

Answers

Working with unfamiliar problems: Part 1

- 1 5050
2 almost 20
3 1111111101
4 12 144
5 $245 \times 13 = 3185$

6

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

- 7 10 cm, 6.25 cm²
8 5070
9 Answers vary
10 1058 cm²
11 700
12 16 896
13 A square of side 24 cm
14 66
15 2h 5 min

Working with unfamiliar problems: Part 2

- 1 5 242 880
2 $F = 2, O = 9, U = 7, R = 0, I = 1, V = 8, N = 5, E = 4$
i.e. $2970 + 2184 = 5154$
3 $\frac{5}{16}$
4 i 1868 ii 1565 iii 2454, 3666
iv 2151, 3969
5 34%
6 side 16 cm, 8 blocks left over
7 $10a - 15, 5(2a - 3)$
8 22.5 cm
9 a $(1) + (3 + 5) + (7 + 9 + 11) + (13 + 15 + 17 + 19)$
 $= 1^3 + 2^3 + 3^3 + 4^3$
b $1 = 1^2$
 $1 + 3 = 2^2$
 $1 + 3 + 5 = 3^2$
 $1 + 3 + 5 + 7 = 4^2$
 $1 + 3 + 5 + 7 + 9 = 5^2$

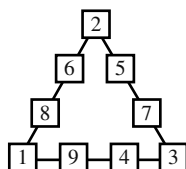
- c 28
d i 28 ii 1275
10 a 15, 17, 21, 23, 27, 29 b 19, 25, 31, 37, 43, 49
c Dominic d Beau e 206 numbers

Chapter 1

Exercise 1A

- 1 a 43 b 34 c 111 d 501
e 48 f 347 g 16 h 41
i 44 j 563 k 17 l 131
2 a 2 b 7 c 0 d 6
e 9 f 9 g 0 h 6
3 a 32 b 387 c 1143 d 55
e 163 f 216 g 79 h 391
i 701 j 229 k 39 l 161
4 a 174 b 431 c 10 362 d 2579
e 58 f 217 g 27 h 13 744
i 878 j 23 021 k 75 l 9088
5 678 km 6 22
7 Answers given from top row down and from left to right.
a 7, 3, 3 b 1, 7, 8 c 2, 5, 3 d 9, 4
e 4, 2, 8 f 0, 0, 7, 1
8 43 marbles
9 a 100 b 50
10 a The sum of two 3-digit numbers cannot be bigger than 1998.
b Subtracting 32 from 36 will give a maximum of 76 ($396 - 320$).
11 a $x + y + z = z + x + y$
b $x - y + z = z - y + x = x + z - y$
12 a The third number is always 3 and others are (9, 3), (8, 4), (7, 5), (6, 6), (5, 7), (4, 8), (3, 9), giving 7 combinations. A 1 has to be carried from the middle column.
b The second number is always 7 and others are (0, 6), (1, 7), (2, 8), (3, 9), giving 4 combinations. A 1 has to be used from the left column.

13 a



b 5 totals, 17, 19, 20, 21 and 23

c 17 in 2 ways, 19 in 4 ways, 20 in 6 ways, 21 in 4 ways and 23 in 2 ways

Exercise 1B

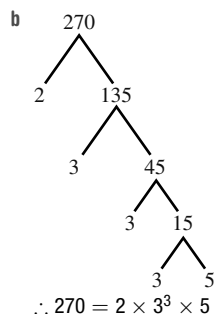
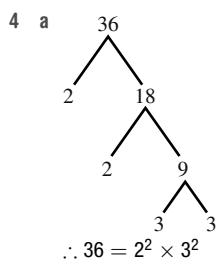
- 1 a 56 b 1300 c 1
d 5 e 3 f 2
- 2 a 40 b 99 c 42 d 72
e 66 f 132 g 32 h 63
i 10 j 11 k 11 l 12
m 8 n 11 o 13 p 12
- 3 a true b true c false d true
e false f true g true h true
i true j false
- 4 a 130 b 260 c 140 d 68
e 17 000 f 13 600 g 413 h 714
i 459 j 366 k 1008 l 5988
m 16 n 63 o 41 p 127
q 16 r 127 s 420 t 38
- 5 a 603 b 516 c 3822 d 90 360
e 9660 f 413 090 g 34 194 h 344 223
- 6 a 28 rem 1 b 30 rem 4 c 416 rem 7
d 13 rem 0 e 13 rem 12 f 166 rem 8
g 7 rem 0 h 1054 rem 16
- 7 \$25
- 8 2358 packets
- 9 option B by \$88
- 10 58 trips
- 11 Numbers are given from top down and left to right.
a 3, 6, 3 b 3, 4, 5, 7, 3, 2
c 6 d 3, 2
- 12 a 1 b a c 0 d 25
- 13 a 34 b 18 c 29 d 17
- 14 a 1700 b 560 c 12 000 d 300
- 15 a 10 (8 child and 2 adult)
b 15 (14 child and 1 adult)
c Take the maximum number of child tickets that leaves a multiple of the adult price remaining.

Exercise 1C

- 1 a 14 b 45 c 43 d 40
- 2 a 6 b 3
- 3 a prime b composite c prime
d composite e composite f composite
g composite h composite
- 4 a 8 b 27 c 64 d 125
e 216 f 343 g 512 h 729
- 5 a 6 b 45 c 24 d 8
e 50 f 36 g 120 h 60
- 6 a 2 b 9 c 8 d 6
e 1 f 1 g 36 h 4
- 7 a 16 b 100 c 169 d 225
e 10 000 f 400 g 5 h 7
i 11 j 30 k 40 l 16
- 8 a 8 b 64 c 343 d 125
e 216 f 1000 g 3 h 2
i 5 j 8 k 9 l 100
- 9 a 24 b 105 c 5 d 4
- 10 4 ways
- 11 30 minutes
- 12 25
- 13 a 55 b They are square numbers.
- 14 15 minutes
- 15 neither
- 16 All even numbers greater than 2 have 2 as a factor as well as 1 and itself, and therefore have more than 2 factors.
- 17 All pairs of factors form groups of 2 except for the repeated factor with a square number, e.g. 9 has 1, 3 and 9 where 3 is the repeated factor.
- 18 a False, LCM of 4 and 8 is 8 not 32. b true
c true
- 19 a i $28 = 23 + 5$ ii $62 = 43 + 19$
iii $116 = 97 + 19$
b 11 and 17
- 20 (3, 5), (5, 7), (11, 13), (17, 19), (29, 31), (41, 43), (59, 61), (71, 73)

Exercise 1D

- 1 a 1, 3, 5, 15
b 1, 2, 3, 4, 6, 8, 12, 24
c 1, 2, 4, 5, 8, 10, 20, 40
d 1, 2, 3, 4, 6, 7, 12, 14, 21, 28, 42, 84
- 2 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
- 3 a 12 b 90 c 280 d 297



- 5 a $2^2 \times 5$ b $2^2 \times 7$ c $2^3 \times 5$ d $2 \times 3^2 \times 5$
 e $2^3 \times 5 \times 7$ f $2^2 \times 7^2$ g $2^3 \times 3^2 \times 5$
 h $2^2 \times 3 \times 5 \times 11$
- 6 a 3 : 2, 3, 5 b 2 : 3, 7 c 3 : 2, 3, 5 d 3 : 5, 7, 11
 7 a divisible by 3 b divisible by 2, 3, 6, 9
 c divisible by 2, 4, 8 d divisible by 3, 9
 e divide by 3, 5, 9 f none
 g 2, 3, 6 h none
- 8 a 5 b 3 c 2 d 7
- 9 a 60, 2 b 28, 14 c 120, 3 d 60, 3
 e 140, 4 f 390, 1 g 126, 3 h 630, 21
- 10 210 days
- 11 61
- 12 a true b false, 12 c true d false 12
- 13 a 2 and 7 b 2 and 11 c 3 and 5 d 7 and 11
- 14 a 2×3^4 b $2^5 \times 3$ c $3^2 \times 5^4$ d $2^8 \times 7$
- 15 a i 2 ii 8 iii 11 iv 15
 v 28 vi 39 vii 94 viii 820
 b i 5 ii 5 iii result is 0
 c result is 11
 d i 11 ii 11 iii 0 iv 0
 e The difference between the sum of the alternating digits is 0 or a multiple of 11.

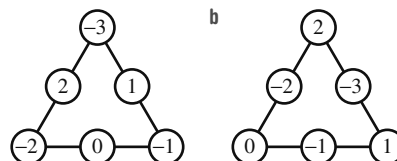
Exercise 1E

- 1 a > b < c < d >
 e > f < g > h <
- 2 a -1, 2 b -1, -4 c -4, -2 d 0, -10
- 3 a -2°C b -1°C c -9°C d 3°C
- 4 a 1 b 4 c 1 d 8
 e 15 f 102 g -5 h -7
 i -7 j -14 k -94 l -12

- 5 a -1 b -5 c -26 d -17
 e -91 f -74 g -11 h -31
 i -29 j -110 k -437 l -564
- 6 a $1 - 4 = -3$ b $-9 + 3 = -6$
 c $-1 + 5 = 4$ d $-15 - 5 = -20$
- 7 a 6 b -4 c -14 d 11
 e 15 f 5 g -3 h 12
- 8 a -1 b 8 c -7 d -1
- 9 ground floor
- 10 a - b -, + c -, -
- 11 \$7
- 12 -23°C
- 13 a true b not always true c not always true
 d true e not always true f not always true
- 14 a true b false c true
- 15 0
- 16 500, pair to give 500 pairs each with a total of 1.
- 17 a $a = 1, b = 4$ b $a = -7, b = 3$
 c $a = -5, b = 2$ d $a = -10, b = 2$

Exercise 1F

- 1 a 6 b -10 c -38 d 46
 e 32 f -88 g -673 h 349
- 2 a subtract b add
- 3 a false b true c true d false
 e true f false g false h true
 i false
- 4 a 4 b 3 c -5 d 15
 e -2 f -14 g -9 h -21
 i -38 j -86 k -105 l -259
- 5 a 5 b 8 c 21 d 38
 e 72 f 467 g -2 h 2
 i 3 j 32 k -57 l 76
- 6 a -3 b -6 c 1 d 10
 e 2 f -14 g -2 h -4
 i -30 j -5 k -6 l 65
- 7 a



8 a

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

b

-12	-19	-14
-17	-15	-13
-16	-11	-18

- 9 a $a = -3, b = -5$ b $a = -15, b = -9$
- 10 $-\$40$
- 11 3 and -8

12 15 and -4

13 a Should be $5 + 2$. b Left off negative on the 2.

14 a true b true c not always true
d true

15 a no b yes c yes d no

16 a

x	-2	-1	0	1	2	3
y	7	6	5	4	3	2

b 18 c -45

17 a

x	-3	-2	-1	0	1	2	3
y	0	1	2	3	4	5	6

b 15 c -9

Progress quiz

- 1 a 33 b 42 c 358 d 392
2 a 323 b 37 c 543 d 2067
3 a 700 b 294 c 16 d 423
4 a 222 b 67 233 c 61 d 23 remainder 2
5 a 24 b 6
6 a 36 b 900 c 8 d 50
7 a 8 b 1 000 000 c 3 d 5
8 $2^3 \times 3^2 \times 5$
9 Divisible by: 2 (last digit 6 is even); 3 ($1 + 2 + 6 = 9$ which is divisible by 3); 6 (divisible by both 2 and 3); 9 ($1 + 2 + 6 = 9$ which is divisible by 9)
Not divisible by: 4 (26 not divisible by 4); 5 (last digit not 0 or 5); 8 (last 3 digits not divisible by 8)
10 a HCF = 6; LCM = 126
b HCF = 15; LCM = 630
11 a 14 b -17 c -74 d -452
e -13 f -70
12 a -6 b -366 c 25 d 49
13 a Each team has 18 students
b 9 teams with green uniform; 6 teams with red uniform; 8 teams with blue uniform

Exercise 1G

1 a

$\square$	$\triangle$	$\square \times \triangle$
3	5	15
2	5	10
1	5	5
0	5	0
-1	5	-5
-2	5	-10
-3	5	-15

b

$\square$	$\triangle$	$\square \times \triangle$
3	-5	-15
2	-5	-10
1	-5	-5
0	-5	0
-1	-5	5
-2	-5	10
-3	-5	15

- 2 a 15, 3 b $-15, -3$ c $-15, -3$ d 15, -3
3 a true b false c true d true
e false
4 a -20 b -54 c -40 d -99
e 6 f 105 g 400 h 300
i -152 j -123 k 54 l 765
5 a -5 b -2 c -4 d -30
e -2 f -26 g -45 h -36
i 3 j 3 k 9 l 6
6 a -3 b -5 c 7 d 6
e -3 f -72 g -252 h -5
i -30
7 a 1 b 14 c 160 d -29
e -120 f 20
8 a $\times, \div$ b $\times, \div$ c $\div, \times$ d $\div, \div$
e $\times, \div$ f $\times, \div$
9 0
10 -16
11 -8 and 3
12 8 and -2
13 a i 4 ii -27 iii -64 iv 25
b Yes, it will be a product of 2 numbers of the same sign.
c Yes, the product of 3 negative numbers will be negative.
14 a true b false c true
15 a 2 b -1 c -2 d 48
16 If $\sqrt{-9}$ was to exist, then you could find a value of a for which $a^2 = -9$. This is not possible using real numbers.
17 Yes, a cube of a negative number gives a negative number.
 $(-3)^3 = -27$ so $\sqrt[3]{-27} = -3$
18 a $y = -3x - 1$ b $y = -7x - 3$
c $y = x^2 + 1$

Exercise 1H

- 1 a true b true c false
d false e false f true
2 Missing numbers are:
a 4, -3 b $-6, 18$ c $-3, -3, 1$
d $-6, -36, -4$
3 Missing numbers are:
a $-3, 8, 5$ b $-8, 26$ c 6, 18
d 11, $-5, 10, -5, -20, -5, 4$

- 4 a -30 b -12 c 12 d -11
e -10 f 5 g 24 h -60
i 40
- 5 a -6 b 24 c 2 d 7 e 0
f 3 g -11 h 2 i -44 j 1
k -12 l 1
- 6 a -1 b -3 c -5 d 3
e -6 f 7 g 0 h -5
- 7 a -15 b -15 c 2 d -8
e 8 f 1 g -4 h 10
- 8 a 22 b 4 c 28 d 122
e -32 f -16 g 152 h 16
- 9 a -15 b 5 c 16 d 14
e 9 f 28 g -1 h 0
i -12 j 19 k 7 l 37
- 10 a 12 b 16 c 2 d 1
e 3 f -23 g -8 h 3
i 28 j 26 k 0 l -22
- 11 -3°C
- 12 a $(-2 + 1) \times 3 = -3$ b $-10 \div (3 - (-2)) = -2$
c $-8 \div (-1 + 5) = -2$
d $(-1 - 4) \times (2 + (-3)) = 5$
e $(-4 + -2) \div (10 + (-7)) = -2$
f $20 + ((2 - 8) \times (-3)) = 38$
g $(1 - (-7) \times 3) \times 2 = 44$
h $(4 + -5 \div 5) \times (-2) = -6$
- 13 a true b not always true c true
d not always true e not always true f true
- 14 a 4 b 1 c -7 d -4
- 15 a -18 b 4 c -1
- 16 a $(1 - 3 \times (-4)) \div (-13) = -1$
b $4 \div (3 + (-7)) \times (-5) = 5$
c $6 - (7 \div (-7) + 6) = 1$
d $-1 - (5 + (-2)) \times (1 - 4) = 8$
- 17 There are 5 answers.
- 18 Answers will vary.

Problems and challenges

- 1 4, 6, 9, 10, 14, 15, 21, 22, 25, 26, 33, 34, 35, 38, 39, 46, 49
- 2 a 13 cm b 9 cm
- 3 2520
- 4 a -105 b 16 c -39
- 5 a $-5 \times (3 \div (-3) + 2) - (4 + (-3)) = -6$
b $-100 \div (4 \times (-2) - 2) \times 3 - (-2) = 32$
- 6 a 6 b 1000 c 210 d 96
- 7 a $y = 3 - x$ b $y = x^2 - 3$
c $y = x^3 + 4$ d $y = y = 2\sqrt[3]{x} - 1$
- 8 a 0 b 2
- 9 a = 7, b = 3; HCF = 63

Multiple-choice questions

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

Short-answer questions

- 1 a 497 b 412 c 129 d 67
e 112 f 139 g 1999 h 5675
- 2 a 539 b 2030 c 61 d 3074
- 3 a 170 b 297 c 336 d 423
e 41 f 119 g 103 h 201
- 4 a 1668 b 21 294 c 281 d 122
- 5 a 3 b 1 c 1 d 7
- 6 a 9 b 11 c 49 d 400
e 3 f 4 g 125 h 1000
- 7 a 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60
b 112, 119, 126, 133, 140, 147
c 31, 37, 41, 43, 47, 53, 59 d 24 e 6
- 8 a $2^2 \times 3^2$ b $2^2 \times 3 \times 7$ c $2 \times 3^2 \times 11$
- 9 a divisible by 2, 3, 4, 6
b divisible by 5
c divisible by 2, 4
d divisible by 3, 9
- 10 a 380 b 2
- 11 a 3 b -5 c -8 d -31
e -76 f -330 g -1 h 98
- 12 a 2 b -8 c -64 d -39
e 16 f 12 g -20 h 92
- 13 a true b false c false d true
- 14 a -10 b 88 c -63 d 200
e 2 f -3 g -4 h 3
- 15 a -4 b -1 c -8 d 26
e -10 f -1 g -1 h -20
- 16 a -11 b 1 c 7 d 30
e 7 f -128 g -5 h 145

Extended-response questions

- 1 a a = \$112, b = -\$208, c = \$ 323, d = -\$275, e = \$240
b \$228 c \$160
- 2 a 72 b $30 = 2 \times 3 \times 5$, $42 = 2 \times 3 \times 7$
c LCM = 210, HCF = 6 d 6 e 210

Chapter 2

Exercise 2A

- 1 a complementary b supplementary
c revolution
- 2 a 45 b 130 c 120 d 240 e 90
- 3 a 40° b 110° c 220°
- 4 a a = 70, b = 270 b a = 25, b = 90
c a = 128, b = 52 d a = 34, b = 146
e a = 25 f a = 40 g a = 120
h a = 50, b = 90 i a = 140
j a = 110, b = 70 k a = 148
l a = 90, b = 41, c = 139

- 5 a $\angle DOE$ b $\angle AOB$ c $\angle DOE$ or $\angle AOB$
d $\angle COD$
- 6 a 270° b 90° c 0° (or 360°)
d 180° e 315° f 135°
g 225° h 45°
- 7 a S b N c W d E
e NE f NW g SW h SE
- 8 a 40° b 72° c 120° d 200°
- 9 a 60 b 135 c 35 d 15
e 36 f 45
- 10 a 105° b 97.5° c 170° d 170°
e 132.5° f 27.5° g 144° h 151.5°
- 11 a Supplementary angles should add to 180° .
b Angles in a revolution should add to 360° .
c Angles on straight line should add to 180° .
- 12 a $a + 3b = 360$
b $a + 2b = 180$
c $a + b = 90$
- 13 a $a = 110$
b $(a + 50)^\circ$ should be the larger looking angle
- 14 a 30 b 54 c 55 d 34
e 30 f 17

Exercise 2B

- 1 a equal b supplementary c equal
- 2 a $\angle BCH$ b $\angle ABE$ c $\angle GCB$ d $\angle BCH$
e $\angle FBC$ f $\angle GCB$ g $\angle FBC$ h $\angle DCG$
- 3 a alternate b alternate
c co-interior d corresponding
e corresponding f co-interior
- 4 All reasons assume that lines are parallel.
a $a = 110$ (corresponding to 110°), $b = 70$ (supplementary to a°)
b $a = 120$ (alternate to 120°), $b = 60$ (co-interior to a°),
 $c = 120$ (corresponding to 120°)
c $a = 74$ (alternate to 74°), $b = 106$ (co-interior to 74°),
 $c = 106$ (supplementary to a°)
d $a = 100$ (supplementary to 80°), $b = 100$ (co-interior to 80°)
e $a = 95$ (corresponding to 95°), $b = 85$ (supplementary to a°)
f $a = 40$ (alternate to 40°), $b = 140$ (co-interior to 40°)
- 5 a $a = 58$, $b = 58$ (both co-interior to 122°)
b $a = 141$, $b = 141$ (both co-interior to 39°)
c $a = 100$ (co-interior to 80°), $b = 80$ (co-interior to a°)
d $a = 62$ (co-interior to 118°), $b = 119$ (co-interior to 61°)
e $a = 105$ (co-interior to 75°), $b = 64$ (corresponding to 64°)
f $a = 25$ (alternate to 25°), $b = 30$ (alternate to 30°)

- 6 a No, the alternate angles are not equal.
b Yes, the co-interior angles are supplementary.
c No, the corresponding angles are not equal.
- 7 a 250 b 320 c 52 d 40
e 31 f 63 g 110 h 145
i 33
- 8 a 130° b 95° c 90° d 97°
e 65° f 86°
- 9 a $\angle AOB = (180 - a)^\circ$ b $\angle AOB = (360 - a)^\circ$
c $\angle AOB = (180 - a - b)^\circ$
- 10 $a = 36$, $b = 276$, $c = 155$, $d = 85$, $e = 130$, $f = 155$,
 $g = 15$

Exercise 2C

- 1 a right-angled triangle b isosceles triangle
c acute-angled triangle d equilateral triangle
e obtuse-angled triangle f equilateral triangle
g isosceles triangle h scalene triangle
- 2 a scalene b isosceles c isosceles d equilateral
e scalene f isosceles
- 3 a right b obtuse c acute
- 4 a 80 b 40 c 58 d 19
e 34 f 36
- 5 a 68 b 106 c 20
- 6 a 65 b 40 c 76
- 7 a 160 b 150 c 80 d 50
e 140 f 55
- 8 a yes b no c yes d yes
e yes f yes
- 9 a 55 b 60 c 25
- 10 a 60 b 231 c 18 d 91
e 65.5 f 60
- 11 a Isosceles, the two radii are of equal length.
b $\angle OAB$, $\angle OBA$ c 30° d 108°
e 40°
- 12 a i a , alternate angles in parallel lines
ii c , alternate angles in parallel lines
b They add to 180° , they are on a straight line.
c $a + b + c = 180$, angles in a triangle add to 180° .
- 13 Hint: Let a° be the third angle.
- 14 Hint: Let a° be the size of each angle.
- 15 a alternate to $\angle ABC$ in parallel lines
b supplementary, co-interior angles in parallel lines
c $a + b + c = 180$, angles in a triangle add to 180° .
- 16 a $a = 30$, $b = 60$, $c = 60$
b $a^\circ + c^\circ = 90$
c $a = 60$, $b = 120$, $c = 30$, $a + c = 90$
d $a = 16$, $b = 32$, $c = 74$, $a + c = 90$
e $a^\circ + c^\circ = 90$
f i $a = x$, $b = 2x$, $c = 90 - x$ ii 90

Exercise 2D

- 1 a non-convex c convex
b non-convex
- 2 a i true ii false iii false iv true
b i false ii true iii false iv true
c i false ii true iii true
d i true ii false iii false
e i true ii false iii true
f i false ii false
- 3 a $a = 104, b = 76$ b $a = 72, b = 72$
c $a = 128$
- 4 a 90 b 61 c 105 d 170 e 70 f 70
- 5 a $a = 100, b = 3, c = 110$
b $a = 2, b = 90$
c $a = 5, b = 70$
- 6 a 152 b 69 c 145 d 74 e 59 f 30
- 7 a 19 b 60 c 36
- 8 a square, rectangle, rhombus and parallelogram
b square, rectangle
- 9 a true b false c true d true
e false f true
- 10 No, the two reflex angles would sum to more than 360° on their own.
- 11 a angle sum $= a^\circ + b^\circ + c^\circ + d^\circ + e^\circ + f^\circ = 180^\circ + 180^\circ$
(angle sum of a triangle) $= 360^\circ$
b $\angle ADC = 360^\circ - (a + b + c)^\circ$ (angle sum of a quadrilateral) reflex
 $\angle ADC = 360^\circ - \angle ADC$
 $= 360^\circ - (360^\circ - (a + b + c)^\circ)$
 $= (a + b + c)^\circ$

Exercise 2E

- 1 a 6 b 4 c 10 d 7
e 5 f 12
- 2 a 720° b 1440° c 3600°
- 3 a square b equilateral triangle
- 4 a 108° b 144° c 135°
- 5 a 720° b 1260° c 900° d 2340°
e 7740° f $18\,000^\circ$
- 6 a 130 b 155 c 105 d 250
e 40 f 265
- 7 a 108° b 128.6° c 147.3° d 168.8°
- 8 a 9 b 15 c 21 d 167
- 9 a 127.5 b 240 c 60 d 60
e 79 f 72
- 10 a circle b Increases to infinity. c 180°
- 11 a $\frac{S}{n}$ b $\frac{180(n-2)}{n}$
c i 150° ii 175.61°
- 12 a 6 b 20 c 11
- 13 a 150 b 130 c 270

Progress quiz

- 1 a $a = 25$ b $b = 232$
b $x = 72$ y $= 108$
c $a = 65$ b $= 115$
d $a = 92$ b $= 88$ c $= 272$
- 2 a $\angle POT$ b $\angle ROS$ c $\angle TOS$ or $\angle POR$
- 3 a 260 b 105 c 44
- 4 a 60 b 30 c 46
d 62 e 60 f 84
- 5 a 60 b 71 c 137
d 72 e 90

Exercise 2F

- 1 a vertices b seven c congruent
d seven e octagonal
- 2 a 24 b 7 c 8
- 3 a 6, 8, 12 b 5, 6, 9 c 7, 7, 12
- 4 A, cube; B, pyramid; F, rectangular prism; G, tetrahedron;
H, hexahedron
- 5 a hexahedron b tetrahedron
c pentahedron d heptahedron
e nonahedron f decahedron
g undecahedron h dodecahedron
- 6 a 8 b 6 c 4 d 5
e 7 f 9 g 10 h 11
- 7 a triangular prism b pentagonal prism
c square prism
- 8 a rectangular pyramid b heptagonal pyramid
c triangular pyramid
- 9 a

Solid	Faces (F)	Vertices (V)	Edges (E)	$F + V$
Cube	6	8	12	14
Square pyramid	5	5	8	10
Tetrahedron	4	4	6	8
Octahedron	8	6	12	14

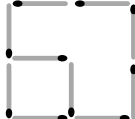
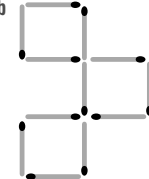
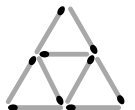
b $F + V$ is 2 more than E .

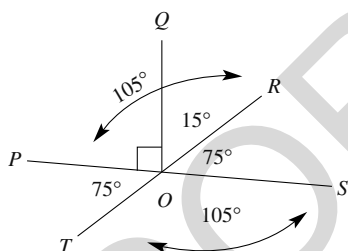
Faces (F)	Vertices (V)	Edges (E)
6	8	12
5	5	8
5	6	9
7	7	12
4	4	6
11	11	20

- 11 a 26 b 11 c 28
- 12 a true b false c true d true
e false (sphere) f true g false
- 13 a yes b yes c no d yes
e yes
- 14 $F = 12, V = 12$ and $E = 24$ so Euler's rule does not apply.

- 15 a hexahedron, rectangular prism
b undecahedron, decagonal pyramid
- 16 a $V = E - F + 2$ b $F = E - V + 2$
- 17 a $V = 8, E = 14, F = 8$ and $V + F - 2 = E$
b $V = 16, E = 24, F = 10$ and $V + F - 2 = E$
c $V = 6, E = 12, F = 8$ and $V + F - 2 = E$
- 18 a true b true
- 19 a i convex ii non-convex iii non-convex
b Answers will vary.

Problems and challenges

- 1 a  b 
- 2 a  b 
- 3 a 30 b 150
- 4 125°
- 5



- 6 180. Find each angle in the interior pentagon in terms of a , b , c , d and/or e . Then solve the sum equal to 540° for a pentagon.

Multiple-choice questions

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

Short-answer questions

- 1 a 50 b 65 c 240 d 36
e 61 f 138
- 2 a 132 b 99 c 77 d 51
e 146 f 41
- 3 95°
- 4 a scalene, 35 b isosceles, 30
c equilateral, 60 d right angle, 19
e acute, 27 f obtuse, 132
- 5 a 67 b 141 c 105

- 6 a $a = 98, b = 82$ b $a = 85, b = 106$
c $a = 231, b = 129$
- 7 a 900° b 1260° c 10800°
- 8 a 108° b 150°
- 9 a 71 b 25 c 67.5
- 10 a hexahedron b decahedron
c undecahedron
- 11 a triangular prism b octagonal prism
c rectangular pyramid

12

F	V	E
5	5	8
9	14	21
7	10	15

- 13 40

Extended-response questions

- 1 a 4320° b 166° c 14° d 360°
e i 28 ii 52 iii 78
- 2 a triangle, quadrilateral, pentagon, hexagon
b $a = 90, b = 119, c = 29, d = 121, e = 270, f = 230$

Chapter 3

Exercise 3A

- 1 a 6, 20, 200 b 14, 40, 140
c 1, 6, 42 d 8, 3, 20
- 2 $\frac{4}{6}, \frac{20}{30}, \frac{10}{15}$
- 3 a false b true c true d true
e true f false
- 4 a $\frac{8}{24}$ b $\frac{6}{24}$ c $\frac{12}{24}$ d $\frac{10}{24}$
e $\frac{20}{24}$ f $\frac{120}{24}$ g $\frac{18}{24}$ h $\frac{21}{24}$
- 5 a $\frac{6}{30}$ b $\frac{10}{30}$ c $\frac{15}{30}$ d $\frac{90}{30}$
e $\frac{20}{30}$ f $\frac{11}{30}$ g $\frac{75}{30}$ h $\frac{15}{30}$
- 6 a 6 b 18 c 2 d 7
e 28 f 50 g 15 h 44
- 7 a 2, 3, 5, 10, 16, 25 b 6, 12, 30, 45, 150, 300
c 4, 6, 8, 14, 20, 30
- 8 a 6, 12, 24, 30, 75, 300 b 10, 15, 20, 25, 50, 60
c 8, 12, 28, 44, 80, 400
- 9 a $\frac{1}{3}$ b $\frac{1}{2}$ c $\frac{5}{6}$ d $\frac{5}{6}$ e $\frac{1}{4}$
f $\frac{3}{5}$ g $\frac{8}{9}$ h $\frac{5}{7}$ i $\frac{5}{3}$
j $\frac{11}{10}$ k $\frac{6}{5}$ l $\frac{4}{3}$

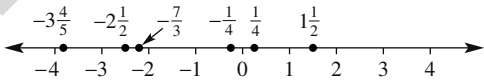
- 10 a $\frac{1}{4}$ b $\frac{2}{5}$ c $\frac{3}{7}$ d $\frac{5}{9}$
 e $\frac{13}{11}$ f $\frac{7}{4}$ g $\frac{21}{17}$ h $\frac{81}{50}$
- 11 $\frac{14}{42} = \frac{1}{3}$, $\frac{51}{68} = \frac{3}{4}$, $\frac{15}{95} = \frac{3}{19}$
- 12 $\frac{5}{11} = \frac{15}{33}$, $\frac{3}{5} = \frac{9}{15}$, $\frac{7}{21} = \frac{1}{3}$, $\frac{8}{22} = \frac{4}{11}$
 $\frac{2}{7} = \frac{6}{21}$, $\frac{20}{50} = \frac{4}{10}$
- 13 a $\frac{3}{4}$ b $\frac{2}{3}$
 c No, $\frac{3}{4} = \frac{9}{12}$ of time complete. However, only $\frac{2}{3} = \frac{8}{12}$ of laps completed.
- 14 a Cannot be simplified, e.g. $\frac{3}{5}$, $\frac{7}{11}$... The HCF of the numerator and denominator is 1.
 b Possibly. e.g. $\frac{15}{16}$, both are composite numbers, but HCF is 1 and therefore the fraction cannot be simplified.
 However, in $\frac{15}{18}$, both numbers are composite, HCF is 3 and therefore the fraction can be simplified to $\frac{5}{6}$.
- 15 a no b yes c 10
- 16 infinite
- 17 a i $6b$ ii $5x$ iii 80 iv $12de$
 v bc vi $3km$ vii $16ac$ viii xy
 b i $\frac{3b}{4}$ ii $\frac{1}{2y}$ iii $\frac{3}{5}$ iv $\frac{5}{8x}$
 v $\frac{2}{3q}$ vi $\frac{10}{x}$ vii $\frac{a}{q}$ viii $\frac{3}{x}$
- c Yes, $\frac{5x}{15x} = \frac{1}{3}$.
- d Yes, $\frac{1}{3} = \frac{a}{3a}$.

Exercise 3B

- 1 a +, - b $\times, \div$
- 2 a $\times, \div$ b +, -
- 3 a 20 b 9 c 50 d 24
- 4 a 3, 12 b 14, 5 c 11, 33 d $\times, 14, 1, 1$
- 5 a $\frac{8}{5}$ b $\frac{2}{3}$ c $\frac{4}{13}$ d $\frac{11}{12}$
- 6 a $\frac{3}{13} \times \frac{7}{9}$ b $\frac{1}{2} \times \frac{4}{1}$ c $\frac{17}{10} \times \frac{1}{3}$ d $\frac{7}{3} \times \frac{4}{7}$
- 7 a $\frac{3}{5}$ b $\frac{5}{9}$ c $1\frac{1}{2}$ d $1\frac{6}{7}$
 e $1\frac{3}{20}$ f $1\frac{1}{10}$ g $\frac{1}{21}$ h $\frac{4}{9}$
- 8 a $4\frac{4}{7}$ b $9\frac{3}{5}$ c $2\frac{3}{8}$ d $1\frac{2}{11}$
 e $9\frac{1}{2}$ f $22\frac{3}{14}$ g $3\frac{3}{4}$ h $1\frac{17}{30}$

- 9 a $\frac{3}{20}$ b $\frac{10}{63}$ c $1\frac{17}{25}$ d $1\frac{13}{27}$
 e $\frac{1}{6}$ f $\frac{3}{8}$ g $\frac{8}{15}$ h 5
- 10 a $3\frac{2}{3}$ b $1\frac{2}{21}$ c 15 d 35
- 11 a $\frac{10}{27}$ b $\frac{5}{6}$ c $\frac{16}{77}$ d $1\frac{7}{15}$
 e $\frac{7}{8}$ f 2 g $1\frac{1}{3}$ h $3\frac{3}{5}$
- 12 a $\frac{33}{35}$ b $\frac{48}{125}$ c $1\frac{2}{5}$ d 3
- 13 a $\frac{15}{16}$ b $\frac{1}{12}$ c $1\frac{1}{6}$ d $1\frac{1}{2}$
- 14 a $\frac{29}{70}$ b $\frac{41}{70}$
- 15 $\frac{3}{5}$
- 16 7 kg
- 17 112
- 18 Answers may vary.
 a 5, 5 b 4 c 5, 2 d 1, 1
- 19 Answers may vary.
 a 2, 5 b 18 c 10, 1 d $3\frac{4}{15}$
- 20 a $\frac{1}{3}$ b $\frac{4}{3}$ c 5 d $4\frac{1}{2}$
- 21 a $\left(\frac{1}{6} + \frac{1}{5} - \frac{1}{3}\right) \times \left(\frac{1}{4}\right) \div \left(\frac{1}{2}\right) = \frac{1}{60}$
 b $\left(\frac{1}{2} \div \frac{1}{6} - \frac{1}{5} + \frac{1}{4}\right) \times \frac{1}{3} = 1\frac{1}{60}$
 c $\frac{1}{4} \div \left(\frac{1}{5} - \frac{1}{6}\right) \times \left(\frac{1}{3} + \frac{1}{2}\right) = 6\frac{1}{4}$

Exercise 3C

- 1 
- 2 a $\frac{1}{4}$ b $-\frac{1}{3}$ c $\frac{3}{5}$ d $-\frac{2}{7}$
- 3 a positive b negative c negative d positive
- 4 a $-\frac{4}{7}$ b $\frac{1}{5}$ c $-\frac{7}{9}$ d $-5\frac{1}{3}$
 e $-\frac{1}{3}$ f $-\frac{2}{5}$ g $\frac{3}{2}$ h $\frac{7}{11}$
- 5 a $-\frac{1}{12}$ b $-\frac{13}{35}$ c $1\frac{1}{10}$ d $\frac{8}{9}$
 e $-\frac{1}{4}$ f $\frac{1}{8}$ g $-\frac{3}{20}$ h $-\frac{4}{15}$
- 6 a $-\frac{12}{35}$ b $-\frac{16}{55}$ c $\frac{4}{15}$ d $\frac{5}{6}$
 e $-\frac{4}{21}$ f $-\frac{1}{8}$ g $\frac{3}{7}$ h $-1\frac{1}{5}$

- 7 a $-\frac{20}{21}$ b $-\frac{9}{20}$ c $\frac{8}{15}$ d $1\frac{1}{3}$
 e $-\frac{2}{7}$ f $-\frac{3}{20}$ g $\frac{3}{4}$ h $2\frac{2}{5}$
- 8 $-\frac{5}{3}$, $-1\frac{1}{2}$, $-\frac{3}{4}$, $-\frac{1}{2}$, $-\frac{1}{5}$, $\frac{1}{16}$, $\frac{3}{4}$, $3\frac{1}{10}$
- 9 $16\frac{3}{4}^{\circ}\text{C}$
- 10 a Mon = $-1\frac{2}{3}$, Tue = $-\frac{1}{2}$, Wed = $-2\frac{1}{4}$, Thur = $\frac{1}{4}$
 b $-4\frac{1}{6}$ c $12\frac{1}{6}$ hours
- 11 $1\frac{7}{20}$ metres
- 12 a > b < c > d <
 e > f > g < h >
- 13 a negative b negative c negative d positive
- 14 a < b > c > d <
- 15 a i $1\frac{1}{2}$ ii $\frac{1}{15}$ iii $-\frac{21}{25}$ iv $-4\frac{23}{40}$
 b Answers may vary: $-\frac{5}{8}$, $-\frac{3}{8}$, $-\frac{2}{8}$, $-\frac{1}{8}$, $\frac{11}{8}$
 c Answers may vary: $-\frac{7}{4}$, $-\frac{5}{4}$, $-\frac{3}{4}$, $-\frac{1}{4}$, $\frac{1}{4}$

Exercise 3D

- 1 E
 2 C
 3 a < b > c < d <
 e > f >
 4 a 10, 6 b 55, 5
 5 a 3.6521, 3.625, 3.256, 3.229, 2.814, 2.653
 b 11.908, 11.907, 11.898, 11.891, 11.875, 11.799
 c 1.326, 1.305, 0.802, 0.765, 0.043, 0.039
 6 a $\frac{31}{100}$ b $\frac{537}{1000}$ c $\frac{163}{200}$ d $\frac{24}{25}$
 e $5\frac{7}{20}$ f $8\frac{11}{50}$ g $26\frac{4}{5}$ h $8\frac{64}{125}$
 i $\frac{13}{250}$ j $6\frac{1}{8}$ k $317\frac{3}{50}$ l $\frac{53}{125}$
 7 a 0.17 b 0.301 c 4.05 d 7.6
 e 0.12 f 0.35 g 2.5 h 1.75
 i 0.275 j 0.375 k 0.68 l 0.232
 8 2.175, 2.18, 2.25, 2.3, 2.375, 2.4
 9 A1, B5, C07, P9, BW Theatre, gym
 10 Opposition leader is ahead by 0.025.
 11 a D, C, E, F, B, A b C, D, A, E, F, B
 12 a 2.655 b $\frac{179}{200}$ c 4.61 525 d $2\frac{1109}{2000}$

13	2.6	4.6	$1\frac{4}{5}$
	2.2	$\frac{6}{2}$	3.8
	4.2	1.4	$3\frac{2}{5}$

- 14 a €59.15 b A\$183.23 c Canada d £35
 e 91.4c f AUD, CAN, US, EURO, GB
 g Cheaper to buy car in GB and freight to Australia.

Exercise 3E

- 1 B 2 E 3 C 4 B
 5 a 62.71 b 277.99 c 23.963 d 94.172
 e 14.41 f 23.12 g 84.59 h 4.77
 6 a 179.716 b 50.3192 c 1025.656 d 18.3087
 7 a 11.589 b 9.784 c 19.828 d 4.58
 8 a 3651.73 b 81.55 c 0.75 d 0.03812
 e 6348 000 f 0.0010615 g 30
 h 0.000452
 9 a 99.6 b 12.405 c 107.42 d 1.8272
 e 0.01863 f 660.88 g 89.0375 h 292.226
 10 a 12.27 b 5.88 c 0.0097 d 49.65
 e 11.12 f 446.6 g 0.322655 h 3.462
 11 a 203.8 b 0.38 c 2 011 500 d 11.63
 e 0.335 f 13.69 g 0.630 625
 h 1353.275
 12 a 16.29 b 15.52 c 66.22 d 1.963
 e 13.3084 f 3.617 g 97 h 42.7123
 13 7.12 m
 14 12 200 skis
 15 1200 km
 16 1807 mm, 1.807 m
 17 a 5.84 b 1 c 0.94 392 d 26.2
 18 D 65.1
 19 Answers may vary.

Exercise 3F

- 1 a T b R c R d T e T
 f R g T h R
 2 a 0.3 b $6.\dot{2}1$ or $6.\overline{21}$ c 8.5764
 d $2.1\overline{356}$ or $2.1\overline{356}$ e $11.\overline{28573}$ or $11.2857\overline{3}$
 f $0.00\overline{352}$ or $0.0035\overline{2}$
 3 a 4 b 9 c 7 d 6
 4 a 0.6 b 0.75 c 0.125 d 0.55
 5 a 0.3 b 0.5 c 0.83 d $0.\overline{72}$
 e $0.4285\overline{71}$ f $0.3846\overline{15}$ g 3.13 h $4.8571\overline{42}$
 6 a 0.766 b 9.5 c 7.0 d 21.5134
 e 0.95 f 17 g 8.60 h 8.106

- 7 a 17.01 b 0.92 c 4.44 d 14.52
e 5.20 f 79.00 g 0.00 h 2.68
- 8 a 65 b 9 c 30 d 4563
- 9 a 0.86 b 0.22 c 0.36 d 0.42
- 10 a 7.7000 b 5.0 c 0.00700
- 11 a 0 seconds b 0 seconds
c 0.06 seconds d 12.765 e 47 cm
- 12 4
- 13 0.0588235294117647
- 14 Frieda is correct. Infinite, non-recurring decimals are known as surds. For example, $\sqrt{3} = 1.73205080\dots$
- 15 Student A: When dealing with a critical digit of 5 they incorrectly round down rather than round up. Student B: When rounding down, student B incorrectly replaces final digit with 0.
- 16 a i T ii R iii R iv R v T vi R
b $8 = 2^3$, $12 = 2^2 \times 3$, $14 = 2 \times 7$, $15 = 3 \times 5$,
 $20 = 2^2 \times 5$, $60 = 2^2 \times 3 \times 5$
c Only denominators which have factors that are powers of 2 and/or 5 terminate.
d i T ii R iii R iv T
v R vi R vii T viii T

Progress quiz

- 1 a $\frac{1}{3} = \frac{2}{6} = \frac{7}{21} = \frac{15}{45}$
b $\frac{5}{2} = \frac{20}{8} = \frac{35}{14} = \frac{125}{50}$
- 2 a $\frac{1}{3}$ b $\frac{3}{5}$ c $\frac{7}{9}$ d $\frac{3}{2}$
- 3 a $\frac{3}{5}$ b $\frac{1}{10}$ c $-\frac{7}{12}$ d $1\frac{1}{5}$
- 4 a $\frac{6}{35}$ b $\frac{2}{3}$ c $-2\frac{1}{4}$ d $4\frac{2}{3}$
- 5 a $2\frac{2}{5}$ b $-1\frac{1}{3}$ c $1\frac{1}{8}$ d $\frac{1}{3}$
- 6 a $0.2531 > 0.24876$ b $17.3568 < 17.3572$
- 7 a $\frac{9}{20}$ b $6\frac{64}{125}$
- 8 a 0.28 b 0.043 c 1.75 d 0.45
- 9 a 48.347 b 177.75
- 10 a 2.3 b 0.00937 c 36.61 d 18.328
e 18.26 f 22.05
- 11 a 0.5 b 0.72 c 6.13
- 12 a 23.67 b 2.740
- 13 a 0.33 b 0.42
- 14 1716 mm

Exercise 3G

- 1 B 2 B 3 C 4 A
- 5 a $\frac{39}{100}$ b $\frac{11}{100}$ c $\frac{1}{5}$ d $\frac{3}{4}$
e $1\frac{1}{4}$ f $\frac{7}{10}$ g $2\frac{1}{20}$ h $6\frac{1}{5}$

- 6 a $\frac{3}{8}$ b $\frac{31}{200}$ c $\frac{1}{3}$ d $\frac{2}{3}$
e $\frac{9}{400}$ f $\frac{9}{200}$ g $\frac{51}{500}$ h $\frac{7}{8}$
- 7 a 0.65 b 0.37 c 1.58 d 3.19
e 0.0635 f 0.0012 g 40.51 h 1.0005
- 8 a 40% b 25% c 55% d 26%
e 22.5% f 68% g 75% h 41.5%
- 9 a 275% b 520% c 175% d 450%
e 348% f 194% g 770% h 915%
- 10 a $33\frac{1}{3}\%$ b $12\frac{1}{2}\%$ c $8\frac{1}{3}\%$ d $6\frac{2}{3}\%$
e 37.5% f $28\frac{4}{7}\%$ g 18.75% h 75%
- 11 a 42% b 17% c 354.1% d 1122%
e 0.35% f 4.17% g 1% h 101%

12 A

13 a

Fraction	Decimal	%
$\frac{1}{4}$	0.25	25%
$\frac{2}{4}$	0.5	50%
$\frac{3}{4}$	0.75	75%
$\frac{4}{4}$	1	100%

b

Fraction	Decimal	%
$\frac{1}{3}$	0.3	$33\frac{1}{3}\%$
$\frac{2}{3}$	0.6	$66\frac{2}{3}\%$
$\frac{3}{3}$	0.9	100%

c

Fraction	Decimal	%
$\frac{1}{5}$	0.2	20%
$\frac{2}{5}$	0.4	40%
$\frac{3}{5}$	0.6	60%
$\frac{4}{5}$	0.8	80%
$\frac{5}{5}$	1	100%

14 a

Fraction	Decimal	%
$\frac{3}{20}$	0.15	15%
$\frac{6}{25}$	0.24	24%
$\frac{3}{8}$	0.375	37.5%
$\frac{5}{40}$	0.125	12.5%
$\frac{7}{10}$	0.7	70%
$\frac{31}{50}$	0.62	62%

b

Fraction	Decimal	%
$\frac{11}{5}$	2.2	220%
$\frac{3}{1000}$	0.003	0.3%
$\frac{13}{200}$	0.065	6.5%
$1\frac{19}{100}$	1.19	119%
$4\frac{1}{5}$	4.2	420%
$\frac{5}{6}$	0.8 $\bar{3}$	83 $\frac{1}{3}$ %

15 $\frac{1}{8}$, 12.5%, 0.125

16 65%, 80%

17 a $\times 100\% = \times \frac{100}{100} = \times 1$

b $\div 100\% = \div \frac{100}{100} = \div 1$

18 a $\frac{BC}{100}$ b 0.CDB c ABC% d DDB.CC%

e $\frac{100A}{D}\%$ f $\frac{100(BA + C)}{A}\%$

19 a 25%, 25%, 12 $\frac{1}{2}$ %, 12 $\frac{1}{2}$ %, 12 $\frac{1}{2}$ %, 6 $\frac{1}{4}$ %, 6 $\frac{1}{4}$ %

Exercise 3H

1 D

2 A

3 a 100

b 10

c 5

d 2

4 a 80%

b 65%

c 78%

d 30%

e 20%

f 80%

g 40%

h 37.5%

i 36 $\frac{2}{3}$ %

j 70 $\frac{5}{6}$ %

k 70 $\frac{5}{6}$ %

l 94 $\frac{4}{9}$ %

5 a 30% b 45% c 31 $\frac{1}{4}$ % d 83 $\frac{1}{3}$ %

e 160% f 683 $\frac{1}{3}$ % g 133 $\frac{1}{3}$ % h 266 $\frac{2}{3}$ %

6 a 8.33% b 66.67% c 42.86% d 37.5%

e 160% f 125% g 112.5% h 233.33%

7 a 5% b 25% c 5% d 25%

e 4% f 4000% g 300% h 600%

8 a 56% b 75% c 86% d 25%

e 40% f 33 $\frac{1}{3}$ %

9 a 18 b 9 c 17 d 16 e 3

f 3 g 5.6 h 175 i 132

j 39.6 k 44.8 l 36.8

10 a 13 b 80 c 100 d 217

e 67.5 f 51.2 g 36.75 h 70.8

11 a 18 minutes b \$0.75 c 45 kg

d 62.5 mL e 5.6 days f 3.3 km

12 a 5 $\frac{1}{3}$ L b 2000 marbles

c \$8 d 45 donuts

13 540

14 Murray, Maeheala, Francesca, Wasim

15 61 $\frac{1}{9}$ %, 61.1%

16 68.75%

17 22

18 \$24, \$24, They are the same. $\frac{40}{100} \times 60 = \frac{60}{100} \times 40$ as multiplication is commutative.

19 B

20 D

21 a 240 cm²

b Area will increase by more than 25%

c 15 cm by 25 cm

d 375 cm²

e 135 cm²

f 56.25%

g 56.25% increase in area

h Multiply the percentage increase in each dimension.

$1.25 \times 1.25 = 1.5625 = 56.25\%$ increase

i i 21% ii 44% iii $\frac{7}{9}$ % iv 125%

j 41.42% increase ($\sqrt{2}$)

Exercise 3I

1 a \$12 b \$33.99 c \$14.50 d \$225

2 a \$40 b \$36 c \$40.50 d \$15

3 a \$12 b \$108

4 shop A: \$270, shop B: \$280

5 a \$440 b \$276 c \$64 d \$41 160

e \$5400 f \$96.96 g \$13.50 h \$50.40

6 a \$480 b \$127.50 c \$39 d \$104

e \$15.40 f \$630

- 7 a \$12 b \$24 c \$37.50 d \$63.75
e \$97.50 f \$4.95
- 8 a \$38.50 b \$82.50 c \$46.20 d \$91.30
e \$57.75 f \$164.99
- 9 shop C: \$80, shop D: \$75
- 10 premier rug: \$250, luxury rug: \$375
- 11 cash \$44.90: credit card: \$44.91
- 12 \$265.60
- 13 \$84
- 14 40%
- 15 Eastern Bikers, \$2320
- 16 a i \$85 ii \$630 iii \$275 iv \$350
b \$106.50
c Sam: \$720, Jack: \$680, Justin: \$700
d Sold: \$3200, Wage: \$960

Exercise 3J

- 1 a \$7 b \$28 c \$3.45 d \$436
- 2 a \$13 b \$45 c \$25.90 d \$247
- 3 D
- 4 A
- 5 a 80% profit b 30% profit
c 25% loss d 16% loss
e $66\frac{2}{3}\%$ profit f 37.5% profit
g $33\frac{1}{3}\%$ loss h 22% loss
- 6 a 20% increase b $16\frac{2}{3}\%$ decrease
c 500% increase d 150% increase
- 7 a 25% increase b 20% increase
c 140% increase
- 8 20% loss
- 9 650% profit
- 10 a \$36 b 75% profit
- 11 a \$350 b 87.5% profit
- 12 a \$2200 b 44% loss
- 13 example: Value = 200, because the 10% decrease is of a larger amount
- 14 store A
- 15 a i 100% ii $66\frac{2}{3}\%$ iii 80%
b term 2
c 500% growth
- 16 a 396 070
b i 22 803 196 ii 24 056 866
iii 26 301 344
c 2.0%

Exercise 3K

- 1 B 2 D 3 B 4 \$500
- 5 a \$900 b \$800 c \$1100 d \$500
e \$550 f \$250
- 6 \$90
- 7 a \$120 b \$240 c \$15 d \$21
- 8 1100 litres 9 600 kg 10 \$300
- 11 a \$50 b \$150 c \$600 d \$30
e \$10 f \$2000
- 12 200 13 \$40 14 D 15 $\frac{800}{y}$
- 16 $\frac{D}{C} \times F$ or $\frac{FD}{C}$
- 17 a \$70 b \$110 c \$50 d \$450
e \$650

Problems and challenges

- 1 72.8% 2 96% 3 $\frac{1}{1000}$ 4 \$48 5 53%
- 6 $\frac{5}{12}$ 7 30% 8 49 years 9 6:33 a.m.
- 10 i $b = -\frac{5}{6}$, $c = -\frac{1}{3}$
ii $b = 1\frac{13}{15}$, $c = 2\frac{1}{30}$

Multiple-choice questions

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

Short-answer questions

- 1 a 21 b 8 c 10
- 2 a $\frac{5}{9}$ b 3 c $\frac{17}{2}$
- 3 a $\frac{7}{11}$ b $\frac{1}{8}$ c $1\frac{3}{4}$ d $1\frac{7}{12}$
e $5\frac{13}{20}$ f $3\frac{17}{30}$
- 4 a 8 b $\frac{13}{28}$ c 14 d 6
e $\frac{1}{18}$ f 2
- 5 a $-\frac{7}{15}$ b $-\frac{3}{20}$ c $\frac{9}{25}$ d $\frac{19}{20}$
e -5 f $-7\frac{7}{12}$
- 6 a = b < c >
- 7 a 30.38 b 12.803 c 56 974 d 50 280
e 74 000 f 2.9037
- 8 a 10.68 b 0.1068 c 14.4 d 0.255
e 3.6 f 197.12
- 9 a 0.667 b 3.580 c 0.005

10

0.1	0.01	0.05	0.5	0.25	0.75	0.3	0.125
$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{20}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{3}$	$\frac{1}{8}$
10%	1%	5%	50%	25%	75%	$33\frac{1}{3}\%$	12.5%

- 11 a 87.5% b 25% c 150% d 4%
e 6%
- 12 a 24 b \$10.50 c 10.5
- 13 a \$616 b \$3280
c \$977.55, overall percentage loss is 0.25%
- 14 \$359.91, \$3639.09
- 15 29%
- 16 \$680
- 17 1120
- 18 \$3.31

Extended-response questions

- 1 21 000 INR, 625 SGD, 15 000 THB, 3500 HKD
- 2 \$30
- 3 a 800 b 3.8%
- 4 a \$96.48 b \$95.03, not enough to buy perfume.

Chapter 4

Exercise 4A

- 1 a 10 b 100 c 1000 d 100 000
e 1000 f 1 000 000
- 2 a 1000 b 100 000 c 1 000 000
- 3 a 10 b 10 c 2
- 4 a 12 m b 22 cm c 10 mm d 44 km
e 1.4 cm f 3.6 m
- 5 a 30 mm b 610 cm c 8930 m d 3000 mm
e 2.1 m f 32 cm g 9.62 km h 0.38 km
i 4.3 mm j 2040 cm k 23.098 m l 3.42 km
m 194.3 m n 0.01 km o 24.03 mm
p 0.994 km
- 6 a 19 m b 44 m c 13 cm d 32 cm
e 28 km f 18 cm g 17.2 mm h 34.4 cm
i 29.4 m
- 7 a 5 b 2 c 4 d 18
e 9.5 f 6.5
- 8 a 40 cm b 17 cm c 7.8 cm d 2000 cm
e 46 cm f 17 600 cm
- 9 a 2 b 3 c 9
- 10 \$2392 11 8 min 12 240 cm

- 13 a $P = 2a + b$ b $P = 2a + 2b$
c $P = 2a + 2b$ d $P = 2a + 2b$
e $P = 8a + 2b$ f $P = 4a + 2b$
- 14 a $x = P - 11$ b $x = P - 4$
c $x = \frac{P-3}{2}$ d $x = \frac{P-8}{2}$
e $x = \frac{P}{4}$ f $x = \frac{P}{8}$

- 15 a 6 squares b 8 squares

Exercise 4B

- 1 a 15.71 b 40.84 c 18.85 d 232.48
- 2 a 3.1 b 3.14 c 3.142
- 3 a diameter b radius c circumference
- 4 Answer is close to pi.
- 5 a 12.57 mm b 113.10 m c 245.04 cm
d 12.57 m e 21.99 km f 15.71 cm
- 6 a 314 cm b 62.8 m c 18.84 km
- 7 a 44 mm b 132 cm c 220 m
- 8 11.0 m
- 9 12 566 m
- 10 a 64.27 cm b 12.34 m c 61.70 mm
- 11 a 28.57 cm b 93.97 m c 5.57 cm
- 12 a 25.13 cm b 56.55 m c 35.71 m
- 13 Svenya and Andre
- 14 $d = 2r$, so $2\pi r$ is the same as πd .
- 15 a 4π b 36π c 78π d 4π
e 7π f 5π
- 16 a 8π b 18π c $5\pi + 20$
- 17 a i $r = \frac{C}{2\pi}$ ii $d = \frac{C}{\pi}$
b i 2.23 m ii 6.37 cm

Exercise 4C

- 1 a i 100 ii 400 iii 3
b i 10 000 ii 70 000 iii 4
c i 1 000 000 ii 5 000 000
iii 2.5
d i 10 000 ii 30 000 iii 7.5
- 2 a 7 m, 3 m b 8 cm, 6 cm (or other way around)
c 2.4 mm, 1.7 mm
- 3 10 000
- 4 a 200 mm² b 70 000 cm² c 500 000 m²
d 30 000 m² e 34 mm² f 0.07 m²
g 30.9 cm² h 4000 m² i 0.2 m² j 0.45 km²
k 0.4 ha l 32.1 cm² m 32 ha n 51 cm²
o 4.3 mm² p 0.4802 m² q 1.904 ha
r 0.2933 ha s 49 m² t 7700 m²
u 24 000 m²
- 5 a 9 cm² b 21 m² c 39 cm² d 18 cm²
e 33 m² f 144 mm² g 63 m² h 3 m²
i 6 km²

- 6 a 70 m^2 b 54 m^2 c 140 cm^2 d 91 cm^2
 e 46 km^2 f 64 mm^2
 7 a $200\,000 \text{ mm}^2$ b $430\,000 \text{ cm}^2$
 c 0.0000374 km^2 d 0.01092 m^2
 e 20 cm^2 f 0.1 ha
 8 a 45 cm^2 b 168 m^2 c 120 km^2
 9 a 6 m b 1.5 cm
 10 a 25 m^2 b 20.25 cm^2 c 28 cm
 d 52 m
 11 10 cm
 12 $\$48$
 13 a $A = 4b^2 + ab$ or $A = b(4b + a)$
 b $A = 1.5ab$ or $A = \frac{3ab}{2}$
 c $A = a^2 - \frac{ab}{2}$ or $A = a\left(a - \frac{b}{2}\right)$
 14 a 4 b 1
 15 a $w = \frac{A}{l}$ b $l = \sqrt{A}$ c $h = \frac{2A}{b}$
 16 a i 2.59 km^2 ii $2\,589\,988 \text{ m}^2$ iii 259 ha
 iv 4047 m^2 v 0.4 ha vi 2.5 acres
 b 81 ha
 c 62%

Exercise 4D

- 1 a 6 b 30 c 13.5 d 33
 2 a 90° b Height c perpendicular
 d parallel, perpendicular e rhombus, kite
 3 a parallelogram, 50 m^2 b parallelogram, 4.5 cm^2
 c parallelogram, 6 m^2 d rhombus, 7.5 cm^2
 e rhombus, 121 km^2 f rhombus, 9.61 m^2
 g kite, 4 cm^2 h kite, 300 mm^2
 i kite, 0.9 mm^2 j trapezium, 96 cm^2
 k trapezium, 32.5 m^2 l trapezium, 560 mm^2
 4 a 6 cm^2 b 35 m^2 c 84.5 cm^2
 5 0.27 m^2
 6 2 m
 7 $\$1160$
 8 3 cm and 9 cm
 9 a trapezium b 19.5 cm^2
 10 a $A = 2x^2$ b $A = 3ab$ c $A = 8a^2$
 11 No, use formula for parallelogram $A = bh$, as we already know these lengths.
 12 a $A = 4 \text{ triangle areas}$

$$= 4 \times \frac{1}{2} \times \text{base} \times \text{height}$$

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

$$= \frac{1}{2}xy$$

- b $A = \text{Area (triangle 1)} + \text{Area (triangle 2)}$

$$= \frac{1}{2} \times \text{base}_1 \times \text{height}_1 + \frac{1}{2} \times \text{base}_2 \times \text{height}_2$$

$$= \frac{1}{2} \times a \times h + \frac{1}{2} \times b \times h$$

$$= \frac{1}{2}ah + \frac{1}{2}bh$$

$$= \frac{1}{2}(a + b)h$$

 c $A = \text{Area (rectangle)} + \text{Area (triangle)}$

$$= \text{length} \times \text{Width} + \frac{1}{2} \times \text{base} \times \text{height}$$

$$= a \times h + \frac{1}{2} \times (b - a) \times h$$

$$= ah + \frac{1}{2}bh - \frac{1}{2}ah$$

$$= \frac{1}{2}ah + \frac{1}{2}bh$$

$$= \frac{1}{2}(a + b)h$$

Exercise 4E

- 1 a 31.4 b 12.56 c 22 d 154
 2 a 78.54 b 530.93 c 30.19 d 301.72
 3 a 5 m b 2.3 mm c 3.5 km
 4 a 154 cm^2 b 154 km^2 c 616 mm^2 d 314 km^2
 e 12.56 m^2 f $31\,400 \text{ m}^2$
 5 a 28.27 cm^2 b 113.10 m^2
 c 7.07 mm^2 d 78.54 km^2
 e 36.32 cm^2 f 9.08 m^2
 6 a 3.14 cm^2 b 201.06 cm^2 c 226.98 mm^2
 d 39.27 cm^2 e 5.09 mm^2 f 100.53 m^2
 7 707 cm^2
 8 yes, by 1310 cm^2
 9 no ($A = 0.79 \text{ km}^2$)
 10 78.54 cm^2
 11 circle of radius 5 m
 12 80 cm^2
 13 a 12.56 cm^2 b 50.24 cm^2
 c quadrupled ($\times 4$) d multiplied by 9
 e multiplied by 16 f multiplied by n^2
 14 a 81π b $\frac{49\pi}{4}$ c 72π
 15 a $A = \frac{\pi d^2}{4}$ b true
 16 a true
 b i 2.33 m ii 1.20 km iii 10.09 mm
 c $r = \sqrt{\frac{A}{\pi}}$

Exercise 4F

- 1 a $\frac{1}{2}$ b $\frac{1}{4}$ c $\frac{1}{6}$ d $\frac{1}{8}$
- 2 a 6.28 b 8.55 c 9.69
- 3 a $\frac{1}{4}$ b $\frac{1}{6}$ c $\frac{1}{3}$
- 4 a 88.49 mm² b 104.72 mm²
c 4.91 cm² d 14.14 cm² e 61.28 m²
f 262.72 cm² g 181.53 m²
h 981.93 m² i 2428.12 km²
- 5 a 37.70 m² b 137.44 m² c 437.21 km²
- 6 a 34.82 m² b 9.14 m² c 257.08 cm²
d 116.38 mm² e 123.61 km²
f 53.70 m² g 50.27 m² h 75.40 mm²
i 12.57 cm²
- 7 1.26 m²
- 8 13 cm radius pizza by 0.13 cm²
- 9 16 965 cm²
- 10 a 78.5% b 30.8% c 21.5%
- 11 a π cm² b $\frac{25\pi}{9}$ m² c 8π mm² d $\frac{75\pi}{2}$ m²
e $9\pi + 9$ cm² f $225 - \frac{225\pi}{4}$ km²
- 12 a 78.5%
b 78.5%, Same answers as for part a.
c Percentage area = $\frac{\pi r^2}{4} \div r^2 \times 100 = 25\pi \approx 78.5\%$
- 13 a 6.54 m² b 2.26 m² c 5.8%

Exercise 4G

- 1 a 6, squares b 6 squares and rectangles
c 6, isosceles triangles and rectangles
- 2 a C b A c B
- 3 a 3 b 6 c 6 d 5
- 4 a 24 cm² b 403.44 m² c 22 cm²
d 352 cm² e 84 m² f 612 cm²
g 120 mm² h 114 m² i 29.7 m²
- 5 a 18 cm² b 146 cm²
- 6 2000 cm² 7 81 m²
- 8 a 138 m² b 658 m² c 62 cm²
- 9 \$107.25
- 10 a SA = $6l^2$ b SA = $2w^2 + 4lw$
c SA = $2wl + 2wh + 2lh$
- 11 a i quadrupled ii multiplied by 9
iii multiplied by 16
b multiplied by n^2
- 12 a 15 072 cm² b 456 cm²

Exercise 4H

- 1 a 24 b 12 c 72
- 2 a 96 b 6 c 2 d 5

- 3 a 1000 b 1 c 1 d 1
e 1 f 1000
- 4 a 36 cm³ b 20 m³ c 27 mm³ d 64 km³
e 320 mm³ f 24 m³
- 5 a 2000 mL b 5000 L c 500 kL d 3 L
e 4 cm³ f 50 mL g 2.5 L h 5100 cm³
- 6 a 24 L b 42 L c 27 L d 18 000 L
e 24 000 L f 360 L
- 7 a i 60 000 000 L ii 60 000 kL iii 60 ML
b 200 days
- 8 80 minutes
- 9 a 500 000 m³ b 500 ML
- 10 8000 kg
- 11 a (1, 1, 12) or (1, 2, 6) or (1, 3, 4) or (2, 2, 3)
b (1, 1, 30) or (1, 2, 15) or (1, 3, 10) or (1, 5, 6) or (2, 3, 5)
c (1, 1, 47)
- 12 Factors greater than 1 include only 2, 23 and 46, but 23 is prime so you cannot find 3 whole numbers that multiply to 46.
- 13 9
- 14 a 20 b 20
c Equal, the number of cubes on the base layer is the same as the number of squares on the base.
d If the number of cubes on the base layer is the same as the number of squares on the base, then Ah gives h layers of A cubes, giving the total.
e Yes, a rectangular prism could use 3 different bases.
- 15 a i By joining two of the same prisms together a rectangular prism could be formed. ii 12 units³
b i 160 cm³ ii 140 m³ iii 2 cm³ iv 112 m³
v 48 mm³ vi 171 cm³

Exercise 4I

- 1 a i prism ii rectangle
b i prism ii triangle
c i not a prism (pyramid)
d i not a prism (cone)
e i prism ii square
f i not a prism (truncated pyramid)
- 2 a 8, 2 b 6, 1.5 c 12, 10
- 3 a 40 b 36 c 10 d 6280
- 4 a 44 m³ b 160 cm³ c 352 mm³
- 5 a 200 cm³ b 15 m³ c 980 cm³ d 60 m³
e 270 mm³ f 60 m³
- 6 a 785.40 m³ b 12 566.37 mm³
c 251.33 cm³ d 7696.90 cm³
e 461.81 m³ f 384.85 m³
g 1178.10 m³ h 2.41 cm³ i 1733.96 km³
- 7 a 14.137 m³ b 14 137 L
- 8 a cylindrical b 283 L
- 9 3 (almost 4 but not quite)

- 10 302.48 cm^3
 11 a 56 000 L b 56 hours
 12 a $20\pi \text{ m}^3$ b $300\pi \text{ cm}^3$ c $144\pi \text{ mm}^3$
 d $245\pi \text{ m}^3$
 13 Answers may vary, an example is $r = 5 \text{ cm}$ and
 $h = 1.27 \text{ cm}$.
 14 $x = \pi h$
 15 a 14.28 cm^3 b 98.17 mm^3
 c 1119.52 cm^3 d 8.90 m^3 e 800 m^3
 f $10\,036.67 \text{ cm}^3$

Progress quiz

- 1 a 6400 mm b 1.8 m c 0.97 km d 250 cm
 2 a 78 cm b 12.4 m c 44 cm d 84 mm
 3 $x = 9$
 4 a $C = 43.98 \text{ cm}$ $A = 153.94 \text{ cm}^2$
 b $C = 81.68 \text{ mm}$ $A = 530.93 \text{ mm}^2$
 5 a 47000 cm^2 b 41 cm^2 c 0.5 ha d 8000 m^2
 6 a 51.84 cm^2 b 0.7 m^2 c 24 cm^2
 d 164 m^2 e 20.48 m^2 f 16.5 m^2 g 3 cm^2
 7 a $P = 11.49 \text{ cm}$ $A = 6.98 \text{ cm}^2$
 b $P = 21.42 \text{ cm}$ $A = 28.27 \text{ cm}^2$
 c $P = 18.09 \text{ cm}$ $A = 16.36 \text{ cm}^2$
 8 a 22.87 cm^2 b 63.27 cm^2
 9 a $SA = 384 \text{ cm}^2$ $V = 512 \text{ cm}^3$
 b $SA = 288 \text{ cm}^2$ $V = 288 \text{ cm}^3$
 c $SA = 142.66 \text{ cm}^2$ $V = 91 \text{ cm}^3$
 10 $V = 274889 \text{ cm}^3$ or 0.2749 m^3 capacity = 274.9 L

Exercise 4J

- 1 a F b D c A d E
 e B f C
 2 a 120 s b 3 min c 2 h d 240 min
 e 72 h f 2 days g 5 weeks h 280 days
 3 a 6 h 30 min b 10 h 45 min
 c 16 h 20 min d 4 h, 30 min
 4 a 180 min b 630 s c 4 min d 1.5 h
 e 144 h f 3 days g 168 h h 1440 min
 i 4 h j 2 weeks k 20 160 min
 l 86 400 s m 5 s n 2.5 s o 7 s
 p 400 milliseconds q 2.7 microseconds
 r 3 nanoseconds
 5 a 6:30 p.m. b 9 a.m. c 6:30 p.m. d 4:30 p.m.
 e 5:30 p.m. f 11:40 a.m.
 6 a 1330 h b 2015 h c 1023 h d 2359 h
 e 6:30 a.m. f 1 p.m. g 2:29 p.m. h 7:38 p.m.
 i 11:51 p.m.
 7 a 2 p.m. b 5 a.m. c 1200 hours
 d 1800 hours

- 8 a 2 h 50 min b 6 h 20 min
 c 2 h 44 min d 8 h 50 min
 e 8 h 19 min f 10 h 49 min
 9 a 11 a.m. b 12 p.m. c 8 p.m. d 7:30 p.m.
 e 7 a.m. f 5 a.m. g 1 a.m. h 10 a.m.
 10 a 5:30 a.m. b 7:30 a.m. c 6:30 a.m. d 1:30 p.m.
 e 2:30 p.m. f 2:30 a.m. g 3 p.m. h 5:30 p.m.
 11 a 5 h b 2.5 h c 8 h d 6 h
 e 7 h
 12 56 million years 13 17 min 28 s
 14 7 h 28 min 15 23 h 15 min
 16 a 33c b 143c or \$1.43
 17 a \$900 b \$90 c \$1.50 d 2.5c
 18 6:30 a.m.
 19 a 8 a.m. 29 March b 10 p.m. 28 March
 c 3 a.m. 29 March
 20 3 a.m. 21 April
 21 11:30 p.m. 25 October
 22 52.14 weeks
 23 a 3600 b 1440 c 3600 d 1440
 24 Friday
 25 a You have to turn your clock back.
 b You have to turn your clock forward.
 c You adjust the date back one day.
 26 Students' reports will vary.

Exercise 4K

- 1 a 9 b 25 c 144 d 2.25
 e 20 f 58 g 157 h 369
 2 a false b true c true d true
 e false f false
 3 hypotenuse, triangle
 4 a c b x c u
 5 a No b No c Yes d Yes
 e Yes f No g Yes h No
 i No

a	b	c	a^2	b^2	$a^2 + b^2$	c^2
3	4	5	9	16	25	25
6	8	10	36	64	100	100
8	15	17	64	225	289	289

- a $a^2 + b^2$ and c^2
 b i 13 ii 20
 c i 25 ii 110
 7 a $3^2 + 4^2 = 5^2$ b $8^2 + 15^2 = 17^2$
 c $9^2 + 12^2 = 15^2$ d $5^2 + 12^2 = 13^2$
 e $9^2 + 40^2 = 41^2$ f $2.5^2 + 6^2 = 6.5^2$
 8 a $a^2 + b^2 = x^2$ b $a^2 + b^2 = d^2$
 c $d^2 + h^2 = x^2$
 9 a no
 b No, $a^2 + b^2 = c^2$ must be true for a right-angled triangle.

- 10 { (6, 8, 10), (9, 12, 15), (12, 16, 20), (15, 20, 25), (18, 24, 30), (21, 28, 35), (24, 32, 40), (27, 36, 45), (30, 40, 50), (33, 44, 55), (36, 48, 60), (39, 52, 65), (42, 56, 70), (45, 60, 75), (48, 64, 80), (51, 68, 85), (54, 72, 90), (57, 76, 95) }, { (5, 12, 13), (10, 24, 26), (15, 36, 39), (20, 48, 52), (25, 60, 65), (30, 72, 78), (35, 84, 91) }, { (7, 24, 25), (14, 48, 50), (21, 72, 75) }, { (8, 15, 17), (16, 30, 34), (24, 45, 51), (32, 60, 68), (40, 75, 85) }, { (9, 40, 41), (18, 80, 82) }, { (11, 60, 61) }, { (20, 21, 29), (40, 42, 58), (60, 63, 87) }, { (12, 35, 37), (24, 70, 74) }, { (28, 45, 53) }, { (33, 56, 65) }, { (16, 63, 65) }, { (48, 55, 73) }, { (13, 84, 85) }, { (36, 77, 85) }, { (39, 80, 89) }, { (65, 72, 97) }

- 11 a yes b no c no d yes

e no f yes

- 12 a a^2 b b^2 c $\sqrt{a^2 + b^2}$

- 13 $2x^2 = c^2$

- 14 a Area of inside square = c^2

$$\text{Area of 4 outside triangles} = 4 \times \frac{1}{2} \times \text{base} \times \text{height} = 2ab$$

$$\text{Total area of outside square} = (a+b)^2 = a^2 + 2ab + b^2$$

$$\text{Area of inside square} = \text{Area (outside square)} -$$

$$4 \text{ triangles}$$

$$= a^2 + 2ab + b^2 - 2ab$$

$$= a^2 + b^2$$

Comparing results from the first and last steps gives

$$c^2 = a^2 + b^2.$$

Exercise 4L

- 1 a yes b no c no d yes

- 2 a 3.16 b 5.10 c 8.06 d 15.17

- 3 a $c^2 = a^2 + b^2$ b $c^2 = a^2 + b^2$

$$= 5^2 + 12^2$$

$$= 9^2 + 40^2$$

$$= 169$$

$$= 1681$$

$$\therefore c = \sqrt{169}$$

$$\therefore c = \sqrt{1681}$$

$$= 13$$

$$= 41$$

- c $c^2 = a^2 + b^2$

$$= 9^2 + 12^2$$

$$= 225$$

$$\therefore c = \sqrt{225}$$

$$= 15$$

- 4 a 5 b 25 c 41 d 20

- e 45 f 61

- 5 a 9.22 b 5.39 c 5.66 d 3.16

- e 4.30 f 37.22

- 6 3.16 m or 316 cm 7 139 cm

- 8 5.5 km 9 3.88 cm

- 10 a 2nd line is incorrect, cannot take the square root of each term.

- b 2nd line is incorrect, cannot add $3^2 + 4^2$ to get 7^2 .

- c Last line should say $\therefore c = \sqrt{29}$.

- 11 a $1^2 + 2^2 \neq 3^2$ b $5^2 + 8^2 \neq 10^2$

- c $12^2 + 21^2 \neq 24^2$

- 12 a 8.61 m b 48.59 cm c 18.56 cm d 22.25 mm

- e 14.93 m f 12.25 m

Exercise 4M

- 1 a 4 b 7 c 3 d 4 e 8

- f 20 g 3 h 5 i 25

- 2 a $a = 12$ b $b = 24$

- 3 a 4 b 9 c 40 d 15

- e 16 f 60

- 4 a 2.24 b 4.58 c 11.49 d 12.65

- e 10.72 f 86.60

- 5 8.94 m 6 12 cm 7 12.12 cm 8 8.49

- 9 a Should subtract not add 10.

- b Should say $a = 5$.

- c Can't take the square root of each term.

- 10 a $\sqrt{24}$ b $\sqrt{3}$ c $\sqrt{4400}$

- 11 a 3.54 b 7.07 c 43.13 d 24.04

- 12 a $6^2 + 8^2 = 10^2$ b It is a multiple of (3, 4, 5).

- c (9, 12, 15), (12, 16, 20), (15, 20, 25) d (8, 15, 17)

- e (3, 4, 5), (5, 12, 13), (8, 15, 17), (7, 24, 25), (9, 40, 41), etc.

Problems and challenges

- 1 10 cm each side

- 2 Yes, 1 L will overflow.

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

- 4 $\sqrt{3} \approx 1.73$ m

- 5 $\sqrt{2}$

- 6 $\sqrt{7}$

- 7 72 cm²

- 8 63.66%

Multiple-choice questions

- 1 E 2 B 3 A 4 C 5 B

- 6 E 7 E 8 B 9 D 10 D

Short-answer questions

- 1 a 2000 mm b 0.5 km c 300 mm² d 0.4 m²

- e 10000 m²

- f 3.5 cm² g 0.4 L

- h 200 L

- 2 a 13 m b 28 cm c 25.13 m d 51.42 mm

- e 48 m f 20 cm

- 3 a 55 cm² b 63 m² c 12 cm² d 136 m²

- e 64 m² f 20 cm² g 28.27 cm²

- h 12.57 m² i 3.84 cm²

- 4 a 70 cm² b 50.14 m² c 74 cm²

- 5 a 320 m² b 408 mm² c 138 cm²

- 6 a 1000 L b 8 L c 0.144 L

- 7 a 2513.27 m³ b 3078.76 cm³
 c 212.06 mm³
 8 a i 287°C ii 239°C
 b 1 h 39 min 18 s
 c 1 h 2 min 4 s
 9 a 10 h 17 min b 9:45 p.m. c 2331 hours
 10 a 6:30 p.m. b 6 p.m. c 8:30 a.m. d 4:30 p.m.
 e 10:30 a.m. f 5:30 p.m. g 8:30 p.m.
 h 8:30 p.m.
 11 a 10 b 25 c 4.24
 12 a 15 b 6.24 c 11.36

Extended-response questions

- 1 a 12.86 cm² b 57.72 cm²
 c 57.72 m² d 6.28 cm³ e 25.72 cm³
 f 38 with some remainder
 2 a 2.8 m b 24 m² c 23 m
 d No, 4000 L short

Chapter 5

Exercise 5A

- 1 a 3a, 2b, 5c b a = 3, b = 2, c = 5
 c 2x + 5y + 8z. Other answers are possible.
 2 a 6 b a = 5, b = 7, c = 1
 c x + 2y + 3z + 4w + 91k. Other answers are possible.
 3 a F b C c E d D e A
 f B
 4 a i 3 ii 7a, 2b, c
 b i 3 ii 19y, 52x, 32
 c i 2 ii a, 2b
 d i 4 ii 7u, 3v, 2a, 123c
 e i 2 ii 10f, 2be
 f i 5 ii 9, 2b, 4c, d, e
 g i 4 ii 5, x²y, 4abc, 2nk
 h i 4 ii ab, 2bc, 3cd, 4de
 5 a 2 b 1 c 9 d -2 e 1
 f 0 g 0 h -6 i -1
 j -12 k -1 l -3
 6 a y + 7 b x - 3 c a + b d 4p
 e 4 - $\frac{q}{2}$ f 10 + $\frac{r}{3}$ g 2(b + c) h b + 2c
 i $\frac{abc}{7}$ j $\frac{a}{4} + \frac{b}{2}$ k $\frac{x}{2y}$ l a - $\frac{b}{2}$
 7 a the sum of 3 and x b the sum of a and b
 c the product of 4, b and c
 d double a is added to b
 e b is subtracted from 4 and the result is doubled.
 f b is doubled and the result is subtracted from 4.

- 8 a 7x
 b i x - 3 ii 7(x - 3)
 9 a 2p b 48p c 30p + 18(p + 20)
 10 a 4a b 7b c 5a + 5b d $\frac{7a + 7b}{2}$
 11 70 + 90x
 12 a 20 + 50t b 0.2 + $\frac{t}{2}$ c 0.2 + 30t
 13 a true b true c false d true
 e false f false
 14 a true b true c false d true
 15 In 2a + 5, the number is doubled then 5 is added. In 2(a + 5), the number is increased by 5 and this result is doubled.
 16 a 36 b 676 c t d 121k
 e 67 108 863

Exercise 5B

- 1 15 2 8 3 30
 4 a 14 b 30 c no
 5 a 30 b 37 c 16 d 58 e 2
 f -40 g -61 h -19
 6 a 24 b -9 c 1 d -19
 e 12 f 90 g 1 h -7
 i 100 j 13 k 45 l 16
 7 a 8 b 32 c 6 d -2
 e 13 f -31
 8 a 96 b 122 c 24 d -38
 e 132 f 54
 9 a E b E c N d E e N
 f N g E h E
 10 a 3 + x b 2 - a c 4t - 2t d 3u - 8
 11 4y + 2x + 5, 5 + 2x + 4y, 2(x + 2y) + 5. Other answers are possible.

12	x	3	1	0.25	6	-2	2
	4x + 2	14	6	3	26	-6	10
	4 - 3x	-5	1	3.25	-14	10	-2
	2x - 4	2	-2	-3.5	8	-8	0

- 13 a (a, b) : (1, 10), (2, 5), (5, 2), (10, 1),
 (-1, -10), (-2, -5), (-5, -2), (-10, -1)
 b infinitely many solutions, e.g. a = -42, b = 52
 c a = 0, b = 0 or a = 2, b = 2
 14 a Yes, only when y = 0.
 b No, need to be equal for all values of x and y.
 15 a 24 ÷ (2 × 3) = 4 but (24 ÷ 2) × 3 = 36 (other answers are possible)
 b No, as there is a division rather than two multiplications
 c No. For example. 24 ÷ (6 ÷ 2) = 8 but
 (24 ÷ 6) ÷ 2 = 4.
 16 a 5 - a and a - 5. Other answers are possible.
 b 17(a - b) and 38(b - a). Other answers are possible.
 c x and x + 1

- 17 a They are equivalent
 b No, for example $(2 + 3)^2 = 25$ but $2^2 + 3^2 = 13$.
 c Yes
 d No, for example. $\sqrt{9 + 16} = 5$ but $\sqrt{9} + \sqrt{16} = 7$
 e For part b, if $a = 0$ or $b = 0$ they are equal. For part d, if $a = 0$ or $b = 0$ they are equal.
- 18 a Multiplication is commutative (order unimportant).
 b Adding a number to itself is double the number.
 c A number subtracted from itself always results in zero.
 d Dividing by 2 and multiplying by $\frac{1}{2}$ have the same effect.

a	5	8	2	3	-20	10	-9	-6
b	2	2	1	7	10	-3	10	-13
a + b	7	10	3	10	-10	7	1	-19
a + 2b	9	12	4	17	0	4	11	-32
a - b	3	6	1	-4	-30	13	-19	7
a - 2b	1	4	0	-11	-40	16	-29	20

Exercise 5C

- 1 a 21 b 21 c true
 2 a 23 b 84 c false
 3 a 28
 b i 12 ii 20 iii 28
 c $7x$
- 4 a L b L c L d N e N
 f L g N h N
 5 a L b L c N d L e N
 f N
- 6 a $5x$ b $19a$ c $9x$ d $7xy$
 e $13uv$ f $14ab$ g $7ab$ h $16k$
 i $10k$
- 7 a $9f + 12$ b $13x + 8y$ c $7a + 11b$ d $13a + 9b$
 e $12 + 12x$ f $8a + 3b + 3$ g $14x + 30y$
 h $21a + 4$ i $17x^2y + 5x$ j $13xy$
 k $-x^2$ l $2a + 4b - 7ab$ m $10 + 9q - 4r$
 n $9b + 2b^2$
- 8 a C b A c D d E e B
 9 a $22x$ b $6y + 6 + 2x$ c $12a + 4b$
 10 a $13c$ b $\$9nc$
 11 a 7, 2 b 6, 7 c 7, 9, 5 d 8, 6
- 12 From left to right, top to bottom: $2x$, $2y$, $3y$, $5x + y$, $2x + 2y$
 13 9 ways
 14 $-50a$
 15 Both are equivalent to $17x + 7y$.
 16 a If $a = 1$, $b = 2$: $4a + 3b = 10$, $7ab = 14$. Other answers are possible.
 b Yes, for example if $a = 0$ and $b = 0$.
 c No. They are equivalent.
- 17 a Yes, both are equivalent to $4x$.
 b -13 , -3 , -2

- 18 a From top left to bottom right: $a + 3$, $-a$, $2b + 4$, $2a$, $a + 1$, $7a + 2b$, 0
 b Answers will vary.

Exercise 5D

- 1 B
 2 a $\frac{3}{5}$ b $\frac{1}{3}$ c $\frac{3}{2}$ d $\frac{3}{5}$
 3 B
 4 a $3xy$ b $5abc$ c $12ab^2$ d $4ac^3$
 5 a $63d$ b $10ab$ c $36x$ d $8abcd$
 e $60abcd$ f $48abde$
- 6 a $24abc$ b a^2 c $3d^2$ d $10d^2e$
 e $14x^2y$ f $10x^2y$ g $8x^2yz$ h $8a^2b^2cd$
 i $48x^3y$ j $18a^3b$ k $24x^3y^2$ l $6xz^2$
 m $-10xy^2z$ n $70a^2b^3$ o $16xy^3$
- 7 a $\frac{1}{2}$ b $\frac{x}{2y}$ c $\frac{5x}{6}$ d $\frac{a}{4}$ e $\frac{x}{3}$
 f $\frac{1}{6x}$ g $\frac{-x}{2yz^2}$ h $\frac{-2y}{3}$ i $\frac{-a}{2b}$
 j $\frac{-7p}{q}$ k 7 l $\frac{3}{4z}$
- 8 a $8ab$ b $24x^2$ c $18xy$ d $17xy$
 e $13a^2$ f $88xy$
 9 a $2y$ b $3b^2$ c -2 d $28rs$
 e $8ab^2$ f $-7x$
- 10 $18x^3$
 11 a x^2 b $4x$
 c $\frac{x^2}{4x} = \frac{x}{4}$ = one quarter of width
- 12 a no b $\frac{2a}{5}$ and $\frac{2}{5} \times a$
 c $a = 1$, $a = -1$
- 13 a $3x^5$ b $-3b^2c^3$ c simplify $\frac{(\text{term } 2)}{(\text{term } 1)}$
 14 a bc b $\frac{8a^2}{3}$ c $\frac{x}{6}$ d $16a$
 e $\frac{1}{2}$ f $\frac{-2x}{y}$

Exercise 5E

- 1 a 7 b 4, 9 c algebraic d 7
 2 a 15 b 20 c 42 d 6
 3 a 4 b 12 c 4 d 30
 4 a $\frac{7}{12}$ b $\frac{17}{35}$ c $\frac{3}{10}$ d $\frac{3}{20}$
 5 a 15 b 20 c 20 d 12
 6 a $2x$ b $6a$ c $16z$ d $15k$
 7 a $\frac{3x}{4}$ b $\frac{7a}{3}$ c $\frac{3b}{5}$ d $\frac{5k}{3}$
 e $\frac{5a}{6}$ f $\frac{9a}{20}$ g $\frac{7p}{10}$ h $\frac{3q}{4}$
 i $\frac{29k}{35}$ j $\frac{16m}{15}$ k $\frac{47p}{30}$ l $\frac{5x}{8}$

8 a $\frac{2y}{5}$ b $\frac{5p}{13}$ c $\frac{8r}{7}$ d $\frac{6q}{5}$
 e $\frac{p}{6}$ f $\frac{t}{15}$ g $\frac{7u}{22}$ h $\frac{11y}{6}$
 i $\frac{-r}{6}$ j $\frac{-13u}{42}$ k $\frac{33u}{4}$ l $\frac{-29p}{132}$

9 a $\frac{13x}{3}$ b $\frac{7x}{2}$ c $\frac{11a}{5}$ d $\frac{2p}{3}$
 e $\frac{100u+9v}{30}$ f $\frac{7y-4x}{10}$ g $\frac{4t+7p}{2}$
 h $\frac{x-3y}{3}$ i $\frac{35-2x}{7}$

10 a $\frac{x}{3}$ b $\frac{x}{4}$ c $\frac{7x}{12}$

11 a $\frac{T}{4} + \frac{B}{2}$ b $\frac{T+2B}{4}$ c 251 litres

12 $\frac{A-40}{2}$

13 a For example, if $x = 12$, $\frac{x}{2} + \frac{x}{3} = 10$ and $\frac{5x}{6} = 10$.

b For example, if $x = 1$, $\frac{1}{4} + \frac{1}{5} \neq \frac{2}{9}$.

c No. If $x = 1$ they are different.

14 a i $\frac{x}{6}$ ii $\frac{x}{12}$ iii $\frac{x}{20}$ iv $\frac{x}{30}$

b Denominator is product of initial denominators, numerator is always x .

c $\frac{x}{10} - \frac{x}{11}$

15 a $\frac{2z}{3}$ b $\frac{7x}{10}$ c $\frac{29u}{8}$ d $\frac{29k}{12}$

e $\frac{3p-12}{4}$ f $\frac{47u}{60}$ g $\frac{24+j}{12}$ h $\frac{16t+2r}{15}$

Exercise 5F

1 a 8 b 3 c 55 d 32

2 C

3 a $\frac{7}{15}$ b $\frac{2}{11}$ c $\frac{3}{22}$ d $\frac{1}{4}$ e $\frac{5}{6}$

f $\frac{3}{8}$ g $\frac{12}{17}$ h $\frac{4}{9}$

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

5 a $\frac{2x}{15}$ b $\frac{a}{63}$ c $\frac{8a}{15}$ d $\frac{4c}{25}$

e $\frac{8ab}{15}$ f $\frac{21a^2}{10}$

6 a $\frac{7xy}{5}$ b $\frac{7bd}{15}$ c $\frac{6ab}{5c}$ d $\frac{18de}{7}$

e $\frac{1}{4}$ f $\frac{2}{3}$

7 a $\frac{15a}{4}$ b $\frac{14x}{15}$ c $\frac{18a}{5}$ d $\frac{7}{6x}$

e $\frac{6}{5y}$ f $\frac{x}{14}$ g $\frac{10a}{7}$ h $\frac{10b}{7c}$

i $\frac{3x}{10y}$ j $\frac{2y^2}{3x}$ k $\frac{5}{42x^2}$ l $\frac{14a^2}{5b}$

8 a $\frac{12x}{5}$ b $\frac{4x}{15}$ c $\frac{10}{x}$ d $\frac{4a}{3}$

e $\frac{7}{2x}$ f $\frac{2}{x}$

9 a $\frac{x}{2}$ b $\frac{x}{6}$

10 a xy b i $\frac{x}{2}$ ii $\frac{3y}{4}$ iii $\frac{3xy}{8}$

c $\frac{3}{8}$

11 a $\frac{3q}{2}$ b $\frac{x}{2}$ c 1 d $\frac{3x}{8}$

12 a 1 b x^2 c Both are $\frac{x}{3}$

d $\frac{a}{bc}$ e $\frac{ac}{b}$

13 a i $\frac{11x}{30}$ ii $\frac{x}{30}$ iii $\frac{x^2}{30}$ iv $\frac{6}{5}$

b $\frac{x}{5} \div \frac{x}{6}$

14 a $1 \div \frac{a}{b} = \frac{1}{1} \times \frac{b}{a} = \text{reciprocal of } \frac{a}{b}$ b $\frac{a}{b}$

15 a x^2 b $\frac{x^2}{4}$ c $\frac{9x^2}{25}$. Proportion is $\frac{9}{25} < \frac{1}{2}$.

d $\frac{49x^2}{100}$ or $0.49x^2$ e 0.707 (Exact answer is $\frac{1}{\sqrt{2}}$.)

Exercise 5G

1 a 10 b $5x$ c $10 + 5x$ d $10 + 5x$

2 $6 + 21x$

3 a $6a$ b 42 c $6a + 42$ d $6a + 42$

4 D

5 a 10 b 12 c 10 d 14

6 a $9a + 63$ b $4 + 2t$ c $8m - 80$ d $24 - 3v$

e $-45 - 5g$ f $-35b - 28$

g $-9u - 81$ h $-40 - 8h$

i $30 - 5j$ j $12 - 6m$ k $30 - 3b$ l $2c - 16$

7 a $8zk - 8zh$ b $6jk + 6ja$

c $4ur - 4uq$ d $2pc - 2pv$

e $10ma + mv$ f $-2ys - 10yg$

g $-24sq - 3sg$ h $-gn - 4fg$

i $-8cu - 80ct$ j $-jt - 5js$

k $2hu - 9mu$ l $20mw - 40am$

8 a $65f + 70$ b $44x + 16$ c $15a + 32$ d $24v + 60$

e $76a + 70$ f $20q - 30$ g $32m - 30$ h $22m + 32$

9 a $6x + 4y + 8z$ b $14a - 21ab + 28ay$

c $8qz + 4aq + 10q$ d $-6 - 12k - 6p$

e $-5 - 25q + 10r$ f $-7kr - 7km - 7ks$

- 10 a $55d + 37$ b $115f + 54$ c $32j + 30$
d $75d + 32$ e $4j + 40$ f $68g + 52$
- 11 a $3(t + 4) = 3t + 12$ b $2(u - 3) = 2u - 6$
c $3(2v + 5) = 6v + 15$ d $2(3w - 2) = 6w - 4$
- 12 a D b A c B d E e C
- 13 a $5b + 3g$ b $2(5b + 3g) = 10b + 6g$
c $14b + 10g$ d \$220
- 14 a $2(4a + 12b), 8(a + 3b)$. Other answers are possible.
b $2(2x + 4y)$. Other answers are possible.
c $4(3a - 2b)$. Other answers are possible.
d $3a(6b + 4c)$. Other answers are possible.
- 15 a 1836
b 1836
c i 154 ii 352 iii 627 iv 869
d i 35 ii 399 iii 143 iv 39 999
e $(D5)^2 = ?25$ where ? is $D \times (D + 1)$
- 16 Both simplify to $8a + 6ab$.
- 17 $x^2 + 3xy + 2y^2$
- 18 $\frac{1}{3}(6(x + 2) - 6) - 2$ simplifies to $2x$.
- 19 a $\frac{5x+2}{6}$ b $\frac{8x+15}{15}$ c $\frac{5x-2}{8}$ d $\frac{7x+10}{12}$
e $\frac{7x+3}{10}$ f $\frac{31x+9}{35}$

Progress quiz

- 1 a 5 b $3a, 9b, ab, c, 8$ c $3, -9, 1, 0$
d 8 e -1
- 2 a $5 + m$ b $8k$ c $p - 7$
d $h + 12$ e $2 \times (x + y)$ f $\frac{a}{b}$
g $\frac{k}{2} - \frac{m}{3}$ h $\frac{ac}{5}$
- 3 a 6 b -27 c 54 d 4
- 4 a E b N c N d E
- 5 a L b L c N d L
- 6 a $7h + 3$ b $5a + 8$ c $5xy + 3x$
d $-gk - 5g^2 + 12$
- 7 a $6ab$ b $10d^2$ c $30a^2bc^2d$ d $12p^2q^2$
e $\frac{1}{4}$ f $\frac{2x}{5}$ g $\frac{1}{3a}$ h $-\frac{2m}{3t}$
- 8 a $\frac{7m}{9}$ b $\frac{11k}{6}$ c $\frac{20a - 9b}{24}$ d $\frac{13x}{3}$
- 9 a $\frac{6ab}{35}$ b $\frac{8m}{15}$ c $\frac{4y}{3}$ d $\frac{3}{2p}$
- 10 a $3x + 6$ b $15a - 20b$ c $6x + 4$ d $10b + 5$

Exercise 5H

- 1 a 1, 2, 4, 5, 10, 20 b 1, 2, 3, 4, 6, 12
c 1, 3, 5, 15 d 1, 3, 9, 27
- 2 2
- 3 a 6 b 5 c 20 d 2

- 4 a 12 b 35 c 12, 30 d $14a, 21b$ e 7
f 3 g 2, q h 4

5	$5x + 15$	25	50	35	15	0	-15
	$5(x + 3)$	25	50	35	15	0	-15

- 6 a 5 b 4 c 9 d $7x$
e $2y$ f $11xy$ g $4r$ h $3a$ i p
- 7 a $3(x + 2)$ b $8(v + 5)$ c $5(3x + 7)$
d $5(2z + 5)$ e $4(10 + w)$
f $5(j - 4)$ g $3(3b - 5)$ h $4(3 - 4f)$
i $5(d - 6)$
- 8 a $2n(5c + 6)$ b $8y(3 + r)$
c $2n(7j + 5)$ d $4g(6 + 5j)$
e $2(5h + 2z)$ f $10(3u - 2n)$
g $8y(5 + 7a)$ h $3d(4 + 3z)$
i $3m(7h - 3x)$ j $7u(7 - 3b)$
k $14u(2 - 3b)$ l $3(7p - 2c)$
- 9 For example: length = 2, width = $6x + 8$. Other answers are possible.
- 10 a 5 b $4a + 12$
- 11 a $6x + 18$ b $6(x + 3)$ c $x + 3$ d $2x + 6$
e $3x + 9$
- 12 a $7x + 7$ b $7(x + 1)$ c Student prediction.
d $28(x + 1)$
- 13 $(x + 2)(y + 3)$
- 14 a i I eat fruit and I eat vegetables.
ii Rohan likes Maths and Rohan likes English.
iii Petra has a computer and Petra has a television.
iv Haypen plays tennis and Haypen plays chess and
Anthony plays tennis and Anthony plays chess.
b i I like sewing and cooking.
ii Olivia and Mary like ice cream.
iii Brodrick eats chocolate and fruit.
iv Adrien and Ben like chocolate and soft drinks.
- 15 a $\frac{2}{5}$ b $\frac{7}{2}$ c $\frac{3c + 5}{1 + 2b}$ d $\frac{2a + b}{4c + 5d}$ e $\frac{5}{3}$
f $\frac{7}{9}$ g $\frac{7}{2}$ h $\frac{6}{4 + q}$ i 5

Exercise 5I

- 1 a 35 b 41 c 5
- 2 a 50 b 20 c 0
- 3 a $2x + y$ b 8
- 4 a $3n$ b \$36
- 5 a $3(x + 2)$ or $3x + 6$ b 33 units²
- 6 C
- 7 a $5x$ b $10x$ c $5(x + 3)$ or $5x + 15$
- 8 a $30 + 40x$ b \$350
- 9 a \$50 b \$60 c 2 hours 30 minutes
- 10 a \$140 b $60 + 80x$
c i \$60 ii \$80

- 11 a $10 + 4n$ b $20 + n$ c 30
 d deal 1 e deal 3
 f i 3 ii 4, 10 iii 10
 12 a i $2(x + 2)$ ii $2x + 4$ iii $4\left(\frac{x}{2} + 1\right)$
 b All expand to $2x + 4$.
 c Divide by 2.
 13 a 6 b 6
 c Both dimensions are negative, so the shape cannot exist.
 14 a $F + H$ b $F + 2H$ c $F + \frac{H}{2}$ d $F + tH$
 15 3 buy deal F, 2 buy E, 1 buys D, 3 buy C, 5 buy B and 86 buy A.

Exercise 5J

- 1 5, 7
 2 B
 3 a i 4 ii 8 iii 32 iv 64
 b 2^5
 4 a $5 \times 5 \times 5$
 b $5 \times 5 \times 5 \times 5$
 c $5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$
 5 a 4^7 b 3^{12} c 2^{18} d 7^6
 6 a m^7 b x^6 c q^{13} d r^9
 e m^9 f a^9 g r^9 h z^{36}
 i k^4 j j^3 k m^8 l x^4
 7 a $20m^5$ b $10k^7$ c $28x^{14}$ d $28y^{13}$
 e m^6n^{10} f x^2y^3 g $3r^3s^7$ h $2y^{15}z^5$
 i $110x^4$ j $15a^6$ k $8x^5y^7$ l $14a^5b^4$
 m $-14x^7y^4$ n $-4a^5b^3$ o $-16c^6d$ p $84x^4y^5$
 8 a 3^5 b 10^8 c 2^5 d 5^2
 9 a m^3 b z^3 c q^7 d r^9
 e m^2n^5 f a^5b^3 g xy^6z^2 h $x^2y^3z^3$
 i $4k^3$ j $2m^{13}$ k $\frac{5x^{18}y^7}{3}$ l $\frac{a^2}{2}$
 10 a x^2 b a^9 c a^2b d $\frac{kj^2}{8}$
 e $4x^7y^3$ f 10
 11 a $2^3 = 8$ b $5^4 = 625$ c 1
 12 a $a = 2, b = 4$ is the only solution.
 13 a i 4 ii -8 iii 16 iv -32
 b i positive ii negative
 c 1024
 14 a 5^0 b 1 c 1 d 1
 15 a that $a - b = 2$ b 125
 16 a i 5×10^7 ii 7×10^9
 iii 5×10^{-3} iv 2×10^{-7}
 b i 2000 000 hours ii 40 000 000 days
 iii 0.003 seconds iv 0.000000003 seconds
 c i 34.7 days ii 250 hours
 iii 0.72 seconds iv 4.32 milliseconds

Exercise 5K

- 1 A 2 B 3 C
 4 a 1 b 1 c 5 d $12y^2$ e 1
 f 13 g $2y^2$ h 4 i $3a^2$
 5 a 2^{12} b 5^{16} c 6^{36} d d^9
 e k^{24} f m^{50}
 6 a $9x^{10}$ b $8u^{12}$ c 5^4x^{20} d 12^3x^{15}
 e $16x^8$ f $49x^4$ g $9^{10}x^{70}$ h 10^5x^{10}
 7 a x^{21} b y^{18} c $500k^{23}$ d $25m^{22}$
 e $8x^{18}$ f 5^4p^{18} g y^{10} h p^8
 i $2p^{13}$ j $3^{10}x^{14}$ k $8h^5$ l q^2
 8 a 5 b 3 c 5 d 2
 9 a x^{24} b x^{60} c $((2^3)^4)^5, (2^7)^{10}, 2^{100}, ((2^5)^6)^7$
 10 a i 2 ii 5 iii 6
 b 54
 11 a x^7 b x^{12}
 c For example if $x = 2$ they give different values (128 vs 4096)
 d $x = 0, x = 1$
 12 a 1 b $5^{2-2} = 5^0$
 c $3^0 = 3^{2-2} = \frac{3^2}{3^2} = \frac{9}{9} = 1$
 d $100^0 = 100^{2-2} = \frac{100^2}{100^2} = \frac{10\,000}{10\,000} = 1$
 e $\frac{0^2}{0^2}$ cannot be calculated (dividing by zero).
 13 a Both equal 2^{12} . b A $(2^4)^3$, B $(2^2)^6$, C $(4^2)^3$
 c 3, 5. Other answers are possible.
 14 a 9 b 3 c 3 d 6
 15 a 1 b Many answers are possible.
 16 a 5^4 b x^8 c x^4y^9 d $a^7b^{12}c^{10}$
 e $x^{80}y^{10}$ f $7^2 = 49$ g 1 h 25
 i $10^4 = 10\,000$

Problems and challenges

- 1 $10m + 10 = 10(m + 1)$
 2 Any list with $6 - 2a$ central; $2 - a, 6a - 5$ together;
 $a - 7, 4(a + 1)$ together. e.g. $2 - a, 6a - 5, 6 - 2a,$
 $a - 7, 4(a + 1)$
 3 $4^{1999}, 16^{1000}, 2^{4001}, 8^{1334}$
 4 a $\frac{65}{4}$ b $\frac{225}{4}$ c 0
 5 a $\frac{5-4a}{30}$ b $\frac{9x+4}{42}$
 6 a 8 b 45 c 4
 7 a All perimeters = $4a$
 Areas: $a^2, \frac{3}{4}a^2, \frac{6}{9}a^2, \frac{10}{16}a^2, \frac{15}{25}a^2$
 b $P = 24, A = \frac{9009}{500}$ or approximately 18.
 8 $V = 2^{3x} 3^{3y} \text{cm}^3, TSA = 2^{2x+1} 3^{2y+1} \text{cm}^2$
 9 a $x = 3$ b $a = 4$ c $b = 3, c = 2$
 d $x = \frac{1}{2}$ e $k = \frac{5}{3}$

Multiple-choice questions

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

Short-answer questions

- 1 a false b true c true d false
e true
2 a 2 b 3 c 4 d 6
3 a 11 b 14 c 29 d 8
4 a -3 b 3 c -9 d 14
e -3 f 12
5 3
6 a $16m$ b $2a + 5b$ c $2x^2 - x + 1$
d $7x + 7y$ e $9x + x^2$ f $-m - 12n$
7 a $36ab$ b $15xy$ c $16xy$
8 a $5x$ b $-4c$ c $15x$ d $3ab$
9 a $\frac{x}{4}$ b $\frac{6a+b}{15}$ c $\frac{9}{x}$ d $\frac{3b}{2}$
10 a $3x - 12$ b $-10 - 2x$ c $3kl - 4km$
d $7x - 6y$ e $13 - 3x$ f $10 - 20x$ g $18x + 2$
11 a $2(x + 3)$ b $8(3 - 2g)$ c $3x(4 + y)$
d $7a(a + 2b)$
12 a $a + 2$ b 12 c $\frac{1}{4 + 3q}$
13 a 7 b 3 c 6 d 1
14 a m^7 b $12m^8$ c m^2 d $2a^4$
e x^{12} f $8a^6$
15 a $-2x^4y^2z^2$ b y^{10} c 7 d 2
e $4y^{10}$ f m^6 g $2b$ h y^4

Extended-response questions

- 1 a $120 + 80n$
b $80 + 100n$
c A costs \$360, B costs \$380.
d any more than two hours
e $520 + 440n$
f \$2720
2 a $xy - \frac{x^2}{4}$ b $33m^2$ c $2x + 2y$ d $26m$
e Area = $xy - \frac{x^2}{3}$, Perimeter = $2x + 2y$
f Area is reduced by $\frac{x^2}{12}$ and perimeter remains the same.

Semester review 1

Integers

Multiple-choice questions

- 1 B 2 C 3 C 4 A 5 B

Short-answer questions

- 1 a 5169 b 1350 c -288 d 695
e 1386 f 2800 g 81 h 64
i -19
2 a -14 b 30 c 72 d -7
e 54 f -6
3 a 6 b 7 c 20 d 3
4 a 168 b 72 c 300 d 66150
5 a -3 b 40 c 27 d -55
e 25 f -8 g 19

Extended-response questions

- a Hong Kong b Moscow, New York
c Hong Kong d 8.9°C e 14.8°C
f Min = 10.7°C , Max = 16.5°C

Lines, shapes and solids

Multiple-choice questions

- 1 B 2 D 3 C 4 C 5 C

Short-answer questions

- 1 a 66 b 25 c 123 d 35
e 70 f 98
2 a $x = 81, y = 99$ b $a = 75$
c $a = 62, b = 62$ d $a = 65, b = 65$
e $a = b = c = d = 100, e = 80$
f $x = 95, y = 85$
3 a 48 b 45 c 60 d 75
e 121 f 75
4 a $a = b = 90$
b $a = 73, b = 95$
c $a = 265, b = 30$
5 120°

Extended-response questions

- $b = 65$ (supplementary to a)
 $c = 65$ (alternate to b)
 $d = e = 57.5$ (isosceles triangle)
 $f = 122.5$ (supplementary to d)
 $g = 122.5$ (revolution angle 360)
 $h = 180$ (straight angle)
 $i = 295$ (revolution)

Fractions, decimals and percentages

Multiple-choice questions

- 1 D 2 C 3 C 4 B 5 C

Short-answer questions

- 1 a 18 b 1 c 5
 2 a $\frac{1}{4}$ b $\frac{7}{5}$ c $3\frac{1}{4}$ d $-\frac{2}{21}$
 e $\frac{1}{3}$ f $\frac{9}{10}$
 3 a $\frac{5}{2}$ b $\frac{1}{8}$ c $\frac{5}{21}$
 4 a $\frac{9}{2}$ b $\frac{3}{4}$ c $\frac{5}{8}$
 5 a 6.93 b 7.58 c 4.03 d 6.51
 e 3854.8 f 792
 6 a 545.9 b 1008 c 0.614
 7

Fraction	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{5}$	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{4}{5}$	$\frac{19}{20}$	$\frac{99}{100}$	$\frac{1}{200}$
Decimal	0.25	0.5	0.2	0.3	0.6	0.8	0.95	0.99	0.005
Percentage	25%	50%	20%	33.3%	66.6%	80%	95%	99%	0.5%

- 8 a 5.6 b 11.76 c 85.5 m d \$1.98
 e \$105 f 4930 g
 9 a \$700 b \$862.4 c \$0.9936
 10 25

Extended-response questions

- a i \$1784.15 ii \$1516.53 iii \$1289.05
 b 6 years
 c N. There will always be 85% of the previous value.

Measurement and introductions to Pythagoras' theorem

Multiple-choice questions

- 1 C 2 B 3 D 4 B 5 D

Short-answer questions

- 1 a 500 cm b 180 cm c 90000 cm²
 d 1.8 m e 4000 cm³ f 10000 m²
 2 a 18.6 cm b 64 m c 40 m
 3 a i 25.13 m ii 50.27 m²
 b i 47.12 cm ii 176.71 cm²
 4 a i 25.71 m ii 39.27 m²
 b i 17.85 cm ii 19.63 cm²
 c i 54.85 mm ii 169.65 mm²
 5 a 30 m² b 48 m²
 6 a SA = 105.84 m², V = 74.088 m³.
 b SA = 85 m², V = 50 m³
 c SA = 60 m², V = 24 m³
 7 a 615.75 m³ b 392 699.08 cm³
 c 1.26 m³ or 1 256 637.06 cm³
 8 a 13 b 14.42
 9 a 1530 b 0735

Extended-response questions

- a $15 - 2x$ b x c $x(15 - 2x)^2$
 d $169 m^3$ e $x = 2.5$

Algebra

Multiple-choice questions

- 1 C 2 A 3 D 4 B 5 D

Short-answer questions

- 1 a $p + q$ b $3p$ c $\frac{m^2}{2}$ d $\frac{x+y}{2}$
 2 a 9 b 25 c 102 d 116
 e -24 f -24
 3 a $24k$ b $3a$ c a^3 d $\frac{p}{2}$
 e $7ab + 2$ f $x - 1$ g $2y$ h $2n - 2m$
 4 a xy b $\frac{x}{7}$ c $\frac{7w}{10}$ d $\frac{7a}{2}$
 5 a $\frac{m}{6}$ b ab c $\frac{2}{3}$
 6 a $12m - 18$ b $4 + 2m$ c $9A + 6$
 7 a $6(3a - 2)$ b $6m(m + 1)$
 c $-8m(m + 2n)$
 8 a $8x + 20$ b $3x(x + 10)$
 9 a m^9 b $32a^4$ c $-48a^6b^9$ d a^6
 e a^4b^2 f $\frac{1}{2}$
 10 a x^{14} b $16a^{12}$ c $25a^8b^{12}$ d 1 e 1
 f $-5c^2$

Extended-response questions

- a $(7a + x)$ cm b $6a^2 \text{ cm}^2$ c $x = 5a$
 d $12a \text{ cm}$ e 216 cm^2

Chapter 6

Exercise 6A

- 1 a 3 : 7 b 5 : 4
 2 a 1 : 3 b 7 : 15
 3 a 9 : 4 b 52 : 17 c 7 : 12 d 3 : 5
 4 a 5 : 3 b 7 : 15 c 3 : 7 : 5 d 5 : 3 : 7
 5 a 8 : 3 b 3 : 14 c 3 : 11 d 8 : 6
 6 a 13 : 7 b 11 : 9 c 13 : 9 : 11 : 7
 d 20 : 20 or 1 : 1
 7 a 12 b 14 c 4 d 9 e 2
 f 4 g 2 h 10 i 77
 j 51 k 9 l 11
 8 a 4 : 6 : 10 b 2 : 6 : 8 c 7 : 49 : 63
 d 11 : 55 : 33

9 Answers may vary.

a 2 : 4, 3 : 6, 5 : 10 b 4 : 10, 20 : 50, 200 : 500

c 4 : 3, 16 : 12, 40 : 30 d 3 : 1, 6 : 2, 18 : 6

10 2 : 5 and 4 : 10, 6 : 12 and 1 : 2, 7 : 4 and 70 : 40

11 a 3 : 30 b 1 : 10, 10 : 100

12 2

13 a 2 : 3 b 3 : 5 c 2 : 3 d 5 : 4

14 Victoria, Tasmania, South Australia

15 No, three is not a factor of 10.

16 1 : 2

17 a 5 : 8 b 9 : 13 c no

18 a $3x$ b $2.5x$ c $4y$ d $2x$

19 a 4 : 21 b 3 : 7 c 3 : 1 d 7 : 2

20 1 : 1

Exercise 6B

1 a 1 : 1 b 1 : 2

2 D 3 B 4 C

5 a 1 : 4 b 1 : 5 c 1 : 6 d 1 : 3

e 4 : 5 f 5 : 8 g 3 : 4 h 3 : 10

i 9 : 7 j 2 : 1 k 9 : 7 l 3 : 1

m 3 : 1 n 1 : 9 o 6 : 11 p 2 : 1

q 12 : 1 r 1 : 6 s 8 : 5 t 6 : 5

6 a 1 : 2 : 3 b 4 : 7 : 11 c 7 : 10 : 2 d 17 : 7 : 3

e 1 : 2 : 3 f 2 : 6 : 5 g 9 : 14 : 2 h 2 : 4 : 7

7 a 2 : 3 b 5 : 4 c 8 : 15 d 10 : 7

e 3 : 2 f 7 : 8 g 33 : 4 h 27 : 14

8 a 2 : 1 b 11 : 3 c 50 : 21 d 52 : 45

9 a 2 : 5 b 14 : 1 c 3 : 25 d 1 : 35

e 20 : 3 f 2 : 25 g 50 : 11 h 5 : 1

i 2 : 5 j 1 : 6 k 12 : 1 l 9 : 1

m 1 : 16 n 2 : 9 o 1 : 7 p 14 : 3

q 1 : 8 r 30 : 1

10 B

11 a 2 : 11 b 9 : 11 c 2 : 9

12 a 2 : 3 : 3 b 1 : 1 c 2 : 5 d 5 : 7

13 a 5 : 5 : 2 : 4 : 3 : 1 : 20

b 20 : 20 : 8 : 16 : 12 : 4 : 80

c i 1 : 4 ii 1 : 1

14 Andrew did not convert a.m.ounts to the same units. Correct ratio is 40 : 1.

15 a 8 : 1 b 8 : 1, yes

16 Answers may vary.

a 24 minutes to 1 hour b 2 kilometres to 1500 metres

17 a $a : 2b$ b $5x : y$ c $1 : a$ d 5 : 24

e $h : 3$ f $2x : 5$

18 a 4 : 3 b 16 : 9 c squared. $16 : 9 = 4^2 : 3^2$

d 47 : 20

Exercise 6C

1 a 10 b 6 c 14 d 9

2 a $\frac{3}{8}$ b $\frac{5}{8}$

3 a 1 : 3 b 1 : 1 c 2 : 5 d 1 : 4

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

5 a \$24 and \$36 b \$70 and \$40

c \$150 and \$850

d 8 kg and 40 kg

e 8 kg and 6 kg

f 150 kg and 210 kg

g 24 m and 48 m

h 15 m and 25 m

i 124 m and 31 m

6 a \$100 and \$300 b \$160 and \$240

c \$150 and \$250

d \$180 and \$220

7 a \$40, \$80, \$80 b \$50, \$150, \$200

c 2 kg, 4 kg, 6 kg

d 22 kg, 11 kg, 55 kg

e 96 kg, 104 kg, 120 kg

f \$5000, \$10 000, \$15 000, \$20 000

8 a 60, 540 b 200, 100, 300 c 100, 250, 250

d 240, 140, 160, 60

9 nitrogen: 500 g, potassium: 625 g, phosphorus: 375 g

10 40° , 60° , 80°

11 \$250 12 48 13 240 14 294

15 120 pages

16 shirt \$160, jacket \$400

17 a 8 b 3 : 5

c 2 boys and 2 girls were absent or 5 boys and 9 girls.

18 a Ramshid: \$125, Tony: \$83.33, Maria: \$41.67

b 10 : 6 : 5

c Ramshid: \$119.05, Tony: \$71.43, Maria: \$59.52

d \$17.85 e \$11.90

f Original ratio, as he receives \$5.95 more.

g Ramshid: \$120, Tony: \$70, Maria: \$60

Exercise 6D

1 50 000 cm

2 3 m

3 a 100 000 mm b 100 m c 0.1 km

4 a 0.56 km b 56 000 cm c 560 000 mm

5 Numbers and units may vary.

a i 200 m ii 40 m iii 730 m

b i 16 km ii 370 m iii 25 km

c i 6.4 m ii 288 m iii 12 m

d i 150 cm ii 24.6 m iii 2.13 km

e i 88 m ii 620 cm iii 5 mm

f i 20 m ii 120 cm iii 77.5 cm

g i 6 cm ii 1.6 mm iii 200 m

h i 0.3 mm ii 115 m iii 8.15 mm

6 a i 1 m ii 20 m iii 3 mm

b i 20 m ii 2 m iii 1.5 mm

- c i 13.5 cm ii 4.5 m iii 7.365 cm
 d i 60 cm ii 9 cm iii 0.02 mm
 e i 20 m ii 3 m iii 5 mm
 f i 2.3 m ii 16.5 cm iii 61.5 cm
 g i 3 m ii 5 cm iii 2 mm
 h i 20 cm ii 15 m iii 1.64 m
- 7 a 1 : 250 b 1 : 50 000 c 1 : 50 000
 d 1 : 18 000 e 7 : 1 or 1 : $\frac{1}{7}$
 f 600 : 1 or 1 : $\frac{1}{600}$
- 8 a 1 : 10 000 b 1 : 1000 c 1 : 300
 d 1 : 150 000 e 1 : 125 f 1 : 200 000
 g 1 : 100 000 h 50 : 1 i 10 000 : 1
- 9 a 80 m b 4.5 cm
 10 8.5 km
 11 a $3.5 \text{ m} \times 2.5 \text{ m}$ b $4.6 \text{ m} \times 4.6 \text{ m}$
 c $7.8 \text{ m} \times 2.1 \text{ m}$
 12 Length 11 m, height 4 m
 13 a 1 : 40 b 56 cm
 14 a 24 km b 160 km c 12.5 cm
 15 1 : 0.01 and 100 : 1, 25 : 1 and 50 : 2, 20 : 1 and 1 : 0.05
 16 a car: D, 1 : 10 b school grounds: B, 1 : 1000
 c Mt Kosciuszko: A, 1 : 10 000
 17 With chosen scale, the map will be 8 m wide by 8 m high, which is too big to be practical.
 18 The ratio provided is the wrong way around. It should be 1000 : 1.

Exercise 6E

- 1 B, C, E, F, H
 2 employee's wage: \$15/h
 speed of a car: 68 km/h
 cost of building new home: \$2100/m²
 population growth: 90 people/day
 resting heart rate: 64 beats/min
- 3 a \$/kg b \$/L c words per minute
 d goals/shots on goal e kJ/serve or kJ/100 g
 f L/min g mL/kg or mg/tablet h runs/over
- 4 a 3 days/year b 5 goals/game
 c \$30/h d \$3.50/kg e \$14 000/acre
 f 4500 cans/hour g 1200 revs/min
 h 16 mm rainfall/day i 4 min/km
 j 0.25 km/min or 250 m/min
- 5 a 300 km/day b \$140/year
 c 6.5 runs/over d 7.5 cm/year
 e 1.5 kg/year f dropped 2.5°C/h
- 6 a 3 L/h b 7 hours
 7 158 cm
 8 a 1.5 rolls/person b \$6/person
 c \$4/roll

- 9 a i 5.8 hours/day ii 6.5 hours/day
 iii 42 hours/week iv 6 hours/day
 b 180 hours
- 10 Harvey: 3.75 min/km, Jacques: 3.33 min/km; Jacques
- 11 a 1200 members/year b 12 years
- 12 a i 9 km/L ii $\frac{1}{9}$ L/km
 b Find the reciprocal.
- 13 a i \$4 ii \$7.25 iii \$16.50 iv \$22.50
 b 75c/minute
 c Teleconnect
 d Connectplus
 e $16\frac{2}{3}$ min or 16 min and 40 seconds

Progress quiz

- 1 a 1 : 24 b 23 : 25 c 1 : 2
 2 a 6 b 4 c 4 d 24 : 9
 3 a 2 : 3 b 6 : 9 : 10 c 1 : 12
 d 3 : 40 e 1 : 3
 4 a \$500, \$300 b \$5000, \$1875, \$625
 c 400 m, 600 m
 5 a \$1760 b \$560
 6 320 m 7 4.32 cm 8 1 : 2 000 000
 9 a 60 students/bus b \$1.40/kg c 74.4 km/h
 10 a 160 km/day b \$2500/yr c 8 cm/yr
 11 Kelly earns the most by \$750
 Kelly earns \$96570
 Todd earns \$95820
- 12 21 m/s is faster
 (21 m/s = 75.6 km/h)

Exercise 6F

- 1 \$27 2 \$17.60 3 \$43.30 4 \$36
 5 a 75 b 36 c 7 m d 133 cm
 6 a 520 mL b 11 goals c 350 mm
 d 1 875 000 kilobytes
 7 Leonie \$600, Mackenzie \$300, total \$1350
 8 a 25c/min b 4c/s c 210 L/h d 1.2 L/h
 e 6 kg/year f 0.84 kg/week g 6 kg/\$
 h 3.8c/mm i 30 m/s j 50.4 km/h
 9 a small: \$1.25/100 g, medium; \$1.20/100 g, large:
 \$1.10/100 g
 b 4 large, 1 medium, 1 small, \$45.20
- 10 12 s
- 11 a 1.2 cm/month, 0.144 m/year
 b 25 months, 2 years and 1 month
- 12 a $45 \text{ m}^2/\text{h}$ b 900 m² c $\frac{5}{6} \text{ m}^2/\text{min}$
- 13 a $\frac{\$y}{x}$ b $\frac{\$12y}{x}$ c $\frac{\$zy}{x}$

- 14 a 21 cm, 28 cm, Perimeter = 84 cm
b 19 cm, 22 cm, Perimeter = 58 cm
15 50 pa/mD
16 a Perth b 56 hours c 40 hours
d Phil is 1125 km from Perth, Werner is 1575 km from Sydney.
e 2450 km from Sydney, 1750 km from Perth
f 46 hours and 40 minutes

Exercise 6G

- 1 a 3 hours b 5 hours, $\times 5$
c $\times 10$, 30 minutes, $\times 10$ d $\times 6$, 720 litres, $\times 6$
2 a \$12, \$60, $\times 5$
b $\div 5$, 30 rotations, $\div 5$, $\times 7$, 210 rotations, $\times 7$
3 a 2400 b 19 200
4 100 litres 5 40 litres 6 150 days
7 a 22 500 b 375 c 10 minutes
d 6 seconds
8 a 3750 beats b 1380 beats
c 80 minutes
9 \$2520 10 22.5 kg
11 Bionic woman wins by 4 seconds.
12 a $7\frac{1}{2}$ days b $187\frac{1}{2}$ students!
13 2.4 days
14 a $2\frac{2}{3}$ days b Matric: $\frac{1}{3}$, Hugh: $\frac{4}{9}$, Ethan: $\frac{2}{9}$
15 a 80 cans b 5 dogs c 15 days
16 12 hours
17 a \$ b m c min d min
18 a buddies: \$4.50/L, 1.25 L bottles: \$1.28/L, 2 L bottles:
\$1.10/L, cans: \$1.60/L
b buddies: \$135, 1.25 L bottles: \$38.40, 2 L bottles: \$33,
cans: \$48
c greatest amount = 54 L, least amount = 13.2 L

Exercise 6H

- 1 D 2 A 3 B 4 D
5 a 10 m/s b 7 m/s c 60 km/h d 50 km/h
e 120 km/h or 2 km/min f 45 km/h or 0.75 km/min
6 a 1080 m b 450 m c 36 km d 50 km
7 a 8 hours b $\frac{1}{2}$ hour or 30 minutes c 11.5 hours
d 7 seconds
8 a 10 m/s b 50 m/s c 11 m/s d 4000 m/s
9 a 54 km/h b 7.2 km/h c 0.72 km/h
d 3600 km/h
10 a 25 km/h b 40 s c 60 km d 120 m/min
e 70 km f 100 s
11 2025 km
12 a 27 km/h b $2\frac{1}{4}$ km

- 13 27 m/s
14 24 km/h
15 10.4 m/s, 37.6 km/h
16 a 58.2 km/h b 69.4 km/h
17 Answers may vary; e.g. 150 km/h, 160 km/h
18 250 m
19 8 : 02 : 40; 2 minutes and 40 seconds after 8 a.m.
20 a 343 m/s b 299 792 458 m/s c 0.29 s
d 0.0003 s e 874 030
f how many times the speed of sound
(mach 1 = speed of sound)
g 40 000 km/h or 11.11 km/s
h 107 218 km/h, 29.78 km/s i 29.78 km/s
j-m Answers vary

Problems and challenges

- 1 a 2 b $3\frac{1}{5}$ c $2\frac{2}{3}$
2 1 : 3 3 9 km/h
4 a 1 hour b 12 sets
5 12 sheep 6 $\frac{5}{9}$ hour 7 0.75 km
8 5 hours 9 12.57 a.m. 10 68.57 km/h
11 A 20 km trip at 100 km/h takes $\frac{1}{5}$ hour which Max has been
used to drive the first 10 km. The second 10 km cannot be
travelled in zero time; hence it is impossible for Max to achieve
a 100 km/h average speed.

Multiple-choice questions

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

Short-answer questions

- 1 a 1 : 2 b 2 : 1 c 5 : 9
2 a false b false c true d false
e true
3 a 25 b 12 c 6 d 3
4 a 1 : 4 b 3 : 2 c 3 : 4 d 1 : 8
e 3 : 1 f 1 : 5 g 3 : 2 h 2 : 1
i 2 : 3 j $2a : 1$ k 2 : 5 l 11 : 2
m 10 : 3 n 1 : 3 : 6
5 a 5 : 2 b 1 : 3 c 2 : 5 d 1 : 2
e 1 : 5 f 1 : 4 g 3 : 25 h 3 : 10
6 a \$35 : \$45 b 160 kg : 40 kg c 30 m : 10 m
d \$340 : \$595 : \$510 e 60c : 20c : 20c
7 a \$1152 b 144 cm c 1.125 L
8 a 5 km/h b \$50/h c 140 km/day
9 a 12.5 km/L, 8 L/100 km b 2.5 g/min, 150 g/h
c \$2400/day, \$100/h
10 a 0.2 m b 27 m c 140 m

- 11 500 mm
 12 a 1 : 1.5, $x = 9$ cm b 1:3, $x = 12$ cm
 13 a 200c/min b 21.6 km/h c 200 m/s
 14 a 301 km b \$39.20 c $6\frac{2}{3}$ hours
 15 a 64 km/h b 108 min c 6.75 km

Extended-response question

- a 2:15 p.m. b 100 km/h c 11:30 a.m.
 d 467 km
 e 5 hours at 93.4 km/h
 f The Harrison's petrol cost \$282.15, the Nguyen's petrol cost \$313.50.

Chapter 7

Exercise 7A

- 1 a true b false c true d false
 e true f true
 2 a 13 b 9 c 2 d 2
 3 a 7 b 9 c 15 d 8
 4 a 25 b 25 c yes
 d $2 + x = 7$ (other answers possible)
 5 a true b true c false d false
 e true f false
 6 a true b false c true d true
 e false f true
 7 a C b I c C d C
 8 a $x = 7$ b $x = 13$ c $v = 3$ d $p = 19$
 e $x = 2$ f $x = 8$ g $u = 7$ h $k = 11$
 i $a = 3$
 9 a $2x + 7 = 10$ b $x + \frac{x}{2} = 12$
 c $25 + a = 2a$ d $h + 30 = 147$
 e $4c + 3t = 21$ f $8c + 2000 = 3600$
 10 a 7 b 42 c 13 d -8
 e 40 f -13
 11 a $3.2x = 9.6$ b $x = 3$
 12 a $E + 10 = 3E$ b $E = 5$ c 5 years old
 d 15
 13 $t = 3, t = 7$
 14 a $3 \times 3 = 9$
 b $-3 \times (-3) = 9$
 c $x = 8, x = -8$
 d $x = 0$ is the only solution and $-0 = 0$, but $x = 1$ and $x = -1$ are distinct solutions.
 e Positive numbers square to give positives but so do negatives. (neg $\times$ neg = pos)
 15 a No number can equal 3 more than itself.
 b Addition is commutative.

- c If $x = 7$ it is true, if $x = 6$ it is false.
 d i S ii S iii N iv S
 v A vi S vii N viii S
 ix A
 e $7 + x = x + 7$. Other answers are possible.
 16 a $p = 1, p = -3$
 b one
 c Many answers possible, e.g. $(p - 2) \times (p - 3) \times (p - 5) = 0$ has 3 solutions.
 17 a $a = 10, b = 6, c = 12, d = 20, e = 2$
 b $f = \frac{1}{2}$
 18 a $c = 4, d = 6$ (or $c = 6, d = 4$)
 b $c = 11, d = 3$
 c $c = 24, d = 6$
 d $c = 7, d = 0$ (or $c = 0, d = -7$)

Exercise 7B

- 1 a $3x + 4 = 14$ b $11 + k = 18$
 c $9 = 2x + 4$
 2 a 12 b 25 c 16 d $4z$
 3 a 8 b $x = 8$
 4 B
 5 a $2x = 20$ b $2 + q = 10$ c $18 = 17 - q$
 d $12x = 24$ e $7p + 6 = 2p + 10$
 f $3q = 2q$
 6 a $x = 3$ b $q = -3$ c $x = 5$
 d $p = 7$ (missing operation: $\div 4$) e $x = 3$
 f $p = 6$ (missing operation: $\times 3$)
 7 a $a = 3$ b $t = 7$ c $q = 9$ d $k = 9$
 e $x = 10$ f $h = -10$ g $l = -4$ h $g = -9$
 8 a $h = 3$ b $u = 4$ c $s = 3$ d $w = 8$
 e $x = -4$ f $w = -5$ g $a = 2$ h $y = -8$
 9 a $d = 3$ b $j = -6$ c $a = 2$ d $y = 2$
 e $k = -4$ f $n = -7$ g $b = -3$ h $b = 4$
 10 a $x = \frac{7}{2}$ b $q = \frac{1}{3}$ c $b = \frac{1}{2}$ d $x = \frac{5}{2}$
 e $x = -\frac{5}{2}$ f $p = -\frac{23}{2}$ g $y = \frac{13}{5}$
 h $y = -\frac{3}{2}$
 11 a $p + 8 = 15, p = 7$ b $q \times -3 = 12, q = -4$
 c $2k - 4 = 18, k = 11$ d $3r + 4 = 34, r = 10$
 e $10 - x = 6, x = 4$ f $10 - 3y = 16, y = -2$
 12 a $x = 2$ b $x = 2$ c $x = 6$
 13 a $x = 7, y = \frac{14}{5}$ b $x = 2, y = 26$
 c $x = \frac{10}{3}$ d $p = 15, q = \frac{13}{4}$
 14 $10x + 6x = 194.88$, hourly rate = \$12.18

15 a $\begin{array}{l} -4 \left(\begin{array}{l} 7x+4=39 \\ 7x=35 \\ x=5 \end{array} \right) -4 \\ 7 \left(\begin{array}{l} x=5 \\ -2x=-10 \end{array} \right) +7 \\ -2 \left(\begin{array}{l} -2x=-10 \\ -2x+13=3 \end{array} \right) \times -2 \\ 13 \left(\begin{array}{l} -2x+13=3 \end{array} \right) +13 \end{array}$

b $\begin{array}{l} -4 \left(\begin{array}{l} 10k+4=24 \\ 10k=20 \\ k=2 \end{array} \right) -4 \\ 10 \left(\begin{array}{l} k=2 \\ 3k=6 \end{array} \right) +10 \\ 3 \left(\begin{array}{l} 3k=6 \\ 3k-1=5 \end{array} \right) \times 3 \\ -1 \left(\begin{array}{l} 3k-1=5 \end{array} \right) -1 \end{array}$

16 a $\begin{array}{l} -3 \left(\begin{array}{l} 4x+3=11 \\ 4x=8 \end{array} \right) -3 \\ 2 \left(\begin{array}{l} 4x=8 \\ 2x=4 \end{array} \right) +2 \end{array}$

b no

c The two equations have different solutions and so cannot be equivalent.

17 a $x = 5$

b Opposite operations from bottom to top.

c For example, $7 - 3x = -8$.

d You can start with $x = 5$ and perform any operation to get a new equivalent equation (e.g. multiply by 2, multiply by 3, ...).

18 a $x = 3$ b $x = 1$ c $x = 2$ d $x = 4$

e $x = 3$ f $x = 1$ g $x = \frac{3}{2}$ h $x = 0$

i $x = 1$

Exercise 7C

1 a 8 b 5 c no

2 a 30 b 10 c $\times 2, 22$ d $\times 10, 70$

3 a C b A c B d D

4 a $b = 20$ b $g = 20$ c $a = 15$ d $k = 18$

e $l = 20$ f $w = -10$ g $s = -6$ h $v = 12$

i $m = 14$ j $n = 14$ k $j = -5$ l $f = 20$

5 a $t = -12$ b $h = 2$ c $a = -2$ d $c = -3$

e $s = -6$ f $j = 2$ g $v = -12$ h $n = 9$

i $q = -6$ j $f = 3$ k $l = -6$ l $r = 7$

m $x = 10$ n $u = 3$ o $k = 4$ p $b = -11$

q $m = 12$ r $y = 8$ s $p = 3$ t $g = -2$

6 a $x = 35$ b $y = -24$ c $p = 14$ d $x = 16$

e $x = 12$ f $k = -13$

7 a 19 b -13 c 12 d 26

8 a $100 - \frac{b}{3} = 60$ b \$120

9 a $x = 15$

b Yes

c i $q = 130$ ii $q = 130$

d Keeps numbers smaller, so can be done without calculator.

e i $p = 28$ ii $q = -81$ iii $p = -77$ iv $r = 34$

10 a $x = 6$ b $x = 3$ c $x = 1$ d $x = 2$

e $x = 8$ f $x = -5$

11 a $x = \frac{57}{4}$ b $x = \frac{22}{3}$ c $x = \frac{80}{3}$ d $x = \frac{2}{3}$

12 a $x = 24$ b $x = 60$ c $x = 12$ d $x = 24$

e $x = 15$ f $x = 42$

Exercise 7D

1 a true b false c false d true

2 a $3x + 3$ b 5 c $5p + 9 = 5$

d $22k + 12 = 13$

3 B

4 a $f = 5$ b $y = 3$ c $s = 3$ d $j = 2$

e $t = -2$ f $n = -5$ g $y = -5$ h $t = -4$

i $q = -3$

5 a $t = -2$ b $c = 2$ c $t = 5$ d $z = 3$

e $t = 3$ f $q = -2$ g $x = 9$ h $w = 9$

i $j = -5$

6 a $a = 3$ b $g = 2$ c $n = -2$ d $u = 7$

e $h = -5$ f $j = -5$ g $c = 1$ h $n = -1$

i $a = -4$ j $v = -7$ k $c = -3$ l $t = 3$

m $n = 4$ n $n = -3$ o $l = 2$

7 a $x = \frac{11}{2}$ b $k = \frac{2}{3}$ c $m = \frac{-3}{2}$

d $j = \frac{5}{2}$ e $j = \frac{-1}{2}$ f $z = \frac{11}{2}$

8 a $2x + 3 = 3x + 1$ so $x = 2$

b $z + 9 = 2z$ so $z = 9$ c $7y = y + 12$ so $y = 2$

d $n + 10 = 3n - 6$ so $n = 8$

9 a $x = 6$ and $y = 10$ b $x = 4$ and $y = 7$

10 Area = 700 units², Perimeter = 110 units

11 a $4p + 1.5 = 2p + 4.9$ b \$1.70 c 11

12 a $x = 5$ b $x = 5$

c Variable appears on RHS if subtract $3x$.

13 $x = 8, y = 6$, so length = width = 29.

14 a No solutions.

b Subtract $2x$, then $3 = 7$ (impossible).

c $5x + 23 = 5x + 10$. Other answers are possible.

15 a $x = 20$ b $x = 17, y = 51, z = 10$

c $k = 12$ d $b = 10, a = 50$

e $a = 60, b = 30, c = 20$ f $x = 3.5$

Exercise 7E

1 a 12 b 14 c 8, 10 d 50, 30

2 a C b A c D d B

3 a

x	0	1	2
$4(x + 3)$	12	16	20
$4x + 12$	12	16	20
$4x + 3$	3	7	11

b $4x + 12$

4 a $7x$ b $9p + 3$ c $6x + 4$ d $7k + 4$

e $x + 6$ f $5k + 21$

- 5 a $u = 6$ b $j = 3$ c $p = 6$ d $m = 4$
 e $n = 5$ f $a = 3$
- 6 a $p = -2$ b $u = -3$ c $v = -5$ d $r = -4$
 e $b = -7$ f $d = 3$
- 7 a $y = 3$ b $l = 2$ c $w = 2$ d $c = 2$
 e $d = 2$ f $w = 6$ g $p = 4$ h $k = 2$
 i $c = 10$
- 8 a $x = 7$ b $r = 5$ c $f = 3$ d $p = 2$
 e $h = 4$ f $r = 5$ g $r = 5$ h $p = 6$
 i $a = 5$
- 9 a $r = 7$ b $l = 2$ c $x = 7$ d $s = 8$
 e $y = 7$ f $h = 3$
- 10 a $d + 4$ b $2(d + 4)$ c $2(d + 4) = 50$
 d 21
- 11 a $5w + 3(w + 4)$ b \$11.50
- 12 a $2(k - 5) = 3(k - 10)$ b 20
- 13 a 3.5 b 80
- 14 The equation is $2(x + 3) = 4x - 11$, which would mean 8.5 people next door.
- 15 Equation $3(x - 5) = 9(x + 1)$ has solution $x = -4$.
 He cannot be -4 years old.
- 16 a $2n + 6 = 2n + 3$ implies $6 = 3$.
 b $8x + 12 = 8x + 3$ implies $12 = 3$, but if $x = 0$ then $4(2x + 3) = 4x + 12$ is true.
- 17 a $x = \frac{3}{2}$ b $p = \frac{36}{5}$ c $n = -\frac{81}{10}$
 d $q = 0$ e $x = \frac{8}{5}$ f $m = \frac{1}{4}$

Exercise 7F

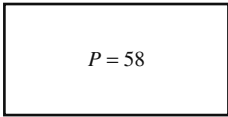
- 1 a 11 b 6 c 7 d -28
- 2 B
- 3 A
- 4 a $A = 19$ b $A = 51$ c $A = -1$ d $A = 33$
- 5 a $a = 5$ b $a = 11$ c $a = -2$
- 6 a $y = 10$ b $x = 6$ c $x = -2$
- 7 $m = 5.5$
- 8 a $y = 4$ b $y = 8$ c $x = 4.5$ d $x = 6$
- 9 a $G = 43$ b $a = 9$
- 10 a \$23
 b i $161 = 3 + 2d$ ii $d = 79$ iii 79 km
- 11 a $F = 50$ b $C = 35$ c 37.8°C
- 12 a $A = 60$ b $h = 4$ c 11
- 13 a $T = \frac{V}{2} + 5$. Other answers are possible.
 b 44 mL if using rule above. Other answers are possible.
 c $\frac{(10 - 10)^2}{20} + 10 = 10$ and $\frac{(20 - 10)^2}{20} + 10 = 15$
- 14 a 92 b 24
- 15 A and C

- 16 a $-40^\circ\text{C} = -40^\circ\text{F}$
 b $160^\circ\text{C} = 320^\circ\text{F}$
 c $1.8x = 1.8x + 32$ implies $0 = 32$
- 17 a A charges \$14.80, B charges \$16.20.
 b 45 minutes
 c 2 minutes per call
 d $t = 50$ and $c = 40$. Other answers are possible.
 e 40 minutes

Progress quiz

- 1 a T b F c T
- 2 a $k = 16$ b $c = 13$ c $m = 8$ d $t = 5$
- 3 a $2n + 5 = 17$ b $a + 26 = 3a$
- 4 a $a = 7$ b $k = -3$ c $h = -7$ d $y = 8$
 e $u = 12$ f $j = 7$ g $d = 5$ h $m = -8$
- 5 a $u = 40$ b $h = 14$ c $x = 9$ d $w = 4$
- 6 a $n = 7$ b $w = -2$ c $e = -9$
- 7 a $a = 5$ b $w = 11$ c $q = 5$ d $p = -4$
- 8 a $l = 10$ cm b $b = 16$ cm
- 9 a $-6q = 30$; $q = 5$ b $\frac{2m}{3} = 12$; $m = 18$
 c $\frac{3k + 4}{2} = -13$; $k = -10$
 d $\frac{3x + 10}{2} = 14$; $x = 6$
- 10 $5(m - 8) = 3(m + 2)$; $m = 23$
- 11 $h = 12$ cm

Exercise 7G

- 1 a D b A c E d C e B
- 2 a B b C c A d D
- 3 a $p = 6$ b $x = 9$ c $k = 4$ d $a = 3$
- 4 a Let c = cost of one cup. b $4c = 13.2$
 c $c = 3.3$ d \$3.30
- 5 a Let c = cost of one chair.
 b $6c + 1740 = 3000$ c $c = 210$ d \$210
- 6 a $2(4 + w) = 72$ or $8 + 2w = 72$ b $w = 32$
 c 32 cm
- 7 a Let t = time spent (hours).
 b $70 + 52t = 252$ c $t = 3.5$ d 210 minutes
- 8 2
- 9 a $4w = 26$, $w = 6.5$ b 42.25 cm^2
- 10 Alison is 18.
- 11 $x = 65$, $y = 115$
- 12 a 118 b 119 c 12 688
- 13 a 
 b 12 m
 c 204 m^2

14 a 50 b -6 c $x = 2R - 10$

15 a A, B and E

b A, B and D

c Impossible to have 0.8 people in a room but can have 8 mm insect.

d The temperature this morning increased by 10°C and it is now 8°C . Other answers are possible.

16 a 17 b -8 c $\frac{2}{7}$ d $\frac{4}{3}$

e 25

Exercise 7H

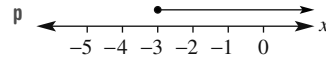
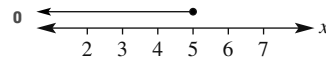
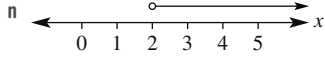
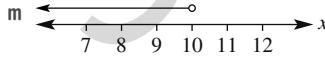
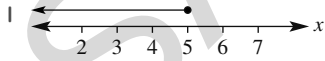
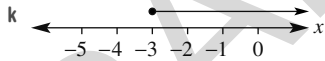
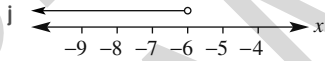
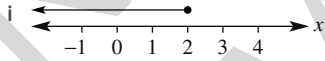
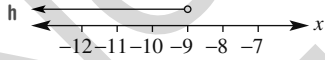
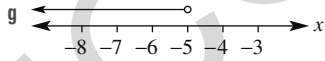
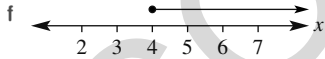
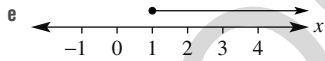
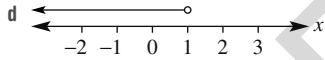
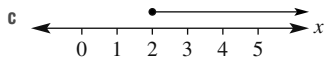
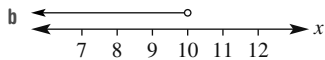
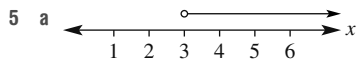
1 a true b false c true d false

e true f true

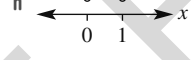
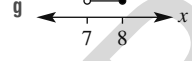
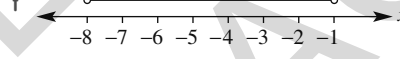
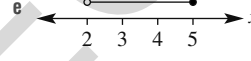
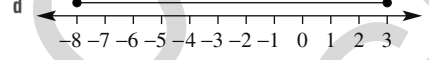
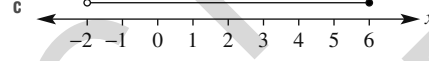
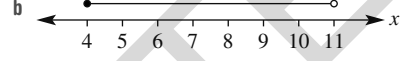
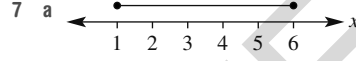
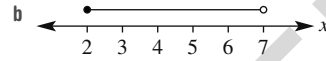
2 a D b A c B d C

3 a true b false c false d true

4 a true b false c false d true

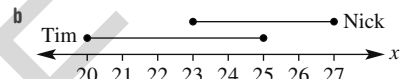


6 a 3, 4, 6, 4.5, 5, 2.1, 6.8, 2

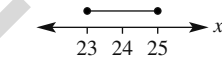


8 a C b A c G d F

9 a $20 \leq t \leq 25$ and $23 \leq n \leq 27$



c They are between 23 and 25 years old.



10 a i E ii B iii A iv B

v D

b $73 \leq x \leq 80$

c D

d B or A

e C only

11 a If x is larger than 7 it must automatically be larger than 5.

b i $x > 5$ ii $x < 3$ iii $x > 1$ iv $x < 10$

v $3 < x < 10$ vi $7 < x \leq 10$

c i $3 < x < 5$ ii $-2 < x < 4$

iii $7 < x < 8$ iv $9 \leq x < 10$

12 a 1 b ∞ c ∞ d 0 e 0

f 1 g ∞ h 0

13 a Must be true. b Must be true.

c Not necessarily (e.g. $y = 0$). d Must be true.

e Not necessarily (e.g. $x = 3$ and $y = 5$).

f Must be true.

- 14 a 30 b 110 c 200 d 1000
e 10 f 20 g 34 h 10

Exercise 71

- 1 a true b true c false d false
2 a true b false c false d true
3 a 4 b $x < 4$
4 a 6, 3 b $x \geq 3$ c true
5 a $x > 3$ b $l \geq 3$ c $g > 5$ d $r \leq 7$
e $k > 2$ f $s < 5$ g $a > 4$ h $n \geq 5$
i $d \geq 7$ j $h < 5$ k $r \leq 2$ l $y < 4$
6 a $d > 29$ b $y \leq 10$ c $x > 11$ d $q \leq 18$
e $x > 7$ f $h < 1$ g $p \geq 2$ h $j < 5$
7 a $x > 1$ b $s \leq 2$ c $n < 5$ d $j > 10$
e $v \geq -2$ f $j \geq -5$ g $c \leq 2$ h $h \geq 0$
i $s < -3$ j $v < -2$ k $v \leq -2$ l $v > -5$
8 a C b A c B d D
9 a $4c + 20 > 25$ b $c > 1.25$ c \$1.30
10 a $6g + 4 \leq 36$ b $g \leq \frac{16}{3}$ c 5 goals
11 a $C \geq 15$ b $C \leq 20$ c $15 \leq C \leq 20$
d $47.7 \leq C \leq 57.7$
12 a $x > 4$ b $k > 3$ c $a < -2$
d $-3 < a < -2$
13 a If $5x - 2 > 0$ then $x > \frac{2}{5}$, so x is positive.
b If $2x + 6 > 0$ then $x > -3$, so $x + 5 > 2$ is positive.
c Yes, for example if $x = 4$.
d no
14 a clues B and D b $x = 8$.
15 a $x > 2$ b $a \leq -2$ c $b < -3$ d $c < -4$
16 a $x \leq 3$ b $a > -3$ c $b \leq 8$ d $c > 2$
e $k > 20$ f $g < -5$ g $a > 8$ h $k \leq 9$
i $p > 4.5$

Problems and challenges

- 1 a 13 b 7.5 c 9 years d \$44.44
e 15 f 150 units
2 a 2nd step or 3rd line (can't divide by 0)
b
$$\begin{array}{l} 28 \left(\begin{array}{l} 0 = 1 \\ 0 = 28 \end{array} \right) \times 28 \\ 22 \left(\begin{array}{l} 0 = 28 \\ 22 = 50 \end{array} \right) + 22 \end{array}$$

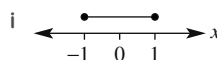
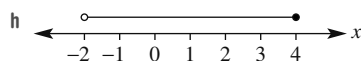
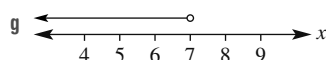
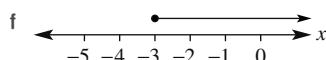
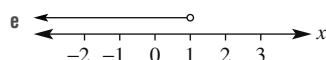
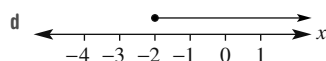
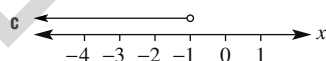
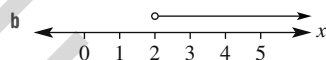
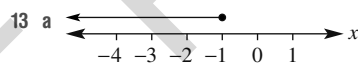
3 $6 \leq x \leq 7$
4 $2x = 2(3 + x) - 1$ or $3x + 1 = 2 + 3(x + 1)$
5 a 65 kg, 62 kg, 55 kg
b 70 kg, 60 kg, 48 kg
c 35 kg, 42 kg, 45 kg, 48 kg
6 a 188 mm
b $L = 8 + 36n$
c 195 links

Multiple-choice questions

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

Short-answer questions

- 1 a false b true c true
2 a $m = 4$ b $m = -12$ c $a = -1$
d $m = \frac{1}{5}$ e $m = 15$ f $a = 6$
3 a $2m + 3 = 3m$ b $5(n + 4) = 20$
c $x + x + 2 = 74$
4 a subtract 15 b add 5 c subtract $2a$
5 a $a = 4$ b $y = -9$ c $x = -4$ d $x = 4$
e $x = 2$ f $a = 1$
6 a $m = -6$ b $x = 8$ c $y = -18$ d $k = -58$
e $w = -2$ f $a = 43$
7 a $x = 14$ b $x = 6$ c $x = 40$
8 a $a = 8$ b $m = \frac{1}{2}$ c $x = 4$ d $a = 2$
e $x = -8$ f $x = 9$
9 a $x = 3$ b $x = -4$ c $x = -4$ d $a = 4$
e $a = -7$ f $m = 4$ g $a = -3$ h $x = 17$
i $x = 1$
10 a $I = 21$ b $M = 3$ c $c = 4$ d $x = 3, y = 2$
11 a 12 b 4 c 8.5
12 a $x \leq 4$ b $1 < x \leq 7$



- 14 a $x \geq 100\,000$ b $x \leq 6700$
c $1.54 \leq x \leq 1.9$

- 15 a $x > 2$ b $x < 8$ c $x < -4$ d $x \geq 2$
 e $x < -2$ f $x \geq 8$ g $x < -12$ h $x > 13$
 i $x \geq 2$

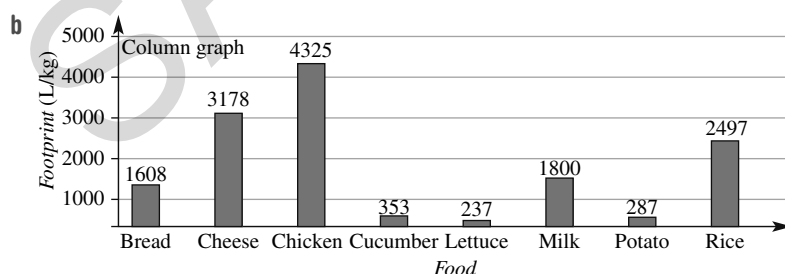
Extended-response questions

- 1 a $S = 20 + 0.12n$ b 30 times
 c $Y = 15 + 0.2n$ d 25
 e $20 + 0.12n = 15 + 0.2n$, $n = 62.5$, so 63 is the minimum number.
 2 a $18x - 180$
 b i \$35.50 ii \$41 iii \$459
 c \$25
 d \$30
 e $30 \leq x \leq 35$

Chapter 8

Exercise 8A

- 1 a 320 b 270 c 300 d Expton e Calcville
 2 a 10 b 6 c Phillip d Nyree e 4 years
 3 a 9 b handball c 24 d 8F
 e water polo
 4 a Slesha b Ross c 4 years old
 5 a rent b charity c 50% d \$2400
 6 a 2 hours b 7 hours c sleeping d $\frac{1}{6}$
 7 a 20 b periods 3 and 6 c period 7
 d periods 1 and 5
 8 a 20°C b 12°C c midday
 9 a 1.5 metres b the fourth second
 c 2 metres below surface d Answers will vary.
 10 a Survey 2 b Survey 1 c Survey 3
 11 a Town A population decreased then increased. Town B steady increase, Town C population increased then decreased.
 b i To find the total combined population in the 3 towns.
 ii To work out the average population per year (total $\div$ 10).
 Other answers are possible.
 12 Need numbers for a meaningful axis but not for labels of each sector.
 13 a Column graph – categorical data. (Sector graph is inappropriate as not measuring proportions of a whole.)

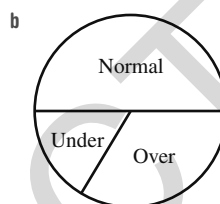


- c As water becomes scarcer it is more difficult to produce these foods.

- d Answers will vary.

	Bread	Cheese	Chicken	Cucumber	Lettuce	Milk	Potato	Rice
e Efficiency (g/L)	622	315	231	2833	4219	556	3484	400

- 14 a 2 months underweight, 6 months normal weight, 4 months overweight



- c Can see how weight changes over time.
 d Can see how much of the year the dog was underweight, overweight and normal weight.
 e Answers will vary.

Exercise 8B

- 1 a true b false c true d false
 2 a 4 b 7 c 11 d 111 1111
 3 a

	Passes	Shots at goal	Shots that go in	Steals
Frequency	3	12	8	2

- b 12 c 8 d 4

4 a

People in family	2	3	4	5	6	7	8
Tally	I	II	III	IIII	IIII	II	III
Frequency	1	2	4	4	4	2	3

b 4

- c 9

5

a

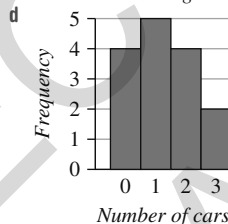
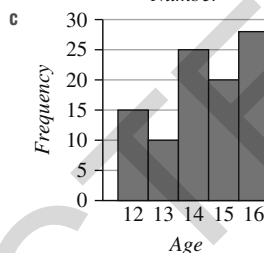
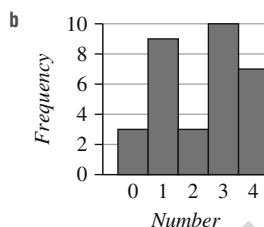
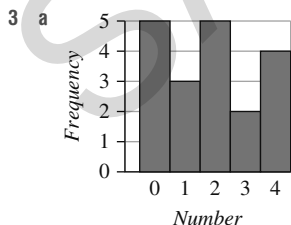
Number of hours	0–1	2–4	5–9	10–14	15–19	20–24	25–166
Tally	5	3	12	15	9	4	2

- b 50 c 9 d 8 e 35

- 6 a
- | Height (cm) | Tally | Frequency |
|-------------|-------|-----------|
| 130–139 | III | 3 |
| 140–149 | HHH | 5 |
| 150–159 | II | 2 |
| 160–169 | III | 3 |
| 170–179 | III | 3 |
| 180–189 | I | 1 |
| 190+ | IIII | 4 |
- b 2 c 5
- d 10
- 7 a 10 b 2 c 4 d 17
- 8 a B b D c A d C
- 9 a 28 b 130 c 19 d 13.1 years old
- e 14.4
- 10 a
- | Score | 0–19 | 20–39 | 40–59 | 60–79 | 80–100 |
|-----------|------|-------|-------|-------|--------|
| Frequency | 0 | 4 | 7 | 20 | 12 |
- b
- | Score | 0–29 | 30–59 | 60–89 | 90–100 |
|-----------|------|-------|-------|--------|
| Frequency | 3 | 8 | 30 | 2 |
- c It is unknown how many of the 3 people in the 20s got less than 25 and how many got more.
- d
- | Score | 0–24 | 25–49 | 50–74 | 75–100 |
|-----------|------|-------|-------|--------|
| Frequency | 2 | 4 | 20 | 17 |
- e 43
- 11 a
- | Range | 10–19 | 20–29 | 30–39 |
|-----------|-------|-------|-------|
| Frequency | 3 | 4 | 6 |
- b Many possible answers.
- c a stem-and-leaf plot
- d when individual numbers are not required but an overview is more important
- 12 a Many possible answers.
- b There are 5 possible values and it happened 6 times, so one value is repeated.
- c Even if each score was achieved twice that would only account for 10 weeks (not 11).
- d yes
- e yes
- 13 a Monday 3, Tuesday 2, Wednesday 1, Thursday 3
- b 2 hours c 12 ways d 3 ways e 6 ways
- f 30 ways

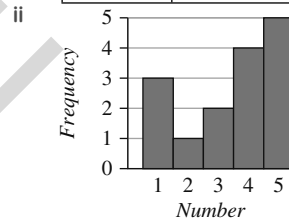
Exercise 8C

- 1 a 2 b 9 c 11 years old
- 2 a 4 b 4 c 8



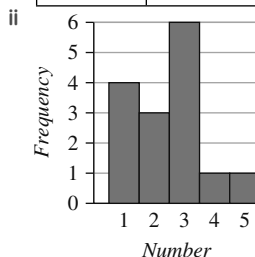
4 a i

Number	Frequency
1	3
2	1
3	2
4	4
5	5



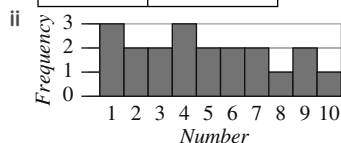
b i

Number	Frequency
1	4
2	3
3	6
4	1
5	1



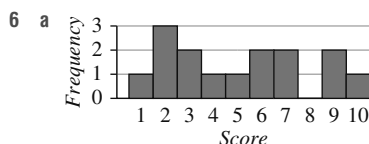
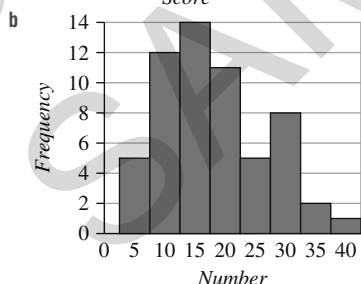
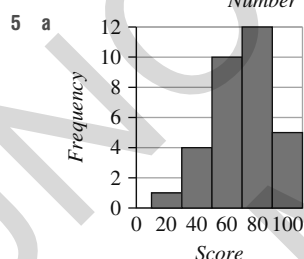
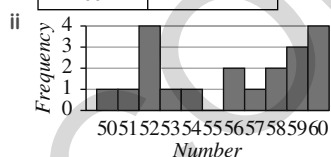
c i

Number	Frequency
1	3
2	2
3	2
4	3
5	2
6	2
7	2
8	1
9	2
10	1



d i

Number	Frequency
50	1
51	1
52	4
53	1
54	1
55	0
56	2
57	1
58	2
59	3
60	4



b Edwin is worse than Fred as most of Fred's scores are 8 or higher.

- 7 a D b A c B d C
8 a Marie b Con c Frank d Bill

9 a It would look identical but the x-axes labels would start at 22 and go to 26.

b It would look just like the right half (12–14, but labelled 0–2).

10 a No, just that she is more likely to get higher marks than lower marks

b 9 weeks of 5, then 8 weeks of 6, then 7 weeks of 7, then 4 weeks of 8, then 2 weeks of 9 out of 10

c They were absent from the test, or having a very bad day.

11 a

Survey location	Height graph (cm)	Weight graph (kg)	Age graph (years)
Primary school classroom	Graph 4	Graph 7	Graph 6
Shopping centre	Graph 8	Graph 2	Graph 9
Teachers common room	Graph 5	Graph 3	Graph 1

b Answers will vary.

Exercise 8D

- 1 a mode b mean c median
2 a 15 b 5 c 3
3 a 1, 2, 4, 5, 6, 7, 9 b 5 c 5
4 a 7 and 9 b 16 c 8
5 a i 5 ii 4 b i 2 ii 2
c i 5 ii 3 d i -3 ii 0
e i 0 ii -9 f i 0 ii 3
g i 12.9 ii 15 h i 13.1 ii 20
i i 11.1 ii 12 j i 10.4 ii 5
k i 2.4 ii -6 l i -3.4 ii -6
6 a 6 b 4 c 8 d 5 e 8
f 7 g 3 h 7
7 a 5 b 5.5 c 7.5 d 8
e 10.5 f 12
8 a 8.4 b 8 c 8
d Only the mean would change (increase)
9 a 18, 19, 20, 23, 25, 27, 31, 32, 32, 37 b 26
c 26.4 d 32
10 a white b meat-lovers c wednesday
d South Australia
11 a i 51 grams ii 50.39 grams
b shop A

- 12 a 3 b 10 c 8.8 d 9
e If one of the 7 scores become a 1. (others possible)
- 13 a 16 years old b 15.03 years old
c 15
- 14 a 16 b -3 c 5 d 7 e 9
- 15 Most frequent value makes sense for numbers or categories, but the mean requires adding (numbers) and the median requires ordering (numbers).
- 16 a 6 b It is multiplied by 3 (18).
c It is four higher (10). d It is now 44 (not 6 squared).
e It is squared.
- 17 a \$1 477 778 b \$630 000
c A strong effect — it makes the mean significantly higher.
d No effect — it is not factored in the median.
e Median is not easily distorted by a few very large values.
- 18 a 4 b 11 c 2 d 4.5
- 19 a Possible: 1, 5, 7, 7
b Impossible: median = mean for set with two items
c Impossible: must be x, x, y and then mode = median
d Possible: -5, 3, 5, 5
- 20 a Many answers possible.
b 40, 60, 80, 60, 60, 0, 20, 80
c 59, 79, 100, 79, 79, 19, 39, 100
d No
e between 50 and 69.25
f C or B
g When sorted from worst to best, she got E, D, C, B, B, B, A, A and the average of the two middle marks must be a B if they were both Bs.
h i 75 to 94.75 ii B or A

Exercise 8E

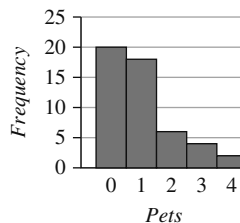
- 1 a 8 b 1 c 7
2 a 4 b 9 c 5
3 a 5 b 12 c 7
4 a lower quartile b lowest c sort (or order)
d median e odd f centre
5 a 4 b 10 c 5.5
6 a 3, 4, 5, 5, 6, 7, 8, 10 b 4.5 c 7.5 d 3
7 a 9 b 10 c 15 d 14
e 30 f 27 g 16.9 h 8.7
8 a 19 b 11 c 21 d 15 e 7
f 9.5 g 3.16 h 1.76
9 a 23 b 19 c 35 d 32
e 16.5 f 10.5 g 3.45 h 1.15
10 a 11 b 10.5 c 9 d 8
e 32 f 23 g 18 h 13
11 a 15 b 35 c Nathan d Gary
12 a 1.7 b 1.8 c Max
13 a i 9 ii 10
b i 4.5 ii 4.0

- c Sara
d Andy
- 14 a 9, 10, 11. Other answers are possible.
b 0, 10, 20. Other answers are possible.
- 15 a 0, 20. Other answers are possible.
b -9, 11. Other answers are possible.
- 16 a i 8 ii 4
b i 98 ii 4
c A single outlier does not affect the IQR but the range is greatly affected.
- 17 a 10
b 4
c No, the range is the largest difference between two numbers.
d Yes, for instance, for a set like 2, 2, 2, 6, 6, 6.
- 18 a no effect b range is doubled
- 19 The lower quartile is the number above the bottom quarter of values and the upper quartile is the number below the top quarter of values.
- 20 a 4
b 3
c It would stay the same.
d It would stay the same.
e i It would double. ii It would double.

Exercise 8F

Some answers may vary.

- 1 a surveying 1000 randomly selected people
b surveying 10 friends
- 2 a $\frac{2}{5}$ b 2000 c 300
- 3 a symmetric b skewed c bi-modal
d skewed e symmetric
- 4 a b skewed



- c 400 d 1200
e More likely that people will have pets if near a vet clinic.
- 5 a Yes, it is required information.
b No, it is too vague or subjective.
c No, it is too vague or subjective.
d No, it addresses wealth but not income.
e No, it is irrelevant.
f Yes, it can be used to decide income.
g No, if it is not a pay day then results will be distorted.

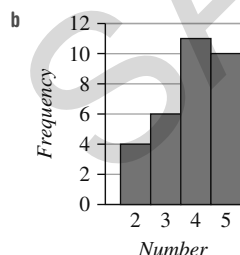
- 6 a at midday on a Thursday on a major road
b outside a political party office
c in a butcher's shop
d at 11 p.m., when people will buy just a few items
- 7 a 'How many siblings do you have?'
b-d Results will vary.
e Different samples from among the same population can yield different means.
- 8 a 108 g
b if two bars were on scales together
c symmetrical
d IQR as it is not affected by outlier
e median
- 9 a at a professional dance studio in the afternoon
b at a university physics department
c Choose a large random sample.
- 10 a Only one year level. Possibly streamed class, so similar work ethic.
b Only males would be surveyed, also same age.
c A range of students in age, gender and results.
d A more studious sample would give a higher mean.
- 11 There will be two distinct taller sections, corresponding to the most common heights for boys and girls. At a single-sex school the distribution is likely to be symmetric.
- 12 a i 75% ii 95% iii 15%
iv Between 15% and 95% of the population are in favour.
b Busy people are less likely to participate and will not be counted.
c 'Do you enjoy participating in surveys?'
d Helps correct for measurement error, caused by people answering either randomly or mistakenly.
- 13 Answers vary

Progress quiz

- 1 a April, \$5500 b \$500 c \$19500
- 2 a 180° b 50 c milk and soft drink
- 3 a i Tuesday ii Thursday iii Saturday
b 3 cm
c 25 mm

4 a

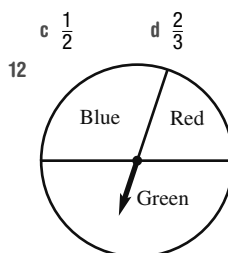
Number	2	3	4	5
Tally		I	I	
Frequency	4	6	11	10



- 6 a 3.87 (2 dec pl) b 4 c 4 d 3
e $5 - 3 = 2$
- 7 a Bias towards students who buy their lunch - less likely to eat homemade food.
b Bias towards students who spend longer on homework if only Year 12s considered.
c Bias towards adults with at least one child, excluding all childless adults.

Exercise 8G

- 1 a B b C c D d A
- 2 a Event C b Event A c Event B d Event C
- 3 a true b false c true d true
- 4 a P, I, A, N, O b $\frac{1}{5}$ c $\frac{3}{5}$
d $\frac{2}{5}$ e $\frac{4}{5}$
- 5 a 1, 2, 3, 4, 5, 6 b $\frac{1}{6}$ c $\frac{1}{2}$
d 1, 2, 3, 4, 6 e $\frac{5}{6}$ f 0
- 6 a $\frac{1}{2}$ b $\frac{1}{5}$ c $\frac{3}{10}$ d $\frac{4}{5}$
e $\frac{1}{2}$ f $\frac{7}{10}$ g choosing a purple marble
- 7 a 8 b $\frac{1}{8}$ c $\frac{1}{4}$ d $\frac{3}{8}$
e green, green, red, yellow, purple f $\frac{5}{8}$
g $\frac{3}{4}$ h spinning purple (or spinning yellow)
i spinning orange
- 8 a 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 b $\frac{1}{10}$
c $\frac{1}{5}$ d $\frac{3}{10}$ e $\frac{1}{2}$ f $\frac{3}{5}$
- 9 a $\frac{1}{3}$ b $\frac{5}{6}$ c $\frac{1}{3}$ d $\frac{5}{6}$
- 10 a 0.7 b 0.25 c 0.45 d 20
- 11 a 1 red, 2 orange, 3 purple b $\frac{1}{6}$



- 13 a $\frac{1}{5}$ b $\frac{1}{4}$ c 18
d It approaches $\frac{1}{2}$ or 0.5.

- 14 a 0.8
 b i 0.4 ii 0.8 iii 0.2
 c $2p$
 d $1 - 2(1 - p)$ or $2p - 1$
 e If $\Pr(\text{pass}) = 0.6$ then twice as likely to fail gives
 $\Pr(\text{other person pass}) = 0.2$, which is not the same as half of 0.6.
- 15 a 2 red, 1 blue b 2 blue, 1 green
 c 5 green d 6 blue, 1 red, 5 green e 1 green
 f 1 blue, 5 green g 6 blue, 5 green

Exercise 8H

- 1 a 10 b H2, H4, T2, T4 c $\frac{2}{5}$
 d T1, T3, T5 e $\frac{3}{10}$

- 2 a $\frac{1}{4}$ b HH, TT c $\frac{1}{2}$

3

	1	2	3	4	5	6
H	H1	H2	H3	H4	H5	H6
T	T1	T2	T3	T4	T5	T6

- b 12 c $\frac{1}{12}$ d $\frac{1}{4}$

	R	I	D	E
L	LR	LI	LD	LE
I	IR	II	ID	IE
N	NR	NI	ND	NE
E	ER	EI	ED	EE

- b 16 c $\frac{1}{16}$ d $\frac{1}{16}$ e $\frac{1}{4}$
 f $\frac{1}{4}$ g $\frac{1}{8}$

- 5 a

	R	P	B
R	RR	RP	RB
P	PR	PP	PB
G	GR	GP	GB
B	BR	BP	BB

- b $\frac{1}{12}$

- c $\frac{1}{12}$ d $\frac{1}{12}$ e $\frac{1}{6}$ f $\frac{1}{4}$

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

Sum	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

- b $\frac{1}{9}$ c $\frac{8}{9}$ d 7 e 2 and 12

	Y	W	B	B	B
W	WY	WW	WB	WB	WB
O	OY	OW	OB	OB	OB
O	OY	OW	OB	OB	OB

- b $\frac{2}{15}$ c $\frac{1}{15}$ d $\frac{2}{15}$ e $\frac{1}{5}$ f $\frac{1}{15}$

- 9 a $\frac{1}{8}$ b $\frac{1}{3}$ c $\frac{2}{3}$

10 63

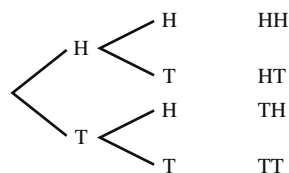
- 11 a $\frac{1}{52}$ b $\frac{1}{26}$ c $\frac{1}{16}$ d $\frac{1}{4}$ e $\frac{1}{2704}$

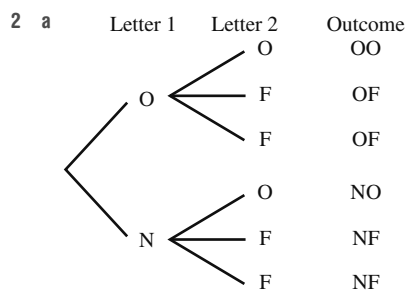
f The second card would then depend on the first card (e.g. if a red card was selected, it would be a little less likely that the next card would be red).

- 12 a i $\frac{1}{4}$ ii $\frac{1}{2}$
 b i $\frac{1}{16}$ ii $\frac{1}{4}$ iii $\frac{1}{16}$ iv $\frac{1}{8}$
 c OYBBBB (or some rearrangement of those letters)
 d i $\frac{1}{9}$ ii $\frac{7}{18}$ iii $\frac{1}{12}$ iv $\frac{1}{6}$
 v $\frac{11}{36}$ vi $\frac{3}{4}$
 e i $\frac{1}{24}$ ii $\frac{1}{8}$ iii $\frac{1}{12}$ iv $\frac{1}{4}$
 v $\frac{1}{4}$ vi $\frac{3}{4}$

Exercise 8I

- 1 a Coin 1 Coin 2 Outcome b 4

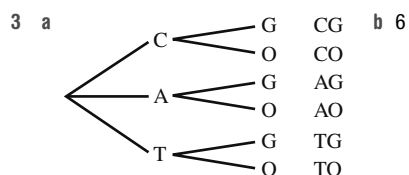




b OF, NO, NF, NF

c 6

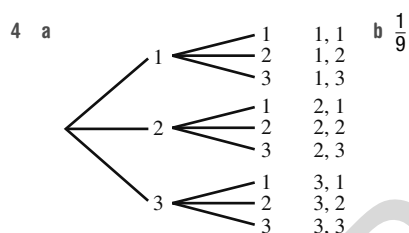
d 2



c $\frac{1}{6}$

d $\frac{1}{6}$

e $\frac{1}{3}$



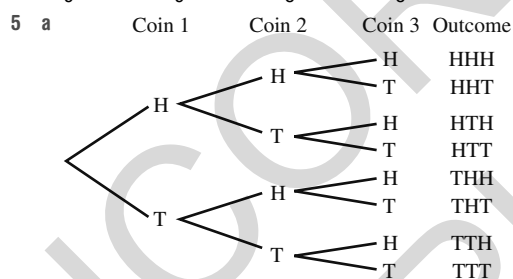
b $\frac{1}{9}$

c $\frac{1}{9}$

d $\frac{2}{9}$

e $\frac{1}{3}$

f $\frac{1}{3}$



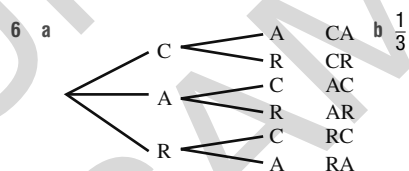
b $\frac{1}{8}$

c $\frac{7}{8}$

d $\frac{1}{8}$

e $\frac{3}{8}$

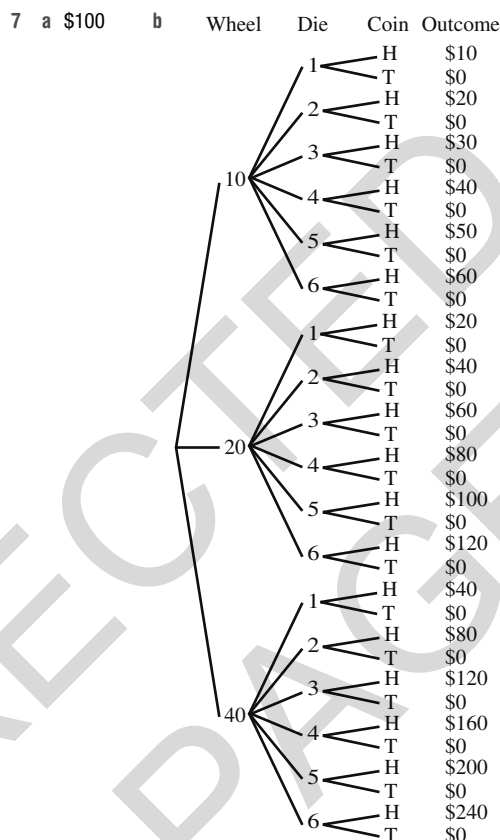
f exactly 2 g $\frac{1}{2}$



c $\frac{1}{3}$

d 0

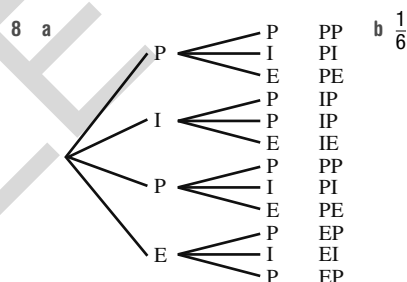
e 1



c $\frac{1}{18}$

d $\frac{1}{6}$

e $\frac{19}{36}$



c $\frac{1}{6}$

d $\frac{5}{6}$

9 32

10 a $\frac{1}{16}$

b $\frac{1}{16}$

c They are equally likely.

d 3 heads

e 3 heads could be HTHHT or HTTHH or THTHH etc. but heads must be HHHHH $\left(\frac{1}{32}\right)$.

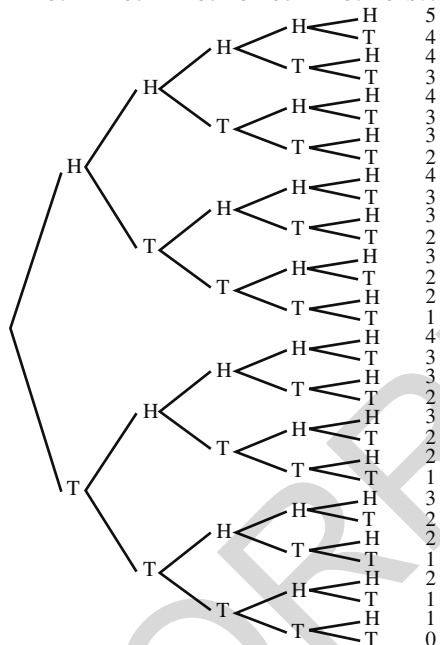
11 a There are 12 outcomes when choosing from WORM and 30 when choosing from MORROW.

b You can't select two letters that are the same.

- 12 a The first two coins are tails.
 b There are not exactly two tails.
 c The first and third coin are not both heads.
 d at least one tail
 e four heads
 f at least one head or at least one tail

- 13 a 20 b 120 c $\frac{1}{5}$ d $\frac{4}{5}$

- 14 a Coin 1 Coin 2 Coin 3 Coin 4 Coin 5 Score



- b $\frac{1}{32}$ c $\frac{1}{32}$ d $\frac{1}{2}$ e $\frac{5}{16}$

- f $\frac{319}{512}$ (approximately 0.62)

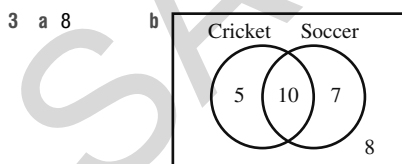
Exercise 8J

1 a

	Like bananas	Dislike bananas	Total
Like apples	30	15	45
Dislike apples	10	20	30
Total	40	35	75

- b 30 c 20 d 75

- 2 a 2 b 4 c 1 d 3



- c 15 d 22 e 12

- 4 a 15

b

	Employed	Unemployed	Total
University degree	10	3	13
No university degree	5	2	7
Total	15	5	20

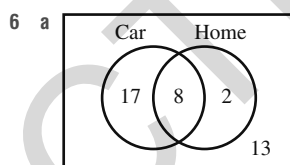
- c The 10, 13, 15 and 20 would all increase by 1.

- 5 a 26

- b 12

- c 11

- d i $\frac{2}{13}$ ii $\frac{7}{26}$ iii $\frac{7}{13}$ iv $\frac{15}{26}$



- b $\frac{1}{5}$

- c $\frac{17}{40}$ d $\frac{1}{4}$ e $\frac{8}{25}$ f $\frac{4}{5}$

- 7 a 12 b $\frac{2}{15}$ c $\frac{13}{15}$ d $\frac{4}{5}$ e $\frac{1}{8}$

8 a

	B	Not B	Total
A	20	50	70
Not A	20	10	30
Total	40	60	100

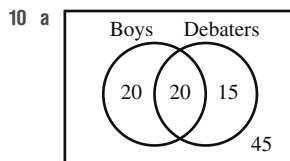
b

	B	Not B	Total
A	6	5	11
Not A	4	3	7
Total	10	8	18

9 a

	Sports	Not Sports	Total
Automatic	2	13	15
Not Automatic	8	17	25
Total	10	30	40

- b $\frac{1}{5}$ c $\frac{13}{40}$ d $\frac{2}{15}$



- b i 20% ii 15% iii 60% iv 65%

- c $\frac{4}{7}$ d $\frac{1}{4}$

- 11 a $\frac{1}{5}$ b 45 c $\frac{2}{9}$ d $\frac{1}{3}$

- 12 A inclusive or B is more likely since it also includes all the values in the middle of a Venn Diagram.

- 13 a 4

- b No, not if the 5 spots are in the last row/column.

- c Filling it requires a negative number, which is impossible.

14 a $\frac{x}{w+x+y+z}$ b $\frac{w+x}{w+x+y+z}$

c

	B	Not B	Total
A	x	w	x + w
Not A	y	z	y + z
Total	x + y	w + z	w + x + y + z

- 15 a 120
b 60
c i $\frac{59}{120}$ ii $\frac{19}{40}$ iii $\frac{1}{2}$ iv $\frac{29}{120}$
v $\frac{7}{20}$ vi $\frac{17}{60}$
d i $\frac{10}{19}$ ii $\frac{5}{19}$
e i $\frac{29}{59}$ ii $\frac{34}{59}$
f They are male, under 40 and not using a trolley.
g More likely to be female ($\frac{30}{59} > \frac{29}{59}$).
h More likely to use trolley ($\frac{30}{57} > \frac{27}{57}$).

Exercise 8K

- 1 a 2 b 0.2 c 0.6
2 a 0.19 b $\frac{1}{6}$ c experimental
3 a 0.6 b 0.1 c 0.86 d 40
4 a
- | No. of cars | 0 | 1 | 2 | 3 | 4 |
|-------------|----|----|----|---|---|
| Frequency | 12 | 37 | 41 | 8 | 2 |
- b 100 c 0.12 d 0.51
5 a 50 b yes c yes (but very unlikely)
6 a $\frac{1}{3}$ b 200 c 300
7 a i 0.35 ii 0.25 iii 0.2 iv 0.2
b 200
8 a Answers will vary. b Answers will vary.
c 10
9 a Flip 5 coins. Heads = correct answer, tails = incorrect answer. Count number of heads for score out of 5.
b Answers will vary.
10 a 3 b 2 c 14 d 3
e 19 f 8
11 a i B ii D iii A iv C
b Answers will vary.
c Answers will vary.
d Answers will vary, but should be approximately 60.
e 39
12 a Could be (Red: 1, 2, Blue: 3, 4, Green: 5, 6)
b Could be (Red: 1, 2, 3, 4 Blue: 5, Green: 6)
c Could not be; probability of $\frac{1}{5}$ cannot be achieved with single die roll.

- 13 a If all three coins show heads, then count the event as happening.
b If tails is flipped and the number 5 is rolled.
c If two 'small' numbers are rolled (counting small as 1 or 2).
d If the sum of the dice is 12.

- 14 a 0 b $\frac{3}{11}$ c $\frac{1}{16}$ d false
e true
15 a i 16 cm² ii 100 cm² iii $\frac{4}{25}$ iv 84
b i 300 ii 600 iii 100
c approximately 562.5 cm²
d 56 250 m²

Problems and challenges

- 1 5, 11, 14 2 41 3 12 4 0.25
5 a MOON b OFF c DING d PROBABILITY
e STUMBLE f TRY
6 32 7 $\frac{5}{9}$ 8 0.000977
9 1 red, 3 blue, 4 yellow

Multiple-choice questions

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

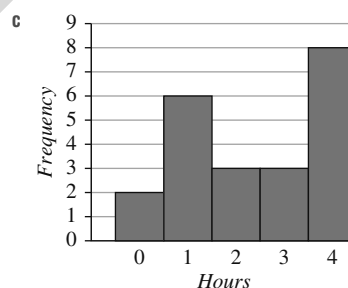
Short-answer questions

- 1 a government bus b train c 72°
d 1000
e Example: Prices went up for government buses.

- 2 a 22

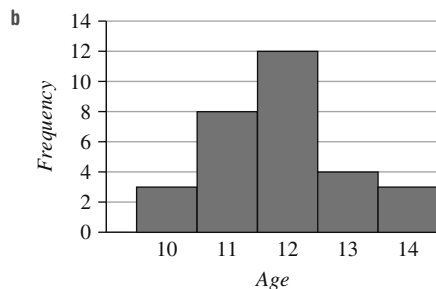
b

Hours	0	1	2	3	4
Frequency	2	6	3	3	8



- d $\frac{1}{11}$ e 2.4
3 a 38, 43, 44, 44, 52, 53, 55, 56, 59, 60, 61, 62, 63, 64, 66, 68, 69, 70, 71, 72, 74, 84
b 44
c 61.5
d 16

4 a 30



c 11.87 years d 12

5 a lowest: 50 kg, highest 85 kg

b

Weight	Frequency
50–	6
55–	6
60–	8
65–	7
70–	7
75–	1
80–85	5

c i 35 kg ii 60–64 kg

d Only teenagers were chosen, not including children or adults.

6 a i 6.5 ii 6 iii 3.5 iv 9.5
v 6

b Mean and median have increased by 1, but IQR is the same because all numbers have just increased by 1.

7 a Not enough people, and her friends might work harder (or less hard) than other students.

b She could choose 10 people who worked less hard than her.

8 a $\frac{1}{8}$ b $\frac{1}{2}$ c $\frac{1}{4}$ d 1, 4, 6, 8 e 0

9 a M, A, T, H, E, M, A, T, I, C, I, A, N b $\frac{2}{13}$

c $\frac{6}{13}$ d $\frac{7}{13}$ e $\frac{12}{13}$

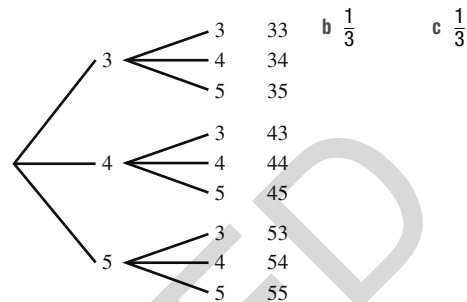
10 a

	H	T
1	H1	T1
2	H2	T2
3	H3	T3
4	H4	T4
5	H5	T5
6	H6	T6

b $\frac{1}{4}$

c $\frac{1}{12}$

11 a



d $\frac{1}{3}$

e $\frac{2}{3}$

f $\frac{1}{3}$

12 a 50

b 25

c 24%

d 1%

e $\frac{12}{25}$

f $\frac{24}{25}$

Extended-response questions

1 a

	Uses public transport	Does not use public transport	Total
Own a car	20	80	100
Do not own a car	65	35	100
Total	85	115	200

b 200

c $\frac{1}{2}$

d $\frac{1}{10}$

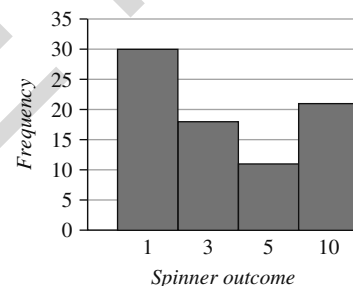
e $\frac{4}{17}$

f $\frac{1}{5}$

g i More public transport users expected.

ii People less likely to use public transport in regional area.

2 a

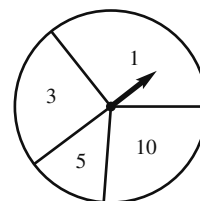


b 1, it has the most occurrences.

c 3 and 10, as they have the closest outcomes.

d $\frac{3}{8}$

e

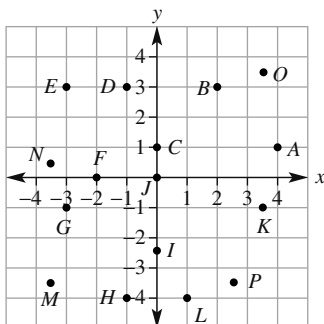


Chapter 9

Exercise 9A

- 1 a (0, 0) b y c 1st quadrant
d 3rd quadrant e -2 f -5
- 2 a 3 b -1 c -2 d 0
e -2 f 0 g -3 h 0
- 3 A(1, 1), B(5, 0), C(3, 4), D(0, 4), E(-1, 2), F(-3, 3),
G(-5, 1), H(-3, 0), I(-4, -2), J(-2, -5), K(0, -3),
L(2, -3), M(5, -5)

4

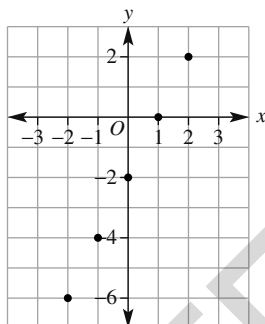


- 5 a house b fish
- 6 a B b C c E d D
- 7 a triangle b rectangle c parallelogram
d kite
- 8 a (2, 4) b (-5, 2) c (-1, -2.5)
d (4.5, -4.5)
- 9 a (1, -2), (1, -1), (1, 0), (1, 1)
b (-1, 0), (0, 0), (1, 0), (2, 0)
c (-2, 3), (-1, 2), (0, 1), (1, 0)
d (-2, -3), (-1, 0), (0, 3), (1, 6), (2, 9)
- 10 a quadrant 4 b quadrant 2
c quadrants 2 and 3 d quadrants 3 and 4
- 11 a line on the y-axis
- 12 a 10 b 4 c 7 d 11 e 6
f 4
- 13 a 5 b 13 c 25 d $\sqrt{13}$
e $\sqrt{90}$ f $\sqrt{61}$

Exercise 9B

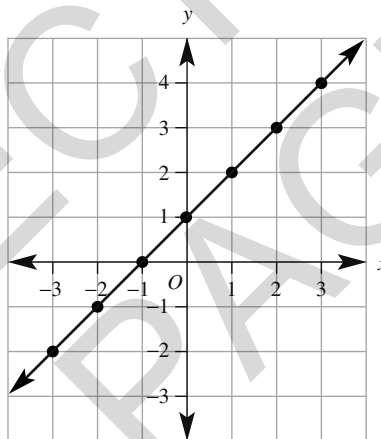
- 1 a 5 b 7 c 3 d 1
e -7 f -11 g 25 h -21
- 2 a 2 b -2 c -13

3



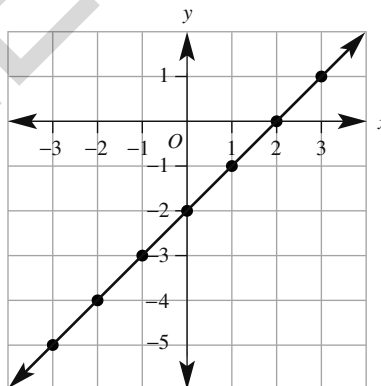
4 a

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



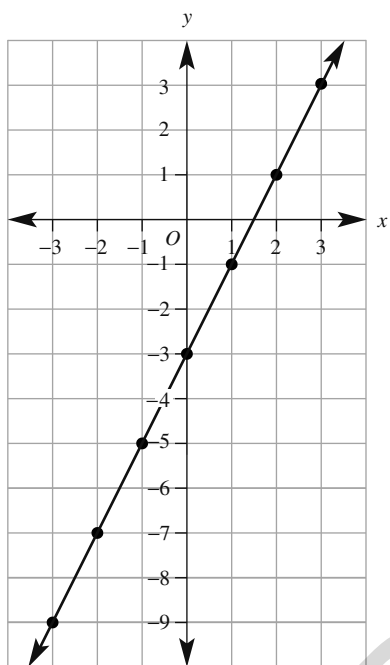
b

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



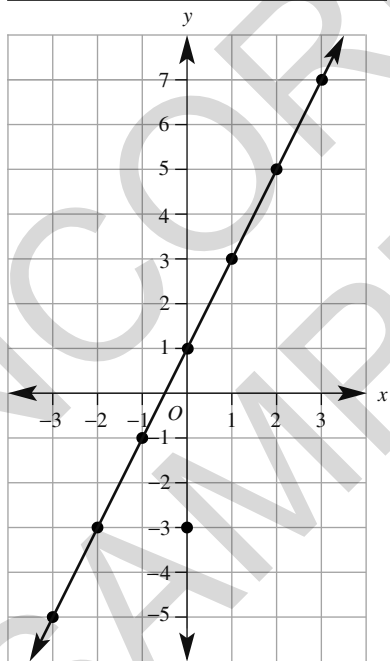
c

x	-3	-2	-1	0	1	2	3
y	-9	-7	-5	-3	-1	1	3



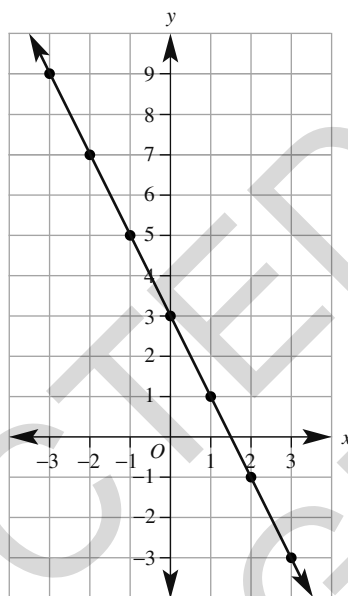
d

x	-3	-2	-1	0	1	2	3
y	-5	-3	-1	1	3	5	7



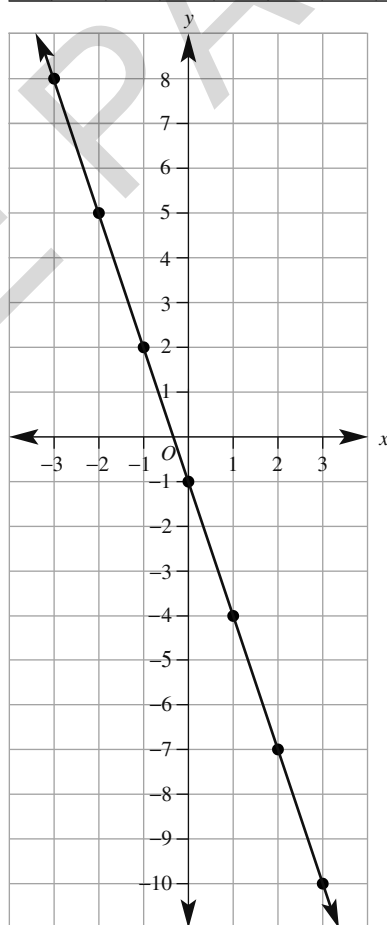
e

x	-3	-2	-1	0	1	2	3
y	9	7	5	3	1	-1	-3



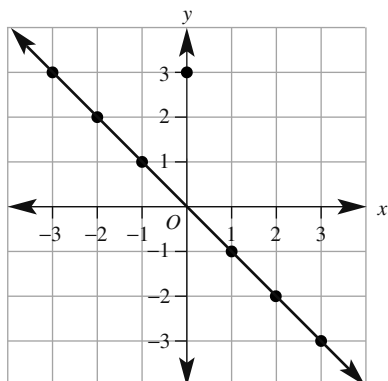
f

x	-3	-2	-1	0	1	2	3
y	8	5	2	-1	-4	-7	-10



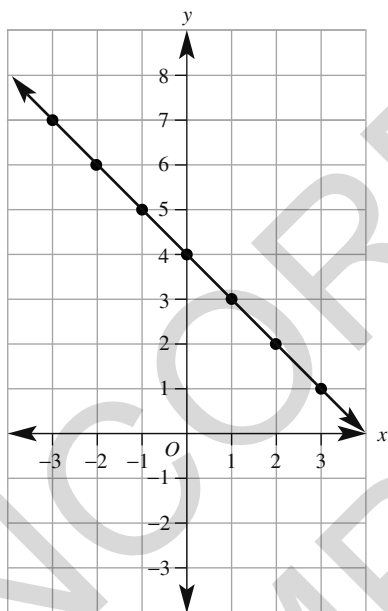
g

x	-3	-2	-1	0	1	2	3
y	3	2	1	0	-1	-2	-3



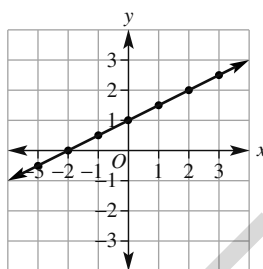
h

x	-3	-2	-1	0	1	2	3
y	7	6	5	4	3	2	1

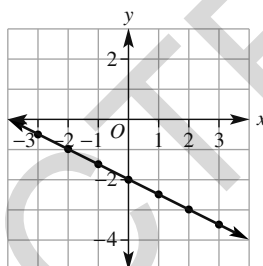


- 5 a i yes ii no
 b i no ii yes
 c i no ii no
 d i yes ii yes
 e i yes ii no
 f i yes ii yes
 g i no ii yes

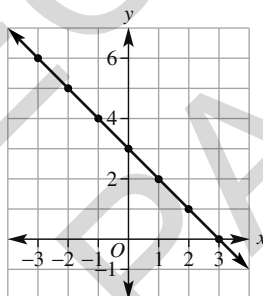
6 a



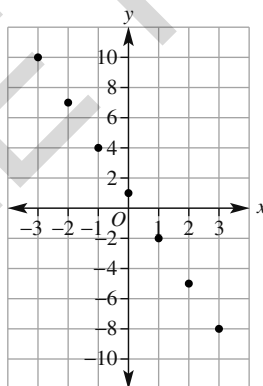
b



c

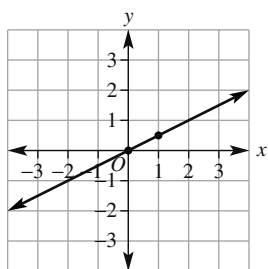


d

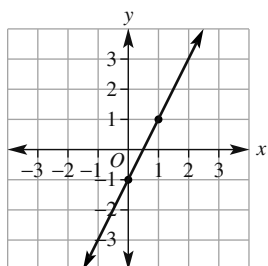


- 7 a $(-1, 0)$, $(0, 1)$ b $(2, 0)$, $(0, 2)$
 c $(-2, 0)$, $(0, 4)$ d $(2, 0)$, $(0, 10)$
 e $(1.5, 0)$, $(0, -3)$ f $(\frac{7}{3}, 0)$, $(0, 7)$
 8 $(1, 3)$
 9 a 2

b i



ii



10 a When $x = 0$, $y = 0$ for all rules.

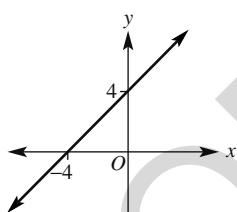
b All the rules have a constant so when $x = 0$ $y \neq 0$.

11 a The coefficient of x is positive.

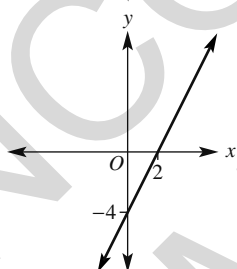
b The coefficient of x is negative.

c the coefficient of x

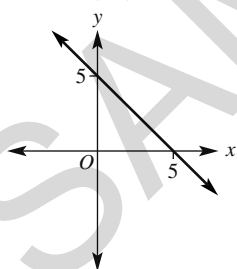
12 a



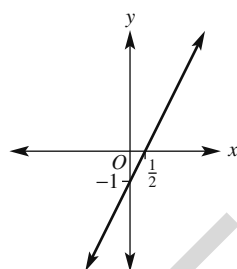
b



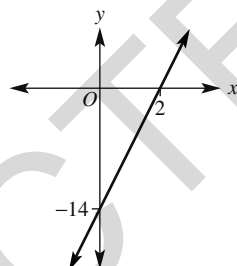
c



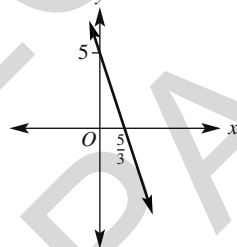
d



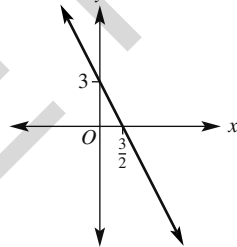
e



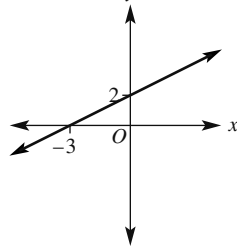
f



g



h



Exercise 9C

- | | | | | |
|------------------|-----------------|------|------|-----|
| 1 a 2 | b -1 | c 2 | d -3 | |
| 2 a 3 | b 1 | c 1 | d 0 | |
| 3 a 2 | b -2 | c -3 | d -1 | |
| e -10 | f -2 | g 0 | h 3 | i 4 |
| 4 a $y = 2x + 4$ | b $y = 3x - 1$ | | | |
| c $y = -x + 1$ | d $y = -2x + 6$ | | | |

- 5 a $y = 4x + 1$ b $y = 2x - 3$
 c $y = -2x - 2$ d $y = -x + 4$
 6 a $y = x + 1$ b $y = 2x - 2$
 c $y = -3x + 2$ d $y = -x$
 7 a $y = x + 2$ b $y = x - 4$
 c $y = 2x - 1$ d $y = -x + 1$
 8 a $y = 3x + 1$ b $y = 5x + 1$
 c $y = 2x + 4$

- 9 $y = 8x - 2$
 10 $y = -x + 1$
 11 a $y = 5 - 2x$ b $y = 7 - 3x$
 c $y = 4 - x$ d $y = 10 - 4x$

- 12 a $b - 2$ b $y = (b - 2)x + 2$

- 13 a $b - a$ b $y = (b - a)x + a$

- 14 a 5 extra matchsticks are needed for each new shape and 1 matchstick is needed for the first hexagon, so the rule is $y = 5x + 1$.

- b 2 extra matchsticks are needed for each new shape and 4 matchsticks are needed for the sides, so the rule is $y = 2x + 4$.

- 15 a x is not increasing by 1.

- b 1

- c $y = x - 2$

- d i $y = 2x + 3$

- iii $y = -2x + 3$

- ii $y = 3x - 1$

- iv $y = -4x - 20$

Exercise 9D

- 1 a positive b negative c negative d positive

- 2 a 2 b 3 c $\frac{3}{2}$ d 2

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

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

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

- 4 a positive b undefined c zero d negative

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

- f 4

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

- e -3 f $-\frac{3}{2}$

- 7 grassy slope

- 8 torpedo

- 9 a $\frac{3}{4}$ b $\frac{5}{2}$ c $-\frac{3}{2}$ d $-\frac{7}{10}$

- 10 a $\frac{5}{2}$ b $\frac{5}{3}$ c $-\frac{8}{3}$ d $-\frac{2}{3}$ e $\frac{8}{3}$

- f $-\frac{3}{10}$

- 11 Answers may vary. Examples:

- a (1, 3), (2, 6), (3, 9)

- b (-1, -3), (-2, -6), (-3, -9)

- 12 a 2 b 10 c $b = 2a$ d $a = \frac{b}{2}$

- 13 a $-\frac{1}{2}$ b $-\frac{3}{2}$ c $b = -\frac{a}{2}$ d $a = -2b$

- 14 a $\frac{2}{3}$ b $-\frac{2}{7}$ c $\frac{8}{9}$ d $\frac{4}{3}$

- e $-\frac{3}{7}$ f 4 g $-\frac{8}{9}$ h -1

- i $-\frac{2}{7}$ j $-\frac{8}{33}$ k $-\frac{18}{25}$

Exercise 9E

- 1 a $y = 2x + 3$ b $y = 4x + 2$

- c $y = -3x + 1$ d $y = -5x - 3$

- e $y = 2x - 5$ f $y = -10x - 11$

- 2 a $c = 1, m = 2$

- c $c = -1, m = -1$

- e $c = 0, m = -3$

- 3 a $m = 4, c = 2$

- c $m = \frac{1}{2}, c = 1$

- e $m = -2, c = 3$

- g $m = -7, c = -1$

- i $m = -1, c = -6$

- k $m = -\frac{2}{3}, c = -\frac{1}{2}$

- l $m = \frac{3}{7}, c = -\frac{4}{5}$

- 4 a $y = 2x - 1$

- c $y = 3x + 3$

- e $y = 2x + 1$

- 5 a $y = -x + 2$

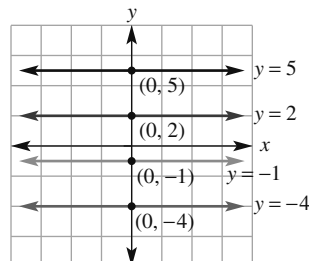
- c $y = -3x - 1$

- e $y = -5x - 2$

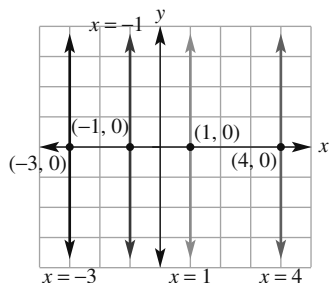
- 6 a $y = 4$ b $y = 1$

- e $x = 5$ f $x = -2$

- 7 a, b, c, d



e, f, g, h



8 a $y = \frac{2}{5}x + 2$ b $y = -\frac{1}{4}x + \frac{1}{2}$

c $y = \frac{1}{3}x - \frac{3}{4}$

9 a $y = 3x$ b $y = -5x$ c $y = -x + 3$

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

10 a $y = 2x + 3$ b $y = -\frac{1}{2}x + 5$

c $y = -x + 2$ d $y = 2x + 10$

11 a 15 square units b 40 square units

12 a It is a horizontal line passing through (0, 0).

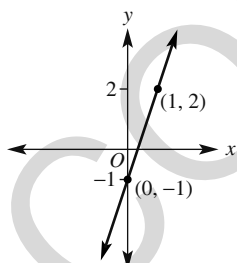
b It is a vertical line passing through (0, 0).

13 a $y = \frac{b}{a}x$ b $y = -x$ c $y = -\frac{a}{b}x + a$

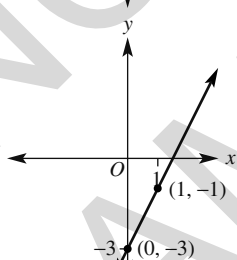
14 a $m = -3, c = 5$ b $m = 2, c = 3$

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

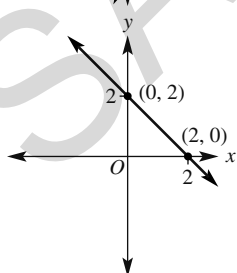
15 a



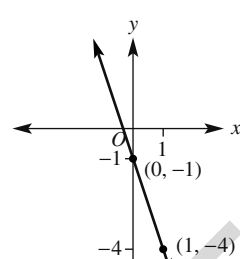
b



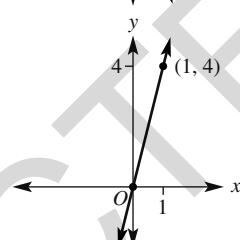
c



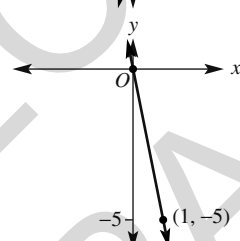
d



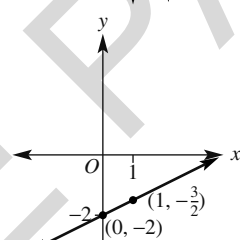
e



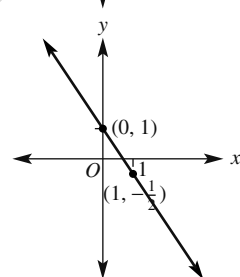
f



g



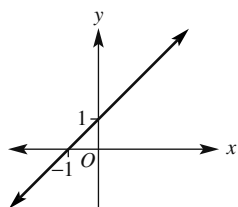
h



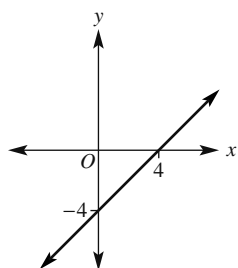
Exercise 9F

- | | | | | |
|--------|------------------|------------------|------|-----|
| 1 a 2 | b -5 | c 7 | | |
| 2 a -1 | b 4 | c -2 | d 0 | |
| 3 a 4 | b -2 | c -5 | d -5 | e 4 |
| f -7 | g $-\frac{1}{3}$ | h $-\frac{2}{5}$ | i -2 | |
| j -4 | k 2 | l 45 | | |
| 4 a 1 | b 6 | c -2 | d 4 | e 3 |
| f -2 | g -10 | h 2 | i 2 | |
| j -2 | k -7 | l 11 | | |

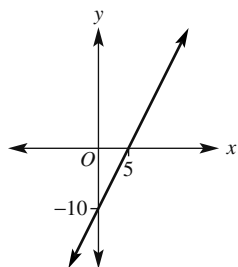
5 a



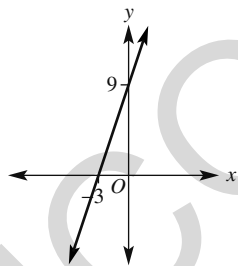
b



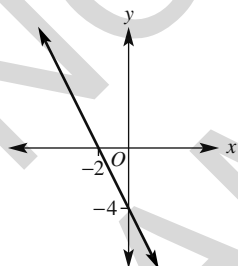
c



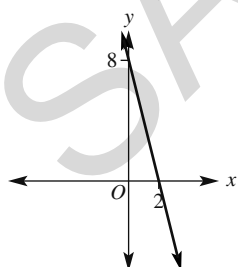
d



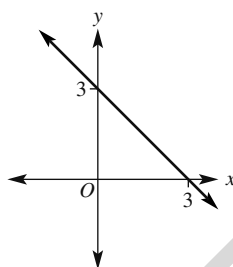
e



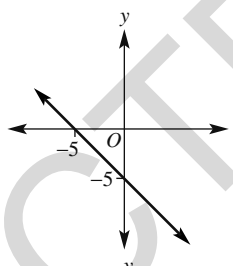
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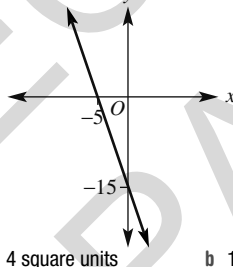
g



h



i

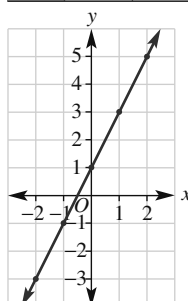


- 6 a 4 square units b 1.5 square units
c 12.5 square units d 8 square units
- 7 a $y = x + 4$ b $y = \frac{1}{2}x - 1$
c $y = 3x + 6$ d $y = -5x + 25$
- 8 a 20 cm b 10 seconds
- 9 a 200 cents b 200 seconds
- 10 horizontal lines; e.g. $y = 2$, $y = -5$
- 11 a negative b positive c negative d positive
- 12 $x = -\frac{c}{m}$
- 13 a 6 b 4 c -2 d 3
e $-\frac{2}{3}$ f $\frac{3}{2}$ g -2 h $\frac{3}{2}$ i $\frac{1}{3}$

Progress quiz

1

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



- 2 a i yes ii no
b i no ii yes

3 a $y = 3x - 1$ b $y = -2x + 2$

4 $y = -2x + 1$

x	-1	0	1	2
y	3	1	-1	-3

- 5 a undefined b positive c zero d negative

6 a 2 b 1 c $-\frac{2}{3}$

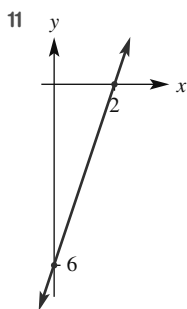
7 a $m = 3, c = 2$ b $m = \frac{2}{3}, c = -5$

c $m = -3, c = 4$ d $m = -1, c = -\frac{4}{5}$

8 a $y = x + 3$ b $y = -3x + 3$

9 a $x = 3$ b $y = -2$

10 a 3 b -4



12 $y = -2x - 5$

Exercise 9G

1

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

$$\begin{array}{l} -4 \left(\begin{array}{l} 7x + 4 = 39 \\ 7x = 35 \end{array} \right) -4 \\ 7 \left(\begin{array}{l} x = 5 \end{array} \right) \div 7 \\ -2 \left(\begin{array}{l} -2x = -10 \end{array} \right) \times -2 \\ 13 \left(\begin{array}{l} -2x + 13 = 3 \end{array} \right) +13 \end{array}$$

2 i $x = 5$ ii $x = -1$

3 a (2, 4) b (3.2, 6.4) c (-2.3, -4.6)

d (3.5, 7) e (-7, -14) f (1000, 2000)

g (31.42, 62.84) h (-24.301, -48.602)

i $\left(\frac{\text{any number}}{2}, \text{any number} \right)$

4 a (4, 3) b (-2, -3) c (-2, 1)

5 a $x = 2$ b $x = 0.5$ c $x = 3$ d $x = -2.5$

e $x = -1.5$

6 a $x = -2.5$ b $x = 3$ c $x = -0.5$

d $x = 4$ e $x = 5$

7

$$\begin{array}{l} -4 \left(\begin{array}{l} 10k + 4 = 24 \\ 10k = 20 \end{array} \right) -4 \\ 10 \left(\begin{array}{l} k = 2 \end{array} \right) \div 10 \\ 3 \left(\begin{array}{l} 3k = 6 \end{array} \right) \times 3 \\ -1 \left(\begin{array}{l} 3k - 1 = 5 \end{array} \right) -1 \end{array}$$

8 a $x = 3.67$ b $x = -1.53$ c $x = 5.30$

9 a (4.78, 1.78) b (-1.33, 3.41)

10 a $x + 2 = 1$ and $5 - 2x = 7$

b Any point that lies on the line is correct, e.g. (-2, 9) (0, 5) (1, 3) (2, 1)

c Any point that lies on the line is correct, e.g. (-2, 0) (0, 2) (1, 3) (3, 5)

d (1, 3)

$y = x + 2$ $y = 5 - 2x$

$3 = 1 + 2$ $3 = 5 - 2 \times 1$

$3 = 3$ True $3 = 3$ True

e $x = 1$

- 11 a $A = 10 + 8n$ applies to Ruby as she has \$10 to start with and adds to her savings by \$8 times the number (n) of hours worked. $A = 24 + 6n$ applies to Jayden as he has \$24 to start with and increases his savings by \$6 times the number (n) of hours worked.

b i $n = 4$ ii $n = 4$ iii $n = 7$ iv $n = 7$

v $n = 11$ vi $n = 11$

c Many solutions e.g. (2, 26) (4, 42) (7, 66) (9, 82) (11, 98)

d Many solutions e.g. (2, 36) (4, 48) (7, 66) (9, 78) (11, 90)

e (7, 66) (7, 66)

$A = 10 + 8n$ $A = 24 + 6n$

$66 = 10 + 8 \times 7$ $66 = 24 + 6 \times 7$

$66 = 10 + 56$ $66 = 24 + 42$

$66 = 66$ True $66 = 66$ True

f $n = 7$

g Ruby and Jayden have both worked 7 hours and both have \$66 saved.

12 a

Time in seconds	0	1	2	3	4	5	6	7	8	9	10
Max's distance in metres	0	6	12	18	24	30	36	42	48	54	60
Jessica's distance in metres	10	14	18	22	26	30	34	38	42	46	50

b $28 \left(\begin{array}{l} 0 = 1 \\ 0 = 28 \end{array} \right) \times 28$

$22 \left(\begin{array}{l} 22 = 50 \end{array} \right) + 22$

c $d = 6t$

d i $6t = 18$ ii $6t = 30$ iii $6t = 48$

e $d = 10 + 4t$

f i $10 + 4t = 22$ ii $10 + 4t = 30$

iii $10 + 4t = 42$

g $(5, 30) (5, 30)$

$d = 6t \quad d = 10 + 4t$

$30 = 6 \times 5 \quad 30 = 10 + 4 \times 5$

$30 = 30$ True $30 = 30$ True

h Max catches up to Jessica. They are both 30 m from the starting line and have each run for 5 seconds.

13 a $2x - 3 = -12, x = -4.5$

b $2x - 3 = 2, x = 2.5$

c $2x - 3 = 6, x = 4.5$

d $2x - 3 = 5, x = 4$

e $2x - 3 = 9, x = 6$

f $2x - 3 = -6, x = -1.5$

14 a i $(-2, 17) (-1, 14) (0, 11) (1, 8) (2, 5) (3, 2)$

$(4, -1) (5, -4)$

ii $(-2, -3), (-1, -1) (0, 1) (1, 3) (2, 5) (3, 7)$

$(4, 9) (5, 11)$

b $(2, 5) \quad y = 11 - 3x \quad y = 2x + 1$

$5 = 11 - 3 \times 2 \quad 5 = 2 \times 2 + 1$

$5 = 11 - 6 \quad 5 = 4 + 1$

$5 = 5$ True $5 = 5$ True

c It is the only shared point.

15 a i Any answer with y a whole number is correct:

$2x - 1 = -3, 2x - 1 = -1, 2x - 1 = 3$

ii No. Many possible correct examples,

e.g. $2x - 1 = 2.5, 2x - 1 = -1.75, 2x - 1 = 2.8$

b i Any answers with y -value to one decimal place are

correct, e.g. $2x - 1 = -2.6, 2x - 1 = -1.8, 2x - 1 = 0.7$

ii No. Many possible correct answers,

e.g. $2x - 1 = 0.42, 2x - 1 = -1.68, 2x - 1 = 2.88$

c i $2x - 1 = 2.04, 2x - 1 = 2.06$

ii Many possible correct answers, e.g. $(1.521, 2.042)$

$(1.529, 2.058); 2x - 1 = 2.042, 2x - 1 = 2.058$

iii Yes, for every two points on a line another point can be found in the between them so there are an infinite number of points on a line. Also an infinite number of equations can be solved from the points on a straight line if the graph has a suitable scale (digitally possible).

16 a i $x = 2, x = -2$ ii $x = 3, x = -3$

iii $x = 4, x = -4$ iv $x = 5, x = -5$

b For each y -coordinate there are two different points so two different solutions.

c i $x = 2.24, x = -2.24$ ii $x = 2.61, x = -2.61$

iii $x = 0.7, x = -0.7$ iv $x = 3.57, x = -3.57$

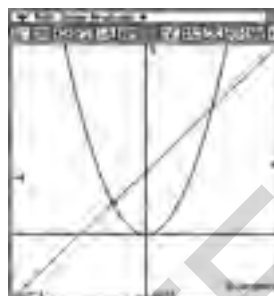
v $x = 4.34, x = -4.34$

d The graph of $y = x^2$ does not include a point where $y = -9$.

e Many correct answers all with x^2 equal to a negative number, e.g. $x^2 = -5, x^2 = -10, x^2 = -20$

f Positive numbers or zero.

g $x = -1, x = 2$



h i $x = -2.77, x = 5.77$ ii $x = -8.27, x = 3.27$

iii no solution

iv $x = 3$

Exercise 9H

1 a 15 b 45 c 5 d 125

2 a $m = 3, c = 2$ b $m = -2, c = -1$

c $m = 4, c = 2$ d $m = -10, c = -3$

e $m = -20, c = 100$ f $m = 5, c = -2$

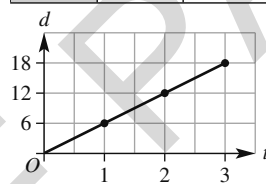
3 a 60 cm b 150 cm c 330 cm

4 a 28 L b 24 L c 10 L

5 a

t	0	1	2	3
d	0	6	12	18

b



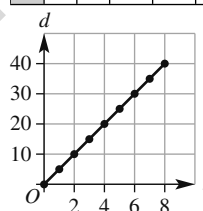
c $d = 6t$ d 9 km e 2 hours

6 a

t	0	1	2	3	4	5	6	7	8
d	0	5	10	15	20	25	30	35	40

c $d = 5t$

b

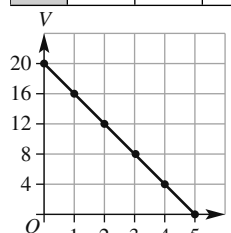


d 22.5 km e 4 hours

7 a

t	0	1	2	3	4	5
v	20	16	12	8	4	0

b

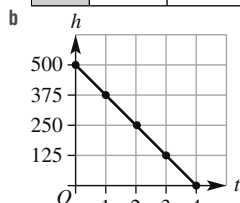


c $V = -4t + 20$

d 11.2 L e 3 seconds

8 a

t	0	1	2	3	4
h	500	375	250	125	0



c $h = -125t + 500$ d 275 m e 3 minutes

9 a $M = -0.5t + 3.5$ b 7 hours c 4.5 hours

10 a $d = 15t$

b 3 hours

c 3 hours 20 minutes

11 2 days 15 hours

12 a 2000 L

b Decreasing; it has a negative gradient.

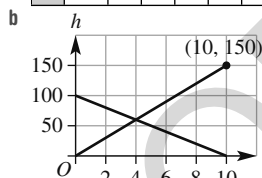
c 300 L/h

13 a Using cents, $m = \frac{1}{2}$ and $c = 10$.

b Using dollars, $m = 0.005$ and $c = 0.1$.

14 a

t	0	1	2	3	4	5	6	7	8	9	10
h_1	0	15	30	45	60	75	90	105	120	135	150
h_2	100	90	80	70	60	50	40	30	20	10	0

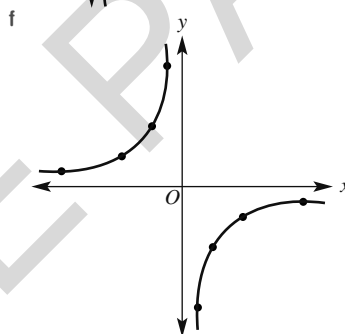
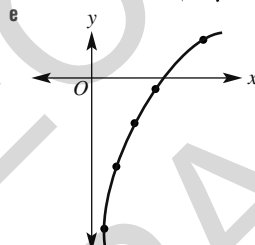
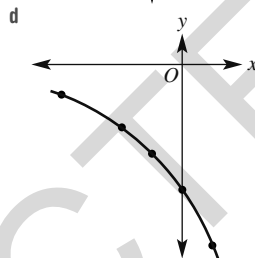
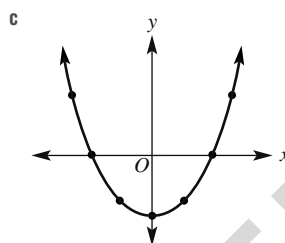
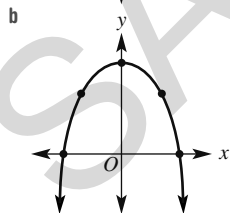
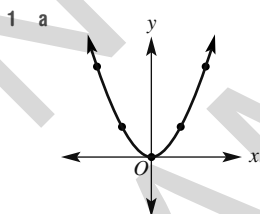


c 10 seconds d $h = 15t$, $h = -10t + 100$

e at 4 seconds f at 2.5 seconds

g at 3.5 seconds h no, 60 m, 60 m and 50 m

Exercise 9I

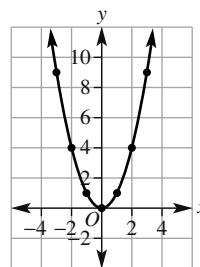


2 a -1 b 8 c 3 d 15

3 a 2 b 4 c 8 d 16

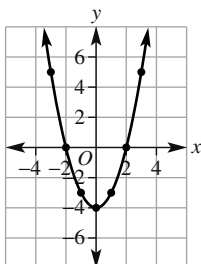
4 a $y = x^2$

x	-3	-2	-1	0	1	2	3
y	9	4	1	0	1	4	9



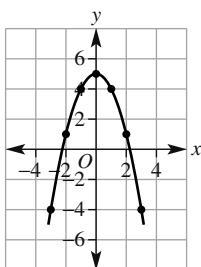
b $y = x^2 - 4$

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



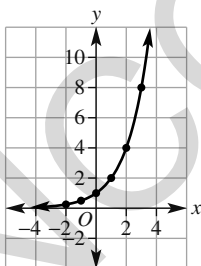
c $y = 5 - x^2$

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



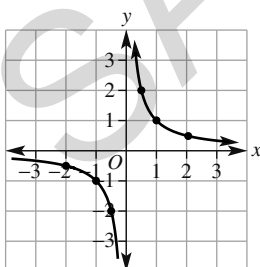
d $y = 2^x$

x	-2	-1	0	1	2	3
y	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4	8



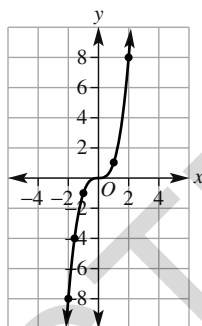
e $y = \frac{1}{x}$

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



f $y = x^3$

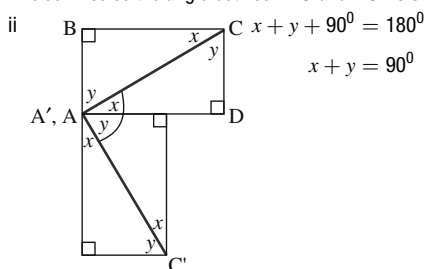
x	-2	-1	0	1	2
y	-8	-1	0	1	8



- 5 a $y = x^2 - 2$ b $y = 3 - x^2$
 c $y = x^3$ d $y = 3^x$ e $y = \sqrt{x}$ f $y = \frac{1}{x}$
 6 a 0 and 9 b -10 and -1 c -3 and 6
 d -27 and 27 e -28 and 26
 f -64 and 8
 7 a parabola b line c hyperbola d exponential
 e hyperbola f parabola g line h exponential
 8 a Upright parabolas, as a increases the graphs become narrower.
 b Inverted (upside down) parabolas, as a increases the graphs become narrower.
 c Parabolas, as a increases the graphs shift up.
 d Parabolas, as a increases the graphs shift right.

Problems and challenges

- 1 3 hours
 2 a $y = x^2 - 3$ b $y = 10 - x^2$
 c $y = \sqrt{x} + 1$ d $y = x^3 - 3$
 3 $-\frac{1}{3}$ 4 40 min 5 $\frac{14}{3}$
 6 $y = \frac{1}{2}x + \frac{1}{2}$
 7 1588
 8 4 hours 45 minutes
 9 60 units²
 10 a i Diagonal AC has been rotated about A by 90° clockwise so the angle between AC and AC' is 90° .



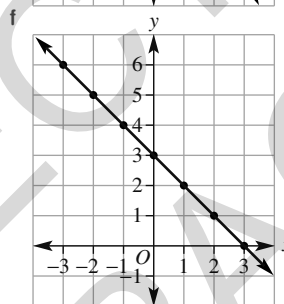
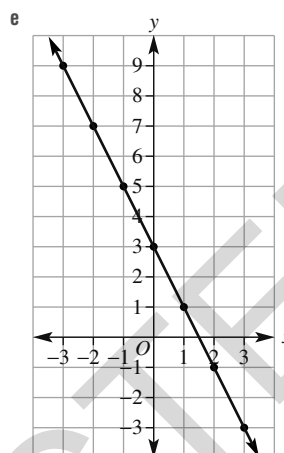
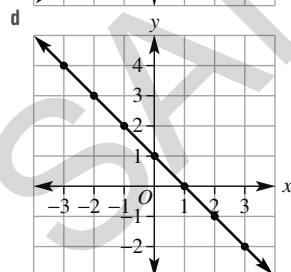
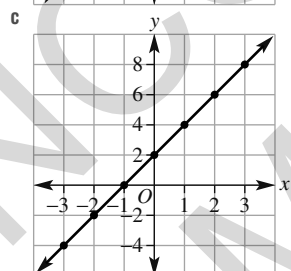
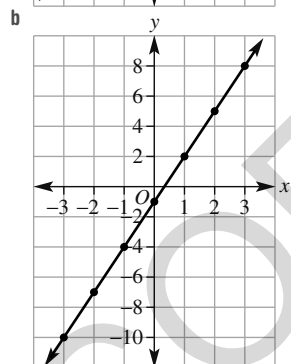
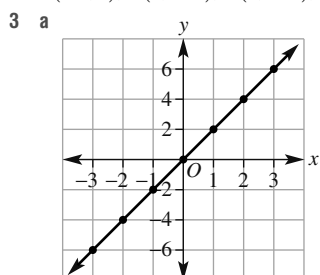
b $\frac{p}{q} \times \frac{-q}{p} = -1$

Multiple-choice questions

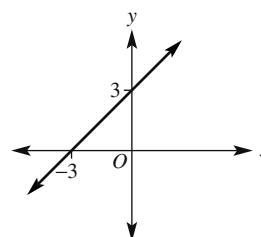
- 1 B 2 C 3 C 4 D 5 B
6 D 7 A 8 E 9 D 10 E

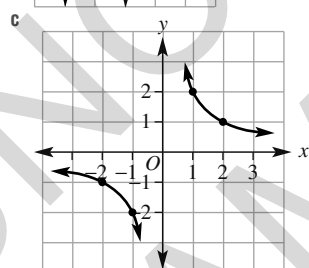
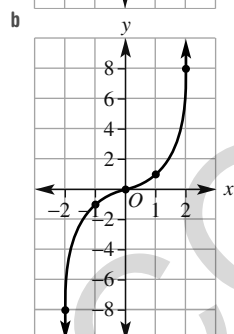
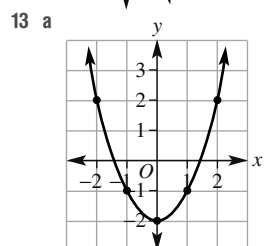
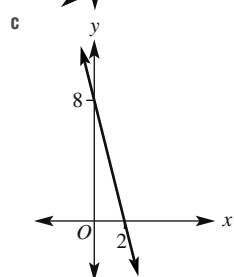
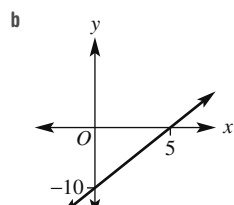
Short-answer questions

- 1 a 100 km
b 1 hour
c i 50 km ii 100 km
d section C
2 $A(2, 3), B(0, 2), C(-2, 4), D(-3, 1), E(-3, -3),$
 $F(-1, 0), G(0, -4), H(1, -2), I(4, -3), J(3, 0)$



- 4 a $y = 2x + 1$ b $y = 3x + 2$
c $y = x + 3$ d $y = -x + 1$
e $y = -4x - 1$ f $y = -x + 2$
5 a 3 b $\frac{1}{2}$ c 2 d -1
e -4 f $-\frac{3}{2}$
6 a -4 b $-\frac{1}{2}$ c 1 d -2
7 a $m = 5, c = 2$ b $m = 2, c = -4$
c $m = -3, c = 7$ d $m = -1, c = -\frac{1}{2}$
8 a $y = 2x + 1$ b $y = 3x$ c $y = x - 2$
d $y = -4x$ e $y = -2x - 4$ f $y = -\frac{1}{2}x + 1$
9 a $y = 6x$ b $y = -4x$ c $y = -x + 1$
d $y = \frac{1}{2}x - 2$
10 a $x = 6$ b $x = 4$ c $x = -4$ d $y = -5$
e $y = -1$ f $y = 5$
11 a 6 b -3 c -4 d 2
12 a



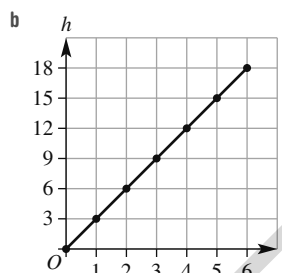


14 a 2 b -2 c $\frac{1}{2}$

Extended-response questions

1 a

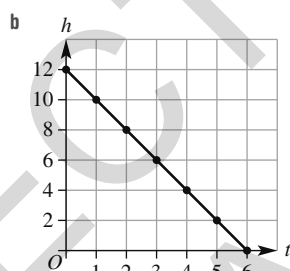
t	0	1	2	3	4	5	6
h	0	3	6	9	12	15	18



c $h = 3t$ d 10.5 mm e 30 mm f 5 days

2 a

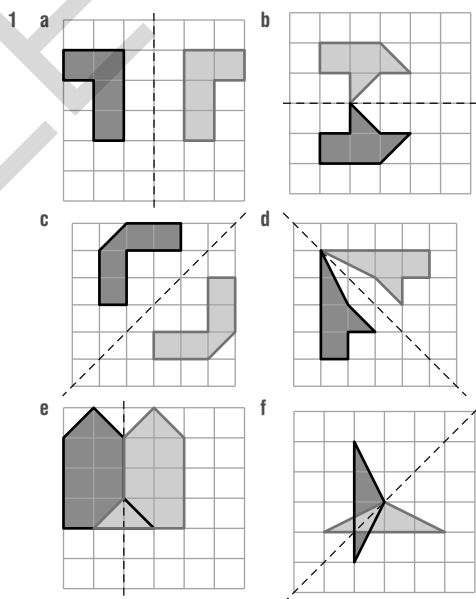
t	0	1	2	3	4	5	6
h	12	10	8	6	4	2	0

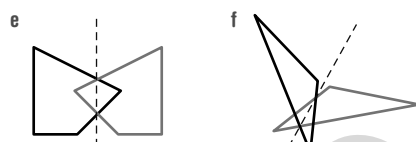
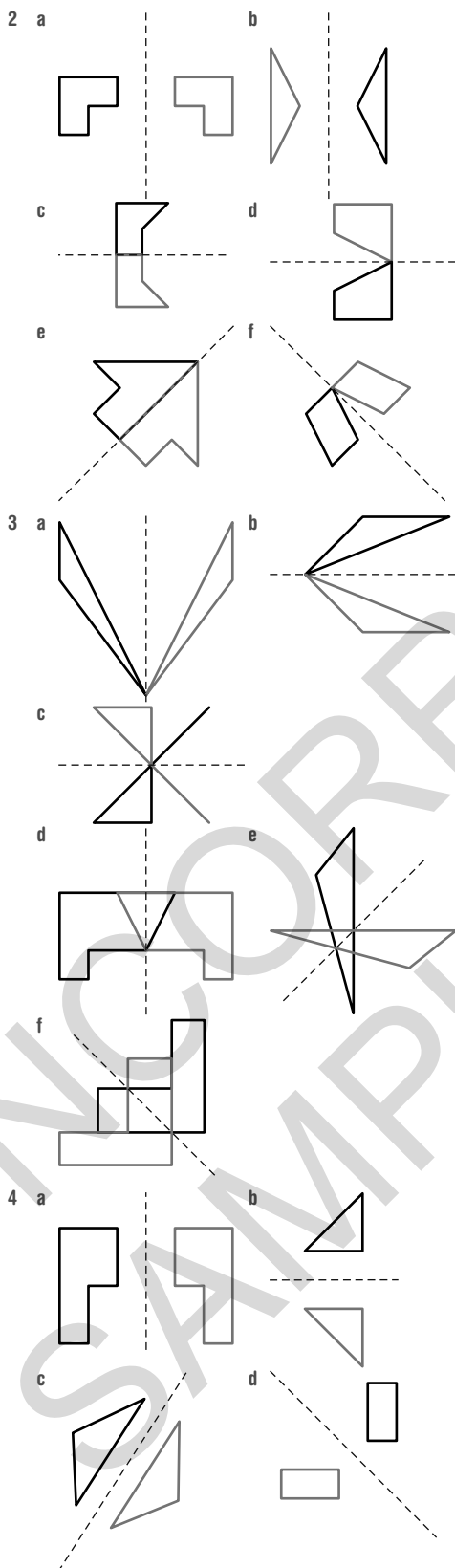


c 6 minutes d -2 e $h = -2t + 12$
f 7 km g 4 minutes 15 seconds

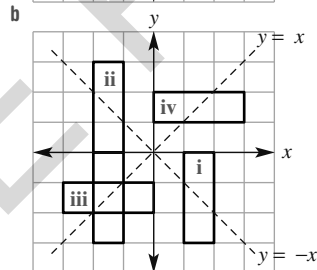
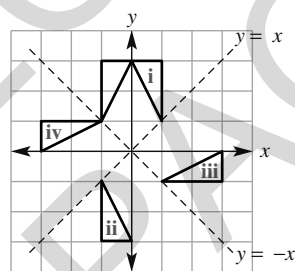
Chapter 10

Exercise 10A

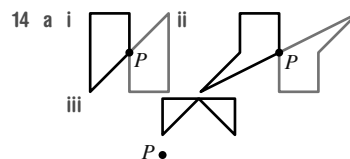




- 5 a $A'(2, 0)$, $B'(1, -3)$, $C'(4, -2)$
 b $A'(-2, 0)$, $B'(-1, 3)$, $C'(-4, 2)$
 6 a $A'(-1, 2)$, $B'(-4, 2)$, $C'(-4, 4)$, $D'(-1, 4)$
 b $A'(1, -2)$, $B'(4, -2)$, $C'(4, -4)$, $D'(1, -4)$
 7 a 4 b 2 c 2 d 1 e 0
 f 0 g 1 h 3 i 8
 8 a (0, 4) b (4, 4) c (-2, 4) d (-4, 4)
 e (-10, 4) f (-42, 4) g (2, 2) h (2, -8)
 i (2, -4) j (2, -2) k (2, -14) l (2, -78)
 9 10 m^2 , the area is unchanged after reflection.
 10 n
 11 Reflection in the y-axis.
 12 a



13 They are on the mirror line.



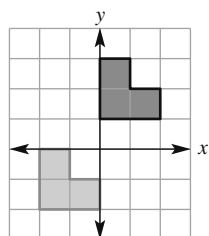
- b i yes ii no iii yes
 c square, rectangle, rhombus, parallelogram

Exercise 10B

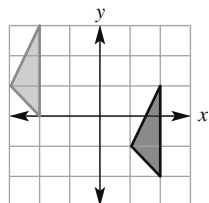
- 1 a right, up b left, up c right, down
 d left, down
 2 a (5, -2) b (-2, -6) c (-7, 4)
 d (9, 17)
 3 a horizontal b vertical c vertical d horizontal

- 4 a (1, -1) b (3, -1) c (2, -2) d (2, -4)
e (3, 7) f (-3, 5) g (2, -3) h (3, -5)
i (-20, 8) j (-9, -25)

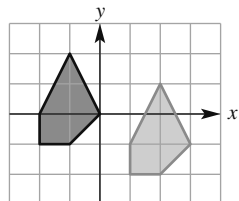
5 a



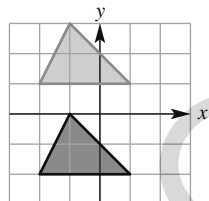
b



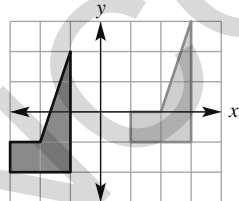
c



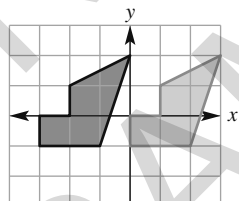
d



e



f



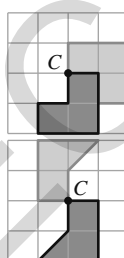
- 6 a (15, 2) b (21, -1) c (13, 6) d (9, 2)
e (11, -2) f (3, 4) g (11, -9)
h (19, -10) i (25, -4) j (-13, 13)
k (9, 17) l (-8, -39)
7 a (7, 0) b (-1, -4)
8 a 2.3 km (or 2300 m) b (2, 3)
9 a $x = -2, y = -2$ b $x = 6, y = -4$

- c $x = -3, y = 2$ d $x = 28, y = -60$
10 a (-3, 2) b (5, 0) c $(-x, -y)$
d (x, y)
11 a (-1, 0) b (1, 2) c $(c, b - c)$
12 a $x \approx 4.47$ b just OK c 80 holes

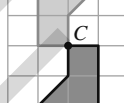
Exercise 10C

- 1 a anticlockwise, 90° b clockwise, 90°
c anticlockwise, 90° d clockwise, 90°
e anticlockwise, 180° f clockwise, 180°
2 a 270° b 180° c 302° d 64°
3 a 4 b 2 c 5 d 2
e 4 f 2

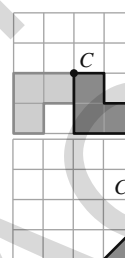
4 a



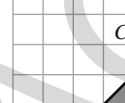
c



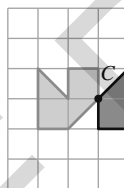
b



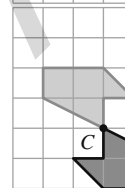
d



e



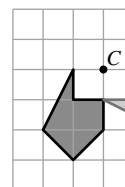
f



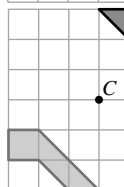
5 a



b



c

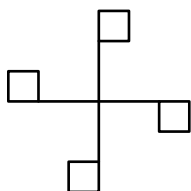


- 6 a (-4, -3) b (-4, -3) c (3, -4)
d (-3, 4) e (-3, 4)
f (3, -4) g (4, 3)
7 a $A'(4, -4), B'(4, -1), C'(1, -1)$
b $A'(4, 4), B'(1, 4), C'(1, 1)$
c $A'(-4, -4), B'(-1, -4), C'(-1, -1)$
8 a 90° b 180° c 90°
9 H, I, N, O, S, X and Z

10 Answers may vary. Examples are:

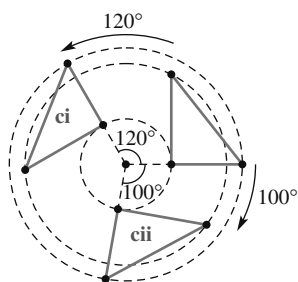
- a parallelogram b regular hexagon

c

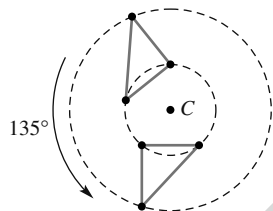


- 11 a 180° b 90°

12



13



- 14 a use $x = 70^\circ$ b use $x = 40^\circ$

Exercise 10D

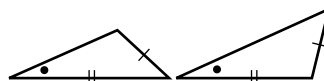
- 1 a yes
b i D ii E iii F
c i DE ii EF iii DF
d i $\angle E$ ii $\angle F$ iii $\angle D$
- 2 a yes
b i D ii E iii F
c i DE ii EF iii DF
d i $\angle E$ ii $\angle F$ iii $\angle D$
- 3 a yes
b i D ii E iii F
c i DE ii EF iii DF
d i $\angle E$ ii $\angle F$ iii $\angle D$
- 4 a i E ii H
b i EH ii GH
c i $\angle G$ ii $\angle E$
- 5 a i F ii I
b i FJ ii HI
c i $\angle H$ ii $\angle J$
- 6 (J, G), (D, K), (C, I)
- 7 a 32 b 24 c 20 d 8 e 4
- 8 (A, J), (C, K), (E, G)
- 9 a (A, E), (B, D), (C, F)
b (A, Y), (B, X), (C, W), (D, Z)

- c (A, W), (B, X), (C, Z), (D, Y)
d (A, T), (B, Z), (C, X), (D, S), (E, W)

- 10 a $\triangle AMC, \triangle BMC$
b Yes, all corresponding sides and angles will be equal.
- 11 a i $\triangle ABD, \triangle CBD$
ii Yes, all corresponding sides and angles will be equal.
b i $\triangle ABC, \triangle ACD$
ii No, sides and angles will not be equal.
- 12 yes
- 13 a reflection in the y -axis then translation by the vector $(1, -2)$
b rotation anticlockwise by 90° then translation by the vector $(6, 3)$
c rotation by 180° then translation by the vector $(-2, 1)$
d reflection in the x -axis, reflection in the y -axis and translation by the vector $(-2, 1)$
e reflection in the x -axis, reflection in the y -axis and translation by the vector $(3, 2)$
f rotation by 180° then translation by the vector $(3, 2)$

Exercise 10E

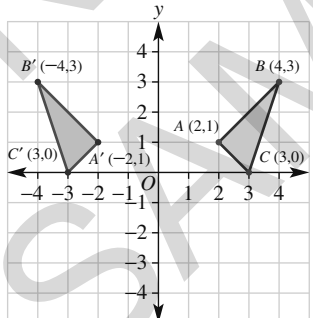
- 1 a SSS b RHS c SAS d AAS
- 2 a $\triangle ABC \equiv \triangle EFD$ b $\triangle ABC \equiv \triangle FED$
c $\triangle XYZ \equiv \triangle UST$ d $\triangle ABC \equiv \triangle ADC$
- 3 a SAS b SSS c RHS d AAS
e RHS f AAS
- 4 a $x = 4, y = 1$ b $x = 9, a = 20$
c $x = 5, a = 24$ d $x = 5, a = 30$
e $x = 4, a = 95, b = 25$
f $x = 11, a = 50, b = 90$
- 5 a no b yes, SAS c yes, AAS d no
- 6 a $EF = 3$ m b $\angle B = 30^\circ$
c $AC = 6$ cm d $\angle C = 20^\circ$
- 7 a no b yes c yes d no
- 8 Yes, show SSS using Pythagoras' theorem.
- 9 a You can draw two different triangles with SSA.

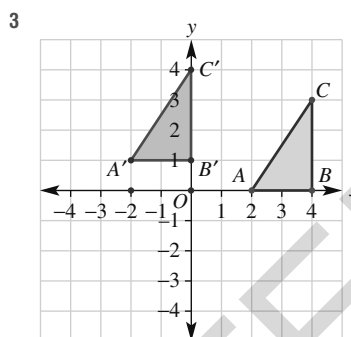


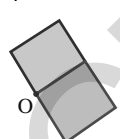
- b You can draw an infinite number of triangles with the same shape but of different size.
- 10 a $\angle CAB = \angle CED$ (equal alternate angles)
 $\angle ACB = \angle ECD$ (vertically opposite angles)
 $AC = EC$ (given equal and corresponding sides)
 $\therefore \triangle ABC \equiv \triangle EDC$ (AAS)
b $BD = BD$ (given and common equal side)
 $\angle ADB = \angle CDB$ (given and equal angles)
 $AD = CD$ (given equal sides)
 $\therefore \triangle ADB \equiv \triangle CDB$ (SAS)

- c $\angle ACB = \angle CAD$ (equal alternate angles)
 $\angle CAB = \angle ACD$ (equal alternate angles)
 $AC = AC$ (given and common equal side)
 $\therefore \triangle ABC \equiv \triangle CDA$ (AAS)
- d $\angle ABC = \angle ADC$ (given 90° angles)
 $AC = AC$ (given and common equal side)
 $BC = DC$ (given equal sides)
 $\therefore \triangle ABC \equiv \triangle ADC$ (RHS)
- 11 a $AB = AC$ (equal given equal sides)
 $BM = CM$ (equal given equal sides)
 $AM = AM$ (given and common equal side)
 $\therefore \triangle ABM \equiv \triangle ACM$ (SSS)
 $\therefore \angle AMB = \angle AMC$
As $\angle AMB + \angle AMC = 180^\circ$ then
 $\angle AMB = \angle AMC = 90^\circ$.
- b $\angle AEB = \angle CDB$ (equal alternate angles)
 $\angle EAB = \angle DCB$ (equal alternate angles)
 $EB = BD$ (given equal sides)
 $\therefore \triangle AEB \equiv \triangle CDB$ (AAS)
 $\therefore AB = BC$ and $AC = 2AB$
- c $AD = DC$ (given equal sides)
 $AB = CB$ (given equal sides)
 BD is a common side
 $\therefore \triangle ABD \equiv \triangle CBD$ (SSS)
 $\therefore \angle DAB = \angle DCB$
- d $\triangle ACD \equiv \triangle ACB$ (SSS)
so $\angle DCA = \angle BCA$
Now $\triangle DCE \equiv \triangle BCE$ (AAS)
with $\angle CDE = \angle CBE$ (isosceles triangle)
So $\angle DEC = \angle BEC$
Since $\angle DEC$ and $\angle BEC$ are supplementary (sum to 180°)
So $\angle DEC = \angle BEC = 90^\circ$
So diagonals intersect at right angles.

Progress quiz

- 1 a 
- b $A'(2, -1)$ $B'(4, -3)$ $C'(3, 0)$
- 2 a (3, 5)
b (4, -2)



- 4 4
5 
- 6 $A'(0, 2)$ $B'(0, 4)$ $C'(-3, 4)$
- 7 a SAS
b $\triangle ACB \equiv \triangle QPR$ (SAS)
c $\angle CQR$
d angle ACB
- 8 $\angle ABE = \angle CBD$ (vertically opposite)
 $AB = CB$ (given)
 $EB = DB$ (given)
 $\therefore \triangle ABE \equiv \triangle CBD$ (SAS)

Exercise 10F

- 1 (A, J), (C, K), (F, H), (I, L)
- 2 a i $\angle D$ ii $\angle E$ iii $\angle F$
b i AB ii BC iii CA
c i 2 ii 2 iii 2
d Yes, all side ratios are equal and all interior angles are equal.
- 3 a yes, 2 b yes, 2 c yes, 4 d yes, 4
- 4 a i $(AB, EF), (BC, FG), (CD, GH), (DA, HE)$
ii $(\angle A, \angle E), (\angle B, \angle F), (\angle C, \angle G), (\angle D, \angle H)$
iii 2 iv $a = 100, x = 2, y = 3$
b i $(AB, DE), (BC, EF), (CA, FD)$
ii $(\angle A, \angle D), (\angle B, \angle E), (\angle C, \angle F)$ iii 3
iv $x = 3$
c i $(AB, EF), (BC, FG), (CD, GH), (DA, HE)$
ii $(\angle A, \angle E), (\angle B, \angle F), (\angle C, \angle G), (\angle D, \angle H)$
iii 1.5 iv $a = 40, x = 4, y = 4.5$
d i $(AB, FG), (BC, GH), (CD, HI), (DE, IJ), (EA, JF)$
ii $(\angle A, \angle F), (\angle B, \angle G), (\angle C, \angle H), (\angle D, \angle I), (\angle E, \angle J)$
iii 2.5 iv $a = 115, x = 5$
- 5 a Yes, all ratios are 2.
b Yes, squares of different sizes.
c No, ratios are not equal.
d Yes, ratios are both 2.5 with equal angles.

6 360 cm 7 15 cm 8 1.25 9 3

- 10 a True, angles and side ratios will be equal.
 b False, side ratios may be different.
 c True, angles and side ratios will be equal.
 d False, side ratios may be different.
 e False, angles and side ratios may be different.
 f False, side ratios and angles may be different.
 g False, side ratios and angles may be different.
 h False, side ratios and angles may be different.
 i True, shape is always the same.

- 11 a no
 b No, they can have different shapes.

12 16

- 13 a i $\sqrt{8}$ ii 2
 b $\frac{2}{\sqrt{2}} = \sqrt{2}$ (small to big)
 c Using Pythagoras' theorem, the side length of the 2nd square is $\sqrt{\left(\frac{x^2}{2}\right) + \left(\frac{x^2}{2}\right)} = \sqrt{\frac{x^2}{2}} = \frac{x}{\sqrt{2}}$.
 So the scale factor is $x \div \frac{x}{\sqrt{2}} = x \times \frac{\sqrt{2}}{x} = \sqrt{2}$.
 d 2 (small to big)

Exercise 10G

- 1 a $\triangle ABC \sim \triangle EFD$ or use III instead of n
 b $\triangle ABC \sim \triangle FDE$
 c $\triangle ABC \sim \triangle DEF$
 d $\triangle ABC \sim \triangle DEF$ (order does not matter)
- 2 a AAA b SAS c RHS d SSS
- 3 a SSS b AAA
 $\frac{DE}{AB} = \frac{10}{5} = 2$ $\angle A = \angle D$
 $\frac{DF}{AC} = \frac{24}{12} = 2$ $\angle B = \angle E$
 $\frac{EF}{BC} = \frac{26}{13} = 2$ $\therefore \triangle ABC \sim \triangle DEF$
- c SAS d RHS
 $\frac{DE}{AB} = \frac{10}{5} = 2$ $\angle D = \angle A = 90^\circ$
 $\angle D = \angle A$ $\frac{EF}{BC} = \frac{26}{13} = 2$
 $\frac{DF}{AC} = \frac{6}{3} = 2$ $\frac{DF}{AC} = \frac{22}{11} = 2$
 $\therefore \triangle ABC \sim \triangle DEF$ $\therefore \triangle ABC \sim \triangle DEF$
- e RHS f SAS
 $\angle E = \angle B = 90^\circ$ $\frac{DE}{AB} = \frac{9}{6} = 1.5$
 $\frac{DF}{AC} = \frac{4}{1} = 4$ $\angle D = \angle A$
 $\frac{EF}{BC} = \frac{2}{0.5} = 4$ $\frac{DF}{AC} = \frac{18}{12} = 1.5$
 $\therefore \triangle ABC \sim \triangle DEF$ $\therefore \triangle ABC \sim \triangle DEF$

g AAA h SSS

$$\begin{aligned} \angle A &= \angle D \\ \angle C &= \angle F \\ \therefore \triangle ABC &\sim \triangle DEF \end{aligned} \quad \begin{aligned} \frac{DE}{AB} &= \frac{10}{4} = 2.5 \\ \frac{DF}{AC} &= \frac{15}{6} = 2.5 \\ \frac{EF}{BC} &= \frac{15}{6} = 2.5 \\ \therefore \triangle ABC &\sim \triangle DEF \end{aligned}$$

- 4 a $x = 8, y = 10$ b $x = 12, y = 6$
 c $x = 15, y = 4$ d $x = 3, y = 15$
- 5 a 2.5 b yes (SSS) c 2.5
- 6 a yes b no c no d yes
- 7 4 m
- 8 a yes (AAA) b 2.5 c 15 m
- 9 If two angles are known then the third is automatically known using the angle sum of a triangle.

- 10 a AAA
 $\angle A = \angle D$ (corresponding angles in parallel lines)
 $\angle B = \angle B$ (Common)
- b AAA
 $\angle ACB = \angle ECD$ (vertically opposite)
 $\angle E = \angle A$ (alternate angles in parallel lines)
- c AAA
 $\angle A = \angle A$ (common)
 $\angle ABC = \angle ADB$ (given)
- d SAS
 $EF = BA$ (equal sides)
 $\angle E = \angle B$ (equal interior angles in regular polygons)
 $DE = CB$ (equal sides)

11 Using Pythagoras' theorem $AC = 25$.

$$\frac{DF}{AC} = \frac{50}{25} = 2$$

$$\frac{ED}{AB} = \frac{14}{7} = 2$$

$$\therefore \triangle ABC \sim \triangle DEF \text{ (RHS)}$$

- 12 a 4 b 2.4 c $\frac{16}{3}$ d $\frac{10}{3}$

Exercise 10H

- 1 a alternate angles in parallel lines
 b alternate angles in parallel lines
 c alternate angles in parallel lines
- 2 a co-interior angles in parallel lines, $a = 110$
 b co-interior angles in parallel lines, $a = 52$
- 3 SAS, AAS and RHS
- 4 a AC b BD c DB
- 5 a AAS b RHS c SSS d SAS
- e AAS f SSS
- 6 $\angle ABE = \angle CDE$ (alternate angles in parallel lines)
 $\angle BAE = \angle DEC$ (alternate angles in parallel lines)
 $AB = CD$ (given)
 $\triangle ABE \equiv \triangle CDE$ (AAS)

$BE = DE$ and $AE = CE$ because corresponding sides on congruent triangles are equal.

- 7 $\angle EFI = \angle GHI$ (alternate angles in parallel lines)
 $\angle FEI = \angle HGI$ (alternate angles in parallel lines)
 $EF = GH$ (given)
 $\triangle EFI \equiv \triangle GHI$ (AAS)
 $EI = GI$ and $FI = HI$ because corresponding sides on congruent triangles are equal.
- 8 a equal (alternate angles in parallel lines)
b equal (alternate angles in parallel lines)
c BD d AAS e They must be equal.
- 9 a $VU = TU$, $VW = TW$, UV is common.
So $\triangle VWU \equiv \triangle TWU$ by SSS.
b $\angle VWU = \angle TWU$ and since they add to 180° they must be equal and 90° .
- 10 a SSS (3 equal sides)
b They are equal and add to 180° so each must be 90° .
c Since $\triangle QMN$ is isosceles and $\angle MQN$ is 90° then $\angle QMN = 45^\circ$.
- 11 a $AB = CB$, $AD = CD$ and BD is common.
So $\triangle ABD \equiv \triangle CBD$ by SSS.
b $\triangle ABD \equiv \triangle CBD$ so $\angle DAB = \angle DCB$
c $\triangle ABD \equiv \triangle CBD$ so $\angle ADB = \angle CDB$
- 12 Let $AD = BC = a$ and $AB = CD = b$.
Then show that both BD and AC are equal $\sqrt{a^2 + b^2}$.
- 13 $\angle ABD = \angle CDB$ (alternate angles in parallel lines)
 $\angle ADB = \angle CBD$ (alternate angles in parallel lines)
 BD is common
So $\triangle ABD \equiv \triangle CDB$
So $AB = CD$ and $AD = BC$
- 14 a $\angle DCE$ b $\angle CDE$
c There are no pairs of equal sides.
- 15 a $\triangle ACD$ is isosceles.
b $AD = CD$, $\angle DAE = \angle DCE$ and $\angle ADE = \angle CDE$ (AAS)
c $\angle AED = \angle CED$ and sum to 180° so they are both 90° .
- 16 a First show that $\triangle ABD \equiv \triangle CDE$ by SSS.
So $\angle ABD = \angle CDE$ and $\angle ADB = \angle CBD$ and since these are alternate angles the opposite sides must be parallel.
b First show that $\triangle ABE \equiv \triangle CDE$ by SAS.
So $\angle ABE = \angle CDE$ and $\angle BAE = \angle DCE$ and since these are alternate angles the opposite sides must be parallel.
c First prove that $\triangle ABD \equiv \triangle BAC$ by SSS.
Now since $\angle DAB = \angle CBA$ and they are also co-interior angles in parallel lines then they must be 90° .

Problems and challenges

- 1 3, Reason is AAA for each pair with a right angle and a common angle.
- 2 a B C D E K

b A M T U V W Y

c H I O X

2 31

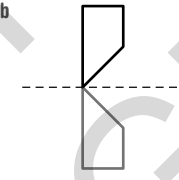
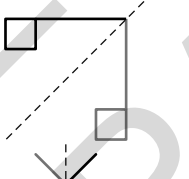
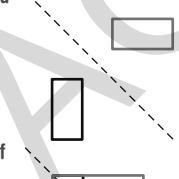
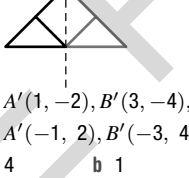
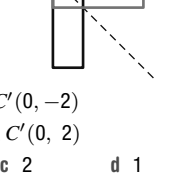
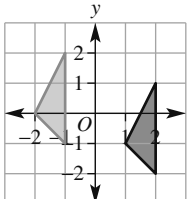
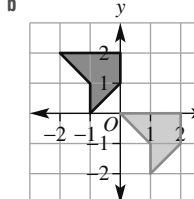
3 a $(3 - r) + (4 - r) = 5$, so $r = 1$ b $r = 4 - 2\sqrt{2}$

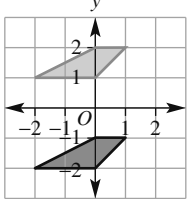
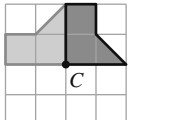
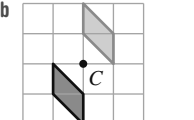
4 $\frac{60}{17}$

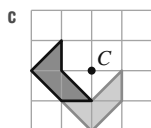
Multiple-choice questions

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

Short-answer questions

- 1 a  b 
- c  d 
- e  f 
- 2 a $A'(1, -2)$, $B'(3, -4)$, $C'(0, -2)$
b $A'(-1, 2)$, $B'(-3, 4)$, $C'(0, 2)$
- 3 a 4 b 1 c 2 d 1 e 6
f 0
- 4 a (1, 4) b (3, -6) c (-3, -7) d (4, 6)
- 5 a  b 

- c 
- 6 a 3 b 2 c no rotational symmetry
- 7 a  b 



- 8 a i F ii G
b i EH ii FG
c i $\angle G$ ii $\angle E$
- 9 a RHS b SAS c SSS d AAS
- 10 a $x = 3, a = 25$ b $x = 5, a = 18$
- 11 a $\angle BAE = \angle DCE$ (alternate angles in parallel lines)
 $\angle ABE = \angle CDE$ (alternate angles in parallel lines)
 $AB = CD$ (given)
 $\therefore \triangle ABE \equiv \triangle CDE$ (AAS)
b $AE = CE$ and $BE = ED$ so AC and BD bisect each other.
- 12 a $AE = CE, AB = CB$ and BE is common
 $\therefore \triangle ABE \equiv \triangle CBE$ (SSS)
b $\angle AEB = \angle CEB$ because $\triangle ABE \equiv \triangle CBE$ and since
 $\angle AEB + \angle CEB = 180^\circ$
 $\angle AEB = \angle CEB = 90^\circ$ so AC and BD bisect at right angles.
- 13 a $(AB, EF), (BC, FG), (CD, GH), (DA, HE)$
b $(\angle A, \angle E), (\angle B, \angle F), (\angle C, \angle G), (\angle D, \angle H)$ c 3
d $y = 1.5, a = 115, x = 3$
- 14 a Yes, SAS b Yes, SSS c Yes, AAA d Yes, RHS
- 15 a $h = 6$ b $x = 2$ c $x = \frac{24}{11}$ d $d = 12.5$

Extended-response questions

- 1 a $A'(0, 1), B'(-2, 1), C'(-2, 4)$
b $A'(3, 1), B'(3, -1), C'(0, -1)$
c $A'(1, -1), B'(-1, -1), C'(-1, 2)$
- 2 a to form two similar triangles.
b AAA ($\angle DAB = \angle ECB$ and $\angle ABD = \angle CBE$)
c 3
d 12 m

Semester review 2

Ratios and rates

Multiple-choice questions

- 1 C 2 B 3 C 4 C 5 D

Short-answer questions

- 1 a 2 : 3 b 1 : 2 : 3 c 6 : 7 d 3 : 40
e 3 : 8 f 3 : 10
- 2 a 576 cm, 384 cm
b \$1500, \$2500
c \$1.60, \$4, \$2.40
- 3 18.75 m²
- 4 \$7750

- 5 a 300 g/h b \$30/h c 100 km/h
6 \$2.27
7 90 km/h

Extended-response questions

- a 742.5 km b 16.5 km c 6.1 L d \$35.37
e 18 km

Equations and inequalities

Multiple-choice questions

- a B b D c B d C e B

Short-answer questions

- 1 a $w = 9$ b $m = 72$ c $x = 1$ d $a = 2$
e $w = -3$ f $x = 35$
- 2 a $m = -\frac{1}{2}$ b $a = -1$ c $x = 0$ d $x = \frac{15}{8}$
e $a = \frac{13}{8}$ f $a = \frac{7}{5}$
- 3 6
- 4 4 years
- 5 a $x > 1$ b $x \leq 2$ c $-1 < x \leq 2$
6 a $x > -8$ b $x \leq 3$ c $x \leq 30$

Extended-response questions

- a $C = 5n + 1500$ b $R = 17n$ c 125
d $P = 12n - 1500$ e \$900 f $-\$300$ (A loss)

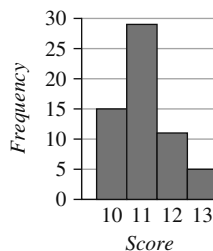
Probability and statistics

Multiple-choice questions

- a A b A c B c C d B

Short-answer questions

- 1 a i 13.75 ii 14 iii 8
b i 23 ii 18.5 iii 56
c i 10 ii 9.45 iii 15.7
- 2 a 8.5 b 4 c 14.5 d 10.5
- 3 16.9
- 4 a 17.4, 18 b 11.1, 11
- 5



- 6
- | | | | | | | |
|---|----|----|----|----|----|----|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| H | H1 | H2 | H3 | H4 | H5 | H6 |
| T | T1 | T2 | T3 | T4 | T5 | T6 |
- 7 a $\frac{7}{16}$ b $\frac{1}{16}$ c $\frac{15}{16}$ d $\frac{1}{2}$ e 0
- 8 a $\frac{3}{50}$ b $\frac{39}{50}$ c $\frac{1}{50}$ d $\frac{24}{25}$

Extended-response questions

- a 18 b 78 c 78 d Group A

Straight line graphs

Multiple-choice questions

- 1 D 2 B 3 C 4 D 5 D

Short-answer questions

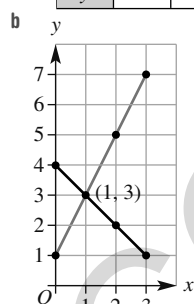
- 1 a 1st b 2nd c 3rd d 4th

2 a i

x	0	1	2	3
y	1	3	5	7

ii

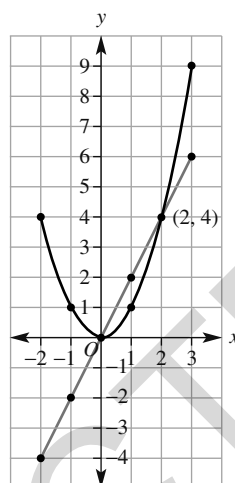
x	0	1	2	3
y	4	3	2	1



- 3 a $x = 2$
b $y = 3$
c $y = 1.5x$
d $y = -x - 2$
- 4 a i $y = 1.5x$ ii $y = -x - 2$
iii $y = 3$ iv $y = 1.5x$
b $y = -x - 2$ and $x = 2$

5

x	-2	-1	0	1	2	3
$y = x^2$	4	1	0	1	4	9
$y = 2x$	-4	-2	0	2	4	6



Extended-response questions

- a $R = 13n$
b \$400 (Wages)
c
-
- d (50, 650)
e \$400

Transformation and congruence

Multiple-choice questions

- 1 C 2 B 3 D 4 D 5 C

Short-answer questions

- 1 a 0 b 2 c 2 d 1
2 a (2, 2)
b $(-1, -2)$
3 a $A'(1, -1), B'(1, -3), C'(3, -2)$
b $A'(-1, -1), B'(-3, -1), C'(-2, -3)$
4 a SSS b AAS c RHS
5 A, C
6 a $\triangle BCD, \triangle ACE$ (AAA)
b Vertex C
c $x = 9$

Extended-response questions

- a 15 cm b 2 : 5 c 4 : 25 d 10 cm

UNCORRECTED
SAMPLE PAGES