Name: _____ Date: _____

15.2

Coulomb's Law

READ

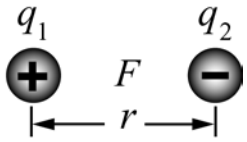
In this skill sheet, you will work with Coulomb's law. There are many similarities and some differences between the equation of universal gravitation and the equation for Coulomb's law. They are both inverse square law relationships, and they both have similar arrangements of variables.

When two charges q_1 and q_2 are separated by a distance r, there exists a force between them that is given by:

Coulomb's law

Constant $(9 \times 10^9 \text{ N m}^2/\text{c}^2)$ — Charges (C)

Force (N) $F = K \dfrac{q_1 q_2}{r^2}$ Distance (m)



where F equals the force in newtons and K is a constant equal to 9×10^9 N-m^2/C^2. The units of q_1 and q_2 are the coulombs (C). Distance is given in meters. Here are some important points about the relationships of the variables in Coulomb's law.

- Force is inversely proportional to the square of the distance between the charges. Therefore, if the distance increases by a factor of 2, the force decreases by a factor of 4.
- Force is proportional to the strength of each charge.
- When the two charges have the same sign (positive or negative), the force between them is repulsive because like charges repel.
- When the charges have opposite signs, the force between them is attractive because unlike charges attract.

PRACTICE 1

1. What happens to the force between two charges if the distance between them is tripled?
2. What happens to the force between two charges if the distance between them is quadrupled?
3. What happens to the force between two charges if the distance between them is cut in half?
4. What happens to the force between two charges if the magnitude of one charge is doubled?
5. What happens to the force between two charges is the magnitude of both charges is doubled?
6. What happens to the force between two charges if the magnitude of both charges is doubled and the distance between them is doubled?
7. What happens to the force between two charges if the magnitude of both charges is doubled and the distance between them is cut in half?

Practice set 1:

1. The force becomes $^{1}/_{9}$ as strong.
2. The force becomes $^{1}/_{16}$ as strong.
3. The force quadruples.
4. The force doubles.
5. The force quadruples.
6. The force does not change.
7. The forces becomes 16 times as large.