

Q3.

$$\begin{aligned} \text{a) } \log 4 + \log 125 \\ = \log 500 \approx 2.699 \end{aligned}$$

$$\begin{aligned} \text{b) } \log_3 63 - \log_3 7 \\ = \log_3 9 = 2 \end{aligned}$$

$$\begin{aligned} \text{c) } \log_6 2 + \log_6 3 \\ = \log_6 6 = 1 \end{aligned}$$

$$\begin{aligned} \text{d) } \log_4 36 - \log_4 18 \\ = \log_4 2 = \frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{e) } \log_3 6 + \log_3 12 - \log_3 8 \\ = \log_3 9 = 2 \end{aligned}$$

$$\begin{aligned} \text{f) } \log_6 12 - \log_6 \left(\frac{1}{3}\right) \\ = \log_6 36 = 2 \end{aligned}$$

$$\begin{aligned} \text{g) } \frac{1}{2} \log_2 16 - \frac{1}{3} \log_2 8 \\ = \log_2 4 - \log_2 2 \\ = \log_2 \frac{4}{2} = 1 \end{aligned}$$

$$\begin{aligned} \text{h) } \log_5 64 - 6 \log_5 2 \\ = \log_5 64 - \log_5 64 \\ = \log_5 1 = 0 \end{aligned}$$

$$\begin{aligned} \text{i) } \log_2 3 + \log_2 2 - \log_2 6 - \log_2 8 \\ = \log_2 \frac{1}{8} = -3 \end{aligned}$$

$$\begin{aligned} \text{j) } \log_2 \left(\frac{1}{4}\right) - 2 \log_2 \left(\frac{1}{8}\right) \\ = \log_2 \left(\frac{1}{4}\right) (64) = \log_2 16 = 4 \end{aligned}$$

$$\begin{aligned} \text{k) } -2 \log_4 8 + \log_4 \left(\frac{1}{2}\right) \\ = \log_4 \left(\frac{1}{2}\right) - \log_4 64 \\ = \log_4 \frac{1}{128} = -\frac{7}{2} \end{aligned}$$

### Proof of 2<sup>nd</sup> law

$$\text{let } \log_c x = p, \log_c y = q$$

$$\Rightarrow c^p = x, c^q = y$$

$$\frac{x}{y} = \frac{c^p}{c^q} = c^{p-q}$$

$$\Rightarrow \log_c \frac{x}{y} = p - q$$

$$\Rightarrow \log_c \frac{x}{y} = \log_c x - \log_c y$$