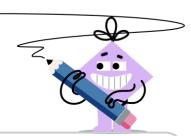


mobius

Logarithmic Scales - Magnitude Difference to Measured Value Ratio



$$\begin{array}{c} \mathsf{pH} = -\mathsf{log}\, [\mathsf{H}^+] \\ \mathsf{pH}_2 - \mathsf{pH}_1 = -3 \end{array} \overset{\mathsf{If a solution has a pH 3 lower on pH scale what is the ratio of the Hydrogen ion concentration measurements?} \\ \mathsf{pH}_2 - \mathsf{pH}_1 = -3 \overset{\mathsf{A}}{=} \frac{[\mathsf{H}^+]_2}{[\mathsf{H}^+]_1} = 31,623 \\ \overset{\mathsf{B}}{=} \frac{[\mathsf{H}^+]_2}{[\mathsf{H}^+]_2} = 1,000 \end{array}$$

If a solution has a pH 3 lower on the pH scale what is the ratio of their Hydrogen ion concentration measurements?

$$A \frac{[H^+]_2}{[H^+]_1} = 31,623$$

$$^{B}~\frac{[H^{+}]_{2}}{[H^{+}]_{1}}=1,000$$

If a sound has a dB magnitude 30 higher on the decibel scale what is the ratio of their

sound energy measurements?

$$M = log(\frac{l}{l_0})$$
 $M_2 - M_1 = 3$
 $\frac{l_2}{l_1} = 31,623$
 $\frac{l_2}{l_1} = 1,000$

$$M_2 - M_1 = 3$$

If an earthquake has a magnitude 3 higher on the Richter scale what is the ratio of their

$$\left| \frac{\mathsf{I}_2}{\mathsf{I}_1} = 31,623 \right| \frac{\mathsf{I}_2}{\mathsf{I}_1} = 1,000$$

3

$$\mathsf{dB} = 10\log\big(\frac{\mathsf{I}}{\mathsf{I}_0}\big)$$

$$eta_2 - eta_1 = 30 \ egin{array}{c} egin{array}{c} egin{array}{c} eta_1 \ \hline egin{array}{c} eta_2 = 30 \ \hline egin{array}{c} eta_2 \ \hline egin{array}{c} eta_1 = 1,000 \ \hline egin{array}{c} eta_2 \ \hline egin{array}{c} eta_1 = 631 \ \hline \end{array} \end{array}$$

4

$$\mathsf{dB} = 10\log\left(\frac{\mathsf{I}}{\mathsf{I}_0}\right)$$

$$eta_2 - eta_1 = 50$$

If a sound has a dB magnitude 50 higher on the decibel scale what is the ratio of their sound energy measurements?

$$\mathsf{dB} = \mathsf{10}\,\mathsf{log}\,(rac{\mathsf{I}}{\mathsf{I}_0})$$
 $eta_2 - eta_1 = \mathsf{50}$ $egin{array}{c} \mathsf{A} & \mathsf{B} \ rac{\mathsf{I}_2}{\mathsf{I}_1} = \mathsf{100,000} \ rac{\mathsf{I}_2}{\mathsf{I}_1} = \mathsf{199,526} \end{array}$

5

$$M = \log\left(\frac{1}{I_0}\right)$$

$$M_2 - M_1 = 1$$

If an earthquake has a magnitude 1 higher on the Richter scale what is the ratio of their

$$M=\log{(rac{1}{I_0})}^{ ext{the Richter scale what is the ratio of their wave size measurements?}}$$
 $M_2-M_1=1$ $rac{1}{I_1}=1$ $rac{1}{I_1}=10$

6

$$\mathsf{dB} = 10\log{(\frac{\mathsf{I}}{\mathsf{I}_0})}$$

$$\beta_2 - \beta_1 = 100$$

If a sound has a dB magnitude 100 higher on the decibel scale what is the ratio of their

$$ext{dB} = 10 \log{(rac{ extsf{I}}{ extsf{I}_0})} egin{align*} egin{al$$

7

$$\mathsf{dB} = \mathsf{10}\log{(rac{\mathsf{I}}{\mathsf{I}_0})}$$

If a sound has a dB magnitude 40 higher on the decibel scale what is the ratio of their sound energy measurements?

$$\mathsf{dB}=\mathsf{10}\,\mathsf{log}\,(rac{\mathsf{I}}{\mathsf{I}_0})$$
 $eta_2-eta_1=\mathsf{40}$ $egin{array}{c} \mathsf{A} \ rac{\mathsf{I}_2}{\mathsf{I}_1}=\mathsf{3},\mathsf{162} rac{\mathsf{I}_2}{\mathsf{I}_1}=\mathsf{10},\mathsf{000} \end{array}$

8

$$M = \log\left(\frac{1}{I_0}\right)$$

$$M_2 - M_1 = 7$$

If an earthquake has a magnitude 7 higher on the Richter scale what is the ratio of their

$$\mathsf{M} = \mathsf{log}\left(rac{\mathsf{I}}{\mathsf{I}_0}
ight)^{rac{\mathsf{R}}{\mathsf{I}_0}} \mathsf{M}_2 - \mathsf{M}_1 = \mathsf{7} \mathsf{I}_{rac{\mathsf{I}_2}{\mathsf{I}_1} = 1 imes 10^7}^{rac{\mathsf{I}_2}{\mathsf{I}_1} = 3.16 imes 10^7}$$