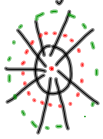
Chapter 14 - Fields & Forces

§14-1 Laws of Force

Let's say you have 1000 skewers stuck into a styrofoam ball and evenly distributed: Think about how many skewers strike a given surface area at various distances from the centre of the ball.



SA of a sphere = $4\pi r^2$

	r (m)	SA (m²)	skewers / m²
1000	1	4π	$\frac{1000}{4\pi}$
1000	2	16π	$\frac{1000}{16\pi}$
1000	3	36π	$\frac{1000}{36\pi}$
1000	4	64π	$\frac{1000}{64\pi}$

$\times \frac{1}{4}$ $\times \frac{1}{16}$

There is an inverse-squared relationship

$F_g = \frac{Gm_1m_2}{r^2}$

$F_g \propto \frac{1}{r^2}$

With charged objects then we can have attractive forces or repulsive forces.

$F_Q \propto \frac{1}{r^2}$

$F_Q \propto q_1$

$F_Q \propto q_2$

$F_Q \propto \frac{q_1q_2}{r^2}$

$F_Q = \frac{kq_1q_2}{r^2}$ (Coulomb's Law)

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

F_Q is the electrostatic force of attraction or repulsion (N)

k is Coulomb's Law constant ($9.0 \times 10^9 \frac{N \cdot m^2}{C^2}$)

q_1 and q_2 are the charges (size only) (C)

* Do not use +/- on the charges.... use this only to work out the direction of the force

* μC are used often

so $52.3 \mu C = 52.3 \times 10^{-6} C$

* $e = 1.6 \times 10^{-19} C$ (the charge on an electron)

TODO:

① Look MP/637

② PP/638

for Wed

$F_g = \frac{Gm_1m_2}{r^2}$

$F_g' = \frac{G(\frac{1}{2}m_1)(m_2)}{(2r)^2}$

$F_g' = \frac{1}{2} \cdot \frac{1}{4} \left(\frac{Gm_1m_2}{r^2}\right) F_g$

$F_g' = \frac{1}{8} F_g$

$F_g' = \frac{1}{8}(80N)$

$F_g' = 10N$

$K = \frac{R^3}{T^2}$

$R^3 = kT^2$

$F = ma$

$a = \frac{F}{m}$

$a' = \frac{F}{3m}$ (a)

$a' = \frac{1}{3}a$