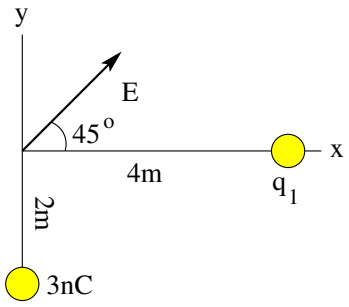
Intermediate Exam I: Problem #1 (Spring '05)

The electric field $\vec{E}$ generated by the two point charges, 3nC and q_1 (unknown), has the direction shown.

(a) Find the magnitude of $\vec{E}$.

(b) Find the value of q_1.



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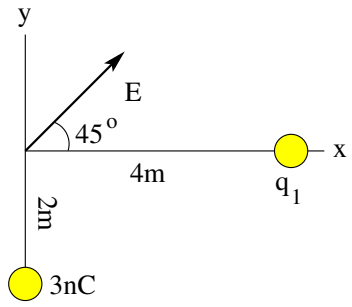

Solution:

(a) $E_y = k\dfrac{3\text{nC}}{(2\text{m})^2} = 6.75\text{N/C}$,

$E_x = E_y$,

$E = \sqrt{E_x^2 + E_y^2} = 9.55\text{N/C}$.

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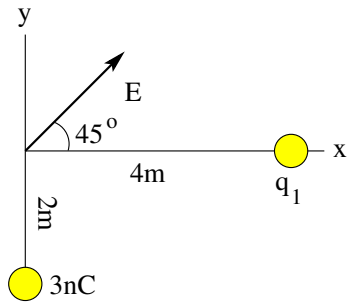

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(b) $E_x = k\dfrac{(-q_1)}{(4\text{m})^2},$

$q_1 = -\dfrac{(6.75\text{N/C})(16\text{m}^2)}{k} = -12\text{nC}.$