

Answer on Question #41298, Physics, Mechanics

The force of gravitational attraction between two masses is 64 N. What will be the force if one mass is doubled and the distance between them is quadrupled?

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:

$$F_1 = G \frac{m_1 m_2}{r^2} = 64 \text{ N}$$

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

The ratio of forces is

$$\frac{F_1}{F_2} = G \frac{m_1 m_2}{r^2} \cdot \frac{16r^2}{2Gm_1 m_2} = \frac{16}{2} = 8$$

Thus,

$$F_2 = \frac{F_1}{8} = \frac{64}{8} = 8 \text{ N}$$

Answer. $F_2 = 8 \text{ N}$.