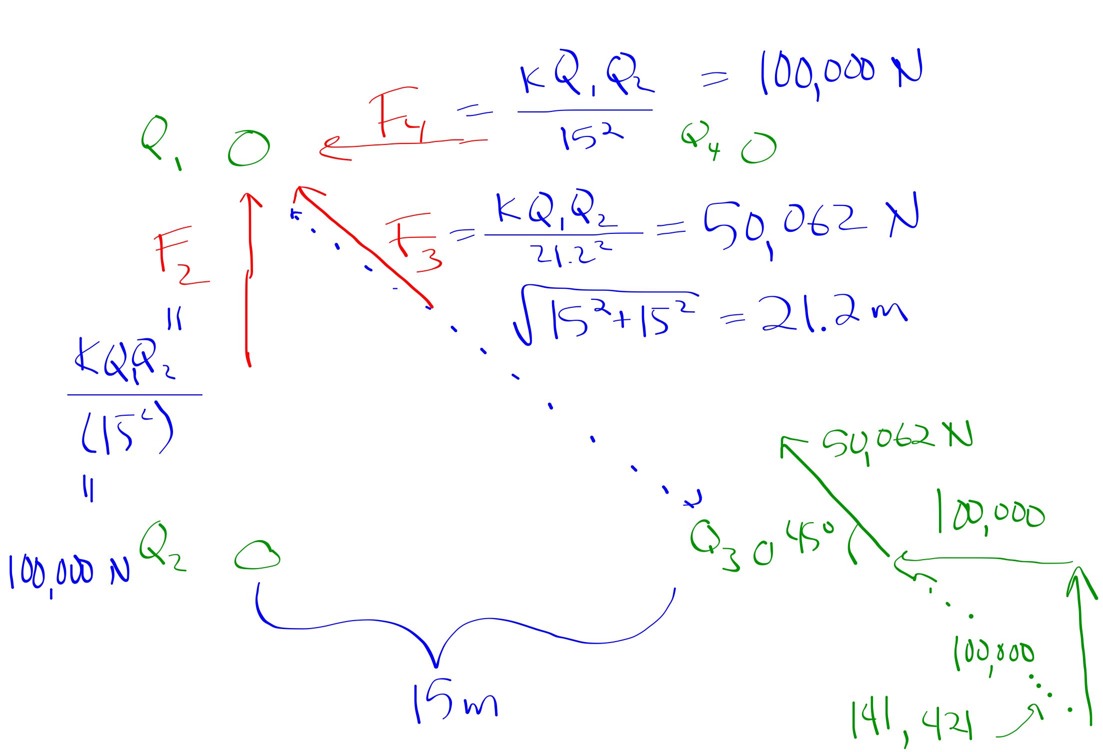
10. A charge of 0.0500 C is placed at each corner of a square 15.0 m on a side. Determine the magnitude and direction of the force on each charge. (If this problem seems familiar, it should. We recently did one almost identical to it. For the stamp, nothing short of a complete solution with all supporting work will qualify as an acceptable “attempt” on this problem. Just a word of warning: simple pictures and half-hearted tries with random equations written down aren’t going to cut it, at least to earn the stamp.)

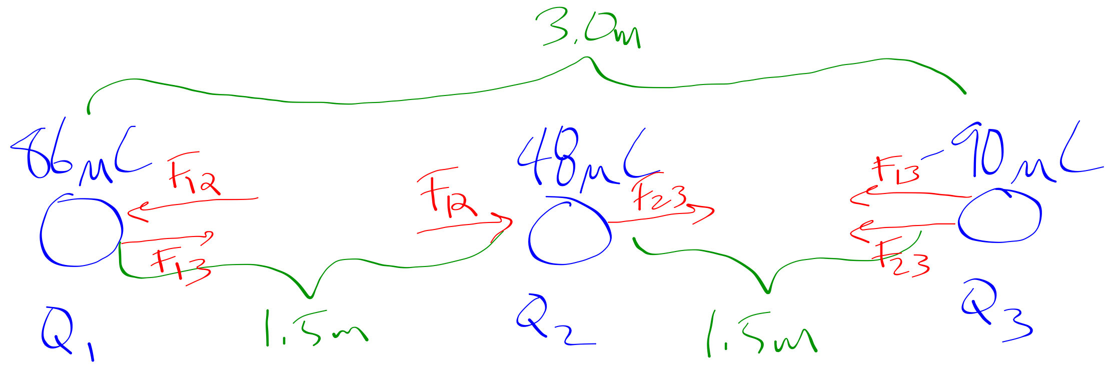


$$F = \frac{kQ_1Q_2}{r^2}$$

(all Q = 0.05 C)

F_{NET} = 191,483 N (directly out from center of square) 45°

9. Particles of charge +86 μC, +48 μC, and -90 μC are placed in a line. The center one (the +48 μC charge) is 1.5 m from each of the others. Calculate the net force on each due to the other two.



$$F_{12} = \frac{kQ_1Q_2}{r^2} = \frac{(9E9)(86E-6)(48E-6)}{1.5^2} = 16.5\text{N (repulsive)}$$

$$F_{23} = -17.28\text{ N (attractive)}$$

$$F_{13} = -7.74\text{ N (attractive)}$$

$$F_1 = 16.5\text{ (left)} + 7.74\text{ (right)} = 8.76\text{ N (left)}$$

$$F_2 = 16.5\text{ (right)} + 17.28\text{ (right)} = 33.78\text{ N (right)}$$

$$F_3 = 17.28\text{ (left)} + 7.74\text{ (left)} = 25.02\text{ (left)}$$

Gravity:

$F_g = \frac{G m_1 m_2}{r^2}$ (force, N)

Coulomb's Law

$F = \frac{K Q_1 Q_2}{r^2}$ (force, N)

g (m/s^2)

earth

$\frac{G m_1 \cancel{m_2}}{r^2} = \cancel{m_2} a$ (N/kg)

$W = mg$

$E = \frac{F}{q}$ (N/C)

GPE: change in energy

change in height!

$\Delta GPE = mgh - mgh_0$

Voltage: electrical potential

Electric field: The force a +1 Coulomb charge would feel in a given location because of other charges (vector → magnitude & direction)

$$\boxed{E = \frac{F}{q}} = \frac{\frac{kQq}{r^2}}{q} = \boxed{\frac{kQ}{r^2} = E}$$

units: N/C

If we know Q → the location & charge of a single charge creating an electric field or the equivalent single charge it would take to make a given electric field then: $F = \boxed{\frac{kQq}{r^2}}$