

MA10103: Foundation Mathematics I

PROBLEM SHEET 3

All the documents for this class are now – besides on the web page – also available on *Moodle*. Moodle access key: **ma10103**

Please, do all questions and hand in solutions to the starred questions at the lecture on *Monday 22nd October*.

1. Simplify the following:

$$\frac{3^4}{3^2 \times 9^3}; \quad 8^{1/2} \times 2^{-3}; \quad (2^3)^{1/2} \times 4^{1/4}; \quad \frac{x^{1/4} \times x^{5/4}}{x^{-1/6}}; \quad \frac{p^{1/2} \times p^{-3/4}}{p^{-5/4}};$$
$$\left(\sqrt{t}\right)^5 \times \left(\sqrt{t^3}\right); \quad (y^2)^{3/2} \times y^{-3}; \quad \frac{(16)^{5/4}}{8^{4/3}}; \quad \frac{y^{1/2}}{y^{-3/4}} \times \sqrt{y^{1/2}}; \quad x^{(5/2)} \times x^2/x^{1/2}.$$

2*. Evaluate, **without** using a calculator, the following, and express the answer as a decimal:

$$\left(\frac{1}{3}\right)^{-1}; \quad \left(\frac{1}{4}\right)^{5/2}; \quad (8)^{-2/3}; \quad \frac{1}{(16)^{-1/2}}; \quad \left(\frac{1}{9}\right)^{-3/2}.$$

3*. Recall that the relationship between velocity and distance travelled by an object moving without the application of external forces are related by

$$\text{distance} = \text{velocity} \times \text{time}.$$

Recall also that the speed of light is approximately $3 \times 10^8 \text{ms}^{-1}$. Compute, **without** using a calculator:

- (a) the time it takes for light to travel $18 \times 10^{30} \text{m}$;
- (b) how far light travels in an hour;
- (c) how long it takes light to travel $81 \times 10^9 \text{km}$.

Please turn over!

4. Bob cycled along the Kennet-Avon Canal last Sunday. He started in Bath, cycled 20km, took a break and then returned back home. For the first leg of his journey, he travelled with an average speed of 30km/h, while on his return trip (being already tired) his average speed was 20km/h. What was his overall average speed?

5*. Rewrite the following as equations involving logarithms:

$$10^4 = 10000; \quad 3^2 = 9; \quad 10^{-2} = 0.01; \quad 4^{1/2} = 2; \quad p = q^4.$$

Rewrite the following without logarithms:

$$\log_{10} 100000 = 5; \quad \log_2 8 = 3; \quad \log_5 1 = 0; \quad \log_3 27 = 3; \quad \log_x y = z.$$

6. Express the following in terms of $\log p$, $\log q$, and $\log r$:

$$\log pq; \quad \log pqr; \quad \log(p/q); \quad \log(pq/r); \quad \log(p/qr); \quad \log(p^3/q^2r).$$

Simplify the following:

$$\log p + \log q; \quad 3 \log p + \log q; \quad \log q - \log r; \quad 3 \log q + 7 \log p; \quad n \log p - \log q.$$