Question

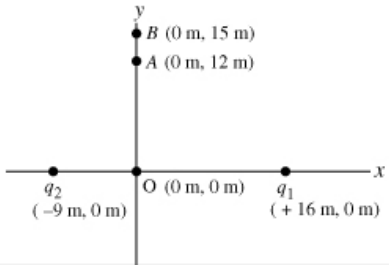
Two point charges are placed on the x axis. (Figure 1) The first charge, q1 = 8.00nC , is placed a distance 16.0m from the origin along the positive x axis; the second charge, q2 = 6.00nC , is placed a distance 9.00m from the origin along the negative x axis.

Part A

Calculate the electric field at point A, located at coordinates (0 m, 12.0m).

Give the x and y components of the electric field as an ordered pair. Express your answer in newtons per coulomb to three significant figures.

EAx,EAy = ? N/C



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Answers

Corey Tucker answered this more than 1 day later
First answer!

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The electric field from q1 is given by:

F1 = kq1 / r1^2

r1 = sqrt(12^2+16^2)=20
F1 = 8.9875 * 10^9 * (8.00 * 10^-9) / 20^2
F1 = 0.18 N/C

Likewise, for q2:

F2 = kq2 / r2^2

r2 = sqrt(12^2+9^2)=15

F2 = 8.9875 * 10^9 * (6.00 * 10^-9) / 15^2

F2 = 0.24 N/C

To find the x and y components, just use trigonometry (note that the direction of the field is away from the charges, since the charges are positive, so q1's x component will be negative, q2's x component will be positive, and both y components will be positive:

F1, x = F1 * cos(?1)
F1, x = 0.18 * -cos(36.87)
F1, x = -0.144 N/C

F1, y = F1 * sin(?1)
F1, y = 0.18 * sin(36.87)
F1, y = 0.108 N/C

F2, x = F2 * cos(?2)
F2, x = 0.24 * cos(53.13)
F2, x = 0.144 N/C

F2, y = F2 * sin(?2)
F2, y = 0.24 * sin(53.13)
F2, y = 0.192 N/C

So the sum of the x components is 0 (+0.144 from q2, -0.144 from q1. The sum of the y components is 0.300 (0.144 + 0.192):

0,0.300 N/C

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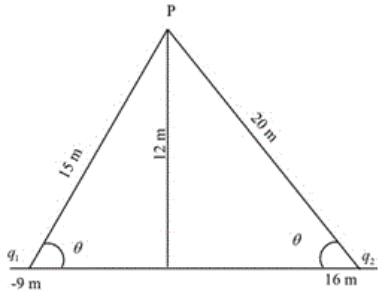
Shaina answered this more than 1 day later
1,195 answers

Was this answer helpful? 19 0

In the following figure, the charges are placed at -9 m and 16 m. The electric field is calculated at 12 m from the origin. The distance of the charge q_1 and q_2 from the point P is calculated using geometry.



The electric field due to charge q_1 is given by,

$$E_1 = k\frac{q}{r^2} = \left(9\times10^9\ \text{N}\cdot\text{m}^2/\text{C}^2\right)\left(\frac{6\times10^{-9}\ \text{C}}{\sqrt{(9\ \text{m})^2+(12\ \text{m})^2}}\right) = 0.24\ \text{N/C}$$

The electric field due to charge q_2 is given by,

$$E_2 = k\frac{q}{r^2} = \left(9\times10^9\ \text{N}\cdot\text{m}^2/\text{C}^2\right)\left(\frac{8\times10^{-9}\ \text{C}}{\sqrt{(16\ \text{m})^2+(12\ \text{m})^2}}\right) = 0.18\ \text{N/C}$$

Resolve the electric field into x and y components.

$$E_{1x} = E_1\cos\theta = (0.24\ \text{N/C})\left(\frac{-9}{15}\right) = -0.144\ \text{N/C}$$

$$E_{1y} = E_1\sin\theta = (0.24\ \text{N/C})\left(\frac{12}{15}\right) = 0.192\ \text{N/C}$$

$$\left(\frac{16}{}\right)$$

$$E_{2x} = E_2 \cos\theta = (0.18\ \text{N/C})\left(\frac{}{20}\right) = 0.144\ \text{N/C}$$

$$E_{2y} = E_2 \sin\theta = (0.18\ \text{N/C})\left(\frac{12}{20}\right) = 0.108\ \text{N/C}$$

Add the components of force. Thus, the electric field is,

$$((-0.144\ \text{N/C} + 0.144\ \text{N/C}), (0.192\ \text{N/C} + 0.108\ \text{N/C})) = (0, 0.30\ \text{N/C})$$

Comment