Practice Numbers – set 1

Exercise 1.1
(a) Evaluate each of the following ‘by hand’.
   (i) $10^4$  (ii) $10^5$  (iii) $3^4$
(b) Use your calculator to find each of the following.
   (i) $6^5$  (ii) $4.3^4$  (iii) $(-7.1)^3$  (iv) $(-8)^7$  (v) $12^4$

Exercise 1.2
(a) Express each of the following numbers in scientific notation.
   (i) 1 427 000 000  (ii) 8075  (iii) 0.003 27  (iv) 0.5672
   (v) 0.000 000 400 7
(b) Express each of the following numbers in full.
   (i) $3.298 \times 10^5$  (ii) $7.654 \times 10^1$  (iii) $1.098 \times 10^{-3}$
   (iv) $3.4 \times 10^{-10}$

Exercise 1.3
(a) Round 2.141 599 6 to the following numbers of decimal places.
   (i) one  (ii) three  (iii) four  (iv) five
(b) (i) Round 63 056 to two significant figures.
   (ii) Round 0.038 to one significant figure.
   (iii) Round 0.040 06 to three significant figures.
(c) (i) Round 23.009 to one decimal place.
   (ii) Round 9999 to three significant figures.
   (iii) Round 6080 to two significant figures.
   (iv) Round 16.99 to one decimal place.

Exercise 1.4
(a) Find the factors of 36.
(b) Find the prime factors of 36.

Exercise 1.5
(a) Find the prime factors of:
   (i) 8  (ii) 16  (iii) 32.
(b) What is the highest common factor of 8, 16 and 32?

Exercise 1.6
(a) What is the LCM of 28 and 36?
(b) What is the LCM of 7, 10 and 14?

Exercise 1.7
Convert each of the following fractions into decimals.
(a) $\frac{1}{3}$  (b) $\frac{1}{4}$  (c) $3\frac{3}{4}$  (d) $1\frac{5}{8}$  (e) $3\frac{5}{8}$
Exercise 1.8
(a) Evaluate each of the following and express the result in its lowest terms.
   (i) $\frac{2}{3} + \frac{1}{6}$  (ii) $1\frac{1}{2} + \frac{3}{8}$  (iii) $\frac{18}{25} - \frac{2}{5}$  (iv) $4\frac{2}{7} - 1\frac{2}{7}$
(b) Evaluate each of the following and express the result in its lowest terms.
   (i) $\frac{4}{5} \times \frac{2}{7}$  (ii) $\frac{4}{5} \div \frac{2}{7}$  (iii) $1\frac{2}{25} \times 3\frac{8}{9}$  (iv) $4\frac{2}{7} \times 1\frac{2}{3}$
(v) $1\frac{3}{5} \div 1\frac{1}{11}$

Exercise 1.9
Evaluate each of the following.
(a) (i) $(-2) + (-7)$  (ii) $(-5) + 8$  (iii) $3 + (-5)$
(b) (i) $4 - (-2)$  (ii) $(-3) - (-5)$  (iii) $(-3) - (-3)$
(c) (i) $4 \times (-3)$  (ii) $(-2) \times (-7)$  (iii) $3 \times (-9)$
(d) (i) $24 \div (-6)$  (ii) $(-40) \div (-8)$  (iii) $(-45) \div 15$

Exercise 1.10
Factorise and simplify each of the following mentally. Then check your result using a calculator.
(a) $\frac{100^2}{25^2}$  (b) $\frac{4^4}{24}$  (c) $\frac{9^2}{3^3}$

Exercise 1.11
(a) Evaluate each of the following, first as a power, then as a number.
   (i) $10^2 \times 10^3$
   (ii) $10^3 \times 10^{-1}$
   (iii) $(-10)^3 \times (-10)^2$
   (iv) $10^\frac{1}{3} \times 10^\frac{1}{2} \times 10^\frac{1}{3}$
   (v) $10^{-2} \times 10^{-1}$
(b) Evaluate each of the following, first as a power, then as a number.
   (i) $10^7 \div 10^4$
   (ii) $10^4 \div 10^7$
   (iii) $(-10)^7 \div (-10)^4$
   (iv) $10^\frac{5}{2} \div 10^\frac{1}{2}$
   (v) $10^{-2} \div 10^{-1}$

Exercise 1.12
(a) Evaluate each of the following without a calculator.
   (i) $\sqrt{100}$  (ii) $\frac{9}{\sqrt{9}}$  (iii) $\frac{\sqrt{18}}{\sqrt{2}}$
(b) Simplify each of the following by factorising first.
   (i) $\sqrt{200}$  (ii) $\sqrt{112}$  (iii) $\sqrt{256}$  (iv) $\frac{\sqrt{15}}{\sqrt{3}}$
Solutions to Exercises

Solution 1.1

(a) (i) 10000 (ii) 100000 (iii) 81

(b) (i) 7776 (ii) 341.8801 (iii) −357.911

Solution 1.2

(a) (i) 1.427 × 10^9 (ii) 8.075 × 10^5

Solution 1.3

(a) (i) 2.1 (ii) 2.142 (iii) 2.1416

Solution 1.4

(a) The factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18 and 36.

(b) 36 = 2 × 2 × 3 × 3 = 2^2 × 3^2

Solution 1.5

(a) The prime factors are as follows.

(i) 8 = 2 × 2 × 2 = 2^3

(ii) 16 = 2 × 2 × 2 × 2 = 2^4

(iii) 32 = 2 × 2 × 2 × 2 × 2 = 2^5

(b) The HCF of 8, 16 and 32 is 2^3 = 8.

Solution 1.6

(a) 28 = 2 × 2 × 7 = 2^2 × 7

36 = 2 × 2 × 3 × 3 = 2^2 × 3^2

So the LCM of 28 and 36 is 2^2 × 3^2 × 7 = 252.

(b) 7 = 7

10 = 2 × 5

14 = 2 × 7

So the LCM of 7, 10 and 14 is 2 × 5 × 7 = 70.

Solution 1.7

(a) 0.2 (b) 0.33333... = 0.3 (c) 3.75

(d) 1.125 (e) 3.428571

Solution 1.8

(a) (i) \( \frac{2}{3} + \frac{1}{4} = \frac{3}{4} + \frac{1}{3} = \frac{5}{6} \)

(ii) \( 1\frac{3}{4} + \frac{3}{8} = \frac{7}{4} + \frac{3}{8} = \frac{14}{8} + \frac{3}{8} = \frac{17}{8} = 2\frac{1}{8} \)

(iii) \( \frac{37}{45} - \frac{7}{25} = \frac{185}{225} - \frac{21}{225} = \frac{164}{225} \)

(iv) \( 4\frac{1}{2} - 1\frac{3}{5} = \frac{22}{5} - \frac{8}{5} = \frac{14}{5} - \frac{56}{35} = \frac{24}{35} \)

(b) (i) \( \frac{1}{3} \times \frac{2}{7} = \frac{2}{21} \)

(ii) \( 2 \div \frac{1}{3} = \frac{2}{3} \times \frac{3}{1} = 2 \)

(iii) \( 1\frac{1}{2} \times \frac{3}{4} = \frac{5}{2} \times \frac{3}{4} = \frac{15}{8} = \frac{18}{8} -\frac{9}{8} = \frac{9}{8} \)

(iv) \( 2\frac{2}{5} \times \frac{7}{8} = \frac{12}{5} \times \frac{7}{8} = \frac{14}{1} \times \frac{7}{8} = \frac{98}{8} = \frac{7}{1} \)

(v) \( \frac{2}{3} \div \frac{1}{2} = \frac{2}{3} \times \frac{2}{1} = \frac{4}{3} \)

In parts (iii)–(v), some use has been made of cross cancelling in products of fractions. For example, in \( \frac{27}{25} \times \frac{35}{2}, 9 \) is divided into 27 and 9, and 5 is divided into 25 and 35, to give \( \frac{3}{5} \times \frac{1}{7} = \frac{3}{7} \).

Solution 1.9

(a) (i) −9 (ii) 3 (iii) −2

(b) (i) 6 (ii) 2 (iii) 0

(c) (i) −12 (ii) 14 (iii) −27

(d) (i) −4 (ii) 5 (iii) −3

Solution 1.10

(a) \( \frac{100^2}{25} = \left( \frac{100}{25} \right)^2 = 4^2 = 16 \)

(b) \( \frac{4^2}{3^2} = \left( \frac{4}{3} \right)^2 = 16 \)

(c) \( \frac{9^3}{9^2} = \left( \frac{9}{9} \right)^3 = 3^3 = 27 \)

Solution 1.11

(a) (i) \( 10^5 = 100000 \) (ii) \( 10^2 = 100 \)

(iii) \( (−10)^5 = −100000 \) (iv) \( 10^1 = 10 \)

(v) \( 10^{-3} = 0.001 \)

(b) (i) \( 10^3 = 1000 \) (ii) \( 10^{-3} = 0.001 \)

(iii) \( (−10)^3 = −1000 \) (iv) \( 10^1 = 10 \)

(v) \( 10^{-1} = 0.1 \)

Solution 1.12

(a) (i) \( \sqrt{100} = 10 \)

(ii) \( \frac{9}{\sqrt{3}} = \sqrt{3} = 3 \)

(iii) \( \sqrt{\frac{12}{2}} = \sqrt{6} = 3 \)

(b) (i) \( \sqrt{200} = \sqrt{2 \times 100} = 10\sqrt{2} \)

(ii) \( \sqrt{112} = \sqrt{2 \times 2 \times 2 \times 2 \times 7} = 4\sqrt{7} \)

(iii) \( \sqrt{256} = \sqrt{4 \times 4 \times 4 \times 4} = 4 \times 4 = 16 \)

(iv) \( \sqrt{\frac{12}{9}} = \sqrt{\frac{4}{3}} = \sqrt{\frac{4}{3}} \times \sqrt{3} = \frac{4\sqrt{3}}{3} \)