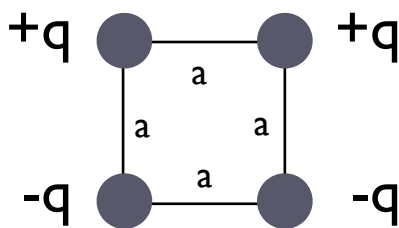


Problem Set 3: Electrostatics

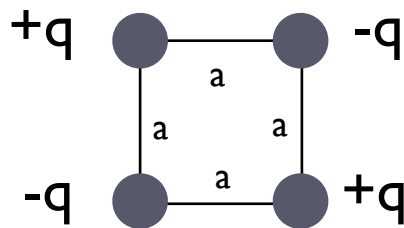
Instructions:

1. Answer all questions below. Show your work for full credit.
2. All problems are due Fri 16 July 2010 by the end of the day.
3. You may collaborate, but everyone must turn in their own work.

1. A charge $5q$ and a charge $-q$ are separated by a distance d . Find all points along a line connecting the two charges where the electric *potential* is zero.
2. A sphere the size of the earth has 1 C of charge distributed evenly over its surface. What is the electric field strength just outside the surface, in volts per meter? What is the potential of the sphere, in volts, if the zero potential is at an infinite distance from the sphere?
3. What is wrong with the idea of a gravity screen, something that will “block” gravity the way a conducting sheet seems to “block” the electric field? Think about the difference between the gravitational source and electrical sources. Note that a closed conducting container does not block the field of outside sources, but merely allows the surface charges to set up a compensating field. Why can't something of this sort be contrived for gravity? What would you need to accomplish it?
4. Two positive and two negative charges are arranged on a square lattice of side a in two different ways, shown below. Calculate the potential energy of each configuration. Which configuration of charges is more stable? Why?



(a)



(b)

5. An electron is accelerated from rest through a 5000 V potential difference. What velocity does the electron attain?