Solutions Programme F.1 Arithmetic

Solutions to exercises from the book Engineering Mathematics 7th edition. The book is divided into frames and the numbers of the exercises refers to these frames.

- **2.** The numbers -10, 4, 0, -13 are of a type called integers.
- 3. (a) -3 > -6
 - (b) 2 > -4
 - (c) -7 < 12
- 5. (a) 8 + (-3) = 8 3 = 5
 - **(b)** 9 (-6) = 9 + 6 = 15
 - (c) (-14) (-7) = -14 + 7 = -7
- 7. (a) $(-5) \times 3 = -15$
 - **(b)** $12 \div (-6) = -2$
 - (c) $(-2) \times (-8) = 16$
 - (d) $(-14) \div (-7) = 2$
- 9. $34 + 10 \div (2 3) \times 5 = 34 + 10 \div (-1) \times 5 = 34 10 \times 5 = 34 50 = -16$ Some numbers and the rounding of these numbers to the nearest 10, 100 and 1000.
 - (a) 1846, 1850, 1800, 2000
 - **(b)** -638, -640, -600, -1000
 - (c) 445, 450, 400, 0
- **14.** (a) $18 \times 21 19 \div 11 \approx 20 \times 20 20 \div 10 = 398$
 - **(b)** $99 \div 101 49 \times 8 \approx 100 \div 100 50 \times 10 = -499$
- 17. This frame holds multiple review exercises that follow below.
 - 1. (a) -1 > -6
 - (b) 5 > -29
 - (c) -14 < 7
 - **2.** (a) $16 12 \times 4 + 8 \div 2 = 16 48 + 4 = -28$
 - **(b)** $(16-12) \times (4+8) \div 2 = 4 \times 12 \div 2 = 24$
 - (c) 9-3(17+5[5-7])=9-3(17-10)=9-21=-12
 - (d) $8(3[2+4]-2[5+7]) = 8(3\times6-2\times12) = 8(18-24) = 8(-6) = -48$

3. (a) Show that: $6-(3-2)\neq (6-3)-2$ Proof: LHS=6-(3-2)=6-1=5 RHS=(6-3)-2=3-2=1

 $LHS \neq RHS$

- (b) Show that: $100 \div (10 \div 5) \neq (100 \div 10) \div 5$ Proof: $LHS = 100 \div (10 \div 5)) = 100 \div 2 = 50$ $RHS = (100 \div 10) \div 5 = 10 \div 5 = 2$ $LHS \neq RHS$
- (c) Show that: $24 \div (2-6) \neq 24 \div 2 24 \div 6$ Proof: $LHS = 24 \div (2-6) = 24 \div (-4) = -6$ $RHS = 24 \div 2 - 24 \div 6 = 12 - 4 = 8$ $LHS \neq RHS$
- 4. Some numbers and the rounding of these numbers to the nearest 10, 100 and 1000.
 - (a) 2562, 2560, 2600, 3000
 - **(b)** 1500, 1500, 1500, 2000
 - (c) -3451, -3450, -3500, -3000
 - (d) -14525, -14530, -14500, -15000
- 19. (a) $12 = 1 \times 12 = 2 \times 6 = 3 \times 4$ So the factors of 12 are 1, 2, 3, 4, 6, 12.
 - (b) $25 = 1 \times 25 = 5 \times 5$ So the factors of 25 are 1, 5, 25.
 - (c) $17 = 1 \times 17$ So the factors of 17 are 1, 17.
- **21.** (a) $84 = 2 \times 42 = 2 \times 2 \times 21 = 2 \times 2 \times 3 \times 7$
- 23. The prime factorizations of 84 and 512 are

$$84 = 2 \times 2 \times 3 \times 7$$

The highest common factor of 84 and 512 is hence

$$HCF = 2 \times 2 = 4$$

And the lowest common multiple is

$$LCF = 2 \times 3 \times 7 = 10752$$

- **26.** This frame holds multiple review exercises that follow below.
 - 1. Repeated integer division by increasingly bigger numbers gives the following products of prime factors.
 - (a) $429 = 3 \times 11 \times 13$
 - **(b)** $1820 = 2 \times 2 \times 5 \times 7 \times 13$
 - (c) $2992 = 2 \times 2 \times 2 \times 2 \times 11 \times 17$
 - (d) $3185 = 5 \times 7 \times 7 \times 13$
 - 2. (a) The prime factorizations of 63 and 42 are

$$63 = 3 \times 3 \times 7$$

$$42 = 2 \times 3 \times 7$$

The highest common factor of 63 and 42 is hence

$$HCF = 3 \times 7 = 21$$

And the lowest common multiple is

$$LCF = 2 \times 3 \times 3 \times 7 = 126$$

(b) The prime factorization of 34 and 92 are

$$34 = 2 \times 17$$

$$92 = 2 \times 2 \times 23$$

The highest common factor of 34 and 92 is hence

$$HCF = 2$$

And the lowest common multiple is

$$LCF = 2 \times 2 \times 17 \times 23 = 1564$$

28. An example of a proper fraction is $\frac{-8}{11}$

30.
$$\frac{5}{9} \times \frac{2}{7} = \frac{5 \times 2}{9 \times 7} = \frac{10}{63}$$

33.
$$\frac{3}{8}$$
 of $\frac{5}{7} = \frac{3}{8} \times \frac{5}{7} = \frac{3 \times 5}{8 \times 7} = \frac{15}{56}$

34.
$$\frac{7}{5}$$
 and $\frac{28}{20}$ are equivalent fractions because $\frac{7}{5} \times \frac{4}{4} = \frac{7 \times 4}{5 \times 4} = \frac{28}{20}$

35.
$$\frac{84}{108} = \frac{42 \times 2}{54 \times 2} = \frac{42}{54} = \frac{21 \times 2}{27 \times 2} = \frac{21}{27} = \frac{7 \times 3}{9 \times 3} = \frac{7}{9}$$

37.
$$\frac{7}{13} \div \frac{3}{4} = \frac{7}{13} \times \frac{4}{3} = \frac{28}{39}$$

38. The reciprocal of
$$\frac{17}{4}$$
 is $\frac{4}{17}$

39. The reciprocal of
$$-5$$
 is $-\frac{1}{5}$

41.
$$\frac{5}{9} + \frac{1}{6} = \frac{10}{18} + \frac{3}{18} = \frac{13}{18}$$

43.
$$\frac{11}{15} - \frac{2}{3} = \frac{11}{15} - \frac{10}{15} = \frac{1}{15}$$