Mapping an Electric Field Practice

Review the Textbook on Electric Fields and Electric Field Lines:

- **Phys 1402:** Serway/Vuille: Sections 15.4, 15.5, and Quick Quiz 15.6.
- **Phys 2426:** Serway/Jewett: Sections 23.4, 23.6, Quick Quiz 23.5.

1. A dust particle has $2.4 \times 10^8$ extra electrons. What is the charge of the dust particle?
   \((-3.84 \times 10^{-11} \text{ C} = -0.0384 \text{nC})\)

2. A charge of 4.67nC is placed in the electric field of 2.14 N/C. Calculate the force exerted on the charge by the field.
   \((9.99 \times 10^{-9} \text{ N or 9.99nN})\)

3. Calculate an electric field in a point 2.6 cm away from a charge $Q = -9.7 \text{ nC}$
   \((1.3 \times 10^5 \text{ N/C})\)

4. What is the direction of the electric field in question #3?
   (Inward, towards the charge)

5. Two small steel ball bearings have the same radius and they are located 1.2 m apart. One has a charge of $+3 \mu\text{C}$, while the other has a charge of $-5 \mu\text{C}$. What is the electric force they exert on each other?
   \((94 \text{ mN, attractive})\)

6. The steel balls from question #5 are brought in contact with each other, and then replaced in their original positions. What charge does each ball have now?
   (Each ball has $-1 \mu\text{C}$ of charge.)

7. Now, what is the electric force the ball bearings exert on each other?
   \((6.3 \text{ mN, repulsive})\)

8. From the sketch of the field lines shown in Figure 1 determine the ratio $Q_a/Q_b$ (including the sign)
   \((+4. \text{ Note: Both charges are + because the E-Field points away.})\)

9. From the sketch if the field lines shown in Picture 2, determine the signs of charges (+ or −) placed in points A, B, and C.
   (A is positive and B&C are negative. Note that the field points away from the labeled + charge. Following the field lines tells us it points toward B and C. Following on from there, the field points away from A.)

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**Figure 1:** Field Lines from two Charges

**Figure 2:** Field Lines from Multiple Charges