15 a $r = \sqrt{\dfrac{2A}{\pi}}$ **b**   4.8 cm

16 a $A = a^2 + \dfrac{bh}{2}$ **b** $A = 61$

    c $a = \sqrt{A - \dfrac{bh}{2}}$ **d** $a = 12$

17 a side length of the larger cube $= 2x$

    b $V = 9x^3$ **c** $x = \sqrt[3]{\dfrac{V}{9}}$

    d Learner's explanation and working. Example:

      Used the formula $x = \sqrt[3]{\dfrac{V}{9}}$ to work out the value of x. $x = \sqrt[3]{\dfrac{576}{9}} = 4\,\text{cm}$

      Side length of larger cube is $2 \times 4 = 8\,\text{cm}$

      Area of one face of larger cube $= 8 \times 8 = 64\,\text{cm}^2$

      Surface area of larger cube $= 6 \times 64 = 384\,\text{cm}^2$

Exercise 3.1

1   **A** and **ii**, **B** and **vi**, **C** and **iv**, **D** and **i**, **E** and **iii**, **F** and **v**

2 a $3.4 \times 10^2 = 3.4 \times 100 = 340$

    b $4.8 \times 10^3 = 4.8 \times 1000 = 4800$

    c $12.5 \times 10^1 = 12.5 \times 10 = 125$

    d $5 \times 10^5 = 5 \times 100\,000 = 500\,000$

    e $14 \times 10^3 = 14 \times 1000 = 14\,000$

3   **A** and **ii**, **B** and **v**, **C** and **iv**, **D** and **i**, **E** and **iii**

4 a $3.4 \times 10^{-2} = 3.4 \div 100 = 0.034$

    b $8 \times 10^{-3} = 8 \div 1000 = 0.008$

    c $15 \times 10^{-4} = 15 \div 10\,000 = 0.0015$

    d $12 \times 10^{-1} = 12 \div 10 = 1.2$

5 a 2800   **b** 28 000

    c 280   **d** 2880

    e 280 000   **f** 0.2

    g 28   **h** 0.2

    i 0.028   **j** 0.28

    k 0.028   **l** 28.8

6 a 3.4   **b** 3.4

    c 0.034   **d** 0.034

    e 0.034   **f** 0.034

    g 34   **h** 3.4

    i 3400   **j** 30 400

    k 30   **l** 340

7   POWERS OF TEN – EASY!

8 a i 5000   **ii** 500

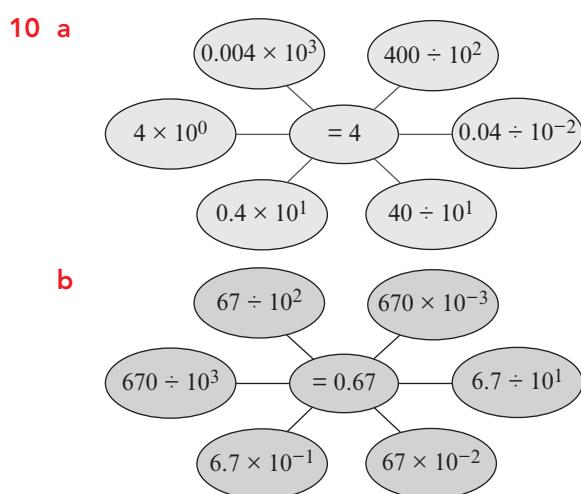   **iii** 50   **iv** 5

     v 0.5   **vi** 0.05

    b larger

9 a i 0.099   **ii** 0.99

     iii 9.9   **iv** 99

     v 990   **vi** 9900

    b smaller

10 a

0.004×10^3 $400 \div 10^2$

4×10^0 $= 4$ $0.04 \div 10^{-2}$

0.4×10^1 $40 \div 10^1$

    b

$67 \div 10^2$ 670×10^{-3}

$670 \div 10^3$ $= 0.67$ $6.7 \div 10^1$

6.7×10^{-1} 67×10^{-2}

11 a 45: A, D, H   4.5: B, E, J   0.45: C, G, I

    b 0.045: F is spare. Learner's own answers. For example: 45×10^{-3}, 4.5×10^{-2}, etc.

12 a ✓   **b** ✓   **c** ✗

    d ✗   **e** ✓   **f** ✗

13 a 270   **b** 0.0048   **c** 125 000

14 a B   **b** A   **c** C   **d** B

Exercise 3.2

1 a 4×0.3 $4 \times 3 = 12$ so $4 \times 0.3 = 1.2$

    b 7×0.4 $7 \times 4 = 28$ so $7 \times 0.4 = 2.8$

    c 9×-0.1 $9 \times -1 = -9$ so $9 \times -0.1 = -0.9$

d $-15 \times 0.2 - 15 \times 2 = -30$ so
$-15 \times 0.2 = -3$

e 8×0.02 $8 \times 2 = 16$ so $8 \times 0.02 = 0.16$

f $-5 \times -0.04 - 5 \times -4 = 20$ so
$-5 \times -0.04 = 0.2$

g 11×0.07 $11 \times 7 = 77$ so
$11 \times 0.07 = 0.77$

2 a $6 \div 0.3$ $6 \times 10 = 60$
$0.3 \times 10 = 3$ $60 \div 3 = 20$

b $8 \div 0.2$ $8 \times 10 = 80$
$0.2 \times 10 = 2$ $80 \div 2 = 40$

c $-9 \div 0.1$ $-9 \times 10 = -90$
$0.1 \times 10 = 1$ $-90 \div 1 = -90$

d $12 \div 0.4$ $12 \times 10 = 120$
$0.4 \times 10 = 4$ $120 \div 4 = 30$

e $6 \div -0.02$ $6 \times 100 = 600$
$-0.02 \times 100 = -2$ $600 \div -2 = -300$

f $8 \div 0.04$ $8 \times 100 = 800$
$0.04 \times 100 = 4$ $800 \div 4 = 200$

g $-16 \div -0.08$ $-16 \times 100 = -1600$
$-0.08 \times 100 = -8$ $-1600 \div -8 = 200$

3 a 1.2   **b** 2.6

c 3.6   **d** -8.1

e 3.3   **f** -0.24

g 0.28   **h** 0.45

i 1.4   **j** -5.55

4 **A**, **C**, **E**, **I** (0.024); **D**, **G**, **J**, **L** (0.24);
B, **F**, **H**, **K** (2.4)

5 a 20   **b** 40

c 30   **d** -40

e 200   **f** -250

g 300   **h** 3000

i 200   **j** -400

6 a **B**   **b** **B**   **c** **C**   **d** **B**

7 a 0.12   **b** 1.35

c 0.072   **d** 0.15

e 0.055   **f** 30

g 9   **h** 5

i 7   **j** 40

8 a True   **b** True

c False   **d** True

9 Hassan is incorrect. Numerator should be:
$2.5 \times 0.2 = 0.5$, not 5.

Denominator should be: $5 \times 0.1 = 0.5$, not 50.
Answer $= 1$.

10 a 20   **b** 30

c 500   **d** 0.2

11 a **i** 1.1   **ii** 2.2   **iii** 3.3

     iv 4.4   **v** 5.5   **vi** 6.6

b **i** larger   **ii** smaller

c **i** 80   **ii** 40

   iii 20   **iv** 16

   v 10

d **i** larger   **ii** larger

12 a 158.4   **b** 158.4

c 0.015 84   **d** 352

e 0.352   **f** 3.52

13 a Estimate: $6 \times 40 = 240$ Accurate: 271.377

b Estimate: $200 \div 0.4 = 500$ Accurate: 495

c Estimate: $\dfrac{80 \times 5}{0.2} = \dfrac{400}{0.2} = 2000$
Accurate: 2400

14 a $5.4\,\text{m}^2$ **b** $7.2\,\text{m}^2$

c $0.48\,\text{m}^2$ **d** $0.124\,\text{m}^2$

15 $4\,\text{m}$

16 $0.35\,\text{m}$

17 a True   **b** True

c False, 0.0025   **d** False, 0.3

e True   **f** True

Exercise 3.3

1 a $300 increased by 15%
$100\% + 15\% = 115\%$ multiplier is 1.15
$300 \times 1.15 = \$345$

b $200 increased by 20%
$100\% + 20\% = 120\%$ multiplier is 1.2
$200 \times 1.2 = \$240$

c $400 increased by 32%
$100\% + 32\% = 132\%$ multiplier is 1.32
$400 \times 1.32 = \$528$

2 a $300 decreased by 15%
$100\% - 15\% = 85\%$ multiplier is 0.85
$300 \times 0.85 = \$255$

b $200 decreased by 20%

$100\% - 20\% = 80\%$ multiplier is 0.8

$200 \times 0.8 = \$160$

c $400 decreased by 32%

$100\% - 32\% = 68\%$ multiplier is 0.68

$400 \times 0.68 = \$272$

3 **A** and **vi**, **B** and **iii**, **C** and **i**, **D** and **iv**, **E** and **ii**, **F** and **v**

4 **a** $800 increased by 10%, then increased by 20%.

$800 \times 1.1 = 880$ → $880 \times 1.2 = \$1056$

b $800 decreased by 10%, then decreased by 20%.

$800 \times 0.9 = 720$ → $720 \times 0.8 = \$576$

c $800 increased by 25%, then decreased by 40%.

$800 \times 1.25 = 1000$ → $1000 \times 0.6 = \$600$

d $800 increased by 5%, then decreased by 15%.

$800 \times 1.05 = 840$ → $840 \times 0.85 = \$714$

5 **a** **i** 198   **ii** 198

   b =

   c **i** =   **ii** =

6 **a** **i** 85.8   **ii** 362.5

   b **i** 891   **ii** 48.72

7 **a** 1.071   **b** $1.29

8 **a** **i** 33.6   **ii** 120

   b **i** 127.5   **ii** 76.95

9 **a** 0.63   **b** $529.20

10

End of year:	Calculation:	Amount:
1	4000×1.05	$4200.00
2	$4000 \times (1.05)^2$	$4410.00
3	$4000 \times (1.05)^3$	$4630.50
4	$4000 \times (1.05)^4$	$4862.03
5	$4000 \times (1.05)^5$	$5105.13

11 **a** **i** 1800×0.88

     ii $1800 \times (0.88)^2$

     iii $1800 \times (0.88)^3$

   b The value of the scooter after 7 years.

c The value of the scooter after 12 years.

d $1800 \times (0.88)^4 = \$1079.45$ and $1800 \times (0.88)^5 = \$949.92$

e $1800 \times (0.88)^n$

12 **a** **A** and **ii**, **B** and **v**, **C** and **i**, **D** and **iv**, **F** and **iii**

   b **E** and 0.54

13 **a** 60% increase then 45% decrease → multiplier $= 0.88$ → $600 \times 0.88 = \$528$

   b 15% decrease then 12% increase → multiplier $= 0.952$ → $800 \times 0.952 = \$761.60$

   c 45% increase then 24% increase → multiplier $= 1.798$ → $400 \times 1.798 = \$719.20$

14 **a** 1.1016   **b** $2400

15 Learner's own answers. For example:

   a $1.5 \times 0.4 = 0.6$ → 50% increase and 60% decrease

     $1.2 \times 0.5 = 0.6$ → 20% increase and 50% decrease

   b $1.25 \times 1.2 = 1.5$ → 25% increase and 20% increase

     $2 \times 0.75 = 1.5$ → 100% increase and 25% decrease

16 500 000

Exercise 3.4

1 **a** 115, 116, 117, 118, 119, 120, 121, 122, 123, 124

   b 115

   c 124

2 **a** 65, 66, 67, 68, 69, 70, 71, 72, 73, 74

   b 65

   c 74

3 **a** 24.5, 24.6, 24.7, 24.8, 24.9, 25.0, 25.1, 25.2, 25.3, 25.4

   b 24.5

   c 25.4

4 **a** 7.5, 7.6, 7.7, 7.8, 7.9, 8.0, 8.1, 8.2, 8.3, 8.4

   b 7.5

   c 8.4

5 **a** 2.5   **b** 3.5

6 **a** 85   **b** 95

7 **a** $6.5 \leqslant x < 7.5$

b $27.5 \leqslant x < 28.5$

c $134.5 \leqslant x < 135.5$

d $558.5 \leqslant x < 559.5$

8 **a** $45 \leqslant x < 55$ **b** $415 \leqslant x < 425$

c $3735 \leqslant x < 3745$ **d** $5205 \leqslant x < 5215$

9 **a** $750 \leqslant x < 850$ **b** $1150 \leqslant x < 1250$

c $6650 \leqslant x < 6750$ **d** $9050 \leqslant x < 9150$

10 **a** $18.5\,\text{m}^2$

b $19.5\,\text{m}^2$

c $18.5\,\text{m}^2 \leqslant x < 19.5\,\text{m}^2$

11 **a** **i** 55 **ii** 65

b $55 \leqslant x < 65$

12 **A**, **ii** and **c**; **B**, **ii** and **a**; **C**, **i** and **e**; **D**, **iii** and **b**; **E**, **i** and **f**; **F**, **iii** and **d**

13 **a** **i** 495 g

ii 505 g

iii $495\,\text{g} \leqslant x < 505\,\text{g}$

b **i** $2 \times 495\,\text{g} = 990\,\text{g}$

ii $2 \times 505\,\text{g} = 1010\,\text{g}$

14 **a** **i** 145 cm

ii 155 cm

iii $145\,\text{cm} \leqslant x < 155\,\text{cm}$

b Carlos has worked out the correct answer as all pieces of wood can vary between 145 cm and 155 cm, so you must multiply the upper and lower bounds by 3.

Pepe is incorrect as he has multiplied the rounded number by three then worked out $+/-\,5\,\text{cm}$ from that answer instead of $+/-\,15\,\text{cm}$ from that answer (as there are three pieces of wood).

15 **a** **i** 1.15 litres or 1150 mL

ii 1.25 litres or 1250 mL

iii 1.15 litres $\leqslant x <$ 1.25 litres or $1150\,\text{mL} \leqslant x < 1250\,\text{mL}$

b **i** 5.75 litres or 5750 mL

ii 6.25 litres or 6250 mL

iii 5.75 litres $\leqslant x <$ 6.25 litres or $5750\,\text{mL} \leqslant x < 6250\,\text{mL}$

Exercise 4.1

1 **a** $2x - 6 = 10$
$2x = 10 + 6$
$2x = 16$
$x = \dfrac{16}{2}$
$x = 8$

b $4(3x + 2) = 32$
$12x + 8 = 32$
$12x = 32 - 8$
$12x = 24$
$x = \dfrac{24}{12}$
$x = 2$

c $\dfrac{y}{2} - 3 = 1$
$\dfrac{y}{2} = 1 + 3$
$\dfrac{y}{2} = 4$
$y = 4 \times 2$
$y = 8$

d $5y + 3 = 9 + 2y$
$5y - 2y = 9 - 3$
$3y = 6$
$y = \dfrac{6}{3}$
$y = 2$

2 **a** $5 - 2x = 9$
$-2x = 9 - 5$
$-2x = 4$
$x = \dfrac{4}{-2}$
$x = -2$

b $6(3 - x) = 3x$
$18 - 6x = 3x$
$18 = 3x + 6x$
$18 = 9x$
$\dfrac{18}{9} = x$
$x = 2$

c $\dfrac{3y}{4} + 1 = 7$
$\dfrac{3y}{4} = 7 - 1$
$\dfrac{3y}{4} = 6$
$3y = 6 \times 4$
$3y = 24$
$y = \dfrac{24}{3}$
$y = 8$

d $3(y + 5) = 2(20 - y)$
$3y + 15 = 40 - 2y$
$3y + 2y = 40 - 15$
$5y = 25$
$y = \dfrac{25}{5}$
$y = 5$

3 **a** $\dfrac{30}{x} = 5$
$30 = 5x$
$\dfrac{30}{5} = x$
$x = 6$

b $\dfrac{63}{y + 1} = 9$
$63 = 9(y + 1)$
$\dfrac{63}{9} = y + 1$
$7 = y + 1$
$7 - 1 = y$
$y = 6$

4 **a** $g = 12$ **b** $g = -10$

c $p = 7$ **d** $g = 7$

e $y = 5$ **f** $y = 12$

g $x = -3$ **h** $x = -2$

5 **a** $5x + 15 = 10x - 20 \rightarrow x = 7$

    b $x + 3 = 2x - 4 \rightarrow x = 7$

    c Learner's own answers.

6 **a** $8x - 32 + 20 - 4x = 0 \rightarrow 4x - 12 = 0 \rightarrow x = 3$

    b $2(x - 4) + 5 - x = 0 \rightarrow 2x - 8 + 5 - x = 0 \rightarrow$
      $x - 3 = 0 \rightarrow x = 3$

    c Learner's own answers.

7 **a** $5(23 + 4) = 5 \times 27 = 135$ and
      $2(30 - 23) = 2 \times 7 = 14$, $135 \neq 14$

    b Line 1: he added 5 and 4 instead of
      multiplying 5 and 4.

      Line 2: he subtracted $2x$ instead of adding
      $2x$ and added 9 instead of subtracting 9.

    c $x = 5\frac{5}{7}$,

      $5\left(5\frac{5}{7} + 4\right) = 5 \times 9\frac{5}{7} = 45 + \frac{25}{7} = 45 + 3\frac{4}{7} = 48\frac{4}{7}$

      and $2\left(30 - 5\frac{5}{7}\right) = 2 \times 24\frac{2}{7} = 48\frac{4}{7}$

8 **a** $a = 21$

    b $b = \frac{1}{4}$

    c $c = 2$

    d $d = 4\frac{3}{5}$
    Learner's checks.

9 **a** $n + 2(n + 3) = 90 \rightarrow 3n + 6 = 90$

    b $n = 28$

    c 28 and 62

10 **a** $5(x - 8) = 2(x + 10)$

    b 20

11 **a** **B** and **E**

    b **A** $x = 6480$ **B** $x = 5$ **C** $x = \frac{1}{5}$ **D** $x = \frac{1}{5}$
      E $x = 5$

      B and **E** give the correct answer of five
      grandchildren.

12 **a** $x + 50$ and $2x + 80$

    b $2x + 80 = 144$

    c $x = 32$

13 **a** $s + 2s + 2s + 5 = 100 \rightarrow 5s + 5 = 100$

    b $s = 19$

    c 43 cm

14 **a** $y + 3y + y - 2 + 4(y - 2) = 116$

    b $y = 14$

    c 48

15 **a** **i** $3(a - 2) = a$ **ii** 3 cm

    b **i** $3(a - 2) + 3(a - 2) + a + a = 44$ or
      $2a + 6(a - 2) = 44$ or $a + 3(a - 2) = 22$
      or $4a - 6 = 22$

      ii 7 cm and 15 cm

16 **a** $\frac{420}{9 - x} = 60$ **b** $x = 2$

Exercise 4.2

1 ① $2x - 1 = x + 5$ ② $y = 2x - 1$
      $2x - x = 5 + 1$ $= 2 \times 6 - 1$
            $x = 6$ $= 12 - 1$
                                         $= 11$
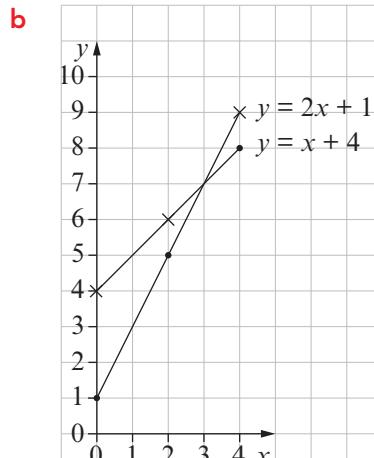
    ③ Check values are correct. $y = x + 5$
                                    $= 6 + 5$
                                    $= 11$

    ④ $x = 6$ and $y = 11$

2 ① $6x + 3 = 2x - 9$ ② $y = 6x + 3$
      $6x - 2x = -9 - 3$ $= 6 \times -3 + 3$
          $4x = -12$ $= -18 + 3$
              $x = \frac{-12}{4} = -3$ $= -15$

    ③ $y = 2x - 9$ ④ $x = -3$ and $y = -15$
      $= 2 \times -3 - 9$
      $= -6 - 9$
      $= -15$

3 **a**

$y = 2x + 1$

x	0	2	4
y	1	5	9

$y = x + 4$

x	0	2	4
y	4	6	8

    b

    c $(3, 7)$; $x = 3$, $y = 7$