6) $I_1 = 15.0\,dB$

$I_2 = \frac{1}{2} I_1 \Rightarrow \frac{I_2}{I_1} = \frac{1}{2}$

a) $L_1 = 10\,dB \log \frac{I_1}{I_0}$

$L_2 = 10\,dB \log \frac{I_2}{I_0}$

$\Delta L = L_2 - L_1$

$\Delta L = 10\,dB \log \frac{I_2}{I_0} - 10\,dB \log \frac{I_1}{I_0}$

$\Delta L = 10\,dB \left(\log \frac{I_2}{I_0} - \log \frac{I_1}{I_0}\right) = 10\,dB \log \frac{I_2/I_0}{I_1/I_0}$

$\Delta L = 10\,dB \log \frac{I_2}{I_1} = 10\,dB \log\left(\frac{1}{2}\right)$

$\boxed{\Delta L = -3.0103\,dB}$

b) No. We found $\Delta L = 10\,dB \log \frac{I_2}{I_1}$ meaning the change depends only on the ratio of I_2 to I_1, not on the value of I_1. So, for instance, in the case giving $I_1 = 15\,dB$ and $I_2 = 7.5\,dB$ yielding $\Delta L = -3.0103\,dB$. But we would get the same result if I_1 were 40 dB and I_2 were 20 dB. Any pair of values such that $\frac{I_2}{I_1} = \frac{1}{2}$ works. It doesn't matter what I_1 is as long as $I_2 = 2 I_1$