LAWS OF MOTION MINDMAP

Force and Newton's Laws →

- **Force** = push or pull which tries to change State or shape of an Object.

Gravitational Force | Electromagnatic Force | Weak Nuclear Force | Strong Nuclear Force

Electromagnatic Force → Normal | Tension | Spring force | Friction

Newton's Laws of Motion →

→ 1st Law = Law Of Inertia

→ 2nd Law = $F \propto \frac{dp}{dt} \Rightarrow \boxed{F = ma}$

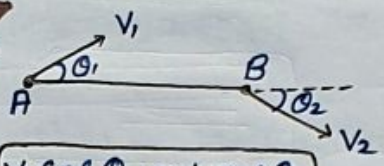
→ 3rd Law = Action - Reaction Law

Solving problem → System → Identify the force → Free body Diagram → Use Newton's Laws.

String Constraint and Circular Motion →

- **String Constraint** –

→ Velocity along the string should remain constant.



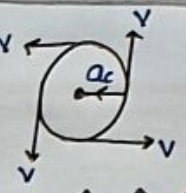
$\boxed{V_1 \cos\theta_1 = V_2 \cos\theta_2}$

→ Virtual-Work Method →

$\boxed{\vec{T_1}.\vec{v_1} + \vec{T_2}.\vec{v_2} + \ldots = 0}$

- **Uniform Circular Motion** –

$\boxed{F_{net} = ma_c \quad F_{net} = \frac{mv^2}{r}}$



Friction: →

- **Static Friction** → $f_{static} = f_{applied}$

- **Limiting Friction** → $f_{limiting} = \mu_S N$

μ_S = Coeff. of Static friction

- **Kinetic Friction** → $f_{kinetic} = \mu_K N$

μ_K = Coeff. of Kinetic friction

- **Conservation Of Momentum** →

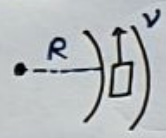
→ When external force = 0

→ Momentum of the system remains Conserved.

→ Recoil Velocity of the gun = $\boxed{-\frac{m\vec{v}}{M}}$

Banking on Roads: –

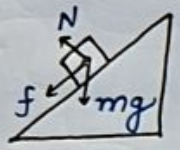
→ W/o Banking → $v_{max} = \sqrt{\mu R g}$



→ with Banking → $v_{max} = \sqrt{gR\tan(\phi + \theta)}$

$\phi = \tan^{-1}(\mu)$

θ = angle of Banking



- **Some Other forces** →

→ Thurst Force: $\boxed{F = -v\frac{dm}{dt}}$

→ Spring Force: $\boxed{F = Kx}$

→ Pseudo Force: $\boxed{\vec{F} = -m\vec{a}}$ → (-ve) sign shows that direction of force is opposite to direction of acc.^{n} of frame.

Here,
m = mass of Body
a = acceleration of frame

NEET SLAYER