## 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.**  $34 + 10 \div (2 3) \times 5 = 34 + 10 \div (-1) \times 5 = 34 10 \times 5 = 34 50 = -16$
- **13.** 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 factorization 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 product 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 factorization 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

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