

Coulomb's Law Simulator

Classroom worksheet · Interactive simulation: <https://lkforge.com/tools/physics/coulombs-law/>

Name: _____ Date: _____

Learning objectives

- Apply Coulomb's law to the force between charges.
- Describe how force depends on charge and separation.
- Compare attractive and repulsive interactions.

Variables to change

- Charge magnitudes
- Charge signs
- Separation distance

Procedure

1. Place two like charges and note the force.
2. Double one charge and observe the force.
3. Double the separation and observe the force.
4. Switch one charge's sign and note the direction change.

Observations

Record the force as you change charge magnitude, separation, and sign.

Questions

1. Write Coulomb's law.
2. What happened to the force when you doubled the separation?

3. What happened when you doubled one charge?
4. How do like and unlike charges interact?
5. How is Coulomb's law similar to Newton's law of gravitation?

Answer key (instructors)

- **1.** $F = k \cdot q_1 \cdot q_2 / r^2$, with $k \approx 8.99 \times 10^9 \text{ N} \cdot \text{m}^2 / \text{C}^2$.
- **2.** It dropped to one quarter — the force is inverse-square in distance.
- **3.** The force doubled — it is proportional to each charge.
- **4.** Like charges repel; unlike charges attract.
- **5.** Both are inverse-square laws; Coulomb's can attract or repel, while gravity only attracts.

Coulomb's law $F = k \cdot q_1 q_2 / r^2$ gives the electrostatic force: proportional to each charge and inverse-square in separation. Like charges repel, unlike attract — the same inverse-square form as gravity, but two-signed.