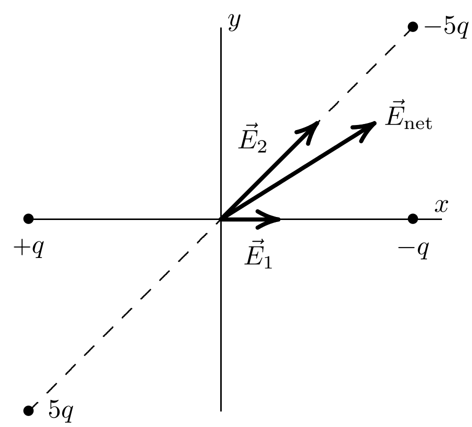
64. From symmetry, the only two pairs of charges which produce a non-vanishing field $\vec{E}_{\text{net}}$ are: pair 1, which is in the middle of the two vertical sides of the square (the $+q$, $-2q$ pair); and pair 2, the $+5q$, $-5q$ pair. We denote the electric fields produced by each pair as $\vec{E}_1$ and $\vec{E}_2$, respectively. We set up a coordinate system as shown to the right, with the origin at the center of the square. Now,



$$E_1 = \frac{1}{4\pi\varepsilon_0}\left(\frac{q}{d^2} + \frac{2q}{d^2}\right) = \frac{3q}{4\pi\varepsilon_0 d^2} \qquad \text{and} \qquad E_2 = k\left[\frac{5q}{(\sqrt{2}d)^2} + \frac{5q}{(\sqrt{2}d)^2}\right] = \frac{5q}{4\pi\varepsilon_0 d^2} \ .$$

Therefore, the components of $\vec{E}_{\text{net}}$ are given by

$$\begin{aligned} E_x &= E_{1x} + E_{2x} = E_1 + E_2 \cos 45^\circ \\ &= \frac{3q}{4\pi\varepsilon_0 d^2} + \left(\frac{5q}{4\pi\varepsilon_0 d^2}\right)\cos 45^\circ = 6.536\left(\frac{q}{4\pi\varepsilon_0 d^2}\right) \ , \end{aligned}$$

and

$$E_y = E_{1y} + E_{2y} = E_2 \sin 45^\circ = \left(\frac{5q}{4\pi\varepsilon_0 d^2}\right)\sin 45^\circ = 3.536\left(\frac{q}{4\pi\varepsilon_0 d^2}\right) \ .$$

Thus, the magnitude of $\vec{E}_{\text{net}}$ is

$$E = \sqrt{E_x^2 + E_y^2} = \sqrt{(6.536)^2 + (3.536)^2}\left(\frac{q}{4\pi\varepsilon_0 d^2}\right) = \frac{7.43q}{4\pi\varepsilon_0 d^2} \ ,$$

and $\vec{E}_{\text{net}}$ makes an angle θ with the positive x axis, where

$$\theta = \tan^{-1}\left(\frac{E_y}{E_x}\right) = \tan^{-1}\left(\frac{3.536}{6.536}\right) = 28.4^\circ \ .$$