

The Law of Electrostatic Force

Purpose:

The purpose of this activity is to determine the law of electrostatic force - that is, to determine the relationship between the force of attraction or repulsion between two charges and the factors that affect this force.

Getting Ready:

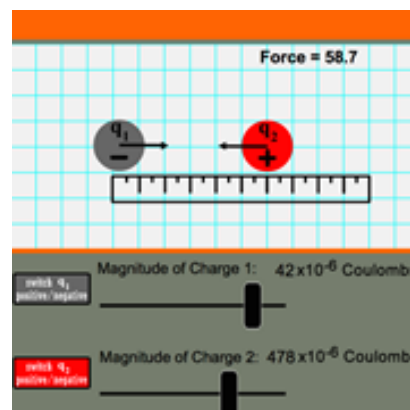
Navigate to the **Coulomb's Law** Interactive at The Physics Classroom website:

<http://www.physicsclassroom.com/Physics-Interactives/Static-Electricity/Coulomb-s-Law>

Navigational Path:

www.physicsclassroom.com ==> Physics Interactives ==> Static Electricity ==> Coulomb's Law

Once you've launched the Interactive, resize it to the size that you would like it to be. Then begin experimenting with the interface. Observe that the two charged objects can be dragged about the screen and centered on the gridlines of the background grid. Observe that the ruler can also be dragged about the screen. Observe how the sliders can also be dragged to change the value of the quantity of charge upon each charge. Finally, observe how the value of the electrostatic force between objects is displayed in the upper right of the simulation window.



Challenge #1

How is electrostatic force (F_{elect}) related to the magnitude of charge on the two objects (q_1 and q_2)? Keeping the same separation distance for all trials, systematically alter the charges of the objects and record the force. Be systematic and use purposeful changes such as doubling, tripling, and quadrupling of charge..

Make a claim describing the relationship between F_{elect} and q_1 and q_2 . Support your claim with evidence (references to the data) and reasoning.

Charge on 1 (q_1)	Charge on 2 (q_2)	Force (F_{elect})

Challenge #2

How is the electrostatic force (F_{elect}) related to the separation distance (d) the two charges? Keeping the magnitude of charge on both objects constant, conduct a systematic study to collect data relating separation distance to force. The separation distance is defined as the distance between the centers of the two objects; the best strategy involves centering the objects on a gridline and using distances that are a whole number of squares.

Make a claim describing the relationship between F_{elect} and d . Support your claim with evidence (references to the data) and reasoning.

Separation Distance (d)	Force (F_{elect})

Conclusion:

Suggest an equation relating F_{elect} , q_1 , q_2 and d of the form $F_{\text{elect}} = k \cdot \dots$ where k is a proportionality constant (no need to determine its value). Place the three variables q_1 , q_2 and d on the right side of the equation in a numerator or a denominator; use a power if needed. Your equation should be consistent with your claims made in **Challenge #1** and **Challenge #2**.