

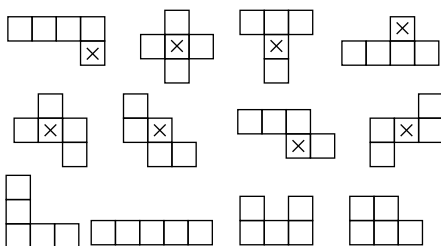
Answers

Working with unfamiliar problems: Part 1

- 1 14, 27
- 2 123456787654321
- 3 625
- 4 60
- 5 431×52
- 6 \$490
- 7 16
- 8 150°
- 9 270
- 10 discuss: e.g. count how many times 'the' appears on one page and multiply by the number of written pages in the book.
- 11 varies: e.g. 7.5 km for an average step of 75 cm
- 12 a $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 \times 9 = 100$
b many solutions e.g. $123 - 45 - 67 + 89 = 100$
- 13 2.5 cm, 75 cm (answers vary if thickness of glass considered)
- 14 \$110, \$130, \$170
- 15 7 trips
- 16 $2\frac{2}{3}$ days

Working with unfamiliar problems: Part 2

- 1 17, 26, 35, 44, 53, 62, 71, 80
- 2 60° , 155°
- 3 12, 18, 20, 24, 30, 36 and 40
- 4 12 arrangements possible, 8 open box nets















5 25

- 6 231
- 7 2520
- 8 15
- 9 4
- 10 1100 (a square of 9 coins is approximately 80 cm^2); approximately \$220
- 11 41°
- 12 7
- 13 7200°
- 14 99
- 15 e
- 16 204

Chapter 1

Exercise 1A

- 1 a Babylonian b Roman c Egyptian
- 2 a i I ii n iii e iv f
b i v ii < iii v
c i I ii V iii X iv L v C
- 3 $5 - 1 = 4$
- 4 a i III ii nni iii en|| iv eennnn||
b i vv ii <<<< iii v v
iv vv <<<<
c i II ii IX iii XXIV
iv CLVI
- 5 a i 33 ii 111 iii 213
iv 241
b i 12 ii 24 iii 71
iv 205
c i 4 ii 8 iii 16
iv 40
- 6 a XXXVI b eennnn|| c <<<< d DCLXXVIII
- 7 <<< (21)
- 8 CLXXXVIII (188)
- 9 nnnn
nnnn|| (64)

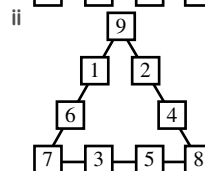
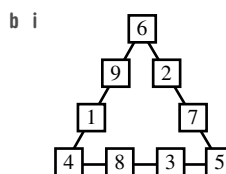
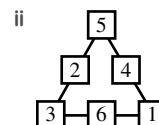
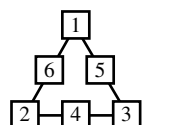
- 10 a Roman b Babylonian c Roman
- 11 a IV b IX c XIV d XIX
 e XXIX f XLI g XLIX h LXXXIX
 i XCIX j CDXLIX k CMXXII l MMMCDI
- 12 A separate picture is to be used for each 1, 10, 100 etc. The number 999 uses 27 pictures.
- 13 a i  ii   iii 
 iv   v  
 vi    
- b third position = $60 \times 60 = 3600$
 c 216 000
- 14 Answers may vary.

Exercise 1B

- 1 a hundreds b thousands c tens d ones
- 2 a 263 b 7421 c 36 015 d 100 001
- 3 a B b E c D d A
 e C f F g G
- 4 a 7 b 70 c 70 d 700
 e 700 f 7000 g 700 h 70 000
- 5 a 20 b 2000 c 200 d 200 000
- 6 a true b false c true d true
 e false f true g false h true
- 7 a $1 \times 10 + 7 \times 1$ b $2 \times 100 + 8 \times 10 + 1 \times 1$
 c $9 \times 100 + 3 \times 10 + 5 \times 1$ d 2×10
 e $4 \times 1000 + 4 \times 100 + 9 \times 10 + 1 \times 1$
 f $2 \times 1000 + 3 \times 1$ g $1 \times 10\,000 + 1 \times 1$
 h $5 \times 10\,000 + 5 \times 1000 + 5 \times 100 + 5 \times 10 + 5 \times 1$
- 8 a 347 b 9416 c 7020
 d 600 003 e 4 030 700 f 90 003 020
- 9 a 44, 45, 54, 55
 b 29, 92, 279, 729, 927
 c 4, 23, 136, 951
 d 345, 354, 435, 453, 534, 543
 e 12 345, 31 254, 34 512, 54 321
 f 1001, 1010, 1100, 10 001, 10 100
- 10 a 6 b 6 c 24
- 11 27
- 12 a $a \times 10 + b \times 1$
 b $a \times 1000 + b \times 100 + c \times 10 + d \times 1$
 c $a \times 100\,000 + a \times 1$
- 13 Position gives the place value and only one digit is needed for each place. There is also a digit for zero.
- 14 a You do not need to write the zeros.
 b i 41×10^2 ii 37×10^4 iii 2177×10^4
 c i 38 100 ii 7 204 000 iii 1 028 000 000
 d i 1×10^6 ii 1×10^9 iii 1×10^{12}
 iv 1×10^{100} v $1 \times 10^{\text{googol}}$

Exercise 1C

- 1 a add, plus, sum
 b minus, take away, difference
- 2 a 10 b 69
 c 12 d 20
- 3 a i 8 ii 27 iii 132
 b i 6 ii 16 iii 8
- 4 a true b true c true
 d false e true f false
- 5 a 18 b 19 c 32
 d 140 e 21 f 9
- 6 a 64 b 97 c 579
 d 748 e 948 f 5597
 g 378 683 h 591 579 i 201 011
- 7 a 11 b 36 c 112
 d 4 e 3111 f 10 001
- 8 a 24 b 75 c 95
 d 133 e 167 f 297
- 9 a 24 b 26 c 108
 d 222 e 317 f 5017
- 10 a 51 b 128 c 244
 d 119 e 242 f 502
- 11 a 12 b 27 c 107
 d 133 e 14 f 90
 g 1019 h 0 i 3
- 12 38 hours
- 13 107 runs
- 14 32 cows
- 15 29 marbles
- 16 107 cards
- 17 a i



- 18 a Because $3 + 9$ is more than 10, so you have to carry.
b Because $8 - 6$ is easy, but $1 - 6$ means you have to carry.

19 a $c - b = a$ b $b - a = c$

- 20 a four ways (totals are 9, 10, 11 and 12)

b Answers may vary.

21 a

6	1	8
7	5	3
2	9	4

b

10	15	8
9	11	13
14	7	12

c

15	20	13
14	16	18
19	12	17

d

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

22 29 and 58

Exercise 1D

- 1 a 17 b 101 c 144 d 110
e 1005 f 143 g 201 h 1105
- 2 a 8 b 27 c 67 d 84
e 15 f 92 g 29 h 979
- 3 a 8 b 1 c 1 d 6
e 2 f 1 g 8 h 3
- 4 a 87 b 99 c 41 d 86
e 226 f 745 g 1923 h 5080
- 5 a 161 b 225 c 2229 d 1975
- 6 a 77 b 192 c 418 d 4208
e 1223 f 1982
- 7 a 31 b 20 c 19 d 58
e 36 f 112 g 79 h 72
- 8 a 16 b 47 c 485 d 166

9 1854 sheep

10 576 kilometres

- 11 a 1821 students b 79 students

12 a

3	8
+	5 3
<hr/>	
9	1

b

1	1	4
+	7	7
<hr/>		
1	9	1

c

6	7
+	8 4 7
<hr/>	
9	1 4

13 a

6	2
-	2 8
<hr/>	
3	4

b

2	6	5
-	1	8 4
<hr/>		
8	1	

c

3	0	9	2
-	9	2	7
<hr/>			
2	1	6	5

- 14 a i 29 ii 37
b yes
c no
d The balance of $-19 + 20$ is $+1$, so add 1 to 36.

- 15 a Answers may vary.
b Different combinations in the middle column can be used to create the sum.

16 a

62	67	60
61	63	65
66	59	64

b

101	115	114	104
112	106	107	109
108	110	111	105
113	103	102	116

17 452 and 526

Exercise 1E

- 1 a 20, 24, 28 b 44, 55, 66 c 68, 85, 102
- 2 a true b true
c false d true
e true f true
g false h true
i false
- 3 a 3 b 0
c 5 d 2
- 4 a 56 b 54
c 48 d 121
e 72 f 35
g 108 h 39
- 5 a 57 b 174
c 112 d 266
e 105 f 124
g 252 h 159
- 6 a 96 b 54
c 96 d 72
- 7 a 66 b 129
c 432 d 165
e 258 f 2849
g 2630 h 31 581
- 8 a 235 b 4173
c 3825 d 29 190

9 \$264

10 1680 metres

11 116 cards

12 no

13 a

3	9
×	7
<hr/>	
2	7 3

b

2	5
×	5
<hr/>	
1	2 5

$$\begin{array}{r} 79 \\ \times 3 \\ \hline 237 \\ \hline \end{array}$$

$$\begin{array}{r} 27 \\ \times 7 \\ \hline 189 \\ \hline \end{array}$$

$$\begin{array}{r} 232 \\ \times 5 \\ \hline 1160 \\ \hline \end{array}$$

$$\begin{array}{r} 132 \\ \times 8 \\ \hline 1056 \\ \hline \end{array}$$

$$\begin{array}{r} 39 \\ \times 9 \\ \hline 351 \\ \hline \end{array}$$

$$\begin{array}{r} 314 \\ \times 7 \\ \hline 2198 \\ \hline \end{array}$$

14 12 ways

15 a 3×21

c 7×32

e $a \times 38$

b 9×52

d 5×97

f $a \times 203$

16 three ways: (0, 1), (1, 5), (2, 9). You cannot carry a number to the hundreds column.

17 a Answers may vary; e.g.

$$\begin{array}{r} 217 \\ \times 7 \\ \hline 1519 \\ \hline \end{array}$$

b Answers may vary; e.g.

$$\begin{array}{r} 295 \\ \times 3 \\ \hline 885 \\ \hline \end{array}$$

18 6, 22

Exercise 1F

1 a 2 b 0 c 0 d 4

2 a 100 b 10 c 10 000

3 a incorrect, 104

b incorrect, 546

c correct

d incorrect, 2448

4 a 400 b 290 c 1830 d 4600

e 50 000 f 63 000 g 14 410 h 29 100 000

5 a 340 b 1440 c 6440 d 22 500

e 41 400 f 460 000 g 63 400 h 9 387 000

6 a 407 b 1368 c 1890 d 9416

e 18 216 f 40 768 g 18 620 h 33 858

7 a 209 b 546 c 555 d 2178

8 \$2176

9 \$6020

10 86 400 seconds

$$\begin{array}{r} 23 \\ \times 17 \\ \hline 161 \\ 230 \\ \hline 391 \\ \hline \end{array}$$

$$\begin{array}{r} 49 \\ \times 37 \\ \hline 343 \\ 1470 \\ \hline 1813 \\ \hline \end{array}$$

$$\begin{array}{r} 143 \\ \times 13 \\ \hline 429 \\ 1430 \\ \hline 1859 \\ \hline \end{array}$$

$$\begin{array}{r} 126 \\ \times 21 \\ \hline 126 \\ 2520 \\ \hline 2646 \\ \hline \end{array}$$

12 60 480 degrees

13 One number is a 1.

14 a 39 984 b 927 908 c 4 752 188 d 146 420 482

15 a 1600 b 780 c 810 d 1000

16 a 84 000 b 3185

17 123, 117

Progress quiz

1 a $\begin{array}{c} \cap \\ \text{en} \end{array}$

b CXXXIV

2 $5 \times 10\,000 + 8 \times 100 + 6 \times 10 + 2 \times 1$

3 a 375 b 64 c 57 d 71

4 a 62 b 78

5 a 28 b 72 c 108 d 45

6 a 84 b 195

7 a 252 b 948 c 15 022

8 a 3800 b 1680 c 102 600

9 a 312 b 5072

10 a 1973 students b 77 students

Exercise 1G

1 a 2 b 3 c 7 d 12

2 a 1 b 2 c 2 d 5

3 a 1 b 1 c 5 d 5

4 a 4 b 3 c 6 d 5

e 7 f 9 g 8 h 11

5 a 21 b 19 c 19 d 41

e 29 f 21 g 302 h 98

6 a 22 b 31 c 17 d 7

7 a 26 b 1094 c 0 d 0

8 a 23 rem. 2 b 13 rem. 1 c 69 rem. 1

d 41 rem. 1 e 543 rem. 1 f 20 333 rem. 2

g 818 rem. 3 h 10 001 rem. 0

9 a 131 rem. 2 b 241 rem. 4 c 390 rem. 5

d 11 542 rem. 1

10 13 packs

- 11 124 packs
 12 a \$243 b \$27
 13 67 posts
 14 15 taxis
 15 19 trips; any remainder needs 1 more trip

16

2	9	12
36	6	1
3	4	18

- 17 a 1, 12 b 13, 7 c 4, 5
 18 \$68
 19 a a b 0 c 1
 20 8 or 23
 21 $a = b$ or $a = -b$
 22 a 33 rem. 8 b 54 rem. 8 c 31 rem. 1
 d 108 rem. 1 e 91 rem. 16 f 123 rem. 26
 23 a 3 rem. 269 b 11 rem. 5 c 18 rem. 625

24

1	6	20	56
40	28	2	3
14	5	24	4
12	8	7	10

- 25 a 37 b 43 c 75 d 91
 e 143 f 92

Exercise 1H

- 1 a up b down c up d up
 e down f down
 2 a larger b smaller c smaller d larger
 3 a 60 b 30 c 120 d 190
 e 200 f 900 g 100 h 600
 i 2000
 4 a 20 b 30 c 100 d 900
 e 6000 f 90 000 g 10 000 h 10
 5 a 130 b 80 c 150 d 940
 e 100 f 1000 g 1100 h 2600
 i 1000
 6 a 120 b 160 c 100 d 12
 e 40 f 2000 g 4000 h 100
 7 a 1200 b 6300 c 20 000 d 8 000 000
 e 5 f 16 g 10 h 25
 8 Answers may vary.
 9 ≈ 2100 scoops
 10 ≈ 1200 sheep
 11 ≈ 8 people
 12 a 200 b 100 000 c 800 d 3 000 000
 13 a i larger ii larger
 b i larger ii larger
 c i smaller ii smaller
 d i larger ii larger
 14 a i 9 ii 152 iii 10
 iv 448

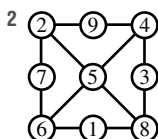
- b One number is rounded up and the other is rounded down.
 c i 3 ii 3 iii 1 iv 2
 d If the numerator is decreased, then the approximation will be smaller. If the denominator is increased then the approximation will also be smaller. If the opposite occurs the approximation will be larger.

Exercise 1I

- 1 a addition b division
 c multiplication d multiplication
 e division f addition
 g division h multiplication
 i division j subtraction
 k multiplication l division
 2 a true b false c false d true
 3 a 23 b 21 c 0 d 18
 e 32 f 2 g 22 h 22
 i 38 j 153 k 28 l 200
 4 a 10 b 3 c 2 d 22
 e 2 f 9 g 18 h 3
 i 10 j 121 k 20 l 1
 5 a 48 b 18 c 13 d 28
 e 22
 6 a 27 b 10 c 8 d 77
 e 30 f 21 g 192
 7 75 books
 8 45 TV sets
 9 a $(4 + 2) \times 3 = 18$ b $9 \div (12 - 9) = 3$
 c $2 \times (3 + 4) - 5 = 9$ d $(3 + 2) \times (7 - 3) = 20$
 e $(10 - 7) \div (21 - 18) = 1$
 f $(4 + 10) \div (21 \div 3) = 2$
 g $[20 - (31 - 19)] \times 2 = 16$
 h $50 \div (2 \times 5) - 4 = 1$
 i $(25 - 19) \times (3 + 7) \div 12 + 1 = 6$
 10 first prize \$38, second prize \$8
 11 a no b yes c no d yes
 e yes f no g no h yes
 i yes
 12 a no b yes c no d yes
 13 a b b 0 c $a + 1$ d b
 14 a Multiply by 2 and add 1.
 b Multiply by 3 and subtract 3, or subtract 1 and then multiply by 3.
 c Multiply by itself and add 1.

Problems and challenges

- 1 The two people pay \$24 each, which is \$48 in total. Of that \$48 the waiter has \$3, leaving a balance of \$45 for the bill.



3 5

4 One way is $(2 + 7) \times 11 + 4 - 3$

5 a 22 L/day b 7900 L/year

6 21, 495

Multiple-choice questions

- 1 B 2 C 3 E 4 A 5 B
6 A 7 D 8 C 9 B 10 A

Short-answer questions

- 1 a i III ii nnni iii eee nnn III
b i <<<< ii >>>> iii >>> <<<<
c i XIV ii XL iii CXLVI
- 2 a 50 b 5000 c 50 000
- 3 a 459 b 363 c 95 d 217
- 4 a 128 b 2324 c 191 d 295
- 5 a 95 b 132 c 220 d 41
e 33 f 24 g 29 000 h 10 800
i 14 678
- 6 a 1413 b 351 c 46 rem 5 d 7540 rem 2
- 7 a
$$\begin{array}{r} 2 \overline{) 23} \\ \underline{+ 73} \\ 96 \end{array}$$

b
$$\begin{array}{r} 7 \overline{) 729} \\ \underline{- 47} \\ 256 \end{array}$$

c
$$\begin{array}{r} 5 \overline{) 371} \\ \times 2 \\ \hline 3 \\ \underline{1 } \\ 1 \end{array}$$

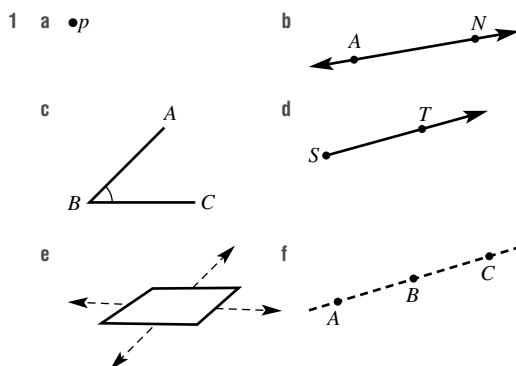
d
$$\begin{array}{r} 1 \overline{) 83} \\ 5 \overline{) 915} \\ \underline{9} \end{array}$$
- 8 a 70 b 3300 c 1000
- 9 a 800 b 400 c 5000 d 10
- 10 a 24 b 4 c 14 d 20
e 0 f 13

Extended-response questions

- 1 a 646 loads b 9044 kilometres
c \$36 430 d \$295
- 2 a 3034 sweets b 249
c liquorice sticks, 6 d yes (124)

Chapter 2

Exercise 2A



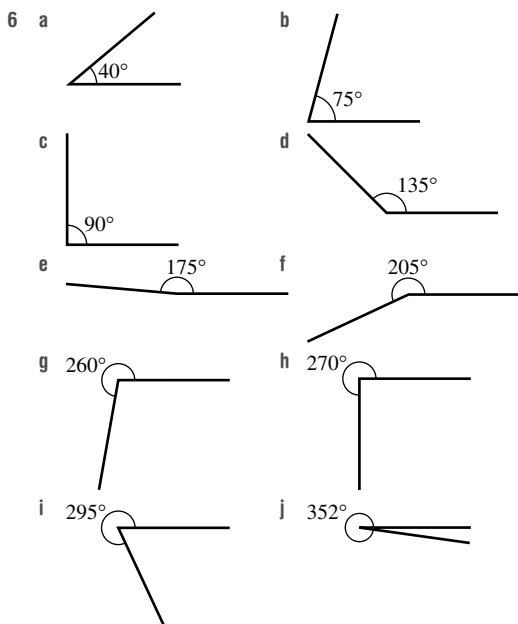
- 2 a all in a straight line
b all meet at the same point
- 3 a ray b line c segment
- 4 a line b plane c plane d point
e line f plane g line h point
- 5 a point T b line CD c angle BAC
d plane e ray PQ f segment ST
- 6 a $\angle BOC$ b $\angle BAC$ c $\angle BEA$ d $\angle AOC$
- 7 a segments AB, BC, AC, BD, CD; angles ABD, CBD, CDB, BCD
b segments PQ, PR, QR, RS, QS; angles PQS, RQS, QRS, RSQ
- 8 a C, B and D b A, C and D
- 9 a no b yes
- 10 a 8 b 14
- 11 10
- 12 Missing numbers are 0, 1, 3, 6, 10, 15. For 5 points, add 4 to the previous total; for 6 points, add 5 to the previous total, and so on.
- 13 All segments should intersect at the same point; i.e. are concurrent.
- 14 a yes b no
- 15 number of segments = $\frac{n}{2}(n-1)$

Exercise 2B

- 1 Answers may vary.
- 2 a 2 b 3 c 4
- 3 a 50° b 145° c 90°
d 250°
- 4 a acute, 40° b acute, 55°
c right, 90° d obtuse, 125°
e obtuse, 165° f straight, 180°
g reflex, 230° h reflex, 270°
i reflex, 325°

- 5 a i 20° ii 25° iii 35°
iv 40° v 35°

b $\angle AOF$ (155°)



- 7 a 29° b 55° c 35° d 130°
8 Yes, the two smaller angles make up the larger angle.
9 a 180° b 360° c 90° d 270°
e 30° f 120° g 330° h 6°
i 54° j 63° k 255° l 129°
10 a 180° b 90° c 120° d 30°
11 a i 70° ii 70° iii 90°
iv 90° v 80° vi 80°

b no

c Subtract 360° until you have a number that is less than 180° , then change the sign if it is negative.

- 12 Use the revolution to get $360^\circ - 60^\circ = 300^\circ$.
13 a 115° b 127.5° c 85° d 77.5°
e 122° f 176.5°

Exercise 2C

- 1 a, b angles should add to 90° c complementary
2 a, b angles should add to 180°
c supplementary
3 a, b angles should add to 360°
c vertically opposite angles
4 a $\angle BOC$ b $\angle AOD$ and $\angle BOC$
c $\angle COD$
5 a 60 b 15 c 135 d 70
e 40 f 115 g 37 h 240
i 130
6 a N b N c S d N
e C f C g C h S

- 7 a $EF \perp GH$ b $ST \perp UV$ c $WY \perp XY$
8 a 30 b 75 c 60 d 135
e 45 f 130
9 a No, should add to 90° . b Yes, they add to 180° .
c Yes, they add to 360° . d Yes, they are equal.
e No, they should be equal. f No, should add to 360° .
10 a 30 b 60 c 60 d 45
e 180 f 36

11 24°

- 12 a $a + b = 90$ b $a + b + c = 180$ c $a + b = 270$

13 Only one angle – the others are either supplementary or vertically opposite.

- 14 a 360° b 72 c 108

Regular shape	a	b
Triangle	120	60
Square	90	90
Pentagon	72	108
Hexagon	60	120
Heptagon	$(360 \div 7)$	$(900 \div 7)$
Octagon	45	135

Progress quiz

- 1 a G
b angle EGF or FGH or EGK or KGH and other names
c angle EGF or KGH and other names
d AD , IJ and EH
e angle ABF or angle KBD measures 125°
2 a $x = 28$ (angles in a right angle add to 90)
b $x = 75$ (angles on a straight line add to 180)
c $x = 64$ (vertically opposite)
d $x = 23$ (angles in a straight line add to 180)
e $x = 43$ (angles in a right angle add to 90)
f $x = 60$ (revolution)
g $x = 150$ (revolution)
h $x = 65$ (vertically opposite)
i $x = 270$ (revolution)
j $x = 50$ (revolution)
k $x = 115$ (angles in a straight line add to 180)
l $x = 34$ (vertically opposite)
3 a Vertically opposite angles are equal.
b 34°
c 180°

Exercise 2D

- 1 a 4 b no
2 a 2 b yes
3 a equal b supplementary
c equal d equal
4 a $\angle DEH$ b $\angle BEF$ c $\angle DEB$ d $\angle CBG$

- 5 a $\angle FEG$ b $\angle DEB$ c $\angle GEB$ d $\angle ABC$
 6 a $\angle CFG$ b $\angle BCF$
 7 a 130, corresponding b 70, corresponding
 c 110, alternate d 120, alternate
 e 130, vertically opposite f 67, vertically opposite
 g 65, cointerior h 118, cointerior
 i 100, corresponding j 117, vertically opposite
 k 116, cointerior l 116, alternate

- 8 a $a = 70, b = 70, c = 110$
 b $a = 120, b = 120, c = 60$
 c $a = 98, b = 82, c = 82, d = 82$
 d $a = 90, b = 90, c = 90$
 e $a = 95, b = 85, c = 95$
 f $a = 61, b = 119$

- 9 a No, corresponding angles should be equal.
 b Yes, alternate angles are equal.
 c Yes, cointerior angles are supplementary.
 d Yes, corresponding angles are equal.
 e No, alternate angles should be equal.
 f No, cointerior angles should be supplementary.

- 10 a 35 b 41 c 110 d 30
 e 60 f 141

- 11 a 65 b 100 c 62 d 67
 e 42 f 57 g 100 h 130
 i 59

- 12 a 12 angles b two angles

- 13 120

- 14 a i The angle marked a is alternate to the 20° angle.
 ii The angle marked b is alternate to the 45° angle.
 b i $a = 25, b = 50$ ii $a = 35, b = 41$
 iii $a = 35, b = 25$

- 15 a $a = 120, b = 120$ b 60
 c opposite angles are equal

- 16 a Both angles do not add to 180° .
 b The cointerior angles do not add to 180° .
 c Alternate angles are not equal.

- 17 a i $\angle BDE$, alternate ii $\angle BED$, alternate
 b add to 180°
 c Three inside angles of a triangle add to 180° , which is always true.

- 18 Each triangle adds to 180° , so the total is 360° .

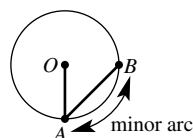
Exercise 2E

- 1 a $a = 65, b = 115$ b $a = 106, b = 106$
 c $a = 55, b = 55$
 2 a $\angle BED, a = 30$ b $\angle EBD, a = 70$
 c $\angle ADC$ or $\angle ABD, a = 50$
 3 a 60 b 120 c 115 d 123
 e 50 f 80 g 60 h 65
 i 45 j 60 k 55 l 335

- 4 a 130° b 120° c 55° d 75°
 e 90° f 75°
 5 a 50 b 150 c 60
 6 a 1 b 2 c 2
 7 a 30 b 60 c 40 d 30
 e 120 f 10
 8 a 60 b 45 c 12
 9 a 110 b 250 c 40 d 110
 e 40 f 300

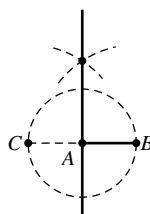
Exercise 2F

- 1 a–e

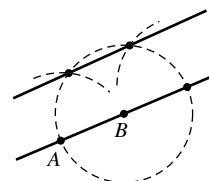


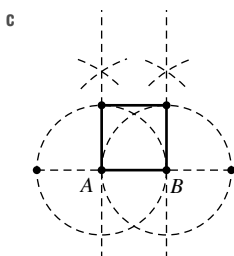
- 2 Your two circles should just touch.
 3 $\angle BAC$ and $\angle ABC$ should be equal.
 4 $\angle AEC$ should be 90° .
 5 $\angle BAD$ should be 60° .
 6 $\angle AOE$ and $\angle BOE$ should be equal.
 7 a Construct the two circles so that they have the same radius.
 b Use two circles of the same size. Point E should be the midpoint of AB .
 8 a Construct a 60° angle (see Question 4) and then bisect this angle by constructing the angle bisector to form two 30° angles (see Question 5).
 b Construct an angle bisector of one of the 30° angles from part a.
 9 a First, construct a 90° angle by constructing a perpendicular line and then construct the angle bisector of the 90° angle.
 b Construct the angle bisector of one of the 45° angles from part a.
 10 No, the circles must overlap.
 11 a Yes, follow the procedure as in Question 6.
 b Yes, construct as for an acute or obtuse angle and draw the angle bisector on the reverse side of the vertex.

- 12 a



- b





Exercise 2G

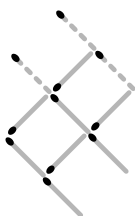
1–9 Answers may vary and can be checked by testing the properties of the constructions.

Problems and challenges

1 77.5°

2 720°

3



4 60°

5 6

Multiple-choice questions

- 1 C 2 B 3 D 4 C 5 D
6 E 7 C 8 A 9 E 10 B

Short-answer questions

- 1 a segment CD b $\angle AOB$ c point P
d plane e ray AC f line ST
- 2 a acute, 35° b obtuse, 115° c reflex, 305°
- 3 a 180° b 90° c 90° d 150°
- 4 a 20 b 230 c 35 d 41
e 15° f 38 g 60 h 120
i 30
- 5 a a° and b° b a° and d°
c a° and c° d b° and c°
e c° and d° or b° and d°
- 6 a Yes, corresponding angles are equal.
b No, alternate angles should be equal.
c No, co-interior angles should be supplementary.
- 7 a 100 b 95 c 51 d 30
e 130 f 78
- 8 a 145° b 140° c 100°
- 9 a The angle should be divided in half.
b The angle should be 90° .

Extended-response questions

- 1 a i 32° ii 32° iii 148°
iv 58°
b i corresponding ii co-interior
iii supplementary
c i 21° ii 159° iii 69°
- 2 a 12 pieces
b 30
c i 15 ii 22.5 iii 20
iv 24

Chapter 3

Exercise 3A

- 1 a M b N c F d N
e F f F g M h F
i N j M k N l F
- 2 a F b N c M d N
e N f N g N h M
i F j M k F l N
- 3 a 1, 2, 5, 10
b 1, 2, 3, 4, 6, 8, 12, 24
c 1, 17
d 1, 2, 3, 4, 6, 9, 12, 18, 36
e 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60
f 1, 2, 3, 6, 7, 14, 21, 42
g 1, 2, 4, 5, 8, 10, 16, 20, 40, 80
h 1, 2, 3, 4, 6, 12
i 1, 2, 4, 7, 14, 28
- 4 a 5, 10, 15, 20, 25, 30
b 8, 16, 24, 32, 40, 48
c 12, 24, 36, 48, 60, 72
d 7, 14, 21, 28, 35, 42
e 20, 40, 60, 80, 100, 120
f 75, 150, 225, 300, 375, 450
g 15, 30, 45, 60, 75, 90
h 100, 200, 300, 400, 500, 600
i 37, 74, 111, 148, 185, 222
- 5 a 3, 18 b 5 c 1, 4, 6, 9, 12, 24
d 3, 4, 5, 8, 12, 15, 24, 40, 120
- 6 a 22 b 162 c 21 d 117
- 7 a 24 b 1 c 1, 4, 9, 16, 25
- 8 a 12×16 b 21×15
c 12×15 d 11×11
e 12×28 or 24×14 or 21×16
f 19×26 or 38×13
- 9 a 20 min b 5 laps c 4 laps

- 10 a 25 b 0 c 23
 d 2, 7, 12, 17, 37, 47, 62, 87, 137, 287
 e 2
- 11 a false b true c false d false
 e true
- 12 a 840 b 2520
- 13 a 1, 2, 4, 5, 10, 20, 25, 50, 100
 b 1, 2, 4, 5, 10, 20, 25, 50, 100
- 14 Answers may vary, but they should be multiples of 9.
- 15 The larger number gives the reply. Any number is a multiple of its factors. So the answer is 'yes'.
- 16 Check the output each time.

Exercise 3B

- 1 a 1, 2, 4 b 4
- 2 Factors of 18 are 1, 2, 3, 6, 9 and 18.
 Factors of 30 are 1, 2, 3, 5, 6, 10, 15 and 30.
 Therefore, the HCF of 18 and 30 is 6.
- 3 a 24, 48 b 24
- 4 Multiples of 9 are 9, 18, 27, 36, 45, 54, 63, 72, 81 and 90.
 Multiples of 15 are 15, 30, 45, 60, 75, 90, 105 and 120.
 Therefore, the LCM of 9 and 15 is 45.
- 5 a 1 b 1 c 2 d 3
 e 4 f 15 g 50 h 24
 i 40 j 25 k 21 l 14
- 6 a 10 b 3 c 1 d 1
 e 8 f 12
- 7 a 36 b 21 c 60 d 110
 e 12 f 10 g 36 h 18
 i 60 j 48 k 132 l 105
- 8 a 30 b 84 c 12 d 45
 e 40 f 36
- 9 a HCF = 5, LCM = 60 b HCF = 12, LCM = 24
 c HCF = 7, LCM = 42 d HCF = 9, LCM = 135
- 10 312
- 11 9
- 12 LCM = 780, HCF = 130

- 13 a 12 min
 b Andrew 9 laps, Bryan 12 laps, Chris 6 laps
 c 3 times (including the finish)
- 14 a 8, 16 b 24, 32
- 15 1 and 20; 2 and 20; 4 and 20; 5 and 20; 10 and 20; 4 and 5; 4 and 10.
- 16 no
- 17 a 2520
 b 2520
 c Identical answers; 2520 is already divisible by 10, so adding 10 to list does not alter LCM.
 d $27\,720 (2^3 \times 5 \times 7 \times 9 \times 11)$

Exercise 3C

- 1 a not even
 b digits do not sum to a multiple of 3
 c 26 is not divisible by 4
 d last digit is not 0 or 5
 e not divisible by 3 (sum of digits is not divisible by 3)
 f 125 is not divisible by 8 and it is not even
 g sum of digits is not divisible by 9
 h last digit is not 0
- 2 a 2 b 2 c 0 d 0
- 3 3, 6 and 9
- 4 2, 5 and 10
- 5 a i yes ii no iii yes
 iv yes v no vi yes
 vii no viii yes ix no
 x yes xi no xii yes
 xiii yes xiv no xv no
 xvi yes xvii no xviii no
- 6 a 10, 15, 20, 25, 30
 b 12, 15, 18, 21, 24
 c 10, 12, 14, 16, 18
 d 12, 18, 24, 30, 36
 e 16, 24, 32, 40, 48
 f 18, 27, 36, 45, 54
 g 10, 20, 30, 40, 50
 h 12, 16, 20, 24, 28
- (other answers possible)

7

Number	Divisible by 2	Divisible by 3	Divisible by 4	Divisible by 5	Divisible by 6	Divisible by 8	Divisible by 9	Divisible by 10
243 567	X	✓	X	X	X	X	✓	X
28 080	✓	✓	✓	✓	✓	✓	✓	✓
189 000	✓	✓	✓	✓	✓	✓	✓	✓
1 308 150	✓	✓	X	✓	✓	X	✓	✓
1 062 347	X	X	X	X	X	X	X	X

- 8 a no b \$14.25
 9 2, 4, 8, 11, 22, 44
 10 200
 11 15
 12 980
 13 966
 14 a yes
 b Multiples of 3; adding a multiple of 3 does not change the result of the divisibility test for 3.
 c 18
 15 a 0, 4, 8 b 2, 6
 16 36
 17 a 11 b 9 c 7 d 5 e 3
 18 a 11, 22, 33, 44, 55, 66, 77, 88, 99
 b 0
 c 110, 121, 132, 143, 154, ...
 d equals the centre digit or 11 plus the centre digit
 e difference is 0 or 11
 f Sum the odd- and even-placed digits. If the difference between these two sums is 0 or is divisible by 11, then the number is divisible by 11.
 g i yes ii yes iii no
 iv yes v yes vi yes

Exercise 3D

- 1 no
 2 yes
 3 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
 4 4, 6, 8, 9, 10, 12, 14, 15, 16, 18
 5 101
 6 211
 7 a C b P c C d P
 e C f C g P h P
 i C j C k C l P
 m P n P o C p P
 8 a 2, 3, 7 b 3, 13 c 2, 3, 5 d 5
 e 2, 7 f 2, 3
 9 a 32, 33, 34, 35, 36, 38, 39, 40, 42, 44, 45, 46, 48, 49
 b 51, 52, 54, 55, 56, 57, 58, 60, 62, 63, 64, 65, 66, 68, 69
 c 81, 82, 84, 85, 86, 87, 88, 90, 91, 92, 93, 94, 95, 96, 98, 99
 10 a 5, 11 b 7, 13 c 11, 13 d 11, 17
 e 5, 73 f 7, 19
 11 14
 12 5 and 7, 11 and 13, 17 and 19, as well as other pairs
 13 17 and 71, as well as other pairs
 14 (5, 7, 11), as well as other groups
 15 $32 = 29 + 3$, $34 = 29 + 5$, $36 = 29 + 7$, $38 = 31 + 7$,
 $40 = 37 + 3$, $42 = 31 + 11$, $44 = 41 + 3$, $46 = 41 + 5$,
 $48 = 41 + 7$
 16 $2 + 3 = 5$ and $2 + 5 = 7$. All primes other than 2 are odd and two odds sum to give an even number that is not a prime. So any pair that sums to a prime must contain an even prime, which is 2.
 17 Check your spreadsheet using smaller primes.

Exercise 3E

- 1 E
 2 D
 3

Value	Base number	Index number	Basic numeral
2^3	2	3	8
5^2	5	2	25
10^4	10	4	10000
2^7	2	7	128
1^{12}	1	12	1
12^1	12	1	12
0^5	0	5	0

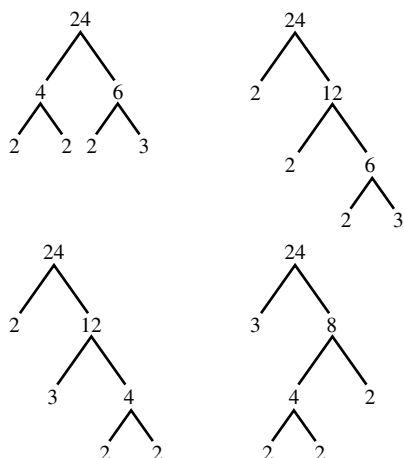
- 4 a 3^3 b 2^5 c 15^4 d 10^4
 e 6^2 f 20^3 g 1^6 h 4^3
 i 100^2
 5 a $3^2 \times 5^2$ b $2^2 \times 7^3$ c $9^2 \times 12^2$
 d $5^3 \times 8^2$ e $3^3 \times 6^3$ f $7^4 \times 13^2$
 g $4^3 \times 7^1 \times 13^1$ h $9^3 \times 10^2$ i $2^3 \times 3^2 \times 5^2$
 6 $2^6 \times 3^5 \times 5^4$
 7 a $2 \times 2 \times 2 \times 2$
 b 17×17
 c $9 \times 9 \times 9$
 d $3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$
 e $14 \times 14 \times 14 \times 14$
 f $8 \times 8 \times 8 \times 8 \times 8 \times 8 \times 8 \times 8$
 g $10 \times 10 \times 10 \times 10 \times 10$
 h $54 \times 54 \times 54$
 8 a $3 \times 3 \times 3 \times 3 \times 3 \times 2 \times 2 \times 2$
 b $4 \times 4 \times 4 \times 3 \times 3 \times 3 \times 3$
 c $7 \times 7 \times 5 \times 5 \times 5$
 d $4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 9 \times 9 \times 9$
 e $5 \times 7 \times 7 \times 7 \times 7$
 f $2 \times 2 \times 3 \times 3 \times 3 \times 4$
 g $11 \times 11 \times 11 \times 11 \times 11 \times 9 \times 9$
 h $20 \times 20 \times 20 \times 30 \times 30$
 9 a 32 b 64 c 1000 d 72
 e 10000 f 1000 g 64 h 121
 10 a 25 b 1 c 10 d 64
 e 128 f 8 g 22 h 900
 i 8
 11 a 4 b 2 c 3 d 6
 e 3 f 2 g 2 h 4
 12 a < b > c = d <
 e > f > g < h <
 13 125

- 14 a 126 b 55 min c 244, 140, 625
d 75 min e Approx. 75 000 000 000 000 000
- 15 a + b × c − d ÷
e × f −
- 16 x^y
- 17 $a = 2, b = 4$
- 18 a 1, 2, 6, 24, 120, 720
b i $2^4 \times 3^2 \times 5 \times 7$ ii $2^7 \times 3^2 \times 5 \times 7$
iii $2^7 \times 3^4 \times 5 \times 7$ iv $2^8 \times 3^4 \times 5^2 \times 7$
c 0
d 0
e It is the index number on the base 5.
i 1 ii 1 iii 3 iv 6
f e.g. $23! \times 4!$

Exercise 3F

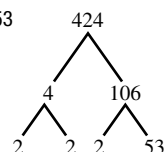
- 1 composite: 15, 8, 9, 27, 4, 12; prime: 13, 7, 5, 23, 11, 2
- 2 a 5, 4 b 6, 2 c 10, 2, 5
- 3 a 3, 3, 2, 5 b 2, 2, 2, 7 c 5, 11, 2, 2
- 4 a $2^3 \times 3^2$ b $3^4 \times 5^2$ c $2^2 \times 3 \times 7^2$
d $2^2 \times 3^2 \times 11^2$
- 5 a $2^3 \times 3^2$ b $2^3 \times 3$ c 2×19 d $2^2 \times 11$
e $2^2 \times 31$ f $2^4 \times 5$ g $2^5 \times 3$ h 2^4
i 3×5^2 j 3×37 k 2^6 l $2^3 \times 7$
- 6 a $2^3 \times 3 \times 5^2$ b $2^5 \times 5^2$ c $2^3 \times 5^4$
d $2^5 \times 3 \times 5^2$ e $2^6 \times 5^6$ f $2^3 \times 3^2 \times 5^4$
g $2^2 \times 5 \times 41$
h $2 \times 3 \times 5 \times 23$
- 7 a D b A c C d B
- 8 2310
- 9 a $144 = 2^4 \times 3^2, 96 = 2^5 \times 3$
b $\text{HCF} = 2^4 \times 3 = 48$
- 10 a $25\,200 = 2^4 \times 3^2 \times 5^2 \times 7, 77\,000 = 2^3 \times 5^3 \times 7 \times 11$
b $\text{HCF} = 2^3 \times 5^2 \times 7 = 1400$

11



- 12 i 424 cannot have a factor of 5.
ii 8 is not a prime number.

iii $\therefore 424 = 2^3 \times 53$

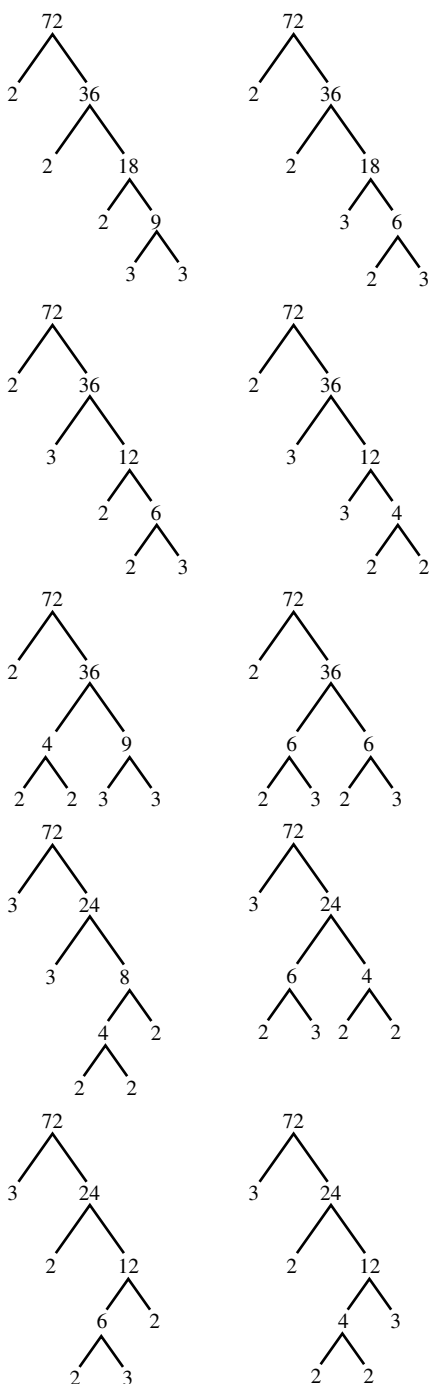


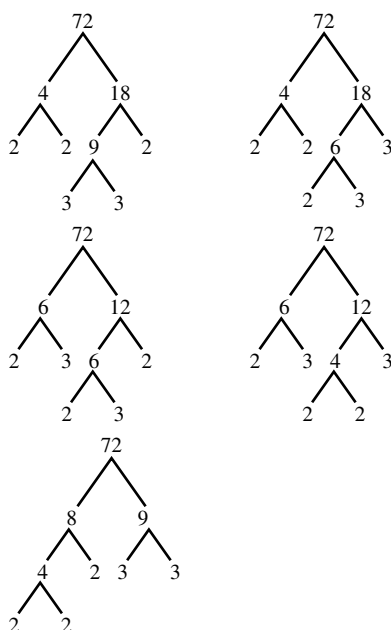
- 13 a i $5 \times 10 \neq 60$ ii 6 is not a prime number.

iii A 2 has been left off.

b $60 = 2^2 \times 3 \times 5$

14





- 15 $2 \times 3 \times 5 \times 7 = 210$ $2 \times 3 \times 7 \times 11 = 462$
 $2 \times 3 \times 5 \times 11 = 330$ $2 \times 3 \times 7 \times 13 = 546$
 $2 \times 3 \times 5 \times 13 = 390$ $2 \times 3 \times 7 \times 17 = 714$
 $2 \times 3 \times 5 \times 17 = 510$ $2 \times 3 \times 7 \times 19 = 798$
 $2 \times 3 \times 5 \times 19 = 570$ $2 \times 3 \times 7 \times 23 = 966$
 $2 \times 3 \times 5 \times 23 = 690$ $2 \times 5 \times 7 \times 11 = 770$
 $2 \times 3 \times 5 \times 29 = 870$ $2 \times 5 \times 7 \times 13 = 910$
 $2 \times 3 \times 5 \times 31 = 930$ $2 \times 3 \times 11 \times 13 = 858$

Progress quiz

- 1 a 16: 1, 2, 4, 8, 16
b 70: 1, 2, 5, 7, 10, 14, 35, 70
- 2 a 7, 14, 21, 28 b 20, 40, 60, 80
- 3 a 5 b 18
- 4 a 24 b 45
- 5 a no, last 2 digits not $\div 4$
b yes, sum of $21 \div 3$
c yes, sum of $24 \div 3$, and even $\div 2$
d yes, sum of $27 \div 9$
- 6 2, 3, 4, 5, 6, 10, 12, 20, 24, 30, 40, 60, 120
- 7 a C: large number of factors
b N: only one factor
c P: only two factors, 1 and itself
d N
- 8 a 5, 7
b 2, 3
- 9 a 5^4
b $3^2 \times 7^5$

- 10 a $3 \times 3 \times 3 \times 3 = 81$
b $1 \times 1 \times 1 \times 1 \times 3 \times 3 = 9$
c $5 \times 10 \times 10 \times 10 \times 10 = 50\,000$
d $4 \times 4 = 16$
e $9 \times 9 - 3 \times 3 \times 3 \times 2 = 81 - 54 = 27$

- 11 a $24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$
b $180 = 2^2 \times 3^2 \times 5$

Exercise 3G

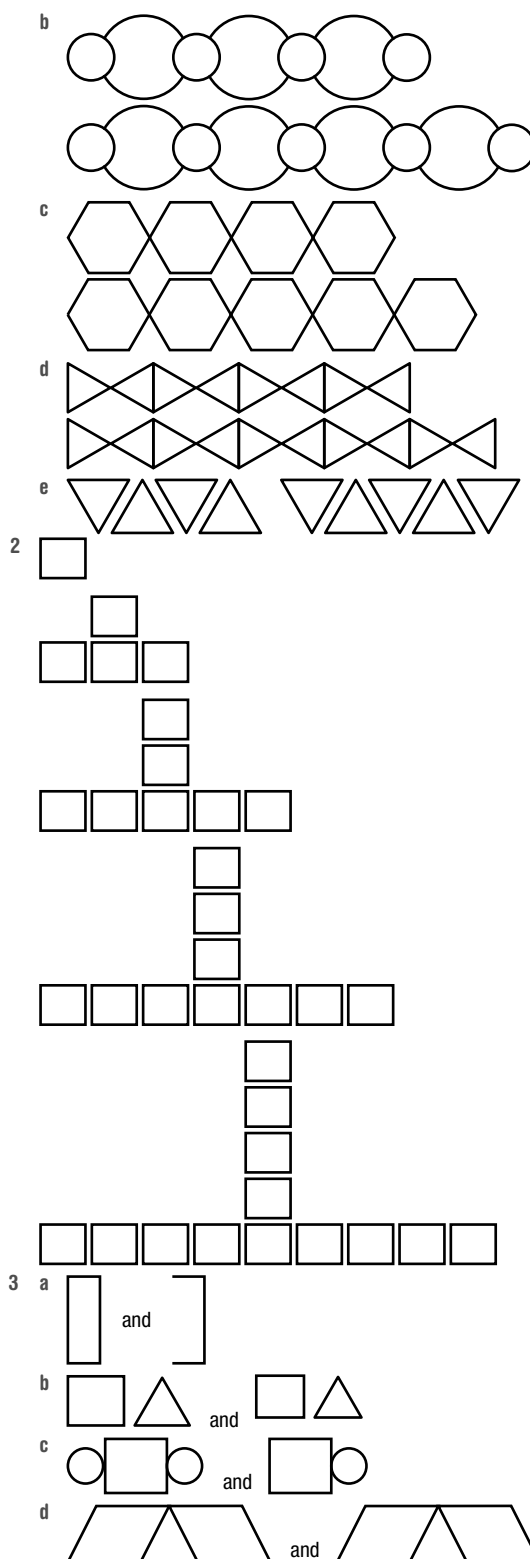
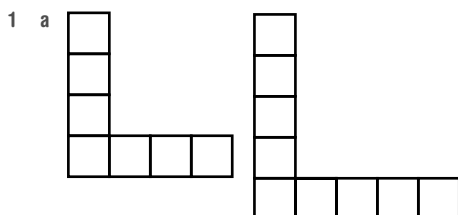
- 1 36 cm^2 , a square number
- 2 $1^2 = 1, 2^2 = 4, 3^2 = 9, 4^2 = 16, 5^2 = 25, 6^2 = 36, 7^2 = 49, 8^2 = 64, 9^2 = 81, 10^2 = 100, 11^2 = 121, 12^2 = 144, 13^2 = 169, 14^2 = 196, 15^2 = 225$
- 3 a A square is not possible.
b draw a 4 by 4 square
- 4 a 36 b 25 c 121 d 100
e 49 f 144
- 5 a 5 b 4 c 10 d 7 cm
- 6 a 64 b 49 c 1 d 144
e 9 f 225 g 25 h 0
i 121 j 10\,000 k 289 l 1089
- 7 a 5 b 3 c 1 d 11
e 0 f 9 g 7 h 4
i 2 j 12 k 20 l 13
- 8 a 50 b 80 c 90 d 27
- 9 a 30 b 64 c 65 d 36
e 4 f 0 g 81 h 4
i 13
- 10 64, 81, 100
- 11 121, 144, 169, 196
- 12 a 4 and 81 b 36 and 121; other answers possible
- 13 1, 9 and 49
- 14 a 144 b 144 c $a = 3, b = 4$
d Answers may vary; e.g. $4^2 \times 5^2$ and 20^2
- 15 a $3^2 + 4^2 = 9 + 16 = 25$ b 10^2
c 15^2 d 50^2
- 16 a 121 and 12\,321 b 1\,234\,321
c 1\,234\,321
- 17 no, $9^2 = 81$
- 18 a false b false c true
d true e true (if $a \geq 0$) f false
g false h false




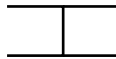
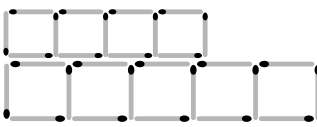
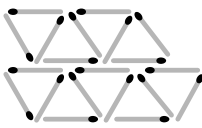
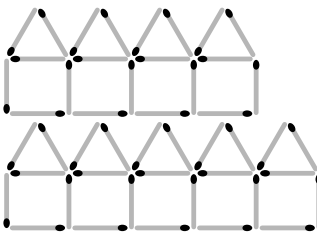
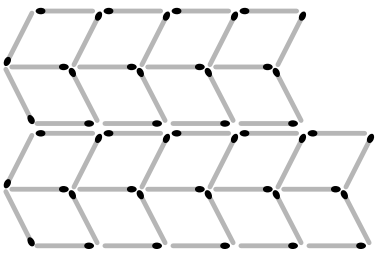
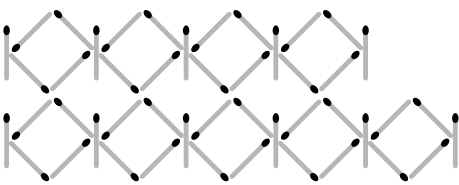
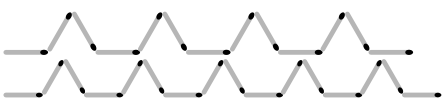
Exercise 3H

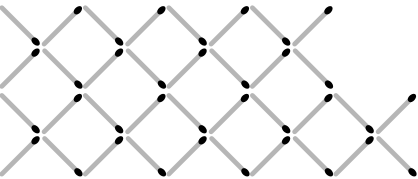
- 1 a 8, 11, 14, 17, 20 b 32, 31, 30, 29, 28
c 52, 48, 44, 40, 36 d 123, 130, 137, 144, 151
- 2 a 3, 6, 12, 24, 48 b 5, 20, 80, 320, 1280
c 240, 120, 60, 30, 15 d 625, 125, 25, 5, 1

- 3 a ratio of 3
c difference adding 11
e ratio of $\frac{1}{2}$
g neither
- 4 a 23, 28, 33
c 14, 11, 8
e 27, 18, 9
g 505, 606, 707
- 5 a 32, 64, 128
c 12, 6, 3
e 176, 352, 704
f 70 000, 700 000, 7 000 000
g 16, 8, 4
h 76, 38, 19
- 6 a 50, 32, 26
c 32, 64, 256
e 55, 44, 33
g 70, 98, 154
- 7 a 17, 23, 30
c 36, 49, 64
e 17, 19, 23
g 5, 7, 6
- 8 a 49, 64, 81; square numbers
b 21, 34, 55; Fibonacci
c 216, 343, 512; cubes (i.e. powers of 3)
d 19, 23, 29; primes
e 16, 18, 20; composite
f 161, 171, 181; palindromes
- 9 a 115, 121, 128
c 42, 41, 123
- 10 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 (total = 55)
- 11 a 39
c 110
- 12 1, 0, 0, 1, 2
- 13 difference is 0, ratio is 1, Jemima
- 14 a 55 b 100 c 2485 d 258
- 15 a 3 b 10 c 45 d 276
e $n \times (n - 1) \div 2$
- 16 a 135 b 624 c 945

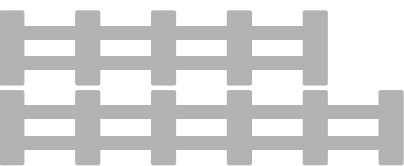
Exercise 3I



- e  and 
- f  and 
- 4 a i 
 ii 4, 7, 10, 13, 16
 iii 4 sticks are required to start, then 3 are added
 b i 
 ii 3, 5, 7, 9, 11
 iii 3 sticks are required at the start, then 2 are added
 c i 
 ii 6, 11, 16, 21, 26
 iii 6 sticks are required to start, then 5 are added
 d i 
 ii 7, 12, 17, 22, 27
 iii 7 sticks are required to start, then 5 are added
 e i 
 ii 6, 11, 16, 21, 26
 iii 6 sticks are required to start, then 5 are added
 f i 
 ii 4, 7, 10, 13, 16
 iii 4 sticks are required to start, then 3 are added

- 5 a 
 b

No. of crosses	1	2	3	4	5
No. of sticks required	4	8	12	16	20

 c Number of sticks = $4 \times$ number of crosses
 d 80 sticks
 6 a 
 b


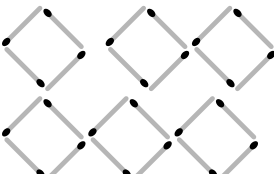



No. of fence sections	1	2	3	4	5
No. of planks required	4	7	10	13	16

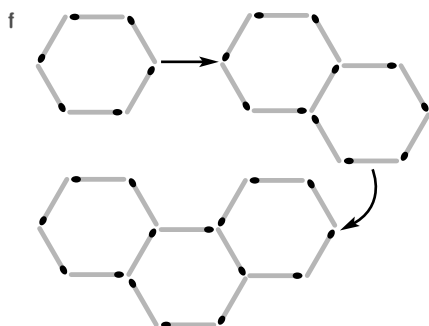
 c Number of planks = $3 \times$ number of fence sections + 1
 d 61 planks
 7 a

No. of tables	1	2	3	4	5
No. of students	5	8	11	14	17

 b Number of students = $3 \times$ number of tables + 2
 c 23 students
 d 21 tables
 8 a

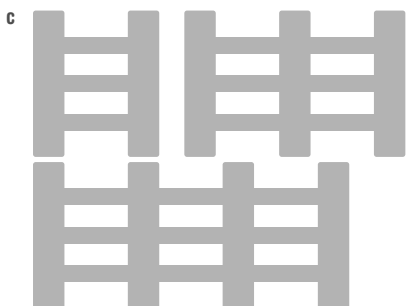
Spa length	1	2	3	4	5	6
No. of tiles	8	10	12	14	16	18

 b Number of tiles = $2 \times$ spa length + 6
 c 36 tiles
 d 12 units
 9 A
 10 A
 11 Answers may vary.
 a 
 b 
 c 
 d 
 e 



12 a 5 b 41 c $4g + 1$ d 16

13 a $m + n$
b number of pieces for each new panel



14 b

No. of straight cuts	1	2	3	4	5	6	7
No. of sections created	2	4	7	11	16	22	29

c 56
d 211

Exercise 3J

1 a true b false c true d true
2 C
3 B
4 a A b D c B d C

5 a

input	4	5	6	7	10
output	7	8	9	10	13

b

input	5	1	3	21	0
output	10	2	6	42	0

c

input	11	18	9	44	100
output	3	10	1	36	92

d

input	5	15	55	0	100
output	1	3	11	0	20

6 a

input	1	2	3	4	5
output	7	17	27	37	47

b

input	6	8	10	12	14
output	7	8	9	10	11

c

input	5	12	2	9	0
output	16	37	7	28	1

d

input	3	10	11	7	50
output	2	16	18	10	96

7 a $output = input + 1$ b $output = 4 \times input$
c $output = input + 11$ d $output = input \div 6$

8 $output = 3 \times input$

9 $output = input - 9$

10 a

input	3	6	8	12	2
output	7	34	62	142	2

b

input	6	12	1	3	8
output	5	3	25	9	4

c

input	5	12	2	9	0
output	30	156	6	90	0

d

input	3	10	11	7	50
output	15	190	231	91	4950

11 a

input	c	d	$2p$	b^2	www
output	$c + 6$	$d + 6$	$2p + 6$	$b^2 + 6$	$www + 6$

b

input	t	k	p^2	$2f$	ab
output	$3t - 2$	$3k - 2$	$3p^2 - 2$	$6f - 2$	$3ab - 2$

12

input	b	d	e	g^2	mn	x	c	0	1
output	bc	cd	ec	g^2c	cmn	xc	c^2	0	c

$output = c \times input$

13 a $output = 2 \times input + 1$; $output = 3 \times input - 2$

b infinite

14 a i $output = 2 \times input - 3$

ii $output = 4 \times input + 1$

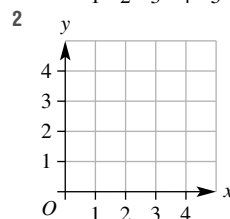
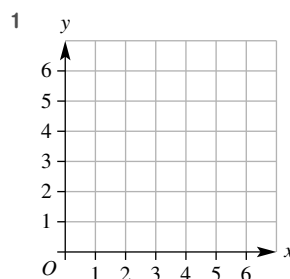
iii $output = 5 \times input - 1$

iv $output = input \div 6 + 2$

v $output = 10 \times input + 3$

vi $output = 4 \times input - 4$

Exercise 3K



3 C

4 C

5 a x-axis

b y-axis

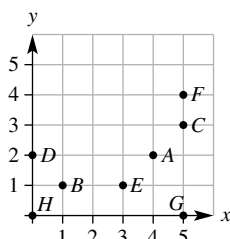
c origin

d first

e y-coordinate

f x, y, x, y

6



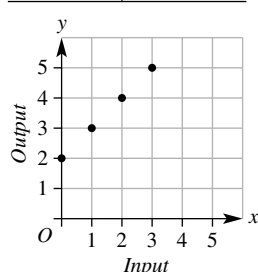
7 a $A(1, 4), B(2, 1), C(5, 3), D(2, 6), E(4, 0), F(6, 5), G(0, 3), H(4, 4)$

b $M(1, 2), N(3, 2), P(5, 1), Q(2, 5), R(2, 0), S(6, 6), T(0, 6), U(5, 4)$

8 a

input (x)	output (y)
0	2
1	3
2	4
3	5

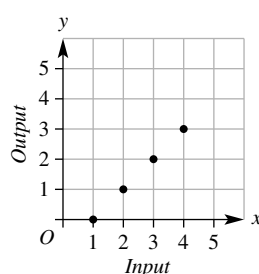
b



9 a

input (x)	output (y)
1	0
2	1
3	2
4	3

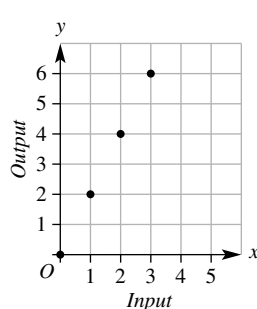
b



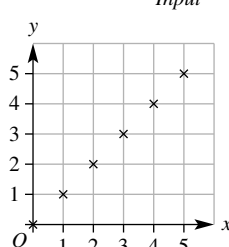
10 a

input (x)	output (y)
0	0
1	2
2	4
3	6

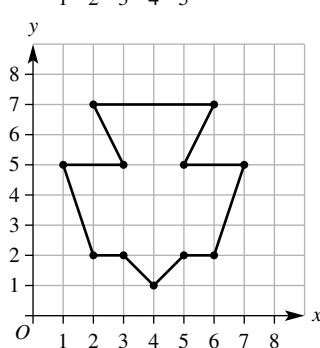
b



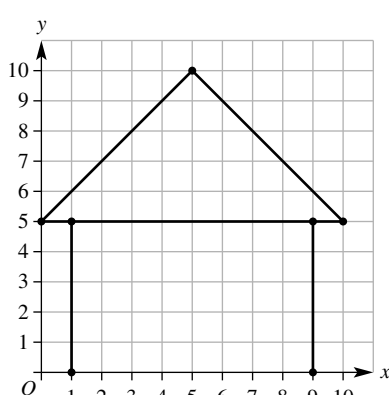
11



12



13 a



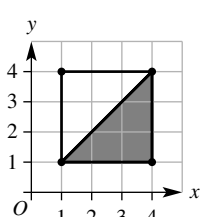
b $(4, 0), (4, 3), (6, 3), (6, 0)$, but answers may vary.

c Answers may vary.

d Answers may vary.

14 a $B(1, 4), C(4, 4), D(4, 1)$

b



- 15 a HELP
 b (4, 4), (5, 1), (3, 1), (3, 4), (5, 1), (5, 4)
 c key under pot plant
 d 21510032513451001154004451255143
- 16 a $D(4, 5)$ b $D(4, 1)$ c $D(0, 0)$ d $D(1, 5)$
- 17 a $\text{output} = \text{input} + 2$
 b $\text{output} = \text{input} \times 3$
 c $\text{output} = \text{input} \div 2$
- 18 a (3, 6) or any with $x = 3$
 b any point on a vertical line with $x = 3$
 c (3, 5)
- 19 a $M(3, 2)$
 b (1, 2)
 c Find the average of the x values, then the average of the y values.
 d (4, 2)
 e (2.5, 3.5)
 f $(-0.5, -0.5)$
 g (5, 3)

Problems and challenges

- 1 101
- 2 a 28 (1, 2, 4, 7, 14)
 b 1, 2, 4, 8, 16, 31, 62, 124, 248
- 3 a 18 tulips per bunch
 b 7 red, 6 pink and 8 yellow bunches
- 4 $14 + 18 = 32$
- 5 $5^2 = 4^2 + 9$, $6^2 = 5^2 + 11$
- 6 Answers may vary. Check that the answer is the whole number that you are looking for.
- 7 602
- 8 1, 5, 7, 11, 13, 17, 19, 23, 25, 29, 31, 35

Multiple-choice questions

- 1 B 2 E 3 C 4 E 5 B
 6 B 7 D 8 A 9 C 10 E
 11 B 12 D

Short-answer questions

- 1 a 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 24,
30, 40, 60, 120
 b For example, 1200, 1440, 1800
- 2 a 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, 88, 96, 7, 14, 21,
 28, 35, 42, 49, 56, 63, 70, 77, 84
 b 7, 13
- 3 a i 5 ii 2 iii 24
 b i 65 ii 18 iii 88
- 4 a composite 21, 30, 16; prime 11, 7, 3, 2
 b only one, 13

- 5 a 2, 5, 7, 11 b 30, 42, 70
- 6 a 6^8 b $5^4 \times 2^5$
- 7 a 2^5 b $2^3 \times 5^2$ c $3^2 \times 5^2$
- 8 a 10 b 3 c 4
- 9 a 16 b 7 c 397 d 131
- 10 a no b yes c no
- 11 a

Number	Divisible by 2	Divisible by 3	Divisible by 4	Divisible by 5
84 539 424	✓	✓	✓	✗

Number	Divisible by 6	Divisible by 8	Divisible by 9	Divisible by 10
84 539 424	✓	✓	✗	✗

Explanation:

84 539 424 is an even number, therefore is divisible by 2.

84 539 424 has a digit sum of 39, therefore is divisible by 3, but not by 9.

84 539 424 is divisible by 2 and 3, therefore is divisible by 6.

The last two digits are 24, which is divisible by 4.

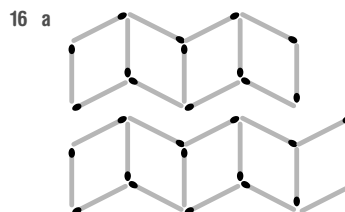
The last three digits are 424, which is divisible by 8.

The last digit is a 4, therefore not divisible by 5 or 10.

b many possible answers

c Any six-digit number ending in 0 with sum of digits = 243.

- 12 a 5 b 50 c 13 d 18
 e 14 f 20
- 13 a 36, 39, 42 b 43, 35, 27 c 112, 70, 28
- 14 a 280, 560, 1120 b 900, 300, 100 c 100, 2500, 6250
- 15 a 168, 51, 336, 46, 672, 41
 b 212, 307, 421, 554, 706, 877



No. of rhombuses	1	2	3	4	5
No. of sticks required	4	7	10	13	16

- c Four sticks are required to start the pattern, and an additional three sticks are required to make each next term in the pattern.

- 17 a 5 b 32 c $3g + 2$
 d 21 windows

input	3	5	7	12	20
output	8	10	12	17	25

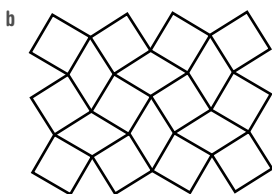
input	4	2	9	12	0
output	15	11	25	31	7

- 19 a $output = input + 9$
 b $output = 12 \times input + 8$
 c $output = 2 \times input + 1$
 d $output = 10 - input$
- 20 a $A(1, 3), B(3, 4), D(2, 1)$
 b $C(4, 2)$
 c $E(5, 0)$

Extended-response questions

- 1 a area = $3^3 \times 5^3 \text{ cm}^2$, perimeter = $2 \times 3^3 + 2 \times 5^3 \text{ cm}$
 b area = 16^3 or 4^6 or 2^{12} , perimeter = 16^2 or 4^4 or 2^8
 c $a^4 \times c^2$
 d 16^2 or 4^4 or 2^8
 e 3^x

- 2 a i 1 ii 2



Rows	1	2	3	4	5	6
Desks per row	4	4	4	4	4	4
Total no. of desks	4	8	12	16	20	24
Total no. of rhombuses	0	3	6	9	12	15

- d Number of rhombuses = $3 \times (\text{number of rows} - 1)$
 $= 3(n - 1)$

Rows	1	2	3	4	5	6	7	8
Desks per row	5	5	5	5	5	5	5	5
Total desks	5	10	15	20	25	30	35	40
Rhombuses	0	4	8	12	16	20	24	28

Rows	1	2	3	4	5	6	7	8
Desks per row	6	6	6	6	6	6	6	6
Total desks	6	12	18	24	30	36	42	48
Rhombuses	0	5	10	15	20	25	30	35

Rows	1	2	3	4	5	6	7	8
Desks per row	7	7	7	7	7	7	7	7
Total desks	7	14	21	28	35	42	49	56
Rhombuses	0	6	12	18	24	30	36	42

Rows	1	2	3	4	5	6	7	8
Desks per row	8	8	8	8	8	8	8	8
Total desks	8	16	24	32	40	48	56	64
Rhombuses	0	7	14	21	28	35	42	49

- f No. of rhombuses = $(\text{no. of desks} - 1) \times (\text{no. of rows} - 1)$
 $= (d - 1)(n - 1)$

- g 10 201 desks

- 3 a 36, 49, 64; square the counting numbers
 b 125, 216, 343; cube of the counting numbers

- c (4, 6), (5, 7), (6, 8); each y value is 2 more than the x value
 d 31, 31, 30; days of the month in a leap year
 e $\sqrt{5}, \sqrt{6}, \sqrt{7}$; square root of the counting numbers
 f 7, 64, 8; two sequences: 1, 2, 3, 4, ... and 1, 2, 4, 8, 16, ...

Chapter 4

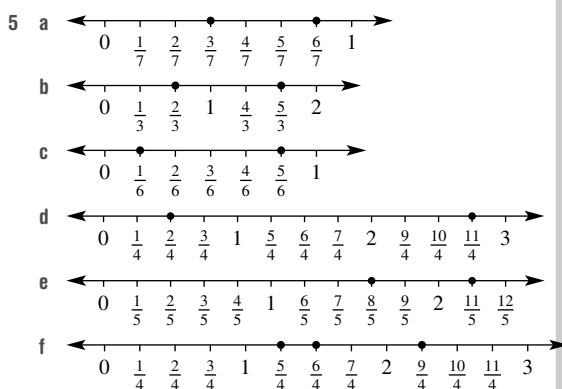
Exercise 4A

- 1 a 9 b 7

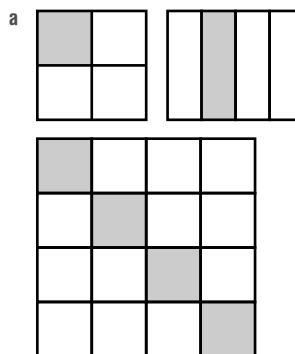
- 2 proper: b, e, f, g
 improper: a, c, h, i, k, l
 whole numbers: d, j, k

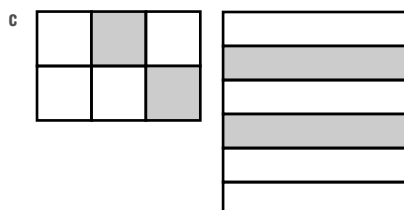
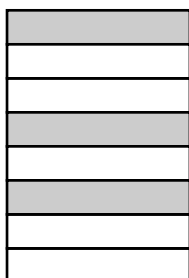
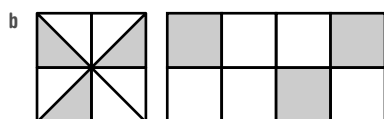
- 3 A a 4 b 1 c i 4 ii 1 iii $\frac{1}{4}$
 B a 8 b 7 c i 8 ii 7 iii $\frac{7}{8}$
 C a 3 b 2 c i 3 ii 2 iii $\frac{2}{3}$
 D a 12 b 5 c i 12 ii 5 iii $\frac{5}{12}$

- 4 d, g, j, l, m



- 6 Answers may vary.





7 a $\frac{7}{5}, \frac{8}{5}, \frac{9}{5}$ b $\frac{9}{8}, \frac{10}{8}, \frac{11}{8}$

c $\frac{5}{3}, \frac{6}{3}, \frac{7}{3}$ d $\frac{7}{7}, \frac{6}{7}, \frac{5}{7}$

e $\frac{5}{2}, \frac{3}{2}, \frac{1}{2}$ f $\frac{23}{4}, \frac{28}{4}, \frac{33}{4}$

8 a $\bigcirc = 1\frac{1}{2}, \frac{3}{2}; \square = 3\frac{1}{2}, \frac{7}{2}; \triangle = 5, \frac{10}{2}$

b $\bigcirc = \frac{1}{5}; \square = \frac{4}{5}; \triangle = 2\frac{1}{5}, \frac{11}{5}$

c $\triangle = \frac{3}{7}; \square = 1\frac{4}{7}, \frac{11}{7}; \bigcirc = 2\frac{2}{7}, \frac{16}{7}$

d $\square = 3\frac{1}{3}, \frac{10}{3}; \triangle = 3\frac{2}{3}, \frac{11}{3}; \bigcirc = 4\frac{2}{3}, \frac{14}{3}$

9 division

10 a $\frac{6}{11}$ b $\frac{4}{8} = \frac{1}{2}$ c $\frac{7}{12}$ d $\frac{5}{6}$

e $\frac{3}{12} = \frac{1}{4}$ f $\frac{5}{9}$

11 a $\frac{12}{43}$ b $\frac{13}{15}$ c $\frac{11}{12}$ d $\frac{1}{12}$

e $\frac{2}{11}$ f $\frac{144}{475}$ g $\frac{7}{20}$ h $\frac{1}{4}$

i $\frac{3}{7}$

12 Proper fraction: When you have part of a whole, and therefore you have a numerator that is smaller than the denominator. Improper fraction: It is called improper because

it is impossible to break a whole into parts and end up with more than a whole. An improper fraction is when the numerator is greater than the denominator.

13 c

14 a i $\frac{1}{5}$ ii 50 mL

b i 40 mL ii $\frac{4}{25}$

c i 32 mL ii $\frac{16}{125}$

d i 90 mL ii $\frac{9}{25}$

e i 122 mL ii $\frac{61}{125}$

f Approximately, yes they will.

Exercise 4B

1 $\frac{3}{6}, \frac{2}{4}, \frac{11}{22}, \frac{5}{10}$

2 $\frac{4}{10}, \frac{16}{40}, \frac{2}{5}, \frac{80}{200}$

3 a 2, 12, 10, 20, 300

b 1, 3, 24, 20, 40

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

c $\frac{2}{3}$ d $\frac{3}{4}$

5 a 10, 10, 10, 1

b 2, 2, 2, 2

c 4, 4, 4, 7

d 3, 3, 3, 3, 5

6 Answers may vary.

a $\frac{2}{4}, \frac{3}{6}, \frac{4}{8}, \frac{10}{20}$

b $\frac{2}{8}, \frac{3}{12}, \frac{4}{16}, \frac{10}{40}$

c $\frac{4}{10}, \frac{6}{15}, \frac{8}{20}, \frac{10}{25}$

d $\frac{6}{10}, \frac{12}{20}, \frac{24}{40}, \frac{48}{80}$

e $\frac{4}{18}, \frac{6}{27}, \frac{8}{36}, \frac{20}{90}$

f $\frac{6}{14}, \frac{9}{21}, \frac{12}{28}, \frac{30}{70}$

g $\frac{10}{24}, \frac{50}{120}, \frac{500}{1200}, \frac{5000}{12000}$

h $\frac{6}{22}, \frac{9}{33}, \frac{12}{44}, \frac{30}{110}$

7 a 9

b 50

c 33

d 56

e 8

f 2

g 12

h 39

i 35

j 200

k 105

l 2

8 a \neq

b $=$

c \neq

d \neq

e $=$

f $=$

g $=$

h $=$

i $=$

9 a $\frac{3}{4}$

b $\frac{2}{3}$

c $\frac{1}{3}$

d $\frac{4}{11}$

e $\frac{2}{5}$

f $\frac{1}{11}$

g $\frac{1}{7}$

h $\frac{1}{3}$

i $\frac{7}{9}$

j $\frac{3}{8}$

k $\frac{5}{6}$

l $\frac{5}{1} = 5$

10 a $\frac{7}{14} = \frac{1}{2}$ b $\frac{12}{16} = \frac{3}{4}$ c $\frac{4}{42} = \frac{2}{21}$ d $\frac{7}{63} = \frac{1}{9}$

11 $\frac{2}{9}$

12 a 35

b 45

c 30

d 24

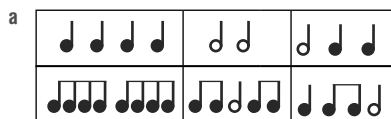
13 Justin 4, Joanna 3, Jack 5

14 a 75

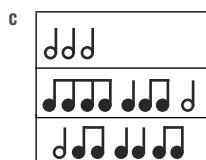
b $\frac{1}{3}$

c 150

- 15 Answers may vary; $\frac{6}{10}$
 16 Answers may vary.



b 12 quavers (eighth notes) to a bar



d

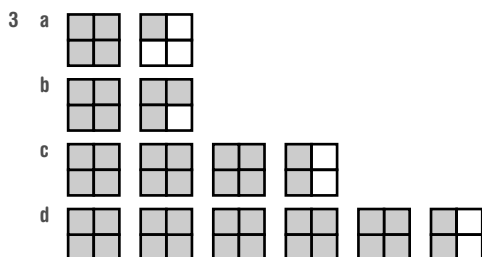
Note	British name / American name	Rest
	Breve / Double whole note	
	Semibreve / Whole note	
	Minim / Half note	
	Crotchet / Quarter note	
	Quaver / Eighth note <small>For notes of this length and shorter, the note has the same number of flags (or hooks) as the rest has branches.</small>	
	Semiquaver / Sixteenth note	

e Each dot increases the length of the note by another 50%.

e.g. $\text{D} \bullet = \frac{3}{4}$ note (value = 3 beats)
 = half note + 50%
 = half note + quarter note

Exercise 4C

- 1 a 2 and 3 b 11 and 12 c 36 and 37
 2 a 24 b 360 c 60 d 24



- 4 a 8 b 12 c 28 d 44
 e 17 f 7 g 10 h 24

5 a $A 7\frac{1}{2}$, $B 10\frac{1}{2}$

b $C 1\frac{2}{3}$, $D 2\frac{1}{3}$, $E 4\frac{2}{3}$

c $F 23\frac{1}{5}$, $G 24\frac{2}{5}$, $H 25\frac{4}{5}$, $I 26\frac{1}{5}$

6 a $\frac{11}{5}$ b $\frac{8}{5}$ c $\frac{10}{3}$ d $\frac{17}{3}$

e $\frac{29}{7}$ f $\frac{24}{7}$ g $\frac{5}{2}$ h $\frac{13}{2}$

i $\frac{14}{3}$ j $\frac{34}{3}$ k $\frac{42}{5}$ l $\frac{103}{10}$

m $\frac{55}{9}$ n $\frac{25}{9}$ o $\frac{42}{8}$ p $\frac{21}{8}$

q $\frac{23}{12}$ r $\frac{38}{11}$ s $\frac{53}{12}$ t $\frac{115}{12}$

u $\frac{115}{20}$ v $\frac{803}{100}$ w $\frac{643}{10}$ x $\frac{104}{5}$

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

e $3\frac{2}{3}$ f $4\frac{1}{5}$ g $2\frac{2}{7}$ h $2\frac{1}{2}$

i $1\frac{5}{7}$ j $3\frac{1}{6}$ k $6\frac{2}{3}$ l $10\frac{1}{4}$

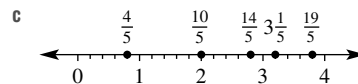
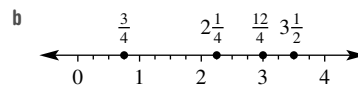
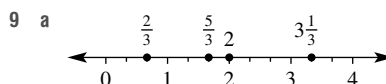
m $4\frac{3}{8}$ n $5\frac{1}{5}$ o $6\frac{6}{7}$ p $13\frac{2}{3}$

q $3\frac{1}{12}$ r $7\frac{4}{11}$ s $9\frac{3}{10}$ t $11\frac{1}{7}$

u $2\frac{31}{100}$ v $33\frac{3}{10}$ w $12\frac{3}{11}$ x $12\frac{5}{12}$

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

e $1\frac{1}{8}$ f $3\frac{1}{3}$ g $2\frac{2}{3}$ h $2\frac{2}{5}$



10 a $2\frac{1}{3}$, $3\frac{2}{3}$, 4

b $1\frac{4}{7}$, $2\frac{1}{7}$, $3\frac{4}{7}$, $3\frac{6}{7}$

c $2\frac{2}{5}$, $4\frac{1}{5}$, $4\frac{4}{5}$, $6\frac{1}{5}$

- 11 a 15 b $1\frac{7}{8}$ c 9 d $1\frac{1}{8}$
 12 a 11 b 9 c $4x - 1$
 d $3y - 1$ e mn
 13 a i $1\frac{2}{3}, 2\frac{1}{3}, 3\frac{1}{2}$ ii $1\frac{5}{6}$
 b i $2\frac{3}{4}, 3\frac{2}{4}, 4\frac{2}{3}$ ii $1\frac{11}{12}$
 c i $3\frac{4}{5}, 4\frac{3}{5}, 5\frac{3}{4}$ ii $1\frac{19}{20}$
 d $1\frac{29}{30}$
 e A mixed number with a whole number part equal to 1.
 Denominator equal to product of two largest numbers,
 numerator is one less than denominator.

Exercise 4D

- 1 a $\frac{5}{7}$ b $\frac{7}{3}$ c $\frac{9}{11}$ d $\frac{8}{5}$
 2 a 10 b 21 c 20 d 30
 e 6 f 10 g 12 h 24
 i 30 j 12 k 24 l 30
 3 a 15 b 20 c 21 d 10
 e 24 f 60 g 12 h 12
 4 a 6 b 8 c 4 d 6
 e 15 f 15
 5 a > b > c = d <
 e < f > g < h =
 i > j > k < l =
 m > n > o < p >
 6 a $\frac{3}{5}, 1\frac{2}{5}, \frac{8}{5}$ b $\frac{2}{9}, \frac{1}{3}, \frac{5}{9}$
 c $\frac{2}{5}, \frac{3}{4}, \frac{4}{5}$ d $\frac{3}{5}, \frac{2}{3}, \frac{5}{6}$
 e $2\frac{1}{4}, \frac{5}{2}, \frac{11}{4}, 3\frac{1}{3}$ f $\frac{5}{3}, \frac{7}{4}, \frac{11}{6}, \frac{15}{8}$
 g $\frac{11}{5}, \frac{9}{4}, 2\frac{1}{2}, 2\frac{3}{5}, 2\frac{7}{10}$ h $4\frac{1}{6}, 4\frac{10}{27}, 4\frac{4}{9}, 4\frac{2}{3}, \frac{15}{3}$
 7 a $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ b $\frac{3}{5}, \frac{3}{6}, \frac{3}{7}, \frac{3}{8}$
 c $\frac{7}{2}, \frac{7}{5}, \frac{7}{7}, \frac{7}{8}$ d $\frac{1}{10}, \frac{1}{15}, \frac{1}{50}, \frac{1}{100}$
 e $10\frac{2}{3}, 8\frac{3}{5}, 7\frac{1}{11}, 5\frac{4}{9}$ f $2\frac{1}{3}, 2\frac{1}{5}, 2\frac{1}{6}, 2\frac{1}{9}$
 8 $\frac{1}{4}, \frac{1}{8}, \frac{1}{11}$
 9 Andrea, Rob, Dean, David
 10 a $\frac{5}{9}, \frac{6}{9}$ b $\frac{11}{4}, \frac{14}{4}$ c $\frac{5}{6}, \frac{3}{6}$ d $\frac{10}{14}, \frac{11}{14}$
 11 Answers may vary.
 a $\frac{13}{20}$ b $\frac{1}{3}$ c $\frac{5}{21}$ d $\frac{3}{4}$
 e $2\frac{1}{4}$ f $8\frac{29}{40}$

- 12 a 7, 8 b 16
 13 a Thomas b $\frac{1}{10}$ th of a donut
 14 a i $\frac{1}{4}$ ii $\frac{3}{8}$ iii $\frac{1}{2}$
 iv $\frac{1}{3}$

Exercise 4E

- 1 a denominator
 b denominator, numerators
 c denominators, lowest common denominator
 d check, simplified
 2 a 5 b 5 c 4, 3, 7 d 8, 15, 23, 3
 3 a 15 b 20 c 6 d 6
 e 8 f 10 g 77 h 9
 i 24 j 18 k 30 l 48
 4 a ✓ b ✗ c ✗ d ✓
 e ✓ f ✗ g ✓ h ✗
 i ✓ j ✗ k ✓ l ✗
 5 a $\frac{5}{8}$ b $\frac{5}{7}$ c $\frac{4}{5}$ d $\frac{9}{11}$
 e $\frac{7}{8}$ f $\frac{7}{12}$ g $\frac{7}{15}$ h $\frac{5}{9}$
 i $1\frac{2}{7}$ j $1\frac{3}{10}$ k $1\frac{4}{5}$ l $1\frac{4}{19}$
 6 a $\frac{3}{4}$ b $\frac{14}{15}$ c $\frac{2}{3}$ d $\frac{7}{12}$
 e $\frac{13}{20}$ f $\frac{19}{20}$ g $\frac{13}{21}$ h $\frac{23}{40}$
 i $1\frac{13}{30}$ j $1\frac{9}{28}$ k $1\frac{13}{33}$ l $1\frac{5}{12}$
 7 a $3\frac{4}{5}$ b $7\frac{3}{7}$ c $12\frac{3}{4}$ d $5\frac{5}{9}$
 e $10\frac{1}{3}$ f $21\frac{1}{6}$ g $19\frac{3}{11}$ h $12\frac{2}{5}$
 8 a $4\frac{5}{12}$ b $7\frac{7}{30}$ c $12\frac{1}{6}$ d $13\frac{9}{28}$
 e $15\frac{1}{10}$ f $19\frac{1}{9}$ g $25\frac{21}{44}$ h $15\frac{5}{24}$
 9 a $\frac{14}{15}$ b $\frac{1}{15}$
 10 $8\frac{3}{20}$ km
 11 a $\frac{3}{4}$ b 400
 c $\frac{1}{4}$, 250 pieces
 12 a $\frac{47}{60}$ b $\frac{13}{60}$ c 39
 13 a 5, 2 b 2, 4, 8 c 5, 1
 d 5, 1, 15; other answers possible.

14 Jim $\left(\frac{36}{60}\right)$, Vesna $\left(\frac{37}{60}\right)$, Juliet $\left(\frac{38}{60}\right)$, Mikhail $\left(\frac{39}{60}\right)$

15 a maximum: $\frac{6}{1} + \frac{5}{2} + \frac{4}{3} = 9\frac{5}{6}$

minimum: $\frac{1}{4} + \frac{2}{5} + \frac{3}{6} = 1\frac{3}{20}$

b maximum: $\frac{8}{1} + \frac{7}{2} + \frac{6}{3} + \frac{5}{4} = 14\frac{3}{4}$

minimum: $\frac{1}{5} + \frac{2}{6} + \frac{3}{7} + \frac{4}{8} = 1\frac{97}{210}$

c Maximum: Largest numbers as numerators, smallest numbers as denominators; combine largest numerator available with smallest denominator available to produce the fractions.

Minimum: Smallest numbers as numerators, largest numbers as denominators; combine smallest numerator available with smallest denominator available to produce the fractions.

Exercise 4F

1 a denominator
c simplify

b multiply
d multiply

2 a 12 b 10 c 15 d 18
e 24 f 60 g 56 h 63

3 a 1 b 3 c 4, 3, 1 d 12, 10, 2

4 a ✓ b ✗ c ✗ d ✓
e ✗ f ✓ g ✓ h ✗
i ✓ j ✓ k ✗ l ✗

5 a $\frac{2}{7}$ b $\frac{3}{11}$ c $\frac{7}{18}$ d $\frac{1}{3}$

e 0 f $\frac{4}{9}$ g $\frac{3}{19}$ h $\frac{8}{23}$

i $\frac{31}{100}$ j $\frac{12}{25}$ k $\frac{16}{25}$ l $\frac{2}{5}$

6 a $\frac{5}{12}$ b $\frac{1}{10}$ c $\frac{1}{10}$ d $\frac{9}{28}$

e $\frac{1}{6}$ f $\frac{23}{36}$ g $\frac{13}{33}$ h $\frac{2}{15}$

i $\frac{1}{8}$ j $\frac{3}{20}$ k $\frac{1}{36}$ l $\frac{1}{9}$

7 a $1\frac{3}{5}$ b $8\frac{3}{7}$ c $1\frac{1}{7}$ d $3\frac{2}{9}$

e $2\frac{5}{12}$ f $3\frac{5}{28}$ g $4\frac{7}{18}$ h $7\frac{1}{20}$

8 a $2\frac{2}{3}$ b $4\frac{3}{5}$ c $4\frac{2}{3}$ d $4\frac{8}{9}$

e $4\frac{2}{3}$ f $\frac{37}{45}$ g $9\frac{37}{44}$ h $2\frac{29}{60}$

9 $\frac{11}{20}$ L

10 $\frac{3}{5}$

11 $\frac{1}{6}$

12 $\$7\frac{3}{4}$, \$7.75

13 a ice-cream $\frac{3}{4}$, chocolate $\frac{3}{4}$, sponge $\frac{7}{8}$

b ice-cream $\frac{1}{4}$, chocolate $\frac{1}{4}$, sponge $\frac{1}{8}$

c $2\frac{3}{8}$

d $\frac{5}{8}$

14 a 3, 4 b 3, 1 c 1, 2 d 4, 3

15 a $\frac{1}{4}$ b 4 years c 10 years

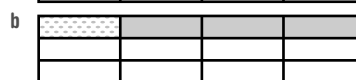
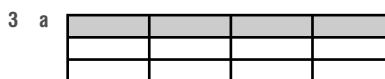
16 a $\frac{8}{15}$: 'Converting to an improper fraction' is quick and efficient for this question.

b $3\frac{36}{55}$: 'Borrowing a whole number' keeps the numbers smaller and easier to deal with for this question.

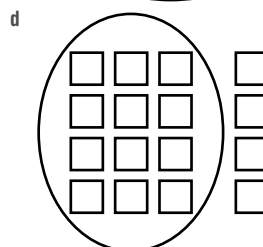
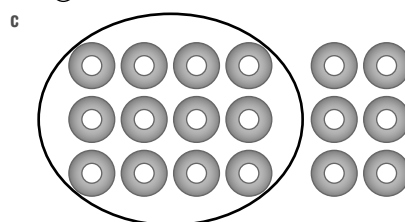
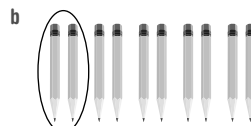
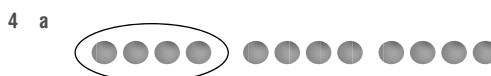
Exercise 4G

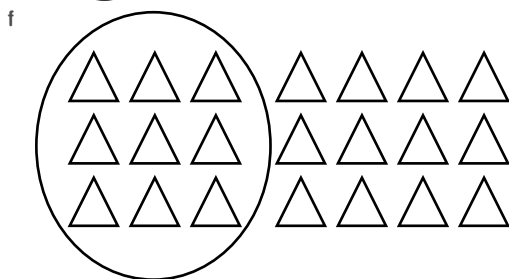
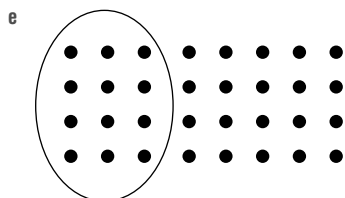
1 a 0, 1 b 1
c whole number, proper fraction

2 You get a smaller answer because you are multiplying by a number that is less than 1.



c $\frac{1}{12}$





5 D
6 a $\frac{3}{20}$ b $\frac{2}{21}$ c $\frac{10}{21}$ d $\frac{8}{45}$

e $\frac{2}{5}$ f $\frac{1}{7}$ g $\frac{1}{4}$ h $\frac{5}{11}$

i $\frac{5}{22}$ j $\frac{1}{3}$ k $\frac{6}{11}$ l $\frac{4}{11}$

m $\frac{6}{35}$ n $\frac{3}{10}$ o $\frac{2}{7}$ p $\frac{1}{6}$

7 a 6 b 9 c 16 d 15
e 12 f 4 g 80 h 33

8 a $5\frac{5}{6}$ b $1\frac{31}{35}$ c $3\frac{3}{10}$ d $4\frac{7}{8}$

e $5\frac{1}{3}$ f 7 g 6 h $3\frac{1}{3}$

9 a $3\frac{11}{15}$ b $1\frac{25}{63}$ c $7\frac{4}{5}$ d 24

10 a $3\frac{1}{5}$ b $\frac{3}{16}$ c 4 d 33

e $\frac{2}{7}$ f $3\frac{3}{8}$ g $\frac{4}{15}$ h 6

11 a $\frac{3}{5}$ b 48 boys, 72 girls

12 $11\frac{2}{3}$ L

13 7 cups of self-raising flour, 3 cups of cream

14 7 games

15 a $\times \frac{7}{12}$ b $\times \frac{7}{12}$ c $\times \frac{1}{12}$ d \checkmark

e \checkmark f $\times \frac{1}{12}$

16 D; e.g. $\frac{2}{7} \times \frac{3}{5} = \frac{6}{35}$. The two numerators will always multiply to give a smaller number than the two larger denominators. Hence, the product of two proper fractions will always be a proper fraction.

17 Answers may vary.

a $\frac{2}{5} \times \frac{3}{2}$ b $\frac{5}{4} \times \frac{3}{5}$ c $\frac{3}{7} \times \frac{2}{6}$

18 $\frac{2}{7}, \frac{3}{8}$

Exercise 4H

1 A
2 a $\frac{5}{11} \times \frac{5}{3}$ b $\frac{1}{3} \times \frac{5}{1}$ c $\frac{7}{10} \times \frac{5}{12}$ d $\frac{8}{3} \times \frac{1}{3}$

3 a $\frac{5}{2} \div \frac{4}{3}, \frac{5}{2} \times \frac{3}{4}$ b $24 \div \frac{16}{5}, \frac{24}{1} \times \frac{5}{16}$

c $\frac{47}{11} \div \frac{21}{4}, \frac{47}{11} \times \frac{4}{21}$ d $\frac{8}{3} \div \frac{80}{7}, \frac{8}{3} \times \frac{7}{80}$

4 a less b more c more d more
e less f less

5 a $\frac{7}{5}$ b $\frac{5}{3}$ c $\frac{9}{2}$ d $\frac{8}{1}$

e $\frac{3}{7}$ f $\frac{5}{23}$ g $\frac{6}{11}$ h $\frac{3}{26}$

i $\frac{1}{12}$ j $\frac{1}{101}$ k 9 l 1

6 a $\frac{3}{8}$ b $\frac{5}{33}$ c $\frac{2}{5}$ d $\frac{5}{7}$

e $\frac{3}{4}$ f $1\frac{1}{3}$ g $1\frac{3}{5}$ h $\frac{3}{14}$

7 a 20 b 21 c 100 d 120

e 30 f 40 g 4 h $6\frac{2}{3}$

8 a $\frac{5}{7}$ b $\frac{4}{5}$ c $\frac{11}{14}$ d $\frac{3}{4}$

e $1\frac{11}{16}$ f $1\frac{3}{11}$ g $3\frac{1}{3}$ h $\frac{3}{4}$

9 a $\frac{3}{40}$ b 30 c $1\frac{13}{35}$ d $\frac{1}{3}$

e 28 f $\frac{4}{15}$ g $6\frac{4}{7}$ h $2\frac{1}{10}$

10 $\frac{3}{4}$

11 10

12 $\frac{9}{10}$ m

13 8

14 22 km

15 $\frac{1}{2}$ of 8 and $\frac{1}{2} \div \frac{1}{8} = 4$, $12 \div 4$ and $12 \times \frac{1}{4} = 3$,

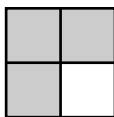
$10 \times \frac{1}{2}$ and $10 \div 2 = 5$, $3 \div \frac{1}{2}$ and $3 \times 2 = 6$

16 a $\frac{9}{20}$ b $\frac{45}{64}$ c $\frac{5}{16}$ d $\frac{1}{5}$

17 a 240 km b 160 km

Progress quiz

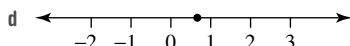
- 1 a a square with 4 equal parts, 3 of which are shaded;



many other possible answers

b 4

c 3



e proper fraction

2 $1\frac{2}{3}$ or $\frac{5}{3}$ or $1\frac{4}{6}$ or $\frac{10}{6}$

3 $\frac{2}{5} = \frac{4}{10}, \frac{6}{15}, \frac{20}{50}, \frac{10}{25}, \frac{8}{20} \dots$; many other possible answers

4 a $\frac{2}{5}$ b $\frac{1}{2}$ c $\frac{7}{3} = 2\frac{1}{3}$ d 3

5 $\frac{8}{5}$

6 $3\frac{1}{4}$

7 a $>$ b $=$ c $=$ d $<$

8 $\frac{4}{9}, \frac{1}{2}, \frac{2}{3}, \frac{9}{4}$

9 a $\frac{6}{7}$ b $\frac{7}{10}$ c $1\frac{3}{20}$ d $5\frac{1}{4}$

10 a $\frac{1}{12}$ b $\frac{7}{12}$ c $2\frac{3}{10}$

11 a \$336 b $\frac{14}{33}$ c $\frac{3}{5}$ d $\frac{3}{4}$

12 a $\frac{5}{4}$ b $\frac{1}{6}$ c $\frac{2}{5}$ d 12

13 a $\frac{7}{32}$ b $10\frac{2}{3}$ c $1\frac{2}{7}$

Exercise 4I

1 a 70, 70 b 48, 48 c 60, 60
d 20, 20 e 40, 40 f 63, 63

2 a $\frac{1}{4} = 25\%$, $\frac{2}{4} = 50\%$, $\frac{3}{4} = 75\%$, $\frac{4}{4} = 100\%$

b $\frac{1}{5} = 20\%$, $\frac{2}{5} = 40\%$, $\frac{3}{5} = 60\%$, $\frac{4}{5} = 80\%$,
 $\frac{5}{5} = 100\%$

c $\frac{1}{3} = 33\frac{1}{3}\%$, $\frac{2}{3} = 66\frac{2}{3}\%$, $\frac{3}{3} = 100\%$

3 a 86% b 20%

4 a $\frac{11}{100}$ b $\frac{71}{100}$ c $\frac{43}{100}$ d $\frac{49}{100}$

e $\frac{1}{4}$ f $\frac{3}{10}$ g $\frac{3}{20}$ h $\frac{22}{25}$

5 a $1\frac{1}{5}$ b $1\frac{4}{5}$ c $2\frac{37}{100}$ d $4\frac{1}{100}$

e $1\frac{3}{4}$ f $1\frac{1}{10}$ g $3\frac{4}{25}$ h $8\frac{2}{5}$

6 a 8% b 15% c 97% d 50%

e 35% f 32% g 86% h 90%

i 112% j 135% k 400% l 160%

7 a $12\frac{1}{2}\%$ b $33\frac{1}{3}\%$ c $26\frac{2}{3}\%$ d $83\frac{1}{3}\%$

e 115% f 420% g 290% h $32\frac{1}{2}\%$

8 a $\frac{3}{4}$ b 75% c $\frac{1}{4}$ d 25%

9 $12\frac{1}{2}\%$

10 70%

11 70%, 80%

12 a $\frac{18}{25}$ b 72%

13 $\frac{55}{1000} = \frac{11}{200}$

14 a $\frac{25}{1000} = \frac{1}{40}$ b $\frac{825}{1000} = \frac{33}{40}$
c $\frac{125}{1000} = \frac{1}{8}$ d $\frac{1}{3}$

Exercise 4J

1 a 10 b 100 c 2 d 1

e 5 f 4

2 a ii b ii c i d i

3 a 70 b 36 c 10 d 27

e 10 f 7 g 150 h 200

i 4 j 48 k 44 l 190

m 22 n 84 o 36 p 63

4 a 96 b 600 c 66 d 100

e 15 f 72 g 73 h 600

5 10% of \$200 = \$20

20% of \$120 = \$24

10% of \$80 = \$8

50% of \$60 = \$30

20% of \$200 = \$40

5% of \$500 = \$25

30% of \$310 = \$93

10% of \$160 = \$16

1% of \$6000 = \$60

50% of \$88 = \$44

6 a \$42 b 24 mm c 9 kg

d 90 tonnes e 8 min f 400 cm

g 1.5 g h 3 hectares i 144 seconds

7 35

8 no (red \$45, striped \$44)

9 240

- 10 12
- 11 a 120 b 420 c 660
- 12 a \$80/week b \$2080 c \$4160
- 13 a computer games 30 min, drums 24 min, outside 48 min, reading 12 min
b 5% time remaining
c yes, with 1 min to spare
- 14 80 min
- 15 a 20 b 90 c 20 d 64
- 16 they are the same
- 17 $37\frac{1}{2}\%$
- 18 a \$140 b \$1.50
- 19 a i 1200 ii 24%, 22%, 20%, 18%, 16%
iii 2%
b i 30%
ii week 1: 30%, 2400 pieces; week 2: 25%, 2000 pieces; week 3: 20%, 1600 pieces; week 4: 15%, 1200 pieces; week 5: 10%, 800 pieces

Week	Cumulative %	Pieces completed
Week 1	30%	2400
Week 2	55%	4400
Week 3	75%	6000
Week 4	90%	7200
Week 5	100%	8000

Exercise 4K

- 1 a 4 b 4 c $\frac{1}{2}$ d 50%
e $\frac{1}{2}$ f 50%
- 2 a 10 b $\frac{1}{5}$ c $\frac{4}{5}$ d 20%
e 80%
- 3 a $\frac{3}{10}$, 30% b $\frac{3}{5}$, 60% c $\frac{1}{5}$, 20% d $\frac{3}{4}$, 75%
e $\frac{1}{20}$, 5% f $\frac{1}{2}$, 50% g $\frac{1}{4}$, 25% h $\frac{3}{20}$, 15%
- 4 a $\frac{3}{5}$, 60% b $\frac{1}{2}$, 50% c $\frac{1}{4}$, 25% d $\frac{2}{5}$, 40%
e $\frac{3}{4}$, 75% f $\frac{4}{5}$, 80%
- 5 a $\frac{1}{10}$ b 10%
- 6 a $\frac{1}{5}$ b 20% c $\frac{4}{5}$ d 80%
- 7 a $\frac{3}{4}$ b 75% c $\frac{1}{4}$ d 25%
- 8 95%
- 9 80%
- 10 a $\frac{1}{25}$, 4% b $\frac{2}{5}$, 40% c $\frac{1}{20}$, 5% d $\frac{1}{100}$, 1%

- e $\frac{1}{50}$, 2% f $\frac{1}{40}$, 2.5%
- 11 a $\frac{1}{5}$ b 40%
- 12 a 5% b $\frac{1}{5}$
- 13 Ross 75%, Maleisha 72%
- 14 hatch 15%, 4WD 16%; hence, 4WD has larger price reduction.
- 15 yellow 20%, blue 19%; hence, blue has least percentage of sugar.
- 16 a i $\frac{b}{a+b}$ ii $\frac{a}{a+b}$
b i $\frac{100b}{a+b}$ ii $\frac{100a}{a+b}$
- 17 a $\frac{a}{a+b}$ b $\frac{100b}{a+b}$
- 18 a 3 b $\frac{1}{30}$ c $\frac{1}{6}$ d $\frac{17}{30}$
e 20% f 96.67%

Problems and challenges

- 1 22.5
- 2 Answers will vary, but a possible answer is:
a 6, 7, 8, 9
b 4, 5, 6, 7, 8
c 2, 3, 4, 6, 7, 8
d 1, 2, 3, 4, 5, 6, 9

$\frac{2}{5}$	$A = \frac{9}{10}$	$\frac{4}{5}$
$B = \frac{11}{10}$	$C = \frac{7}{10}$	$D = \frac{3}{10}$
$E = \frac{3}{5}$	$\frac{1}{2}$	1

- 4 a $\frac{1}{6} + \frac{1}{5} \times \frac{1}{3}$ b $\frac{1}{3} \div \frac{1}{4} - \frac{1}{6}$ c $\frac{1}{6} + \frac{1}{4} - \frac{1}{5}$
- 5 Because the final 20% reduction is off the original \$50 plus also off the \$10 increase, the 20% reduction will be \$12 overall.

Multiple-choice questions

- 1 B 2 C 3 A 4 C 5 D
6 B 7 D 8 D 9 A 10 C

Short-answer questions

- 1 $\frac{1}{14}, \frac{1}{10}, \frac{1}{8}, \frac{1}{6}, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}$
- 2 $\frac{3}{5} = \frac{6}{10} = \frac{9}{15} = \frac{12}{20} = \frac{15}{25}$ etc

Multiplying by the same number in the numerator and denominator is equivalent to multiplying by 1, and so does not change the value of the fraction.

- 3 a $\frac{3}{5}$ b $\frac{2}{7}$ c $\frac{5}{7}$
- 4 a $1\frac{1}{2}$ b $1\frac{3}{4}$ c $1\frac{2}{3}$ d $3\frac{1}{2}$
- 5 a $\frac{2}{7} < \frac{4}{7}$ b $\frac{3}{8} > \frac{1}{8}$
- c $1\frac{2}{3} > 1\frac{3}{5}$ d $3\frac{1}{9} < \frac{29}{9}$
- 6 a $\frac{5}{7}$ b $\frac{5}{8}$
- 7 a 10 b 21 c 24
- 8 a 10 b 21 c 24
- 9 a $2\frac{1}{5}, \frac{9}{5}, 1\frac{3}{5}$ b $\frac{9}{4}, \frac{11}{6}, \frac{14}{8}, \frac{5}{3}$
- c $5\frac{2}{3}, 5\frac{7}{18}, 5\frac{1}{3}, \frac{47}{9}, 5\frac{1}{9}$
- 10 a $\frac{1}{2}$ b $\frac{5}{6}$ c $1\frac{5}{24}$ d $5\frac{23}{30}$
- e $\frac{1}{2}$ f $2\frac{1}{2}$ g $1\frac{9}{40}$ h $6\frac{5}{36}$
- i $12\frac{3}{5}$
- 11 a 7 b 80 c 12 d 5
- e $\frac{1}{6}$ f $7\frac{1}{2}$
- 12 a $\frac{4}{3}$ b $\frac{12}{7}$ c $\frac{4}{11}$ d $\frac{3}{16}$
- 13 a $\frac{1}{5}$ b 20 c 4 d $\frac{1}{5}$

14

Percentage form	Fraction
36%	$\frac{9}{25}$
220%	$2\frac{1}{5}$
5%	$\frac{5}{100}$
140%	$1\frac{2}{5}$
44%	$\frac{11}{25}$
18%	$\frac{9}{50}$

- 15 a ii b i
- 16 a $\frac{3}{5}, 60\%$ b $\frac{1}{5}, 20\%$
- c $\frac{1}{16}, 6.25\%$ d $\frac{3}{10}, 30\%$

Extended-response questions

- 1 a $7\frac{5}{8}$ b $5\frac{11}{24}$ c $10\frac{17}{80}$ d $6\frac{2}{21}$
- 2 $129\frac{9}{25}$
- 3 a \$176 b \$24
- 4 a \$550 b 264 L c \$99 d \$200
- 5 a $12\frac{1}{2}$ b \$208
- 6 $55\frac{2}{3}\%$

Chapter 5

Exercise 5A

- 1 a $4x, 3y, 24z, 7$ b 7
- c 4 d z
- 2 a F b A c D
- d B e C f E
- 3 a i 2 ii 17
- b i 3 ii 15
- c i 3 ii 21
- d i 4 ii 2
- e i 2 ii 1
- f i 4 ii 12
- 4 a $x + 1$ b $5 + k$ c $2u$ d $4y$
- e $\frac{p}{2}$ f $\frac{q}{3}$ g $r - 12$ h $9n$
- i $10 - t$ j $\frac{y}{8}$
- 5 a $2(x + 5)$ b $3a + 4$ c $8k - 3$ d $8(k - 3)$
- e $6(x + y)$ f $\frac{7x}{2}$ g $\frac{p}{2} + 2$ h $12 - xy$
- 6 a The product of 7 and x .
- b The sum of a and b .
- c The sum of x and 4 is doubled.
- d a is tripled and subtracted from 5.
- 7 a 70 b $10n$
- 8 a $8x$ b $x + 3$ c $8(x + 3)$
- 9 a $1000x$ b $100x$ c $100\,000x$
- 10 a $\frac{\$A}{4}$ b $\frac{\$A}{n}$
- c $\frac{\$A - 20}{n}$
- 11 'One-quarter of the sum of a and b .' Other answers possible.
- 12 a true b true c false d true
- e false
- 13 a false b false c true d true

- 14 $c \div 2, c - 4, c + 1, 2c, 3c, 3c + 5, 4c - 2, c \times c$
 15 'The sum of twice the value of x is taken from 3' becomes $3 - 2x$. Other answers possible.

Exercise 5B

- 1 a 14 b 1 c 10 d 8
 2 13
 3 15
 4 3

- 5 a 17 b 20 c 72 d 12
 6 a 8 b 10 c 9 d 14
 e 12 f 3 g 19 h 9
 i 7 j 20 k 3 l 1
 m 47 n 20 o 35 p 86
 q 8 r 6

- 7 a 8 b 4 c 5 d 9
 e 4 f 45 g 5 h 24
 i 50 j 8 k 5 l 20

- 8 a 27 b 22 c 41 d 8
 e 10 f 70

9 a

n	1	2	3	4	5	6
$n + 4$	5	6	7	8	9	10

b

x	1	2	3	4	5	6
$12 - x$	11	10	9	8	7	6

c

b	1	2	3	4	5	6
$2(b - 1)$	0	2	4	6	8	10

d

q	1	2	3	4	5	6
$10q - q$	9	18	27	36	45	54

- 10 a 75 b 45 c 54 d 11
 e 12 f 5 g 33 h 19

11 5

12 x is between 4 and 33 inclusive.

13

x	5	9	12	1	6	7
$x + 6$	11	15	18	7	12	13
$4x$	20	36	48	4	24	28

- 14 a 1 and 24, 2 and 12, 3 and 8, 4 and 6
 b Infinitely many answers; e.g. $x = \frac{1}{5}, y = 120$.
 15 Because $5 \times (a + a)$ is $5 \times 2 \times a$, which is $10a$. Every multiple of 10 ends with 0.

16 a

x	5	10	7	9	5	8
y	3	4	2	5	2	0
$x + y$	8	14	9	14	7	8
$x - y$	2	6	5	4	3	8
xy	15	40	14	45	10	0

- b 2 and 2, 3 and $1\frac{1}{2}$, 6 and $1\frac{1}{5}$; other answers possible.

Exercise 5C

1 a

	$x = 0$	$x = 1$	$x = 2$	$x = 3$
$2x + 2$	2	4	6	8
$(x + 1) \times 2$	2	4	6	8

b equivalent

2 a

	$x = 0$	$x = 1$	$x = 2$	$x = 3$
$5x + 3$	3	8	13	18
$6x + 3$	3	9	15	21

b no

3

	$6x + 5$	$4x + 5 + 2x$
$x = 1$	11	11
$x = 2$	17	17
$x = 3$	23	23
$x = 4$	29	29

They are equivalent because they are always equal.

- 4 a $2x + 4$ and $x + 4 + x$ b $5a$ and $4a + a$
 c $2k + 2$ and $2(k + 1)$ d $b + b$ and $4b - 2b$

- 5 a C b A c E d F
 e B f D

6 $2x + 2 + 2x, 2(2x + 1)$; other answers possible.

7 $2(w + l)$; other answers possible.

8 $9a + 4b$; other answers possible (must have 2 terms).

9 6

10 If $x = 8$, all four expressions have different values.

11 b $x \times y$ and $y \times x$

c $a \times (b + c)$ and $a \times b + a \times c$

d $a - (b + c)$ and $a - b - c$

e $a - (b - c)$ and $a - b + c$

f $a \div b \div c$ and $a \div (b \times c)$

	$4 \times (a + 2)$	$8 + 4a$
$x = 1$	12	12
$x = 2$	16	16
$x = 3$	20	20
$x = 4$	24	24

- 12 a $5(2 + a)$
 c $24 + 6a$
 13 $2a + a + 5b$, $3a + 12b - 7b$; others answers possible.
 14 a Yes; for any value of x expressions A and B are equal, and expression B and C are equal, so expressions A and C are equal.
 b No; e.g. if expression A is $7x$, expression B is $3x$ and expression C is $5x + 2x$.

Exercise 5D

- 1 a x and y b a , b and c
 c k d p and q
 2 a like b like terms c terms
 d $15a$; others answers possible.
 e equivalent f $5x + 4$; others answers possible.
 3 a N b L c L d N
 e N f L g N h L
 i L j L k L l N
 4 a $2a$ b $5x$ c $7b$ d $8d$
 e $12u$ f $12ab$ g $11ab$ h xy
 5 a $3a + 5b$ b $7a + 9b$ c $x + 6y$
 d $7a + 2$ e $7 + 7b$ f $6k - 2$
 g $5f + 12$ h $4a + 6b - 4$ i $6x + 4y$
 j $8a + 4b + 3$ k $7h + 4$ l $14x + 30y$
 m $2x + 9y + 10$ n $8a + 13$ o $12b$
 p $9ab + 4$ q $6xy + 5x$ r $7cd - 3d + 2c$
 s $9uv + 7v$ t $11pq + 2p - q$ u $6ab + 36$
 6 a $27n$ b $31n$ c $58n$
 7 a $3a + 4$ b 19
 8 a $4x$ b $7x$ c $11x$ d $3x$
 9 a $12xy$ b $6ab + 5$ c $10ab$
 d $6xy + 3$ e $5xy + 14$ f $10cde$
 g $6xy + 6x + 4$
 h $9ab + 9$ i $7xy - 2y$

	$3x + 2x$	$5x$
$x = 1$	5	5
$x = 2$	10	10
$x = 3$	15	15

- b For example, if $x = 5$ and $y = 10$, then $3x + 2y = 35$ but $5xy = 250$.

	$5x + 4 - 2x$	$3x + 4$
$x = 1$	7	7
$x = 2$	10	10
$x = 3$	13	13

- b For example, if $x = 10$, $5x + 4 - 2x = 34$ but $7x + 4 = 74$.
 c For example, if $x = 1$, $5x + 4 - 2x = 7$ but $7x - 4 = 3$.
 12 a $2a + a + 3b$, $b + 3a + 2b$; others answers possible.
 b 12

Progress quiz

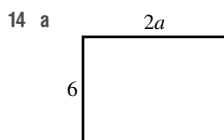
- 1 a 4 b $7a, 4b, c, 9$
 c 4 d 9
 2 a $m \times p$ or mp b $a + k$
 c $t + 8$ d $w - 4$
 3 a $\frac{m}{2} + 7$ b $\frac{m+7}{2}$ c $\frac{a+k}{3}$
 d $a + \frac{k}{3}$ e $3(d - 12)$ f $3d - 12$
 4 a 19 b 3 c 9
 5 a 24 b 11 c 5
 d 22 e 3
 6 $3a + 4$ and $4 + 3a$
 7 a L b N c N d L
 8 a $8a + 5b + 5$ b $7cd + 3c + 8d + 4$
 9 $8x + 8y$, $8(x + y)$ (other variations possible)

Exercise 5E

- 1 a both are 21 b both are 35
 c both are 56 d yes
 2 a true b true c false d true
 e false f false
 3 a $\frac{2}{3}$ b $\frac{2}{3}$ c $\frac{2}{3}$
 4 a C b E c B d A
 e D
 5 a $2x$ b $5p$ c $8ab$ d $6a$
 e $28f$ f $10ab$ g $16xy$ h $10b$
 i $28xz$
 6 a $36a$ b $63d$ c $8e$ d $15a$
 e $12ab$ f $63eg$ g $8abc$ h $28adf$
 i $12abc$ j $8abc$ k $60defg$ l $24abcd$
 m w^2 n a^2 o $3d^2$ p $2k^2$

- q $7p^2$ r $3q^2$ s $12x^2$ t $15z^2$
u $36r^2$
- 7 a $\frac{x}{5}$ b $\frac{z}{2}$ c $\frac{a}{12}$ d $\frac{b}{5}$
e $\frac{2}{x}$ f $\frac{5}{d}$ g $\frac{x}{y}$ h $\frac{a}{b}$
i $\frac{4x+1}{5}$ j $\frac{2x+y}{5}$ k $\frac{2+x}{1+y}$ l $\frac{x-5}{3+b}$
- 8 a $\frac{2}{5}$ b $\frac{5}{9}$ c $\frac{9a}{4}$ d $\frac{2b}{5}$
e $\frac{x}{2}$ f $\frac{3x}{4}$ g $\frac{2}{3}$ h $\frac{3}{4}$
i $2a$ j 3 k $2y$ l $\frac{3}{y}$
- 9 a $3k$ b $6x$ c $12xy$
10 a $4xg$ b nxg c $2nxg$
11 a $\$20$ b $\frac{\$C}{5}$
12 a $3a$ b $7c$ c $7b$ d $12y$
e $10x$

- 13 a $6p$
b $3 \times 2p$ also simplifies to $6p$, so they are equivalent.



- b $12a$
c $\frac{12a}{3a}$ simplifies to 4. It has four times the area.
d Area is multiplied by 9.
- 15 a $3 \times a \times a \times b \times b$
b $7x^2y^3$
c $1200a^3b^2c^2$
d $24a^3b^2c^2$

Exercise 5F

- 1 a $3a + 6$
b $x + y + x + y = 2x + 2y$
c $p + 1 + p + 1 + p + 1 + p + 1 = 4p + 4$
d $4a + 2b + 4a + 2b + 4a + 2b = 12a + 6b$
- 2 a $4x$ b 12 c $4x + 12$
- 3 a 60, 3, 63
b 30, 4, 210, 28, 238
c 20, 1, 100, 5, 95

4 a

	$4(x + 3)$	$4x + 12$
$x = 1$	16	16
$x = 2$	20	20
$x = 3$	24	24
$x = 4$	28	28

- b equivalent expressions
- 5 a $12(x + 4)$ and $12x + 48$
b $8(z + 9)$ and $8z + 72$
c $(3 + a)(3 + b)$ and $9 + 3a + 3b + ab$
- 6 a $6y + 48$ b $7l + 28$
c $8s + 56$ d $8 + 4a$
e $7x + 35$ f $18 + 3a$
g $81 - 9x$ h $5j - 20$
i $8y - 64$ j $8e - 56$
k $6e - 18$ l $80 - 10y$
- 7 a $60g - 70$ b $15e + 40$
c $35w + 50$ d $10u + 25$
e $56x - 14$ f $27v - 12$
g $7q - 49$ h $20c - 4v$
i $4u + 12$ j $48l + 48$
k $5k - 50$ l $9o + 63$
- 8 a $6it - 6iv$ b $2dv + 2dm$
c $10cw - 5ct$ d $6es + 6ep$
e $dx + 9ds$ f $10ax + 15av$
g $5jr + 35jp$ h $in + 4iw$
i $8ds - 24dt$ j $2fu + fv$
k $14kv + 35ky$ l $4em + 40ey$
- 9 a $5(x + 3) = 5x + 15$ b $2(b + 6) = 2b + 12$
c $3(z - 4) = 3z - 12$ d $7(10 - y) = 70 - 7y$
- 10 a $b + g + 1$
b $2(b + g + 1) = 2b + 2g + 2$
- 11 $3(4x + 8y)$ and $2(6x + 12y)$; others answers possible.
- 12 $2l + 2w$
- 13
-
- 14
-
- 15 a 4 ways, including $1(10x + 20y)$
b infinitely many ways
- 16 a Rosemary likes Maths and Rosemary likes English.
b Priscilla eats fruit and Priscilla eats vegetables.

- c Bailey likes the opera and Lucia likes the opera.
 d Frank plays video games and Igor plays video games.
 e Pyodir likes fruit and Pyodir likes vegetables and Astrid likes fruit and Astrid likes vegetables.

Exercise 5G

- 1 a 35 b 20
 2 a 24 cm b 40 cm
 3 a $3x$ b 36
 4 $2n$
 5 a $10x$ b $15x$ c kx
 6 a 180 km b 30 km c $70n$
 7 a \$200 b \$680 c $50 + 80x$
 8 a B b A c D
 d E e C
 9 a
- | Hours | 1 | 2 | 3 | 4 | 5 |
|-----------------|-----|-----|-----|-----|-----|
| Total cost (\$) | 150 | 250 | 350 | 450 | 550 |
- b $100t + 50$
 c \$3050
 10 a \$25 b $\$(10x + 5)$ c \$75
 11 a 90c b \$6.30 c $0.3 + 0.6t$
 12 a 33
 b $g = 8, b = 5$
 c $g = 3$ and $b = 2, g = 1$ and $b = 14, g = 0$ and $b = 20$
 13 a $\$(5b + 2c + 6d)$ b $\$(5b + 4c + 3d)$
 c \$8
 14 a cn b $3cn$ c $6cn$
 15 a $10 + 30x$
 b 2 h 20 min
 c Because you don't pay the booking fee twice.
 d \$32
 e It will get closer to \$30.
 16 a $\$(0.2 + 0.6t)$ b $\$(0.8 + 0.4t)$
 c Emma's d 3 min
 e Answers will vary.

Problems and challenges

- 1 25
 2 a $P = 10m$ b $P = 20(x + 3)$ c $P = 5(w + y)$
 3 Largest $18x + 70$, smallest $12x + 44$,
 difference $6x + 26 = 86$ cm
 4 $15a + 10, 5(3a + 2)$
 5 a $a = 4, b = 12, c = 16, d = 8, e = 36$
 b $a = 6, b = 3, c = 5, d = 10, e = 15$
 6 5050
 7 Because $2(x + 3) - 12 - x + 2$ simplifies to x .

Multiple-choice questions

- 1 B 2 A 3 C 4 D 5 D
 6 C 7 A 8 E 9 A 10 A

Short-answer questions

- 1 a $5a, 3b, 7c, 12$ b 12
 2 a $u + 7$ b $3k$ c $7 + \frac{r}{2}$
 d $h - 10$ e xy f $12 - x$
 3 a 15 b 24 c 2 d 32
 4 a 15 b 8 c 4 d 27
 5 a 16 b 200 c 5 d 20
 6 a E b N c E d N
 7 a L b N c L d L
 e N f L g N h L
 8 a $7x + 3$ b $11p$
 c $7a + 14b + 4$ d $3m + 17mn + 2n$
 e $1 + 7c + 4h - 3o$ f $4u + 3v + 2uv$
 9 a $12ab$ b $6xyz$ c $36fgh$ d $64klm$
 10 a $\frac{3}{2}$ b $\frac{3}{5}$ c $\frac{a}{3}$ d $\frac{4x}{3z}$
 11 a $3x + 6$ b $4p - 12$ c $14a + 21$ d $24k + 36l$
 12 $2(6b + 9c), 6(2b + 3c)$; other answers possible
 13 $9t$
 14 $g + b$
 15 $3x$

Extended-response questions

- 1 a i \$24.50 ii \$45.50 iii \$213.50
 b $3.5 + 2.1d$
 c \$87.50
 d If $d = 40, 2.1 + 3.5d = 142.10$, not 87.50.
 e $6 + 1.2d$
 2 a 26 b \$78
 c $4x + 2y + 10$ d $12x + 6y + 30$
 e $x(x + 5) + 3y$; other answers possible.

Chapter 6

Exercise 6A

- 1 a $\frac{2}{10}$ b $\frac{3}{100}$ c $\frac{7}{1000}$
 2 a 5 b 6 c 7 d 37
 3 a $\frac{6}{10}$ b $\frac{6}{100}$ c $\frac{6}{1000}$ d $\frac{6}{10}$
 e 6 f $\frac{6}{100}$ g $\frac{6}{100}$ h $\frac{6}{1000}$
 4 a false b false c true d false
 e true f true g false h true
 i true j true k true l false

- 5 a 0.3 b 0.8 c 0.15 d 0.23
e 0.9 f 0.02 g 0.121 h 0.074
- 6 a 6.4 b 5.7 c 212.3 d 1.16
e 14.83 f 7.51 g 5.07 h 18.612
- 7 a 7.6 b 12.9 c 33.04
d 26.15 e 8.42 f 99.012
- 8 a 0.1 b 0.03 c 0.02 d 0.5
e 0.001 f 0.01 g 0.15 h 0.11
- 9 a 3.05, 3.25, 3.52, 3.55 b 3.06, 3.6, 30.3, 30.6
c 1.718, 1.871, 11.87, 17.81
d 22.69, 22.96, 26.92, 29.26, 29.62
- 10 a Waugh, Border, Gilchrist, Taylor, Hughes
b first
- 11 a day 6 b day 4 c days 2, 5 and 6
- 12 a *c.c, c.a, b.c, b.a, a.c, a.b*
b *c.bc, c.ab, b.ca, b.bb, a.ca, a.bc, a.aa, ba.ca, ab.ab*
- 13 a 0.a b 0.0a c 0.aa d a.a0a
- 14 a i 0.1, 1.0 (2 ways)
ii 0.12, 0.21, 1.02, 1.20, 2.01, 2.10, 10.2, 12.0, 20.1, 21.0 (10 ways)
iii 0.123, 0.132, 0.213, 0.231, 0.312, 0.321, 1.023, 1.032, 1.203, 1.230, 1.302, 1.320, 2.013, 2.031, 2.103, 2.130, 2.301, 2.310, 3.012, 3.021, 3.102, 3.120, 3.201, 3.210, 10.23, 10.32, 12.03, 12.30, 13.02, 13.20, 20.13, 20.31, 21.03, 21.30, 23.01, 23.10, 30.12, 30.21, 31.02, 31.20, 32.01, 32.10, 102.3, 103.2, 120.3, 123.0, 130.2, 132.0, 201.3, 203.1, 210.3, 213.0, 230.1, 231.0, 301.2, 302.1, 310.2, 312.0, 320.1, 321.0 (60 ways)
b 408 ways

Exercise 6B

- 1 a 5.8 b 2 c 80 d 6.78
- 2 a 5 b 9 c 1 d 4
e 0 f 9 g 6 h 5
- 3 a i 1 ii 7 iii 4 iv 8
b i 25.8 ii 25.82 iii 25.817 iv 26
- 4 a 14.8 b 7.4 c 15.6 d 0.9
e 6.9 f 9.9 g 55.6 h 8.0
- 5 a 3.78 b 11.86 c 5.92 d 0.93
e 123.46 f 300.05 g 3.13 h 9.85
i 56.29 j 7.12 k 29.99 l 0.90
- 6 a 15.9 b 7.89 c 236 d 1
e 231.9 f 9.4 g 9.40 h 34.713
- 7 a 24.0 b 14.90 c 7 d 30.000
- 8 a 28 b 9 c 12 d 124
e 22 f 118 g 3 h 11

- 9 a \$13 b \$31 c \$7 d \$1567
e \$120 f \$10 g \$1 h \$36
- 10 a \$51 b \$44 c very accurate
- 11 a 0 s b 0.4 s c 0.34 s d 52.825 s
- 12 2.25, 3 decimal places
- 13 Samara: Round to 2 decimal places = 0.45, then round this to 1 decimal = 0.5. Cassandra: Rounding to 1 decimal place, critical digit is the second 4, which is less than 5, therefore rounded to 1 decimal place = 0.4.
Samara has a flaw of rounding an already rounded number. Cassandra is correct.
- 14 depends on your calculator
- 15 depends on your software package

Exercise 6C

- 1 C
- 2 B
- 3 a 27.97 b 25.94 c 247.4 d 58.31
- 4 a 16.06 b 21.33 c 343.75 d 37.567
e 21.592 f 340.0606
- 5 a 12.1 b 114.13 c 6.33 d 70.79
- 6 a 12.3 b 131.4 c 22.23 d 13.457
e 43.27 f 4947.341
- 7 a 7, 8 b 6, 5, 1, 4 c 0, 1, 0, 2 d 7, 5, 1, 6, 1
- 8 186.19
- 9 \$54.30
- 10 49.11 mm

+	0.01	0.05	0.38	1.42
0.3	0.31	0.35	0.68	1.72
0.75	0.76	0.80	1.13	2.17
1.20	1.21	1.25	1.58	2.62
1.61	1.62	1.66	1.99	3.03

- 12 \$2036.10
- 13 a 8.038 b 0.182 c 2.438 d 1.308
- 14 a Answers will vary; e.g. $3.57 + 4.15 + 3.44$
b Answers may vary; e.g. $1.35 + 2.87 + 6.94 = 11.16$
- 15 Always end up with \$10.89 unless the starting value has the same first digit, in which case we end up with zero. The 8 forms as it comes from adding two 9s. This produces a 1 to be carried over, which results in the answer being a \$10 answer, rather than a \$9 answer.

Exercise 6D

- 1 a 00 b 000 c 00 d 00000
- 2 a 000 b 00 c 0 d 00000

- 3 a i right 2 places
iii right 6 places
v left 3 places
vii right 1 place
b right 1 place
- 4 a 48.7 b 352.83 c 4222.7 d 1430.4
e 5699.23 f 125.963 g 12 700 h 154 230
i 3400 j 2132 k 86 710 000 l 516 000
- 5 a 4.27 b 35.31 c 2.4422 d 56.893
e 12.135 18 f 9.326 11 g 0.029 h 0.001 362
i 0.000 54 j 0.367 k 0.000 002 l 0.010 000 4
- 6 a 2291.3 b 31.67 c 0.49 d 0.222
e 63 489 000 f 0.001 003 2
- 7 a 15 600 b 43 000 c 225.1 d 0.016
e 213 400 f 21.34 g 0.007 h 9 900 000
i 0.0034
- 8 a 158.4 b 3.36 c 85.4 d 7054
e 71.06 f 7.5 g 2.037 h 21.7
- 9 \$137
- 10 a 1 200 000 mL
b 12 000
- 11 3000c, \$30
- 12 \$21 400
- 13 225 kg
- 14 Answers may vary.

Starting number	Answer	Possible two-step operations
12.357	1235.7	$\times 1000, \div 10$
34.004 5	0.034 004 5	$\div 100, \div 10$
0.003 601	360.1	$\times 100, \times 1000$
<i>bac.dfg</i>	<i>ba.cdfg</i>	$\div 100, \times 10$
<i>d.swkk</i>	<i>dswkk</i>	$\times 100\ 000, \div 10$
<i>fwy</i>	<i>f.wy</i>	$\div 1000, \times 10$

- 15 $\div 1\ 000\ 000$
- 16 a i 5×10^{13} ii 4.2×10^7 iii 1.23×10^{16}
b i 2×10^{19} ii 1.08×10^{21}
e 3.5×10^{-11}
f i 1×10^{-6} ii 9×10^{-10} iii 7.653×10^{-12}

Exercise 6E

- 1 a 1 b 2 c 3 d 3 e 5
f 2 g 4 h 3 i 9
- 2 a 19.2 b 1.92 c 0.192
- 3 It helps you check the position of the decimal point in the answer.

- 4 a The decimal point is the actual 'dot'; decimal places are the numbers after the decimal point.
b 1 decimal point, 4 decimal places
- 5 in the question; decimal places
- 6 a 20.84 b 26.6 c 183.44 d 100.8
e 218.46 f 15.516 g 23.12 h 12.42
i 5.44 j 311.112 k 0.000 966 l 1.321 31
- 7 a 100.8 b 483 c 25 400 d 9800
e 14 400 f 364 550 g 0.68 h 371
i 90.12
- 8 a \$31.50, \$32 b \$22.65, \$23
c \$74.80, \$75 d \$17.40, \$17
e \$145.20, \$145 f \$37 440, \$37 440
g \$88.92, \$89 h \$4.41, \$4
i \$18.0625, \$18
- 9 29.47 m
- 10 3.56 kg
- 11 165.85 km
- 12 a 67.2 m b \$198.24
- 13 \$1531.25
- 14 a 738.4 km b yes
c 1.57 L left in the tank
- 15 Answers may vary; 0.25, 0.26
- 16 Answers may vary; 0.0043
- 17 a 38.76 b 73.6 c 0.75 d 42, 0.42

Exercise 6F

- 1 B
- 2 directly above the decimal point in the dividend
- 3 a 60 b 60 c 60 d 60
b An identical change has occurred in both the dividend and the divisor.
- 4 a 32.456, 3 b 12 043.2, 12
c 34.5, 1 d 1 234 120, 4
- 5 a 4.2 b 6.1 c 21.34 d 0.7055
e 1.571 f 0.308 g 3.526 h 124.3
i 0.0024 j 117.105 k 0.6834 l 0.002 562 5
- 6 a 30.7 b 77.5 c 26.8 d 8.5
e 44.4 f 645.3 g 0.08 h 0.050 425
i 980 j 800.6 k 0.79 l 2 161 000
- 8 a 1.1807 b 8.267 c 0.012 374 8
d 0.004 23 e 0.096 487 f 0.000 782 5
- 9 a 11.83 kg b \$30.46 c 304.33
d 239.17 g e 965.05 L f \$581.72
- 10 a 20.84 b 93.36 c 10.93
d 18.49 e 67.875 f 158.35
- 11 a 8, 9 b 9 c 1, 5, 5 d 7, 7, 0
- 12 \$1.59/L

- 13 238 frames
 14 26.67, 26 can be filled
 15 a \$66.35 b \$21.90
 16 apples \$3.25/kg; bananas \$3.10/kg; hence, bananas are better value.
 17 a 24.5 m/s b 88.2 km/h c yes
 18 a 24.53 b 19.7 c 2453
 d 1.97 e 2.453 f 197
 19 a 0.5 b 0.3 c 0.01 d 1.1 e 4.8
 f Answers may vary

Progress quiz

- 1 a 6 hundredths b 6 units
 2 a 0.9 b 0.019 c 3.25
 3 0.043, 0.34, 0.43, 3.4, 4.3
 4 a 16.88 b 2.350 c 0.7
 5 a 5.4 b 17.031 c 3.52 d 5.78
 6 a 3450 b 0.653 45
 7 a 90 000 b 119 c 1.912 d 136 800
 e 14.1 f 0.013 g 193.2 h 0.221
 i 9000 j 2.52
 8 a 8.011 b 197.44
 9 a \$10.15 b \$3.99 per kg c 25 kg

Exercise 6G

- 1 a 5 b 100 c 75, 7 d 5, 4
 2 a 2 b 15, 20 c 10, 4 d 16
 3 a false b true c true d false
 e true f true
 4 a $\frac{1}{2}$ b $6\frac{2}{5}$ c $10\frac{3}{20}$ d $18\frac{3}{25}$
 e $3\frac{1}{4}$ f $\frac{1}{20}$ g $9\frac{3}{40}$ h $5\frac{24}{125}$
 5 a 0.7 b 0.9 c 0.31 d 0.79
 e 1.21 f 3.29 g 0.123 h 0.03
 6 a $\frac{8}{10} = 0.8$ b $\frac{5}{10} = 0.5$ c $\frac{35}{100} = 0.35$
 d $\frac{46}{100} = 0.46$ e $5\frac{95}{100} = 5.95$ f $3\frac{25}{100} = 3.25$
 g $\frac{25}{10} = 2.5$ h $\frac{375}{1000} = 0.375$
 7 a 0.5 b 0.5 c 0.75 d 0.4
 e 0.3 f 0.375 g 0.416 h 0.428571
 8 a 0, 0.5, 1
 b 0, 0.3, 0.6, 0.9 (0.999999... = 1)
 c 0, 0.25, 0.5, 0.75, 1
 d 0, 0.2, 0.4, 0.6, 0.8, 1.0
 9 a $\frac{1}{4}$, 0.4, $\frac{1}{2}$, $\frac{5}{8}$, 0.75, 0.99
 b $\frac{1}{9}$, 0.13, $\frac{3}{7}$, 0.58, $\frac{4}{5}$, 0.84

- 10 a Tan: $= \frac{11}{37} = 0.297$; Lillian: $= \frac{6}{21} = 0.285714$;
 hence, Tan is the better chess player.
 b two or more
 11 0.11 mm, $\frac{11}{100}$ mm
 12 0.5, 0.3, 0.25, 0.2, 0.16, $0.\overline{142857}$, 0.125, 0.1, 0.1
 13 $\frac{1}{10}$, $\frac{1}{5}$, $\frac{1}{4}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{4}{5}$, $\frac{9}{10}$
 14 Answers may vary; $2\frac{4}{9}$, $2\frac{45}{100}$, $2\frac{3}{7}$
 15 $2\frac{4}{7}$, $= 0.571428$, repeating pattern

Exercise 6H

- 1 a 95% b 60% c 75% d 26%
 2 C 3 B 4 A
 5 a 50 b 50%
 c i 5 ii 100 iii 20 iv 1
 d i 50% ii 50% iii 50% iv 50%
 6 a 100, ÷, 100, . b 35, 100, 35, 0
 c out of, 126, 100, 26
 7 a 0.32 b 0.27 c 0.68 d 0.54
 e 0.06 f 0.09 g 1 h 0.01
 i 2.18 j 1.42 k 0.75 l 1.99
 8 a 0.225 b 0.175 c 0.3333 d 0.0825
 e 1.1235 f 1.888 g 1.50 h 5.20
 i 0.0079 j 0.000 25 k 0.0104 l 0.0095
 9 a 80% b 30% c 45% d 71%
 e 41.6% f 37.5% g 250% h 231.4%
 i 2.5% j 0.14% k 1270% l 100.4%
 10 a 86%, 0.78, 75%, 0.6, 22%, 0.125, 2%, 0.5%
 b 50, 7.2, 2.45, 1.8, 124%, 55%, 1.99%, 0.02%
 11 35%
 12 a 25% b 78%
 13 24 gegalitres
 14 a $ab.cd\%$ b $aac\%$ c $abdc\%$
 d $d.d\%$ e $cdb.a\%$ f $cc.cddd\%$
 15 a 0.0ab b $b.cd$ c 0.ac
 d 0.00da e $ab.bb$ f 0.ddd
 16 a no
 b Answers may vary. Examples include: percentage score on a Maths test, percentage of damaged fruit in a crate, percentage of spectators wearing a hat, percentage of the day spent sleeping.
 c Answers may vary. Examples include: percentage profit, percentage increase in prices, percentage increase in the price of a house, percentage score on a Maths test with a bonus question.

- 17 a $F \div A \times 100$
 b F: points scored for the team; A: points scored against the team
 c 100%
 d 158 points
 e yes; Hawthorn 90.60%, Port Adelaide 91.32%

Problems and challenges

- 1 a 2 b 100A c 0.2
 d $\frac{479}{330}$ or $\frac{1437}{990}$
 e $2 \times \$1$ coins, 3×50 -cent pieces and 3×20 -cent pieces
- 2 Height of rungs: 0.18 m, 0.36 m, 0.54 m, 0.72 m, 0.9 m, 1.08 m, 1.26 m, 1.44 m, 1.62 m, 1.8 m
- 3 a A = 1, B = 7, C = 8
 b A = 7, B = 5, C = 1, D = 9
 c A = 4, B = 2
 d A = 3, B = 7
- 4 a i 1.96 ii 2.25 iii 2.1025
 b i 1.41 ii 1.414

Multiple-choice questions

- 1 D 2 B 3 C 4 E 5 A
 6 D 7 D 8 B 9 A 10 C

Short-answer questions

- 1 a 0.44, 0.4, 0.04 b 2.16, 2.026, 2.016
 c 0.98, 0.932, 0.895
- 2 a 8.1 b 0.81 c 8.01 d 0.801
- 3 a 3 hundredths = $\frac{3}{100}$ b 3 thousandths = $\frac{3}{1000}$
 c 3 ones = 3
- 4 a false b false c true
 d true e false f true
- 5 45.270, 45.271, 45.272, 45.273, 45.274, 45.265, 45.266, 45.267, 45.268, 45.269
- 6 a 423.5 b 15.89 c 7.3 d 70.000
 e 2.8 f 0.67 g 0.455
 h 0.012 345 679 012 345 679 012 345 679 012 345 68
- 7 a 9.53 b 4.137 c 43.35
 d 240.49857 e 83.497 f 205.22
- 8 a true b false c false d false
 e true
- 9 a 5 b 5 c 4 d 2
- 10 a 137 b 790 c 22.51 d 0.096 208
 e 696.956 f 360.5 g 563 489.3
- 11 a 19.2 b 63.99 c 19.32 d 0.95
 e 1.52 f 6 g 16 h 3
 i 3.109

Decimal	Fraction	Percentage
0.45	$\frac{45}{100} = \frac{9}{20}$	45%
0.7	$\frac{70}{100} = \frac{7}{10}$	70%
0.32	$\frac{32}{100} = \frac{8}{25}$	32%
0.06	$\frac{6}{100} = \frac{3}{50}$	6%
0.79	$\frac{79}{100}$	79%
1.05	$\frac{105}{100} = \frac{21}{20}$	105%
0.35	$\frac{35}{100} = \frac{7}{20}$	35%
0.65	$\frac{60}{100} = \frac{13}{20}$	65%
0.125	$\frac{125}{1000} = \frac{1}{8}$	12.5%

Extended-response questions

- 1 a Jessica \$12.57; Jaczinda \$13.31; hence, Jaczinda earns higher pay rate by 74c per hour.
 b \$37.47, \$37.45 to the nearest 5 cents
 c \$40.56
 d \$48.34
- 2 a \$30.40 b \$18 240.30
- 3 32 min and 43 seconds, on average



Semester review 1

Whole numbers

Multiple-choice questions

- 1 E 2 B 3 D 4 C 5 A

Short-answer questions

- 1 a  b LXXIV c 
- 2 a 67 849 b 700 850
- 3 a 99 323 b 6867 c 441
 d 196 000 e 1644 f $764\frac{3}{4}$
- 4 a false b true c true
- 5 36
- 6 a 30 b 56 c 48 d 160
 e 16 f 42

- 7 a false b true c false d true
e true f true
8 $18 \times (7 + 3)$
9 9 times
10 a 3 859 640 b 3 860 000 c 4 000 000

Extended-response questions

- 1 a 28 b \$700 c \$1000 d 12 h

Geometry

Multiple-choice questions

- 1 A 2 B 3 B 4 B 5 D

Short-answer questions

- 1 a $AC \parallel FD$ or $EB \parallel DC$
b BF and BD
c CD, ED, BD at D or any three of AC, BD, BE or BF at B
d A and B
e E
2 a 30° b 80° c 150°
3 25°
4 78°
5 a $a = 140$ b $a = 50$ c $a = 140$ d $a = 65$
e $a = 62$ f $a = 56$
6 $a = 100, b = 80, c = 100, d = 80, e = 100,$
 $f = 80, g = 100$
7 Because the cointerior angles add to more than 180° .
8 Check with your teacher.

Extended-response questions

- 1 a i $x = 56$ ii $y = 95$ iii $z = 29$
b $x + y + z = 180$

Number properties and patterns

Multiple-choice questions

- 1 C 2 A 3 B 4 E 5 D

Short-answer questions

- 1 a 1, 3, 5, 15
b 1, 2, 3, 5, 6, 10, 15, 30
c 1, 2, 4, 5, 10, 20, 25, 50, 100
2 a 3, 6, 9, 12, 15 b 7, 14, 21, 28, 35
c 11, 22, 33, 44, 55
3 2, 3 and 6
4 4
5 a 121 b 144 c 25

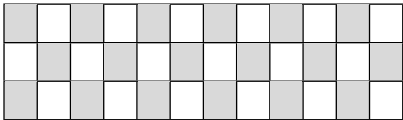
- 6 120
7 false
8 a 1 b 1 c 1
9 a 61 b 17

10

input	4	5	6	9	11	100
output	19	23	27	39	47	403

- 11 A (1, 0), B (4, 1), C (3, 2), D (1, 3), E (3, 4)

Extended-response questions

- 1a 
b 18 c 9th d \$61

Fractions

Multiple-choice questions

- 1 B 2 C 3 E 4 D 5 A

Short-answer questions

- 1 $\frac{3}{10}, \frac{1}{3}, \frac{2}{5}, \frac{1}{2}$
2 $\frac{17}{3}$
3 a $\frac{11}{12}$ b $2\frac{2}{3}$ c $6\frac{1}{4}$ d $\frac{1}{5}$
e 4 f $\frac{1}{2}$
4 $\frac{3}{20}$
5 \$120
6 \$60
7 a true b true c true d false
8 67%

Extended-response questions

- 1 a 6 b $\frac{8}{9}$ c 9
d second dose on Sunday week

Algebra

Multiple-choice questions

- 1 B 2 A 3 C 4 E 5 D

Short-answer questions

- 1 a 4 b yes c 9 d 7
2 a $x + 3$ b $12a$ c $2x + 3y$
d $\frac{w}{6}$ e $y - 2x$
3 a $100m$ b $24x$ c $1\,000\,000p$
d $\frac{y}{24}$

- 4 a 13 b 11 c 39 d 6
e 6 f 24
- 5 36
- 6 a $10a$ b $4x$ c $12a$
d m e $6 + 5a$ f $4x + 2y$
- 7 a $2x + 14$ b $3(x + 4) = 3x + 12$
- 8 a $6bc$ b $5b$ c p
- 9 a $2a + 6$ b $12a - 12b$ c $24m + 32$
- 10 $12xy$

Extended-response questions

- 1 a i \$12 ii $\$(3x + 6)$ iii $\$(3x + 2y)$
b $\$(50 - 3x - 2y)$

Decimals

Multiple-choice questions

- 1 E 2 C 3 D 4 A 5 B

Short-answer questions

- 1 a 0.2 b 0.13 c 1.7
- 2 a 6 units b $\frac{4}{1000}$ c 136.1
- 3 a 18 b 18.4 c 18.40
- 4 a 4.07 b 269.33 c 19.01
d 0.24 e 0.09 f 60
- 5 a 0.833 b 3 c 36
- 6 a 4.5387 b 0.045 387 c 1.23
- 7 a 36 490 b 0.018 c 3886
- 8 a $\frac{4}{5}$ b 1.1 c $\frac{2}{3}$
- 9 a true b false c false
d true e false f true

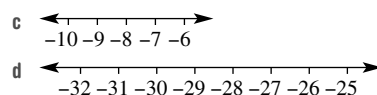
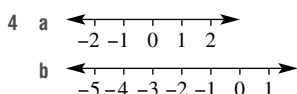
Extended-response questions

- 1 a \$64.08 b \$64.10 c \$64.35 d 25c
e It becomes \$63.90 rather than \$63.80.

Chapter 7

Exercise 7A

- 1 a -2, 2 b 0, 2 c -7, -5 d -5, -3, 0
- 2 a -2 b -6 c 3 d 7
e 15 f -21 g -132 h 1071
- 3 a greater b less c greater d less



- 5 a -2, -1, 0, 1, 2, 3, 4
b -7, -6, -5, -4, -3, -2, -1, 0
c -2, -1, 0, 1 d -4, -3, -2, -1, 0
e -3, -2, -1, 0, 1, 2, 3 f -9, -8, -7, -6, -5, -4
- 6 a < b > c > d <
e > f < g < h >
i < j > k < l >
- 7 a 4°C b -1°C c -7°C d -25°C
- 8 a -10, -6, -3, -1, 0, 2, 4
b -304, -142, -2, 0, 1, 71, 126
- 9 a 0, -1, -2 b -2, 0, 2
c -5, -10, -15 d -44, -46, -48
e -79, -75, -71 f -101, -201, -301
- 10 a \$5 b -\$10
- 11 a -50 m b -212.5 m c 0 m
- 12 a 2 b 4 c 4 d 7
e 3 f 3 g 6 h 44
- 13 a -2 b 1 c -1
d -7 e -51 f 357

Exercise 7B

- 1 a right b right c left d left
- 2 a D b A c B d C
- 3 a 1 b 3 c 2 d 1
e -1 f -3 g -2 h -2
i -4 j -8 k -1 l 2
m 2 n -9 o 6 p -31
- 4 a -2 b -1 c -8 d -19
e -4 f -10 g -15 h -7
i -41 j -12 k -22 l -47
m -300 n -100 o -93 p -634
- 5 a 5 b 9 c 5 d 2
e 5 f 7 g 3 h 10
i 5 j 16 k -4 l -5
m -6 n -13 o -30 p -113
- 6 a 5 b -9 c 1 d -13
e 1 f -22 g -32 h -4
- 7 a \$145 b \$55 c \$5250
- 8 a 3°C b -3°C c -46°C
- 9 69°C
- 10 a 59 m b 56 m
- 11 Answers may vary.
- 12 a i positive ii positive iii negative iv zero
b i no ii yes
- 13 Other combinations may be possible.
a -, + b +, -, - c +, +, -, +
d -, +, +, +, - e +, +, - f -, +, -, -

Exercise 7C

1 b 6, -3 c -3, 1 d -11, -7 e 3, 5
f 6, -2 g -3, 7 h -11, -7

2 a 4 b subtracting c -5
d subtracting e 2 f adding

3 a false b true c true d false
e false f true g false h false

4 a 1 b 5 c 6 d 2
e -3 f -5 g -2 h -4
i -3 j -22 k -35 l -80
m -10 n -29 o -50 p -112

5 a 5 b 11 c 50 d 90
e -4 f -3 g -5 h -34
i 2 j 1 k 0 l 8
m 28 n 34 o -12 p -76

6 a -3 b -10 c -4 d 4
e -1 f 4 g -1 h -5
i -4 j 4 k 2 l -24
m -6 n -5 o 2 p 4

7 a 0 b -5 c 8 d 12
e -9 f 5 g -6 h -91
i -15 j 6 k 17 l 11

8 -143 m

9 -\$35 000

10 -\$30

11 a i \$8000 ii -\$6000

b \$2000

12 a

-2	0	5
8	1	-6
-3	2	4

b

-13	-11	-6
-3	-10	-17
-14	-9	-7

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

14 a 4 b -1 c -3

15 a i no ii yes
b i yes ii no

c Yes, if $b < a$ then subtracting b takes the result to a number bigger than zero.

16 a $\frac{3}{2}$ b $\frac{11}{3}$ c -2 d -4
e $\frac{16}{3}$ f $\frac{23}{2}$ g $-\frac{1}{2}$ h $-\frac{1}{4}$
i $\frac{3}{2}$ j $\frac{15}{2}$ k $\frac{37}{6}$ l $\frac{32}{35}$
m $-\frac{11}{6}$ n $-\frac{27}{20}$ o $\frac{67}{14}$ p $-\frac{53}{30}$

Exercise 7D

1 a

\times	-2	-1	0	1	2
-2	4	2	0	-2	-4
-1	2	1	0	-1	-2
0	0	0	0	0	0
1	-2	-1	0	1	2
2	-4	-2	0	2	4

b

\times	-4	-2	0	2	4
-4	16	8	0	-8	-16
-2	8	4	0	-4	-8
0	0	0	0	0	0
2	-8	-4	0	4	8
4	-16	-8	0	8	16

2 a 2 b -3 c -4 d -4

3 a positive b positive c negative
d positive e positive f negative

4 a -15 b -10 c -6 d -54
e 32 f 28 g 144 h -99
i -39 j -84 k 38 l -108
m 66 n -45 o 63 p 72

5 a -2 b -12 c -2 d -4
e 3 f 1 g -5 h -19
i -7 j -12 k -68 l 8
m 12 n 13 o -13 p 13

6 a 24 b 15 c -4 d 5
e 1 f -10 g 72 h 18
i 1 j -1 k -69 l -3

7 a -7 b 4 c -4 d 8
e 27 f -140 g 2 h -3
i -3 j -1 k -2 l 40

8 a -3 b -3 c 8 d 31
e 3 f 5 g -30 h -100

9 a 4 b 1 c 81 d 100
e 36 f 64 g 9 h 2.25

10 a (1, 6), (2, 3), (-1, -6), (-2, -3)
b (1, 16), (2, 8), (4, 4), (-1, -16), (-2, -8), (-4, -4)
c (-1, 5), (-5, 1)
d (-1, 24), (-24, 1), (-2, 12), (-12, 2), (-3, 8), (-8, 3),
(-4, 6), (-6, 4)

11 a \times, \div b \div, \times c \times, \times d \div, \times

12 a (4, -2), (-4, 2) b (33, -3), (-33, 3)

13 a i -8 ii 64 iii -27

iv 81

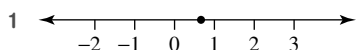
b parts ii and iv, even number of negative factors

c parts i and iii, odd number of negative factors

14 a $-ab$ b $-ab$ c ab

- 15 a $-\frac{1}{4}$ b $-\frac{1}{2}$ c $-\frac{3}{7}$ d 1
 e -1 f $-\frac{5}{4}$ g $\frac{1}{2}$ h 6
 i -1 j 1 k -1 l 1

Progress quiz



- 2 a $-2 < 1$ b $-9 > -12$ c $4 > -5$
 3 -6, -4, 0, 7, 8
 4 a 2 b -9 c -8 d -26
 5 a 5 b -15 c -3 d 20
 6 a 5 b 12
 7 a -12 b 60 c -7 d 4
 8 a 40 b -30 c 16 d -2
 9 a 25 b -8 c 12 d -315
 10 Debt of \$70 or -\$70

Exercise 7E

- 1 a division b multiplication c multiplication
 d division e addition f subtraction
 g multiplication h multiplication i multiplication
 2 a true b false c true
 d false e false f true
 3 a -7 b 7 c 19 d 9
 e 16 f 14 g 6 h -32
 i -5 j -4 k -18 l -4
 m -10 n 4 o 0
 4 a -10 b -2 c -6 d 1
 e 2 f 9 g 1 h 4
 i -14 j -20 k 2 l -5
 m 8 n -6 o -12
 5 \$528
 6 -\$50
 7 a $(-2 + 3) \times 8 = 8$ b $-10 \div (4 + 1) = -2$
 c $(-1 + 7) \times 2 - 15 = -3$
 d $(-5 - 1) \div (-6) = 1$
 e $(3 - 8) \div 5 + 1 = 0$
 f $50 \times (7 - 8) \times (-1) = 50$
 g $-2 \times (3 - (-7)) - 1 = -21$
 h $(-3 + 9) \div (-7 + 5) = -3$
 i $(32 - (-8)) \div (-3 + 7) = 10$
 8 three answers (-10, -21, -31)
 9 a no b no c yes
 d yes e no f yes
 10 a true b true c true
 d true e false f false
 11 a i negative ii negative iii negative
 iv positive v negative vi negative

b If there is an even number of negative factors the result will be positive, if odd then negative

- 12 a 4 b 4 c -4 d -32
 e -32 f 32 g 2 h -2
 i -1

13 Kevin should have typed $(-3)^4$ to raise -3 to the power of 4. -3^4 is -1×3^4 .

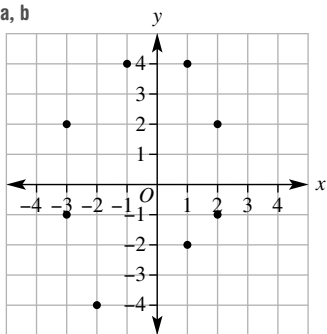
Exercise 7F

- 1 C 2 B 3 no, 20
 4 a 17 b 23 c -8 d 8
 e 6 f 11 g -7 h 6
 i 3 j -9 k -9 l 6
 5 a -8 b -2 c 2 d -13
 e -25 f 17 g 36 h 18
 6 a 38 b 5 c 4 d -13
 e -4 f -16
 7 a 10 b -1 c -24 d -6
 8 a 6 m^2 b 16 m^2
 9 a 32 metres per second
 b 14 metres per second
 c 2 metres per second
 10 a i 16 ii -2
 b A negative width is not possible.
 11 Answer may vary.
 12 Answers may vary.
 13 a $a - a = 0$ and $-b + b = 0$
 b $\frac{a}{a} = 1$
 c $a - a = 0$
 d $\frac{ab}{b}$ cancels to simply give a .
 14 a i 5°C ii -15°C iii -25°C
 b $F = \frac{9C}{5} + 32$

Exercise 7G

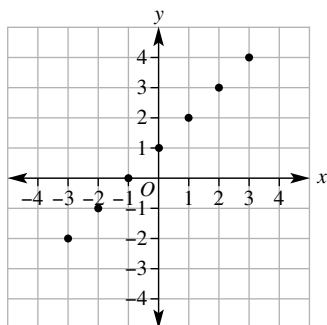
- 1 a D b B c A d C
 e E f H g F h G
 2 a 9 b 18 c 15 d 6
 e 10 f 2 g 1
 3 A(2, 1), B(3, -2), C(-1, -4), D(-2, 2), E(4, 3), F(2, -3),
 G(-3, -1), H(-4, 4)

4 a, b



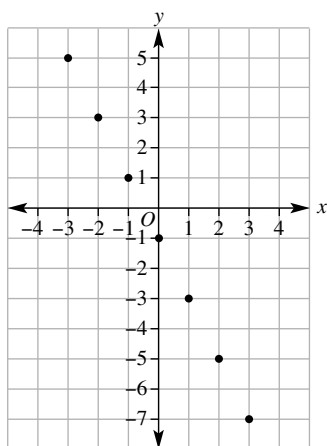
5 a $A(3,0), B(0,-2), C(-1,0), D(0,4), E(0,2), F(1,0), G(0,-4), H(-3,0)$

6 a



b They lie in a straight line.

7 a



b They lie in a straight line.

8 a triangle b rectangle c trapezium d kite

9 a 4 square units b 6 square units
c 4 square units d 15 square units

10 28 km

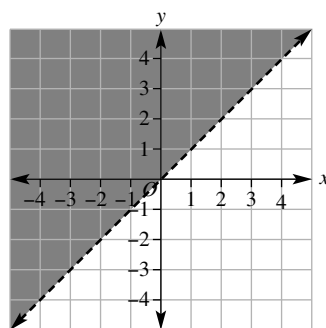
11 $y = 2$

12 $y = 3$

13 a B b C c B, A, C

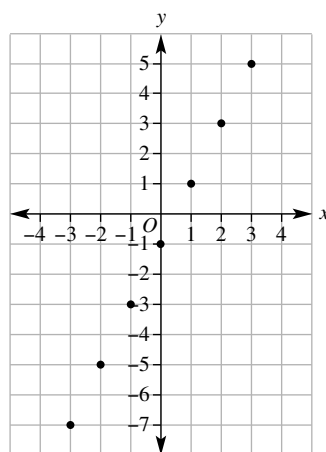
14 a i 1 and 4 ii 4 iii 3 and 4 iv 3

b



15 a $y = \{-7, -5, -3, -1, 1, 3, 5\}$

b, c



d They are in a straight line.

Problems and challenges

- 1 a $-81, 243, -729$ b $4, -2, 1$
c $-10, -15, -21$ d $-8, -13, -21$
- 2 a 0 b -153
c 101
- 3 a $-3 \times (4 + (-2)) = -6$ or $-3 \times 4 \div (-2) = -6$
b $-2 \times 5 \times (-1) + 11 = 21$ or
 $-2 \times 5 \div (-1) + 11 = 21$
c $1 \times 30 \div (-6) - (-2) = -3$
- 4 a 11 and -3 b 21 and -10
- 5 9 pairs
- 6 $a = 1, b = -1, c = -2, d = -3, e = 5$
- 7 $-\frac{1}{25}$
- 8 a $p + t > q + t$ b $t - p < t - q$ c $pt < qt$
- 9 all numbers less than 1 except 0

Multiple-choice questions

- 1 C 2 E 3 B 4 D 5 C
- 6 A 7 E 8 C 9 B 10 C

Short-answer questions

- 1 a < b < c > d <
- 2 a -5 b -2 c -15 d 1
e -2 f -5 g 12 h -18
i -6 j 5 k -11 l 5
- 3 a -1 b -9 c -1 d 2
e -21 f -2 g -87 h 30
- 4 a -10 b -21 c 30 d -5
e -3 f 4 g 1 h -8
- 5 a -2 b -50 c -36 d -1
- 6 a -37 b 8 c -3 d 1
e 56 f 80
- 7 a 10 b -41 c -22 d -11
- 8 A(3, 0), B(2, 3), C(-1, 2), D(-4, -2), E(0, -3), F(4, -4)

Extended-response questions

- 1 a 16°C b -31°C c 8°C d 19°C e 27°C
- 2 rocket

Chapter 8

Exercise 8A

- 1 a iii b iv c i
d v e vi f ii
- 2 a categorical b numerical c numerical
d categorical e numerical f numerical
- 3 Answers will vary.
- 4 a discrete numerical
b continuous numerical
c continuous numerical
d categorical
e categorical
f categorical
g discrete numerical
h discrete numerical
i continuous numerical
j continuous numerical
k continuous numerical
l discrete numerical
m continuous numerical
n discrete numerical
o categorical
p discrete numerical
q discrete numerical
r categorical
- 5 a observation
b sample of days using observation or secondary source records within each day
c census of the class
d sample
e sample
f sample using secondary source data
g census (this question appears on the population census)
h census of the class
i sample
j results from the population census
k observation
l observation
m sample
n sample
- 6 a secondary – a market research company
b secondary – department of education data
c primary data collection via a sample
d secondary source using results from the census
e secondary source using NAPLAN results or similar
- 7 a Proximity to the Indian Ocean makes first hand collection of the data difficult.
b Too many people to ask and a sensitive topic means that using the census results as your source would be better.
c Extremely large population makes primary data difficult to collect.
d Sensitive topic might make student less keen to give honest and reliable answers.
e Cultural issues and the different cultural groups that exist in the community makes collection difficult.
- 8 The data is often collected by a market research company. It is not always possible to know how the data is collected, the areas it is collected from and whether there was a bias introduced in the surveys.
- 9 a Population is the entire group of people but a sample is a selection from within it.
b If the population is small enough (e.g. a class) or there is enough time/money to survey the entire population (e.g. national census).
c When it is too expensive or difficult to survey the whole population, e.g. television viewing habits of all of NSW.
- 10 a The answers stand for different categories and are not treated as numbers. They could have been A–E rather than 1–5.
b i 1 = strongly disagree, 2 = somewhat disagree, 3 = somewhat agree, 4 = strongly agree.
ii 1 = poor, 2 = satisfactory, 3 = strong, 4 = excellent.
iii 1 = never, 2 = rarely, 3 = sometimes, 4 = usually, 5 = always.
iv 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.
- 11 a Excludes people who have only mobile numbers or who are out when phone is rung; could bias towards people who have more free time.
b Excludes people who do not respond to these types of mail outs; bias towards people who have more free time.

- c Excludes working parents; bias towards shift workers or unemployed.
- d Excludes anyone who does not read this magazine; bias towards girls.
- e Excludes people who do not use Facebook; bias towards younger people or people with access to technology.
- 12 a For example, number of babies at a local playground. Other answers possible.
- b Count a sample, e.g. just one floor of one car park.
- 13 It gives ownership and establishes trust where there may not have been any. It also ensures a deeper understanding of the process and need for honesty in the collection and use of any data.
- 14 a Too expensive and difficult to measure television viewing in millions of households.
- b Not enough people – results can be misleading.
- c Programs targeted at youth are more likely to be watched by the students.
- d Research required.
- 15 a Too expensive and people might refuse to respond if it came too often.
- b English as a second language can impact the collection of data (simple, unambiguous English is required). Some people from particular cultures may not be keen to share information about themselves.
- c Some people cannot access digital technologies and they would be excluded from the results.
- d Larger populations and a greater proportion of people in poverty can make census data harder to obtain.
- 16 Different people are chosen in the samples. Larger, randomly selected samples give more accurate guides.
- 17 a i and
- ii Answers will vary.
- iii Random processes give different results.
- b i Different vowels have different frequencies of occurring.
- ii If a high frequency word has an unusual range of vowels, e.g. a webpage on Mississippi.

Exercise 8B

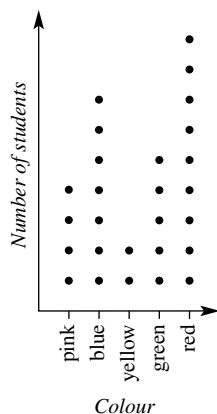
- 1 a 1, 2, 3, 5, 10 c 1
- 2 a 9 b 12 c 9 d 7
- 3 a 30 b 6 c 7 d 7
- 4 a i 6 ii 3 iii 2 iv 1
- b i 11 ii 7 iii 8 iv 2
- c i 18 ii 12 iii 11 iv 11
- d i 17 ii 26 iii 25 iv 25

- e i 32 ii 16 iii 15 iv 10
- f i 40 ii 34 iii 30 iv 55
- g i 102 ii 71 iii 83 iv 84
- h i 91 ii 41 iii 31 iv 18
- 5 a 16.6 b 17.5 c 12
- 6 a Brent b Brent c Ali d Brent
- 7 43.5
- 8 a 2 b 4 c 12
- d 25 e 2.1 f 4
- 9 a 12 b 2 c 0 saves
- 10 a {9, 11}; other solutions possible.
- b {8, 10, 13}; other solutions possible.
- c {0, 100}; other solutions possible.
- d {0, 5, 5, 7, 8, 8.1, 8.9}; other solutions possible.
- 11 a 3 values; e.g. {5, 5, 8}
- b yes, e.g. {0, 0, 5, 5, 5, 7, 20}
- 12 the mean distance (the median is basically unaffected)
- 13 a mean: 7, median: 7.5, mode: 10, range: 12
- b i increases by 5 ii increases by 5
- iii increases by 5 iv no effect
- c i doubles ii doubles iii doubles
- iv doubles
- d Yes; e.g. if the set were duplicated: 1, 1, 3, 3, 5, 5, 10, 10, 10, 10, 13, 13.
- 14 a 7 and 13 b 9, 10, 11
- c They must be 8, 10 and 12.
- 15 Numbers are: $x, x + 1, x + 2$; mean = $\frac{(3x + 3)}{3} = x + 1$ = median
- 16 a range = 6, mean = 7.18 b range = 4, mean = 7.21
- 17 50.5
- 18 a i 4, 4, 4; other solutions possible.
- ii 1, 4, 3, 9, 1; other solutions possible.
- iii 2, 3, 8, 10, 10; other solutions possible.
- iv 1, 2, 3, 4, 4, 16; other solutions possible.
- b It is possible. (Hint: Divide every number by the current range.)

Exercise 8C

- 1 a true b false c true d true e false
- 2 a 5 b 3 c sport d 20
- 3 a 2 b 7 c red d 27

e Favourite colour in 7B

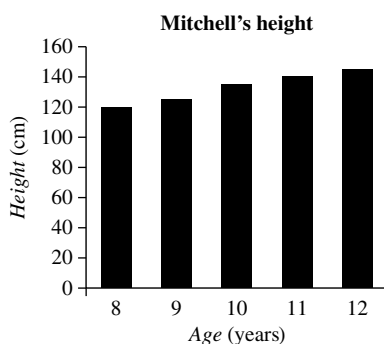


4 a 8 b 24 c 8 d 7 e 2

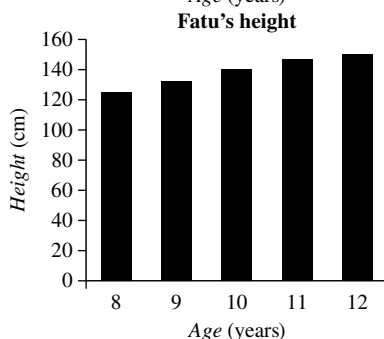
5 a 120 cm b 20 cm c 60 cm

d 11 years old

6 a



b



7 a

	1990	1995	2000	2005	2010	2015
Using public transport	30	25	40	50	60	55
Driving a car	60	65	50	40	20	20
Walking or cycling	10	20	15	15	25	60

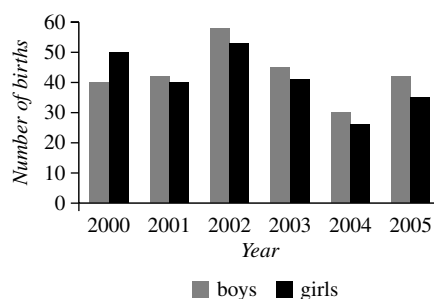
b 2005 and 2010

c 2010 and 2015

d Environmental concerns; others answers possible.

e Public transport usage is increasing; other answers possible.

8 a



b 2000 c 2004 d 2002 e boys

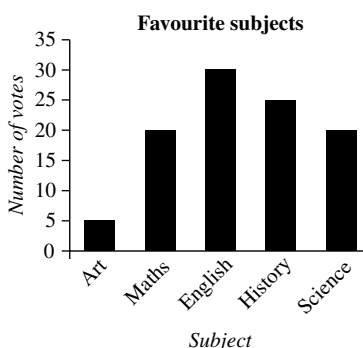
9 a It has increased steadily. b approx. \$38 000

c approx. \$110 000-\$130 000

10 a It is unequal.

b The axes have no labels and it does not have a title.

c



d four times as popular

e one and a half times as popular

f Music

11 a 7 b 7 c 3M: 8, 3S: 4

d 3M e 3M because best student got 10.

12 a 1500 b 104 000 c increased

d approx. 590 000 passengers

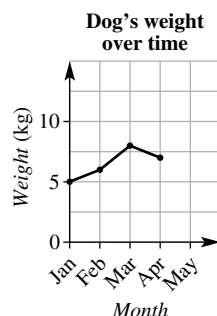
13 Helps to compare different categories quickly by comparing heights.

14 240

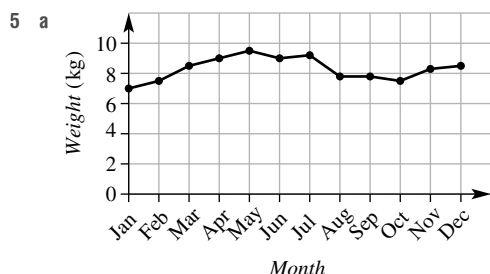
Exercise 8D

1 a 3 kg b 4 kg c 5 kg d 4.5 kg

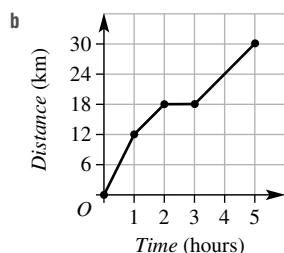
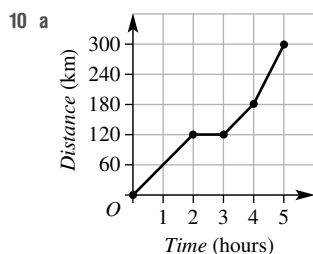
2



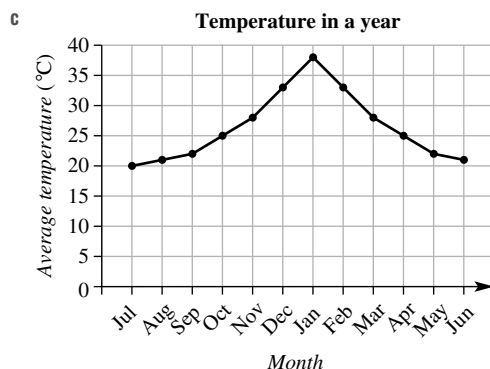
- 3 a 45 cm b 110 cm c 8 years
d 15 cm e 140 cm
- 4 a 23°C
b 2:00 pm
c 12:00 am
d i 10°C ii 18°C iii 24°C
iv 24.5°C



- b Weight increases from January until July, then goes down suddenly.
- c July
- 6 a 200 km b 80 km c At rest
d In the first hour e 40 km
- 7 a 2 hours b 5 km c Fifth hour
- 8 a July
b Year starts July and ends October.
c 20 megalitres because the level stayed the same
d Southern Hemisphere because winter occurs in middle of year.
- 9 a at 7:00 am and 8:00 pm
b at 8:00 am and 11:00 pm
c i around 7:00 am (heater goes on)
ii around 8:00 am (turns heater off)
iii around 8:00 pm (heater put back on)
iv around 11:00 pm (heater turned off)
- d Answers will vary.



- 11 a City is in Southern Hemisphere because hot in January/December.
b City is quite close to equator because winter temperatures reasonably high.



- d Maximum occurs in the middle.
e It depends on what Month 1 means. If it means January, then this is the Northern Hemisphere. If it means June, then this is the Southern Hemisphere.

Exercise 8E

- 1 a 5 b 2
- 2 a 39 b 27 c 134
- 3 57
- 4 a 8, 9, 10, 11, 13, 15, 17, 18, 21, 24
b 10
c i false ii true iii true
iv false
- 5 a range = 20, median = 17 b range = 31, median = 26
c range = 19, median = 40.5

6 a

Stem	Leaf
1	1 2 3 4 4 5 7
2	0 4 8 9
3	1 2 3 5

b

Stem	Leaf
2	0 2
3	9
4	5 7 9 9
5	1 2 2 3 5 6 8 8

c

Stem	Leaf
1	6 6 8
2	1 4 8 9
3	1 2 3 5
4	1 8 9
5	0

d

Stem	Leaf
1	1 2 4
2	7 9
3	2 7 8 8
4	
5	
6	0 0
7	3 8
8	1 7

7 a

Stem	Leaf
8	0 4 5 6
9	0 6
10	1 4 5
11	0 3 4 4 5 9

b

Stem	Leaf
8	1 6
9	1 4 5 6 8
10	2 6 8
11	3 5 5 7
12	0

c

Stem	Leaf
15	5 7 8
16	2 5 7
17	3 4 8
18	1 4 4 5 7
19	2 2 3 3 6 9

d

Stem	Leaf
39	1 5 6
40	1 2 4 5 6 6 8 9
41	1 2 3 3 5 6 7 8
42	0

- 8 a 2 b B c 1 d B
e 1 f N g 2 h 1
i N

- 9 a 10 b 1 c 8
d 58 e 10 seconds

- 10 a i 49 years ii 36 years
b radio station 1
c i 33 to 53 years ii 12 to 32 years

- 11 a i 30 ii 52
b girls
c i 151.5 cm ii 144.5 cm
d boys
e perhaps Year 6 or 7
f Both would have a smaller range and a higher median.

- 12 a 15 b 13
c a is 5 or 6, b is 0, c is 8 or 9, d is 0.

- 13 a Easier to compare sizes of different stems visually.
b Helps in noticing trends and calculating the median.

- 14 a i 30 ii 10
iii between 10 and 19 years old
iv between 31 and 49 years v 18
vi between 18 and 28

- b i true ii false iii true
iv true v false vi false

- c Cannot determine how many people are exactly aged 40 years.

- d close to 30 years

- 15 a minimum: -29°C , maximum: 23°C

- b i 5 ii 10 iii 11

- c Because -05 and 05 are different numbers

- d -5.2°C

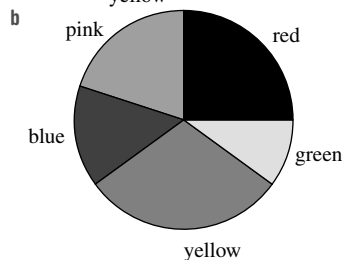
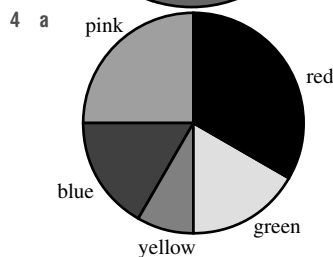
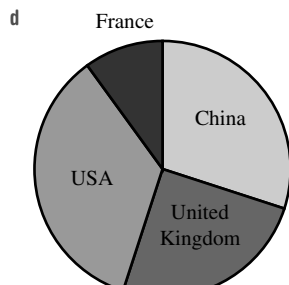
- e -8°C ; it is 2.8°C higher than the mean.

Exercise 8F

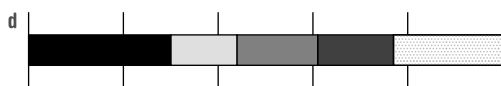
- 1 a playing sport b watching television
c more

- 2 a rugby b basketball c $\frac{1}{5}$ d $\frac{2}{3}$

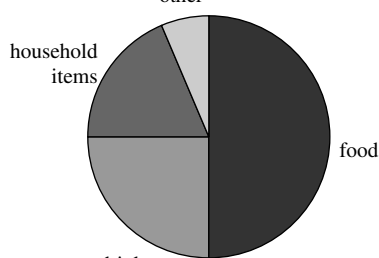
- 3 a 20
b i $\frac{3}{10}$ ii $\frac{1}{4}$ iii $\frac{7}{20}$
iv $\frac{1}{10}$
c i 108° ii 90° iii 126°
iv 36°



c Higher proportion of Year 7s like red; higher proportion of Year 8s like yellow.

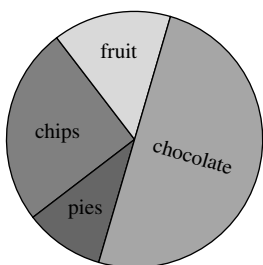


b



6 a i 20 ii 10 iii 6 iv 4

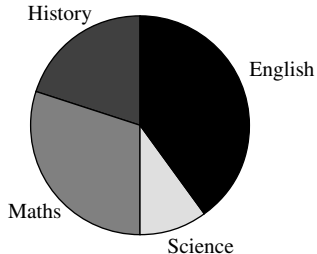
b



c i chips ii fruits and pies
iii chocolate

7 a i 9 ii 6 iii 15

History



8 a Krishna b Nikolas

c It means Nikolas also spends more time playing sport.

9 a 6 b 10

c Bird was chosen by $\frac{1}{8}$, which would be 2.5 people.

d Each portion is $\frac{1}{3}$, but $\frac{1}{3}$ of 40 is not a whole number.

e 24, 48, 72 or 96 people participated in survey.



b 24

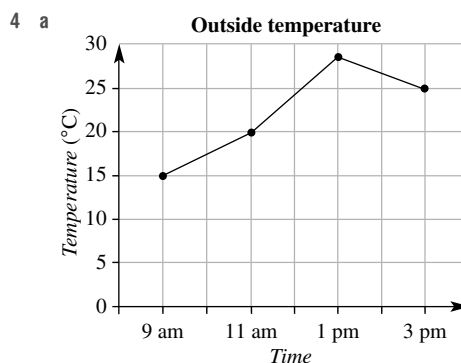
c 6

Progress quiz

1 a categorical b continuous numerical
c discrete numerical d continuous numerical

2 a i 10 ii 6 iii 5 iv 3
b i 13 ii 20 iii 19 iv 15

3 a 2 children b 17 children c 7
d 3 children e 8 children



b around 24°C

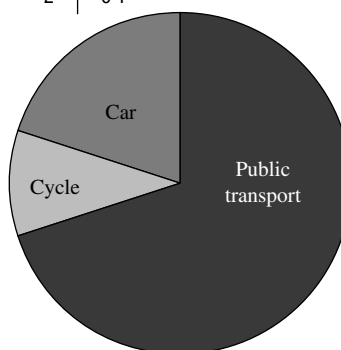
5 a 20 km b 10 km c at rest
d 10 km e 5th hour

6 a 14 towns
b maximum 37°C, minimum 14°C
c 23°C
d 26°C

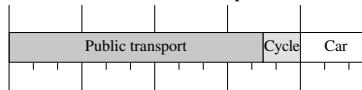
7

Stem	Leaf	1/6 means 16
0	7 9	
1	0 2 6 8 8 9	
2	0 1	

8 a



b



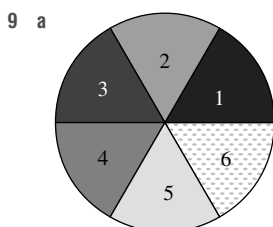
Exercise 8G

1 a D b A c B d C

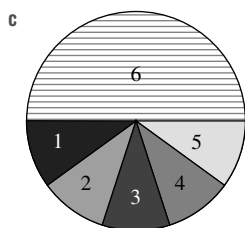
2 a certain b even chance
c unlikely d impossible

3 a true b false c true d false
e true f false

- 4 a D b C c A d B
- 5 a i true ii false iii false
iv true v true
- b i spinner landing on yellow (other answers possible)
ii spinner not landing on red
iii spinner landing on green, blue or red
iv spinner landing on blue or on red
- 6 a spinner 3 b spinner 2 c spinner 1
- 7 Answers will vary.
- 8 a Blue, red and green equally likely.
b Red and green both have an even chance.
c Green and blue equally likely, red and blue are not equally likely.
d Blue is certain.
e Blue, red and green all possible, but no two colours are equally likely.
f Red and blue both have an even chance.



b All sectors have the same size; i.e. 60° .



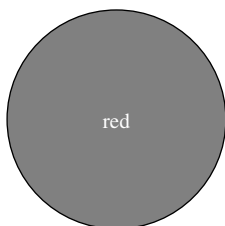
d by replacing the 5 with a 6 (so that there are two faces with 6).

e with 52 equal segments

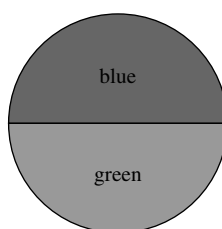
- 10 a spinner 1: $\frac{1}{4}$, spinner 2: $\frac{1}{3}$, spinner 3: $\frac{1}{9}$

b $\frac{1}{2}$

c i



ii

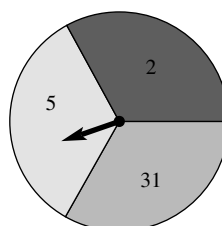


Other answers possible

- d i 50% ii 0% iii 0%, 50%
iv 50%
- e If the two fractions are equal, the two events are equally likely.
- f The proportion of the spinner's area cannot exceed 100% (or 1) and must be greater than or equal to 0%.

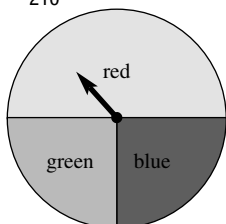
Exercise 8H

- 1 a C b A c D d B
- 2 a sample space b 0 c certain
d more e even chance
- 3 a {1, 2, 3, 4, 5, 6} b {1, 3, 5} c $\frac{1}{2}$
- 4 a 3: red, green, blue
b $\frac{1}{3}$ c $\frac{2}{3}$ d $\frac{2}{3}$ e 0
- 5 a {1, 2, 3, 4, 5, 6, 7}
b $\frac{1}{7}$ c 0 d $\frac{2}{7}$ e $\frac{3}{7}$ f $\frac{4}{7}$
g Number chosen is less than 10; other solutions possible.
- 6 a {M, A, T, H, S} b 0.2 c 0.8
d 60%
- 7 a $\frac{1}{11}$ b $\frac{2}{11}$ c $\frac{5}{11}$
d $\frac{9}{11}$ e $\frac{4}{11}$
- f Choosing a letter in the word ROPE; other solutions possible.
- 8 a 30% b 50% c 80%
- 9 a {2, 3, 4, 5, 6, 7, 8, 9}
b 0.5
c i 0.375 ii 0.375 iii 0
d Possible spinner shown:

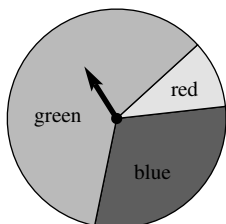


- 10 a i 12 red, 6 blue, 4 yellow, 2 green
ii $\frac{1}{12}$
b i 18 red, 9 blue, 6 yellow, 3 green
ii $\frac{1}{12}$

- c 12
 d No, because it is always $1 - \frac{1}{2} - \frac{1}{4} - \frac{1}{6}$.
- 11 a $a = 1, b = \frac{1}{2}, c = 1, d = \frac{1}{3}, e = 1, f = \frac{2}{5}$
 $g = \frac{3}{5}, h = 1$
 b $\frac{10}{13}$
 c $\frac{3}{7}$
- 12 a yes, $\frac{19}{210}$ b 210 c 840
- 13 a i



- ii Cannot be done because adds to more than 1.
 iii Cannot be done because adds to less than 1.
 iv



- b $1 - x - y$. Also x, y and $1 - x - y$ must all be between 0 and 1.

Exercise 8I

- 1 a $\frac{1}{10}$ b $\frac{2}{5}$ c $\frac{3}{10}$
 2 a $\frac{53}{100}$ b $\frac{47}{100}$ c $\frac{1}{2}$
 3 a 50 b $\frac{2}{5}$ c $\frac{1}{10}$ d $\frac{1}{2}$
 e No, just that nobody did it within the group surveyed.
- 4 a 500
 b 1750
 c i 7 tails ii more
- 5 a 100 b 300
 c yes (but this is very unlikely)
 d from 2 rolls
- 6 Answers will vary.
- 7 a $\frac{1}{4}$ b $\frac{3}{100}$ c $\frac{31}{100}$ d 60
- 8 a 5 b 40 c 70
 d $\frac{26}{35}$ e $\frac{4}{7}$ f 126
- 9 a 2 red, 3 green and 5 blue
 b i yes ii yes iii yes
 iv yes v no
- 10 a C b D c B d A
- 11 a Answers will vary.
 b Answers will vary.

- c No technique for finding theoretical probability has been taught yet.
 d less accurate
 e more accurate
- 12 a False; there is no guarantee it will occur exactly half of the time.
 b False; e.g. in two rolls, a die might land 3 one time. The theoretical probability is not $\frac{1}{2}$, though.
 c False; perhaps the event did not happen yet but it could.
 d True; if it is theoretically impossible it cannot happen in an experiment.
 e False; experiment might have been lucky.
 f True; if it is certain, then it must happen in an experiment.
- 13 a red: 25%, green: 42.2%, blue: 32.8%
 b Fifth set is furthest from the final estimate.
 c have 4 green sectors, 3 blue and 3 red sectors
 d red: 90° , green: 150° , blue: 120°

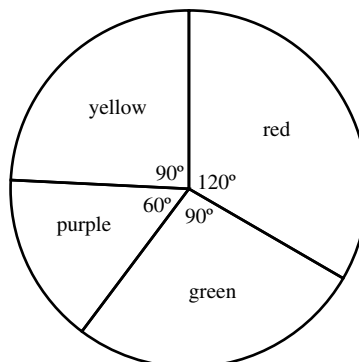
Problems and challenges

- 1 2, 2, 5, 7, 8, 12
 2 a 4 b 10 c 90 d 72
 3

No. of cars	0	1	2	3
No. of students	4	6	8	2

- 4 PROBABLE (or PEBBLIER)
 5 a 60°
 b $192 - 3.6 = 188.4^\circ$
 c $\frac{1}{4}$ or 25%
 d $\frac{99}{100}$ or 99%
 e $\frac{1}{20}$ or 5%
- 6 A spinner with these sector angles has actual probabilities close to the experimental probabilities.

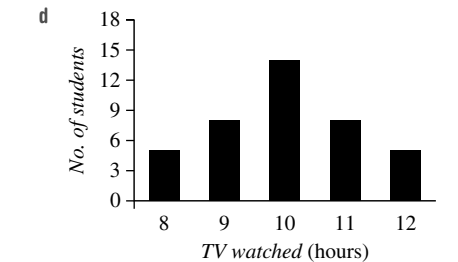
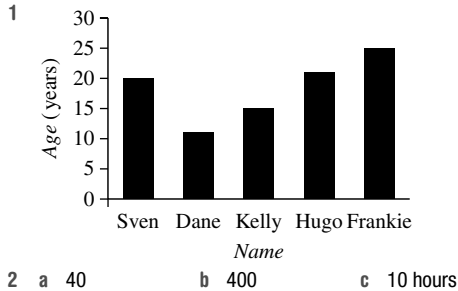
Sector colour	Red	Green	Purple	Yellow
Sector angle	120°	90°	60°	90°
Actual probability	$\frac{40}{120}$	$\frac{30}{120}$	$\frac{20}{120}$	$\frac{30}{120}$
Experimental probability	$\frac{40}{120}$	$\frac{30}{120}$	$\frac{19}{120}$	$\frac{19}{120}$



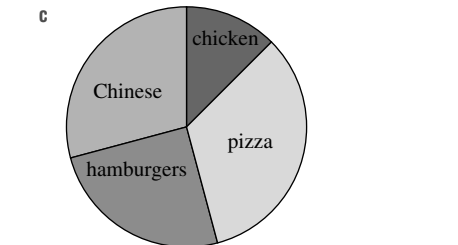
Multiple-choice questions

- 1 B 2 D 3 E 4 D 5 C
6 C 7 A 8 C 9 C 10 B

Short-answer questions

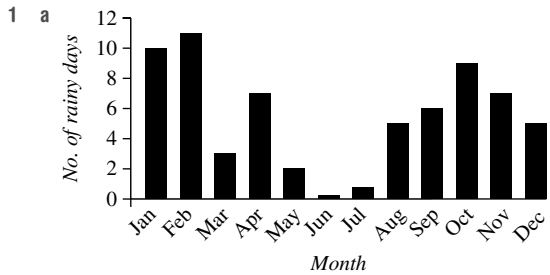


- 3 a 4 students b 2 students
c 1:00 pm d 6 students
- 4 a 105° b 25%



- 5 a 11 b 5 c 3.5 d 2
6 a 12 b 5 c 3.5 d 3
7 a 1 b $\frac{1}{8}$ c $\frac{19}{20}$ d $\frac{3}{4}$
e 0
- 8 a {1, 2, 3, 4, 5, 6} b {heads, tails}
c {D, E, S, I, G, N} d {blue, yellow, green}
- 9 a 9
b i $\frac{5}{9}$ ii $\frac{1}{3}$ iii 0
iv $\frac{1}{3}$ v $\frac{3}{4}$ vi $\frac{4}{9}$
- 10 a $\frac{1}{26}$ b $\frac{2}{13}$ c $\frac{1}{52}$ d $\frac{3}{13}$
- 11 a 42% b 50%
- 12 a $\frac{1}{2}$ b $\frac{1}{4}$ c 25 d 250

Extended-response questions

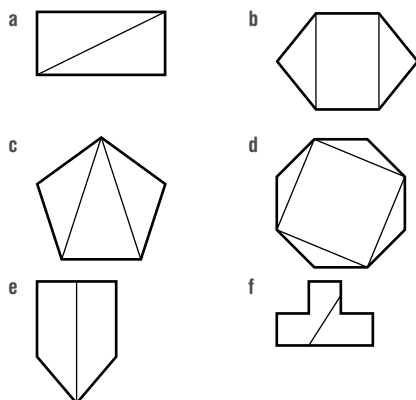


- b 66 c $\frac{6}{92} = \frac{3}{46}$
d discrete numerical e categorical
- 2 a 40
b cheesecake
c $\frac{7}{40}$
d i yes ii no iii yes
iv yes
e 80

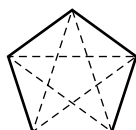
Chapter 9

Exercise 9A

- 1 a pentagon
b i and iii, all interior angles are less than 180°
c ii, there is one interior angle greater than 180°
d regular pentagon
- 2 a b
- c
- 3 a 5 b 3 c 10 d 7
e 11 f 4 g 9 h 6
i 8 j 12
- 4 a i, iv and vi
b i quadrilateral ii pentagon iii hexagon
iv octagon v octagon vi triangle
- 5 a quadrilateral $ABCD$
b pentagon $ABCDE$
c heptagon $DEFGHIJ$
- 6 circle, oval, cylinder, cube, line, segment
- 7 a i 2 ii 7
b i 5 ii 35
- 8 Answers may vary. Some possibilities are given.



- 9 a true b false c false d true
10 a i



b Non-convex, as at least one diagonal will cross over space outside the shape.

11 No, a rectangle is equi-angular.

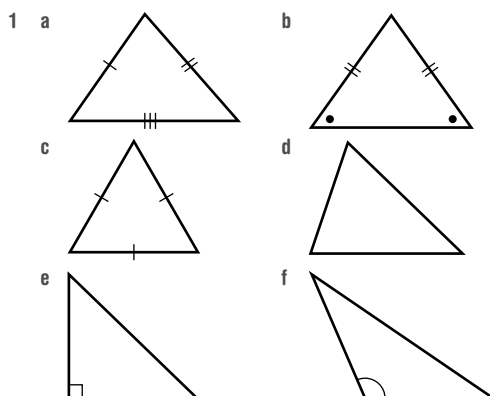
12 No.

13 a

No. of sides	3	4	5	6	7
No. of diagonals (not allowed to cross)	0	1	2	3	4
No. of diagonals (allowed to cross)	0	2	5	9	14

- b i $n - 3$ ii $\frac{n}{2}(n - 3)$

Exercise 9B



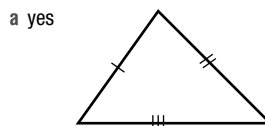
- 2 a A b BC c AC and AB
d $\angle ACB$ and $\angle ABC$

3 a equilateral b isosceles c scalene

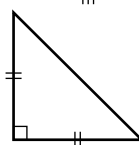
4 a right b obtuse c acute

5 Check measurements with a ruler and protractor.

6 a yes

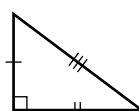


b yes



c no

d yes

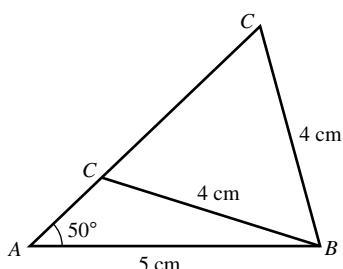


- 7 a 2 b 4 c 6 d 12

8

Triangles	Scalene	Isosceles	Equilateral
Acute			
Right			
Obtuse			

- 9 a yes b isosceles
 10 The two shorter sides together must be longer than the longest side.
 11 a yes b No, the three sides will not join.
 12 a not unique, as triangles can be the same shape but different size
 b unique, as only one triangle is possible
 c not unique, as AC could be of any length
 d not unique, as two triangles are possible



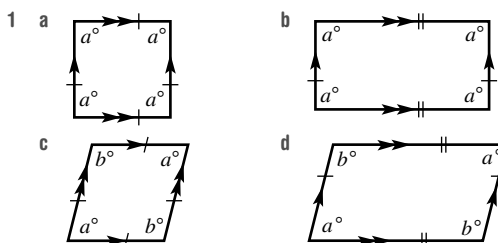
Exercise 9C

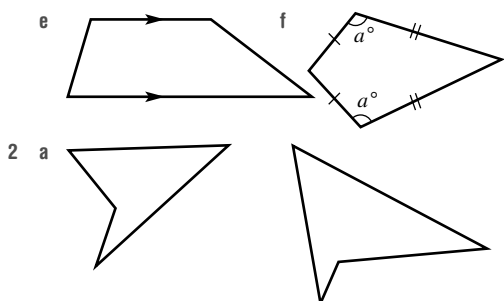
- 1 Check your answers by measuring required lengths and angles.
 2 a yes (SSS) b no c yes (SAS)
 d no e yes (RHS) f yes (AAS)
 3 Check by doing parts d and e.
 4 Check by doing parts d and e.
 5 Check that $\angle CAB = 90^\circ$.
 6 a Start with one side and the intersection of two arcs to give the other two lengths.
 b Start with the base and use two arcs of equal radius.
 c Start with the base and use two arcs with the same radius as the base.
 d Start with the 4 cm segment, construct a right angle (see Q5), then the hypotenuse.
 7 a Start with the base and use two arcs with the same radius as the base.
 b Start with the base, add a perpendicular bisector and place the apex on this line.
 c Start with the base, add a perpendicular line for one side, then add the hypotenuse.
 8 a Triangles with the same angles could be of different size.
 b The angle between the two sides could vary.
 9 b 2 triangles; there are two points on the ray AE that could be used to create the third side.
 c The information does not give a unique triangle.
 10 a Check that the dashed lines form an equilateral triangle.
 b Use the diagram to assist.

Exercise 9D

- 1 b The three angles should add to 180° .
 2 a The 160° angle and a are on a straight line, which should add to 180° .
 b $a + b + 100 = 180$; so if $a = 20$, b must be 60.
 3 60°
 4 a The two base angles in an isosceles triangle are equal.
 b The sum must be 180° (i.e. $70^\circ + 70^\circ + 40^\circ = 180^\circ$).
 5 a 60 b 30 c 55
 d 65 e 25 f 145
 6 a 65 b 20 c 35
 d 75 e 55 f 32
 7 a 30 b 140 c 60
 d 60 e 10 f 142
 8 a 40 b 120 c 45
 d 132 e 16 f 30
 9 a 60 b 60 c 55
 d 55 e 145 f 50
 10 20°
 11 a 155° b 155
 c They are the same.
 d yes, always true
 12 a alternate angles in parallel lines
 b alternate angles in parallel lines
 c They must add to 180° .
 13 a $\angle DCA = a$ (Alternate to $\angle BAC$ and DE is parallel to AB .)
 $\angle ECB = b$ (Alternate to $\angle ABC$ and DE is parallel to AB .)
 $\angle DCA + \angle ACB + \angle ECB = 180^\circ$ (Angles on a line add to 180° .)
 $\therefore a + b + c = 180$
 b $a + b + c = 180$ (Angles in a triangle sum to 180° .)
 $a + b = 180 - c$ (1)
 Also $\angle ACB + \angle BCD = 180^\circ$ (Angles in a straight line sum to 180° .)
 $c + \angle BCD = 180^\circ$
 $\angle BCD = (180 - c)^\circ$ (2)
 From (1) and (2) we have $\angle BAC = a^\circ + b^\circ$.

Exercise 9E





- 2 a
- b 1
- 3 a convex b non-convex c non-convex
- 4 a square b trapezium c kite
d rhombus e rectangle f parallelogram
- 5 a rectangles, kite, parallelogram
b rhombus, parallelogram
c square, rectangle, rhombus, parallelogram
d trapezium
e kite
- 6 a $a = 90, b = 10$
b $a = 100, b = 5$
c $a = 50, b = 130$
- 7 a 5 b 4 c 1 d 10
- 8 Forming a square is possible.
- 9 a square, rectangle
b square, rhombus, kite
- 10 a A square is a type of rectangle because a rectangle can be constrained to form a square.
b Yes, a parallelogram can be constrained to be a rhombus.
c no
- 11 a Use given diagram and check that all sides are the same length.
b Use given diagram and check that the distance between the lines are always equal.

Exercise 9F

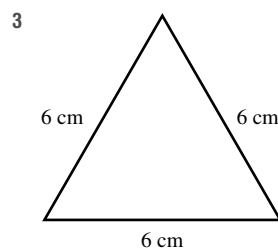
- 1 Answer may vary, but the sum of angles should be very close to 360° .
- 2 Answer may vary, but the sum of angles should be very close to 360° .
- 3 a $a + 70 = 180$, so $a = 110$.
b $b + 110 + 100 + 60 = 360$, so $b = 90$.
- 4 a 130 b 90 c 230
- 5 a $a = 80, b = 90$ b $a = 20, b = 10$
c $a = 120, b = 155$ d $a = 90, b = 35$
e $a = 265, b = 40$ f $a = 270, b = 35$
- 6 a $a = 90$ b $a = 50, b = 130$
c $a = 131$
- 7 a 100 b 70 c 77.5
- 8 a 60 b 115 c 108

- 9 a 130 b 110 c 150
- 10 a possible b impossible
c impossible d possible
e impossible
- 11 $a + b + f = 180$ (sum of angles in a triangle)
 $c + d + e = 180$ (sum of angles in a triangle)
Total sum $= a + b + f + c + d + e$
 $= 180 + 180$
 $= 360$

- 12 a 21 b 60 c 36
d 24 e 22.5 f 60

Progress quiz

- 1 a concave irregular pentagon
b convex regular hexagon
c convex irregular rectangle
d non-convex irregular decagon
- 2 a isosceles triangle
b right-angled triangle



- 3
- 4 180°
- 5 a 70 b 70
- 6 a 60 b 60
- 7 a square b trapezium
c rhombus d parallelogram
- 8 a 102 b 85 c 90
- 9 a 85 b 48 c 122
- 10 a 60 b 48 c 132 d 192

Exercise 9G

- 1 a 4 ways b 2 ways c 3 ways
d 1 way e 2 ways f 0 ways
- 2 a 4 b 2 c 3
d 1 e 2 f 2
- 3 a 4 and 4 b 2 and 2 c 2 and 2
d 1 and 1 e 1 and 1 f 0 and 2
- 4 a equilateral b isosceles c scalene
- 5 a i kite ii rectangle, rhombus
iii none iv square

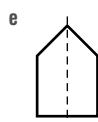
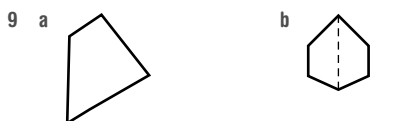
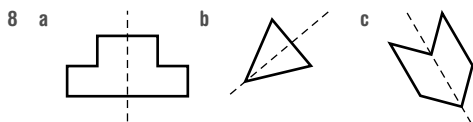
- b i trapezium, kite
 ii rectangle, rhombus, parallelogram
 iii none iv square

- 6 a line and rotational symmetry of order 5
 b line and rotational symmetry of order 1
 c line and rotational symmetry of order 1
 d line and rotational symmetry of order 4

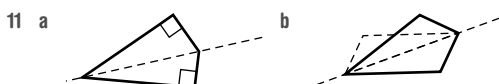
- 7 a A, B, C, D, E, K, M, T, U, V, W, Y

b H, I, O, X

c H, I, N, O, S, X, Z



- 10 a 4 and 4 b 1 and 1 c 1 and 1

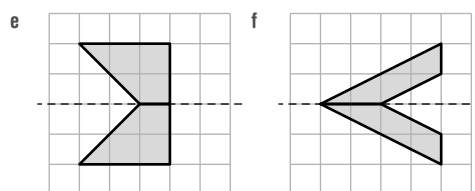
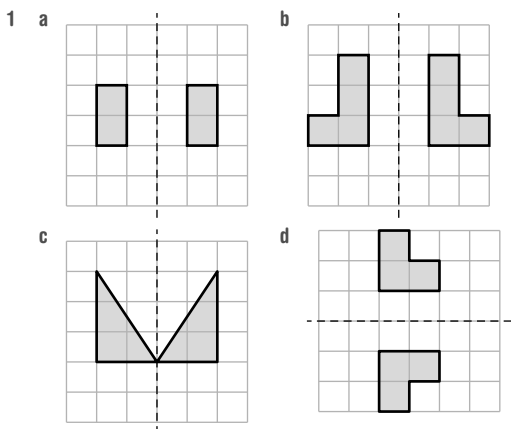


- 12 a i no ii no

b isosceles trapezium

- 13 a 9 b 3 c 4
 d 1 e infinite f infinite

Exercise 9H



- 2 a $(-2, 0)$ b $(-2, 0)$ c $(0, -2)$ d $(0, 2)$

- 3 a no b no

- 4 a $A'(1, 1), B'(1, 4), C'(2, 2), D'(3, 1)$

- b $A'(-3, 4), B'(-3, 1), C'(-2, 1), D'(-1, 2)$

- c $A'(-1, -2), B'(-2, -4), C'(-4, -4), D'(-4, -3)$

- d $A'(2, -1), B'(2, -4), C'(4, -2), D'(4, -1)$

- e $A'(-3, 2), B'(-3, 3), C'(-1, 4), D'(-1, 1)$

- f $A'(-3, -4), B'(-1, -4), C'(-1, -1), D'(-2, -3)$

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

- d $(-3, 3)$ e $(3, 3)$ f $(-3, -3)$

- 6 a $A'(0, -1), B'(2, 0), D'(0, -3)$

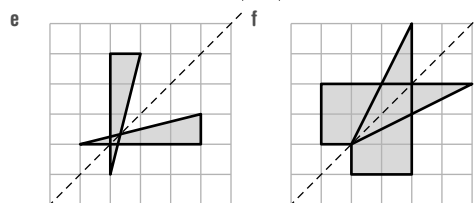
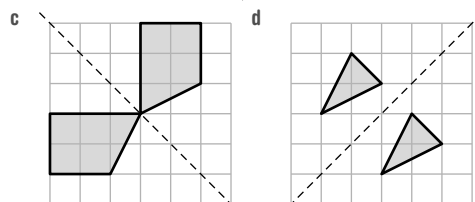
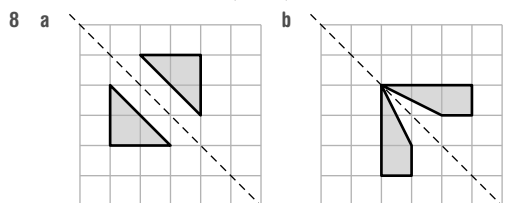
- b $A'(1, 0), B'(0, 2), D'(3, 0)$

- c $A'(0, 1), B'(-2, 0), D'(0, 3)$

- 7 a $A'(-1, 0), B'(-3, 0), D'(-1, 2)$

- b $A'(0, -1), B'(0, -3), D'(-2, -1)$

- c $A'(1, 0), B'(3, 0), D'(1, -2)$



- 9 $(2, -5)$

- 10 a $(0, -1)$ b $(3, 0)$ c $(-1, 2)$

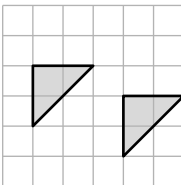
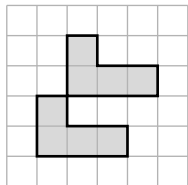
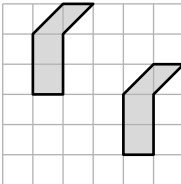
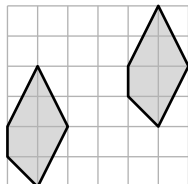
- 11 a 180° b 90° c 90°

- 12 a 270° b 322° c 10°

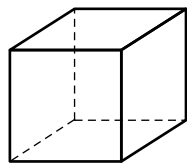
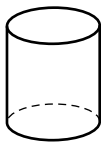
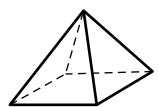
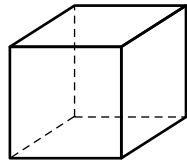
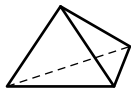
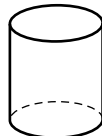

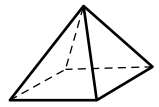
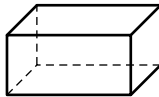
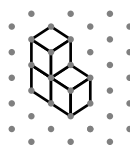
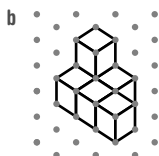

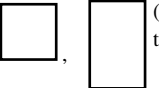

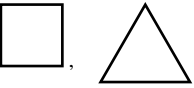


- 13 a $(2, -5)$ b $(2, -5)$
 c the same point d $(4, 1)$ for both

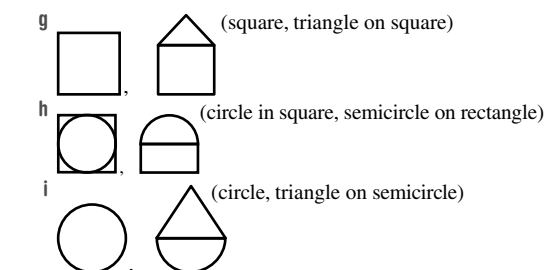
- 14 The triangle has been shifted, not rotated.
 15 Check with your teacher.
 16 Check with your teacher.

Exercise 9I

- 1 a (4, 2) b (1, 2) c (3, 5) d (3, 1)
 e (2, 4) f (0, 1) g (5, 1) h (3, 0)
- 2 a up b left c down d up
 e left f left g right h right
- 3 a 7 units
 b 3 units
 ic 7 units ii 3 units
- 4 a  b 
 c  d 
- 5 a (1, 3) b (-4, 3) c (-2, 1) d (-2, -2)
 e (-2, 5) f (8, 3) g (1, 4) h (2, 1)
 i (3, -3) j (-3, 1) k (-5, 4) l (-4, -2)
- 6 a 3 units up b 7 units down
 c 4 units down d 2 units up
 e 5 units left f 2 units right
 g 1 unit left and 4 units up
 h 3 units right and 6 units up
 i 3 units right and 4 units down
 j 3 units left and 11 units up
 k 12 units right and 3 units down
 l 10 units left and 13 units down
- 7 a 2 units left and 2 units up
 b 4 units left and 4 units up
 c 1 unit right and 5 units down
 d 6 units right and 2 units down
- 8 a 4 b 12
- 9 24 points
- 10 It is neither rotated nor enlarged.
- 11 a 3 right and 1 down b 1 right and 2 up
 c 2 left and 4 down d 6 right and 7 up
- 12 a (-4, -1) b (-4, -3) c (-7, 2)
 d (-13, -5) e (4, -2)

Exercise 9J

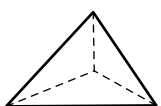
- 1 a  b 
 c 
- 2 a 2 b 4 c 6
- 3 a  b 
 c  d 
 e  f 
- 4 See given diagrams.
- 5 See given diagrams in Question 2.
- 6 a  b 
- 7 a  (two squares)
 b  (square and rectangle with the same top side length)
 c  (circle, isosceles triangle)
 d  (square, isosceles triangle)
 e  (square, diamond)
 f  (2 circles)



8 6

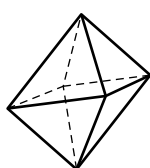
9 20

10 a



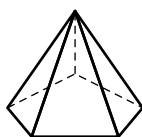
(4-sided pyramid)

b



(8-sided double pyramid)

c



(pyramid with 5-sided base)

11 Yes, one can be rotated to match the other.

12 a C

b A

c B

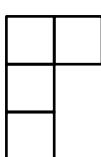
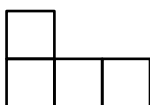
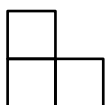
d D

13 a i

front

left

top

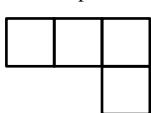
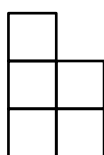
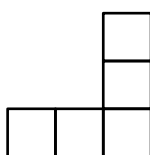


ii

front

left

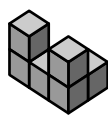
top



b i



ii



Exercise 9K

1 a equal b regular c platonic

2 A and C

3 a equilateral triangle

b square

c equilateral triangle

d regular pentagon

e equilateral triangle

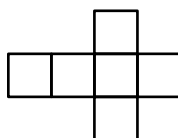
4 a cube

b cylinder

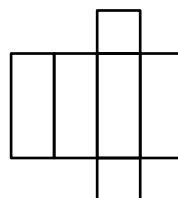
c triangular pyramid

5 Answers may vary.

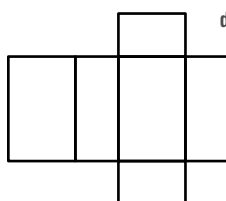
a



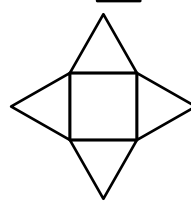
b



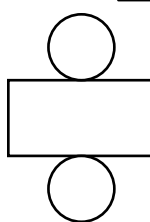
c



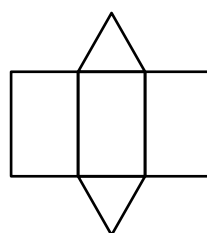
d



e



f



6 a tetrahedron, octahedron, icosahedron

b icosahedron

c octahedron

d tetrahedron

e hexahedron, octahedron

f hexahedron, octahedron

7 a octahedron

b hexahedron

c dodecahedron

d icosahedron

e tetrahedron

8 a 3

b 3

c 4

d 3

e 5

9 a



10 a 2

b 11

11 a 6

b Yes

c There is not the same number of faces meeting at each vertex.

12 a i 1

ii 26

b

n (side length)	1	2	3	4	5
n^3 (number of 1 cm cubes)	1	8	27	64	125
Number of inside cubes	0	0	1	8	27
Number of outside cubes	1	8	26	56	98

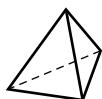
c i n^3

ii $(n-2)^3$

iii $n^3 - (n-2)^3$

Problems and challenges

1 tetrahedron



2 27

3 36

4 a 35

b 1175

5 161

6 18

Multiple-choice questions

1 E

2 B

3 C

4 D

5 C

6 A

7 E

8 C

9 E

10 C

Short-answer questions

1 a 5

b 7

c 11

2 a 2

b 1

3 Check lengths and angles with a ruler and pair of compasses.

4 Check lengths and angles with a ruler and pair of compasses.

5 a yes, AAS

b no

c yes, RHS

6 a 30

b 48

c 50

d 60

e 80

f 130

g 40

h 80

i 105

7 a trapezium

b rhombus

c kite

8 a 90

b 255

c 100

d 125

e 100

f 55

9 a 2, 2

b 1, 1

c 0, 2

10 a $A'(-1, -2)$, $B'(-3, -3)$, $C'(-3, -1)$

b $A'(1, 2)$, $B'(3, 3)$, $C'(3, 1)$

11 a $A'(0, -4)$, $B'(-2, 0)$, $D'(-3, -3)$

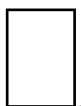
b $A'(4, 0)$, $B'(0, -2)$, $D'(3, -3)$

c $A'(-4, 0)$, $B'(0, 2)$, $D'(-3, 3)$

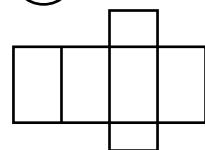
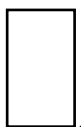
12 a $A'(1, -1)$, $B'(4, -1)$, $C'(3, 1)$

b $A'(-4, 1)$, $B'(-1, 1)$, $C'(-2, 3)$

13 a



b



Extended-response questions

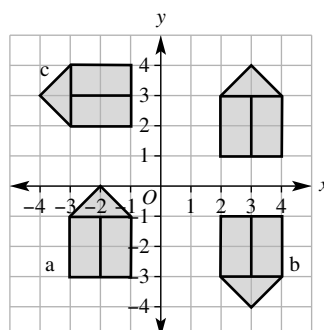
1 a 30°

b 65°

c 35

d It stays the same.

2



Chapter 10

Exercise 10A

1 a E

b N

c E

d E

e E

f N

g E

h E

i N

2 a true

b false

c false

3 true

4 a 19

b 19

c true

5 a true

b false

c true

d true

e false

f false

g true

h false

i true

j true

k false

l true

m false

n false

o true

6 a false

b true

c false

d true

7 a true

b true

c false

d true

8 a true

b false

c true

d true

e true

f false

g false

h true

i true

9 a $3 + x = 10$

b $5k = 1005$

c $a + b = 22$

d $2d = 78$

e $8x = 56$

f $3p = 21$

g $\frac{t}{4} = 12$

h $q + p = q \times p$

10 a $6c = 546$

b $5x = 37.5$

c $12a + 3b = 28$

d $f + 10 = 27$

e $j + 10 + m + 10 = 80$

11 $m = 3$

12 $k = 2$, $k = 6$

13 $x = 1$ and $y = 5$, $x = 2$ and $y = 4$, $x = 3$ and $y = 3$, $x = 4$ and $y = 2$, $x = 5$ and $y = 1$

14 a S

b S

c A

d A

e N

f N

g A

h S

i A

j S

k N

l N

15 a $6 = 2 \times 3$; other solutions possible.

b $5 - 4 = 1$; other solutions possible.

c $10 \div 2 = 7 - 2$; other solutions possible.

d $4 - 2 = 10 \div 5$; other solutions possible.

i	j = 4	j	l = 4	k	v = 2	l	y = 12
m	k = 5	n	y = 9	o	z = 7	p	t = 10
q	b = 12	r	p = 11	s	a = 8	t	n = 3

6

a

$$\begin{array}{ccc} & \swarrow & \searrow \\ -3 & & -3 \\ & \nwarrow & \nearrow \\ & 7a + 3 = 38 & \\ & \swarrow & \searrow \\ & 7a = 35 & \\ & \nwarrow & \nearrow \\ \div 7 & & \div 7 \\ & \swarrow & \searrow \\ & a = 5 & \end{array}$$

b

$$\begin{array}{ccc} & \swarrow & \searrow \\ +10 & & +10 \\ & \nwarrow & \nearrow \\ & 4b - 10 = 14 & \\ & \swarrow & \searrow \\ & 4b = 24 & \\ & \nwarrow & \nearrow \\ \div 4 & & \div 4 \\ & \swarrow & \searrow \\ & b = 6 & \end{array}$$

c

$$\begin{array}{ccc} & \swarrow & \searrow \\ +2 & & +2 \\ & \nwarrow & \nearrow \\ & 2(q + 6) = 20 & \\ & \swarrow & \searrow \\ & q + 6 = 10 & \\ & \nwarrow & \nearrow \\ -6 & & -6 \\ & \swarrow & \searrow \\ & q = 4 & \end{array}$$

d

$$\begin{array}{ccc} & \swarrow & \searrow \\ -3 & & -3 \\ & \nwarrow & \nearrow \\ & 5 = \frac{x}{10} + 3 & \\ & \swarrow & \searrow \\ & 2 = \frac{x}{10} & \\ & \nwarrow & \nearrow \\ \times 10 & & \times 10 \\ & \swarrow & \searrow \\ & 20 = x & \end{array}$$

- | 7 | a subtract 3 | b add 7 | c divide by 5 | d divide by 2 |
|---|--------------|------------|---------------|---------------|
| 8 | a $f = 11$ | b $k = 4$ | c $x = 9$ | d $a = 9$ |
| | e $k = 8$ | f $a = 6$ | g $n = 11$ | h $n = 8$ |
| | i $g = 4$ | j $q = 11$ | k $z = 10$ | l $p = 1$ |
| | m $d = 4$ | n $t = 8$ | o $u = 5$ | p $c = 1$ |
| | q $q = 11$ | r $v = 12$ | s $q = 2$ | t $u = 10$ |

9 a $x = \frac{3}{4}$ b $k = \frac{24}{5}$ c $w = \frac{4}{3}$
d $x = \frac{4}{3}$ e $x = \frac{5}{8}$ f $x = \frac{1}{3}$

- 10 a $r = -7$ b $x = -3$ c $t = -16$ d $y = -24$
e $x = -5$ f $k = -9$ g $x = -6$ h $x = -4$
i $x = \frac{-3}{2}$

- 11 a $x + 5 = 12 \rightarrow x = 7$ b $2y = 10 \rightarrow y = 5$
 c $2b + 6 = 44 \rightarrow b = 19$ d $3(k - 7) = 18 \rightarrow k = 13$
 e $\frac{b}{4} + 3 = 6 \rightarrow b = 12$ f $\frac{k}{2} - 10 = 1 \rightarrow k = 22$

- 12 a $12n + 50 = 410$ b $n = 30$ h
13 a $12 + 5x$ b $12 + 5x = 14.5$
c $x = 0.5$, so pens cost 50 cents.

- 14 a $3w = 15 \rightarrow w = 5$ b $4x = 12 \rightarrow x = 3$
c $2(10 + x) = 28 \rightarrow x = 4$
d $4w = 28 \rightarrow w = 7$

- 15** **a** $x = 6$ **b** $x = 8$ **c** $x = 5$

- 16** Examples include: $x + 1 = 3$, $7x = 14$, $21 - x = 19$,
 $\frac{4}{x} = x$, $\frac{x}{2} = 1$.

17 a

Diagram a shows a circular flow of operations solving the equation $2x + 5 = 13$. The steps are:

- $2x + 5 = 13$
- -5
- $2x = 8$
- $+2$
- $x = 4$
- $\times 5$
- $5x = 20$

b

Diagram b shows a circular flow of operations solving the equation $10 + 2x = 20$. The steps are:

- $10 + 2x = 20$
- -10
- $2x = 10$
- $+2$
- $x = 5$
- $x - 3 = 2$
- -3
- $x - 3 = 2$
- $\times 2$
- $2(x - 3) = 4$

- c** yes **d** yes

- 18 a First step, $4x + 2$ is not completely divided by 4.
b Second step, LHS divided by 3, RHS has 3 subtracted.
c First step, RHS has 5 added not subtracted.
d First step, LHS has $11x$ subtracted, not 12.

- 19** **a** $x = 4$ **b** $x = 1$ **c** $l = 3$ **d** $t = 1$
 e $s = 5$ **f** $b = 19$ **g** $j = 2$ **h** $d = 1$

Exercise 10E

- 1 a true b false c true
d false e true f false
 - 2 a 7 b 9 c false
 - 3 a $b = 44$ b $d = 15$ c $h = 28$ d $p = 26$
 - 4 a B b C c A d D
 - 5 a $m = 12$ b $c = 18$ c $s = 16$ d $r = 10$
e $u = 20$ f $y = 18$ g $x = 4$ h $a = 16$
i $h = 10$ j $j = 15$ k $v = 9$ l $q = 8$
 - 6 a $h = 9$ b $y = 6$ c $j = 3$ d $b = 4$
e $u = 3$ f $t = 9$ g $w = 6$ h $r = 4$
i $q = 9$ j $s = 3$ k $l = 8$ l $z = 7$
m $v = 11$ n $f = 9$ o $x = 2$ p $d = 5$
q $n = 5$ r $m = 11$ s $p = 8$ t $a = 9$
 - 7 a $y = -1$ b $a = -10$ c $x = -10$ d $x = -48$
e $u = -30$ f $y = -10$ g $u = -4$ h $d = -5$
 - 8 a $\frac{t}{2} = 9 \rightarrow t = 18$ b $\frac{q}{3} = 14 \rightarrow q = 42$
c $\frac{2r}{5} = 6 \rightarrow r = 15$ d $\frac{q-4}{2} = 3 \rightarrow q = 10$
e $\frac{x+3}{4} = 2 \rightarrow x = 5$ f $\frac{y}{4} + 3 = 5 \rightarrow y = 8$
 - 9 a $\frac{b}{5} = 31.50$ b $b = 157.5$ c \$157.50
 - 10 a $\frac{x}{2} + 5$
b $\frac{x}{2} + 5 = 11 \rightarrow x = \12
c \$6
 - 11 a The different order in which 3 is added and the result multiplied by 5.
b multiply by 5
c subtract 3
d No, the difference between them is always 2.4 for any value of x .
 - 12 a $4x = 2$ (other solutions possible)
b $7x = 5$
c yes, e.g. $2x + 1 = 0$
 - 13 a i multiply by 2 ii divide by $\frac{1}{2}$
b $x = 26$ for both of them.
c Makes the first step a division (by a fraction) rather than multiplication.
 - 14 a $x = \frac{7}{2}$ b $x = \frac{17}{6}$ c $x = \frac{19}{6}$ d $x = \frac{7}{6}$

Progress quiz

- 1 a E b N c E d N
- 2 a T b F c T d F
- 3 a $5 + m = 12$ b $2d = 24$
c $9x = 72$ d $3c + 4b = 190$
- 4 a $a = 9$ b $x = 4$ c $m = 30$ d $a = 2$
- 5 a $20x = 35$ b $2a = 16$
- 6 a $+8$ b $\div 6$ c $\times 2$
- 7 a $a = 12$ b $w = 31$ c $k = 63$ d $m = 8$
- 8 a $x = 11$ b $a = 7$ c $m = 6$ d $y = 8$
- 9 a $c = 24$ b $a = 8$ c $h = 12$ d $m = 55$
- 10 a $\frac{m}{2} + 5 = 11; m = 12$ b $\frac{7+x}{2} = 9; x = 11$

Exercise 10F

- 1 C
- 2 a 6 b 4 c 2 d 12
- 3 a true b false c true
d true e false f false
- 4 a $2x + 2$ b $10b + 15$ c $6a - 8$ d $35a + 5$
e $12x + 16$ f $24 - 9y$ g $48a + 36$ h $2u - 8$
- 5 a $4a + 2$ b $5 + 3x$ c $3b - 4$ d $3a + 12$
e $6x + 3$ f $k + 6$ g $2b + 6$ h $5k + 1$
- 6 a $s = 6$ b $l = 1$ c $p = 9$ d $y = 0$
e $q = 1$ f $p = 12$ g $m = 5$ h $b = 6$
i $p = 3$ j $p = 7$ k $y = 9$ l $r = 8$
- 7 a $d = 3$ b $x = 2$ c $x = 5$ d $e = 1$
e $a = 1$ f $r = 3$ g $u = 1$ h $q = 11$
- 8 a $s = 1$ b $i = 1$ c $c = 5$ d $v = 8$
e $k = 1$ f $q = 3$ g $y = 4$ h $f = 3$
i $t = 2$
- 9 a $u = -5$ b $k = -3$ c $p = -1$ d $q = -2$
e $u = -1$ f $x = -3$ g $p = -4$ h $r = -10$
i $x = -5$
- 10 a i $2(5 + x) = 14$ ii $x = 2$
b i $3(q - 3) = 30$ ii $q = 13$
c i $2(2x + 3) = 46$ ii $x = 10$
d i $2(y + 4) - y = 17$ ii $y = 9$
- 11 a LHS simplifies to 10, but $10 = 7$ is never true.
b LHS simplifies to 15, not 4.
c LHS simplifies to 6, not 12.
- 12 a LHS = 9, RHS = 9, therefore true.
b LHS = 9, RHS = 9, therefore true.
c LHS simplifies to 9.
d For example $2(x + 5) - 3 - 2x = 7$. Others possible.
- 13 a $s = 6$ b $l = 1$ c $p = 9$ d $y = 0$
e $q = 1$ f $p = 12$ g $m = 5$ h $b = 6$
i $p = 3$ j $p = 7$ k $y = 9$ l $r = 8$

- 14 a $j = 2$ b $a = 1$ c $a = 3$ d $a = 8$
e $c = 4$ f $d = 8$ g $x = 1$ h $x = 3$
i $x = 0$

Exercise 10G

- 1 a N b R c R
d N e R f R
- 2 a 15 b 36 c 8 d 2
- 3 a $h = 7$ b $h = 9$ c $m = 8$ d $m = 10$
- 4 a $y = 23$ b $x = 4$ c $x = 7$
- 5 a $A = 7$ b $q = 4$ c $t = 0$
- 6 a $G = 27$ b $x = 1$ c $y = 5$
- 7 a $20 = w \times 4 \rightarrow w = 5$
b i $25 = 5h \rightarrow h = 5$ ii square
- 8 a $P = 16$ b $h = 3$ c 24 units squared
- 9 a $F = 68$ b $C = 10$ c 12°C d 15°C
- 10 a $d = \frac{S - 3b}{5}$ b $C = \frac{5(F - 32)}{9}$
c $x = \frac{Q - 36}{4}$
- 11 a Check by substituting values back into equation.
b If $D = 20$, C should equal 60 not 50, as in row 2.
c Check by substituting values back into equation.
d For example, $C = 2t - 10$, $C = \frac{Dt}{20} + 20$; other solutions possible.
- 12 a Abbotsford Apes
b 8 goals
c $S = 9q + 6g + b$
d 0 goals and 0 behinds, 2 goals and 12 behinds, 3 goals and 9 behinds, 7 goals and 7 behinds.

Exercise 10H

- 1 a A b C c C
- 2 a $x = 6$ b $a = 2$ c $k = 9$
- 3 a Let c = car's cost b $c + 2000 = 40\,000$
c $c = 38\,000$ d \$38 000
- 4 a Let p = cost of one pen b $12p = 15.6$
c $p = 1.3$ d \$1.30
- 5 a Let h = number of hours worked
b $17h + 65 = 643$
c $h = 34$
d 34 hours
- 6 a $24w = 720$ b $w = 30$ c 30 m
d 108 m
- 7 $2(2x + 3) = 34 \rightarrow x = 7$
- 8 $x = 4$
- 9 1.5 h
- 10 14 years old
- 11 $2x + 154 = 180 \rightarrow x = 13$

- 12 $3y = 90 \rightarrow y = 30$
 13 Examples include: $h = 3, w = 6$ or $h = 12, w = 2.4$; other solutions possible.
 14 $x = 3.5, y = 2$
 15 a possible ($p = 12$)
 b Not possible because solution is not a whole number.
 c possible ($p = 8$)
 16 $a + 2b = 180$, so $a = 180 - 2b = 2(90 - b)$ is always even.
 17 a i $x = 60$
 ii One angle is -10° , which is impossible.
 b i $60 - x + 70 + x + 50$ is always 180, regardless of the value of x .
 ii any value less than 60 and greater than -70 .
 c Answers will vary.

Problems and challenges

- 1 a 26 b 29 c 368 d $31\frac{1}{3}$
 e 36
 2 27 cm
 3 $x = 7, y = 9, P = 72$ cm
 4 1458 m^2
 5 $a = 5, b = 2, c = 12$
 6 a $a = 22.5, b = 37.5$ b $a = 10, b = 23$
 c $a = 36, b = 108$ d $a = 60, b = 40$
 7 26 sheep, 15 ducks
 8 $x = 45; 132, 133, 134, 135, 136$

Multiple-choice questions

- 1 C 2 A 3 D 4 B 5 E
 6 C 7 A 8 A 9 B 10 E

Short-answer questions

- 1 a false b true c true
 d false e true f false
 2 a $2 + u = 22$ b $5k = 41$
 c $3z = 36$ d $a + b = 15$
 3 a $x = 3$ b $x = 6$ c $y = 1$ d $y = 9$
 e $a = 2$ f $a = 10$
 4 a $2x = 8$ b $7a = 28$ c $15 = 3r$ d $16 = 8p$
 5 a $x = 3$ b $r = 45$ c $p = 9$ d $b = 6$
 e $x = 9$ f $r = 4$ g $q = 2$ h $u = 8$
 6 a $u = 8$ b $p = 3$ c $x = 4$ d $y = 8$
 e $y = 4$ f $x = 15$
 7 a $6 + 4p$ b $12x + 48$ c $7a + 35$ d $18x + 9$
 8 a $x = 8$ b $x = 8$ c $x = 7$ d $y = 10$
 e $z = 5$ f $q = 3$

- 9 a no b Solution is $x = \frac{7}{11}$, which is not whole.
 10 a No; LHS simplifies to 10.
 b i Is a solution. ii Is a solution.
 11 a $A = 450 \text{ cm}^2$ b $h = 10$ cm
 12 a 36 b 6 c 3
 13 a 5 b 6 c 20 d 6 cm
 14 a $y = 35$ b $y = 30$

Extended-response questions

- 1 a 75 cents b $C = 15 + 2t$ c \$1.75
 d 12 seconds e 81 seconds
 f 2.5 min in total (50 seconds for the first call, then 100 seconds)
 2 a \$500
 b 30 hours at $\$x/\text{hour}$, and 10 hours at $\$(x + 2)/\text{hour}$.
 c \$660
 d $x = 15$
 e $x = 21$, so Gemma earned \$630 from Monday to Friday.

Chapter 11

Exercise 11A

- 1 a i 1 foot = 12 inches = 16 digits = 4 palms
 ii 1 mile = 1000 paces
 b i 1 foot = 12 inches ii 3 feet = 1 yard
 iii 1 mile = 1760 yards
 c i 1 m = 100 cm ii 1 cm = 10 mm
 iii 1 km = 1000 m
 2 digit, inch, palm, foot, cubit, pace, mile
 3 inch, foot, yard, rod, chain, furlong, mile
 4 millimetre, centimetre, metre, kilometre
 5 a 5 b 5000 c 4
 d 20 e 16 f 80
 6 a 12 b 3 c 36
 d 1760 e 22 f 40
 7 a 10 b 100 c 1000
 d 1000 e 100 000 f 1 000 000
 8 a kilometres b millimetres c metres
 d metres e centimetres f kilometres
 9 a metres b millimetres c kilometres
 d kilometres e metres f centimetres
 10 1 pace
 11 5000
 12 440
 13 a 2 mm b 5 mm c 2 cm
 d 5 cm e 8 cm
 14 a 6 cm b 5 cm c 25 cm

15 a

	mm	cm	m	km
mm	1	$\frac{1}{10}$	$\frac{1}{1000}$	$\frac{1}{1000\ 000}$
cm	10	1	$\frac{1}{100}$	$\frac{1}{100\ 000}$
m	1000	100	1	$\frac{1}{1000}$
km	1 000 000	100 000	1000	1

b

	Inch	Feet	Yard	Mile
Inch	1	$\frac{1}{12}$	$\frac{1}{36}$	$\frac{1}{63\ 360}$
Feet	12	1	$\frac{1}{3}$	$\frac{1}{5280}$
Yard	36	3	1	$\frac{1}{1760}$
Mile	63 360	5280	1760	1

c

	Digit	Palm	Feet	Pace	Mile
Digit	1	$\frac{1}{4}$	$\frac{1}{16}$	$\frac{1}{80}$	$\frac{1}{80\ 000}$
Palm	4	1	$\frac{1}{4}$	$\frac{1}{20}$	$\frac{1}{20\ 000}$
Feet	16	4	1	$\frac{1}{5}$	$\frac{1}{5000}$
Pace	80	20	5	1	$\frac{1}{1000}$
Mile	80 000	20 000	5000	1000	1

- 16 4 rods = 1 chain, but conversion to other units is less simple.
 17 All conversions involve a power of 10.
 18 Answers may vary.

Exercise 11B

- 1 a 100 b 1000 c divide
 d multiply e multiply f divide
- 2 a 1000 b 1000 c 100 000 d 1 000 000
- 3 a right b left
- 4 a 50 mm b 200 cm c 3500 m d 2610 cm
 e 4 cm f 5 m g 4.2 km h 47.2 cm
 i 684 cm j 20 m k 926.1 cm l 4.23 km
- 5 a 2.5 cm b 82 mm c 2.5 m
 d 730 cm e 6200 m f 25.732 km
- 6 a 3000 mm b 600 000 cm c 2400 mm
 d 4000 cm e 0.47 km f 913 m
 g 0.216 km h 0.0005 m
- 7 a 2 cm b 5 cm c 1.5 cm d 3.2 cm
 e 3 cm f 3 cm g 1.2 cm h 2.8 cm
- 8 a 2.7 m b 0.4 km
- 9 a 8.5 km b 310 cm c 19 cm
- 10 a 38 cm, 0.5 m, 540 mm
 b 160 cm, 2100 mm, 0.02 km, 25 m
 c 142 mm, 20 cm, 0.003 km, 3.1 m
 d 10 mm, 0.1 m, 0.001 km, 1000 cm

11 125 cm

12 Bigan tower

13 a \$8200

b \$6.56

c 41c

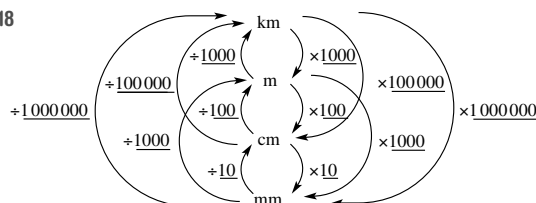
14 625 years

15 50 000 years

16 0.08 mm

17 2500 s

18



19 So that only one unit is used and mm deliver a high degree of accuracy.

20 a i 1 million ii 10 000 iii 1000

iv 1 billion (1 000 000 000)

b 0.312 μm

c The distance you travel in 1 year at light speed

Exercise 11C

- 1 a 10 cm b 12 cm
- 2 a 6 cm b 12 cm c 5.2 cm d 6.4 cm
- 3 a 15 cm b 37 m c 30 km
 d 2.4 m e 26 cm f 10 cm
- 4 a 42 cm b 34 m c 36 km
- 5 a 8.4 cm b 14 m c 46.5 mm
- 6 \$21 400
- 7 a 516 ft b 157.38 m
- 8 a 70 mm b 72 cm
- 9 a 40.7 cm b 130.2 cm c 294 cm
- 10 400 m
- 11 a 5 cm b 5 m c 7 km
- 12 4, including a square
- 13 a $P = a + 2b$ b $P = 4a$ c $P = 2a + 2b$
 d $P = 4a$ e $P = 2a + 2b$ f $P = 2a + b + c$
- 14 a $P = 2a + 2b + 2c$ or $2(a + b + c)$
 b $P = 2a + 2b + 2c$ or $2(a + b + c)$
- 15 a $\frac{P}{4}$ b $\frac{(P - 2a)}{2}$
- 16 a 160 cm b 216 cm c 40 cm
 d $4a + 32$ or $4(a + 8)$

Exercise 11D

- 1 a 8 b 4 cm and 2 cm c 8 cm²
- 2 a 9 b 3 cm and 3 cm c 9 cm²
- 3 a 5 square units b 8 square units
 c 96 square units
- 4 a cm² b m² c ha

- d km^2 e ha f mm^2
- 5 a 6 cm^2 b 3 cm^2 c 2 cm^2
d 5 cm^2 e 4.5 cm^2 f 9 cm^2
- 6 a 200 cm^2 b 22 mm^2 c 7 cm^2
d 25 m^2 e 1.44 mm^2 f 6.25 mm^2
g 1.36 m^2 h 0.81 cm^2 i 179.52 km^2
- 7 a 2 cm b 5 m c 12 km
- 8 a 2 ha b 10 ha c 0.5 ha
- 9 5000 m^2
- 10 2500 cm^2
- 11 $20\,000 \text{ cm}^2$
- 12 a 25 cm^2 b 12 cm c 4 units
- 13 \$2100
- 14 5 L
- 15 8 ha
- 16 a i 10 cm ii 9 mm
b Divide the area by the given length.
- 17 half of a rectangle with area 4 cm^2
- 18 a 121 cm^2 b $\left(\frac{P}{4}\right)^2$
- 19 Area is quadrupled ($\times 4$).
- 20 a i 100 ii 10 000 iii 1 000 000
b $\times 1\,000\,000$ $\times 10\,000$ $\times 100$
 $\text{km}^2 \rightarrow \text{m}^2 \rightarrow \text{cm}^2 \rightarrow \text{mm}^2$
 $\div 1\,000\,000$ $\div 10\,000$ $\div 100$
c i 200 mm^2 ii $100\,000 \text{ cm}^2$
iii $3\,500\,000 \text{ m}^2$ iv 3 cm^2
v 2.16 m^2 vi 4.2 km^2 vii 5000 mm^2
viii 100 ha ix 0.4 ha

Exercise 11E

- 1 a 20 cm b 7 m c 2 m d 6.3 cm
- 2 a 6 m b 11 mm c 1.9 m d 3.2 mm
- 3 a 10 b 56 c 12.5
- 4 a 16 m^2 b 30 cm^2 c 160 m^2 d 1.2 m^2
e 3 mm^2 f 24.5 km^2 g 1.3 cm^2 h 20 m^2
i 4.25 m^2
- 5 a 2 cm^2 b 6 cm^2 c 3 cm^2 d 3 cm^2
- 6 480 m^2
- 7 4800 m^2
- 8 6.8 cm^2
- 9 160 m^2
- 10 \$6300
- 11 a 5 cm b 4.4 mm
- 12 Yes, the base and height for each triangle are equal.
- 13 No, the base and height are always the same.

$$14 \ b = \frac{2A}{h}$$

- 15 a 7 cm^2 b 8 cm^2 c 11 cm^2 d 11 cm^2

Exercise 11F

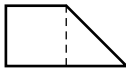

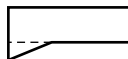
- 1 a $A = bh$
 $= 5 \times 7$
 $= 35$
b $A = bh$
 $= 20 \times 3$
 $= 60$
c $A = bh$
 $= 8 \times 2.5$
 $= 20$
- 2 a $b = 6 \text{ cm}, h = 2 \text{ cm}$
b $b = 10 \text{ m}, h = 4 \text{ m}$
c $b = 5 \text{ m}, h = 7 \text{ m}$
d $b = 5.8 \text{ cm}, h = 6.1 \text{ cm}$
e $b = 5 \text{ cm}, h = 1.5 \text{ cm}$
f $b = 1.8 \text{ m}, h = 0.9 \text{ m}$
- 3 a 40 m^2 b 28 m^2 c 36 km^2 d 17.5 m^2
e 6.3 cm^2 f 30 m^2 g 1.8 cm^2 h 14 cm^2
i 176 mm^2
- 4 a 6 cm^2 b 4 cm^2 c 15 cm^2 d 8 cm^2
- 5 54 m^2
- 6 a 2 m b 7 cm c 0.5 mm
- 7 a 10 cm b 5 m c 2 km
- 8 \$1200
- 9 a 1800 cm^2 b 4200 cm^2
- 10 Because height must be less than 5 cm.
- 11 half; $\text{area}(\text{parallelogram}) = bh$ and $\text{area}(\text{triangle}) = \frac{1}{2}bh$
- 12 area = twice triangle area

$$= 2 \times \frac{1}{2}bh$$

$$= bh$$

- 13 \$4 500 000

Exercise 11G

- 1 a  b  c 
- 2 a addition b subtraction c subtraction
- 3 a $A = l^2 + lw$
 $= 1^2 + 3 \times 1$
 $= 1 + 3$
 $= 4 \text{ cm}^2$
b $A = lw - \frac{1}{2}bh$
 $= 13 \times 8 - \frac{1}{2} \times 5 \times 4$
 $= 104 - 10$
 $= 94 \text{ m}^2$

- 4 a 33 m^2 b 600 mm^2 c 25 m^2
 d 21 m^2 e 171 cm^2 f 45 km^2
- 5 a 39 m^2 b 95.5 cm^2 c 26 m^2
 d 78.5 m^2 e 260 cm^2 f 4 m^2
- 6 a 62 cm^2 b 16 m^2 c 252 cm^2
- 7 a 80 cm^2 b 7 m^2 c 14.5 m^2 d 11.75 cm^2
 8 10.08 m^2
- 9 yes, with \$100 to spare
- 10 Subtraction may involve only two simple shapes.
- 11 a No; bases could vary depending on the position of the top side.
 b Yes, 40 m^2 ; take out the rectangle and join the triangles to give a base of $10 - 6 = 4$.
- 12 a See given diagram in textbook.
 b i $\frac{1}{16}, \frac{1}{32}, \frac{1}{64}, \frac{1}{128}, \frac{1}{256}, \frac{1}{512}, \frac{1}{1024}, \frac{1}{2048},$
 $\frac{1}{4096}, \frac{1}{8192}$ ii no
 c 1 square unit
 d Total must equal 1.

Progress quiz

- 1 a metres b millimetres c kilometres
- 2 a 400 cm b 2000 mm c 35 mm
 d 3000 m e 1450 m f 23 km
- 3 a 14.6 cm b 10.4 m c 354 cm
- 4 a 0.9 m^2 b 49 cm^2
- 5 a 6 m^2 b 31.5 m^2 c 9.68 m^2 d 20 mm^2
- 6 a 55 cm^2 b 72.9 m^2 c 192 mm^2
- 7 a 105 m^2 b 24.5 m^2 c 1820 m^2
- 8 a 225 cm^2 b 200 cm^2 c 7

Exercise 11H

- 1 a 6 b 24 c 24
 d 144 e 56 f 13
- 2 a $V = lwh$ b $V = lwh$ c $V = l^3$
 $= 4 \times 2 \times 3 = 1 \times 3 \times 6 = 2 \times 2 \times 2$
 $= 24 \text{ cm}^3 = 18 \text{ m}^3 = 8 \text{ km}^3$
- 3 a 84 m^3 b 10 cm^3 c 98 cm^3 d 27 cm^3
 e 1000 km^3 f 2.744 mm^3 g 100 m^3 h 11.25 km^3
- 4 $24\,000 \text{ cm}^3$
- 5 96 m^3
- 6 $12\,000 \text{ mm}^3$
- 7 $27\,000\,000 \text{ km}^3$
- 8 a 28 cm^3 b 252 m^3 c 104 cm^3
- 9 600
- 10 4096 cm^3
- 11 a 125 cm^3 b 729 m^3
- 12 a 6 cubic units b 4 cubic units c 14 cubic units
- 13 a i 2 m ii 5 cm iii 7 cm

- iv 3 m
- b Use: Volume \div area of base
 c $h = V \div (l \times w)$
- 14 a i 10 ii 100 iii 10
 iv 1000
 b i 1 000 000 ii 1 000 000 000
 c $\times 1\,000\,000\,000$ $\times 1\,000\,000$ $\times 1000$
 $\text{km}^3 \rightarrow \text{m}^3 \rightarrow \text{cm}^3 \rightarrow \text{mm}^3$
 $\div 1\,000\,000\,000$ $\div 1\,000\,000$ $\div 1000$

Exercise 11I

- 1 a 1 b 1000 c 1000
 d 1000 e 1000
- 2 a 1 L, 1000 mL, 1000 cm^3 b 1 m^3 , 1000 L, 1 kL
- 3 a D b B c F
 d A e C f E
- 4 a 2000 mL b 100 mL c 6000 kL d 24 000 L
 e 2 kL f 3.5 L g 70 L h 2.5 ML
 i 257 mL j 9.32 L k 3847 kL l 47 kL
 m 500 L n 91 ML o 420 mL p 0.17 kL
- 5 a 12 mL b 2.5 m^3 c 875 mL
- 6 a 1200 mL b 1.2 L
- 7 a 6 000 000 L b 0.32 ML
 c 4000 mL d 0.9927 kL
- 8 3 300 000 L
- 9 a 1.5 L b 0.48 L c 0.162 L
 d 8.736 L e 25 L f 32.768 L
- 10 a 2500 m^3 b 2 500 000 L
- 11 a 0.2 mL
 b i 1 L ii 0.6 L iii 14.4 L
 iv 5256 L
- 12 15 days
- 13 41 h 40 min
- 14 1000 days
- 15 a $1000x \text{ cm}^3$ b $0.001x \text{ m}^3$
 c $0.001x \text{ kL}$ d $0.000\,001x \text{ ML}$
- 16 a i $\frac{lwh}{1000\,000}$ ii $\frac{lwh}{1000}$ iii $\frac{lwh}{1000}$
 b i $\frac{lwh \text{ m}^3}{1000}$ ii 1000 lwh L iii $\frac{lwh \text{ kL}}{1000}$
 iv $\frac{lwh \text{ ML}}{1000}$
- 17 a i 8 cm ii 4 cm iii 3.2 cm
 b 0.6 cm
 c 13.4 cm

Exercise 11J

- 1 a 1 kg, 1000 g b 1000 mg, 1 g
- 2 a C b F c A
 d D e B f E

- 3 a B b A c D d C
- 4 a 2000 kg b 70 000 g c 2400 mg d 2.3 g
e 4.620 g f 21.6 t g 470 kg h 0.312 kg
i 0.027 g j 750 kg k 125 g l 0.0105 kg
m 210 t n 470 kg o 592 g p 80 g
- 5 a 4 kg b 12 g c 65 t
- 6 a 12°C b 37°C c 17°C
d 225°C e 1.7°C f 31.5°C
- 7 a 60 kg b 60 000 g c 60 000 000 mg
- 8 a 3000 g b 3 kg
- 9 33°C
- 10 147°C
- 11 a 8 kg b 8.16 kg
- 12 a 400 mg, 370 g, 2.5 kg, 0.1 t
b 290 000 mg, 0.000 32 t, 0.41 kg, 710 g
- 13 a 4th day b 25°C c 26°C
- 14 50 days
- 15 yes, by 215 kg
- 16 a 45.3 t b yes, by 2.7 t
- 17 a 1 g b 1 t c 1000 t
- 18 a 12 kg b 1000 kg c 360 000 kg
- 19 a i 10°C ii 27°C iii 727°C
b i 273 K ii 313 K iii 0 K
- 20 a 180°F b $\frac{5}{9}$ c $\frac{9}{5}$
d i 0°C ii 20°C iii 60°C iv 105°C
e $F = \frac{9C}{5} + 32$

Problems and challenges

- 1 Both line segments are the same length.
- 2 Mark a length of 5 m, then use the 3 m stick to reduce this to 2 m. Place the 3 m stick on the 2 m length to show a remainder of 1 m.
- 3 a 3 cm² b 20 cm²
- 4 500 L
- 5 24 m³
- 6 10.5 cm²
- 7 a 12.5 cm b 3.75 cm
- 8 48 cm²

Multiple-choice questions

- 1 D 2 E 3 C 4 A 5 E
6 B 7 A 8 B 9 E 10 B

Short-answer questions

- 1 a i 16 ii 1000
b i 3 ii 12
c i 10 ii 100 000
- 2 a 50 mm b 2 m c 3700 m d 4.21 km
e 7100 g f 24.9 g g 28.49 t h 9000 g
i 4 L j 29.903 kL k 400 kL l 1000 mL

- m 1440 min n 60 min o 3.5 days p 9000 s
- 3 a 2.5 cm b 2.3 cm c 4.25 kg d 5 L
- 4 a 16 m b 20.6 cm c 23 m d 34 km
e 3.2 mm f 24 m
- 5 a 24.01 cm² b 14 km² c 67.5 m² d 12 cm²
e 14 m² f 5 cm² g 14 m² h 0.9 km²
- 6 a 22 m² b 21 mm² c 291 cm² d 52 m²
- 7 a 18 cm³ b 7.5 cm³ c 64 mm³
- 8 a 72 000 cm³ b 72 000 mL c 72 L
- 9 a 45 mg, 290 000 g, 3 t, 4700 kg
b 50 000 mL, 51 L, 0.5 kL, 1 ML

Extended-response questions

- 1 a i 18 m² ii 180 000 cm²
b 36 m³ c 36 000 L
d 51.4 t e 3 h 52 min 54 s
- 2 a 97.3 m b 5 min 30 s
c 270 m² d \$2040
e 50 m³

Semester review 2

Multiple-choice questions

Negative numbers

- 1 C 2 B 3 D 4 E 5 A

Short-answer questions

- 1 a < b < c =
- 2 a -13 b -84 c -108 d -21
e 84 f 0
- 3 a -24 b 72 c 144 d 21
e 30 f -31
- 4 a negative b positive c negative
- 5 a -15 b -8 c -4
- 6 a -10 b 10 c -20 d -96
e 52 f -1

Extended-response questions

- 1 a D b A, B, O and G; all lie on the x -axis.
c F d i 2 units ii 5 units
e trapezium f 8 square units
g X(4, 2) h DECIDE

Statistics and probability

Multiple-choice questions

- 1 B 2 A 3 B 4 E 5 D

Short-answer questions

- 1 a 1, 2, 3, 5, 5, 5, 8, 8, 9, 10 b 10
c i 5.6 ii 5 iii 5 iv 9
d 11.2
- 2 a A b B c B, C, D, A
- 3 a $\frac{1}{2}$ b $\frac{1}{2}$ c $\frac{1}{4}$
d $\frac{1}{13}$ e $\frac{1}{13}$ f $\frac{1}{26}$
- 4 a 13 b 3, 47 c i 44 ii 22 iii 22
- 5 a 20 b 22
c mean is 23, median is 22

Extended-response questions

- 1 a $\frac{1}{4}$ b $\frac{1}{4}$ c $\frac{1}{2}$
d $\frac{1}{52}$ e $\frac{2}{13}$ f $\frac{1}{13}$
g $\frac{4}{13}$ h $\frac{4}{13}$

Polygons and transformations

- 1 E 2 B 3 D 4 C 5 A

Short-answer questions

- 1 a pentagon b octagon
c isosceles right triangle d rhombus
e trapezium f kite
- 2 a 130 b 45 c 80
- 3 a $a = 60$
b $a = 65$
c $a = 115$
d $a = 90, b = 90$
e $a = 65$
f $a = 132, b = 48, c = 48, d = 102$
- 4 a $A'(2, 0), B'(2, -3), C'(4, 0)$
b $A'(-2, 0), B'(-2, 3), C'(-4, 0)$
c $A'(0, -2), B'(3, -2), C'(0, -4)$
d $A'(0, 2), B \ni (-3, 2), C'(0, 4)$
e $A'(-2, 0), B'(-2, -3), C'(-4, 0)$
f $A'(-2, 1), B'(-2, 4), C'(0, 1)$
g $A'(-1, -2), B'(-1, 1), C'(1, -2)$

Extended-response questions

- 1 a Student's own construction.
b $a + b + c = 180$
c Student's own measurements.
d $x + y + z = 360$
e 360

Equations

Multiple-choice questions

- 1 B 2 E 3 C 4 B 5 D

Short-answer questions

- 1 a $x = 3$ b $x = 108$ c $x = 21$ d $x = \frac{4}{3}$
- 2 a $x = 2$ b $x = 12$ c $m = 7$
- 3 a $y = 20$ b $b = 4$ c $m = 8$
- 4 a $P = 103$ b $S = 61$ c $C = 325$
- 5 a $x = 5$ b $x = 6$ c $x = 18$
- 6 $4x + 25 = 85; x = 15$

Extended-response questions

- 1 a \$320 b \$400
c $\$(200 + 40n)$ d $6\frac{1}{2}h$

Measurement

Multiple-choice questions

- 1 C 2 A 3 E 4 C 5 A

Short-answer questions

- 1 a 500 b 6000 c 1.8 d 0.017
e 1.8 f 5500
- 2 a 272 cm b 11 m c 3m
d 220 cm e 3.4 m f 92 m
- 3 a 1.69 m^2 b 24 m^2 c 60 m^2
d 75 m^2 e 114 m^2 f 171 m^2
- 4 a 729 cm^3 b 120 m^3 c 160 m^3
- 5 a 5000 b 7 c 250
d 3000 e 8 f 25
- 6 21 h 15 min
- 7 120
- 8 5:00 am

Extended-response questions

- 1 a Many answers possible; e.g. $8 \text{ m} \times 10 \text{ m}$, $4 \text{ m} \times 14 \text{ m}$, $15 \text{ m} \times 3 \text{ m}$
b 9 m by 9 m (area = 81 m^2)
c 36 posts
d 9h

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Matthew, p.152 / dedoma, p.153 / hxdzbyx, p.158 / robodread, p.163 / Pressmaster, p.165(b) / Evdokimov Maxim, p.166 / Jennifer Gottschalk, p.173 / Jose Ignacio Soto, pp.174-175 / Maxx-Studio, p.176 / FlashStudio, p.180 / O.V.D., pp.181, 186(b) / Cre8tive Images, p.186(t) / Lasse Kristensen, p.188 / Kert, p.190 / Ilolab, p.193 / Tyler Olson, p.194 / Dmitriy Skorobogatov, p.198 / graphit, p.203 / riekphotos, p.204 / auremar, p.205(t) / JoemanjiArts, p.205(b) / Nonwarit, p.208 / Kelvin Wong, p.210 / Jaimie Duplass, p.211 / Dirk Ott, p.212(l) / Pincasso, p.212(r) / Aleksandar Mijatovic, p.213(t) / Dmitry Naumov, p.213(b) / Johnny Lye, p.218 / Vera Petruk, p.219 / Warren Goldswain, p.224 / Teddy Leung, p.225 / XAOC, p.227 / Aspen Photo, p.230 / bikeriderlondon, pp.231(t), 415, 451(b) / Bikeworldtravel, p.232 / Dmitry Vinogradov, p.235 / Mik Lav, p.236 / Mark Schwettmann, p.237 / Coprid, p.241 / Nir Darom, pp.242(b), 243 / Jeep2499, p.244 / Kevin Hellon, p.249 / Rainer Plendl, pp.250-251 / Minerva Studio, p.252 / Dan Kosmayer, p.269 / phatisakolpap, p.274(t) / Zurijeta, p.275 / Shi Yali, p.276 / Areipa.It, p.280 / monticello, pp.281, 397(c) / Vorobyeva, p.284(t) / iurii, p.284(b) / lightwavemedia, p.285(t) / Syda Productions, pp.286, 397(b) / spiro, p.287 / Goodluz, p.288 / Michael William, p.293(t) / Suwatachai Pluemruetai, p.293(b) / Roman Samokhin, p.296 / Mitch Gunn, p.299 / M. Pellinni, p.300 / Pete Niesen, p.301 / Siberia – Photo and Video, p.304 / Chad McDermott, p.305 / Ministr-84, p.306 / Heather LaVelle, p.310 / Eviled, p.314 / solarseven, p.315 / goory, p.316 / bibiphoto, p.324 / Richard Griffin, p.326 / James Weston, p.327 / Africa Studio, pp.329(t), 553(b) / stefanei, p.329(b) / Nisakorn Neera, p.330 / Rafa Irusta, p.336(l) / Heliosphile, p.336(r) / Lisa S., p.337 / Willem Tims, pp.354-355 / Alperium, p.359 / ppart, p.360 / Armin Rose, p.362 / Lorelyn Medina, p.364 / Ethan Daniels, p.366 / Deyan Georgiev, p.368 / Evgeny Aramanenko, p.373 / Shmeliova Natalia, p.376 / Anna, p.377 / Max Earey, p.378 / Steven Colling, p.380 / Diego Cervo, p.384 / oceanfishing, p.391 / Ulrich Mueller, p.396 / milias1987, p.398 / Daniel Taeger, p.400 / mooinblack, p.404 / Adam Gregor, p.405 / Carbonell, p.409 / Wallenrock, p.410 / jcgphotography, p.411 / ChameleonsEye, p.412(l) / connel, p.412(r) / Frank Wasserfuehrer, p.418 / WilleeCole Photography, p.419 / Tupungato, pp.420, 429, 571 / karamysh, p.421(t) / Ronald Sumners, p.422 / Sofiaworld, p.423 / sanneberg, p.425 / Valentina Razumova, p.426 / Charlie Edward, p.427 / DmitriMaruta, p.428 / Ekaterina Pokrovsky, p.430 / MJTH, pp.435(l&r) / Eric Isselee, p.436 / Pakhotin Andrey, p.438 / 3dfoto, p.439(t) / jabiru, p.439(b) / Bombaert Patrick, p.441(t) / Zbigniew Guzowski, p.441(b) / Boule, pp.443, 451(t) / digitalreflections, p.444 / Artens, p.447(t) / Felix Furo, p.447(b) / bekuinis, p.448 / onsuda, p.449 / Alexander Chaikin, p.453 / Nadezda Cruzova, p.459 / kazoka, p.461 / Francesco Abrignani, p.462 / cappi thompson, p.463 / yodiyim, pp.464-465 / Christopher Tan Teck Hean, p.466 / Photobank, p.470 / psamtik, p.471 / Pavel Ignatov, p.475 / 1stclassphoto, p.479 / CBCK, p.480 / mountainpix, p.484 / Luciano Mortula, p.486 / jopelko, p.496(l) / Ian 2010, p.496(r) / Sergey Titov, p.498(l) / Carolina K. Smith MD, p.468(r) / Nadia Zagainova, p.499(r) / HomeArt, p.501 / Warongdech, p.507 / Christopher Halloran, p.509 / pedrosala, p.513 / Franck Boston, p.514 / hans engbers, p.524 / doomu, p.531 / Hayati Kayhan, p.534 / terekhov igor, p.537 / 3Dsculptor, p.538 / Photocammie, p.539 / Madlen, p.541 / Blend Images, p.542 / BlueSkyImage, p.553(t) / Darren Whittingham, p.555 / Lara65, p.559 / Kostov, p.566 / vbilnov, p.570 / manaemedia, p.572 / KRISANOV YURY, p.574 / Kiev.Victor, p.575 / Jenoeche, p.577 / Kasza, p.587 (drill bit) / RCPHOTO, p.587(a) / Evgeniy Ayupov, p.587(b) / Ashley Whitworth, p.587(c) / Brad Thompson, p.587(d) / Nicola Gavin, p.588(l) / Péter Gudella, p.588(r) / Meunierd, p.589 / racorn, p.590 / Miao Liao, p.594 / Denton Rumsey, p.594 / Fedorov Oleksiy, p.604 / Haak78, p.605 / Hamdan, p.608 / Bildagentur Zoonar GmbH, pp.609 641 / Christian Mueller, p.612 / Ljupco Smokovski, p.615 / Miks Mihalís Ignats, p.616 / tororo reaction, p.623 / Anton_Ivanov, p.626 / Noramin.s, p.629 / Irina Schmidt, p.631 / nubephoto, p.632 / i-m-a-g-e, p.633 / Gyuszko-Photo, p.634(t) / Sebastian Duda, p.634(b) / violetkaipa, p.637 / Andraž Cerar, p.638(b) / darkgreenwolf, p.639 / Joern, p.640 / Dirima, p.647 / Constantine Pankinm, p.656; ©Tristen Murray. 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