Further Practice: Algebraic Skills and Techniques

Remember: all questions match the numbered examples on pages 223–232.

1 If $x = 2$, evaluate $3x - 5$.

2 If $a = 3$, $b = 2$ and $c = 6$, find the value of $5ab - 4c$.

3 If $m = 4$, evaluate $m^2 - m$.

4 If $p = 10$, $3p^2 = ?$

5 If $t = -3$, find the value of $10 - t$.

6 If $a = -2$, find the value of $6a^2$.

7 Find the value of $x^3 - 4x^2 + 8x - 5$ if $x = -1$.

8 Evaluate $\sqrt{x^2 + y^2}$ if $x = 9$ and $y = 40$.

9 Evaluate $\dfrac{b^2 + c^2 - a^2}{2bc}$ when $a = 700$, $b = 800$ and $c = 500$.

10 Find the value, correct to two decimal places, of $4\pi r^2$ when $r = 9$.

11 If $r = \sqrt{\dfrac{A}{\pi}}$ find the value of r, to one decimal place, if $A = 415.5$

12 If $r = 0.05$, $n = 6$ and $M = 2000$, find the value of N to two decimal places if $N = M\left[\dfrac{(1+r)^n - 1}{r(1+r)^n}\right]$.

13 Find $9k + 3k - 7k$

14 Simplify $5a + 4b - 3c$, if possible.

15 Simplify $7a + 3a + 4b$

16 Simplify $8p - 3q - 6p + 5q$

17 Simplify $x^2 + 6x - 5 + 3x - 4x^2 - 2$

18 Simplify $-5a + 4b + 3a - 7b$

19 Simplify $7pq + 3p - 4q - 6qp - 3q + 1$

20 Simplify $7 \times a \times b$

21 Find $4p \times 5q$

22 Find $2a \times 3b \times 5c \times 6d$

23 Simplify $4x \times 3x$

24 Simplify $3p \times 5p \times 2q$

25 Simplify $x^4 \times x^6$

26 Find $a^3b^2 \times ab^5$

27 Simplify $m^3 \times n^4$

28 Find $2a^5 \times 4a^4$

29 Simplify $7x^3y^2 \times 5xy^3$

30 Simplify $6a^2b^3c^2 \times 3abc \times 2a^3b^2c^2$

31 Find $6x \div 2$

32 Find $7m \div m$

33 Find $15xyz \div 5y$

34 Simplify $\dfrac{9ab}{3b}$

35 Simplify $\dfrac{15pq}{3r}$

36 Simplify $\dfrac{18x^2}{12x}$

37 Find $p^6 \div p^2$

38 Simplify $a^5b^6 \div a^2b^3$

39 Find $x^8 \div a^2$

40 Find $36x^{36} \div 9x^9$

41 Find $12a^7b^5c^2 \div 3a^6bc^2$

42 Simplify $\dfrac{24a^7b}{8a^6b^2}$

43 Expand $3(x+5)$

44 Expand $4(2a-3b)$

45 Expand $a(a+6)$

46 Expand $5t(4t+3u-1)$

47 Expand $-7(2a+5b)$

48 Expand $-(p-q)$

49 Simplify $7x^2 + 4x \times 2x$

50 Simplify $10n^{10} \div 2n^2 - 4n \times 3n^7$

51 Expand and simplify $2(8h+7) + 3(5h-9)$

52 Expand and simplify $5(2x+3) - 2(4x+9)$

53 Expand and simplify $x(x-8) - 4(x-1)$

54 Solve $7k + 4 = 25$

55 Solve the equation $6x + 7 = 23 - 2x$

56 Solve $\dfrac{8a-5}{3} = 2a+1$

57 Solve $5x^2 = 1805 \quad (x > 0)$

58 Solve $\sqrt{7x+2} = 3$

59 Change the subject of the equation $v = u + at$ to a.

60 Change the subject of the equation $S = V_0 - Dn$ to n.

61 Make h the subject of the formula $A = \dfrac{1}{2}bh$.

62 Change the subject of the formula $P = 2l + 2b$ to l.

63 Change the subject of the formula $C = \dfrac{5}{9}(F-32)$ to F.

64 Change the subject of the equation $x = kt^2$ to t.

65 Change the subject of the formula $A = \pi r^2$ to r $(r > 0)$.

66 Find the value of x if $y = mx + b$ and, when $y = 7$, $m = 2$ and $b = -1$.

67 If $C = \dfrac{k}{x^2}$ find the value of k for which $C = 50$ and $x = 3.4$

68 Evaluate x $(x > 0)$, when $y = ax^2$ given $a = 5$ and $y = 320$.

69 Find the value of r, correct to one decimal place, if $V = \dfrac{1}{3}\pi r^2 h$ and $V = 5750$ when $h = 19$ $(r > 0)$.

70 a Change the subject of the formula $V = \dfrac{4}{3}\pi r^3$ to r.
   b If $V = 1988$ find r.

71 a Change the subject of the formula $A = \pi(R^2 - r^2)$ to R $(R > 0)$.
   b Find R, correct to one decimal place, if $r = 13$ and $A = 356$.

72 Use the estimation and refinement technique to find the value of x for which $6^x = 10\,077\,696$.

73 Find the value of t, to the nearest whole number, for which $2.3^t = 116\,000$.

74 Find, to two decimal places, the value of x for which $3^x = 21$.

75 If $N = 12\,200$, $M = 800$ and $r = 0.04$, use the estimation and refinement technique and your calculator to find the value of n, to the nearest whole number, for which $N = M\left\{\dfrac{(1+r)^n - 1}{r(1+r)^n}\right\}$.

76 Express 28 000 in scientific notation.

77 Express in scientific notation:
a   600 000
b   9 417
c   7 290 000 000

78 Write 7×10^5 as a normal number.

79 Write as normal numbers:
a 4×10^6
b 3.5×10^4
c 1.234×10^8

80 Express in scientific notation:
a   0.0007
b   0.0312
c   0.000 45

81 Write as decimals:
a 5×10^{-4}
b 8.7×10^{-6}
c 4.61×10^{-5}

82 Find the product of 4.6×10^4 and 3.1×10^{-6}.

83 Find $400\,000 \div 0.000\,05$, expressing the answer in scientific notation.

84 The population of Western Australia is 2×10^6 and its area is 2.5×10^6 square kilometres. Find the population density in people per square kilometre.

85 a   The planet Mercury is 57.5 million kilometres from the sun. Express this distance in metres, in scientific notation.
b   If the speed of light is 3×10^8 m/s, find the time for light from the sun to reach Mercury.

1 Simplify $3x^2 + 5x \times 2x - 8x^3 \div 4x$. *Hint 1*

2 If $a = 3$, $b = 4$ and $c = 6$, evaluate $\dfrac{7a + 4b - 3c}{a^2 + b^2}$. *Hint 2*

3 Simplify $3xy + 5x - 2y + 4yx$. *Hint 3*

4 Expand and simplify:
$5x(x^2 + 3x - 2) - 2(3x^2 + 1)$. *Hint 4*

5 Solve $\dfrac{4x}{9} + \dfrac{x+1}{3} = 5$. *Hint 5*

6 Change the subject of the formula $V = \dfrac{2\pi r^3}{3}$ to r. *Hint 6*

7 Consider the formula $R = \dfrac{a^2 + b^2 - c^2}{2ab}$:

　a Change the subject of the formula to c (given that $c > 0$).

　b If $R = 0.5$, $a = 8$ and $b = 5$ find the value of c. *Hint 7*

8 Use the estimation and refinement technique to find the value of x, to two decimal places, for which $10^x = 5370$. *Hint 8*

9 Find the value of $\dfrac{5.9 \times 10^6 + 1.5 \times 10^5}{4.4 \times 10^8 \times 2.5 \times 10^{-3}}$. *Hint 9*

10 Simplify $8x - 5a + 3a$. *Hint 10*

11 If $p = 3$ and $q = 5$, evaluate pq^2. *Hint 11*

12 Simplify $\dfrac{2ab^2}{8a^3b^2}$. *Hint 12*

13 Arrange in ascending order:
3.1×10^{-2}, 5.834×10^{-4}, 9×10^{-3}. *Hint 13*

14 If $y = 2x^2 + b$ and x is a positive number, find x when $y = 19$ and $b = 1$. *Hint 14*

15 Francesca tried to solve the equation $7x + 19 = 2x - 4$. Her solution appears below.

$$7x + 19 = 2x - 4$$
$7x = 2x - 15$	line I
$5x = 15$	line II
$x = 3$	line III

　a Is $x = 3$ the correct solution to the equation? *Hint 15*

　b Where did Francesca make a mistake? *Hint 16*

Hint 1: Remember the correct order of operations.

Hint 2: Make sure you divide by the whole denominator.

Hint 3: Only add or subtract like terms. xy and yx are the same term.

Hint 4: All of the second bracket must be subtracted. Be careful with the signs.

Hint 5: Multiply every term by the common denominator. Take care when there is more than one term in part of a fraction.

Hint 6: First divide by $\frac{2\pi}{3}$.

Hint 7: Substitute into the rearranged formula from part **a**.

Hint 8: You should know that $10^3 = 1000$ and $10^4 = 10\,000$. Between what two whole numbers must x lie?

Hint 9: Divide the whole numerator by the whole denominator. Use brackets or the calculator's memory.

Hint 10: Remember that the sign in front of the term belongs to the term. Be careful with the signs.

Hint 11: Only q is squared.

Hint 12: The answer is a fraction.

Hint 13: Ascending order means from lowest to highest. Write each number as a decimal for easy comparison.

Hint 14: Substitute, then solve an equation.

Hint 15: Substitute x = 3 into the original equation to see if it satisfies it (makes it true).

Hint 16: Check each line of the solution. There may be more than one mistake.

Solutions

UNIT 5: ALGEBRAIC MODELLING

Ch 12: Algebraic Skills and Techniques

Further Practice p233

1 If $x = 2$,
$$3x - 5 = 3 \times 2 - 5$$
$$= 1$$

2 If $a = 3$, $b = 2$ and $c = 6$,
$$5ab - 4c = 5 \times 3 \times 2 - 4 \times 6$$
$$= 30 - 24$$
$$= 6$$

3 If $m = 4$,
$$m^2 - m = 4^2 - 4$$
$$= 12$$

4 If $p = 10$,
$$3p^2 = 3 \times 10^2$$
$$= 300$$

5 If $t = -3$,
$$10 - t = 10 - (-3)$$
$$= 13$$

6 If $a = -2$,
$$6a^2 = 6 \times (-2)^2$$
$$= 6 \times 4$$
$$= 24$$

7 If $x = -1$,
$$x^3 - 4x^2 + 8x - 5$$
$$= (-1)^3 - 4 \times (-1)^2 + 8 \times -1 - 5$$
$$= -1 - 4 - 8 - 5$$
$$= -18$$

8 If $x = 9$ and $y = 40$,
$$\sqrt{x^2 + y^2} = \sqrt{9^2 + 40^2}$$
$$= \sqrt{1681}$$
$$= 41$$

9 If $a = 700$, $b = 800$ and $c = 500$,
$$\frac{b^2 + c^2 - a^2}{2bc} = \frac{800^2 + 500^2 - 700^2}{2 \times 800 \times 500}$$
$$= \frac{400\,000}{800\,000}$$
$$= 0.5$$

10 When $r = 9$,
$$4\pi r^2 = 4 \times \pi \times 9^2$$
$$= 1017.876\,02 \dots$$
$$= 1017.88 \quad (2\ \text{d.p.})$$

11 If $A = 415.5$,
$$r = \sqrt{\frac{A}{\pi}}$$
$$= \sqrt{\frac{415.5}{\pi}}$$
$$= 11.500\,337\,29 \dots$$
$$= 11.5 \quad (1\ \text{d.p.})$$

12 If $r = 0.05$, $n = 6$ and $M = 2000$,
$$N = M \left[\frac{(1+r)^n - 1}{r(1+r)^n} \right]$$
$$= 2000 \times \left[\frac{(1 + 0.05)^6 - 1}{0.05(1 + 0.05)^6} \right]$$
$$= 10\,151.384\,13 \dots$$
$$= 10\,151.38 \quad (2\ \text{d.p.})$$

13 $9k + 3k - 7k = 5k$

14 $5a + 4b - 3c = 5a + 4b - 3c$

15 $7a + 3a + 4b = 10a + 4b$

16 $8p - 3q - 6p + 5q = 2p + 2q$

17 $x^2 + 6x - 5 + 3x - 4x^2 - 2$
$$= -3x^2 + 9x - 7$$

18 $-5a + 4b + 3a - 7b = -2a - 3b$

19 $7pq + 3p - 4q - 6qp - 3q + 1$
$$= pq + 3p - 7q + 1$$

20 $7 \times a \times b = 7ab$

21 $4p \times 5q = 20pq$

22 $2a \times 3b \times 5c \times 6d = 180abcd$

23 $4x \times 3x = 12x^2$

24 $3p \times 5p \times 2q = 30p^2q$

25 $x^4 \times x^6 = x^{10}$

26 $a^3b^2 \times ab^5 = a^4b^7$

27 $m^3 \times n^4 = m^3n^4$

28 $2a^5 \times 4a^4 = 8a^9$

29 $7x^3y^2 \times 5xy^3 = 35x^4y^5$

30 $6a^2b^3c^2 \times 3abc \times 2a^3b^2c^2 = 36a^6b^6c^5$

31 $6x \div 2 = 3x$

32 $7m \div m = 7$

33 $15xyz \div 5y = 3xz$

34 $\dfrac{9ab}{3b} = 3a$

35 $\dfrac{15pq}{3r} = \dfrac{5pq}{r}$

36 $\dfrac{18x^2}{12x} = \dfrac{3x}{2}$

37 $p^6 \div p^2 = p^4$

38 $a^5b^6 \div a^2b^3 = a^3b^3$

39 $x^8 \div a^2 = x^8 \div a^2 \quad \left[\text{or } \dfrac{x^8}{a^2} \right]$

40 $36x^{36} \div 9x^9 = 4x^{27}$

41 $12a^7b^5c^2 \div 3a^6bc^2 = 4ab^4$

42 $\dfrac{24a^7b}{8a^6b^2} = \dfrac{3a}{b}$

43 $3(x+5) = 3 \times x + 3 \times 5$
$\qquad = 3x + 15$

44 $4(2a - 3b) = 4 \times 2a - 4 \times 3b$
$\qquad = 8a - 12b$

45 $a(a+6) = a \times a + a \times 6$
$\qquad = a^2 + 6a$

46 $5t(4t + 3u - 1) = 20t^2 + 15tu - 5t$

47 $-7(2a + 5b) = -7 \times 2a - 7 \times 5b$
$\qquad = -14a - 35b$

48 $-(p - q) = -p + q$

49 $7x^2 + 4x \times 2x = 7x^2 + 8x^2$
$\qquad = 15x^2$

50 $10n^{10} \div 2n^2 - 4n \times 3n^7 = 5n^8 - 12n^8$
$\qquad = -7n^8$

51 $2(8h + 7) + 3(5h - 9)$
$\quad = 16h + 14 + 15h - 27$
$\quad = 31h - 13$

52 $5(2x + 3) - 2(4x + 9)$
$\quad = 10x + 15 - 8x - 18$
$\quad = 2x - 3$

53 $x(x - 8) - 4(x - 1)$
$\quad = x^2 - 8x - 4x + 4$
$\quad = x^2 - 12x + 4$

54 $7k + 4 = 25$ [subtract 4]
$\quad 7k = 21$ [divide by 7]
$\quad k = 3$

55 $6x + 7 = 23 - 2x$ [add $2x$]
$\quad 8x + 7 = 23$ [subtract 7]
$\qquad 8x = 16$ [divide by 8]
$\qquad x = 2$

56 $\dfrac{8a-5}{3} = 2a + 1$ [multiply by 3]
$\quad 8a - 5 = 6a + 3$ [subtract $6a$]
$\quad 2a - 5 = 3$ [add 5]
$\qquad 2a = 8$ [divide by 2]
$\qquad a = 4$

57 $5x^2 = 1805$ [divide by 5]
$\quad x^2 = 361$ [take the square root]
$\qquad x = \sqrt{361}$ $(x > 0)$
$\qquad x = 19$

58 $\sqrt{7x+2} = 3$ [square both sides]
$\quad 7x + 2 = 9$
$\qquad 7x = 7$
$\qquad x = 1$

59 $v = u + at$
$u + at = v$ [turn the equation around]
$\quad at = v - u$ [subtract u from both sides]
$\qquad a = \dfrac{v-u}{t}$ [divide both sides by t]

60 $S = V_0 - Dn$
$S + Dn = V_0$ [add Dn to both sides]
$\quad Dn = V_0 - S$ [subtract S]
$\qquad n = \dfrac{V_0 - S}{D}$ [divide by D]

61 $A = \dfrac{1}{2}bh$
$2A = bh$ [multiply by 2]
$\dfrac{2A}{b} = h$ [divide by b]
$\quad h = \dfrac{2A}{b}$

62 $P = 2l + 2b$
$2l + 2b = P$
$\quad 2l = P - 2b$ [subtracting $2b$]
$\qquad l = \dfrac{P-2b}{2}$ [dividing by 2]
[Or: $\quad P = 2l + 2b$
$\qquad \dfrac{P}{2} = l + b$ [dividing by 2]
$\qquad l = \dfrac{P}{2} - b$ [subtracting b]]

63 $C = \dfrac{5}{9}(F - 32)$
$\dfrac{9C}{5} = F - 32$
$F = \dfrac{9C}{5} + 32$

64 $x = kt^2$
$kt^2 = x$
$t^2 = \dfrac{x}{k}$
$t = \pm\sqrt{\dfrac{x}{k}}$

65 $A = \pi r^2$
$\pi r^2 = A$
$r^2 = \dfrac{A}{\pi}$
$r = \sqrt{\dfrac{A}{\pi}}$ $(r > 0)$

66 $y = mx + b$
$m = 2, \ b = -1, \ y = 7$
$\quad 7 = 2x + (-1)$
$2x - 1 = 7$
$\quad 2x = 8$
$\quad x = 4$

67 $C = \dfrac{k}{x^2}$
$C = 50, \ x = 3.4$
$50 = \dfrac{k}{3.4^2}$
$\quad k = 50 \times 3.4^2$
$\quad = 578$

68 $y = ax^2$
$y = 320, \ a = 5$
$320 = 5x^2$
$\quad x^2 = 64$
$\qquad x = \sqrt{64}$ $(x > 0)$
$\qquad x = 8$

69 $V = \dfrac{1}{3}\pi r^2 h$
$V = 5750, \ h = 19$
$5750 = \dfrac{1}{3} \times \pi \times r^2 \times 19$
$5750 = \dfrac{19\pi}{3}r^2$
$r^2 = 5750 \div \left(\dfrac{19\pi}{3}\right)$
$\quad = 288.9918704\ldots$
$\quad r = \sqrt{288.9918704\ldots}$ $(r > 0)$
$\quad = 16.999\,760\,89\ldots$
$\quad = 17.0$ (1 d.p.)

70 a $\quad V = \dfrac{4}{3}\pi r^3$
$\qquad 3V = 4\pi r^3$
$\qquad r^3 = \dfrac{3V}{4\pi}$
$\qquad r = \sqrt[3]{\dfrac{3V}{4\pi}}$

  b $\quad V = 1988,$
$\qquad r = \sqrt[3]{\dfrac{3V}{4\pi}}$
$\qquad = \sqrt[3]{\dfrac{3 \times 1988}{4\pi}}$
$\qquad = 7.800\,263\,197\ldots$
$\qquad = 7.8$ (1 d.p.)

71 a $\quad A = \pi(R^2 - r^2)$
$\qquad \dfrac{A}{\pi} = R^2 - r^2$
$\qquad R^2 = \dfrac{A}{\pi} + r^2$
$\qquad R = \sqrt{\dfrac{A}{\pi} + r^2}$ $(R > 0)$

  b $\quad A = 356, \ r = 13$
$\qquad R = \sqrt{\dfrac{A}{\pi} + r^2}$ $(R > 0)$
$\qquad = \sqrt{\dfrac{356}{\pi} + 13^2}$
$\qquad = 16.802\,330\,78\ldots$
$\qquad = 16.8$ (1 d.p.)

72 $6^x = 10\,077\,696$
Guess $x = 7$,
[Any value of x could be used.]
$\quad 6^7 = 279\,936$ [Too low]
Guess $x = 10$,
$\quad 6^{10} = 60\,466\,176$ [Too high]
Guess $x = 9$,
$\quad 6^9 = 10\,077\,696$ [Correct answer]
The solution is $x = 9$.

73 $2.3^t = 116\,000$
Try $t = 12$,
$\quad 2.3^{12} = 21\,914.624\,43\ldots$
Try $t = 20$,
$\quad 2.3^{20} = 17\,161\,558.31\ldots$
Try $t = 15$,
$\quad 2.3^{15} = 266\,635.2355\ldots$
Try $t = 14$,
$\quad 2.3^{14} = 115\,928.3632\ldots$
$\therefore$ the nearest whole number t
for which $2.3^t \approx 116\,000$ is $t = 14$.

74 $3^x = 21$
[$3^2 = 9$ and $3^3 = 27$ so x is between
2 and 3]
Guess $x = 2.5$,
$\quad 3^{2.5} = 15.588\,457\,27\ldots$
Guess $x = 2.7$,
$\quad 3^{2.7} = 19.419\,023\,52\ldots$
Guess $x = 2.8$,
$\quad 3^{2.8} = 21.674\,022\,17\ldots$
Guess $x = 2.77$,
$\quad 3^{2.77} = 20.97132523\ldots$
Guess $x = 2.78$,
$\quad 3^{2.78} = 21.202989\ldots$
If $3^x = 21$, $x = 2.77$ to two decimal
places.

75 $N = M\left\{\dfrac{(1+r)^n - 1}{r(1+r)^n}\right\}$

$12\,200 = 800\left\{\dfrac{(1.04)^n - 1}{0.04(1.04)^n}\right\}$

$n = 24$ (by calculator to the
nearest whole number)

76 $28\,000 = 2.8 \times 10^4$ [$2.8 \times 10\,000$]

77 a $600\,000 = 6 \times 10^5$
b $9417 = 9.417 \times 10^3$
c $7\,290\,000\,000 = 7.29 \times 10^9$

78 $7 \times 10^5 = 7 \times 100\,000$
$\quad\quad = 700\,000$

79 a $4 \times 10^6 = 4 \times 1\,000\,000$
$\quad\quad = 4\,000\,000$
b $3.5 \times 10^4 = 35\,000$
c $1.234 \times 10^8 = 123\,400\,000$

80 a $0.0007 = 7 \times 10^{-4}$
b $0.0312 = 3.12 \times 10^{-2}$
c $0.000\,45 = 4.5 \times 10^{-4}$

81 a $5 \times 10^{-4} = 0.0005$
b $8.7 \times 10^{-6} = 0.000\,0087$
c $4.61 \times 10^{-5} = 0.000\,0461$

82 $4.6 \times 10^4 \times 3.1 \times 10^{-6} = 0.1426$

83 $400\,000 \div 0.000\,05 = 8\,000\,000\,000$
$\quad\quad\quad\quad\quad\quad\quad = 8 \times 10^9$

84 Population density
$= (2 \times 10^6) \div (2.5 \times 10^6)$
$= 0.8$
There are 0.8 people/km².

85 a 57.5 million km
$= 57\,500\,000$ km
$= 5.75 \times 10^7$ km
$= (5.75 \times 10^7) \times 1000$ m
$= 5.75 \times 10^{10}$ m

b Time = distance ÷ speed
$= (5.75 \times 10^{10}) \div (3 \times 10^8)$
$= 191.666\,66\ldots$
$= 192$ (nearest whole number)
192 seconds = 3 minutes and
$\quad\quad\quad\quad\quad\quad$ 12 seconds
It takes approximately 3 minutes and
12 seconds for light from the sun to
reach Mercury.

Challenge p236

1 $3x^2 + 5x \times 2x - 8x^3 \div 4x$
$= 3x^2 + 10x^2 - 2x^2$
$= 11x^2$

2 $a = 3$, $b = 4$, $c = 6$
$\dfrac{7a + 4b - 3c}{a^2 + b^2} = \dfrac{7 \times 3 + 4 \times 4 - 3 \times 6}{3^2 + 4^2}$
$= \dfrac{19}{25}$
$= 0.76$

3 $3xy + 5x - 2y + 4yx = 7xy + 5x - 2y$

4 $5x(x^2 + 3x - 2) - 2(3x^2 + 1)$
$= 5x^3 + 15x^2 - 10x - 6x^2 - 2$
$= 5x^3 + 9x^2 - 10x - 2$

5 $\dfrac{4x}{9} + \dfrac{x+1}{3} = 5$
$9 \times \dfrac{4x}{9} + 9 \times \left(\dfrac{x+1}{3}\right) = 9 \times 5$
$4x + 3(x + 1) = 45$
$4x + 3x + 3 = 45$
$7x + 3 = 45$
$7x = 42$
$x = 6$

6 $V = \dfrac{2\pi r^3}{3}$
$3V = 2\pi r^3$
$\dfrac{3V}{2\pi} = r^3$
$r = \sqrt[3]{\dfrac{3V}{2\pi}}$

7 a $R = \dfrac{a^2 + b^2 - c^2}{2ab}$
$2abR = a^2 + b^2 - c^2$
$c^2 = a^2 + b^2 - 2abR$
$c = \sqrt{a^2 + b^2 - 2abR}$ $(c > 0)$

b $R = 0.5$, $a = 8$, $b = 5$
$c = \sqrt{a^2 + b^2 - 2abR}$
$= \sqrt{8^2 + 5^2 - 2 \times 8 \times 5 \times 0.5}$
$= \sqrt{49}$
$= 7$

8 $10^x = 5370$
Try $x = 3.5$,
$\quad 10^{3.5} = 3162.277\,66\ldots$
Try $x = 3.7$,
$\quad 10^{3.7} = 5011.872\,336\ldots$
Try $x = 3.75$,
$\quad 10^{3.75} = 5623.413\,252\ldots$
Try $x = 3.73$,
$\quad 10^{3.73} = 5370.3179\,64\ldots$
$\therefore x = 3.73$ to two decimal places.

9 $\dfrac{5.9 \times 10^6 + 1.5 \times 10^5}{4.4 \times 10^8 \times 2.5 \times 10^{-3}} = \dfrac{6.05 \times 10^6}{1.1 \times 10^6}$
$= 5.5$

10 $8x - 5a + 3a = 8x - 2a$

11 $p = 3$, $q = 5$
$pq^2 = 3 \times 5^2$
$= 3 \times 25$
$= 75$

12 $\dfrac{2ab^2}{8a^3b^2} = \dfrac{1}{4a^2}$

13 5.834×10^{-4}, 9×10^{-3}, 3.1×10^{-2}
[$0.000\,5834$, $0.009\,0000$, $0.031\,0000$]

14 $y = 2x^2 + b$
When $y = 19$ and $b = 1$
$19 = 2x^2 + 1$
$18 = 2x^2$
$9 = x^2$
$x = 3$ $(x > 0)$

15 $7x + 19 = 2x - 4$

$$7x = 2x - 15 \qquad \text{Line I}$$
$$5x = 15 \qquad \text{Line II}$$
$$x = 3 \qquad \text{Line III}$$

a When $x = 3$,
$$7x + 19 = 7 \times 3 + 19$$
$$= 40$$
$$2x - 4 = 2 \times 3 - 4$$
$$= 2$$
$x = 3$ is not the correct solution.

b There is a mistake in line I.
Subtracting 19 from both sides leaves
$7x = 2x - 23$.
There is a mistake in line II.
Subtracting $2x$ from both sides of
line I leaves $5x = -15$.
The correct solution is:
$$7x + 19 = 2x - 4$$
$$7x = 2x - 23$$
$$5x = -23$$
$$x = -4.6$$