

# MA10103: Foundation Mathematics I

## SOLUTIONS OF PROBLEM SHEET 1

$$1. \quad \frac{2}{7} \times \frac{3}{2} = \frac{2}{7} \times \frac{3}{2} = \frac{3}{7}; \quad \frac{1}{3} + \frac{1}{5} = \frac{5}{3 \times 5} + \frac{3}{5 \times 3} = \frac{5}{15} + \frac{3}{15} = \frac{8}{15}; \quad \frac{3}{4} \times \frac{2}{4} = \frac{3}{4} \times \frac{2}{2 \times 2} = \frac{3}{8}; \quad \frac{2}{7} + \frac{4}{9} = \frac{2 \times 9}{7 \times 9} + \frac{4 \times 7}{9 \times 7} = \frac{18+28}{63} = \frac{46}{63}; \quad \frac{3}{4} \div \frac{3}{7} = \frac{3}{4} \times \frac{7}{3} = \frac{7}{4}; \quad \frac{4}{11} - \frac{1}{7} = \frac{4 \times 7}{11 \times 7} - \frac{11}{7 \times 11} = \frac{28-11}{77} = \frac{17}{77}; \quad \frac{5}{54} \div \frac{25}{18} = \frac{5}{3 \times 18} \times \frac{18}{5 \times 5} = \frac{1}{15}$$

2. (a)  $\sqrt{2} = 1.414$  (3 d.p.)

(b)  $\pi = 3.1416$  (4 d.p.)

(c)  $g = 9.8 \text{ m s}^{-2}$  (1 d.p.)

(d)  $g = 9.8067 \text{ m s}^{-2}$  (4 d.p.)

$\sqrt{2} = 1.41$  (3 s.f.),  $\pi = 3.14$  (3 s.f.),  $g = 9.81 \text{ m s}^{-2}$  (3 d.p.).

$c = 300000000 \text{ m s}^{-1}$  (3 s.f.)

3.  $0.025 = 2.5 \times 10^{-2}$ ;  $937.2 = 9.372 \times 10^2$ ;  $0.000073 = 7.3 \times 10^{-5}$ ;  $324569.3 = 3.245693 \times 10^5$ ;  $1609 = 1.609 \times 10^3$ .

4.  $\frac{1}{5} = 0.2$ ;  $\frac{1}{25} = 0.04$ ;  $\frac{1}{125} = 0.008$ ;  $\frac{1}{3} = 0.\bar{3}$ ;  $\frac{1}{30} = 0.0\bar{3}$ ;  $\frac{1}{300} = 0.00\bar{3}$ .

5\*.  $3 \times 2x = 6x$ ;  $4 \times 7x = 28x$ ;  $3x \times 2x = 6x^2$ ;  $6ab \times 3ba = 18a^2b^2$ ;  $3x \div 2x = \frac{3}{2}$ ;  $(6x)^2 \times 4x = 144x^3$ ;  $\frac{21xy}{7y} = 3x$ ;  $3x + 4y + 2x = 5x + 4y$ ;  $3x^2 + 2 - x^2 = 2x^2 + 2$ ;  $(2x)^2 - 3x^2 = x^2$ ;  $a(b-c) - c(a-b) = ab - 2ac + bc$ ;  $x^2 + (4x-3)2x = 9x^2 - 6x$ .

6\*.  $(2x+3)(x-1) = 2x^2 + x - 3$ ;  $(3a+b)(4a+2) = 12a^2 + 6a + 4ab + 2b$ ;  $(t-3)(t+2) = t^2 - t - 6$ ;  $(t-11)(t+11) = t^2 - 121$ ;  $(s+3)(s+3) = s^2 + 6s + 9$ ;  $(k-3)(k-3) = k^2 - 6k + 9$ ;  $(2k-3)(2k-3) = 4k^2 - 12k + 9$ ;  $(ax+b)^2 = a^2x^2 + 2abx + b^2$ ;  $(ax-b)^2 = a^2x^2 - 2abx + b^2$ ;  $(ax+b)(ax-b) = a^2x^2 - b^2$ .

7.  $x^2 + 8x + 15 = (x+3)(x+5)$ ;  $x^2 + 7x + 6 = (x+1)(x+6)$ ;  $x^2 - 10x + 9 = (x-9)(x-1)$ ;  $x^2 + 8x + 12 = (x+2)(x+6)$ ;  $x^2 + 5x - 14 = (x-2)(x+7)$ ;  $x^2 - 4x - 5 = (x-5)(x+1)$ ;  $x^2 + 9x + 14 = (x+2)(x+7)$ ;  $x^2 - 9 = (x-3)(x+3)$ ;  $x^2 + 4x + 4 = (x+2)^2$ ;  $x^2 - 3x - 18 = (x-6)(x+3)$ ;  $x^2 - 16 = (x-4)(x+4)$ ;  $2x^2 - 3x + 1 = (2x-1)(x-1)$ ;  $9x^2 - 6x + 1 = (3x-1)^2$ ;  $9 + 6x + x^2 = (x+3)^2$ ;  $x^2 + 2ax + a^2 = (x+a)^2$ .

8.  $(x-3)(x^2+2x+1) = x^3 - x^2 - 5x - 3$ ;  $(x^2+2x+3)(x^2-3x+5) = (x^2+2x+3)x^2 + (x^2+2x+3)(-3x) + (x^2+2x+3)5 = x^4 + 2x^3 + 3x^2 - 3x^3 - 6x^2 - 9x + 5x^2 + 10x + 15 = x^4 - x^3 + 2x^2 + x + 15$ ;  $(x-1)(x+1)(2x-4) = (x^2-1)(2x-4) = 2x^3 - 4x^2 - 2x + 4$ ;  $(3a+2q)(4x-3a+z) = -9a^2 - 6aq + 12ax + 3az + 8qx + 2qz$ ;  $(x-3)^3 = x^3 + 3x^2(-3) + 3x(-3)^2 + (-3)^3 = x^3 - 9x^2 + 27x - 27$ ;  $(2x+3)^3 = (2x)^3 + 3(2x)^2 \cdot 3 + 3 \times 2x \times 3^2 + 3^3 = 8x^3 + 36x^2 + 54x + 27$ .