Gravitation

Can we measure gravitational acceleration of a planet without actually going to the planet?   Issac
   -Newton

Formula!

$$F_g = G \frac{m_1 m_2}{r^2}$$

F_g = gravitational force = N

G = Universal Gravitational constant → 6.67×10^{-11}

m_1 = mass of object 1 = kg
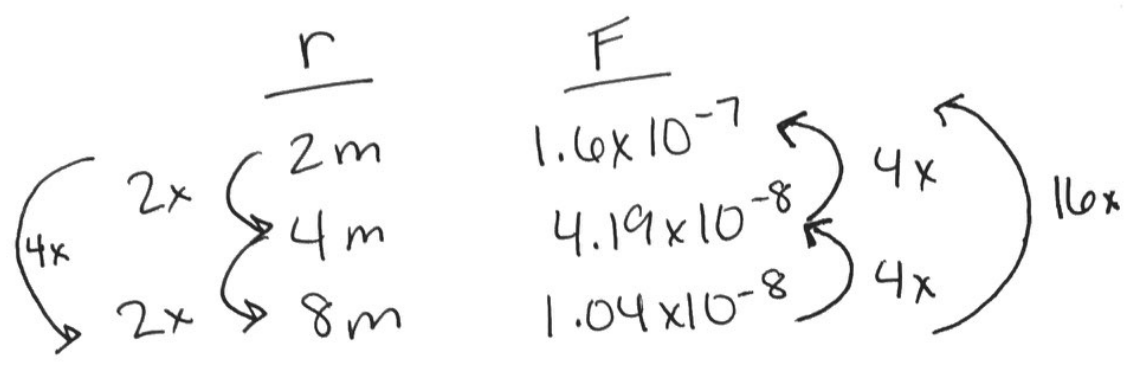
m_2 = mass of object 2 = kg

r = radius (distance between objects) = m

(measure distance from center of one object to the center of the other object.)

G = a relationship between the masses, the radius and the force.
   ↳ always a constant 6.67×10^{-11}

$$\frac{r}{} \qquad \frac{F}{}$$

$$2x \begin{cases} 2m \\ 4m \end{cases} \quad 1.6\times10^{-7} \\ 4.19\times10^{-8} \end{cases} 4x \\ 2x \quad 8m \quad 1.04\times10^{-8} \end{cases} 4x$$ $\Bigg)\,16x$

(with $4x$ bracket on the left spanning $2m$ to $8m$)

Double the distance → $\frac{1}{4}$th the Force

4x the distance → $\frac{1}{16}$th the Force

$\underbrace{\qquad\qquad}$

Because you divide by the square of the distance.

$\underbrace{\qquad\qquad}$

If we triple the distance → $\frac{1}{9}$th the Force

$\frac{1}{2}$ distance → 4 x force

$\frac{1}{3}$ distance → 9 x force

$$F_g = G\frac{m_1 m_2}{r^2}$$

$$m_1 = 100 \text{ kg}$$
$$m_2 = 200 \text{ kg}$$
$$r = 3\,m$$

$$F_g = 6.67\times10^{-11}\frac{(100)(200)}{3^2}$$

$$\boxed{F_g = 1.482\times10^{-7}\,N}$$

Example problem: