

Newton's Laws

THIRD LAW: An interaction between two objects produces two FORCES, one acting ON each object ($\underline{\mathbf{F}}_{AB}$ acts on A).

These two forces are equal and opposite, *i.e.* $\underline{\mathbf{F}}_{AB} = -\underline{\mathbf{F}}_{BA}$.

UNIVERSAL GRAVITATION: Every particle in the Universe attracts every other particle with a force of size

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

where distance r separates masses m_1 and m_2 .

$G = 6.67 \times 10^{-11} \text{ N}\cdot\text{m}^2/\text{kg}^2$ is a measured constant.

SECOND LAW: A particle's acceleration has the same magnitude and direction as the net force ON the particle divided by the particle's mass, *i.e.*

$$\underline{\mathbf{a}}_{\text{of mass } m} = \frac{\sum \underline{\mathbf{F}}_{\text{on mass } m}}{m} \quad \text{or} \quad \sum \underline{\mathbf{F}}_{\text{on mass } m} = m \underline{\mathbf{a}}_{\text{of mass } m}$$

FIRST LAW: A special case of the second law, when both the acceleration of the mass and also the net force ON the mass are equal to zero.