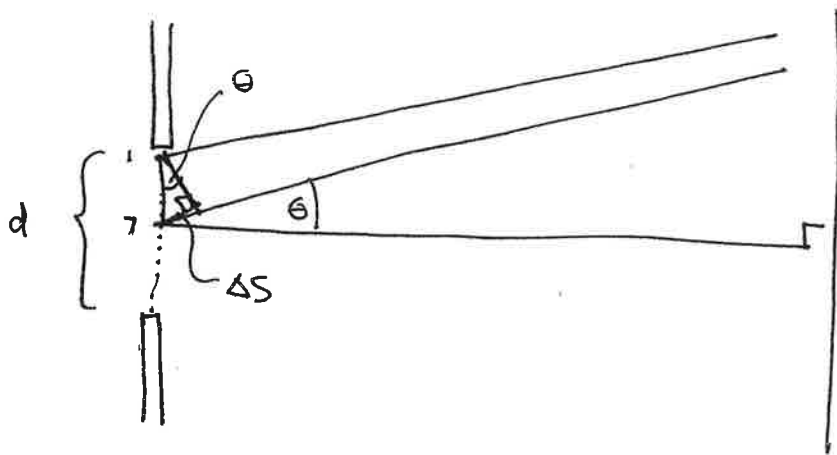


ASQ Vol 3 Ex 14.2 (Huygens principle & wave diffraction)



a)  $\frac{\Delta S}{d/2} = \sin \theta$  or  $\Delta S = d \sin \theta / 2$

b) If  $\Delta S = \frac{\lambda}{2}$  then  $\frac{\lambda}{2} = \frac{d \sin \theta}{2}$

c) There is destructive interference for points

187, 288, 389 ... etc when  $\frac{\lambda}{2} = \frac{d \sin \theta}{2}$

Thus, complete destr. interference when  $\lambda = d \sin \theta$

d) If  $\lambda = 500 \text{ nm}$  and  $d = 5 \text{ cm}$ ,  $\sin \theta = \frac{0.5 \times 10^{-6}}{5 \times 10^{-2}}$

$\theta = 1 \times 10^{-5}$  radians. So  $\Delta \theta = 0.0011$  degrees

There is little or no spreading of the light passing thru the aperture (for light).

e) If  $\lambda = 3 \text{ cm}$  and  $d = 5 \text{ cm}$  then

$\Delta \theta = 74$  degrees

The sound is significantly spread.