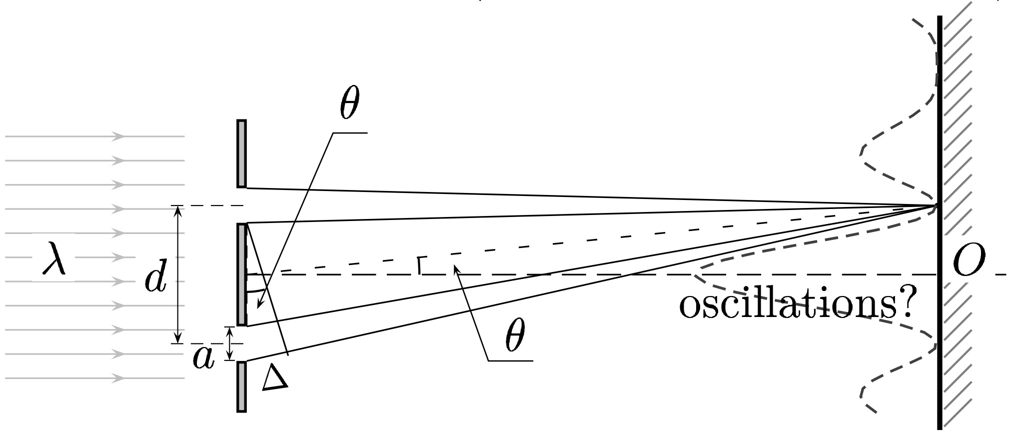
For the double-slits-finite-width setup: "d" is slit-distance, "a" slit-width. Incident light has a wavelength λ. Denote $\phi = k\,\Delta = k\,d\,\theta$ and $\beta = k\,a\,\theta$. The intensity is given by: $\dfrac{I(\phi,\beta)}{I(0,0)} = \cos^2\dfrac{\phi}{2}\left[\dfrac{\sin\dfrac{\beta}{2}}{\dfrac{\beta}{2}}\right]^2$. Here the "double-slit ϕ-pattern" oscillates within the "single-slit β-pattern", while the latter serves as an envelope (dotted distribution above).



If the $d = 6\,a$, number of zeros within the dotted central peak is:

A) 6

B) 8

C) 10

D) 12

First minimum of single-slit is at $\beta = 2\,\pi$, or $\theta_1^s = \dfrac{2\,\pi}{k\,a} = \dfrac{\lambda}{a}$, that of double-slit is at $\phi = \pi$, or $\theta_1^d = \dfrac{\pi}{k\,d} = \dfrac{\lambda}{2\,d}$. For $d = 6\,a$, $\theta_1^d = \dfrac{1}{12\,a} = \dfrac{\theta_1^s}{12}$. For double slits, zeros are at: $\phi = [1, 3, ..., 11]\,\pi$, or $\theta = \pm[\dfrac{1}{12}, ..., \dfrac{11}{12}]\,\theta_1^s$. There are $12 (= 2 \times 6)$ zeros within central peak.

Answer **D**.

38.04-03˙Double˙Slits˙Finite˙Width˙Pattern 2006-9-14