LOGARITHMS IN THE REAL WORLD

1 What is the value of $10 \log_{10}\left(\frac{P_2}{P_1}\right)$ when: **(a)** $P_2 = P_1$ **(b)** $P_2 = 100\,000P_1$

2 How many times louder is:

(a) a sound which is 20 dB louder than another sound

(b) a 75 dB sound than a 35 dB sound

(c) a 79 dB sound than a 72 dB sound?

3 If one sound is twice as loud as another, how many more decibels is its intensity?

4 An earthquake measuring 8.7 on the Richter scale is followed by one that measures 6.5 on the Richter scale. How many times stronger is the first earthquake than the second?

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5 The energy released by an earthquake, E, can be given by $\log_{10} E = 11.8 + 1.5\, M_L$, where M_L is the measurement of its magnitude on the Richter scale. Calculate the energy released by both of the earthquakes in Question **4** and state how many times more energy is released by the first earthquake than by the second.

6 Calculate, correct to one decimal place, the pH level of a solution where the concentration of H^+ (hydrogen) ions is 2.3×10^{-5} mol/L. Is this an acidic or a basic solution?

7 The frequency of the note A3, the A below middle C, is 220 Hz. Another note has a frequency of 1760 Hz.
(a) How many octaves higher than A3 is this note? **(b)** What is this note?

8 Why can you not use the decibel scale to measure a sound of zero intensity, i.e. no sound at all?