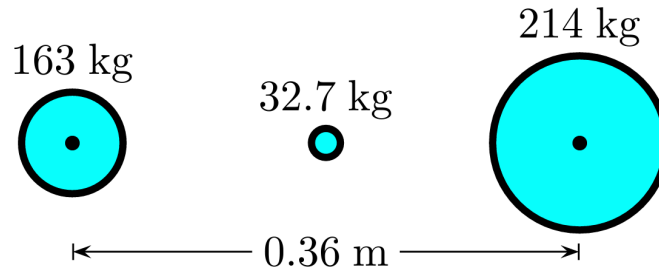


PHY 303K - Discussion Session Week 9

1. Objects with masses of 163 kg and 214 kg are separated by 0.36 m. A 32.7 kg mass is placed midway between them. Leaving the distance between the 163 kg and the 214 kg masses fixed, at what distance from the 214 kg mass (other than infinitely remote ones) does the 32.7 kg mass experience a net force of zero? The value of the universal gravitational constant is $6.672 \times 10^{-11} \text{ N} \cdot \text{m}^2/\text{kg}^2$.



2. Apollo 11 Escape Velocity
 - A. When it orbited the Moon, the Apollo 11 spacecraft's mass was 15300 kg, and its mean distance from the Moon's center was $2.35705 \times 10^6 \text{ m}$. Assume its orbit was circular and the Moon to be a uniform sphere of mass $7.36 \times 10^{22} \text{ kg}$. Calculate the orbital speed of the spacecraft. The gravitational constant is $6.67259 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$.
 - B. What is the minimum energy required for the craft to leave the orbit and escape the Moon's gravitational field?
3. What is the kinetic energy of a satellite of mass m that orbits the Earth of mass M in a circular orbit of radius R ?

1. $K = 0$

2. $K = \frac{1}{2} \frac{G M m}{R}$

3. $K = \frac{1}{4} \frac{G M m}{R}$

4. $K = \frac{1}{2} \frac{G M m}{R^2}$

5. $K = \frac{G M m}{R^2}$