Answer on Question #79428- Physics- Electric Circuits

Question: *Consider three point charges located at the corners of an isosceles right triangle of sides a,a and x,where q1=q2=5.0uC and q3=-2.0uC and a=0.10m with q3 placed at right angle.find the resultant force exerted on q3*

Answer:

Since $q_1 = q_2 > 0$ and $q_3 < 0$, the charges q_1 and q_2 attract q_3. Hence, both Coulomb forces acting on q_3 point towards the corresponding charges located at the corners on the base of a triangle (see figure 1 for details). The net force is just a vector sum of these two separate forces, and it points along the perpendicular to the base of triangle (here we take into account that $q_1 = q_2$ and that given triangle is isosceles right triangle $\rightarrow$ both Coulomb forces are equal and perpendicular to each other). Hence, the net force acting on charge q_3 is equal to (let us put $q_1 = q_2 \equiv q$):

$$F_{net} = \sqrt{|F_{13}|^2 + |F_{23}|^2} = \sqrt{\left(k\frac{q|q_3|}{a^2}\right)^2 + \left(k\frac{q|q_3|}{a^2}\right)^2} = \sqrt{2}k\frac{q|q_3|}{a^2}. \quad (1)$$

Substituting numerical values into (1), we obtain:

$$F_{net} = \sqrt{2}\cdot 9\cdot 10^9 \frac{5\cdot 10^{-6}\cdot 2\cdot 10^{-6}}{(10^{-1})^2} = 9\sqrt{2} \approx 12.7\ N. \quad (2)$$

Finally, one can conclude that the resultant force is equal to 12.7 N.

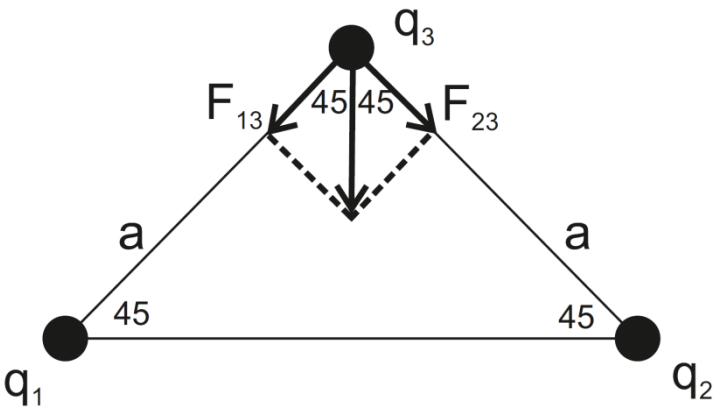

Figure 1.