Coulomb's law

Is an equation describing the attraction between 2 charged objects.

Coulomb found the attraction between 2 objects depends on 2 things:

1- the charge of the object

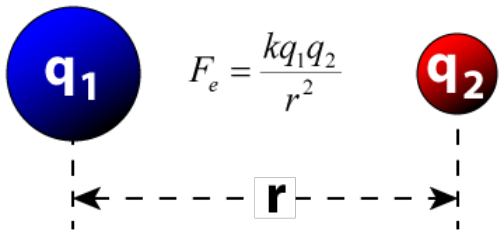
2- The distance between the 2 charged objects.

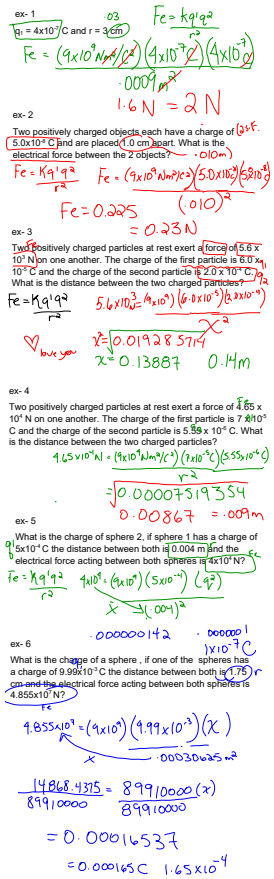
- The stronger the charge the stronger the attraction will be, the greater the distance the weaker the attraction is.

Formula: $Fe=\frac{kq1q2}{r^2}$

Symbol	Stands for	Unit
K	Coulomb's constant = $9x10^9$	Nm^2/C^2
q_1	Charge of 1st item } same #	C
q_2	Charge of 2nd item } same #	C
r^2	Distance between both objects	m
Fe	Electrical force of objects	N

- q_1 and q_2 will be the same number unless specified in the problem.
- r often given in cm, must convert to m. ÷ 100





ex- 1

$q_1 = 4x10^{-7}$ C and r = 3 cm

$F_e = \frac{kq_1q_2}{r^2}$

$F_e = \frac{(9x10^9 Nm^2/C^2)(4x10^{-7}C)(4x10^{-7}C)}{.0009 m^2}$

$1.6 N = 2 N$

ex- 2

Two positively charged objects each have a charge of $5.0x10^{-6}$ C and are placed 1.0 cm apart. What is the electrical force between the 2 objects?

$F_e = \frac{kq_1q_2}{r^2}$ $F_e = \frac{(9x10^9 Nm^2/C^2)(5.0x10^{-6}C)(5.0x10^{-6}C)}{(.010)^2}$

$F_e = 0.225$

$= 0.23 N$

ex- 3

Two positively charged particles at rest exert a force of 5.6×10^3 N on one another. The charge of the first particle is 6.0×10^{-5} C and the charge of the second particle is 2.0×10^{-4} C. What is the distance between the two charged particles?

$F_e = \frac{kq_1q_2}{r^2}$ $5.6x10^3 = \frac{(9x10^9)(6.0x10^{-5})(2.0x10^{-4})}{x^2}$

$x^2 = 0.019285714$

$x = 0.13887$ $0.14m$

ex- 4

Two positively charged particles at rest exert a force of 4.55×10^{-4} N on one another. The charge of the first particle is 7.00×10^{-5} C and the charge of the second particle is 5.55×10^{-4} C. What is the distance between the two charged particles?

$4.55x10^{-4}N = \frac{(9x10^9 Nm^2/C^2)(7x10^{-5}C)(5.55x10^{-4}C)}{r^2}$

$= \sqrt{0.000073919354}$

$0.00867 = .009m$

ex- 5

What is the charge of sphere 2, if sphere 1 has a charge of $5x10^{-4}$ C the distance between both is 0.004 m and the electrical force acting between both spheres is $4x10^{-7}$ N?

$F_e = \frac{kq_1q_2}{r^2}$ $4x10^1 = \frac{(9x10^9)(5x10^{-4})(q^2)}{(.004)^2}$

$.000000142$ $.000000 1 \; x10^{-7}C$

ex- 6

What is the charge of a sphere , if one of the spheres has a charge of $9.99x10^{-3}$ C the distance between both is 1.75 cm and the electrical force acting between both spheres is $4.855x10^{9}$ N?

F_e

$4.855x10^9 = \frac{(9x10^9)(9.99x10^{-3})(x)}{.000306625 m^2}$

$\frac{14868.4375}{899\,10000} = \frac{899\,10000(x)}{899\,10000}$

$= 0.000165537$

$= 0.000165C$ $1.65x10^{-4}$