$\sqrt{2} = 1.414$
$\sqrt{3} = 1.732$

# NEWTONS LAW OF MOTION

$\cos 37 = 4/5$ $\sin 37 = 3/5$ $\cos 53 \to 3/5$ $\sin 53 \to 4/5$

## 1st law :-
→ also called as law of inertia

## 2nd law :
$$F = \frac{dP}{dt} = \frac{\Delta P}{t}$$
rate of change of momentum. only at 'M' const.

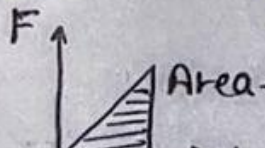
$P = mv$ $\quad F = ma$

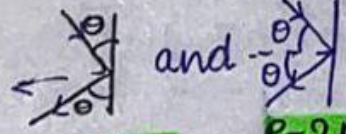
## 3rd law :- m - variable
v = const

$$F = v\frac{dm}{dt}$$
Rocket propulsion

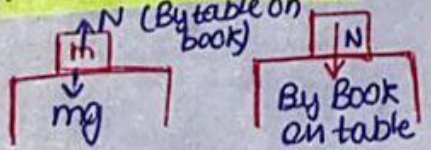
## #Impulse :-
$$F = \frac{dP}{dt} \Rightarrow \int dP = \int F\,dt$$
Impulse

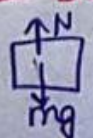
$F = \frac{I}{t}$ Impulse = Δmomentum $P_f - P_i$



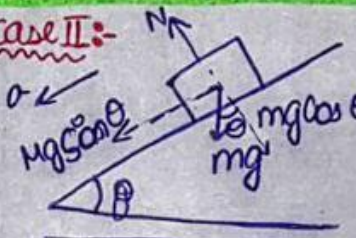

$P = 2mv\sin\theta$ $\quad P = 2mv\cos\theta$

## #NORMAL FORCE :



## *FREE BODY DIAGRAM :-


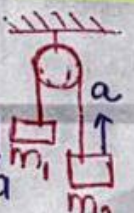

$N = mg$

Case II :-




$N = mg\cos\theta$

$a = g\sin\theta$

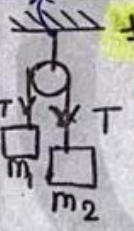
## # Pulley block system :



$m_1 > m_2$

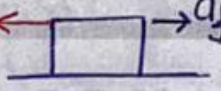
$a = \frac{F_{driving} - f_{oppose}}{M_{Total}}$

$a = \frac{m_1 g - m_2 g}{m_1 + m_2}$

$F = 2T$

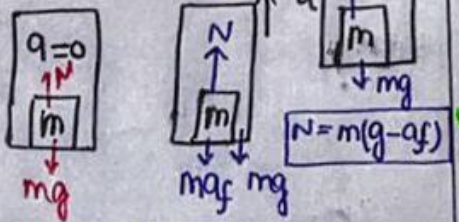
## #Tension :-



$T = \frac{2m_1 m_2 g}{m_1 + m_2}$

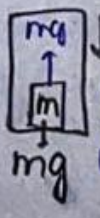
## # Pseudo force :


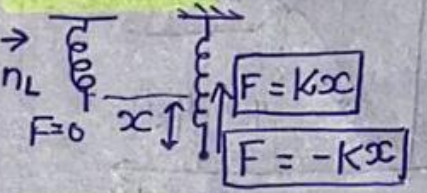

$F_s = ma_f$ → Non-inertial frame

opposite of $a_f$.




$N = mg$ $\quad N = m(a_f + g)$ $\quad N = m(g - a_f)$



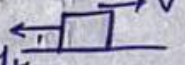

## #SPRING :-



## #FRICTION :
Co-efficient of friction :- μ
→ unitless
→ dimensionless

Static friction
→ at rest
→ $\mu_s > \mu_K$

$f_{max} = \mu_s N$

Kinetic friction
→ (at move)

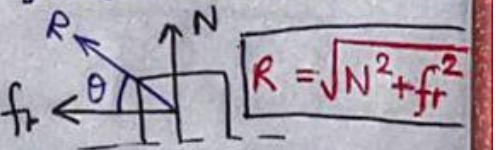



$f = \mu_K N$

(i) If $f_{s\,max}$ > Applied Forces, then actual friction = Fapplied.

(ii) if $f_{s\,max}$ = Fapplied
Factual = Force
'Rest'

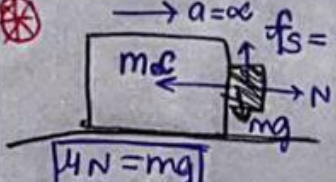
(iii) If $f_{s\,max}$ < Force
Body will move
Factual = $F_{kinetic}$




$R = \sqrt{N^2 + f_r^2}$

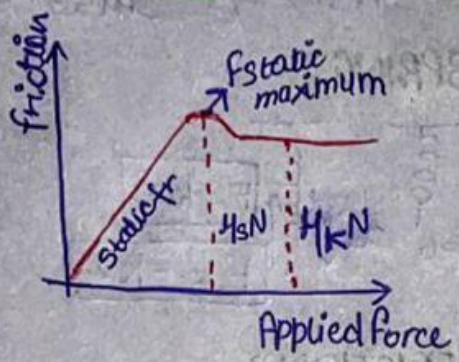
θ = Angle of friction

$\tan\theta = \frac{N}{f}$

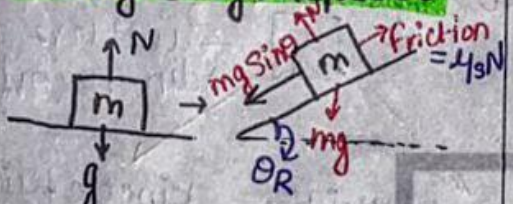



$\mu N = mg$

# GRAPHS :-




# Angle of repose :-



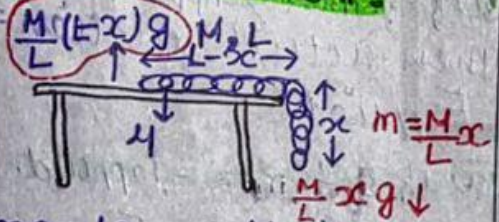

$f_r = \mu_s (Mg\cos\theta)$

$F_a = mg\sin\theta$

$\therefore f_r = F_a$

$$\boxed{\mu_s = \tan\theta}$$

# Chain Problem :-




max length that can Overhang :-

$\lambda = \frac{M}{L}$

$$\boxed{x = \frac{\mu L}{1+\mu}}$$