Answer on Question #49565, Physics, Mechanics | Kinematics | Dynamics

The mass of a planet is 4 times while its radius is 8 times that of the earth. If the weight of an object is 640 N on earth, what will be its weight on the planet?

Solution:

Newton's Law of Universal Gravitation states that there is a gravitational force between any two masses that is equal in magnitude for each mass, and is aligned to draw the two masses toward each other. The formula is:

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

where m_1 and m_2 are the two masses, G is the gravitational constant, and r is the distance between the two masses.

In our case:

$$F_1 = G\frac{m_1 m_2}{r^2} = 640 \text{ N}$$

$$F_2 = G\frac{4m_1 m_2}{(8r)^2}$$

The ratio of forces is

$$\frac{F_1}{F_2} = G\frac{m_1 m_2}{r^2} \cdot \frac{64r^2}{4Gm_1 m_2} = \frac{64}{4} = 16$$

Thus,

$$F_2 = \frac{F_1}{16} = \frac{640}{16} = 40 \text{ N}$$

Answer: 40 N