

Force:

- **Definition:** Force is a push or pull acting on an object, causing it to change its state of motion.

Gravitational Force:

- **Definition:** Gravitational force is the attractive force between two masses due to their mass and the distance between them.

- **Formula:** $F = \frac{Gm_1m_2}{d^2}$

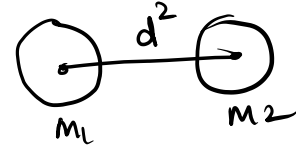
- **Effect:** It governs the motion of celestial bodies, keeping planets in orbit around the Sun and moons around planets.

Newton's Law of Gravitation:

- **Definition:** Newton's Law of Gravitation states that every point mass attracts every other point mass with a force proportional to the product of their masses and inversely proportional to the square of the distance between their centers.

- **Derivation:** (Derivation not included in this brief overview)

- **Equation** ($F = \frac{Gm_1m_2}{d^2}$)

**Universal Gravitational Constant:**

- **Definition:** The universal gravitational constant (G) is a constant of proportionality in Newton's law of gravitation equation. Which is defined as the force of gravitation between any two bodies having unit mass while separating it with unit distance.

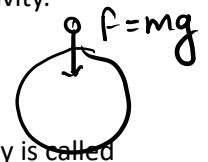
- Unit: Nm^2 / kg^2)

- Value: $6.67 \times 10^{-11} Nm^2 / kg^2$

Gravity: . The force with which any heavenly body attracts any other object toward its center is called gravity.

Formula: ($F = mg$)

Effect: Gravity is the force that gives weight to physical objects.



Acceleration due to Gravity: Acceleration produced in an object while falling under the influence of gravity is called acceleration due to gravity

- Formula: ($g = \frac{Gm}{R^2}$)

- Unit: (m/s^2)

- Effect: It determines the rate at which an object falls in a gravitational field.

- Value: ($g \approx 9.8 m/s^2$) (at the surface of the Earth)

Acceleration due to Gravity at Height and Center:

- Formula (Surface to Height): $g^h = \frac{R^2}{(R+h)^2} \times g$

- Formula (Surface to Center): ($g^c = \left(1 - \frac{d}{R}\right)g$) - Effect: Gravity decreases with height and becomes zero at the center of a spherical mass.

Gravitational Field:

- **Definition:** A gravitational field is a region in which an object with mass experiences a force due to the presence of another mass.

Gravitational Field Intensity:

- **Definition:** Gravitational field intensity is the force experienced by a unit mass at a point in a gravitational field.

Weight:

- Definition: Weight is the force exerted on an object due to gravity.
- Formula: ($W = m \cdot g$)

Freefall and its Condition:

- Definition: Freefall is the motion of an object solely under the influence of gravity.
- Condition: The only force acting on the object should be gravity (no air resistance or other forces).

Weightlessness:

- Definition: Weightlessness is the condition experienced by an object or person when they are in freefall and do not feel the force of gravity.