

Answers

Chapter 1 Numbers and indices 1

Exercise 1A

- | | | | | | |
|------------|------|----------|-----|----------|-----|
| 1 a | -7 | b | -14 | c | -13 |
| d | -400 | e | 0 | f | -40 |
| g | 10 | h | 6 | | |
| 2 a | 6 | b | 19 | c | 0 |
| d | -9 | e | -44 | f | -9 |
| g | -92 | h | 7 | i | 60 |
| j | 4 | k | 0 | l | -33 |
| m | 7 | n | -54 | o | 16 |

Exercise 1B

- | | | | | | |
|------------|-----|----------|-----|----------|----------------|
| 1 a | 120 | b | 336 | c | 1 |
| d | 4 | e | -30 | f | -300 |
| g | -5 | h | -9 | i | 8 |
| j | 60 | k | 6 | l | 1 |
| 2 a | 0 | b | 0 | c | $-\frac{1}{2}$ |
| d | 200 | e | -10 | f | 0 |
| g | 1 | h | 25 | i | -4 |
| j | -4 | k | 4 | l | 2 |

Exercise 1C

- | | | | | | |
|------------|---------------------------------|----------|----------------------------------|----------|-------------------------------|
| 1 a | $\frac{3}{5}$ | b | $\frac{7}{11}$ | c | $\frac{2}{8} = \frac{1}{4}$ |
| d | $\frac{13}{9} = 1\frac{4}{9}$ | e | $\frac{4}{6} = \frac{2}{3}$ | f | $4\frac{3}{5}$ |
| g | $8\frac{1}{3}$ | h | $\frac{6}{9} = \frac{2}{3}$ | i | $4\frac{2}{4} = 4\frac{1}{2}$ |
| j | $6\frac{5}{5} = 7$ | k | $3\frac{10}{9} = 4\frac{1}{9}$ | l | $3\frac{6}{7}$ |
| 2 a | $\frac{13}{15}$ | b | $\frac{5}{12}$ | | |
| c | $\frac{24}{35}$ | d | $\frac{5}{36}$ | | |
| e | $\frac{22}{15} = 1\frac{7}{15}$ | f | $\frac{47}{36} = 1\frac{11}{36}$ | | |

$$\mathbf{g} \quad \frac{9}{6} = \frac{3}{2} = 1\frac{1}{2} \quad \mathbf{h} \quad \frac{3}{8}$$

$$\mathbf{i} \quad \frac{5}{10} = \frac{1}{2} \quad \mathbf{j} \quad \frac{23}{24}$$

$$\mathbf{k} \quad \frac{6}{60} = \frac{1}{10} \quad \mathbf{l} \quad \frac{7}{48}$$

$$\mathbf{3 a} \quad 3\frac{11}{10} = 4\frac{1}{10} \quad \mathbf{b} \quad \frac{7}{60}$$

$$\mathbf{c} \quad 1\frac{3}{10} \quad \mathbf{d} \quad 3\frac{7}{20}$$

$$\mathbf{e} \quad 4\frac{9}{6} = 4\frac{3}{2} = 5\frac{1}{2} \quad \mathbf{f} \quad 6\frac{7}{24}$$

$$\mathbf{g} \quad 6\frac{11}{14} \quad \mathbf{h} \quad 12\frac{6}{10} = 12\frac{3}{5}$$

Exercise 1D

- | | | | |
|------------|--------------------------------|----------|---------------------------------|
| 1 a | $\frac{3}{10}$ | b | $\frac{9}{28}$ |
| c | $\frac{14}{15}$ | d | $\frac{6}{11}$ |
| e | $\frac{12}{21} = \frac{4}{7}$ | f | $\frac{12}{72} = \frac{1}{6}$ |
| g | $\frac{20}{24} = \frac{5}{6}$ | h | $\frac{12}{18} = \frac{2}{3}$ |
| 2 a | $\frac{5}{6}$ | b | $\frac{52}{15} = 3\frac{7}{15}$ |
| c | $\frac{40}{12} = 3\frac{1}{3}$ | d | $\frac{28}{56} = \frac{1}{2}$ |
| 3 a | $\frac{55}{6} = 9\frac{1}{6}$ | b | $\frac{49}{20} = 2\frac{9}{20}$ |
| c | $\frac{16}{21}$ | d | $\frac{52}{22} = 2\frac{4}{11}$ |

Exercise 1E

- | | | | | | |
|------------|-----|----------|------|----------|-----|
| 1 a | 36 | b | 4 | c | 1 |
| d | 0 | e | 64 | f | 900 |
| 2 a | 27 | b | 1000 | c | 16 |
| d | 1 | e | 0 | f | 81 |
| 3 a | 25 | b | 49 | | |
| c | -27 | d | -64 | | |

- 4 a 17 b 1001 c 100
 d 0 e 36 f 999
 g 68 h 93

Exercise 1F

- 1 a 6 b 2 c 1
 d 40 e 12 f 13
 g 15 h 50
- 2 a 3 b 10 c 1
 d -20 e 4 f 0
 g 30 h -1
- 3 a 10 b 1 c 5
 d 2 e 10 f 2
 g 1 h 1

Chapter 1 review

- 1 a -4 b -13 c 1
 d -11 e 8 f -7
 g -10 h 53 i -1
 j 18 k -200
- 2 a 345 b 1 c -24
 d -30 e -5 f -20
 g 12 h 25 i 2
 j 1 k 10
- 3 a $\frac{7}{6} = 1\frac{1}{6}$ b $\frac{11}{40}$
 c $4\frac{19}{20}$ d $3\frac{19}{70}$
- 4 a $\frac{6}{15} = \frac{2}{5}$ b $\frac{15}{28}$
 c $\frac{33}{40}$ d $\frac{21}{8} = 2\frac{5}{8}$
- 5 a 9 b 8 c 1
 d 0 e 1 000 000 f 48
 g 150 h 78
- 6 a 8 b 2 c 17
 d 5 e 1 f 10

Chapter 2 Algebra 1

Exercise 2A

- 1 a $6x + 24$ b $7a - 77$
 c $8 - 2t$ d $10y - 15$
 e $20p + 90q$ f $-8m - 20$
 g $-33d + 55$ h $-1 + 8z$
 i $12a + 18b - 24$ j $-12 + 6x - 9y$
 k $-a + 2b + c$
- 2 a $2(x + 6)$ b $5(3c - 1)$
 c $7(2p - 3)$ d $3(4a + 5)$
 e $8(x - 5)$ f $6(2y + 5)$
 g $2(5 - 4a)$ h $50(2 + 3z)$
 i $7(5a + 4b)$ j $16(p - 2q)$
 k $5(5x - 7y + 11z)$ l $4(3 + 5r - 7s)$
- 3 a $16x$ b c
 c $13y$ d $13x + 11$
 e $2t + 8$ f $9a + b$
 g $-4x + 4y$ h $6p + 11q - 4$
 i $-a - b$ j $2a - 2b$
 k $13 - 5x + y$ l $5x^2 + 4x$
- 4 a 24 b 47 c -2
 d -6 e 30 f 90
 g 27 h 14 i 0
 j 4 k 24 l 13

Exercise 2B

- 1 a $7x + 23$ b $12t + 4$
 c $19p - 30$ d $8y - 5$
 e $8a - 14$ f $4x + 19$
 g $3p + 11$ h $17 - 8x$
- 2 a $26m + 11$ b $24x - 2$
 c $27 + 3p$ d $6y + 13$
 e $9n - 11$ f $17 - 22a$
- 3 a $x^2 + 5x$ b $y^2 - 2y$
 c $p^2 - p$ d $6t + t^2$
 e $w - w^2$ f $6x^2 + 12x$
 g $4r^2 - 12r$ h $6l - 3l^2$
 i $5z^2 + 10z$ j $7b^2 - 3b$
 k $18k - 7k^2$ l $6a^2 + 15a$

- | | |
|-----------------------------|--|
| m $4p^2 - 2p$ | n $18d - 27d^2$ |
| o $-28x^2 - 16x$ | p $-5s + 10s^2$ |
| 4 a $x^2 + 7x + 10$ | b $t^2 + 9t + 8$ |
| c $y^2 + 7y - 30$ | d $a^2 - 2a - 35$ |
| e $p^2 + 5p - 6$ | f $m^2 - m - 12$ |
| g $q^2 - 12q + 20$ | h $x^2 - 8x + 16$ |
| 5 a $2x^2 + 9x + 10$ | b $10a^2 + 29a + 21$ |
| c $18y^2 + 27y + 4$ | d $25p^2 + 20p + 4$ |
| e $7e^2 + e - 8$ | f $8x^2 - 6x - 9$ |
| g $9y^2 + 2y - 11$ | h $21b^2 - 5b - 4$ |
| i $4x^2 - 16x + 15$ | j $20y^2 - 19y + 3$ |
| k $9f^2 - 24f + 16$ | l $1 - 4t + 4t^2$
or $4t^2 - 4t + 1$ |

Exercise 2C

- | | |
|--------------------------|---------------------------|
| 1 a $m(8 + n)$ | b $a(2b - 9)$ |
| c $x(4y + z)$ | d $q(3p - 4r)$ |
| e $4(3p - 4q)$ | f $10(10 + 3x)$ |
| g $v(6u + 5w)$ | h $a(11b - c)$ |
| 2 a $x(x + 3)$ | b $y(4y - 1)$ |
| c $a(6 - a)$ | d $t(t + 1)$ |
| e $3(2a^2 - 1)$ | f $t(5 + 4t)$ |
| g $y(12y - 11x)$ | h $9(3a^2 + 2b^2)$ |
| 3 a $2x(x + 2)$ | b $6y(1 - y)$ |
| c $5u(5u + 7v)$ | d $4b(3a - 2b)$ |
| e $12p(5p + 2q)$ | f $9m(9 - 11m)$ |
| g $5b(14b - 13a)$ | h $400y(4z + 3y)$ |

Exercise 2D

- | | |
|---|---------------------------|
| 1 a $(c + d)(c - d)$ | b $(u + v)(u - v)$ |
| c $(y + x)(y - x)$ | d $(x + 9)(x - 9)$ |
| e $(a + 2)(a - 2)$ | f $(p + 6)(p - 6)$ |
| g $(5 + y)(5 - y)$ | h $(8 + x)(8 - x)$ |
| 2 a $(2x + 3)(2x - 3)$ | |
| b $(4m + 1)(4m - 1)$ | |
| c $(2 + 9p)(2 - 9p)$ | |
| d $(11 + 10a)(11 - 10a)$ | |
| e $(5a + 6b)(5a - 6b)$ | |
| f $(2p + 3q)(2p - 3q)$ | |
| g $(13 + 20n)(13 - 20n)$ | |
| h $\left(2x + \frac{1}{2}y\right)\left(2x - \frac{1}{2}y\right)$ | |

Exercise 2E

- | | |
|------------------------------|--|
| 1 a $(x + 1)(x + 5)$ | b $(a + 1)(a + 11)$ |
| c $(m + 1)(m + 3)$ | d $(y + 2)(y + 7)$ |
| e $(t + 3)(t + 5)$ | f $(x + 1)(x + 22)$ |
| 2 a $(x + 3)(x + 4)$ | b $(k + 2)(k + 6)$ |
| c $(w + 2)(w + 10)$ | d $(m + 1)(m + 16)$ |
| e $(t + 3)(t + 8)$ | f $(p + 3)(p + 3)$
or $(p + 3)^2$ |
| 3 a $(a + 4)(a + 25)$ | b $(p + 1)(p + 13)$ |
| c $(v + 4)(v + 11)$ | d $(x + 20)(x + 20)$
or $(x + 20)^2$ |
| e $(n + 1)(n + 49)$ | f $(t + 1)(t + 1)$
or $(t + 1)^2$ |

Exercise 2F

- | | |
|--|--|
| 1 a $(p - 1)(p - 3)$ | b $(x - 1)(x + 2)$ |
| c $(x + 1)(x - 7)$ | d $(t - 1)(t + 5)$ |
| e $(y - 1)(y - 1)$
or $(y - 1)^2$ | f $(m + 1)(m - 13)$ |
| 2 a $(k - 3)(k + 4)$ | b $(p - 2)(p - 10)$ |
| c $(y + 1)(y - 16)$ | d $(a - 3)(a - 5)$ |
| e $(w - 2)(w + 5)$ | f $(x + 5)(x - 7)$ |
| 3 a $(x - 20)(x - 20)$
or $(x - 20)^2$ | b $(y + 2)(y + 1)$ |
| c $(t + 1)(t - 100)$ | d $(p + 12)(p + 12)$
or $(p + 12)^2$ |
| e $(r + 2)(r - 5)$ | f $(h - 5)(h - 5)$
or $(h - 5)^2$ |

Exercise 2G

- | | | |
|--------------------------|---------------------------|---------------------------|
| 1 a a | b $\frac{1}{x}$ | c p^3 |
| d $\frac{1}{q^2}$ | e $2x$ | f $\frac{1}{3y^2}$ |
| g $\frac{5}{7}$ | h t | |
| 2 a $3b$ | b $\frac{1}{2x}$ | c 1 |
| d $\frac{4b}{3d}$ | e $\frac{x}{y}$ | f $2p$ |
| g $\frac{3}{4ab}$ | h $\frac{uv^2}{3}$ | |

3 a $x + 1$ b $\frac{1}{y + 2}$
 c $\frac{3(t - 1)}{t - 2}$ d $5(q - 1)$
 e $\frac{x}{2(x + 1)}$ f $(a + 4)^2$

4 a $\frac{4 - x}{x + 3}$ b $6(y + 1)(y + 3)$
 c $\frac{t + 4}{6(3 - t)}$

Exercise 2H

1 a $\frac{7x}{10}$ b $\frac{t}{12}$ c $\frac{p^2}{6}$
 d 2 e $\frac{y^2 + 21}{3y}$ f $\frac{w^2 - 16}{8w}$
 g 3 h $\frac{x^2}{10}$

2 a $\frac{7b + 2a}{ab}$ b $\frac{6v - 3u}{uv}$
 c $\frac{cd}{15}$ d $\frac{p}{2q}$
 e $4(x + 5)$ or $4x + 20$ f $\frac{2 - t}{3}$
 g $\frac{x}{5}$ h $\frac{3p}{2q}$

Chapter 2 review

1 a $14x + 13$ b $-12t^2 - 20t$
 c $20m^2 + 13m - 21$

2 a $q(3p + 2r)$ b $m(8 - m)$
 c $5t(3t + 5s)$

3 a $(u + v)(u - v)$ b $(t + 9)(t - 9)$
 c $(5a + 6)(5a - 6)$ d $(4u + 1)(4u - 1)$

4 a $(x + 1)(x + 5)$ b $(y + 2)(y + 4)$
 c $(a + 4)(a + 10)$

5 a $(p - 1)(p + 7)$ b $(x - 4)(x - 5)$
 c $(a + 3)(a - 5)$

6 a p^2 b $\frac{1}{a^3}$ c $\frac{5b}{7a^2}$

7 a $t - 2$ b $\frac{m + 2}{(m + 5)^2}$ c $\frac{2 - x}{3(x - 3)}$

8 a $\frac{7y + 3x}{xy}$ b $\frac{a^2 - 30}{6a}$
 c $\frac{y + 2}{5}$ d $\frac{u}{4v}$

Chapter 3 Trigonometry

Exercise 3A

1 a 7.8 m b 13.8 mm
 c 149.5 m d 3.9 m
 e 33.0 cm f 29.7 m

2 a 37.3 cm b 21.9 m
 c 5.7 cm d 126.0 mm
 e 378.6 m f 3.9 cm

3 a 4.5 cm b 35.1 cm²

4 2.0 m

5 2.6 m

6 42.0 km

7 a 7.5 cm b 29.8 cm²

Exercise 3B

1 a 22.62° b 34.16°
 c 16.77° d 81.03°
 e 38.05° f 36.87°

2 32.01°

3 48.81°

4 54.46°, 54.46°, 71.08°

5 a 31° b 059° c 239°

Exercise 3C

1 a 5 cm b 11.5 cm
 c 7.04 mm d 4.31 m
 e 11.5 cm f 9.23 m

2 a 53.1° b 16.6° c 42.6°

3 22.9 m

4 11.7 km

5 49.5°

6 10.8°

Exercise 3D

1 a 14.10 cm b 1.95 m

c 16.78 mm d 1.63 cm

e 8.28 cm f 58.17 m

2 a 54.0° b 60° c 78.2°

3 4.31 km

4 20.8 cm

5 a No, because the angle between the ground and the slope is 12.1° (which is greater than 8°)

b 8.91 m

Exercise 3E

1 a 36.9° b 42.3° c 22.1 m

d 2.52 mm e 51.1° f 7.65 m

g 5.66 mm h 22.0 cm

2 Yes, the ladder is safe because the angle between the ladder and the ground is 73.3° (which is between 70° and 80°).

3 Perpendicular height is 6.34 cm; area is 63.4 cm^2

4 43.3 cm^2

5 a 42.5° b 8.16 cm

Chapter 3 review

1 a 18.3 mm b 17.4°

c 8.2 m d 22.6°

2 36.0°

3 10.0 m

4 1.8 m

5 17.8 cm

Chapter 4 Geometry 1

Exercise 4A

1 a 17 m b 50 cm

c 2.5 m d $2.83 = 2\sqrt{2}$ mm

e $18.03 = 5\sqrt{13}$ cm f 4.78 m

2 Rectangle **B**'s diagonal is 0.52 cm longer

3 $11.31 = 8\sqrt{2}$ cm

4 2.38 m

5 18.81 km

6 8.56 m

7 32.81 m

8 a $8.60 = \sqrt{74}$ units

b $8.94 = 4\sqrt{5}$ units

c $18.44 = 2\sqrt{85}$ units

d $9.43 = \sqrt{89}$ units

Exercise 4B

1 a 8 cm b 12 m

c 25 cm d $9.2 = 2\sqrt{21}$ cm

e $6.2 = \sqrt{39}$ cm f $86.6 = 50\sqrt{3}$ cm

2 $6.2 = \sqrt{39}$ cm

3 3.4 m

4 60 cm^2

5 a $5.7 = 4\sqrt{2}$ cm b $11.3 = 8\sqrt{2} \text{ cm}^2$

6 $36.7 = 8\sqrt{21} \text{ m}^2$

7 $27.7 = 16\sqrt{3} \text{ cm}^2$

Exercise 4C

1 a 5.8 cm b 13.2 m

c 10.8 cm d 9.4 cm

e 6.5 m f 11.4 mm

2 5.5 m

3 500 m

4 21.66 cm

Exercise 4D

- 1 **a** Right-angled
b Not right-angled
c Not right-angled
d Not right-angled
e Not right-angled
f Right-angled
- 2 **a** Rectangular
b Not rectangular
- 3 Yes, the frame is rectangular.
- 4 Yes, the shed will pass quality control.
- 5 No, the triangle is not a right-angled isosceles triangle.
- 6 No, the pitch is not rectangular.
- 7 Charlotte is correct.

Exercise 4E

- 1 **a** $x = 13$ cm; $y = 13.6$ cm
b $x = 15$ cm; $y = 14.7$ cm
c $x = 7$ cm; $y = 5.7$ cm
d $x = 4$ cm; $y = 8.1$ cm
- 2 **a** 16.58 cm **b** 8.66 cm
c 17.32 mm **d** 21.19 m
e 7 cm
- 3 Height is 44.63 m; length is 52.69 m

Exercise 4F

- 1 **a** $a = 53^\circ$; $b = 127^\circ$
b $c = 112^\circ$; $d = 112^\circ$
c $e = 74^\circ$; $f = 41^\circ$; $g = 65^\circ$
d $h = 55^\circ$; $i = 19^\circ$; $j = 55^\circ$; $k = 106^\circ$
e $m = 50^\circ$; $n = 70^\circ$; $p = 120^\circ$
f $q = 100^\circ$; $r = 30^\circ$; $s = 50^\circ$
- 2 **a** $a = 40^\circ$; $b = 100^\circ$
b $c = 90^\circ$; $d = 20^\circ$
c $e = 55^\circ$; $f = 62.5^\circ$
- 3 **a** $a = 90^\circ$; $b = 52^\circ$
b $c = 58^\circ$; $d = 25^\circ$
c $e = 65^\circ$; $f = 115^\circ$; $g = 32.5^\circ$

- 4 **a** 13 cm **b** 6 cm **c** 7.5 cm

Exercise 4G

- 1 **a** 5 cm **b** 5 cm **c** 6.2 m
2 **a** 13.4 m **b** 8.1 cm **c** 98.0 cm
3 **a** 8 cm **b** 12 cm
c 1.3 cm **d** 85.7 cm

Chapter 4 review

- 1 **a** 13.89 mm **b** 13.57 cm
c 6.18 m
- 2 Triangle is right-angled.
- 3 **a** 5.6 cm **b** 4.6 cm
- 4 **a** $a = 110^\circ$; $b = 110^\circ$; $c = 70^\circ$; $d = 110^\circ$
b $e = 58^\circ$; $f = 92^\circ$; $g = 122^\circ$; $h = 88^\circ$;
 $i = 122^\circ$; $j = 88^\circ$
- 5 **a** $a = 42^\circ$; $b = 96^\circ$ **b** $c = 59^\circ$; $d = 59^\circ$
c $e = 17^\circ$ **d** $f = 74^\circ$; $g = 37^\circ$
e $h = 54^\circ$
- 6 **a** 5 cm **b** 2.0 cm **c** 10.6 cm

Chapter 5 Numbers and indices 2

Exercise 5A

- 1 **a** $\sqrt{15}$ **b** $\sqrt{26}$ **c** $\sqrt{42}$
d $\sqrt{1200}$ **e** $\sqrt{140}$ **f** $\sqrt{240}$
- 2 **a** $\sqrt{5} \times \sqrt{7} = \sqrt{5}\sqrt{7}$
b $\sqrt{11} \times \sqrt{13} = \sqrt{11}\sqrt{13}$
c $\sqrt{2} \times \sqrt{29} \times \sqrt{23} = \sqrt{2}\sqrt{29}\sqrt{23}$
d $\sqrt{3} \times \sqrt{17} \times \sqrt{101} = \sqrt{3}\sqrt{17}\sqrt{101}$

Exercise 5B

- 1 **a** $2\sqrt{2}$ **b** $5\sqrt{3}$ **c** $3\sqrt{5}$
d $2\sqrt{7}$ **e** $4\sqrt{2}$ **f** $6\sqrt{2}$
g $4\sqrt{3}$ **h** $3\sqrt{11}$

2 a $4\sqrt{5}$ b $10\sqrt{3}$ c $10\sqrt{2}$

d $2\sqrt{13}$ e $3\sqrt{7}$ f $7\sqrt{2}$

g $6\sqrt{3}$ h $2\sqrt{11}$

3 a $7\sqrt{2}$ b $\sqrt{3}$

c 0 d $6\sqrt{11}$

4 a $12\sqrt{2}$ b $\sqrt{5}$ c $3\sqrt{3}$

Exercise 5C

1 a $\sqrt{\frac{56}{3}}$ b $\sqrt{\frac{21}{5}}$ c $\sqrt{\frac{2}{7}}$

d $\sqrt{\frac{75}{46}}$ e $\sqrt{\frac{7}{60}}$ f $\sqrt{\frac{101}{102}}$

g $\sqrt{\frac{55}{2}}$

2 a $\frac{\sqrt{11}}{\sqrt{2}}$ b $\frac{\sqrt{53}}{\sqrt{21}}$ c $\frac{\sqrt{3}}{\sqrt{34}}$

d $\frac{\sqrt{201}}{\sqrt{202}}$ e $\frac{\sqrt{20}}{\sqrt{51}}$ f $\frac{\sqrt{11}}{\sqrt{31}}$

g $\frac{\sqrt{80}}{\sqrt{7}}$

Exercise 5D

1 a 3 b 2 c 4

d 5 e 10 f 2

g 20

2 a $\frac{9}{5}$ b $\frac{2}{11}$

c $\frac{10}{3}$ d $\frac{40}{13}$

e $\frac{6}{7}$ f $\frac{15}{12} = \frac{5}{4}$

g $\frac{1}{30}$

Exercise 5E

1 a x^8 b a^9 c k^{13}

d p^7 e t^4 f w^{100}

g 5^{10} h 7^{15} i 2^4

j 10^{12} k 3^{u+v} l y^{p+q}

2 a p^{11} b a^{15} c t^{12}

d 6^{10} e $10x^7$ f $9a^3$

g $12y^7$ h $12t^9$ i $80m^8$

j $120p^9$ k 5^{p+q+r} l y^{a+b+c}

Exercise 5F

1 a a^7 b p^4 c t

d w^5 e m^2 f k^7

g b h 9^2 i 7^4

j 8 k 4^2

2 a $5x^4$ b $4y^3$

c $4w^7$ d $3a$

e $\frac{t^5}{2}$ f $\frac{q^2}{10}$

3 a $\frac{7b^2}{5}$ b $\frac{2r}{3}$

c $\frac{2g^5}{3}$ d $\frac{7a^5}{2}$

Exercise 5G

1 a a^{24} b x^{42} c p^{25}

d 6^{35} e 2^{16} f x^{4p}

g x^{3w} h x^{ab}

2 a a^{23} b r^{31} c m^4

d u e y^8 f x^{12}

g p^{27} h d^{18}

Exercise 5H

1 a $\frac{1}{a^5}$ b $\frac{1}{x^9}$ c $\frac{1}{p}$

d $\frac{1}{7^4}$ e $\frac{1}{10^6}$ f $\frac{4}{t^2}$

g $\frac{8}{y^3}$ h $\frac{1}{3u^7}$

2 a 1 b 1 c 1

d 1 e 2 f 6

g $\frac{1}{5}$ h $\frac{1}{4}$

3 a x^{-7} b n^{-8} c h^{-1}
 d $2p^{-3}$ e $12e^{-4}$ f $\frac{k^{-2}}{3}$
 g $\frac{v^{-5}}{5}$ h $\frac{2j^{-10}}{3}$

Exercise 5I

1 a 10 b 7 c 3
 d 2 e 2 f 4
 g 1 h 10

2 a $h^{\frac{1}{2}}$ b $b^{\frac{1}{2}}$ c $a^{\frac{1}{3}}$
 d $g^{\frac{1}{4}}$ e $t^{\frac{1}{6}}$ f $y^{\frac{1}{k}}$
 g $5^{\frac{1}{2}}$ h $12^{\frac{1}{3}}$

3 a \sqrt{m} b $\sqrt[3]{t}$ c $\sqrt[8]{w}$
 d $\sqrt[4]{a}$ e $\sqrt[4]{p}$ f $\sqrt[k]{k}$
 g $\sqrt[3]{2}$ h $\sqrt[4]{6}$

Exercise 5J

1 a 1000 b 8 c 32
 d 27 e 125 f 1
 g 216 h 128

2 a $\sqrt[4]{a^3} = (\sqrt[4]{a})^3$ b $\sqrt[5]{p^2} = (\sqrt[5]{p})^2$
 c $\sqrt[4]{r^5} = (\sqrt[4]{r})^5$ d $\sqrt{x^{11}} = (\sqrt{x})^{11}$
 e $\sqrt[4]{49^u} = (\sqrt[4]{49})^u$ f $\sqrt[4]{2^a} = (\sqrt[4]{2})^a$
 g $\sqrt[4]{p^a} = (\sqrt[4]{p})^a$ h $\sqrt[4]{x^c} = (\sqrt[4]{x})^c$

3 a $a^{\frac{7}{3}}$ b $x^{\frac{2}{5}}$ c $r^{\frac{6}{5}}$
 d $r^{\frac{5}{6}}$ e $9^{\frac{3}{5}}$ f $3^{\frac{7}{4}}$
 g $5^{\frac{5}{2}}$ h $11^{\frac{9}{2}}$

Exercise 5K

1 a p^7 b t^{-7} c x^4
 d y^{-19} e a^{-7} f u^{-2}
 g w^2 h j^{-2} i $24x^{-1}$
 j 15y

2 a p^8 b a^{10} c h^6
 d a^{-4} e t^{-4} f h^{-16}
 g g^{-3} h k^{10} i $5x^9$
 j $3m^{-6}$

3 a $p^{\frac{4}{5}}$ b m c $a^{\frac{1}{2}}$
 d $w^{-\frac{1}{3}}$ e y^{-1} f $g^{-\frac{1}{2}}$
 g $10r$ h $81n^{\frac{3}{7}}$

4 a $a^{\frac{2}{3}}$ b $n^{\frac{1}{2}}$ c t
 d u^4 e y^{-1} f $v^{-\frac{2}{5}}$
 g $a^{\frac{1}{7}}$ h $x^0 = 1$ i $4a^{\frac{5}{9}}$
 j h^{-1}

5 a $m^{\frac{5}{2}}$ b $a^{\frac{3}{2}}$ c $p^{-\frac{3}{2}}$
 d $p^{\frac{3}{2}}$ e $12x^{\frac{5}{4}}$ f $5d^{-\frac{2}{3}}$
 g $3y^{\frac{3}{2}}$ h $20y^{\frac{10}{3}}$

6 a $2x^{-4}$ b $2p^2$
 c 12 d $10r^{\frac{1}{6}}$

Chapter 5 review

1 $\sqrt{15}$
 2 $\sqrt{2}\sqrt{13}$ or $\sqrt{2} \times \sqrt{13}$
 3 a $5\sqrt{3}$ b $4\sqrt{7}$
 4 a $\frac{7}{9}$ b 10

- 5 a 1 b $\frac{1}{100} = 0.01$ c 4
 d 3 e 100
 6 a p^{10} b t^5 c u^{30}
 d $12t^{\frac{1}{2}}$ e $3a^{-1}$ f 1
 g $4y^{\frac{3}{2}}$

Chapter 6 Algebra 2

Exercise 6A

- 1 a $x=7$ b $t=1$
 c $y=12$ d $m=80$
 e $a=0$ f $a=10$
 g $m=13$ h $y=9$
 i $w=7$ j $x=250$
 2 a $a=9$ b $p=6$
 c $w=4$ d $b=5$
 e $x=1$ f $y=11$
 g $x=18$ h $t=15$
 i $a=14$ j $y=4$
 3 a $x=3$ b $m=3.6$
 c $r=1.2$ d $b=24.5$
 e $y=8.8$ f $p=12$
 4 a $t = \frac{5}{2}$ or $2\frac{1}{2}$ or 2.5
 b $x=2.6$ c $p=2.4$
 d $t=7$ e $m=6.6$
 f $y=54$
 5 a $x=6$ b $t=4$
 c $p=5$ d $t=1$
 e $m=2$ f $w=3$
 g $t=1$ h $x=1$
 6 a $t=3$ b $x=4$
 c $p=24$ d $a=20$
 e $t=4$ f $w=5$
 7 a $t=2$ b $y=0$
 c $r=16$ d $x=3$
 e $u=21$ f $a=5$

Exercise 6B

- 1 a $x=5$ b $t=10$
 c $p=3$ d $m=7$
 e $y=1$ f $w=2$
 g $p=2$ h $t=3$
 i $t=1$ j $a=3$
 k $f=3$ l $q=8$
 2 a $x=2$ b $t=3$
 c $p=2$ d $y=1$
 e $y=0$ f $y=1$

Exercise 6C

- 1 a $x=2$ b $t=3$
 c $m=5$ d $p=6$
 e $t=1$ f $k=5$
 g $a=0$ h $m=4$
 i $t=2$
 2 a $h=1$ b $x=3$
 c $m=2$ d $h=3$
 e $g=2$ f $x=3$
 g $j=1$ h $a=2$
 i $t=7$
 3 a $x=2$ b $t=4$
 c $m=2$ d $m=4$
 e $h=1$ f $x=10$
 g $p=3$ h $y=3$

Exercise 6D

- 1 a $x = \frac{1}{2}$ b $m = \frac{2}{3}$
 c $t = -2$ d $t = -5$
 e $a = -\frac{2}{5}$ f $t = -\frac{1}{2}$
 2 a $x = -\frac{3}{4}$ b $m = -1$
 c $y = \frac{12}{5}$ d $h = -\frac{1}{2}$
 e $g = -1$ f $x = \frac{1}{3}$

3 a $x = -4$ b $t = -\frac{1}{3}$
 c $m = -1$ d $m = \frac{1}{2}$

Exercise 6E

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

c $v = \frac{u-4}{3}$ d $b = \frac{a+5}{6}$

e $x = \frac{y-7}{-3}$ or $x = \frac{7-y}{3}$

f $S = \frac{T-9}{-4}$ or $S = \frac{9-T}{4}$

2 a $R = P - 4Q$ b $Q = \frac{P-R}{4}$

c $B = \frac{A+4C}{3}$ d $c = \frac{a-d}{b}$

e $r = \frac{p-2q}{s}$ f $H = \frac{E-5F}{-G}$ or
 $H = \frac{5F-E}{G}$

3 a $h = 2g + 8$ b $T = 3W - 6R$

c $R = -4P + 40Q$ d $x = 40 - 5y$

e $V = 60U - 10R$ f $c = 6a - 36b - 18$

Exercise 6F

1 a $x = -1$ or $x = -3$ b $t = -2$ or $t = -6$

c $a = -4$ or $a = -10$ d $x = -8$ or $x = 2$

e $p = -5$ or $p = 5$ f $t = 1$ or $t = -9$

g $x = 4$ or $x = -3$ h $m = 3$ or $m = 2$

i $q = 4$ or $q = 7$

2 a $x = -3$ or $x = -\frac{1}{2}$

b $p = -\frac{2}{3}$ or $p = -2$

c $t = 2$ or $t = \frac{1}{2}$

d $y = -\frac{3}{5}$ or $y = 2$

e $a = 5$ or $a = -\frac{1}{3}$

f $k = \frac{1}{4}$ or $k = \frac{9}{2}$

g $x = \frac{4}{5}$ or $x = -\frac{3}{2}$

h $f = -\frac{3}{7}$ or $f = -2$

i $b = \frac{3}{2}$ or $b = \frac{7}{2}$

3 a $x = 0$ or $x = 3$ b $p = 0$ or $p = -8$

c $t = 0$ or $t = -9$ d $a = 0$ or $a = 1$

e $p = 0$ or $p = \frac{1}{2}$ f $y = 0$ or $y = \frac{5}{6}$

Exercise 6G

1 a $x = -1$ or $x = -5$ b $t = -1$ or $t = -3$

c $a = -1$ or $a = -2$ d $m = -2$ or $m = -3$

e $p = -3$ or $p = -4$ f $y = -3$ or $y = -7$

g $k = -1$ or $k = -21$ h $x = -1$ or $x = -7$

i $h = -2$ or $h = -5$

2 a $x = -7$ or $x = 1$ b $x = -1$ or $x = 7$

c $t = -1$ or $t = 5$ d $a = -3$ or $a = 1$

e $k = -4$ or $k = 3$ f $a = -2$ or $a = 10$

g $x = -8$ or $x = 1$ h $p = -2$ or $p = 5$

i $x = -8$ or $x = 5$

3 a $a = 1$ or $a = 3$ b $t = 1$ or $t = 2$

c $x = 1$ or $x = 11$ d $y = 1$ or $y = 5$

e $x = 2$ or $x = 4$ f $p = 3$ or $p = 5$

g $m = 2$ or $m = 10$ h $r = 2$ or $r = 6$

i $x = 1$ or $x = 6$

Exercise 6H

1 a $x = -\frac{1}{2}$ or $x = -4$

b $x = -\frac{1}{3}$ or $x = -1$

c $t = -\frac{2}{5}$ or $t = -3$

d $x = \frac{1}{2}$ or $x = -5$

e $y = 1$ or $y = \frac{1}{3}$

f $x = 2$ or $x = -\frac{1}{4}$

- 2 a $x = -0.1$ or $x = -3.4$
 b $t = -0.4$ or $t = -4.6$
 c $x = -0.4$ or $x = -3.6$
 d $y = 0.4$ or $y = -0.8$
 e $x = 1.5$ or $x = 0.3$
 f $p = 2.4$ or $p = -0.4$

- 3 a $x = -0.586$ or $x = -3.41$
 b $t = -0.232$ or $t = -1.43$
 c $y = -0.288$ or $y = -5.21$
 d $x = 0.725$ or $x = -1.72$
 e $m = 3.87$ or $m = 0.129$
 f $p = 1.62$ or $p = -0.618$

Chapter 6 review

- 1 a $a = \frac{1}{2}$
 b $x = -1$
- 2 a $t = \frac{y-1}{-2}$ or $t = \frac{1-y}{2}$
 b $Q = 3P - 12R$
- 3 a $x = 5$ or $x = -\frac{1}{2}$
 b $t = 0$ or $t = 6$
- 4 a $y = -1$ or $y = -7$
 b $m = -1$ or $m = 6$
 c $t = 4$ or $t = 5$
- 5 a $x = -\frac{1}{3}$ or $x = -2$
 b $x = 0.2$ or $x = -5.2$
 c $y = 0.740$ or $y = -0.540$

Chapter 7 Geometry 2

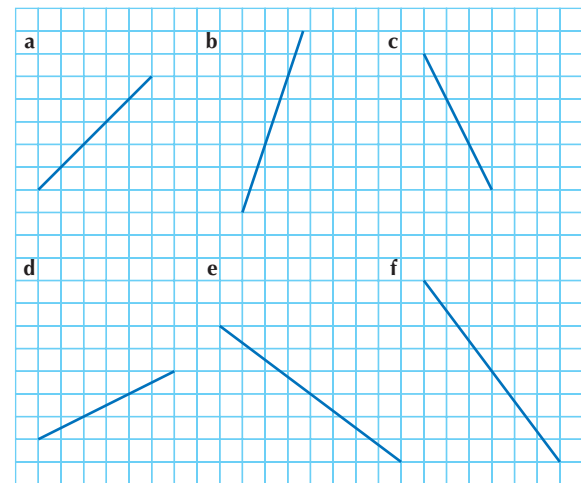
Exercise 7A

- 1 a 2 b 1 c $\frac{1}{2}$
 d $\frac{4}{3}$ e $\frac{4}{5}$ f $\frac{1}{3}$
- 2 a Line a is the steepest.
 b Line f is the least steep.

3 $\frac{1}{30}$

- 4 A 1 B -2 C $\frac{1}{3}$
 D $\frac{3}{2}$ E $-\frac{6}{7}$ F $\frac{8}{3}$
 G $-\frac{3}{2}$ H $-\frac{1}{6}$

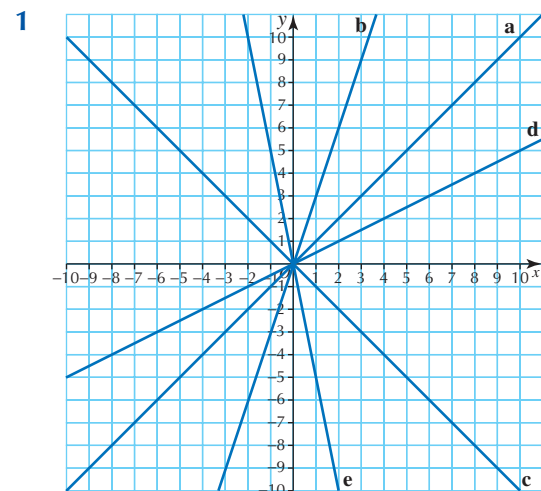
5

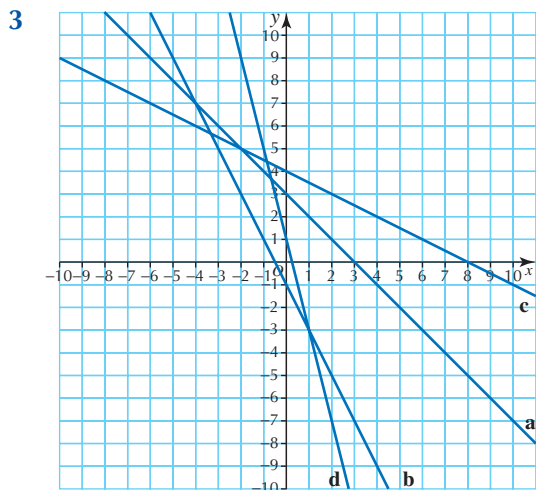
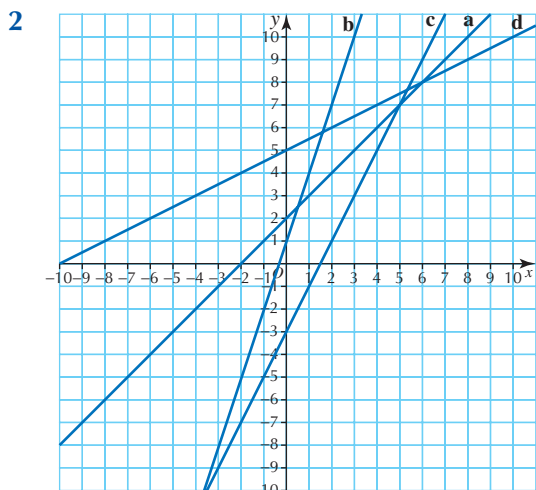


- 6 a 2 b 3 c $\frac{1}{2}$

- 7 Yes, the ramp does meet building regulations because its gradient is 0.0556 (which is less than 0.06).

Exercise 7B





Exercise 7C

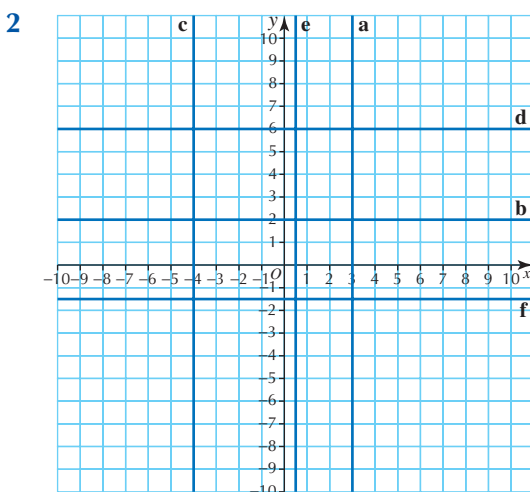
- 1 a i $m = 2$ ii $(0, 1)$
 b i $m = -1$ ii $(0, 3)$
 c i $m = 5$ ii $(0, -1)$
 d i $m = \frac{1}{2}$ ii $(0, 4)$
 e i $m = -3$ ii $(0, -1)$
 f i $m = 2$ ii $(0, -5)$
 g i $m = -\frac{4}{3}$ ii $(0, 1)$
 h i $m = -\frac{1}{3}$ ii $(0, 2)$
- 2 a i $m = -1$ ii $(0, 5)$
 b i $m = -2$ ii $(0, 7)$
 c i $m = 5$ ii $(0, 1)$

- d i $m = 2$ ii $(0, 4)$
 e i $m = -\frac{4}{3}$ ii $(0, \frac{5}{3})$
 f i $m = -\frac{1}{2}$ ii $(0, 4)$
 g i $m = -3$ ii $(0, 9)$
 h i $m = -\frac{3}{4}$ ii $(0, \frac{5}{4})$

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

Exercise 7D

- 1 a $x = 2$ b $y = 3$ c $x = 6$
 d $y = -4$ e $x = -3$ f $y = 0$



Exercise 7E

- 1 **a** 4 **b** 3 **c** 4
d 2 **e** 5 **f** 1
g 2 **h** 0 **i** -6
j -6

- 2 **a** Line **h** is horizontal.
b Lines **i** and **j** are parallel to each other and slope downwards from left to right.

3 **a** $-\frac{7}{6}$ **b** $-\frac{3}{10}$ **c** $\frac{11}{10}$

4 **a** -3 **b** 4 **c** $-\frac{16}{3}$

5 **a** 6 **b** 3 **c** 1 **d** 8

Exercise 7F

- 1 **a** $y = x$ **b** $y = -x - 2$
c $y = 2x - 21$ **d** $y = -3x + 16$
e $y = 4x + 32$ **f** $y = 3x - 4$
g $y = 3x - 9$ **h** $y = 5x + 35$
i $y = -2x + 11$ **j** $y = x + 4$
k $y = 10x + 2$ **l** $x - 3y = -7$ or
 $y = \frac{1}{3}x + 2\frac{1}{3}$

- 2 **a** $y = 4x - 4$ **b** $y = -4x - 9$
c $y = x - 4$ **d** $y = -2x + 13$
e $x + 6y = 13$ **f** $x + 5y = -7$
g $x = 2$ **h** $12y - 4x = 5$

Exercise 7G

- 1 **a** 9 **b** 4 **c** 1 **d** $4\frac{1}{2}$
2 **a** 11 **b** -1 **c** -25 **d** 0.5
3 **a** -1 **b** -15 **c** 1 **d** -9
4 **a** 1 **b** 15 **c** 24 **d** $6\frac{1}{3}$
5 **a** 14 **b** 5 **c** 9 **d** 102
6 2
7 -2
8 -2

9 ± 5

10 -6

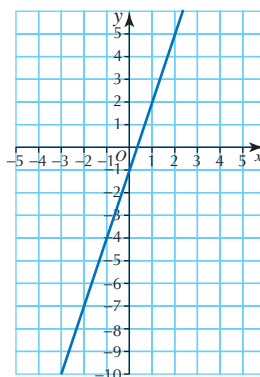
11 1

Chapter 7 review

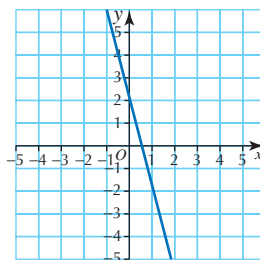
1 **a** 1 **b** -3 **c** $\frac{1}{2}$

2 **a** $y = 2$ **b** $x = -4$

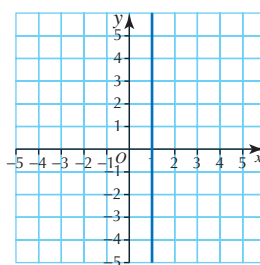
3 **a**



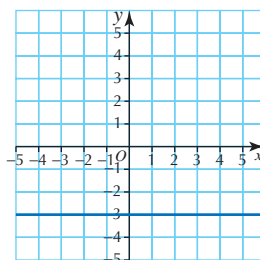
b



c



d



● ANSWERS

4 a i $m = 2$ **ii** $(0, 5)$

b i $m = -3$ **ii** $(0, -4)$

c i $m = -2$ **ii** $(0, 6)$

d i $m = \frac{3}{2}$ **ii** $\left(0, -\frac{5}{2}\right)$

5 a $y = x + 2$ **b** $y = -\frac{3}{2}x - 4$

6 a 3 **b** $-\frac{1}{3}$ **c** $-\frac{10}{7}$

7 a $y = 3x - 8$ **b** $y = -4x - 11$

c $3x - 2y = -13$

8 a $y = 2x$ **b** $y = -4x - 9$

c $7x - 2y = 9$

9 a -1 **b** -28

c 14 **d** -5

10 a 32 **b** 7

c 16 **d** 48