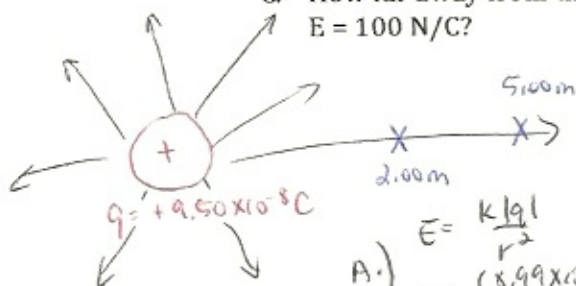


Electric Field: Measuring the Electric Field from a Point Charge

Example 3:

A point charge ($q = +9.50 \times 10^{-8} \text{ C}$) is generating part of the electric field.

- Calculate the strength of the electric field 2.00 m away from this charge.
- Calculate the strength of the electric field 5.00 m away from this charge.
- How far away from this point charge must you be to experience an electric field $E = 100 \text{ N/C}$?



A.) $E = \frac{k|q|}{r^2}$
 $E = \frac{(8.99 \times 10^9) \cdot |9.50 \times 10^{-8}|}{(2.00)^2} = \boxed{213.5 \text{ N/C}}$

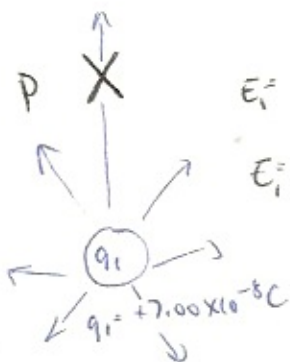
B.) $E = \frac{k|q|}{r^2}$
 $E = \frac{(8.99 \times 10^9) \cdot |9.50 \times 10^{-8}|}{(5.00)^2} = \boxed{34.2 \text{ N/C}}$

C.) $E = 100 \text{ N/C}$
 $r = ?$
 $E = \frac{k|q|}{r^2}$
 $r = \sqrt{\frac{k|q|}{E}}$
 $r = \sqrt{\frac{(8.99 \times 10^9) \cdot |9.50 \times 10^{-8}|}{100}}$
 $r = \boxed{2.92 \text{ m}}$

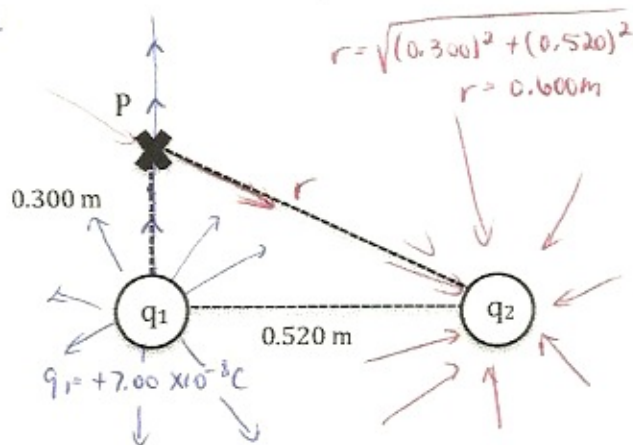
Example 4:

Two point charges (q_1 and q_2) create a right triangle with point P. The point charge q_1 has a charge of $+7.00 \times 10^{-8} \text{ C}$ while point charge q_2 has a charge of $-5.00 \times 10^{-8} \text{ C}$. Calculate the net electric field created by these two point charges at point P.

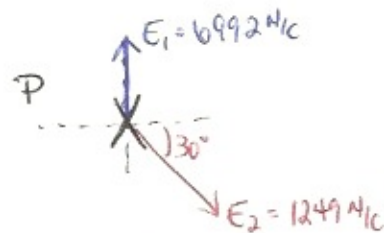
* Evaluate the problem one charge at a time



$E_1 = \frac{k|q_1|}{r^2}$
 $E_1 = \frac{(8.99 \times 10^9) \cdot |7.00 \times 10^{-8}|}{(0.300)^2}$
 $E_1 = \boxed{6992 \text{ N/C}}$
 upward, 90°



$E_2 = \frac{k|q_2|}{r^2}$
 $E_2 = \frac{(8.99 \times 10^9) \cdot |-5.00 \times 10^{-8}|}{(0.600)^2}$
 $E_2 = \boxed{1249 \text{ N/C}}$
 south of east, 30°



Components
 $E_{2x} = \cos(30^\circ) \cdot 1249 = 1082 \text{ N/C}$
 $E_{2y} = \sin(30^\circ) \cdot 1249 = 625 \text{ N/C}$

$\Sigma E_x = E_{2x}$
 $\Sigma E_x = 1082 \text{ N/C}$

$\Sigma E_y = E_1 - E_{2y}$
 $\Sigma E_y = 6992 - 625$
 $\Sigma E_y = 6367 \text{ N/C}$

$E_{\text{net}} = \sqrt{(1082)^2 + (6367)^2}$
 $E_{\text{net}} = \boxed{6458 \text{ N/C}}$

$\theta = \tan^{-1}\left(\frac{6367}{1082}\right)$
 $\theta = \boxed{80^\circ}$

