

Part A: Patterns and Direction

No calculator needed. Use the patterns in Coulomb's law.

1. Two small charged spheres push on each other with a force of 12 N. Find the new force for each change. Treat each change separately, starting from the original 12 N.

Change	New force
Double one of the charges	
Triple the distance	
Cut the distance in half	
Double both charges and double the distance	

2. The two charges below are a fixed distance apart.



$+2.0 \times 10^{-6} \text{ C}$



$-8.0 \times 10^{-6} \text{ C}$

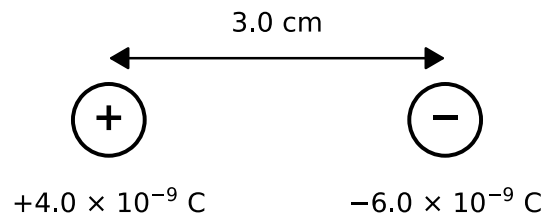
- a. Draw an arrow on each charge to show the direction of the electric force on it.
b. The $-8.0 \times 10^{-6} \text{ C}$ charge is 4 times larger. Which charge feels the bigger force? Explain.

Part B: Using Coulomb's Law

Use $F_e = kq_1q_2/d^2$ with $k = 9.0 \times 10^9 \text{ N}\cdot\text{m}^2/\text{C}^2$. Plug in sizes of charges, then state the direction in words. Show knowns, equation, substitution, and answer.

3. Two charged beads, $+5.0 \times 10^{-6} \text{ C}$ and $+2.0 \times 10^{-6} \text{ C}$, sit 0.30 m apart on a table. What is the electric force between them? Is it attractive or repulsive?

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4. Two specks of dust in a dryer have the charges shown and are 3.0 cm apart. What is the electric force between them? (Convert the distance to meters first.)



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5. A $+3.0 \times 10^{-6} \text{ C}$ charge and a $+6.0 \times 10^{-6} \text{ C}$ charge repel each other with a force of 0.45 N. How far apart are they?

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6. Two identical charged balloons hang 0.50 m apart (center to center) and repel each other with a force of 0.90 N. What is the size of the charge on each balloon? Can you tell whether the balloons are positive or negative? Explain.