$I = 1\times10^{-7}\ W/m^2 \rightarrow L_I = \ldots$

0	1	2	3	4	5
-7 dB	50 dB	70 dB	110 dB	10 dB	30 dB

$L_I = 107\ dB \rightarrow I = \ldots W/m^2$

0	1	2	3	4
$1\times10^{-10.7}$	7×10^{-2}	1×10^{-5}	5×10^{-2}	1×10^{95}

A flute and a saxophone play with intensities of 3.0×10^{-5} W/m^2 and 8.0×10^{-4} W/m^2 respectively. Compare their sound intensity levels.

0 : The sax is 27 times louder
1 : The flute is 27 times louder.
2 : The sax is (89 dB/75 dB)=1.19 times louder.
3 : The SIL of the flute is 14 dB smaller than for the sax.
4 : The difference is 77.0×10^{-5} W/m^2.
5 : The sax is 14 times louder.

One electric generator creates a noise of 96 dB.
How many could you put in a room while keeping the SIL below 101 dB?

Answer with correct number,
use “0” for “more than 5”.

3

Can solve this by converting each SIL to an intensity, then dividing.

Can ALSO solve this as a comparison problem.

Some “sound proofing” material, for application on a wall, is rated to reduce the sound intensity coming through the wall by 35 dB. What fraction of the sound energy impinging on the wall is absorbed by the sound proofing material?

0	1	2	3	4
1/35	35dB	3×10^{-4}	99.97%	97.14%

$$\frac{I_{\text{out}}}{I_{\text{in}}} = 10^{\left(\frac{L_{I,\text{out}} - L_{I,\text{in}}}{10\text{dB}}\right)} = 10^{-3.5} = 3.162\times10^{-4}$$

is the fraction transmitted

$$1 - 3.162\times10^{-4} = 0.999684$$

$$= 99.9684\%$$ is the fraction absorbed

A crying baby, being comforted on your shoulder, has her mouth 8cm from your ear. When the crying reaches your threshold of pain, how far from your ear would you have to hold the baby to reduce the SIL to 100dB?

Since this is a comparison problem, what we really need is an intensity ratio:

$$\frac{I_n}{I_f} = 10^{\left(\Delta L_I / 10\text{dB}\right)} = 10^{\left((120\text{dB}-100\text{dB}) / 10\text{dB}\right)} = 100$$

$$\frac{I_n}{I_f} = \frac{r_f^2}{r_n^2} \rightarrow \sqrt{\frac{I_n}{I_f}} = \frac{r_f}{r_n} \rightarrow r_f = r_n\sqrt{\frac{I_n}{I_f}} = (8\text{cm})\sqrt{100} = 80\text{cm}$$