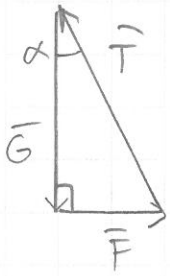


Pallo on tasapainossa: $\Sigma \vec{F} = \vec{G} + \vec{F} + \vec{T} = \vec{0}$

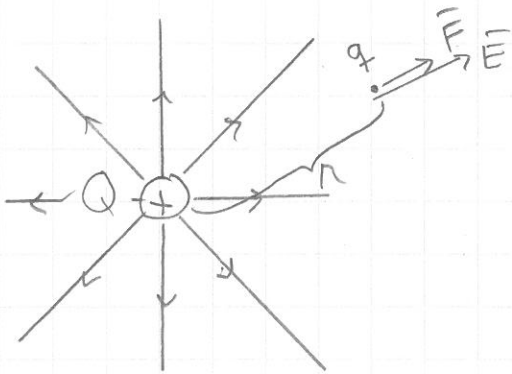
\Rightarrow voimat muodostavat kolmion:



$$\tan \alpha = \frac{F}{G} = \frac{QE}{mg} \quad | \cdot \frac{mg}{E}$$

$$\Rightarrow Q = \frac{mg \tan \alpha}{E} = \frac{13 \cdot 10^{-3} \cdot 10^{-3} \text{ kg} \cdot 9.81 \frac{\text{m}}{\text{s}^2} \cdot \tan 2.5^\circ}{400 \cdot 10^3 \frac{\text{N}}{\text{C}}} \\ \approx 1.39202 \cdot 10^{-11} \text{ C}$$

Varaus Q voi olla positiivinen tai negatiivinen $\Rightarrow Q \approx \pm 14 \text{ pC}$



$$F = k \frac{Qq}{r^2} = qE \quad | : q \neq 0$$

$$\Rightarrow E = k \frac{Q}{r^2} \quad \text{PISTEVARAUKSEN SÄHKÖKENTTÄ (TYHJÖ)}$$

$$E = \frac{k}{\epsilon_n} \frac{Q}{r^2} \quad \text{(ERISTE VÄLIÄINEENA)}$$

3.8

$$E_A = k \frac{Q}{r^2}$$

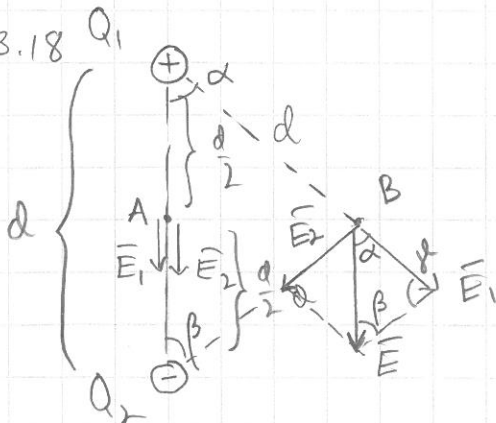
$$E_B = k \frac{3Q}{r^2} = 3E_A$$

$$E_C = k \frac{Q}{(2r)^2} = k \frac{Q}{4r^2} = \frac{1}{4} E_A$$

$$E_D = k \frac{3Q}{(2r)^2} = k \frac{3Q}{4r^2} = \frac{3}{4} E_A$$

järjestys: E_C, E_D, E_A, E_B
pieni \downarrow isoin \downarrow

3.18 Q_1



$$Q_1 = -Q_2 = 16 \text{ nC}, \quad d = 14 \text{ cm}$$

$$A: \begin{cases} \vec{E}_1 \uparrow \vec{E}_2 \\ |Q_1| = |Q_2|, r_1 = r_2 = \frac{d}{2} \Rightarrow E_1 = E_2 \end{cases}$$

$$\vec{E} = \vec{E}_1 + \vec{E}_2$$

$$\Rightarrow E = 2E_1 = 2k \frac{Q}{\left(\frac{d}{2}\right)^2} = 2 \cdot 8.98755 \cdot 10^9 \frac{\text{N}}{\text{C}^2} \cdot \frac{16 \cdot 10^{-9} \text{ C}}{\left(\frac{0.14 \text{ m}}{2}\right)^2}$$

$$\approx 58694.2 \frac{\text{N}}{\text{C}} = 59 \frac{\text{MN}}{\text{C}}$$

(E nolli $Q_2 = 16 \text{ nC}$)