81. (a) We express all lengths in mm, and since $1/d = 180$, we write Eq. 37-22 as

$$\theta = \sin^{-1}\left(\frac{1}{d}\,m\lambda\right) = \sin^{-1}(180)(2)\lambda$$

where $\lambda_1 = 4 \times 10^{-4}$ and $\lambda_2 = 5 \times 10^{-4}$ (in mm). Thus, $\Delta\theta = \theta_2 - \theta_1 = 2.1°$.

(b) Use of Eq. 37-22 for each wavelength leads to the condition

$$m_1\lambda_1 = m_2\lambda_2$$

for which the smallest possible choices are $m_1 = 5$ and $m_2 = 4$. Returning to Eq. 37-22, then, we find

$$\theta = \sin^{-1}\left(\frac{1}{d}\,m_1\lambda_1\right) = 21° \ .$$

(c) There are no refraction angles greater than 90°, so we can solve for "$m_{\rm max}$" (realizing it might not be an integer):

$$m_{\rm max} = \frac{d\sin 90°}{\lambda_2} = 11$$

where we have rounded down. There are no values of m (for light of wavelength λ_2) greater than $m = 11$.