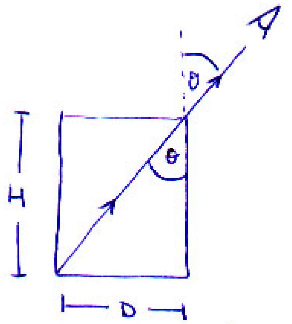
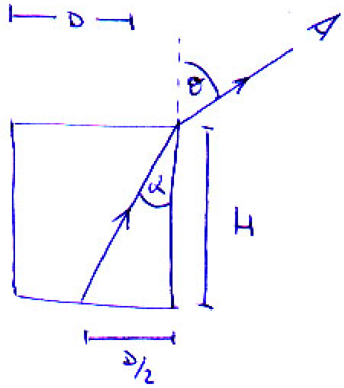
SOLUCIÓN EJERCICIO 23



Por geometría $\tan\theta = \dfrac{D}{H}$ (1 pto)



Ley de Snell $n \,\mathrm{sen}\,\alpha = \mathrm{sen}\,\theta$ (1pto)

Por geometría $\tan\alpha = \dfrac{D/2}{H}$ (1pto)

De la relación $\mathrm{sen}^2\theta + \cos^2\theta = 1$ se tiene

$$1 + \frac{\cos^2\theta}{\mathrm{sen}^2\theta} = \frac{1}{\mathrm{sen}^2\theta}$$

$$1 + \frac{1}{\tan^2\theta} = \frac{1}{\mathrm{sen}^2\theta}$$

$$\frac{\tan^2\theta + 1}{\tan^2\theta} = \frac{1}{\mathrm{sen}^2\theta}$$

$$\Rightarrow \mathrm{sen}\,\theta = \frac{\tan\theta}{\sqrt{1+\tan^2\theta}}$$

Entonces, de la ley de Snell

$$n\frac{\tan\alpha}{\sqrt{1+\tan^2\alpha}} = \frac{\tan\theta}{\sqrt{1+\tan^2\theta}}$$ (1.5 ptos)

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$$n \frac{D/2H}{\sqrt{1 + D^2/4H^2}} = \frac{D/H}{\sqrt{1 + D^2/H^2}}$$

$$\frac{n}{2} \frac{2H}{\sqrt{4H^2 + D^2}} = \frac{H}{\sqrt{H^2 + D^2}}$$

$$n^2 (H^2 + D^2) = 4H^2 + D^2$$

$$(n^2 - 1) D^2 = H^2 (4 - n^2)$$

$$\boxed{H = D \sqrt{\frac{n^2 - 1}{4 - n^2}}}$$

(1.5 ptos)