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18 Light with a wavelength of 546 nm passes through two slits and forms an interference pattern on a screen 8.75 m away.

If the linear distance on the screen from the central fringe to the first bright fringe above is 5.16 cm, what is the slit separation?

$$\lambda = 546 \text{ nm}$$

$$y = L \tan \theta$$

$$L = 8.75 \text{ m}$$

$$d \sin \theta = m \lambda$$

$$y_1 = 5.16 \text{ cm}$$

bright

Solve for θ

$$m = 1$$

$$\theta = \tan^{-1} \left(\frac{y}{L} \right)$$

$$= \tan^{-1} \left(\frac{5.16 \times 10^{-2} \text{ m}}{8.75 \text{ m}} \right)$$

$$= 0.338^\circ$$

Solve for d

$$d = \frac{m\lambda}{\sin\theta} = \frac{(1)(546 \text{ E-}9 \text{ m})}{\sin(0.938^\circ)}$$

$$= \boxed{9.26 \text{ E-}5 \text{ m}}$$