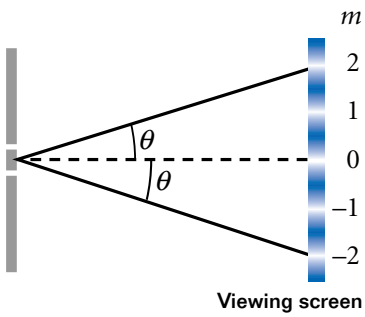

Figure 8
The higher-order ($m = 1, 2$) maxima appear on either side of the central maximum ($m = 0$).

Likewise, if $m = 1$, the path difference is $\pm\frac{3}{2}\lambda$, which is the condition for the second dark fringe on each side of the central maximum, and so forth.

A representation of the interference pattern formed by double-slit interference is shown in **Figure 8.** The numbers indicate the two *maxima* (the plural of *maximum*) that form on either side of the central (zeroth-order) maximum. The darkest areas indicate the positions of the dark fringes, or *minima* (the plural of *minimum*), that also appear in the pattern.

Because the separation between interference fringes varies for light of different wavelengths, double-slit interference provides a method of measuring the wavelength of light. In fact, this technique was used to make the first measurement of the wavelength of light.

SAMPLE PROBLEM A

Interference

PROBLEM

The distance between the two slits is 0.030 mm. The second-order bright fringe ($m = 2$) is measured on a viewing screen at an angle of 2.15° from the central maximum. Determine the wavelength of the light.

SOLUTION

1. DEFINE

Given: $d = 3.0 \times 10^{-5}$ m $\quad m = 2 \quad \theta = 2.15°$

Unknown: $\lambda = ?$

Diagram:

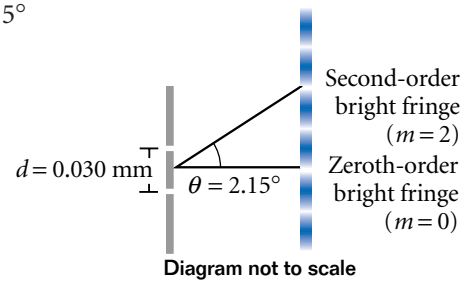

Diagram not to scale

2. PLAN

Choose an equation or situation: Use the equation for constructive interference.

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

Rearrange the equation to isolate the unknown:

$$\lambda = \frac{d\sin\theta}{m}$$

3. CALCULATE

Substitute the values into the equation and solve:

$$\lambda = \frac{(3.0 \times 10^{-5}\text{ m})(\sin 2.15°)}{2}$$

$$\lambda = 5.6 \times 10^{-7}\text{ m} = 5.6 \times 10^{2}\text{ nm}$$

$$\boxed{\lambda = 5.6 \times 10^{2}\text{ nm}}$$

CALCULATOR SOLUTION

Because the minimum number of significant figures for the data is two, the calculator answer 5.627366×10^{-7} should be rounded to two significant figures.

4. EVALUATE

This wavelength of light is in the visible spectrum. The wavelength corresponds to light of a yellow-green color.