CONCEPT: ELECTRIC FIELD

● A single charge will *produce* an **electric field** in all directions that any second charge can *feel* at some distance **r.**

● Charge **q** feels a force in an ELECTRIC FIELD, **E (set up by Q):**

- F = _____ → Units = _____

EXAMPLE**:** A 2C and a 3C charge are separated by some distance *r* such that the electric field at the 2C charge is 10 N/C**.** What is the force on the 2C charge?

PRACTICE: BALANCING GRAVITY

A 1.5μC charge, with a mass of 50g, is in the presence of an electric field that perfectly balances its gravity**.** What magnitude does the electric field need to be, and in what direction does it need to point?

CONCEPT: ELECTRIC FIELD DUE TO POINT CHARGES

● Positive charges produce fields **[OUTWARD | INWARD]**, negative charges produce fields **[OUTWARD | INWARD].**

● A single charge **Q** will produce an ELECTRIC FIELD **E** of magnitude**:**

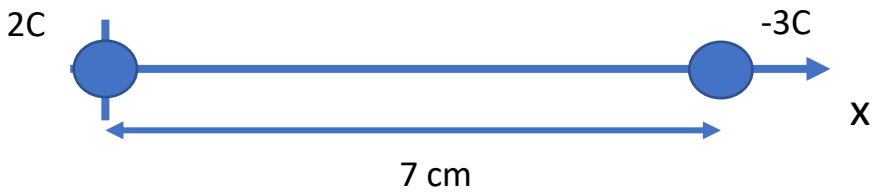
E = _____

- r → distance to **point of interest.** "*What is the E-field at ___?*"

● A second charge **q** feels the force **F** from the Electric Field **E** → $\mathbf{F} = \mathbf{qE} =$ _____**.**

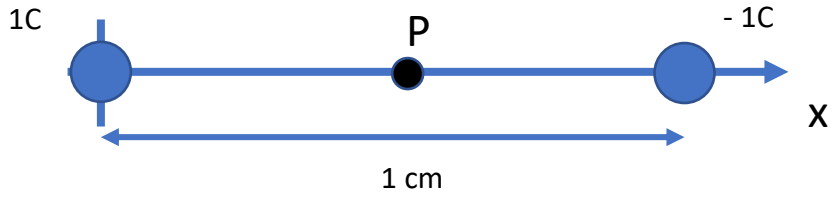
EXAMPLE**:** At a distance *x* from a charge Q, the electric field is 20 N/C**.** At a distance *y*, the electric field is 10 N/C**.** What is the ratio, *x/y*? Assume *x* and *y* lie on the same axis from the electric field source**.**

EXAMPLE**:** Two charges lie on the x-axis as shown below**.** At what point on the x-axis is the electric field zero?



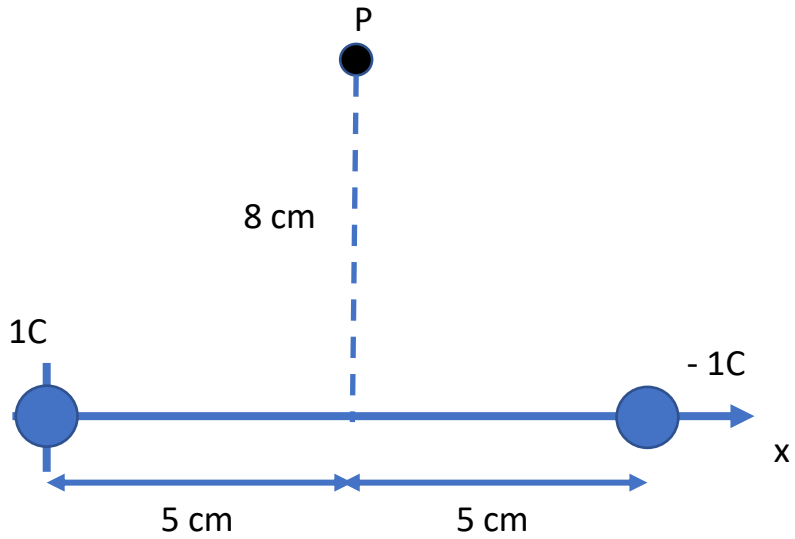
PRACTICE: ELECTRIC DIPOLE

If two equal charges are separated by some distance, they form an electric dipole. Find the electric field at the center of an electric dipole, given by the point *P* in the following figure, formed by a 1C and a – 1C charge separated by 1 cm.



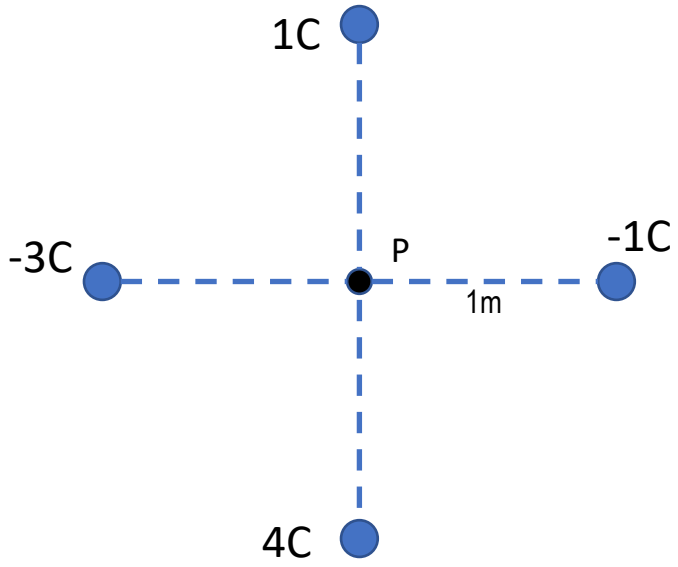
EXAMPLE: ELECTRIC FIELD ABOVE 2 CHARGES

What is the electric field at the point above the two charges, indicated as *P* in the following figure?



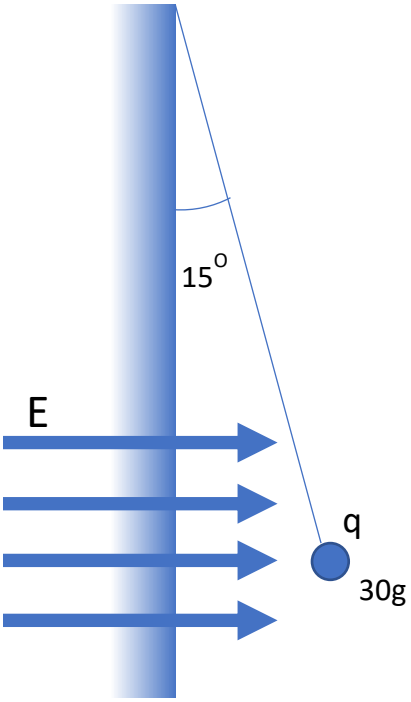
PRACTICE: FIELD AT THE CENTER OF 4 CHARGES

4 charges are arranged as shown in the following figure. Find the electric field at the center of the arrangement, indicated by the point *P*.



EXAMPLE: PENDULUM IN ELECTRIC FIELD

A pendulum is at equilibrium in a uniform electric field as shown in the following figure. If the electric field magnitude is 100N/C, what is the charge on the end of the pendulum, q?



PRACTICE: BALANCING MASS IN UNIFORM ELECTRIC FIELD

In the following figure, a mass *m* with charge *q* is balanced such that its tether is perfectly horizontal. If the mass is *m* and the angle of the electric field is θ, what is the magnitude of the electric field, *E*, expressed in terms of *m*, *q*, and Θ?