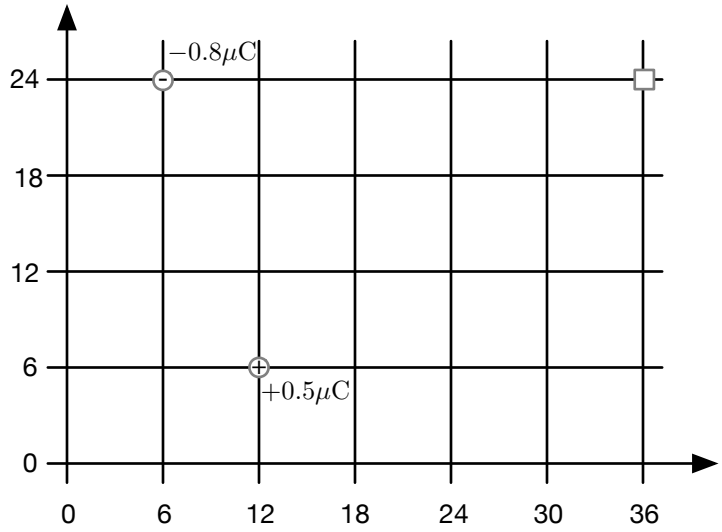
There are two charges located as shown, position is given in **meters**. Compute the magnitude of the electric field due to the two charges at the location of the small square.



$k = 9.0 \times 10^9 \frac{\text{N}\cdot\text{m}^2}{\text{C}^2}$.

Physics 11 - Quiz 6 2/28/2020

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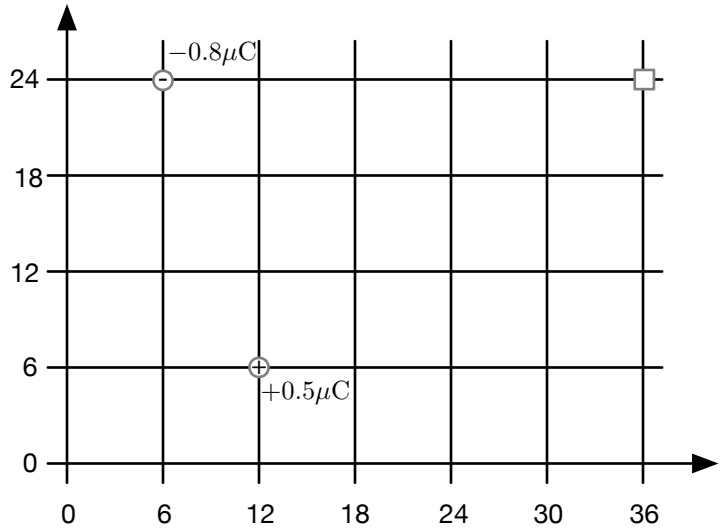
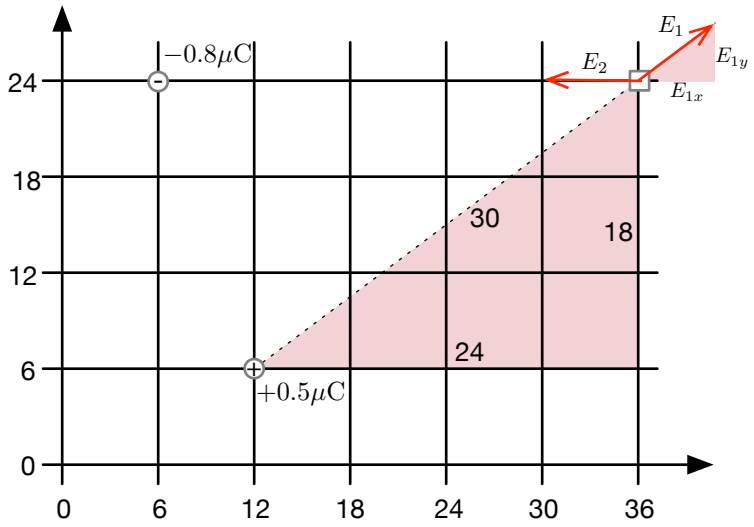


$k = 9.0 \times 10^9 \frac{\text{N}\cdot\text{m}^2}{\text{C}^2}$.

(a) We see that the pink triangle has sides of 24m and 18m so that the diagonal has a length $\sqrt{24^2 + 18^2} = 30\text{m}$.



First compute the magnitude of the electric field produced by the 0.5μC charge.

$$\begin{aligned} E_1 &= k\frac{|q|}{r^2} \\ &= k\frac{|q|}{r_x^2 + r_y^2} \\ &= \left(9.0 \times 10^9 \frac{\text{N}\cdot\text{m}^2}{\text{C}^2}\right) \frac{(0.5 \times 10^{-6}\text{C})}{(30\text{m})^2} = 5.0\frac{\text{N}}{\text{C}} \end{aligned}$$

By similar triangles

$$\frac{E_{1x}}{E_1} = \frac{24}{30} \longrightarrow E_1 x = E_1 \frac{24}{30} = 4.0\frac{\text{N}}{\text{C}}$$

$$\frac{E_{1y}}{E_1} = \frac{18}{30} \longrightarrow E_1 x = E_1 \frac{18}{30} = 3.0\frac{\text{N}}{\text{C}}$$

Now for E_2.

$$\begin{aligned} E_2 &= k\frac{|q|}{r^2} \\ &= \left(9.0 \times 10^9 \frac{\text{N}\cdot\text{m}^2}{\text{C}^2}\right) \frac{(0.8 \times 10^{-6}\text{C})}{(30\text{m})^2} = 8.0\frac{\text{N}}{\text{C}} \end{aligned}$$

so

$$\begin{aligned} E_{2x} &= -E_1 = -8.0\frac{\text{N}}{\text{C}} \\ E_{2y} &= 0 \end{aligned}$$

The components of the net field then are

$$\begin{aligned} E_x &= E_{1x} + E_{2x} = 4.0\frac{\text{N}}{\text{C}} + (-8.0\frac{\text{N}}{\text{C}}) = -4\frac{\text{N}}{\text{C}} \\ E_y &= E_{1y} + E_{2y} = 3.0\frac{\text{N}}{\text{C}} + 0 = 3\frac{\text{N}}{\text{C}} \end{aligned}$$

and the magnitude is then

$$E = \sqrt{(-4.0)^2 + 3.0^2}\frac{\text{N}}{\text{C}} = 5.0\frac{\text{N}}{\text{C}}$$