

# Calculating Gravity (Force of)

Isaac Newton → wondering why planets orbit sun?

Great discovery ⇒ planets orbit b/c of sun's gravitational pull

just like gravity of earth!

invented calculators!

Gravity "Anything with mass has gravity"

Newton's  
Universal  
Law of Gravity

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

$F_g$  = Force of gravity (N)

$G$  = Newton's constant  
 $6.67 \times 10^{-11}$

$m_1$  = mass of object #1 (kg)

$m_2$  = " " object #2 (kg)

$\Delta d$  = distance betw. centre of 2 objects (m)

Calculate  $F_g$  between 2 students.

$$\left. \begin{array}{l} m_1 = 65 \text{ kg} \\ m_2 = 70 \text{ kg} \\ \Delta d = 1 \text{ m} \end{array} \right\}$$

$$\begin{aligned} F_g &= \frac{G m_1 m_2}{\Delta d^2} \\ &= \frac{6.67 \times 10^{-11} (65)(70)}{(1)(1)} \end{aligned}$$

$$\rightarrow 3.0 \times 10^{-7} \text{ (N)}$$



$$M_1 = M_{\text{earth}} = 5.97 \times 10^{24} \text{ kg!}$$

$$M_2 = \text{any object 'm'}$$

Calculate  $F_g$  for any object on earth # m

$$F_g = \frac{(6.67 \times 10^{-11})(5.97 \times 10^{24})M}{(6.37 \times 10^6)(6.37 \times 10^6)}$$

$F_g = 9.8 \text{ m}$

$\vec{g} = 9.8$   
gravitational  
constant  
on  
Earth

$\vec{F}_g = m\vec{g}$

Earth {

$\vec{g} = 9.8 \frac{\text{N}}{\text{kg}} \text{ [down]}$