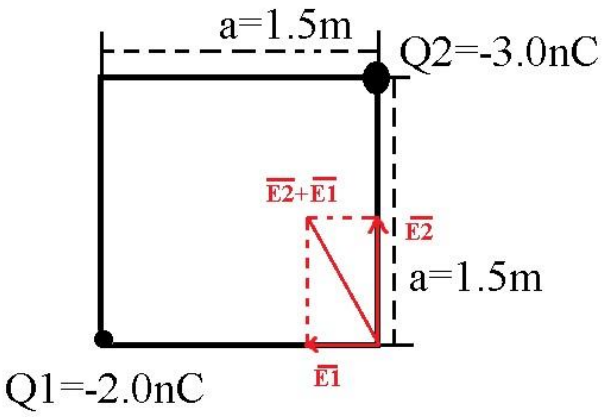
Answer to Question #67116, Physics / Electromagnetism



Problem: A -2.0nC point charged is placed at one corner of a square (1.5m on a side).and a -3.0nC charge is placed on a corner-diagonally away from the first charge. What is the magnitude of the electric field at either of the two unoccupied corners?

Solution:

Let's calculate the value of electric field of first charge in the unoccupied corner of the square:

$$E_1 = \frac{Q_1}{4\pi\varepsilon_0 a^2}$$

The value of electric field of the second charge can be calculated as

$$E_2 = \frac{Q_2}{4\pi\varepsilon_0 a^2}$$

Now considering that electric field is a vector, the illustration and the Pythagorean theorem one can write

$$E = \left|\overrightarrow{E_1} + \overrightarrow{E_2}\right| = \sqrt{\left(\frac{Q_1}{4\pi\varepsilon_0 a^2}\right)^2 + \left(\frac{Q_2}{4\pi\varepsilon_0 a^2}\right)^2}$$

$$E = \frac{\sqrt{{Q_1}^2 + {Q_2}^2}}{4\pi\varepsilon_0 a^2} = \frac{k * \sqrt{{Q_1}^2 + {Q_2}^2}}{a^2} = \frac{8.99 * 10^9 * \sqrt{13 * 10^{-18}}}{1.5^2} = 14.406\ N/C$$

Answer:

The magnitude of the electric field at either of two empty corners of the square is equal to

$$\boldsymbol{E = 14.406\ N/C}$$