

Charge 1	Charge 2	Distance	Electric Force
$q_1$	$q_2$	$d$	$F_e$
$2q_1$	$3q_2$	$d$	
$2q_1$	$\frac{1}{2} q_2$	$d$	
$2q_1$	$q_2$	$2d$	
$q_1$	$3q_2$	$2d$	
$2q_1$	$2q_2$	$2d$	
$2q_1$	$q_2$	$\frac{1}{2} d$	
$\frac{1}{2} q_1$	$q_2$	$\frac{1}{2} d$	
$2q_1$	$\frac{1}{2} q_2$	$2d$	
$\frac{1}{2} q_1$	$\frac{1}{2} q_2$	$\frac{1}{2} d$	

31. **Example:** The particle A carries  $1.2 \times 10^{-4} \text{ C}$ , the particle B carries  $2.4 \times 10^{-4} \text{ C}$ , and the particle C carries  $9.7 \times 10^{-8} \text{ C}$ . The three particles form an equilateral triangle with the measure of the side 0.45 m. What's the ratio of the repelling forces between A-C and B-C?

32. **Example:** Determine the electrical force of attraction between two balloons with separate charges of  $3.5 \times 10^{-8} \text{ C}$  and  $-2.9 \times 10^{-8} \text{ C}$  when separated a distance of 0.65 m.

33. **Exercise:** Each of the two identical hot-air balloons acquires a charge of  $3.2 \times 10^{-6} \text{ C}$  on its surface as it travels through the air. How far apart are the balloons if the electrostatic force between them is  $4.5 \times 10^{-2} \text{ N}$ ?

**Application of Coulomb's Law**

34. A 3-C charge and a 2-C charge attract each other with 5 N of force. How much will a 4-C charge and a 6-C charge attract each other when placed the same distance apart?

- a. 5 N
- b. 12 N
- c. 10 N
- d. 20 N
- e. 40 N
- f. none of the above.

35. Two charges separated a distance of 1.0 meter exert a 6.0-N force on each other. If the charges are pushed to a separation of 2.0 meter, the force on each charge will be

- a. 0.75 N.
- b. 1.5 N.
- c. 3.0 N.
- d. 6.0 N.
- e. 12.0 N.
- f. 24.0 N.

36. Two charged particles held close to each other are released. As they move, the force on each particle increases. Therefore, the particles have

- a. opposite signs.
- b. the same sign.
- c. charges that cannot be determined

37. **Exercise:** The hydrogen atom consists of a single electron (mass  $9.1 \times 10^{-31} \text{ kg}$ ) and a proton (mass  $1.7 \times 10^{-27} \text{ kg}$ ) at an average separation distance of  $5.3 \times 10^{-11} \text{ m}$ . Compare the electrical and gravitational force between the proton and the electron in a hydrogen atom.

38. **Exercise:** If a positive test charge is located between two charged spheres, A and B. Sphere A has a charge of  $+4q$  and is located 0.2 meter from the test charge. Sphere B has a charge of  $-2q$  and is located 0.1 meter from the test charge. If the magnitude of the force on the test charge due to sphere A is  $F$ , what is the magnitude of the force on the test charge due to sphere B?

