HW 12-4 Soln)

Assume that the intensities add, since the sounds of each car are incoherent; that is, let $I_{200} = 100\ I_1$ and $I_{25} = 25\ I_1$.

$\beta_{200} = 110$dB

In general, $\beta = 10 \log_{10}[I/I_o]$ where $I_o = 10^{-12}$ wts/m^2

$\beta_{200} = 10 \log_{10}[I_{200}/I_o]$
$\beta_{25} = 10 \log_{10}[I_{25}/I_o]$

subtract to obtain:

$$\begin{aligned}\beta_{200} - \beta_{25} &= 10 \log_{10}[I_{200}/I_o] - 10 \log_{10}[I_{25}/I_o] \\ &= 10\{[\log_{10}I_{200} - \log_{10}I_o] - [\log_{10}I_{25} - \log_{10}I_o]\} \\ &= 10\{\log_{10}I_{200} - \log_{10}I_{25}\} \\ &= 10\log_{10}[I_{200}/I_{25}] \\ &= 10\log_{10}[200/25] \\ &= 10 \log_{10}[8]\end{aligned}$$

$\beta_{200} - \beta_{25} = 10*0.9 = 9$
$\beta_{25} = \beta_{200} - 9 = 110 - 9 =$ 101 dB