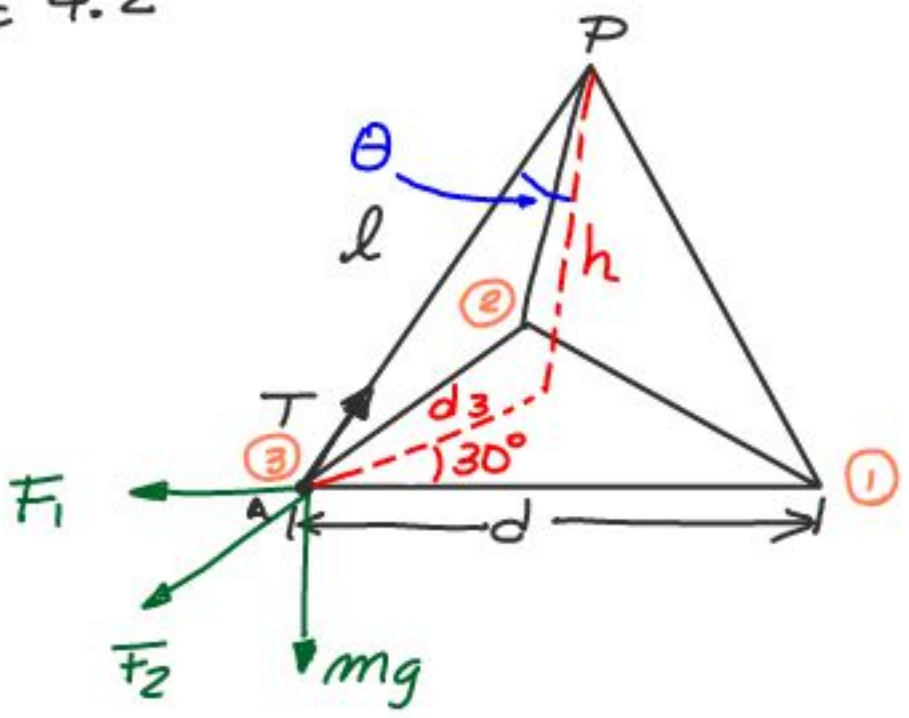
∈ 4.2



EN EL PUNTO A:

$$T \operatorname{sen}\theta \cos 30° = F_1 + F_2 \cos 60°$$

$$= \frac{q^2}{4\pi\epsilon_0 d^2} + \frac{q^2}{4\pi\epsilon_0 d^2}\left(\frac{1}{2}\right)$$

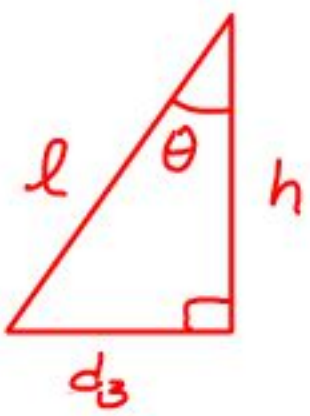
$$= \frac{3q^2}{8\pi\epsilon_0 d^2}$$

$$\boxed{T = \frac{3q^2}{8\pi\epsilon_0 d^2 \operatorname{sen}\theta \cos 30°}}$$

$$T\cos\theta = mg \Rightarrow T = \frac{mg}{\cos\theta}$$

$$T = T$$

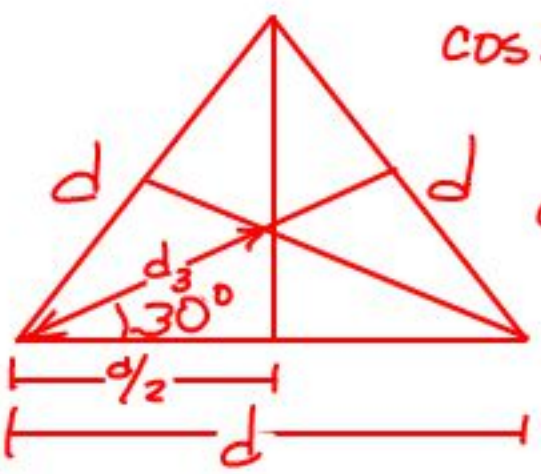
$$\frac{mg}{\cos\theta} = \frac{3q^2}{8\pi\epsilon_0 d^2 \operatorname{sen}\theta \cos 30°}$$



$$\operatorname{sen}\theta = \frac{d_3}{l} = \frac{d}{\sqrt{3}\,l}$$

$$\tan\theta = \frac{d_3}{h} = \frac{d/2}{\cos(30°)\,h} = \frac{d/2}{\frac{\sqrt{3}/2}{h}}$$

BASE



$$\cos 30° = \frac{d/2}{d_3}$$

$$d_3 = \frac{d}{\sqrt{3}}$$

$$\tan\theta = \frac{dh}{\sqrt{3}}$$

$$\tan\theta = \frac{dh}{\sqrt{3}} \qquad h = \sqrt{\ell^2 - d_3^2}$$

$$= \sqrt{\ell^2 - \left(\frac{d/2}{\cos 30^\circ}\right)^2}$$

$$= \sqrt{\ell^2 - \left(\frac{d/2}{\sqrt{3}/2}\right)^2}$$

$$= \sqrt{\ell^2 - \frac{d^2}{3}}$$

$$T = T$$

$$\frac{mg}{\cos\theta} = \frac{3q^2}{8\pi\epsilon_0 d^2 \operatorname{sen}\theta \cos 30^\circ}$$

$$\frac{\operatorname{sen}\theta \cos 30^\circ}{\cos\theta} = \frac{3q^2}{8\pi\epsilon_0 d^2 mg}$$

$$\tan\theta \cos 30^\circ = \frac{3q^2}{8\pi\epsilon_0 d^2 mg}$$

$$\frac{dh}{\sqrt{3}}\left(\frac{\sqrt{3}}{2}\right) = \frac{3q^2}{8\pi\epsilon_0 d^2 mg}$$

$$d\sqrt{\ell^2 - \frac{d^2}{3}} = \frac{3q^2}{4\pi\epsilon_0 d^2 mg}$$

$$q^2 = \frac{4\pi d^3 \epsilon_0 mg\sqrt{\ell^2 - \frac{d^2}{3}}}{3}$$

$$q = \frac{Q}{3} \rightarrow q^2 = \frac{Q^2}{9}$$

$$\therefore Q^2 = 12\pi d^3 \epsilon_0 mg\sqrt{\ell^2 - \frac{d^2}{3}}$$