

# Answers

## Chapter 1

### Exercise 1A

- 1 a** 3      **b** 9      **c** 1      **d** -8  
**e** 5      **f** 2      **g**  $\frac{5}{3}$       **h**  $\frac{-7}{2}$   
**i**  $\frac{7}{3}$       **j**  $\frac{20}{3}$       **k**  $\frac{-10}{3}$       **l**  $\frac{14}{5}$
- 2 a**  $a + b$       **b**  $a - b$       **c**  $\frac{b}{a}$       **d**  $ab$   
**e**  $\frac{bc}{a}$
- 3 a**  $y = 5$       **b**  $t = 5$       **c**  $y = -\frac{3}{2}$       **d**  $x = 2$   
**e**  $t = \frac{11}{2}$       **f**  $y = \frac{8}{3}$       **g**  $y = 136$       **h**  $t = 1$   
**i**  $x = 12$       **j**  $y = -\frac{9}{5}$       **k**  $x = -7$       **l**  $y = 2$
- 4 a**  $\frac{4}{3}$       **b** -5      **c** 2
- 5 a** -1      **b** 18      **c**  $\frac{6}{5}$       **d** 23  
**e** 0      **f** 10      **g** 12      **h** 8  
**i**  $-\frac{14}{5}$       **j**  $\frac{12}{5}$       **k**  $\frac{7}{2}$
- 6 a**  $-\frac{b}{a}$       **b**  $\frac{e-d}{c}$       **c**  $\frac{c}{a} - b$       **d**  $\frac{b}{c-a}$   
**e**  $\frac{ab}{b+a}$       **f**  $a + b$       **g**  $\frac{b-d}{a-c}$       **h**  $\frac{bd-c}{a}$
- 7 a** -18      **b** -78.2      **c** 16.75      **d** 28  
**e** 34      **f**  $\frac{3}{26}$
- 8**  $x = \frac{a^2 + b^2 + 2ab}{ac + bc} = \frac{a + b}{c}$
- 9**  $x = \frac{ab}{a - b - c}$

### Exercise 1B

- 1 a**  $x + 2 = 6$ , 4      **b**  $3x = 10$ ,  $\frac{10}{3}$   
**c**  $3x + 6 = 22$ ,  $\frac{16}{3}$       **d**  $3x - 5 = 15$ ,  $\frac{20}{3}$   
**e**  $6(x + 3) = 56$ ,  $\frac{19}{3}$       **f**  $\frac{x + 5}{4} = 23$ , 87
- 2**  $A = \$8$ ,  $B = \$24$ ,  $C = \$16$       **3** 14 and 28  
**4** 8 kg      **5** 1.3775 m<sup>2</sup>      **6** 49, 50, 51  
**7** 17, 19, 21, 23      **8** 4200 L      **9** 21  
**10** 3 km      **11** 9 and 12 dozen  
**12** 7.5 km/h      **13** 3.6 km      **14** 30, 6

### Exercise 1C

- 1 a**  $x = -1$ ,  $y = -1$       **b**  $x = 5$ ,  $y = 21$   
**c**  $x = -1$ ,  $y = 5$       **d**  $x = 5$ ,  $y = 19$   
**e**  $x = -4$ ,  $y = -13$       **f**  $x = -\frac{8}{5}$ ,  $y = -\frac{2}{5}$
- 2 a**  $x = 8$ ,  $y = -2$       **b**  $x = -1$ ,  $y = 4$   
**c**  $x = 7$ ,  $y = \frac{1}{2}$
- 3 a**  $x = 2$ ,  $y = -1$       **b**  $x = 2.5$ ,  $y = -1$   
**c**  $m = 2$ ,  $n = 3$       **d**  $x = 2$ ,  $y = -1$   
**e**  $s = 2$ ,  $t = 5$       **f**  $x = 10$ ,  $y = 13$   
**g**  $x = \frac{4}{3}$ ,  $y = \frac{7}{2}$       **h**  $p = 1$ ,  $q = -1$   
**i**  $x = -1$ ,  $y = \frac{5}{2}$
- 4 a** No solutions      **b** Infinitely many solutions  
**c** One solution      **d** One solution

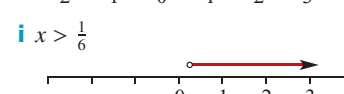
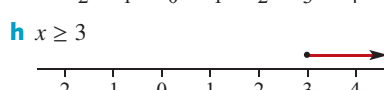
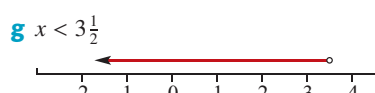
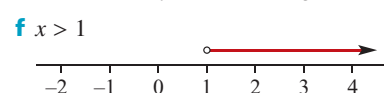
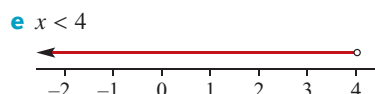
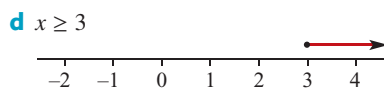
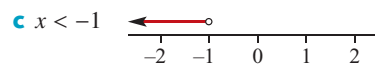
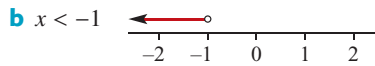
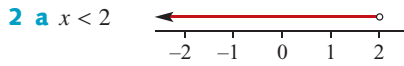
### Exercise 1D

- 1** 25, 113      **2** 22.5, 13.5  
**3 a** \$70      **b** \$12      **c** \$3  
**4 a** \$168      **b** \$45      **c** \$15

- 5 17 and 28    6 44 and 12  
 7 5 pizzas, 25 hamburgers  
 8 Started with 60 and 50; finished with 30 each  
 9 134 adults, 16 children    10  $\frac{7}{10}$   
 11 26    12 420 adults, 540 children  
 13 \$17 000    14 120 shirts, 300 ties  
 15 360 Outbacks, 300 Bush Walkers  
 16 2800 in Mydney, 3200 in Selbourne  
 17 20 kg at \$10, 40 kg at \$11 and 40 kg at \$12

**Exercise 1E**

- 1 a  $x < 1$     b  $x > 13$     c  $x \geq 3$     d  $x \leq 12$   
 e  $x \leq -6$     f  $x > 3$     g  $x < -2$     h  $x \geq -8$   
 i  $x \leq \frac{3}{2}$



- 3 a  $x > \frac{-1}{2}$     b  $x < 2$     c  $x > -5$

- 4  $3x < 20$ ,  $x < \frac{20}{3}$ , 6 pages    5 87

**Exercise 1F**

- 1 a 18    b 9    c 3    d -18  
 e 3    f 81    g 5    h 20  
 2 a  $S = a + b + c$     b  $P = xy$     c  $C = 5p$   
 d  $T = dp + cq$     e  $T = 60a + b$   
 3 a 15    b 31.4    c 1000    d 12  
 e 314    f 720

4 a  $V = \frac{c}{p}$     b  $a = \frac{F}{m}$     c  $P = \frac{I}{rt}$

d  $r = \frac{w - H}{C}$     e  $t = \frac{S - P}{Pr}$     f  $r = \frac{R(V - 2)}{V}$

5 a  $T = 48$     b  $b = 8$     c  $h = 3.82$     d  $b = 10$

6 a  $(4a + 3w) m$     b  $(h + 2b) m$   
 c  $3wh m^2$     d  $(4ah + 8ab + 6wb) m^2$

7 a i  $T = 2\pi(p + q) + 4h$     ii  $88\pi + 112$

b  $p = \frac{A}{\pi h} - q$

8 a  $D = \frac{2}{3}$     b  $b = 2$     c  $n = \frac{60}{29}$     d  $r = 4.8$

9 a  $D = \frac{1}{2}bc(1 - k^2)$     b  $k = \sqrt{1 - \frac{2D}{bc}}$

c  $k = \sqrt{\frac{2}{3}} = \frac{\sqrt{6}}{3}$

10 a  $P = 4b$     b  $A = 2bc - c^2$     c  $b = \frac{A + c^2}{2c}$

11 a  $b = \frac{a^2 - a}{2}$     b  $x = \frac{-ay}{b}$

c  $r = \pm\sqrt{3q - p^2x^2}$     d  $v = \pm\sqrt{u^2\left(1 - \frac{x^2}{y^2}\right)}$

**Chapter 1 review**

**Technology-free questions**

1 a 1    b  $\frac{-3}{2}$     c  $\frac{-2}{3}$     d -27

e 12    f  $\frac{44}{13}$     g  $\frac{1}{8}$     h 31

2 a  $t = a - b$     b  $\frac{cd - b}{a}$     c  $\frac{d}{a} + c$

d  $\frac{cb - a}{c - 1}$     e  $\frac{2b}{c - a}$     f  $\frac{1 - cd}{ad}$

3 a  $x < \frac{2}{3}$     b  $x \leq -148\frac{1}{2}$     c  $x < \frac{22}{29}$     d  $x \geq \frac{-7}{17}$

4  $x = 2(z + 3t)$ , -10

5 a  $d = e^2 + 2f$     b  $f = \frac{d - e^2}{2}$     c  $f = \frac{1}{2}$

6  $400\pi \text{ cm}^3$

7 a  $196\pi$     b  $\frac{975\pi}{2}$

8 a  $r = \frac{A}{\pi s}$     b  $w = \frac{T - P}{Pr}$

c  $r = \frac{n - p}{y^2}$     d  $r = \frac{ac - b^2}{b}$

9 a  $s = 75y^2$     b  $t = 8$

10  $5\sqrt{2} \text{ cm}$

11 12 m and 17 m

12  $m = 2$  and  $n = 15$

13 Mr Apollo earns \$100 000, Mr Adonis earns \$107 200 and Ms Aphrodite earns \$96 000

14 a  $a = \frac{28}{11}$ ,  $b = -\frac{9}{11}$     b  $a = -\frac{11}{5}$ ,  $b = -\frac{33}{5}$

15 5 hours travelling on highways

Multiple-choice questions

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

Extended-response questions

- 1 a  $C = \frac{-10}{9}$  b  $F = 86$  c  $x = -40$   
d  $x = -62.5$  e  $x = \frac{-160}{13}$  f  $k = 5$

- 2 a  $r = \frac{2uv}{u+v}$  b  $m = \frac{v}{u}$   
3 a  $T = 6w + 6\ell$   
b i  $T = 8w$  ii  $\ell = \frac{25}{6}, w = 12\frac{1}{2}$   
c i  $y = \frac{L-6x}{8}$  ii  $y = 22$   
d  $x = 10, y = 5$

- 4 a Distance Tom travelled =  $ut$  km  
Distance Julie travelled =  $vt$  km  
b i  $t = \frac{d}{u+v} h$   
ii Distance from A =  $\frac{ud}{u+v}$  km  
c  $t = 1.25$  h, distance from A = 37.5 km

- 5 a Average speed =  $\frac{2uv}{u+v}$   
b i  $\frac{uT}{v}$  ii  $\frac{vT+uT}{v}$   
6 a  $\frac{3}{a} + \frac{3}{b}$  c i  $c = \frac{2ab}{a+b}$  ii  $\frac{40}{3}$   
7 a  $\frac{x}{8}, \frac{y}{10}$  b  $\frac{80(x+y)}{10x+8y}$   
c  $x = \frac{320}{9}, y = \frac{310}{9}$

- 8 The three lines intersect at the point (4, 3)

Chapter 2

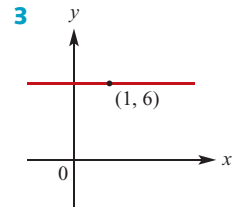
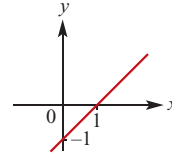
Exercise 2A

- 1 a (5, 8) b  $(\frac{1}{2}, \frac{1}{2})$  c (1.6, 0.7)  
d (-0.7, 0.85)  
2  $M_{AB}(3, 3), M_{BC}(8, 3\frac{1}{2}), M_{AC}(6, 1\frac{1}{2})$   
3 Coordinates of C are (6, 8.8)  
4 a (4, 4) b (2, -0.2) c (-2, 5) d (-4, -3)  
5  $(\frac{1+a}{2}, \frac{4+b}{2})$ ,  $a = 9, b = -6$   
6 a  $5\sqrt{2} \approx 7.07$  b  $\sqrt{17} \approx 4.12$   
c  $\sqrt{34} \approx 5.83$  d 13  
7  $\sqrt{97} + \sqrt{85} + \sqrt{104} \approx 29.27$   
8  $PM = \sqrt{145} \approx 12.04$  9 DN

Exercise 2B

- 1 a 4 b 2 c  $\frac{1}{4}$  d -4 e 1 f -1  
g  $\frac{5}{4}$  h -2 i  $-\frac{5}{4}$  j  $\frac{4}{3}$  k 0

- 2 Any line parallel to the one shown  
 $y = x - 1$



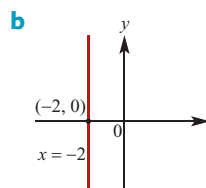
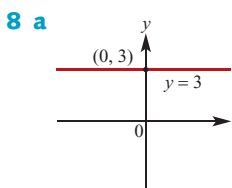
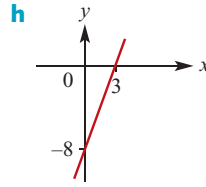
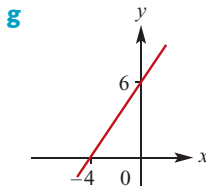
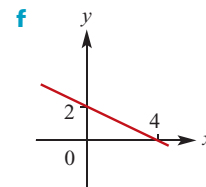
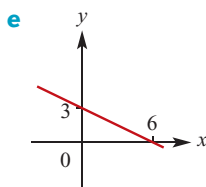
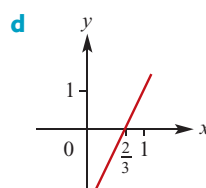
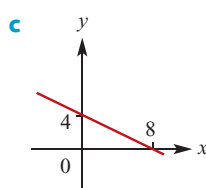
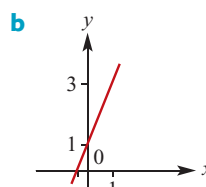
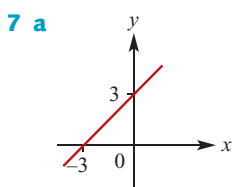
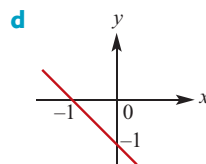
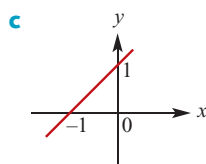
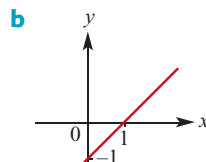
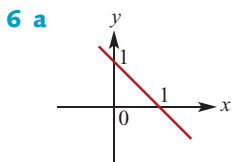
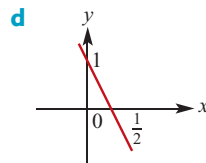
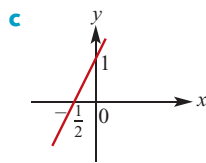
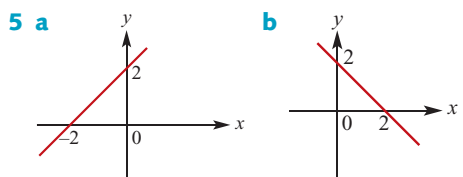
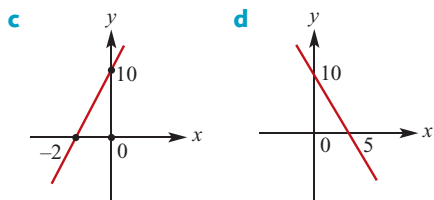
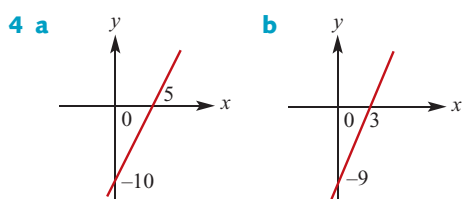
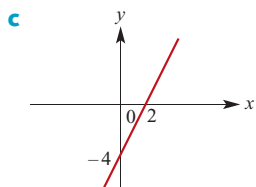
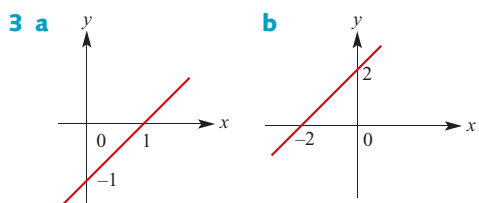
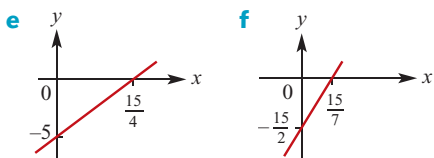
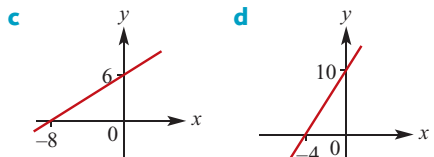
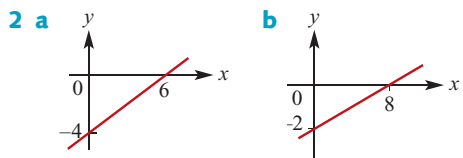
- 4 a  $-\frac{1}{4}$  b  $-\frac{5}{2}$  c -2 d -8 e 0 f -1  
g 7 h 11 i -13 j 11 k 111 l 61  
5 a -2 b  $\frac{2}{5}$   
6 a 54 b  $\frac{5}{6}$   
7 a  $45^\circ$  b  $45^\circ$  c  $26.57^\circ$  d  $135^\circ$   
8 a  $45^\circ$  b  $26.57^\circ$  c  $161.57^\circ$  d  $49.4^\circ$   
e  $161.57^\circ$  f  $135^\circ$   
9 a 1 b -1 c  $\sqrt{3}$  d  $-\sqrt{3}$

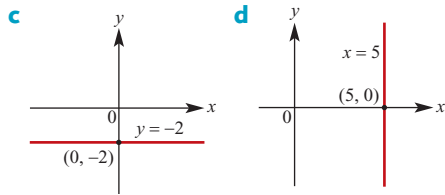
Exercise 2C

- 1 a  $m = 3, c = 6$  b  $m = -6, c = 7$   
c  $m = 3, c = -6$  d  $m = -1, c = -4$   
2 a  $y = 3x + 5$  b  $y = -4x + 6$  c  $y = 3x - 4$   
3 a  $m = 3, c = -6$  b  $m = 2, c = -4$   
c  $m = \frac{1}{2}, c = -2$  d  $m = \frac{1}{3}, c = -\frac{5}{3}$   
4 a  $m = 2, c = -9$  b  $m = -\frac{3}{4}, c = \frac{5}{2}$   
c  $m = -\frac{1}{3}, c = -2$  d  $m = \frac{5}{2}, c = -2$   
5 a  $y = 3x - 11$  b  $y = -2x + 9$   
6 a  $y = -\frac{1}{3}x + \frac{11}{3}$  b  $y = -\frac{7}{5}x + 4$   
c  $y = -2x + 4$  d  $y = \frac{11}{3}x - \frac{61}{3}$   
7 a 2 b  $y = 2x + 6$   
8 a  $y = 2x + 4$  b  $y = -2x + 8$   
9 a  $y = 2x + 6$  b  $y = -2x + 4$   
c  $y = -5x + 15$   
10 a  $y = -\frac{2}{3}x + 4$  b  $y = -2x - 6$   
c  $y = -x + 4$  d  $y = -\frac{3x}{2} + 3$   
11 a  $y = \frac{2}{3}x + 4$  b  $y = \frac{2}{3}x - \frac{2}{3}$   
c  $y = \frac{1}{2}x + 1\frac{1}{2}$  d  $y = -\frac{1}{2}x + 2$   
e  $y = x + 3.5$  f  $y = -0.5x + 0.25$   
12 a  $y = 4x + 4$  b  $y = -\frac{2}{3}x$  c  $y = -x - 2$   
d  $y = \frac{1}{2}x - 1$  e  $y = 3\frac{1}{2}$  f  $x = -2$   
13 Yes 14 Only c  
15 a  $x = 4$  b  $y = 11$  c  $x = 11$  d  $y = -1$

**Exercise 2D**

- 1 a** (0, 4), (4, 0)      **b** (0, -4), (4, 0)  
**c** (0, -6), (-6, 0)      **d** (0, 8), (-8, 0)





- 9 a**  $45^\circ$     **b**  $135^\circ$     **c**  $45^\circ$     **d**  $135^\circ$   
**e**  $63.43^\circ$  (to 2 d.p.)    **f**  $116.57^\circ$  (to 2 d.p.)  
**10 a**  $71.57^\circ$     **b**  $135^\circ$     **c**  $45^\circ$     **d**  $161.57^\circ$   
**11 a**  $a = -4, b = \frac{4}{3}, d = -1, e = \frac{14}{3}$

**Exercise 2E**

- 1 a**  $y = 2x - 10$     **b**  $y = -\frac{1}{2}x$   
**c**  $y = -2x + 6$     **d**  $y = \frac{1}{2}x - 4$   
**e**  $y = \frac{2}{3}x - \frac{14}{3}$     **f**  $y = -\frac{3}{2}x + 4$   
**g**  $y = -\frac{1}{3}x - \frac{2}{3}$     **h**  $y = 3x - 14$   
**2** Parallel lines: a, b, c; non-parallel lines: d  
**3 a**  $y = 4$     **b**  $x = 2$     **c**  $y = 4$     **d**  $x = 3$   
**4**  $y = 2x + 2$   
**5** Midpoint of AB is  $(-1, 6)$ ;  $y = 2x + 8$   
**6**  $m_{BC} = -\frac{3}{5}, m_{AB} = \frac{5}{3}$   
 $\therefore m_{BC} \times m_{AB} = -\frac{3}{5} \times \frac{5}{3} = -1$   
 $\therefore \triangle ABC$  is a right-angled triangle  
**7**  $m_{AB} = -2, m_{BC} = \frac{1}{2}$   
**8**  $m_{RS} = -\frac{1}{2}, m_{ST} = 2 \therefore RS \perp ST$   
 $m_{UT} = -\frac{1}{2}, m_{ST} = 2 \therefore UT \perp ST$   
 (Also need to show  $SR = UT$ .)  
 $\therefore RSTU$  is a rectangle  
**9**  $\ell = -\frac{16}{3}, m = \frac{80}{3}$   
**10 a**  $y = -\frac{1}{2}x + \frac{11}{2}$     **b**  $B(1, 5)$     **c**  $C(2, 7)$

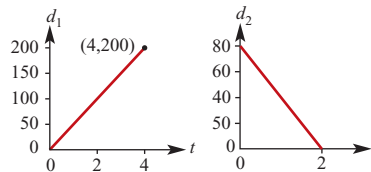
**Exercise 2F**

- 1**  $m = 5$   
**2**  $c = 5$   
**3 a**  $y = -\frac{1}{m}x + 3$     **b**  $m = \frac{1}{7}$   
**4**  $m = 2$   
**5 a**  $x = \frac{3}{m}$     **b**  $m = \frac{9}{5}$     **c**  $m \geq 3$   
**d**  $y = -\frac{x}{m} - 3$   
**6 a**  $x = -\frac{c}{2}$     **b**  $c = -4$     **c**  $c \geq -2$   
**d**  $y = -\frac{1}{2}x + c$

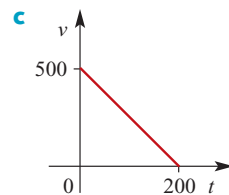
- 7 a**  $x = 4a$     **b**  $m = \frac{12}{a}$     **c i**  $a = 6$     **ii**  $a = -6$   
**8 a**  $x = \frac{c}{2}$     **b**  $c = 9$     **c**  $c \leq 2$     **d**  $y = \frac{1}{2}x + c$   
**e i**  $c = 12$     **ii**  $c = 4$     **iii**  $c = 8$   
**9 a**  $\frac{12}{b}$     **b**  $-\frac{3}{b}$     **c i**  $b = -3$     **ii**  $b = \frac{3}{2}$   
**d**  $y = \frac{b}{3}x - \frac{4b}{3}$

**Exercise 2G**

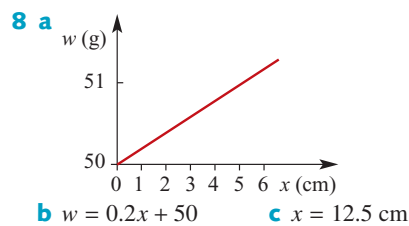
- 1**  $w = 20n + 350$  for  $n \in \mathbb{N} \cup \{0\}$   
**2 a**  $d_1 = 50t$     **b**  $d_2 = 80 - 40t$   
**c** Gradient = 50    Gradient = -40



- 3 a**  $V = 5t$     **b**  $V = 10 + 5t$   
**4 a**  $v = 500 - 2.5t$   
**b** Domain  $0 \leq t \leq 200$ ; Range  $0 \leq v \leq 500$



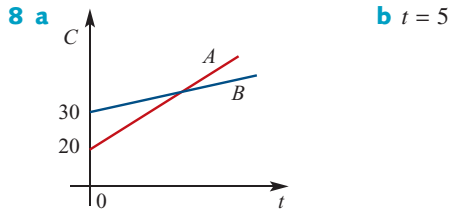
- c**  
**5**  $C = 1.5n + 2.6$   
**6 a**  $C = 0.24x + 85$     **b** \$145  
**7**  $d = 200 - 5t$



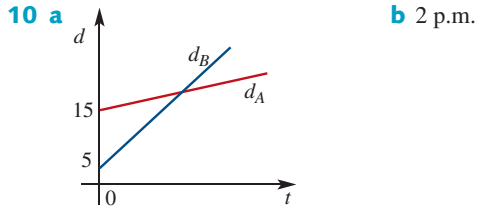
- 8 a**  
**b**  $w = 0.2x + 50$     **c**  $x = 12.5$  cm  
**9 a**  $C = 0.06n - 1$     **b** \$59  
**10 a**  $C = 5n + 175$     **b** Yes    **c** \$175

**Exercise 2H**

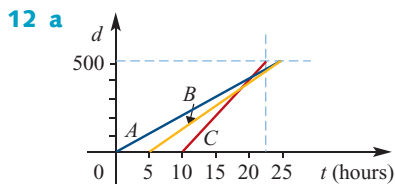
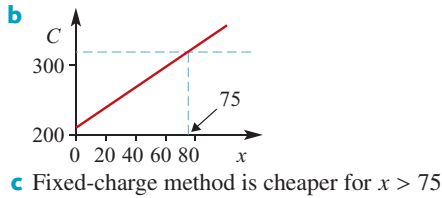
- 1** Both lines have gradient  $-1$ , but their y-axis intercepts are 6 and  $\frac{13}{2}$   
**2**  $(t, 6 - t)$  where  $t$  is a real number  
**3 a**  $m = 4$     **b**  $m \neq 4$     **c**  $m = \frac{9}{5}$   
**4**  $k = 2, m = 5$   
**5**  $k = 24, m = 0$   
**6**  $m = -3$   
**7 a**  $m = -5$     **b**  $m = 3$



**9**  $b = 0.28$  and  $a = 0.3$ ,  $\frac{25}{7}$  m/s



**11 a**  $C_1 = 210 + 1.6x$ ,  $C_2 = 330$



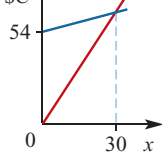
**b** C wins the race

**c** C leaves 5 hours after B, and overtakes B  $13\frac{1}{2}$  hours after B had started, then overtakes A 20 hours after A had started. C wins with a total time of  $22\frac{1}{2}$  hours ( $12\frac{1}{2}$  hours for journey + 10 hours handicap), with A and B deadheating for second place, each with a total time of 25 hours.

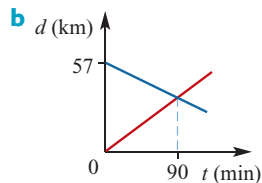
**13** Both craft will pass over the point  $(5\frac{1}{3}, -4)$

**14 a**  $C_T = 2.8x$ ,  $C_B = 54 + x$

**b**  $\$C$  **c** More than 30



**15 a**  $d_A = \frac{1}{3}t$   
 $d_M = 57 - \frac{3}{10}t$



**c** 10:30 a.m. **d** Anne 30 km, Maureen 27 km

## Chapter 2 review

### Technology-free questions

**1 a** Midpoint = (3, 2); Length = 4

**b** Midpoint =  $(-\frac{1}{2}, -\frac{9}{2})$ ; Length =  $\sqrt{74}$

**c** Midpoint =  $(5, \frac{5}{2})$ ; Length = 5

**2 a**  $\frac{9}{4}$  **b**  $-\frac{10}{11}$  **c** Undefined

**d** -1 **e**  $\frac{b}{a}$  **f**  $\frac{-b}{a}$

**3 a**  $y = 4x$  **b**  $y = 4x + 5$

**c**  $y = 4x + 2$  **d**  $y = 4x - 5$

**4 a**  $a = -2$  **b**  $\frac{20}{3}$

**5**  $4y + 3x = -7$

**6**  $3y + 2x = -5$

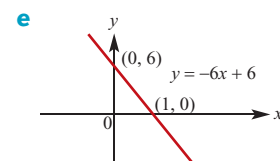
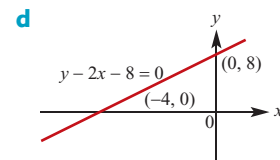
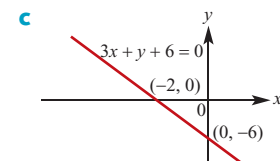
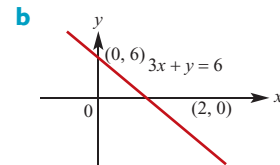
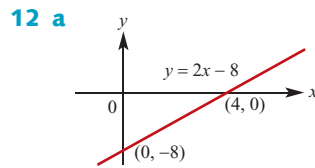
**7 a**  $y = 11$  **b**  $y = 6x - 10$  **c**  $3y + 2x = -3$

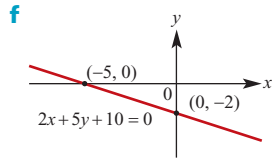
**8**  $\sqrt{3}y - x = 3\sqrt{3} - 2$

**9**  $y + x = 1$

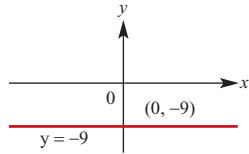
**10**  $y = \frac{1}{3}x + \frac{20}{3}$

**11**  $a = 1$ ,  $b = -\frac{1}{2}$ ,  $d = 5$ ,  $e = 3$

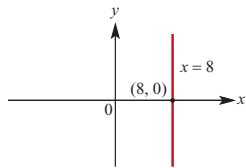




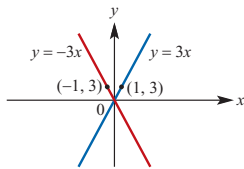
**13 a**  $y = -9$



**b**  $x = 8$



**c i**  $y = 3x$    **ii**  $y = -3x$



**14 a**  $d = 60t$    **b**  $m = 60$

**15**  $S = 800 + 500n$

**16 a**  $y = 2x + 2$    **b i**  $\frac{-2}{a}$    **ii**  $-2 < a < 0$

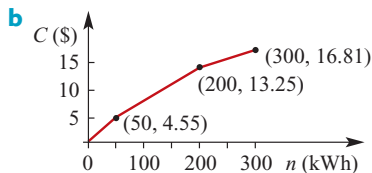
**c**  $\left(\frac{1}{a-1}, \frac{1}{a-1} + 3\right)$

**Multiple-choice questions**

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

**Extended-response questions**

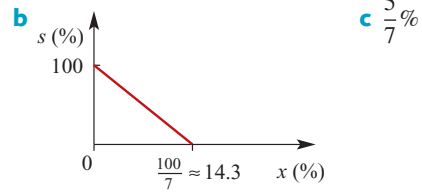
- 1 a**  $C = 550 + 190n$    **b** 12 days  
**c** Fewer than 5 days
- 2 a** Cost of the plug  
**b** Cost per metre of cable   **c** 1.8   **d**  $11\frac{1}{9}$  m
- 3 a** The maximum profit (when  $x = 0$ )  
**b** 43 seats  
**c** The profit reduces by \$24 for each empty seat
- 4 a i**  $C = 0.091n$   
**ii**  $C = 1.65 + 0.058n$   
**iii**  $C = 6.13 + 0.0356n$



- i** For 30 kWh,  $C = 2.73$   
**ii** For 90 kWh,  $C = 6.87$   
**iii** For 300 kWh,  $C = 16.81$
- c** 389.61 kWh

**5 a**  $y = -\frac{7}{3}x + 14\frac{2}{3}$    **b**  $20\frac{1}{3}$  km south

**6 a**  $s = 100 - 7x$



**d**  $14\frac{2}{7}\%$

**e** Probably not a realistic model when  $s = 0$

**f**  $0 \leq x \leq 14\frac{2}{7}$

**7 a**  $AB, y = x + 2; CD, y = 2x - 6$

**b** Intersection is at (8, 10), on the near bank

**8 a**  $\frac{128}{19}$

**b**  $y = -\frac{199}{190}x + \frac{128}{19}$

**c** No, since gradient of  $AB$  is  $\frac{20}{19} \approx 1.053$ , whereas the gradient of  $VC$  is  $-1.047$

**9 a** No   **b**  $1\frac{41}{71}$  km to the east of  $H$

**10 a**  $y = x - 38$    **b**  $B(56, 18)$

**c**  $y = -2x + 166$    **d** (78, 10)

**11 a**  $y = 3x + 2$    **b** (0, 2)

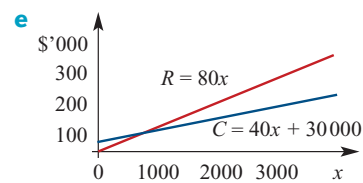
**c**  $y = 3x - 8$    **d** (2, -2)

**e** Area = 10 square units

**f** Area = 40 square units

**12 a**  $C = 40x + 30\,000$    **b** \$45   **c** 5000

**d**  $R = 80x$



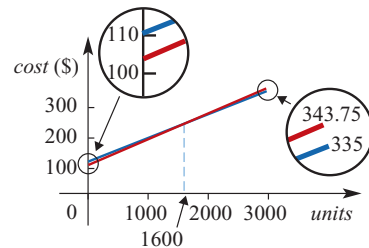
**f** 751   **g**  $P = 40x - 30\,000$

**13 a** Cost with method 1 is \$226.75; cost with method 2 is \$227; so method 1 is cheaper

**b**

	0	1000	2000	3000
Method 1	100	181.25	262.50	343.75
Method 2	110	185	260	335

**c** Cost the same for approx. 1600 units



**d**  $C_1 = 0.08125x + 100, C_2 = 0.075x + 110, x = 1600$

- 14 a** (17, 12)      **b**  $3y = 2x + 2$   
**15 a**  $PD: y = \frac{2}{3}x + 120$ ;  $DC: y = \frac{2}{5}x + 136$ ;  
 $CB: y = -\frac{5}{2}x + 600$ ;  $AB: y = \frac{2}{5}x + 20$ ;  
 $AP: y = -\frac{3}{5}x + 120$   
**b** At B and C, since product of gradients is  $-1$   
 E.g.  $m_{DC} = \frac{2}{5}, m_{CB} = -\frac{5}{2}, m_{DC} \times m_{CB} = -1$

## Chapter 3

### Exercise 3A

- 1 a**  $2x - 8$     **b**  $-2x + 8$     **c**  $6x - 12$   
**d**  $-12 + 6x$     **e**  $x^2 - x$     **f**  $2x^2 - 10x$   
**2 a**  $6x + 1$     **b**  $3x - 6$     **c**  $x + 1$     **d**  $5x - 3$   
**3 a**  $14x - 32$     **b**  $2x^2 - 11x$   
**c**  $32 - 16x$     **d**  $6x - 11$   
**4 a**  $2x^2 - 11x$     **b**  $3x^2 - 15x$   
**c**  $-20x - 6x^2$     **d**  $6x - 9x^2 + 6x^3$   
**e**  $2x^2 - x$     **f**  $6x - 6$   
**5 a**  $6x^2 - 2x - 28$     **b**  $x^2 - 22x + 120$   
**c**  $36x^2 - 4$     **d**  $8x^2 - 22x + 15$   
**e**  $x^2 - (\sqrt{3} + 2)x + 2\sqrt{3}$   
**f**  $2x^2 + \sqrt{5}x - 5$     **g**  $3x^2 + \sqrt{7}x - 14$   
**h**  $5x^2 + (10\sqrt{2} - 3)x - 6\sqrt{2}$   
**i**  $5x^2 - (3\sqrt{5} + 32\sqrt{10})x + 96\sqrt{2}$   
**6 a**  $6x^3 - 5x^2 - 14x + 12$     **b**  $x^3 - 1$   
**c**  $24 - 20x - 8x^2 + 6x^3$     **d**  $3x^2 + 4x + 3$   
**e**  $-10x^2 + 5x - 2$   
**7 a**  $x^2 - 8x + 16$     **b**  $4x^2 - 12x + 9$   
**c**  $36 - 24x + 4x^2$     **d**  $x^2 - x + \frac{1}{4}$   
**e**  $x^2 - 2\sqrt{5}x + 5$     **f**  $x^2 - 4\sqrt{3}x + 12$   
**8 a**  $x^2 - 9$     **b**  $4x^2 - 16$     **c**  $81x^2 - 121$   
**d**  $4x^2 - 9$     **e**  $4x^2 - 25$     **f**  $x^2 - 5$   
**g**  $4x^2 - 27$     **h**  $3x^2 - 7$   
**9 a**  $x^2 + y^2 - z^2 - 2xy$     **b**  $4a^2 - 4ab + b^2 - c^2$   
**c**  $9w^2 + 8uz - 16z^2 - u^2$   
**d**  $4a^2 - 5b^2 + 4ac + c^2$   
**10 a i**  $x^2 + 2x + 1$     **ii**  $(x + 1)^2$   
**b i**  $(x - 1)^2 + 2(x - 1) + 1$     **ii**  $x^2$

### Exercise 3B

- 1 a**  $2(x + 2)$     **b**  $4(a - 2)$     **c**  $3(2 - x)$   
**d**  $2(x - 5)$     **e**  $6(3x + 2)$     **f**  $8(3 - 2x)$   
**2 a**  $2x(2x - y)$     **b**  $8x(a + 4y)$     **c**  $6b(a - 2)$   
**d**  $2xy(3 + 7x)$     **e**  $x(x + 2)$     **f**  $5x(x - 3)$   
**g**  $-4x(x + 4)$     **h**  $7x(1 + 7x)$     **i**  $x(2 - x)$   
**3 a**  $6x^2y^2(x + 2)$     **b**  $xy(7x - 6y)$   
**c**  $2xy^2(4x + 3)$   
**4 a**  $(x^2 + 1)(x + 5)$     **b**  $(x + 3)(y + 2)$

- c**  $(x - 1)(x + 1)(y - 1)(y + 1)$   
**d**  $(a + b)(x + y)$     **e**  $(a^2 + 1)(a - 3)$   
**f**  $(2a - 5)(b - 6)$     **g**  $(2x + 5)(x - 1)$   
**h**  $(x + 2)(x - 2)(x + 2)$   
**i**  $(x - a)(x + a)(x - b)$

- 5 a**  $(x - 6)(x + 6)$     **b**  $(x - 9)(x + 9)$   
**c**  $(x - a)(x + a)$     **d**  $(2x - 9)(2x + 9)$   
**e**  $(3x - 4)(3x + 4)$     **f**  $(5x - y)(5x + y)$   
**g**  $3(x - 4)(x + 4)$     **h**  $2(x - 7)(x + 7)$   
**i**  $3a(x - 3)(x + 3)$     **j**  $(a - \sqrt{7})(a + \sqrt{7})$   
**k**  $(\sqrt{2}a - \sqrt{5})(\sqrt{2}a + \sqrt{5})$   
**l**  $(x - 2\sqrt{3})(x + 2\sqrt{3})$

- 6 a**  $(x - 6)(x + 2)$     **b**  $(7 + x)(3 - x)$   
**c**  $3(x - 1)(x + 3)$     **d**  $-5(2x + 1)$   
**e**  $-24x$     **f**  $-5(x + 7)(x + 1)$

- 7 a**  $(x - 9)(x + 2)$     **b**  $(y - 16)(y - 3)$   
**c**  $(a - 2)(a - 12)$     **d**  $(a + 9)^2$   
**e**  $(x - 8)(x + 3)$     **f**  $(x - 12)(x + 10)$

- 8 a**  $(3x - 1)(x - 2)$     **b**  $(2x + 1)(3x + 2)$   
**c**  $(5x + 3)(x + 4)$     **d**  $(2x + 1)(x + 4)$   
**e**  $(3x - 2)(2x - 5)$     **f**  $(3x + 1)(2x - 3)$   
**g**  $(3x - 2)(4x - 3)$     **h**  $(x - 2)(5x + 6)$   
**i**  $x(5x - 6)(x - 2)$

- 9 a**  $3(y - 6)(y + 2)$     **b**  $2(x - 7)(x - 2)$   
**c**  $4(x - 3)(x - 6)$     **d**  $3(x + 2)(x + 3)$   
**e**  $a(x + 3)(x + 4)$     **f**  $3x(4 - x)^2$

- 10 a**  $x(x + 2)$     **b**  $(2x - 3)(x + 2)$   
**c**  $2(2x + 5)(x + 2)$

### Exercise 3C

- 1 a** 2 or 3    **b** 0 or 2    **c** 4 or 3    **d** 4 or 3  
**e** 3 or  $-4$     **f** 0 or 1    **g**  $\frac{5}{2}$  or 6    **h**  $-4$  or 4  
**2 a**  $-0.65, 4.65$     **b**  $-0.58, 2.58$     **c**  $-2.58, 0.58$   
**3 a** 9,  $-8$     **b** 4, 2    **c** 11,  $-3$     **d** 4,  $-16$   
**e** 2,  $-7$     **f**  $-3, 8$   
**4 a**  $-\frac{3}{2}, -1$     **b**  $\frac{1}{2}, \frac{3}{2}$     **c**  $-\frac{2}{3}, -\frac{3}{2}$     **d**  $-\frac{3}{2}, 2$   
**e**  $\frac{5}{6}, 3$     **f**  $-\frac{3}{2}, 3$     **g**  $\frac{1}{2}, \frac{3}{5}$     **h**  $-\frac{3}{4}, \frac{2}{3}$   
**i**  $\frac{1}{2}$     **j**  $-5, 1$     **k** 0, 3    **l**  $-5, -3$   
**m**  $\frac{1}{5}, 2$   
**5** 3    **6** 4 or 9    **7** 2,  $2\frac{3}{8}$   
**8** 13    **9** 50    **10** 6 cm, 2 cm  
**11** 5    **12** \$90, \$60    **13** 42

### Exercise 3D

- 1 a i** (0,  $-4$ )  
**ii**  $x = 0$   
**iii**  $(-2, 0), (2, 0)$

