In a single slit diffraction experiment the 7th minimum from the center in red light (λ = 650 nm) is observed at 15.7 cm from the center of a screen 3.25 m from the slit.

(a) Find the position of the 8th minimum in green light (λ = 500 nm).
(b) Find the distance between the 8th and 9th minima on the screen, for the green light.

**SOLUTION:**

\[ a \sin \theta_m = m \lambda \]

\[ \theta_m \text{ is small: } \sin \theta_m \approx \tan \theta_m = \frac{y_m}{D} \]

\[ a \frac{y_m}{D} = m \lambda \]

\[ \therefore \ y_m = \frac{m \lambda D}{a} \]

When \( y_m = 15.7 \text{ cm} \), \( \lambda = 650 \text{ nm} \) 7th minimum hence

\[ a = \frac{7 \lambda D}{y_7} = 9.42 \times 10^{-5} \text{ m} \]

5 (a) \( \lambda = 500 \text{ (nm)} \) \( m = 8 \)

\[ y_8 = \frac{8 \lambda D}{a} = \frac{8 \times 500 \text{ (nm)} \times 3.25 \text{ m}}{9.42 \times 10^{-5} \text{ m}} = 13.8 \text{ (cm)} \]

10 (b) \( y_9 - y_8 = \frac{\lambda D}{a} = \frac{y_8}{8} = 1.73 \text{ (cm)} \)