

In a pig-calling contest, a caller produces a sound with an intensity level of 110 dB.

How many such callers would be required to reach the pain level of 120 dB?

$$\beta = 10 \log \left(\frac{I}{I_0} \right)$$

$$10 \beta = \log \frac{I}{I_0}$$

$$\frac{I}{I_0} = 10^{\beta/10}$$

$$I_0 = 1 \times 10^{-12} \frac{\text{W}}{\text{m}^2}$$

$$I = I_0 10^{\beta/10}$$

$$\beta = 110 \text{ dB}$$

$$\beta_{\text{pain}} = 120 \text{ dB}$$

$$I_{\text{pain}} = \left(1 \times 10^{-12} \frac{\text{W}}{\text{m}^2} \right) 10^{\frac{120}{10}} = 1.0 \frac{\text{W}}{\text{m}^2}$$

$$I_{\text{caller}} = \left(1 \times 10^{-12} \frac{\text{W}}{\text{m}^2} \right) 10^{\frac{110}{10}} = 1.0 \times 10^{-1} \frac{\text{W}}{\text{m}^2}$$

$$0.10 \frac{\text{W}}{\text{m}^2}$$

Need 10 callers