Answer on Question #45767, Physics, Electromagnetism

Two charges Q1=500μC and Q2=100μC are located on the XY plane at the positions $\overrightarrow{r_1} = 3\vec{j}\, m$ *and* $\overrightarrow{r_2} = 4\vec{\imath}\, m$. *Find the force exerted on the Q2*

a. $14.4\vec{\imath} + 10.8\vec{j}$ *N*

b. $\mathbf{14.4\vec{\imath} - 10.8\vec{j}}$ ***N***

c. $10.8\vec{\imath} - 14.4\vec{j}$ *N*

d. $10.8\vec{\imath} + 14.4\vec{j}$ *N*

By the Coulomb law:

$$\overrightarrow{F_{12}} = k\frac{Q_1 Q_2}{{r_{12}}^2}\frac{\overrightarrow{r_{12}}}{r_{12}}$$

Where $\overrightarrow{r_{12}} = \overrightarrow{r_2} - \overrightarrow{r_1} = 4\vec{\imath} - 3\vec{j}$

Distance between two charges:

$$r_{12} = \sqrt{(3\vec{j})^2 + (4\vec{\imath})^2} = 5m$$

Then:

$$\overrightarrow{F_{12}} = 9 \cdot 10^9 \frac{N \cdot m^2}{C^2}\frac{500 \cdot 10^{-6}C \cdot 100 \cdot 10^{-6}C}{(5m)^2}\frac{(4\vec{\imath} - 3\vec{j})m}{5m} = 14.4\vec{\imath} - 10.8\vec{j}\, N$$

Answer: force exerted on the Q_2 is $\overrightarrow{F_{12}} = 14.4\vec{\imath} - 10.8\vec{j}\, N$