 km **(ii)** 6.4 km **(iii)** 8.8 km
(c) longer

2 **(a)** When the circles are filled in it means that point is included; when they are not filled in the point is not included.
(b) **(i)** \$0.98 **(ii)** \$1.47 **(iii)** \$2.45
(c) \$1.47

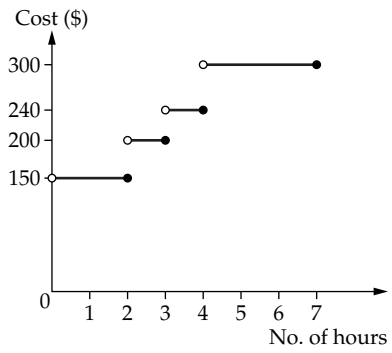
3 **(a)** £165 **(b)**



(c) Michelle will get no pounds if she has no Australian dollars.

(d) **(i)** £26 **(ii)** £89 **(iii)** £149
(e) **(i)** $152 **(ii)** $333 **(iii)** $455

4 **(a)**



(b) **(i)** $150 **(ii)** $150 **(iii)** $240
(c) $300 **(d)** The price is reduced by $60 if they hire the DJ for a half hour less.

Chapter review (p. 489)

Core

1

Number of television sets owned	*Tally*	*Frequency*
0	|||	3
1	𝍸 𝍸 |	11
2	𝍸	5
3	||	2
4	|	1
5	|	1
		23

2 **(a)** column graph **(b)** It is on the right.
(c) July **(d)** 30 cm
(e) January, February, March

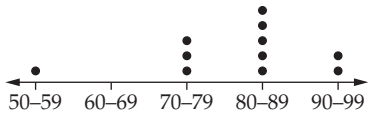
3 **(a)** horizontal column graph
(b) **(i)** 70 **(ii)** 236
(c) They go beyond the graph, the breaks in the graph also indicate this.

4 **(a)** line graph
(b) There is a gap in the scale from 0 to 6%.
(c) Missing section of scale exaggerates differences over time.
(d) 1992 **(e)** 1989 **(f)** 6% **(g)** 9%

5

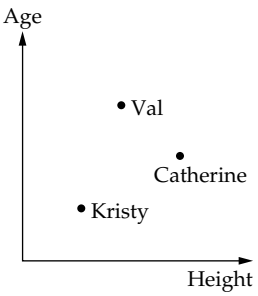
STEM	LEAF
1	1 5
2	5 7 8 9
3	2 5 7 9 9
4	1 3 5

6



7 **(a)** Kristy **(b)** Catherine
(c) Kristy, Val, Catherine
(d) Val, Catherine, Kristy

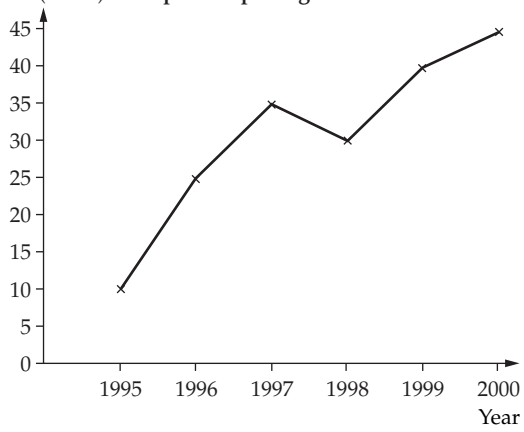
(e)



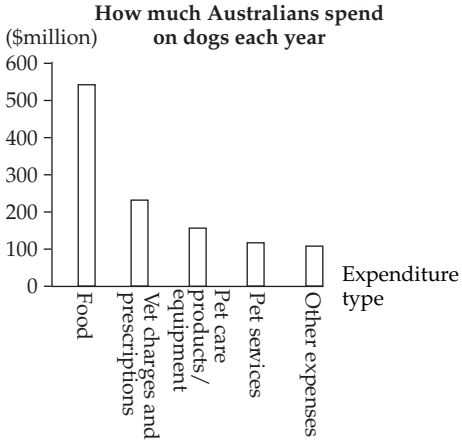
8 **(a)** *D* **(b)** *C* **(c)** *B*

Extension

9 Sales (1000s) **Beeper computer games sales**



10 **(a)** **How much Australians spend on dogs each year**



(b) A bar graph is better than a line graph here because there is no time element involved.

Replay (p. 493)

1 **(a)** 44 **(b)** 24 **(c)** 140
2 **(a)** 20 **(b)** -54 **(c)** -40
3 **(a)** -36 **(b)** 90 **(c)** 60
4 **(a)** 10, 20, 30, 40, 50 **(b)** 6, 12, 18, 24, 30
(c) 12, 24, 36, 48, 60

5 **(a)** 4, 7, 10, 13, 16, 19 **(b)** 5, 1, -3, -7, -11, -15
6 **(a)** 123° **(b)** 6° **(c)** 38°
7 **(a)** 20.37 **(b)** 78.6 **(c)** 0.0292 **8** 48 cm^2
9 **(a)** 60° **(b)** 126°, 54°, 54°
10 **(a)** $\frac{5}{28}$ **(b)** $6\frac{4}{9}$ **(c)** $-\frac{1}{18}$
11 **(a)** $9a - 3b$ **(b)** $8x$ **(c)** $20mn + 6n + 4m$
12 4000 cm^3

Mixed revision four

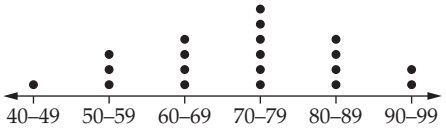
Rewind (p. 494)

Core

1 **(a)** 13 hours 40 minutes
(b) 21 hours 52 minutes
(c) 12 hours 25 minutes
2 **(a)** $12r$ **(b)** $-120ghj$ **(c)** $-\frac{4}{7y}$
3 **(a)**

STEM	LEAF
4	6
5	0 4 8
6	4 7 7 8
7	0 1 4 8 8 8
8	2 2 6 9
9	1 4

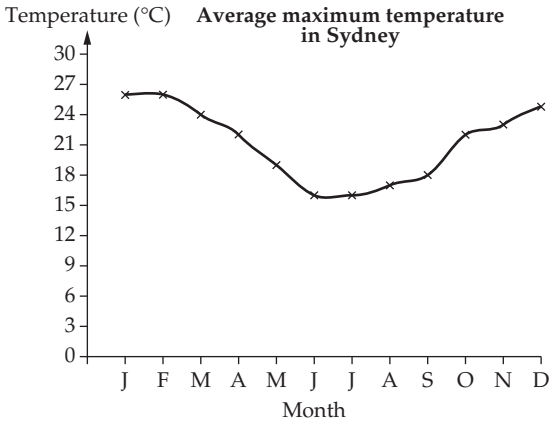
(b)



4 **(a)** -41 **(b)** -240 **(c)** -5
5 $A(2, 1)$, $B(0, -3)$, $C(-3, -1)$, $D(5, 0)$, $E(0, 0)$, $F(-5, 0)$, $G(-2, 4)$, $H(4, -2)$
6 **(a)** $4(f + 5)$ **(b)** $h(7g - 1)$ **(c)** $6m(8 + n)$
7 120 mL
8 **(a)** True **(b)** False **(c)** False
9

Height (cm)	*Frequency*
145–149	1
150–154	2
155–159	5
160–164	7
165–169	2
170–174	3
Total	**20**

10 **(a)** 165 cm^3 **(b)** 173.6 cm^3 **(c)** 64 cm^3
11 **(a)** $k = 7$ **(b)** $r = 4$ **(c)** $p = 5$
12 **(a)** $-15y$ **(b)** $19g - 3fg$ **(c)** $12x^2 + 3x - 8y - xy$
13 **(a)** 1 p.m. **(b)** 1 a.m.
14 **(a)** $7b$ **(b)** $\frac{3}{7y}$ **(c)** $\frac{7}{uv} + \frac{4d}{h}$
15 **(a)** 1700 **(b)** 0.78 **(c)** 2 500 000
16 **(a)**

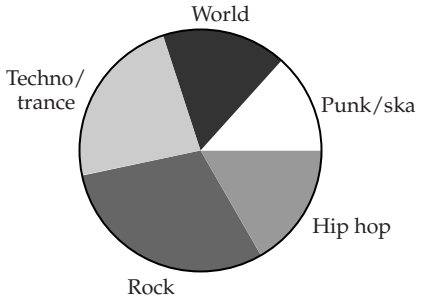


(b) January, February, December **(c)** 16°C
17 **(a)** $7m - 8mn$ **(b)** $12jk + 28k$ **(c)** $-2b + 6c$
18 1.5 kg

Extension

19 196 cm^3
20

Type of band	*Number of this type of band*	*Fraction of whole circle*	*Sector angle*
Punk/ska	4	$\frac{4}{30}$	$\frac{4}{30} \times 360° = 48°$
World	5	$\frac{5}{30}$	60°
Techno/trance	7	$\frac{7}{30}$	84°
Rock	9	$\frac{9}{30}$	108°
Hip hop	5	$\frac{5}{30}$	60°
Total	**30**	**1 ($\frac{30}{30}$)**	**360°**



21 **(a)** 1 a.m. Wednesday **(b)** 4 a.m. Sunday
22 **(a)** $q = 5$ **(b)** $t = 32$ **(c)** $x = -4$
23 80 000 litres

Appendix A

Exercise A.1 (p. 500)

1 **(a)** C = {months of the year}
(b) X = {whole numbers less than 7}
(c) P = {4, 9, 16, 25, 36}
(d) Y = {baseball, netball, football, volleyball}
(e) $7 \in A$ **(f)** Kate $\notin F$
(g) $15 \notin$ {even numbers}

(h) blue ∈ {primary colours}
(i) plate ∈ {bowl, mug, plate, saucer}
(j) 14 ∉ {13, 16, 19, 22, 25}

2 (a) Y is the set of platypus, echidna
(b) E is the set of -10, -8, -6, -4, -2
(c) F is the set of factors of 32
(d) H is the set of multiples of 6
(e) Sydney is not an element of G
(f) 100 is an element of K
(g) 2 is not an element of the set of odd numbers
(h) Kangaroo is an element of the set of marsupials
(i) Eden is an element of the set of Batemans Bay, Eden, Nowra, Wollongong
(j) 15 is not an element of 10, 20, 30, 40, 50

3 (a) $X = \{17, 19, 21, 23\}$ **(b)** $T = \{1, 2, 3, 4, \ldots, 99\}$
(c) $R = \{7, 14, 21, 28, 35, 42, 49\}$
(d) $P = \{1, 2, 4, 5, 10, 20\}$
(e) Z = {January, February, March, April, May, June, July, August, September, October, November, December}
(f) K = {Saturday, Sunday} **(g)** $J = \{a, e, i, o, u\}$
(h) F = {Adelaide, Brisbane, Canberra, Darwin, Hobart, Melbourne, Perth, Sydney}
(i) $L = \{55, 60, 65, 70, \ldots\}$
(j) S = {66, 68, 70, 72, ..., 654}

4 (a) 4 **(b)** 99 **(c)** 7 **(d)** 6 **(e)** 12 **(f)** 2 **(g)** 5 **(h)** 8

5 (a) 0 **(b)** J is a null or empty set. $J = \varnothing$

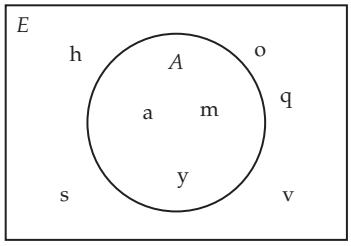
Exercise A.2 (p. 501)

1 (a) $X = Y$ **(b)** $T \leftrightarrow H$ **(c)** $W \leftrightarrow C$
(d) $Q = F$ **(e)** $T \leftrightarrow Y$ **(f)** $K = U$

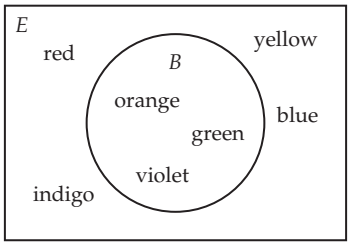
2 Many answers possible. Sets must each have 10 elements.

Exercise A.3 (p. 502)

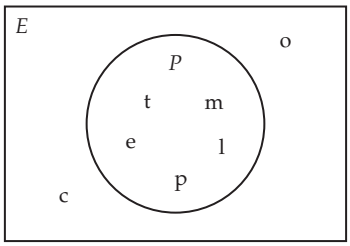
1 (a)



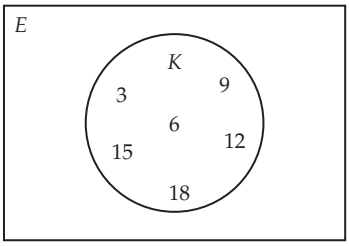
(b)



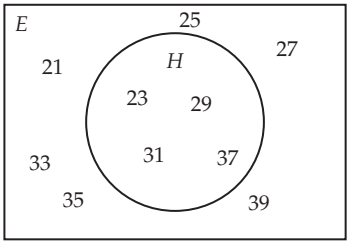
(c)



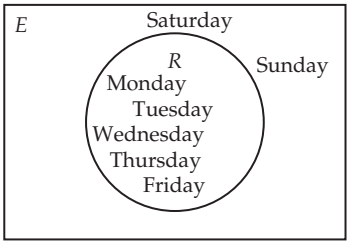
(d)



(e)

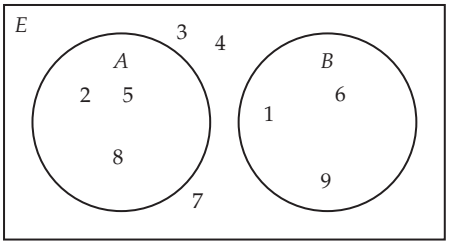


(f)

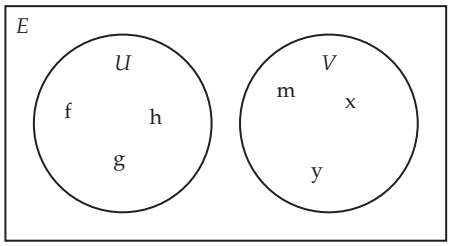


2 (a) $\overline{A}$ = {h, o, q, s, v}
(b) $\overline{B}$ = {red, yellow, blue, indigo}
(c) $\overline{P}$ = {c, n, o} **(d)** $\overline{K} = \varnothing$
(e) $\overline{H}$ = {21, 25, 27, 33, 35, 39}
(f) $\overline{R}$ = {Saturday, Sunday}

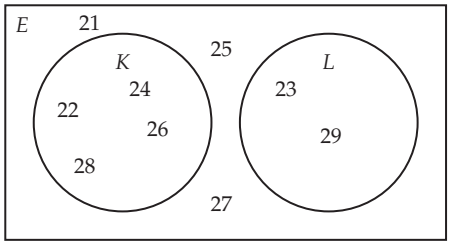
3 (a)



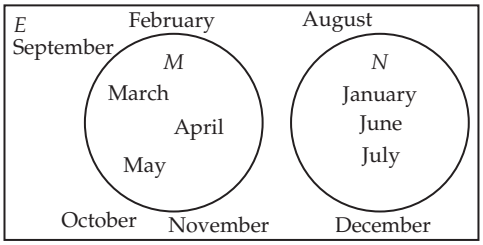
(b)



(c)



(d)

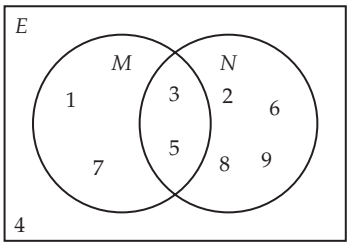


4 (a) $\overline{A} = \{1, 3, 4, 6, 7, 9\}$, $\overline{B} = \{2, 3, 4, 5, 7, 8\}$
(b) $\overline{V} = \{f, g, h\}$, $\overline{U} = \{m, x, y\}$
(c) $\overline{K} = \{21, 23, 25, 27, 29\}$,
$\overline{L} = \{21, 22, 24, 25, 26, 27, 28\}$
(d) $\overline{M}$ = {January, February, June, July, August, September, October, November, December},
$\overline{N}$ = {February, March, April, May, August, September, October, November, December}

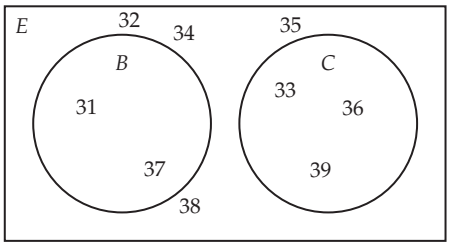
Exercise A.4 (p. 504)

1 (a) (i) $M \cup N = \{1, 2, 3, 5, 6, 7, 8, 9\}$
(ii) $\overline{M \cup N} = \{4\}$ **(iii)** $M \cap N = \{3, 5\}$
(iv) $\overline{M \cap N} = \{1, 2, 4, 6, 7, 8, 9\}$
(b) (i) $B \cup C = \{31, 33, 36, 37, 39\}$
(ii) $\overline{B \cup C} = \{32, 34, 35, 38\}$ **(iii)** $B \cap C = \varnothing$
(iv) $\overline{B \cap C} = \{31, 32, 33, 34, 35, 36, 37, 38, 39\}$
(c) (i) $J \cup K = \{a, b, e, f, i, l, t, u\}$ **(ii)** $\overline{J \cup K} = \varnothing$
(iii) $J \cap K = \{a, t\}$ **(iv)** $\overline{J \cap K} = \{b, e, f, i, l, u\}$
(d) (i) $W \cup X = \{1, 2, 4, 5, 10, 25, 50\}$
(ii) $\overline{W \cup X} = \{20, 100\}$ **(iii)** $W \cap X = \varnothing$
(iv) $\overline{W \cap X} = \{1, 2, 4, 5, 10, 20, 25, 50, 100\}$

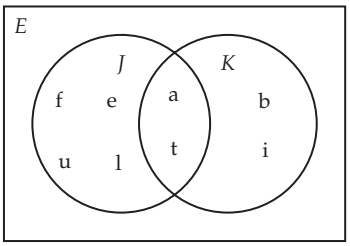
2 (a)



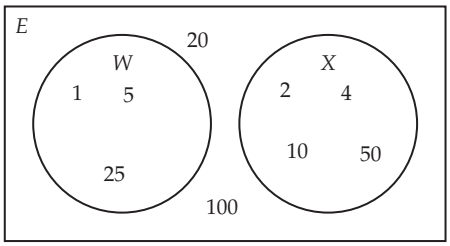
(b)



(c)



(d)



Exercise A.5 (p. 506)

1 (a) 50 **(b)** 30 **(c)** 21 **(d)** 12 **(e)** 17
(f) 8
2 (a) 40 **(b)** 22 **(c)** 28 **(d)** 72 **(e)** 32
3 (a) 48 **(b)** 48 **(c)** 79 **(d)** 54 **(e)** 127