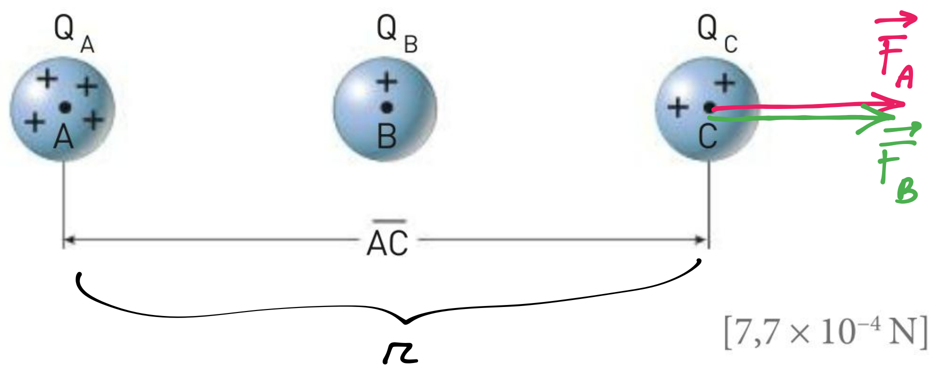
26/9/2018

29 ★★★ Il segmento AC è lungo 24 cm e B è il suo punto medio. In A, B e C sono poste tre cariche puntiformi positive che valgono, rispettivamente, $Q_A = 73{,}5$ nC, $Q_B = 18{,}1$ nC e $Q_C = 33{,}8$ nC.

$n\,C = 10^{-9}\,C$

▸ Determina la forza elettrica totale che agisce sulla carica nel punto C.



[$7{,}7 \times 10^{-4}$ N]

FORZA TOTALE SU C

$$\vec{F} = \vec{F}_A + \vec{F}_B$$

$$F = F_A + F_B = K_0 \frac{Q_A Q_C}{r^2} + K_0 \frac{Q_B Q_C}{\left(\frac{r}{2}\right)^2} =$$

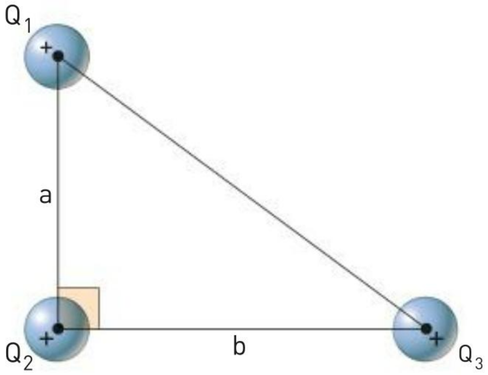
$$= \frac{K_0 Q_C}{r^2}\left[Q_A + 4 Q_B\right] =$$

$$= \frac{8{,}988 \cancel{\times 10^{9}} \cdot 33{,}8 \cancel{\times 10^{-9}}}{(0{,}24)^2}\left[73{,}5 + 4 \cdot 18{,}1\right] \times 10^{-9}\ N =$$

$$= 769506{,}9\ldots \times 10^{-9}\ N \simeq \boxed{7{,}7 \times 10^{-4}\ N}$$

33 ★★★

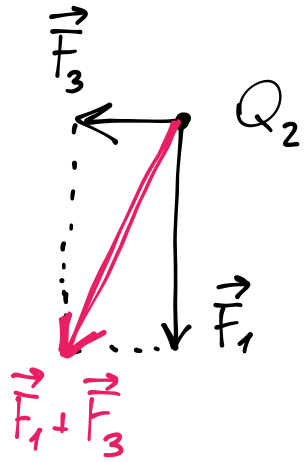
Tre cariche puntiformi $Q_1 = 4,0 \times 10^{-10}$ C, $Q_2 = 5,0 \times 10^{-10}$ C e $Q_3 = 3,0 \times 10^{-10}$ C sono disposte ai vertici di un triangolo rettangolo di cateti $a = 3,0$ cm e b = 4,0 cm. La carica Q_2 è posta nel vertice dell'angolo retto.



- Calcola l'intensità della forza totale subita dalla carica Q_2.
- Calcola l'intensità della forza totale subita dalla carica Q_1.

[$2,2 \times 10^{-6}$ N; $2,3 \times 10^{-6}$ N]

1)

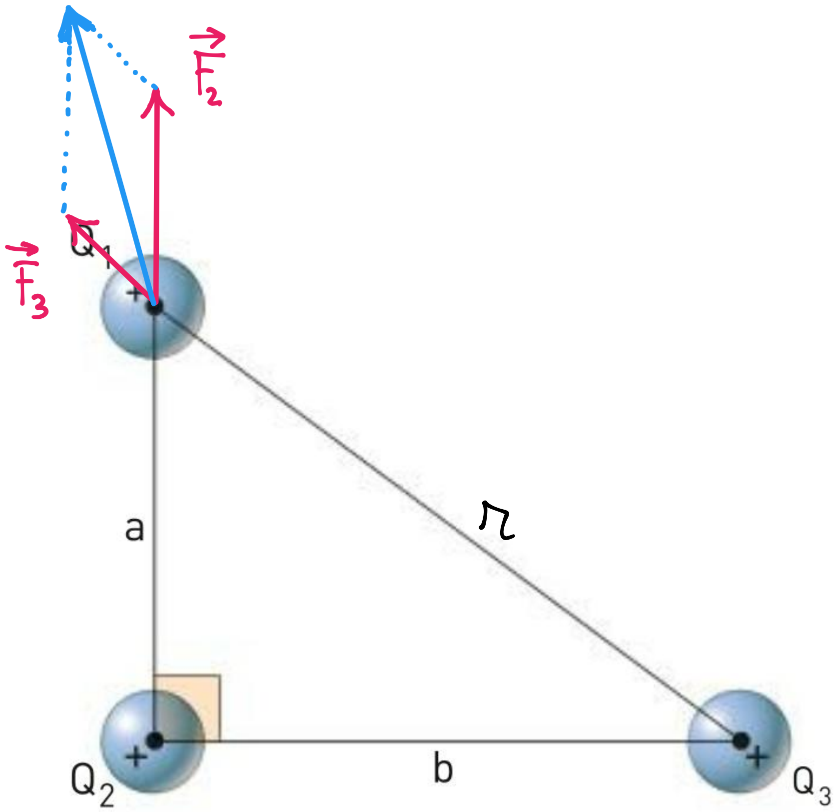


$$F_1 = k_0 \frac{Q_1 Q_2}{a^2} \qquad F_3 = k_0 \frac{Q_3 Q_2}{b^2}$$

$$|\vec{F}_1 + \vec{F}_3| = \sqrt{F_1^2 + F_3^2} = \sqrt{k_0^2 \frac{Q_1^2 Q_2^2}{a^4} + k_0^2 \frac{Q_3^2 Q_2^2}{b^4}} =$$

$$= k_0 Q_2 \sqrt{\frac{Q_1^2}{a^4} + \frac{Q_3^2}{b^4}} = (8,988 \times 10^9)(5,0 \times 10^{-10}) \sqrt{\frac{(4,0)^2}{(0,030)^4} + \frac{(3,0)^2}{(0,040)^4}} \times 10^{-10} \text{ N}$$

$$= 216780,01.... \times 10^{-11} \text{ N} \simeq \boxed{2,2 \times 10^{-6} \text{ N}}$$



$Q_1 = 4{,}0 \times 10^{-10}\ C$

$Q_2 = 5{,}0 \times 10^{-10}\ C$

$Q_3 = 3{,}0 \times 10^{-10}\ C$

$a = 3{,}0\ cm$

$b = 4{,}0\ cm$

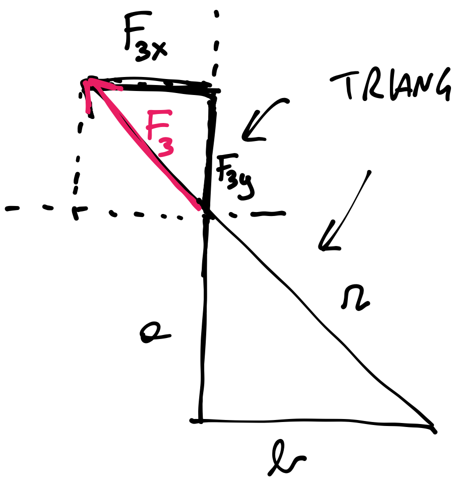
$\hookrightarrow r = 5{,}0\ cm$ (TH. PITAGORA)

$$F_2 = k_0 \frac{Q_1 Q_2}{a^2}$$

$$\boxed{\vec{F}_2 = \left(0,\ k_0 \frac{Q_1 Q_2}{a^2}\right)}$$

$$F_3 = k_0 \frac{Q_1 Q_3}{r^2}$$

TRIANGOLI SIMILI



DA SOMMARE

$$r : F_3 = a : F_{3y}$$

$$F_{3y} = F_3 \cdot \frac{a}{r} = k_0 \frac{Q_1 Q_3\, a}{r^3}$$

$$r : F_3 = b : F_{3x}$$

$$F_{3x} = F_3 \cdot \frac{b}{r} = k_0 \frac{Q_1 Q_3\, b}{r^3}$$

$$\boxed{\vec{F}_3 = \left(-k_0 \frac{Q_1 Q_3\, b}{r^3},\ k_0 \frac{Q_1 Q_3\, a}{r^3}\right)}$$

PROCEDIAMO COI CALCOLI

$$\vec{F}_2 = \left(0,\ k_0 \frac{Q_1 Q_2}{a^2}\right)$$

$$k_0 \frac{Q_1 Q_2}{a^2} = 8{,}988 \times 10^9 \cdot \frac{20 \times 10^{-20}}{9{,}0 \times 10^{-4}}\ N = 19{,}97333\ \times 10^{-7}\ N$$

$$\boxed{\vec{F}_2 = (0,\ 19{,}9733) \times 10^{-7}\ N}$$

$$\vec{F}_3 = \left(-k_0 \frac{Q_3 Q_1 b}{r^3},\ k_0 \frac{Q_3 Q_1 a}{r^3}\right) \qquad \boxed{\vec{F}_3 = (-3{,}45139\ ,\ 2{,}58854) \times 10^{-7} N}$$

$$-8{,}988 \times 10^9 \cdot \frac{12 \times 10^{-20} \cdot 4{,}0 \times 10^{-2}}{125 \times 10^{-6}} = -3{,}45139.. \times 10^{-7}\ N$$

$$8{,}988 \times 10^9\ \frac{12 \times 10^{-20} \cdot 3{,}0 \times 10^{-2}}{125 \times 10^{-6}} = 2{,}58854... \times 10^{-7}\ N$$

$$\vec{F}_2 + \vec{F}_3 = (-3{,}45139\ ,\ 22{,}5618) \times 10^{-7}\ N$$

$$|\vec{F}_2 + \vec{F}_3| = \sqrt{(-3{,}45139)^2 + (22{,}5618)^2}\ \times 10^{-7}\ N = 22{,}8243... \times 10^{-7}\ N$$

$$\simeq \boxed{2{,}3 \times 10^{-6}\ N}$$