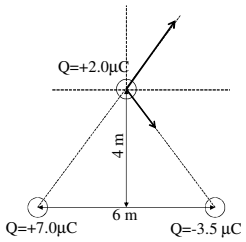
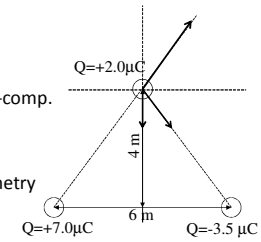
Example Three Charges

- Calculate force on +2μC charge due to other two charges
  - Calculate force from +7μC charge
  - Calculate force from –3.5μC charge
  - Add (VECTORS!)



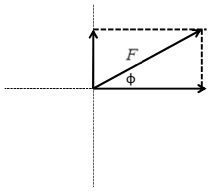
Example Three Charges

- Resolve each force into x and y components
- Add the x-components & the y-comp.
- Use Pyth. Theorem & Trigonometry to express in R,θ notation



Three Charges

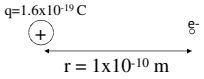
- Use Pyth. Theorem & Trigonometry to express in R,θ notation



Since resultant is in first quadrant,

Example Electric Force on Electron by Proton

- What are the magnitude and direction of the force on the electron by the proton?



Comparison:

Electric *Force* vs. Electric *Field*

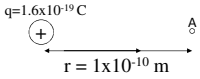
- Electric Force (F) - the actual force felt by a charge at some location.
- Electric Field (E) - found for a location only – tells what the electric force *would be* if a charge were located there:

$$F = qE$$

- Both are vectors, with magnitude and direction

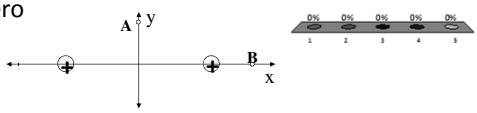
Example Electric Field

- Charged particles create electric fields.
  - Direction is the same as for the force that a + charge would feel at that location.
  - Magnitude given by: $E \equiv F/q$
- Field at A due to proton?



What is the direction of the electric field at point A, if the two positive charges have equal magnitude?

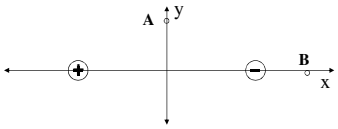
1. Up
2. Down
3. Right
4. Left
5. Zero



Checkpoint

What is the direction of the electric field at point A?

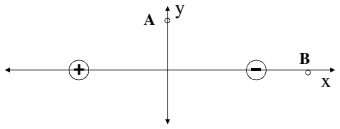
1) Up
2) Down
3) Left
4) Right
5) Zero



Checkpoint

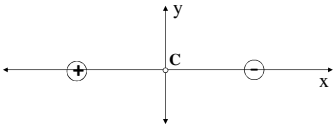
What is the direction of the electric field at point B?

1) Left
2) Right
3) Zero



What is the direction of the electric field at point C?

1. Left
2. Right
3. zero

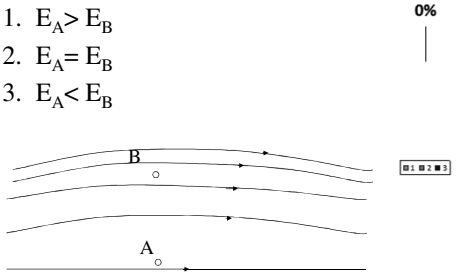


Electric Field Applet

- http://www.cco.caltech.edu/~phys1/java/phys1/EField/EField.html

Compare the magnitude of the electric field at point A and B

1. $E_A > E_B$
2. $E_A = E_B$
3. $E_A < E_B$



E inside of conductor

- Conductor ≡ electrons free to move
  - Electrons feels electric force - will move until they feel no more force (F=0)
  - F=qE: if F=0 then E=0
- **E=0 inside a conductor (Always!)**

E inside of conductor

- Conductor ≡ electrons free to move
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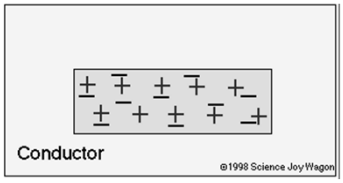

Recap

- E Field has magnitude and direction:
  - E≡F/q
  - Calculate just like Coulomb's law
  - Careful when adding vectors
- Electric Field Lines
  - Density gives strength (# proportional to charge.)
  - Arrow gives direction (Start + end on -)
- Conductors
  - Electrons free to move ⇒ E=0