

8. We note that $\text{nm} = 10^{-9} \text{ m} = 10^{-6} \text{ mm}$. From Eq. 37-4,

$$\Delta\phi = \left(\frac{2\pi}{\lambda}\right) (\Delta x \sin\theta) = \left(\frac{2\pi}{589 \times 10^{-6} \text{ mm}}\right) \left(\frac{0.10 \text{ mm}}{2}\right) \sin 30^\circ = 266.7 \text{ rad} .$$

This is equivalent to $266.7 - 84\pi = 2.8 \text{ rad} = 160^\circ$.