QUESTION:

Calculate the total sound pressure level caused by a combination of sounds with the following SPL,s (a) 25db and 39db (b)60db+60db+60db

SOLUTION:

The sum level of sound pressures of non-coherent sound waves is

$$L_{total} = 10\lg\left(\frac{p_1^2 + p_2^2 + \ldots p_n^2}{p_{ref}^2}\right) = 10\lg\left(\left(\frac{p_1}{p_{ref}}\right)^2 + \left(\frac{p_2}{p_{ref}}\right)^2 + \ldots + \left(\frac{p_n}{p_{ref}}\right)^2\right)$$

As $L_1 = 10\lg\left(\frac{p_1}{p_{ref}}\right)^2 \Rightarrow \left(\frac{p_1}{p_{ref}}\right)^2 = 10^{\frac{L_1}{10}}$, hence

$$L_{total} = 10\lg\left(10^{\frac{L_1}{10}} + 10^{\frac{L_2}{10}} + \ldots + 10^{\frac{L_n}{10}}\right)$$

a) $L_{total} = 10\lg\left(10^{\frac{L_1}{10}} + 10^{\frac{L_2}{10}}\right) = 10\lg\left(10^{\frac{25}{10}} + 10^{\frac{39}{10}}\right) = 39.17 \text{ dB}$

b) $L_{total} = 10\lg\left(10^{\frac{L_1}{10}} + 10^{\frac{L_2}{10}} + 10^{\frac{L_3}{10}}\right) = 10\lg\left(10^{\frac{60}{10}} + 10^{\frac{60}{10}} + 10^{\frac{60}{10}}\right) = 10\lg\left(3 \cdot 10^{\frac{60}{10}}\right) = 64.77 \text{ dB}$

ANSWER:

a) **39.17 dB**
b) **64.77 dB**