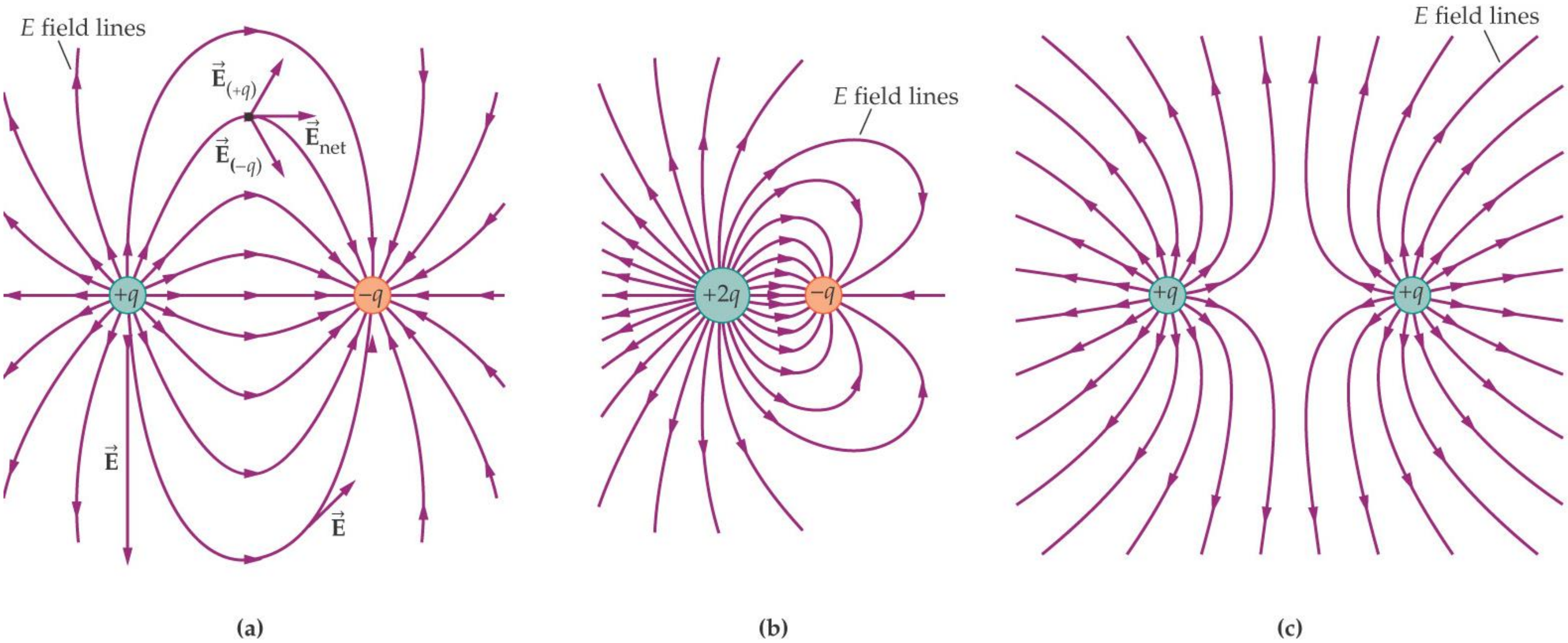
Electric Fields



Electric Fields

Both *gravity* and *electrostatic* forces are non-contact forces. They act on objects that are not touching each other.

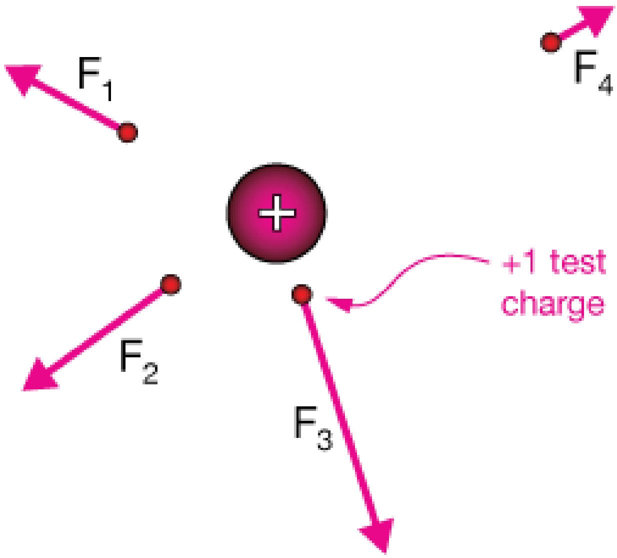
The concept of a <u>force field</u> has been developed a tool to describe "this action-at-a-distance" characteristic of these forces.

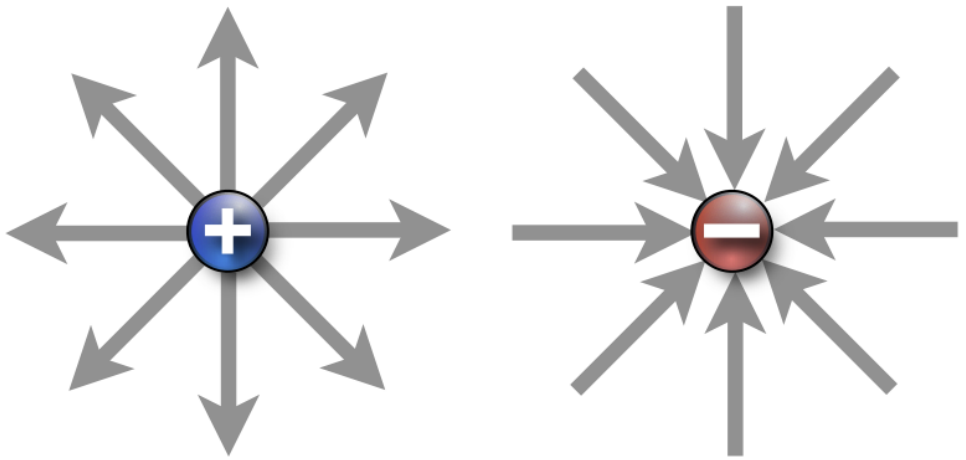
Gravitational Field **Electrostatic Field**

What is an **Electric Field**?

An ***electric field*** is a property of empty space.

The region around a charged object where a **force** would be felt by an other charged object if it were to be sitting there.



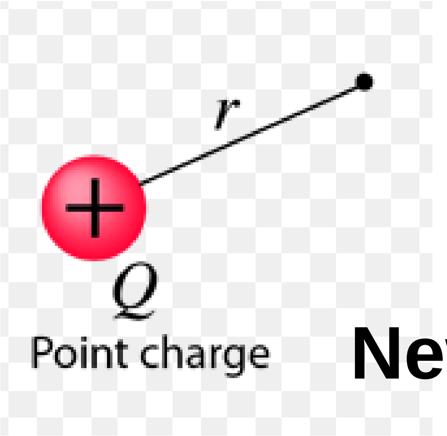


What is **Electric Field Strength**?

Electric Field Strength
is simply:

The number or **NEWTONS**
1 coulomb of charge would feel if it was a distance **r** away from another charged object.

$$E = k\frac{Q}{r^2}$$



UNITS:

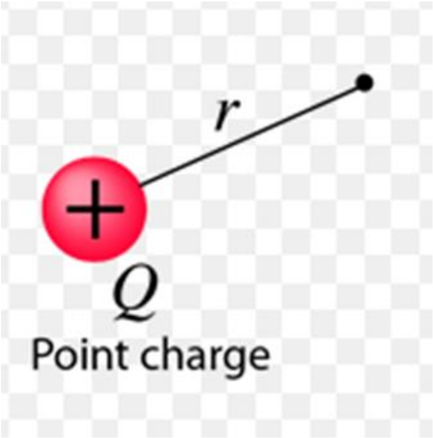
N/C

Newtons/Coulomb

The strength of the electric field depends on:

1. **the Amount of charge on the source and**
2. **the distance away from the source**

$$E = k\frac{Q}{r^2}$$



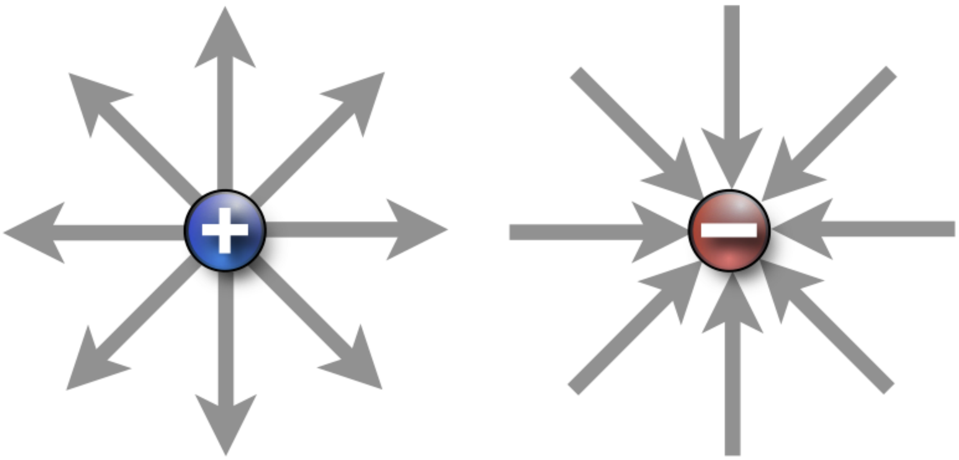
Electric Field lines

<u>Direction</u>:

The electric field lines go in the direction a **positive "test"** charge would go if it was in the field.

<u>Strength</u>:

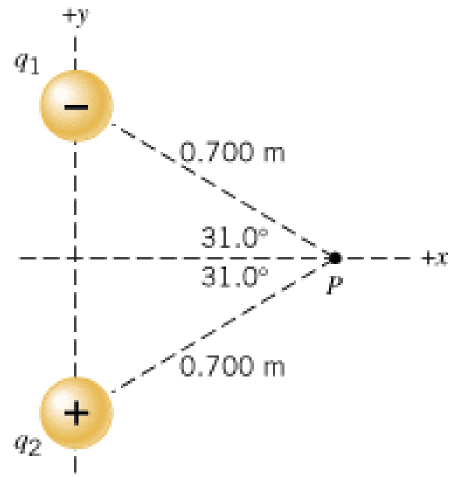
The closer the lines are together, the greater the field strength



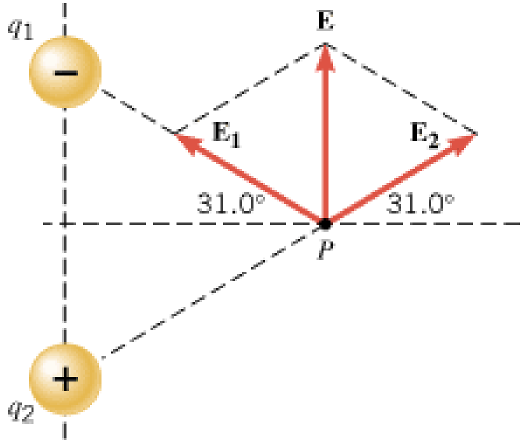
Electric Field

Is a

Vector Quantity



(a)

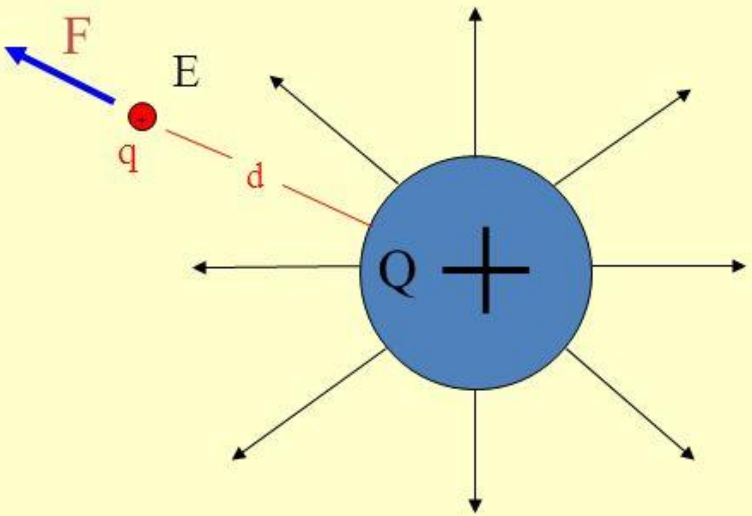


(b)

Force on a charge due to an Electric Field

If a charge, ***q***, is placed at point "**x**" in the field where the Electric Field strength is ***E***, it will experience a force ***F***.

$$F = qE$$



$$E = \frac{F}{q}$$

FORCE! (N)

FIELD STRENGTH! (N/C)

$$\vec{F} = \frac{kQQ}{r^2}$$

$$\vec{E} = \frac{kQ}{r^2}$$

$$\vec{F} = Q\vec{E}$$

$$\vec{E} = \frac{F}{Q}$$