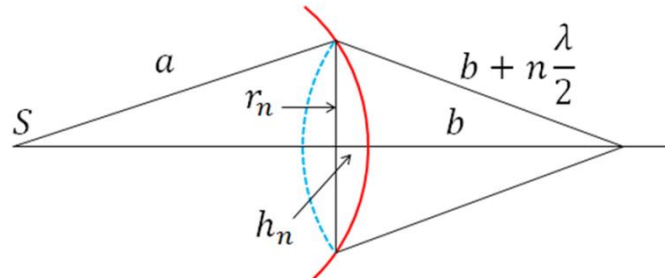


Question. Obtain the expression for area of the $n - th$ zone.

Solution.



Find the area of the $n - th$ Fresnel zone

$$\Delta S_n = S_n - S_{n-1}$$

From the figure

$$r_n^2 = a^2 + (a - h_n)^2 = \left(b + n \frac{\lambda}{2}\right)^2 - (b - h_n)^2$$

$$\lambda \ll a \text{ and } \lambda \ll b$$

We have

$$h_n = \frac{bn\lambda}{2(a+b)}$$

$$S_n = 2\pi a h_n = \frac{\pi ab\lambda}{a+b} n$$

$$\Delta S_n = S_n - S_{n-1} = \frac{\pi ab\lambda}{a+b}$$

So, the area of the $n - th$ Fresnel zone

$$\Delta S_n = \frac{\pi ab\lambda}{a+b}$$

and does not depend on n .