PRAYAS

JEE 2025

Lecture - 07

Physics

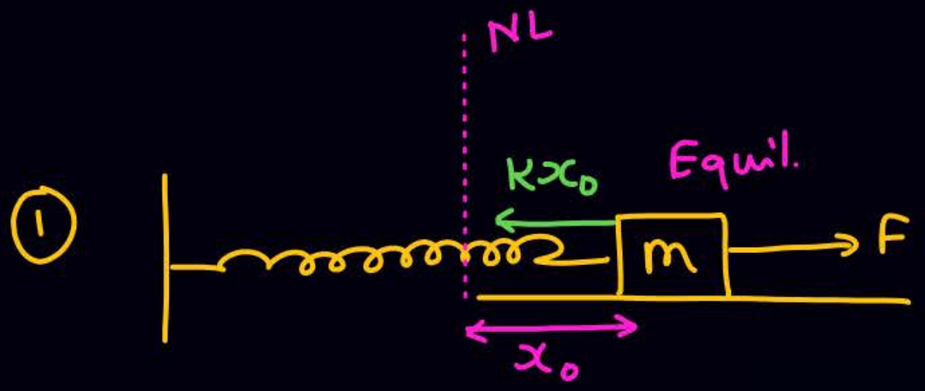
Laws Of Motion

By- Saleem Ahmed Sir

Topics to be covered

1. Spring force
2. Pseudo force
3.
4.

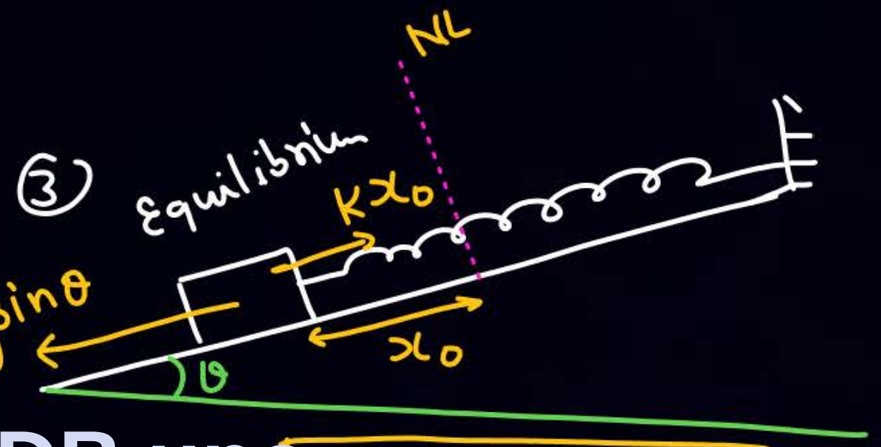
find elongation in spring in following case if block is in equilibrium



①

$F = kx_0$

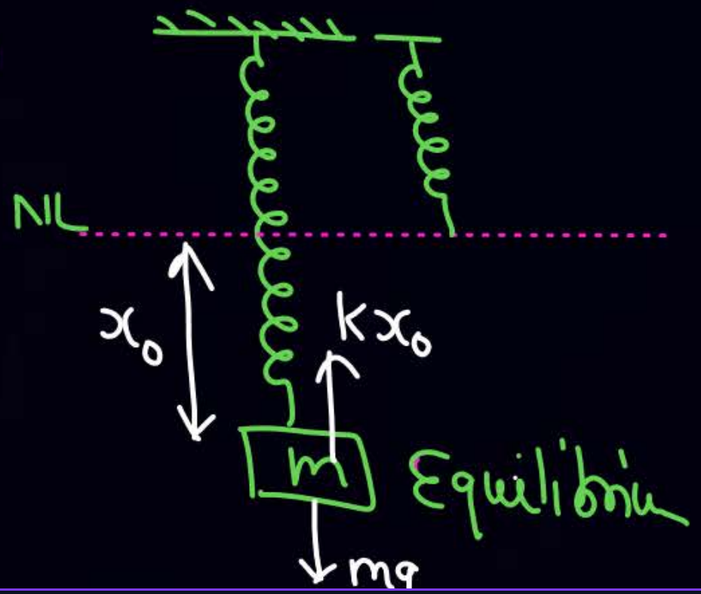
$x_0 = F/k$



③

$kx_0 = mg\sin\theta$

from natural lenght

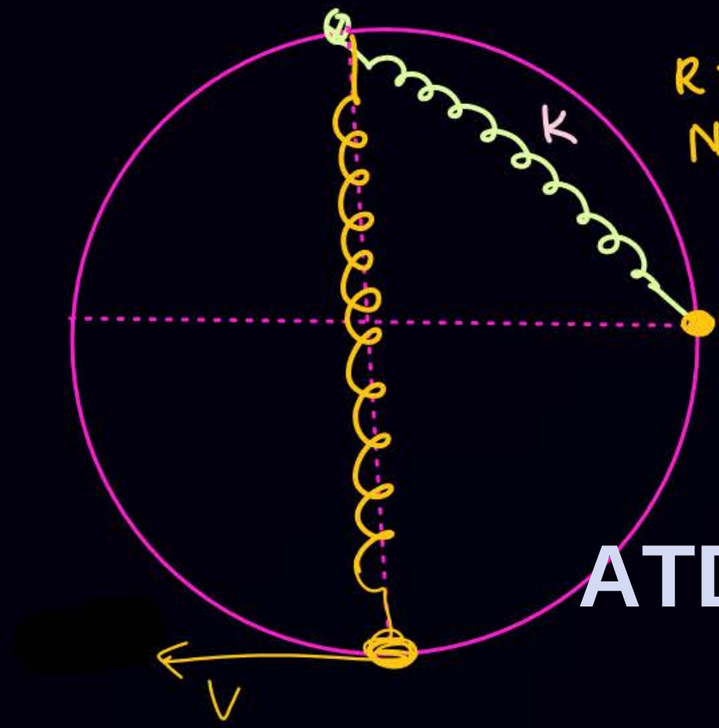


②

$mg = kx_0$

$x_0 = mg/k$

④



$R = 10\,m$

Natural length $= 10\sqrt{2}\ m$

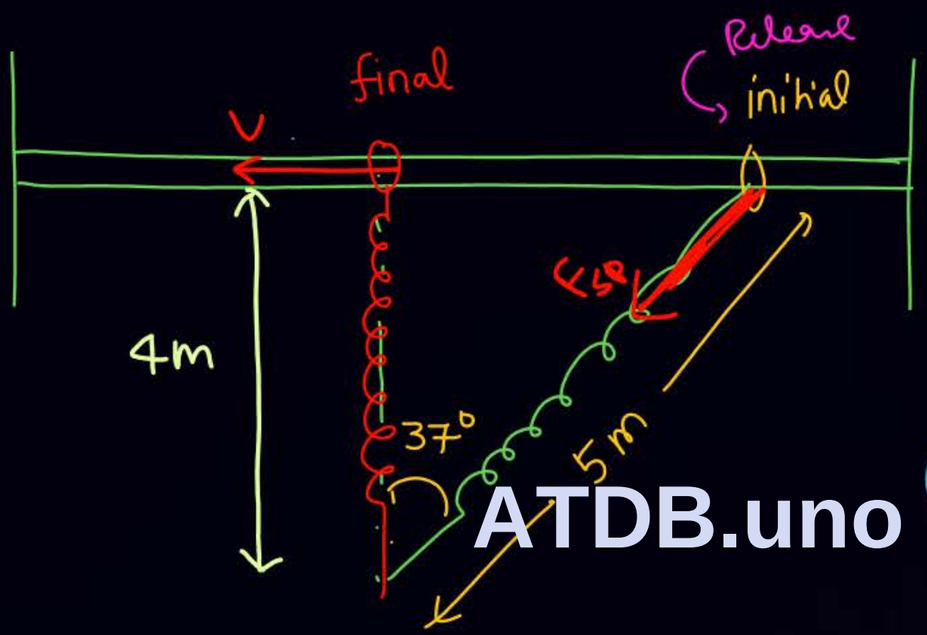
find spring force when mass reaches at point A.

Sol^n $x = 20 - 10\sqrt{2} \equiv$ खिच गया elongation

$F_{sp} = kx$

natural lenght = 2m

Q



① $(F_{sp})_{initial} = Kx_i$

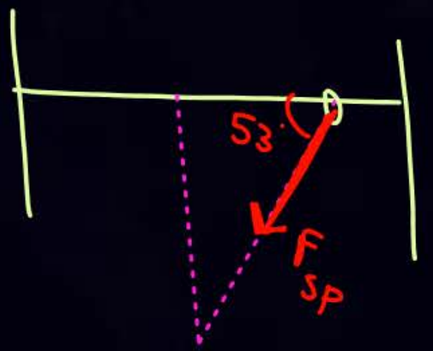
$= 1000 \times 3 = 3000\ N$

② $F_{spring\ final} = Kx_f$

$= 1000 \times 2 = 2000$

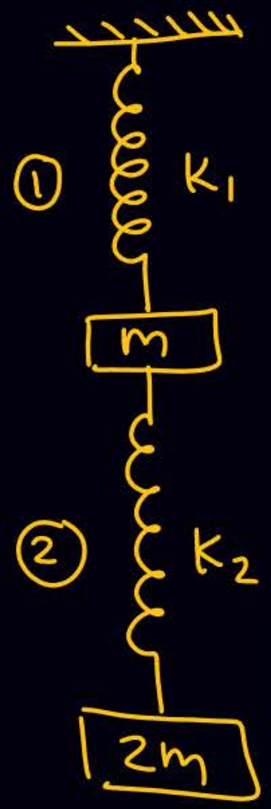
③ $(a)_{initial} =$ $\left(\frac{F_{sp}\cos 53}{m}\right)$ पीछे

K = 1000

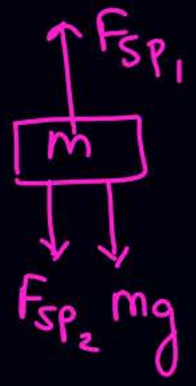


$= \frac{3000 \times \frac{3}{5}}{10} = 180$

Q



Both masses are in equilibrium



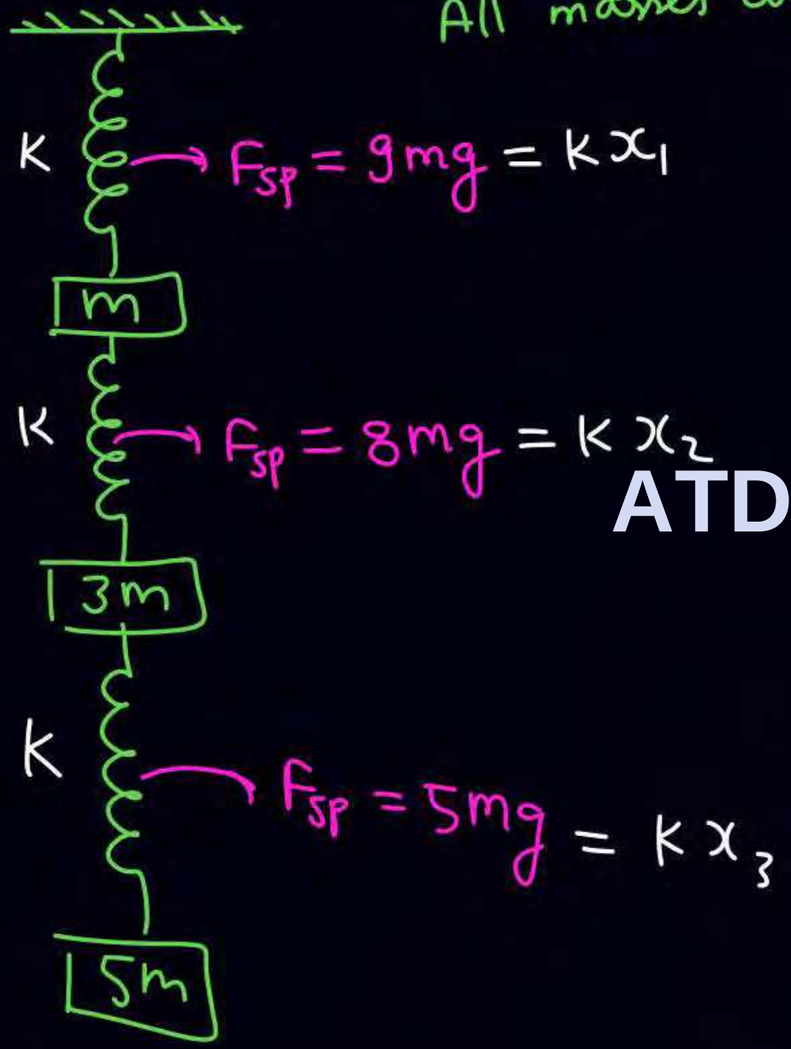
$$F_{SP_1} = mg + F_{SP_2}$$

$$F_{SP_1} = mg + 2mg = 3mg = K_1 x_1$$

$$F_{SP_2} = F_{\text{नीचे वाली Spring}} = 2mg = K_2 x_2$$

Q

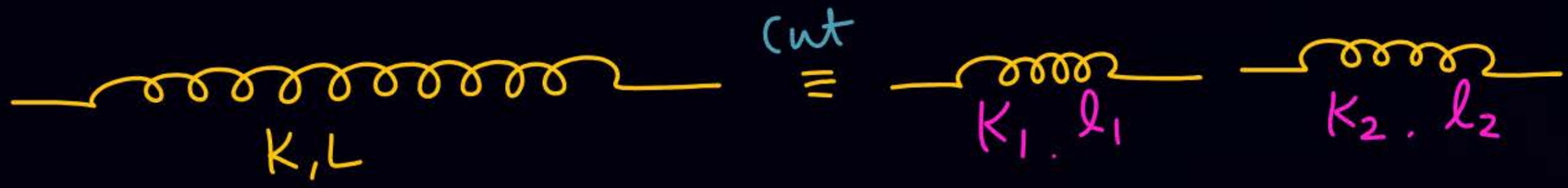
All masses are in equilibrium.



SKC

अगर में F_{sp} = ✓

$F_{sp} = kx$ ✓



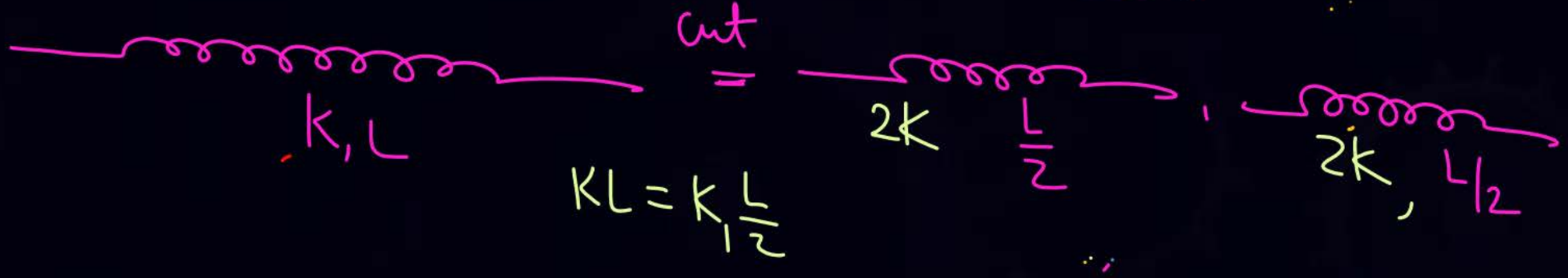
$$KL = K_1 l_1 = K_2 l_2$$

$$KL = K_1 \times \frac{L}{3}$$

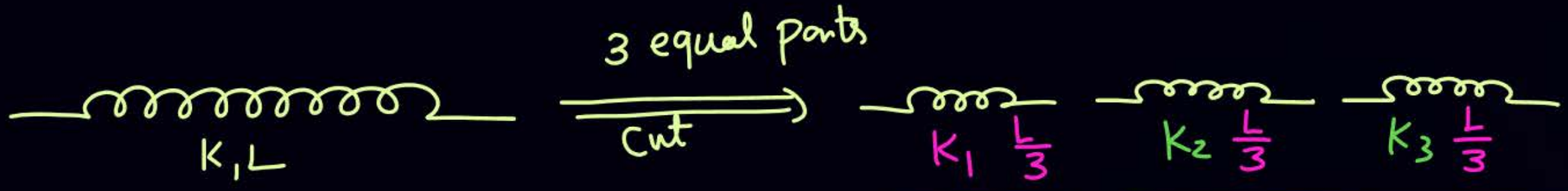
$$\boxed{K_1 = 3K}$$

$$KL = K_2 \times \frac{2L}{3}$$

$$\boxed{K_2 = \frac{3K}{2}}$$

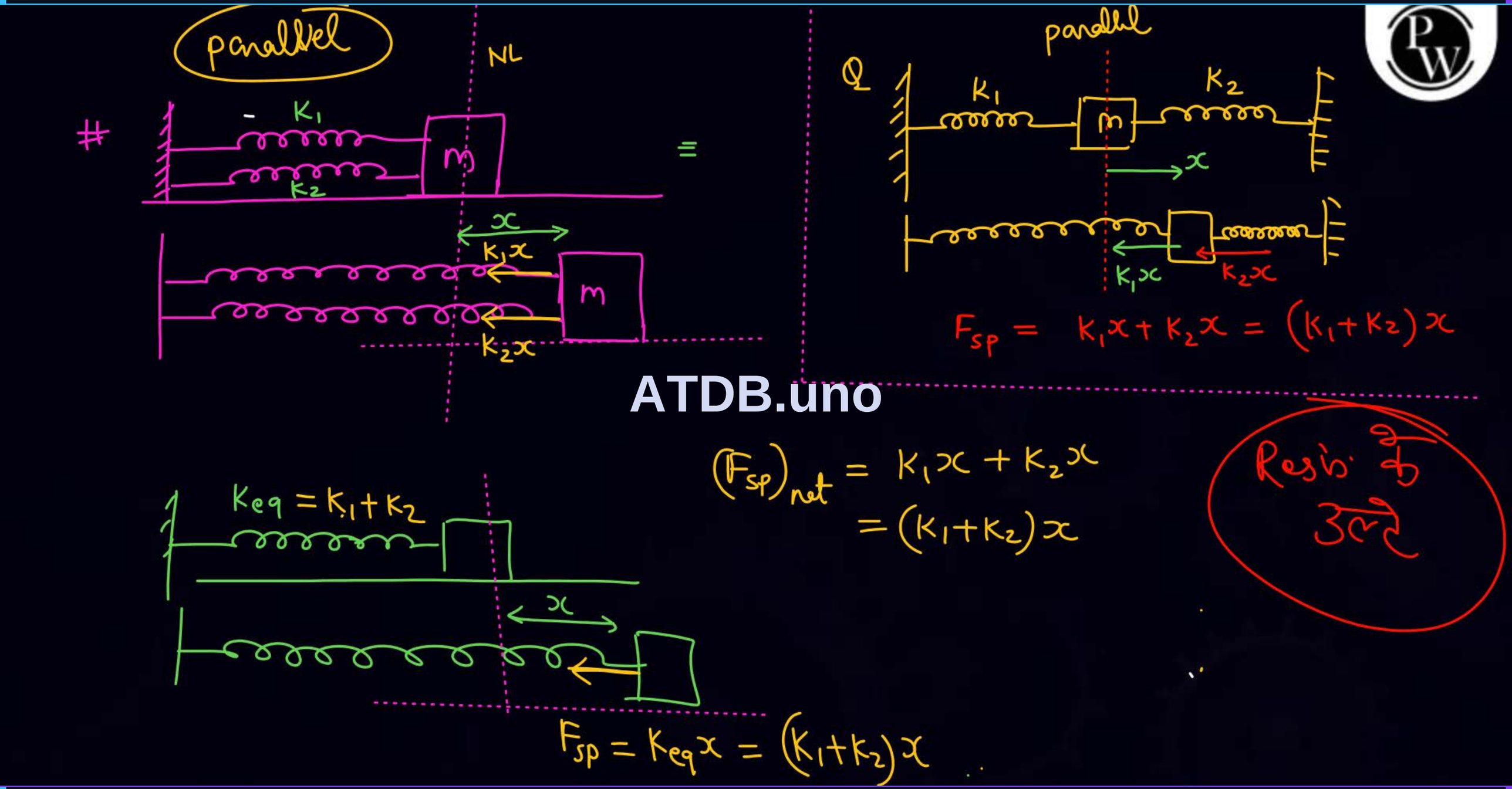


$$KL = K \frac{L}{2}$$



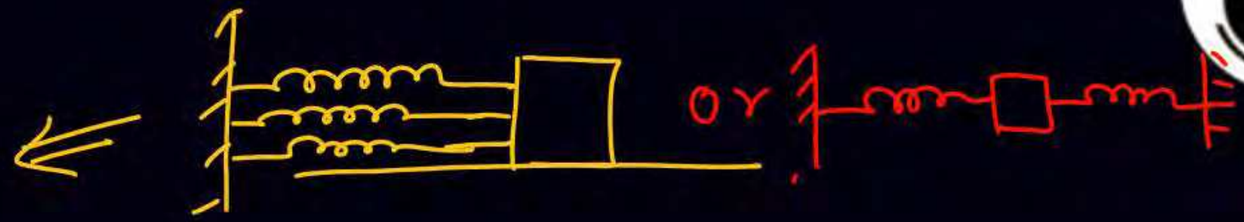
$$KL = K_1 \frac{L}{3} \Rightarrow \boxed{K_1 = 3K} \qquad \boxed{K_1 = K_2 = K_3 = 3K}$$

$$K = nK$$

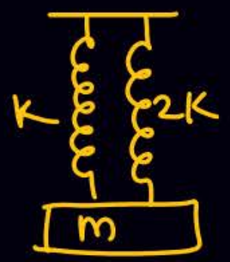


Spring

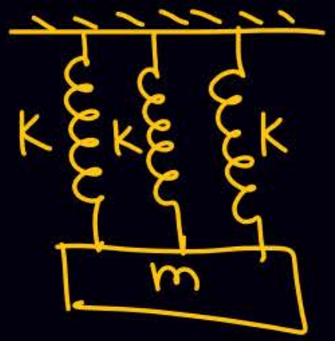
parallel ≡ $K_{eq} = K_1 + K_2 + K_3 + \cdots$



Spring Series ≡ $\frac{1}{K_{eq}} = \frac{1}{K_1} + \frac{1}{K_2} + \cdots$

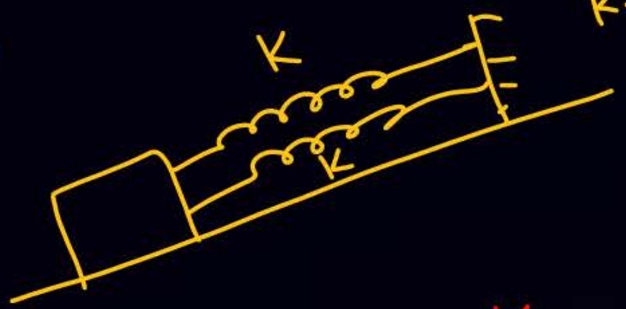
① 

$K_{eq} = K + 2K = 3K$

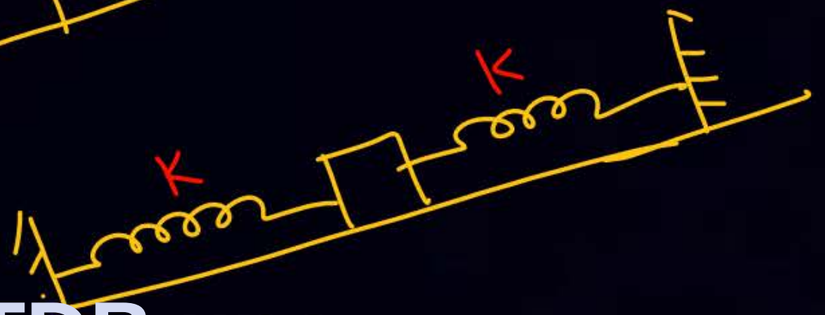
② 

$K_{eq} = K + K + K$

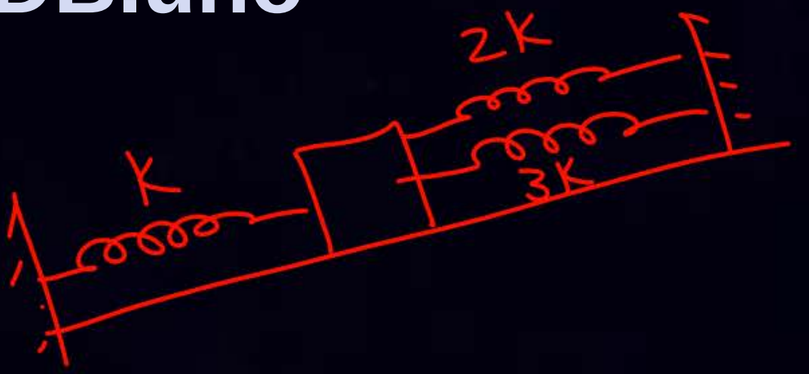
$$T = 2\pi\sqrt{\frac{m}{K_{eq}}}$$

③ 

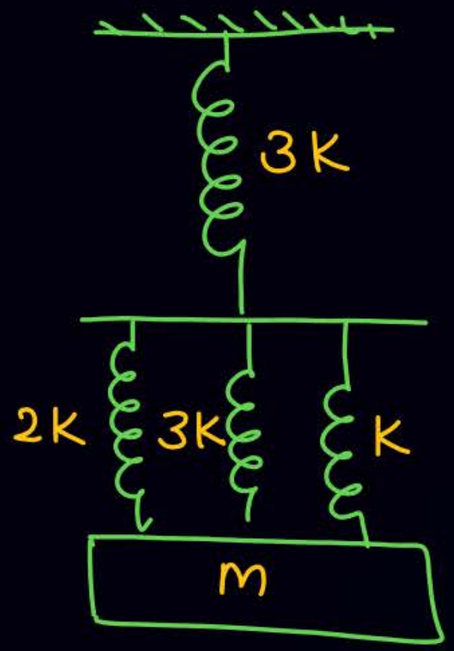
$K_{eq} = 2K$

④ 

$K_{eq} = K + K = 2K$

⑤ 

$K_{eq} = 6K$



$K_{eq} =$

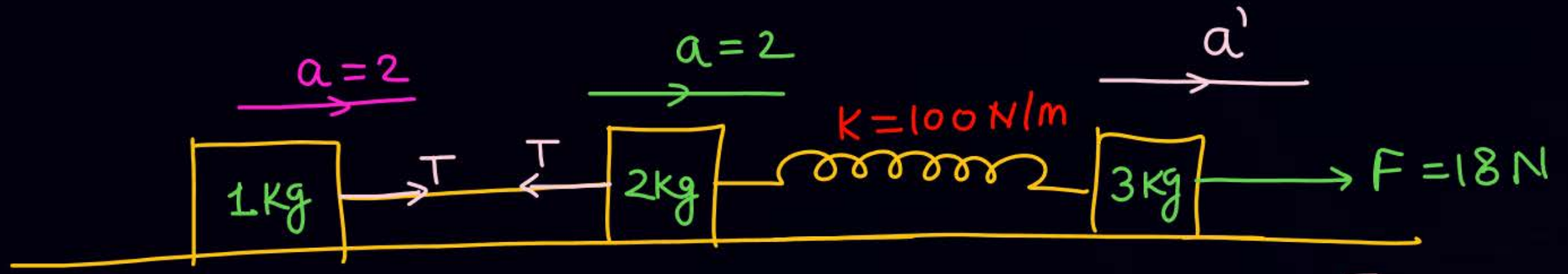
$T = 2\pi\sqrt{\frac{m}{2k}}$

$$\frac{1}{K_{eq}} = \frac{1}{3k} + \frac{1}{6k}$$

$$\frac{1}{K_{eq}} = \frac{2+1}{6k}$$

$$K_{eq} = 2K$$

Q



$T = 2$

$\bar{F}_{ext} = m_1\bar{a}_1 + m_2\bar{a}_2 + m_3\bar{a}_3$

$18 = 1\times2 + 2\times2 + 3\times a'$

$a' = 4$

(1) ace of each block

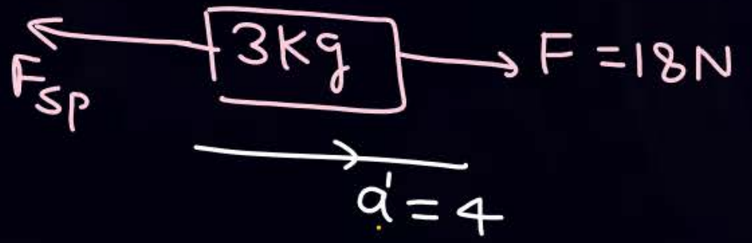
(2) elongation/compression in spring

(3) Spring force.

(Natural lenght = 2m)

$18 - F_{sp} = 3\times4$

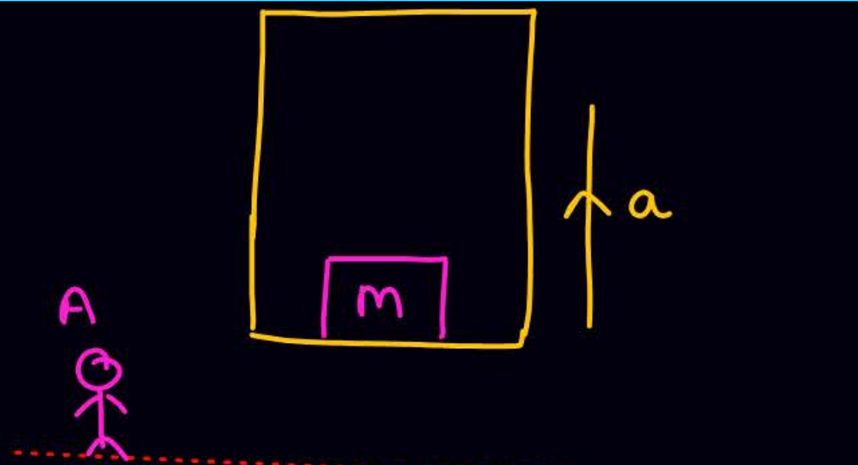
$F_{sp} = 6$



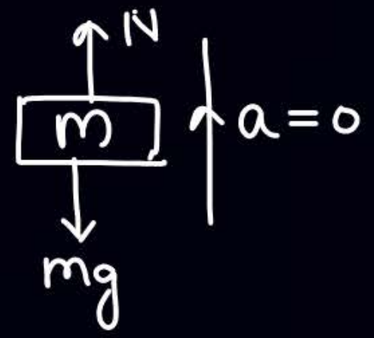
$F_{sp} = 6 = kx$

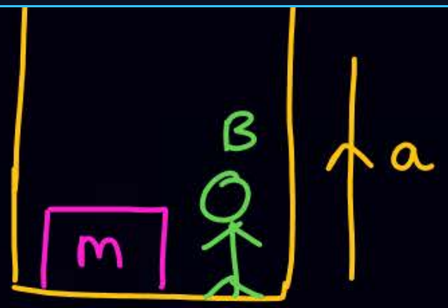
$6 = 100x$

$x = 6$ C.m



wrt B / wrt lift

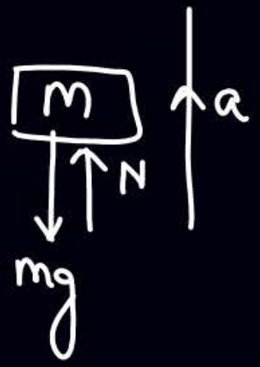




$N = mg$ ✗

$N - mg = ma$

$\boxed{N = mg + ma}$



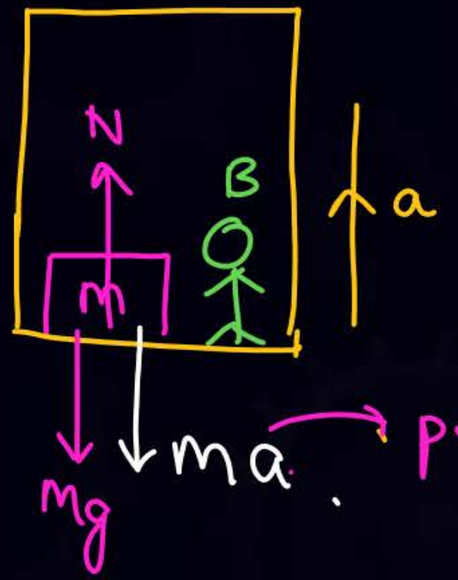
✓

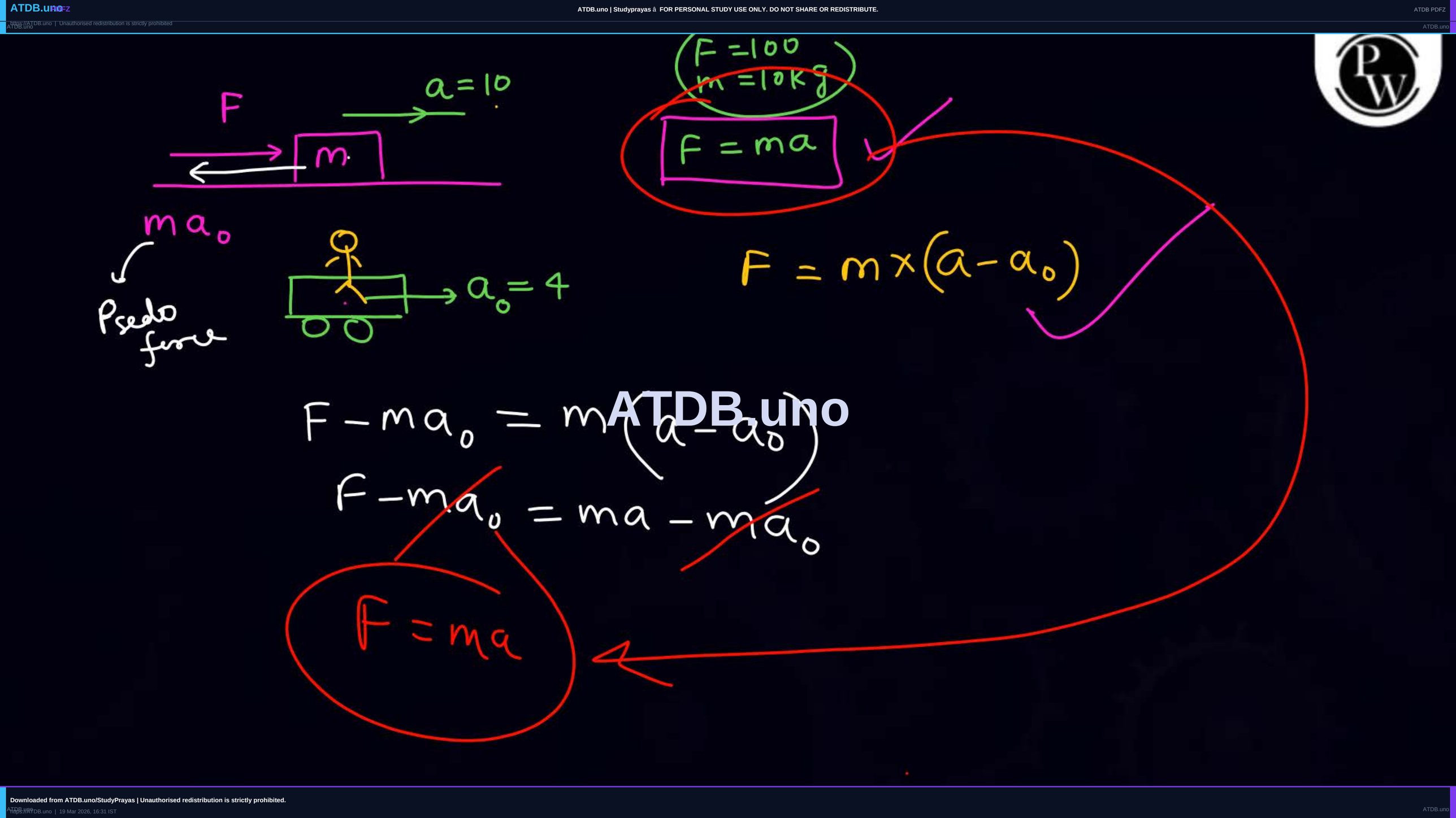
$a_{block} = a_{NIF} - a_{frame} = m \times 0$

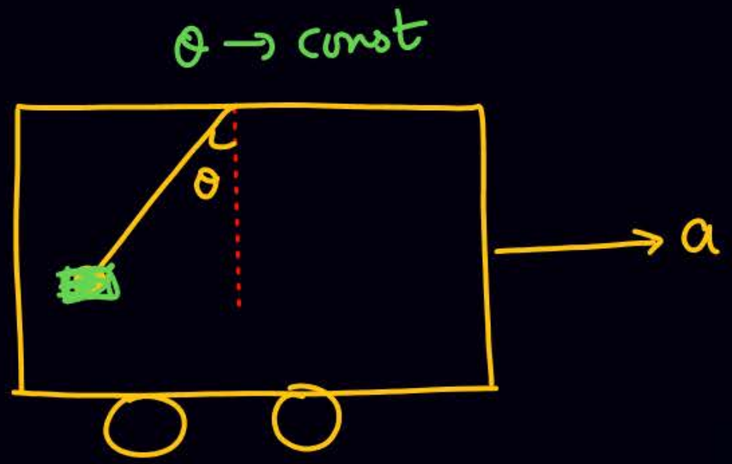
$\boxed{N = mg + ma}$

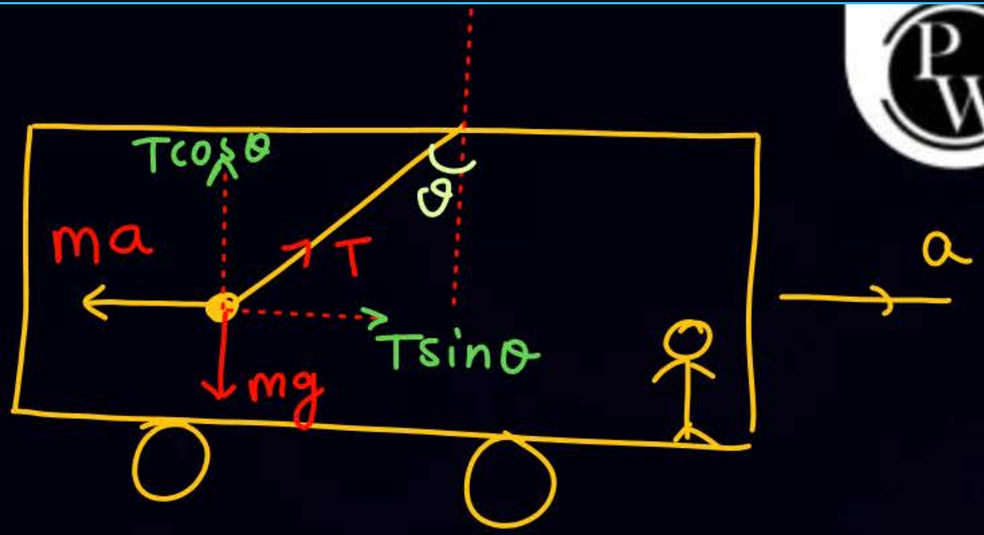
$\vec{F}_{psedo} = -m_{block}\,\vec{a}_{NIF}$

$F_{psedo} = -m_{block}\,a_{आदमी}$









find θ = ?

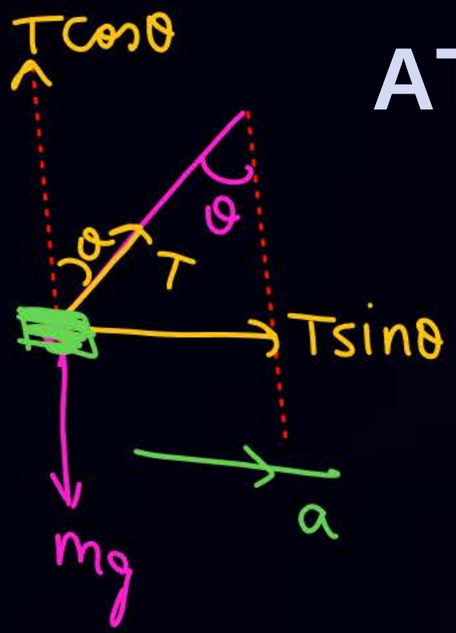
wrt ground

$T\cos\theta = mg$

$T\sin\theta = ma$

$\tan\theta = \frac{a}{g}$

$(a = g\tan\theta)$



$T\sin\theta = ma$

$T\cos\theta = mg$

$\tan\theta = \frac{a}{g}$

$a = g\tan\theta$

Home Work

- DPP 05
  - module H.W given yesterday
  - PYQ will start from tommarow.