

# PRAYAS

## JEE 2025



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Lecture - 07

Physics

### Laws Of Motion

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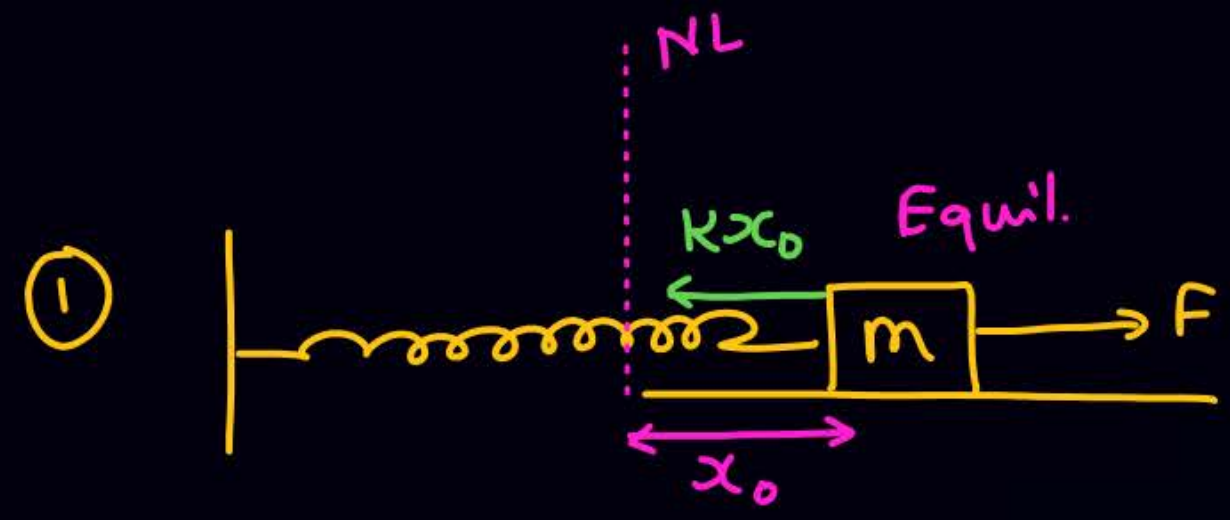
# Topics *to be covered*

- 1 Spring force
- 2
- 3 Pseudo force
- 4

**B.uno**

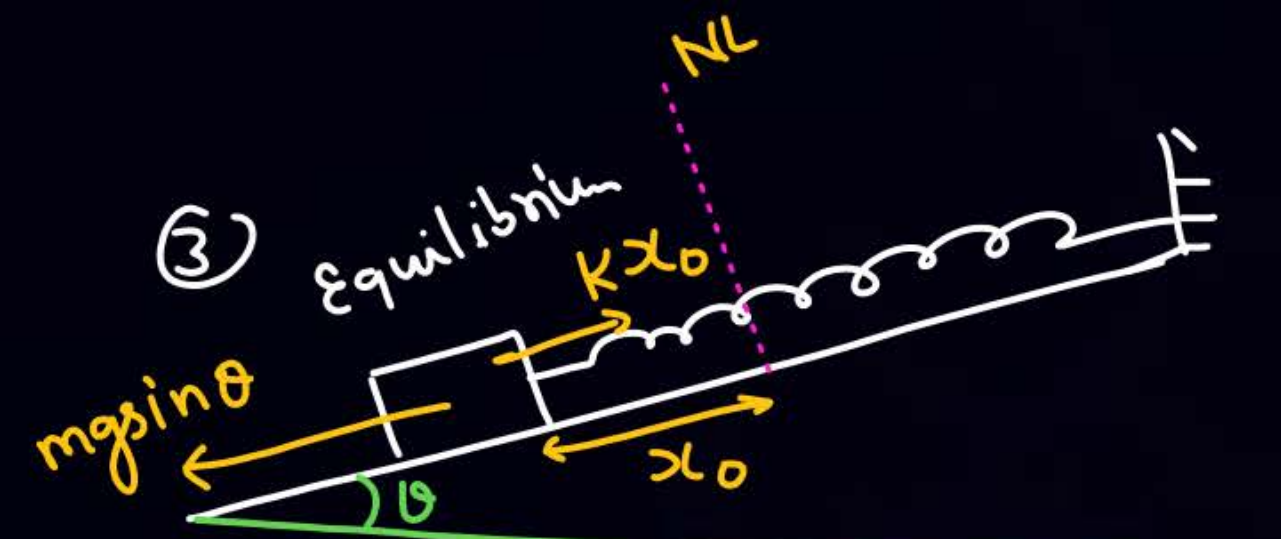


find elongation in spring in following case if block is in equilibrium



$$F = kx_0$$

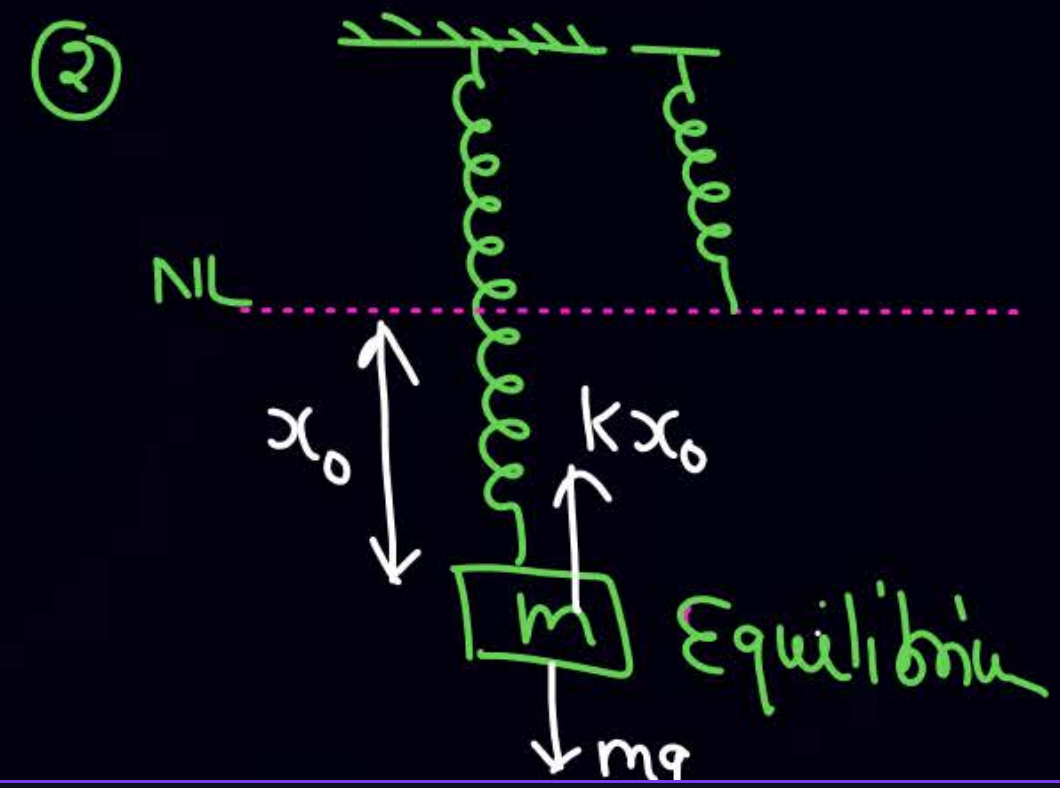
$$x_0 = F/k$$



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$$kx_0 = mgsin\theta$$

from natural length



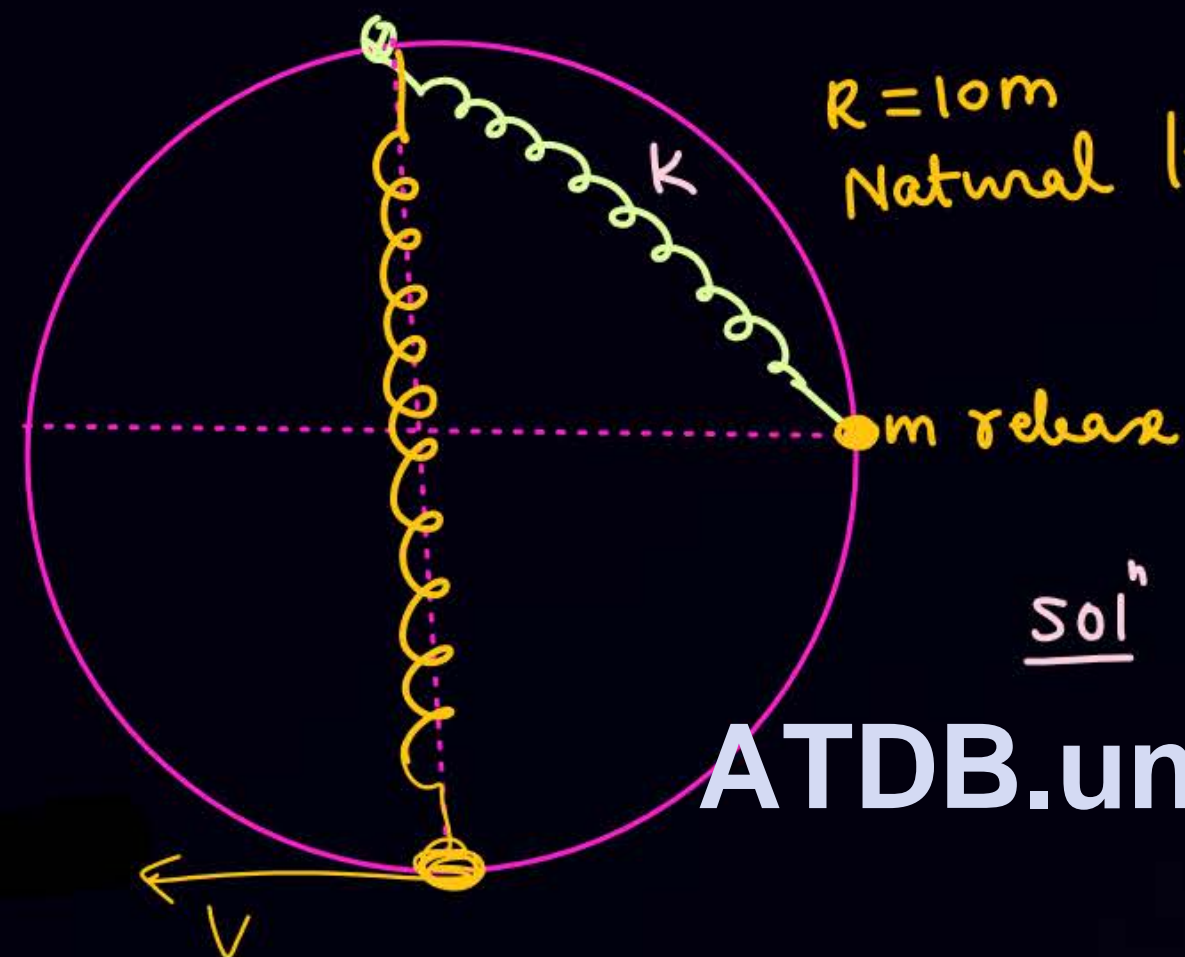
$$mg = kx_0$$

$$x_0 = mg/k$$





④



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

find spring force when mass reaches at point A.

Sol<sup>n</sup>  $x = 20 - 10\sqrt{2} \equiv$  खिच गया elongation

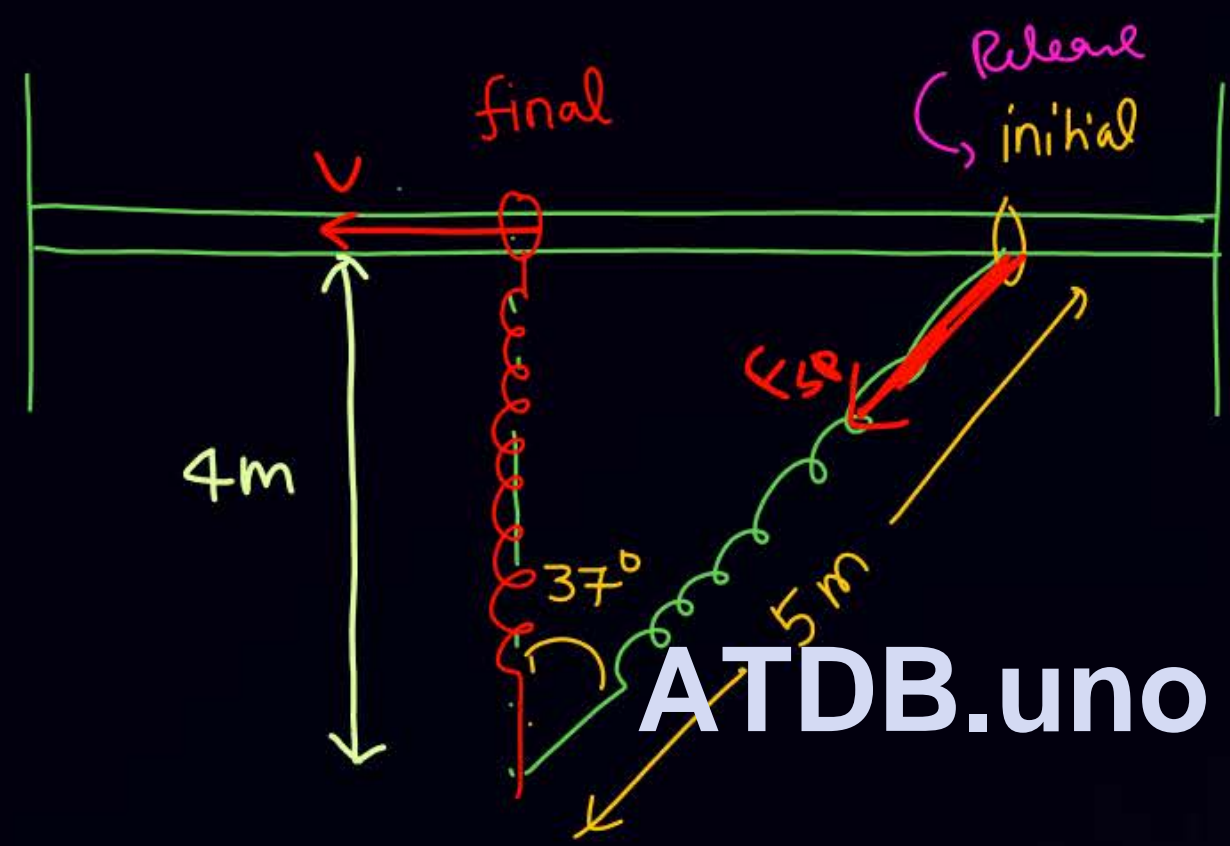
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$$F_{sp} = kx$$



natural length = 2 m

Q



$$\textcircled{1} (F_{SP})_{\text{initial}} = kx_i$$

$$= 1000 \times 3 = 3000 \text{ N}$$

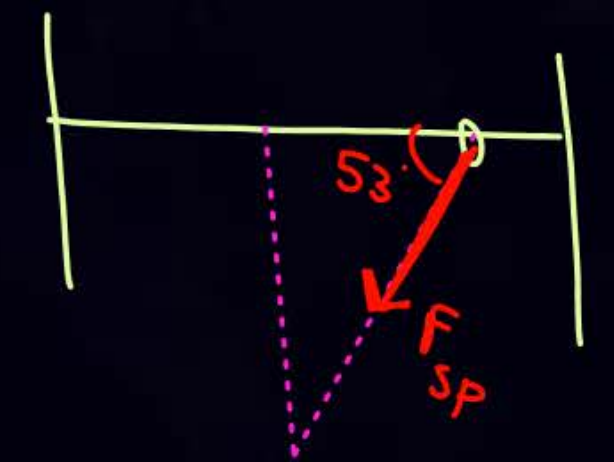
$$\textcircled{2} F_{SP} \text{ final} = kx_f$$

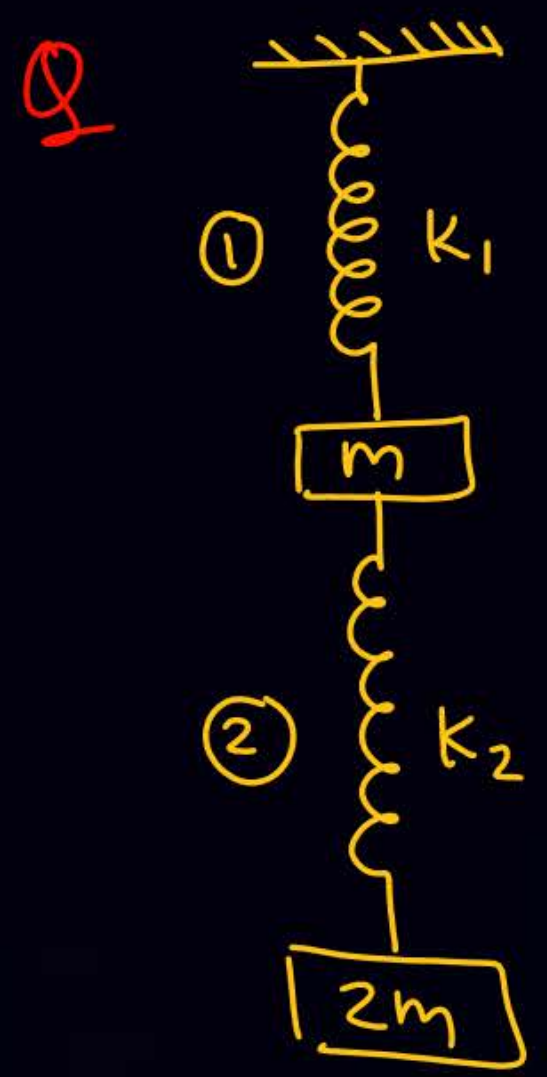
$$= 1000 \times 2 = 2000$$

$$\textcircled{3} (a)_{\text{initial}} = \left( \frac{F_{SP} \cos 53}{m} \right) \text{ m/s}^2$$

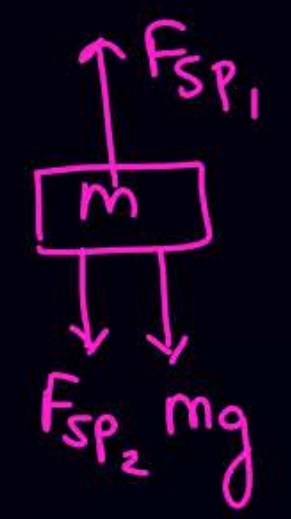
$$= \frac{3000 \times \frac{3}{5}}{10} = 180$$

K = 1000



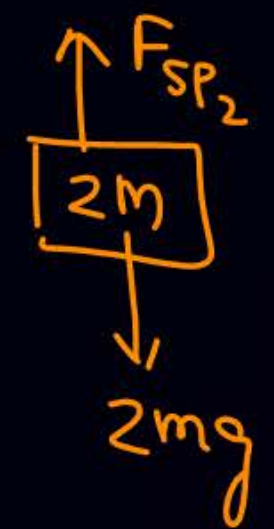


Both masses are in equilibrium



$$F_{SP1} = mg + F_{SP2}$$

$$F_{SP1} = mg + 2mg = 3mg = K_1 x_1$$

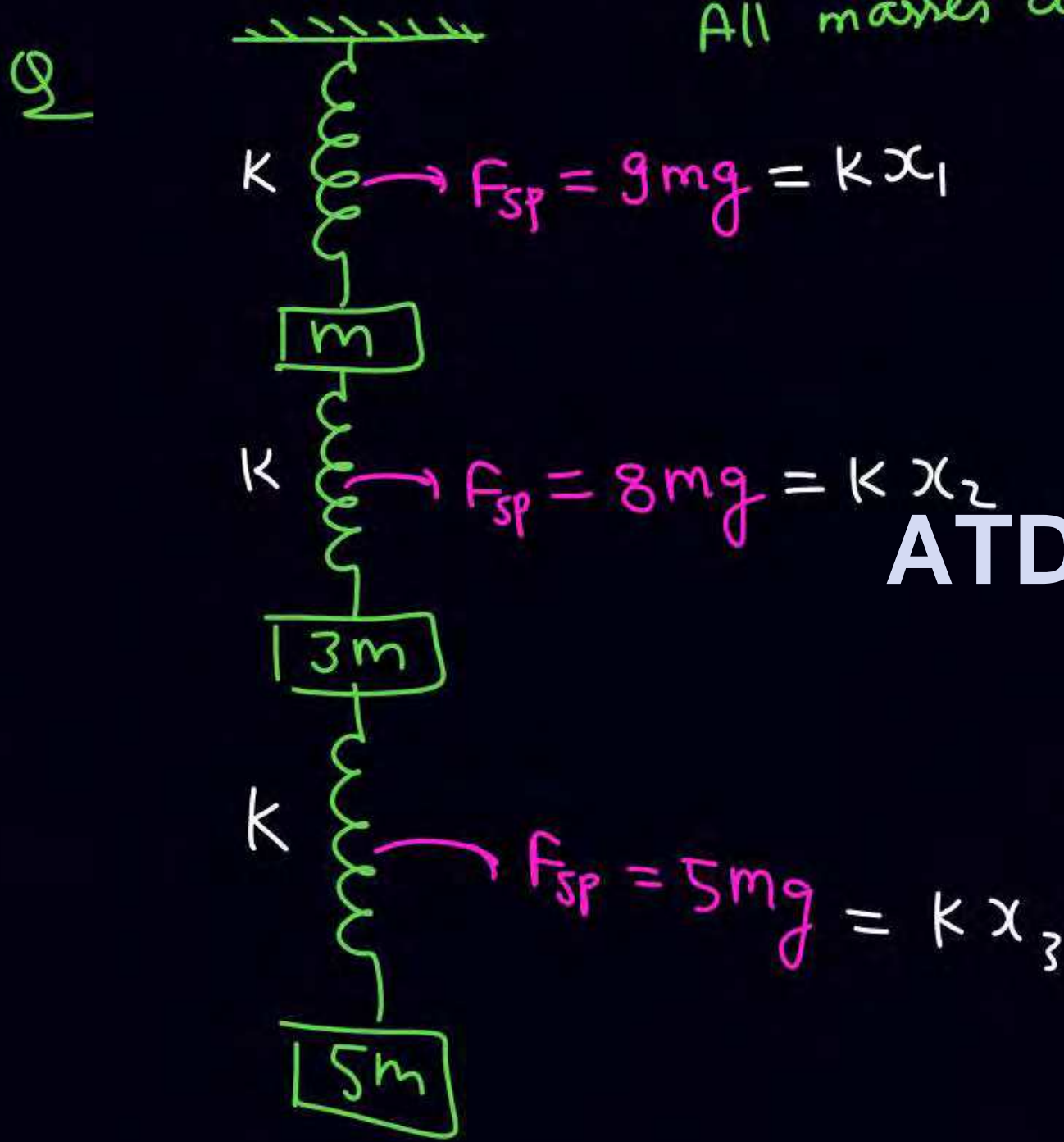


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$$F_{SP2} = F_{\text{नीचे वाला Spring}} = 2mg = K_2 x_2$$



All masses are in equilibrium.

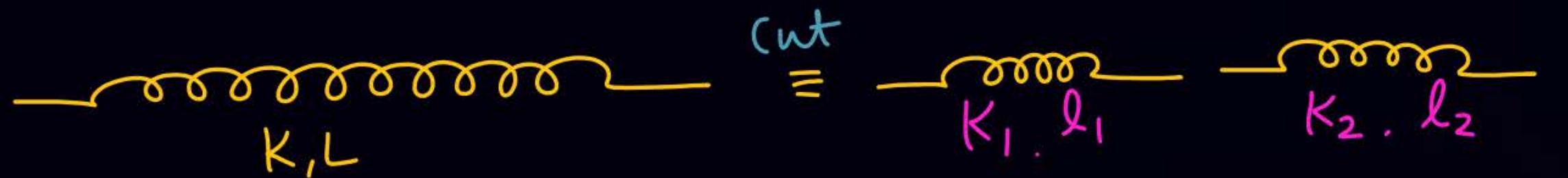


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SKC

अगर में  $F_{sp} = \checkmark$

$$F_{sp} = Kx$$



$$KL = K_1 l_1 = K_2 l_2$$

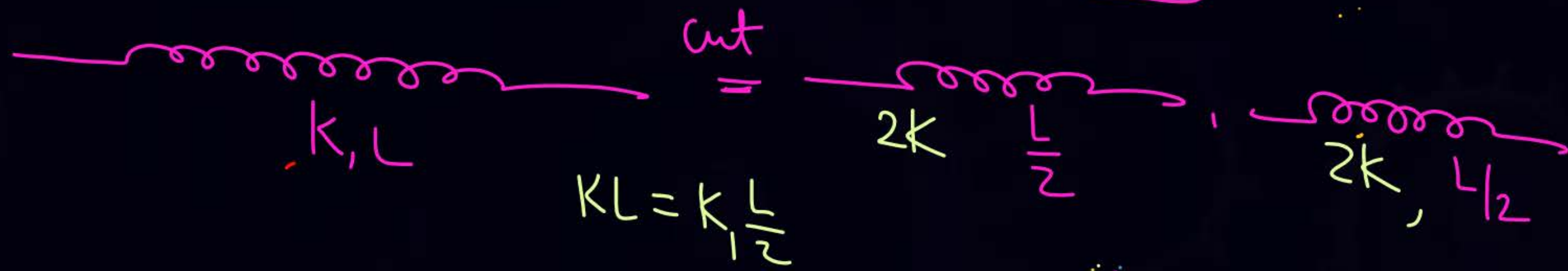


$$KL = K_1 \cdot \frac{L}{3}$$

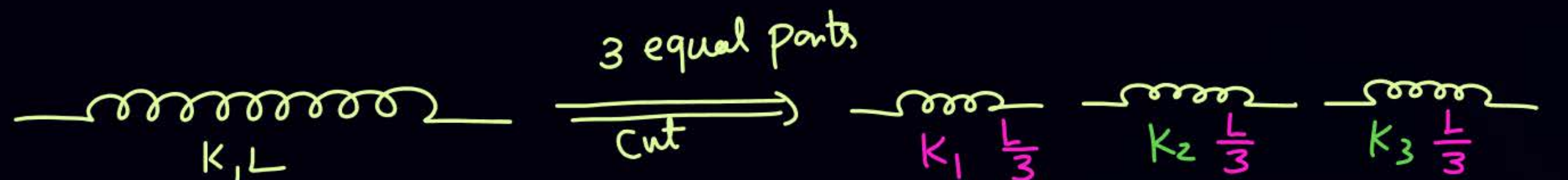
$$KL = K_2 \times \frac{2L}{3}$$

$$K_1 = 3K$$

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

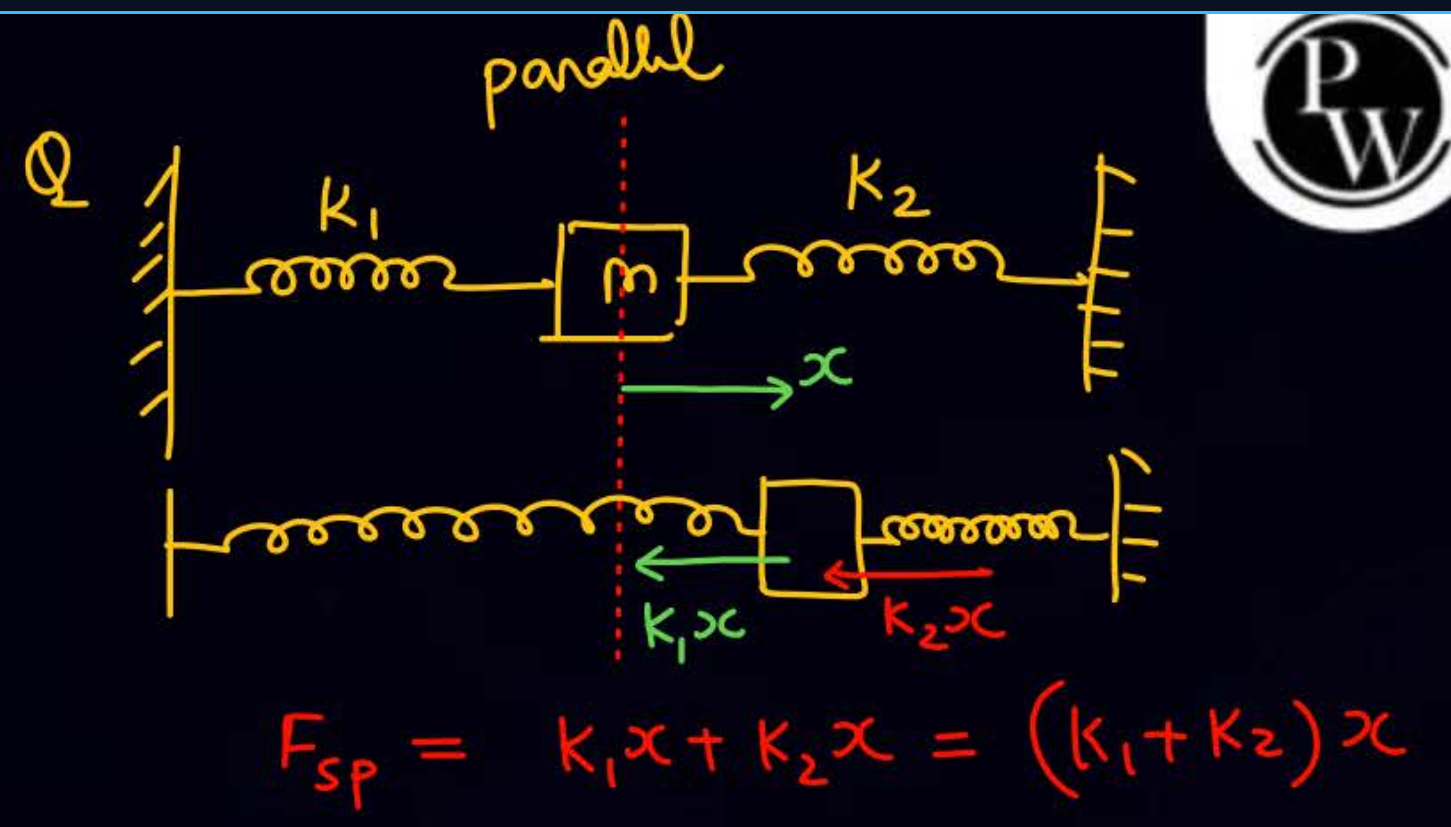
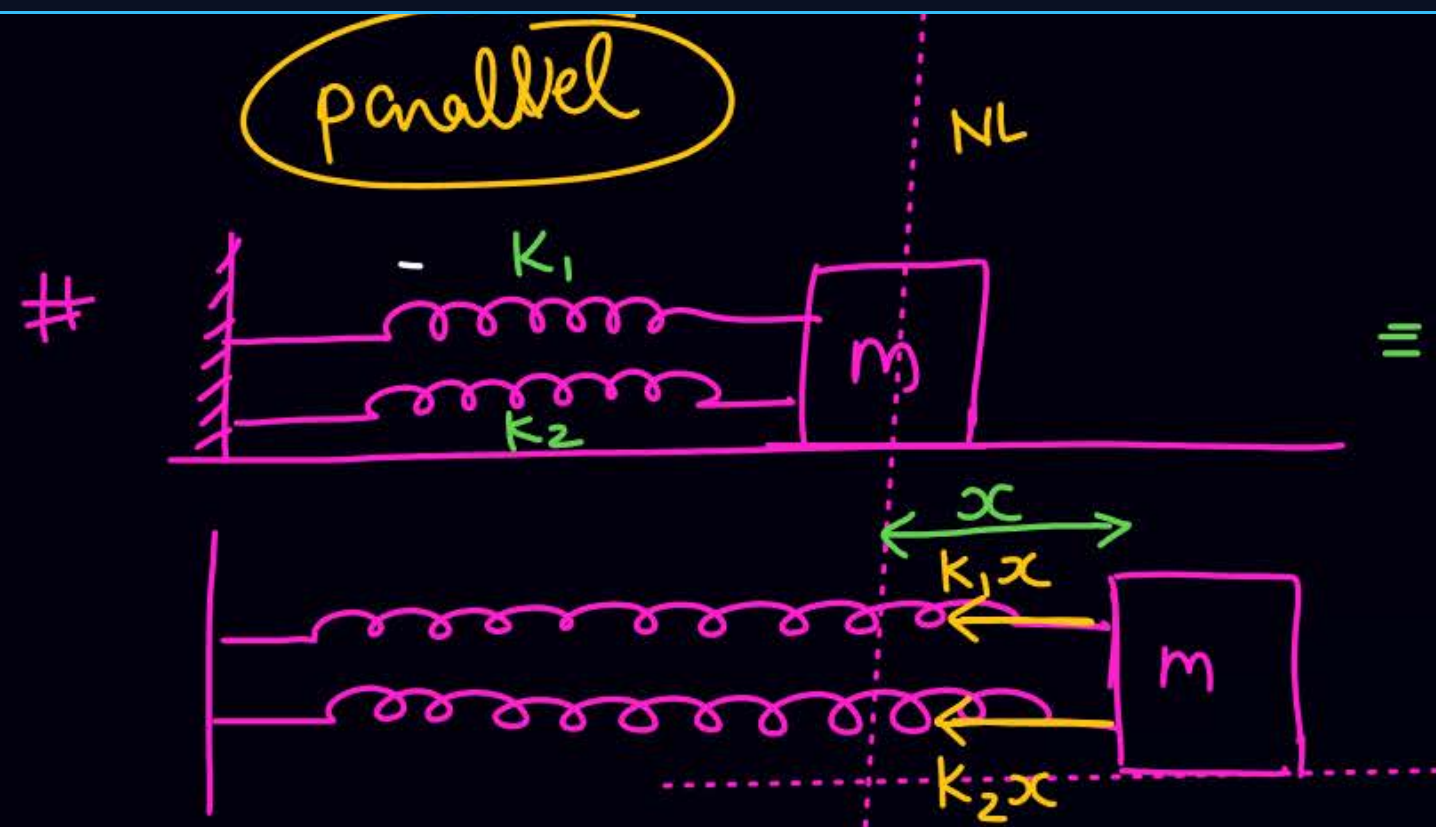


$$KL = K_1 \cdot \frac{L}{2}$$



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

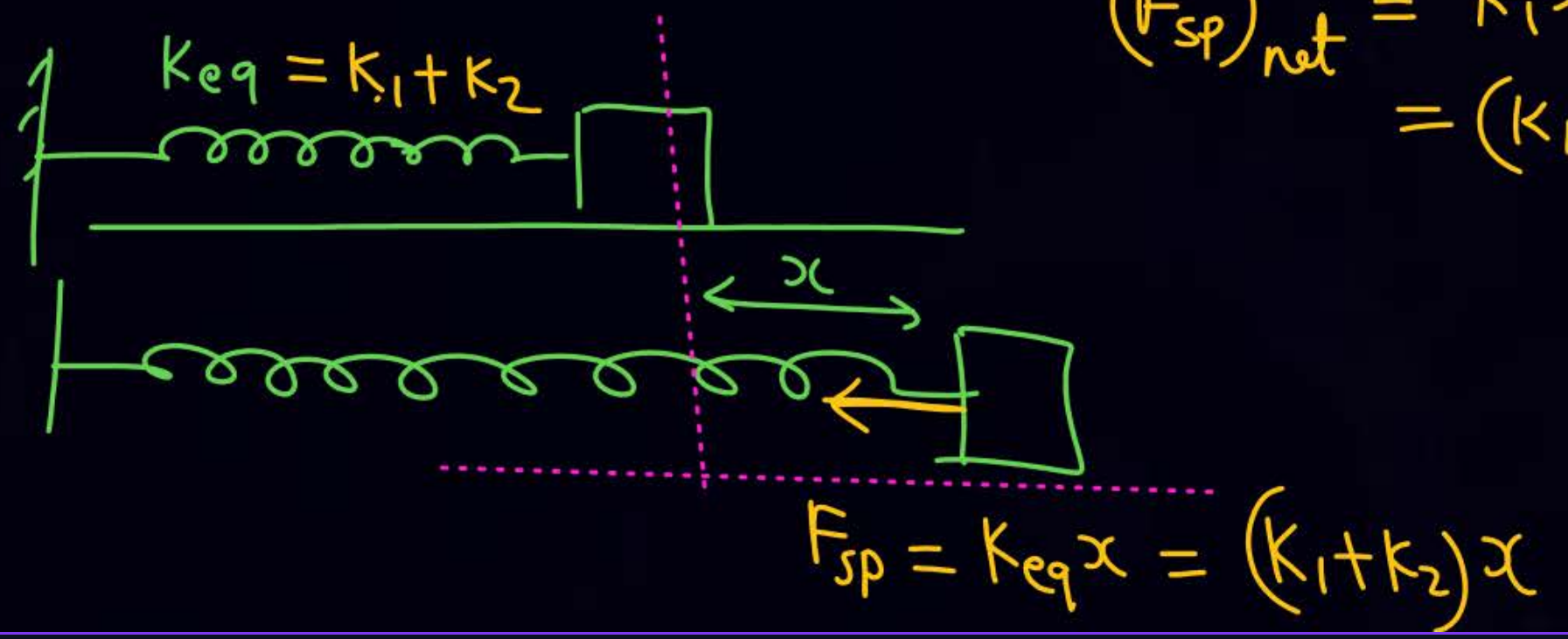




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$$(F_{sp})_{net} = k_1 x + k_2 x = (k_1 + k_2) x$$

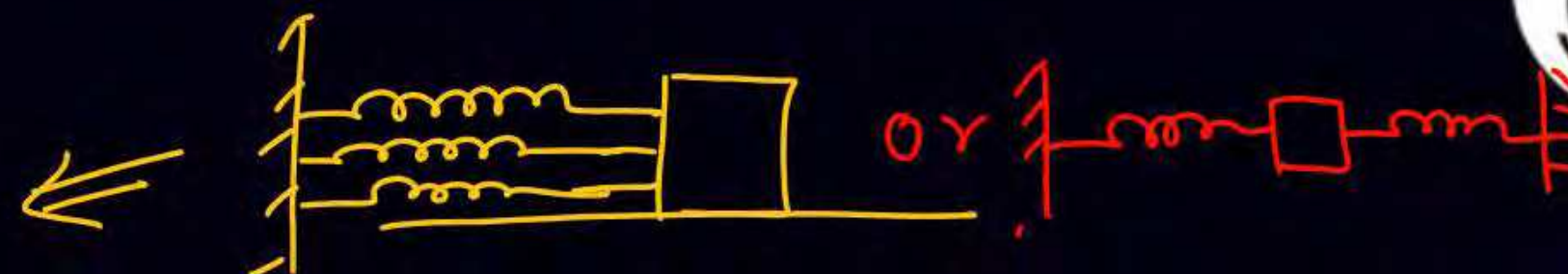
Resis<sup>2</sup> 302





Spring

parallel  $\equiv K_{eq} = K_1 + K_2 + K_3 + \dots$



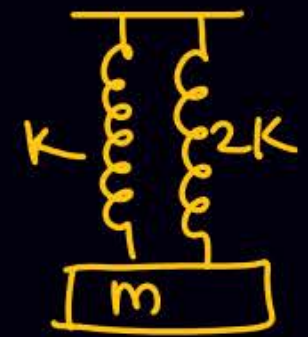
Spring Series  $\equiv \frac{1}{K_{eq}} = \frac{1}{K_1} + \frac{1}{K_2} + \dots$



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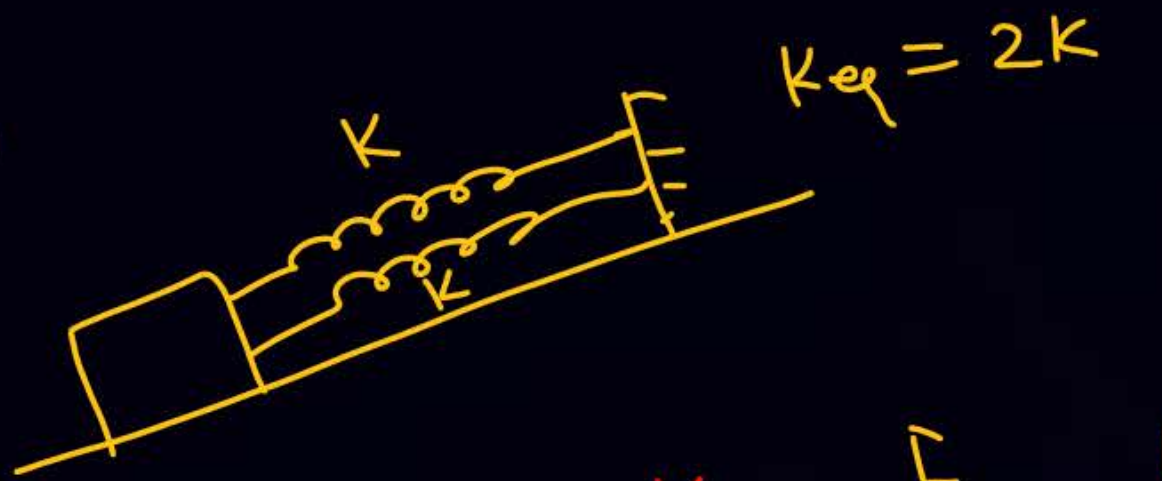


1



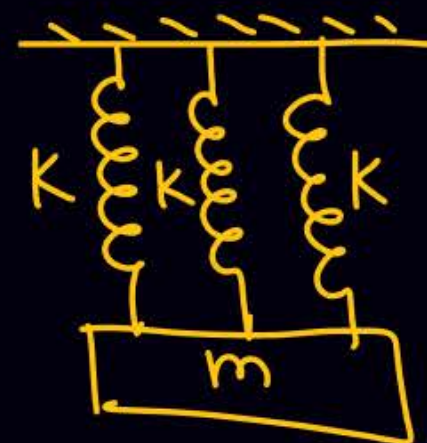
$K_{eq} = K + 2K = 3K$

3



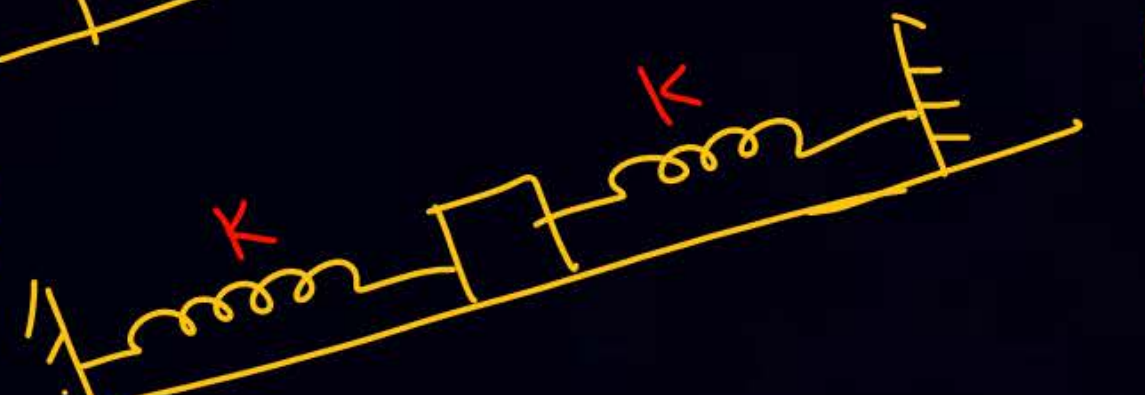
$K_{eq} = 2K$

2



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

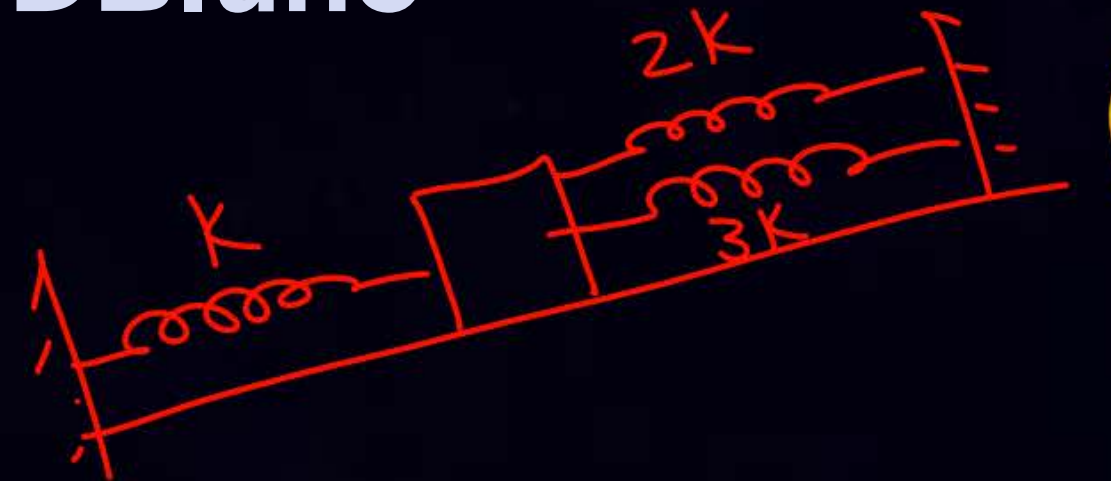
4



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

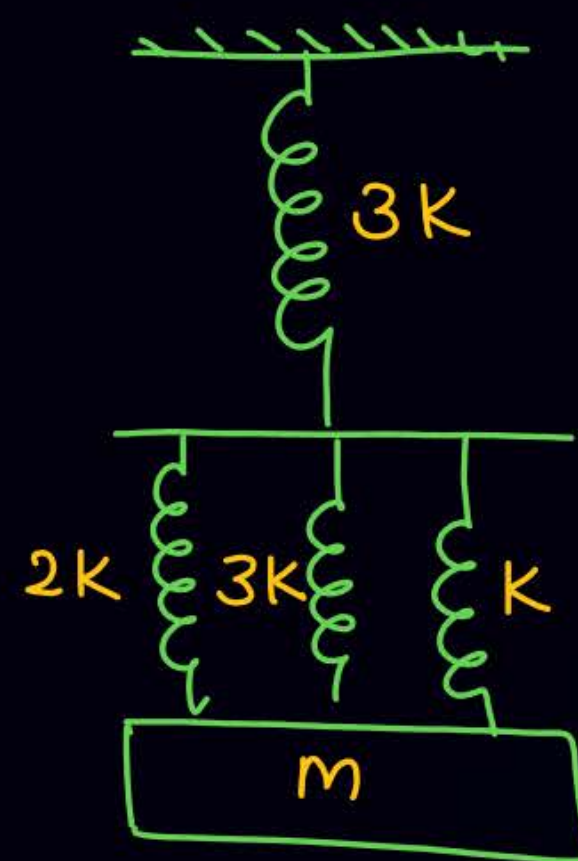
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Q



$K_{eq} = 6K$

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



$$K_{eq} =$$

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

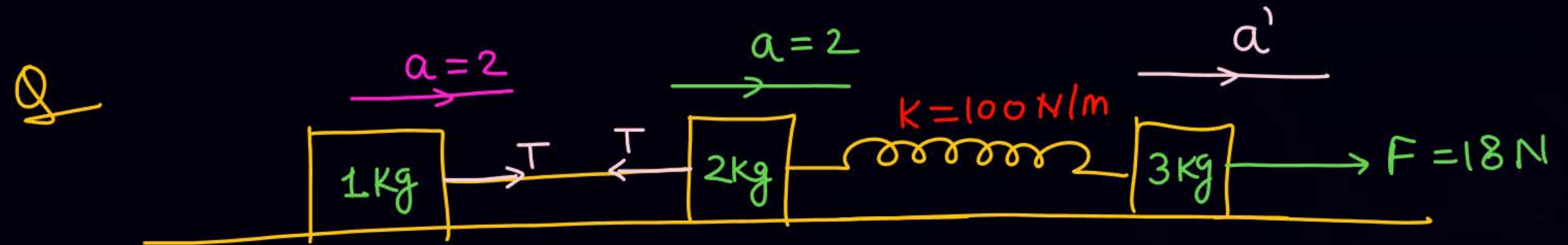
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$$\frac{1}{K_{eq}} = \frac{1}{3K} + \frac{1}{6K}$$

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

$$K_{eq} = 2K$$



- Q
- 1) acceleration of each block
  - 2) elongation/compression in spring
  - 3) spring force.
- (Natural length = 2m)

$T = 2$

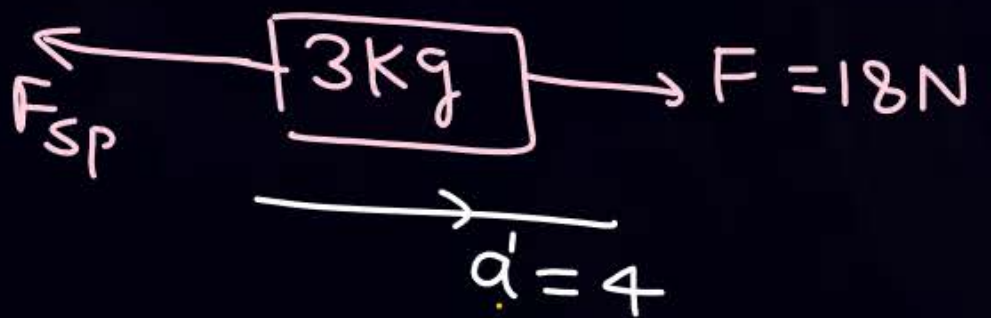
$$\bar{F}_{ext} = m_1 \bar{a}_1 + m_2 \bar{a}_2 + m_3 \bar{a}_3$$

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

$a' = 4$

$$18 - F_{sp} = 3 \times 4$$

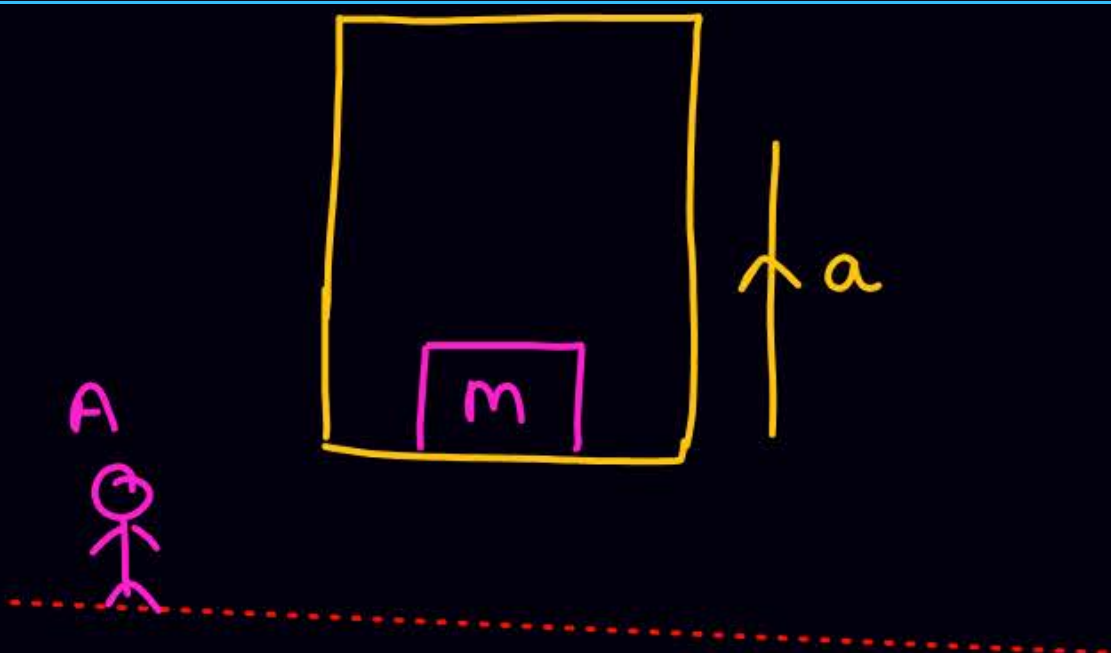
$$F_{sp} = 6$$



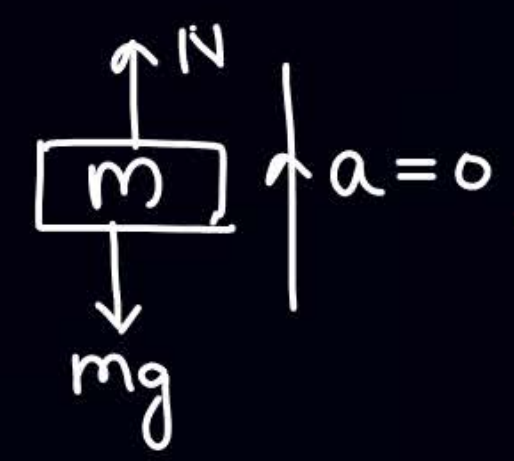
$$F_{sp} = 6 = kx$$

$$6 = 100x$$

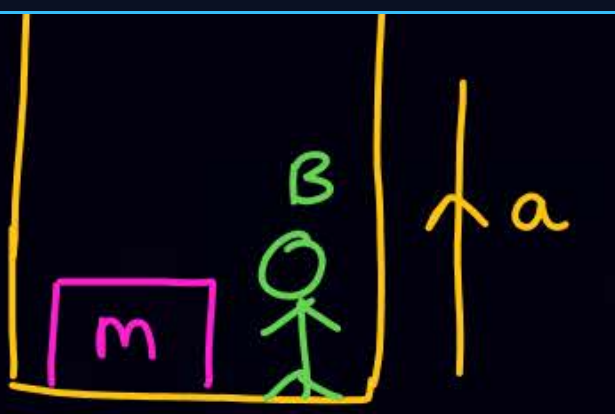
$x = 6 \text{ cm}$



wrt B / wrt lift



$N = mg$  X



$N - mg = ma$

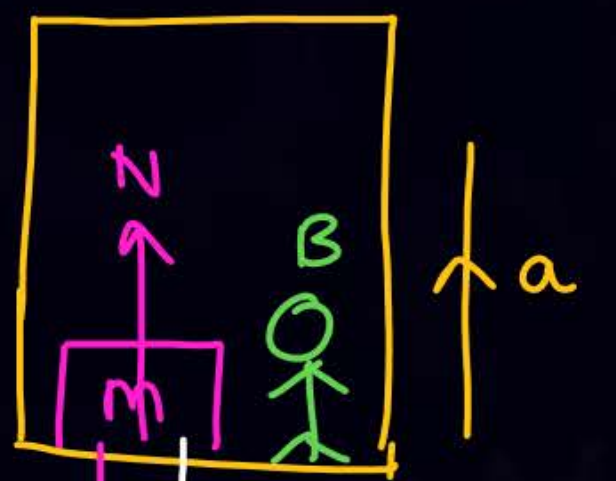
$N = mg + ma$

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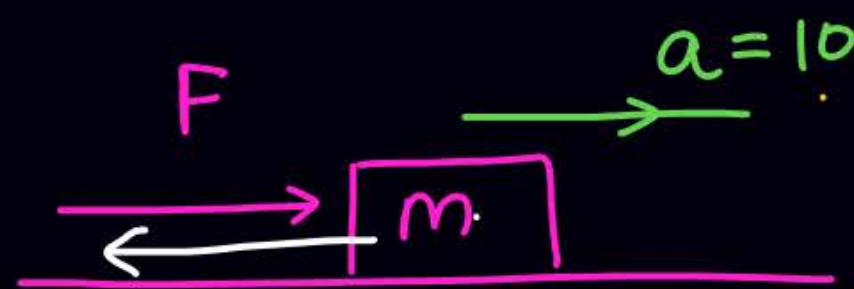
$N = mg + ma$

$F_{psedo} = -m_{block} \vec{a}$

$F_{psedo} = -m_{block} a$  आरही

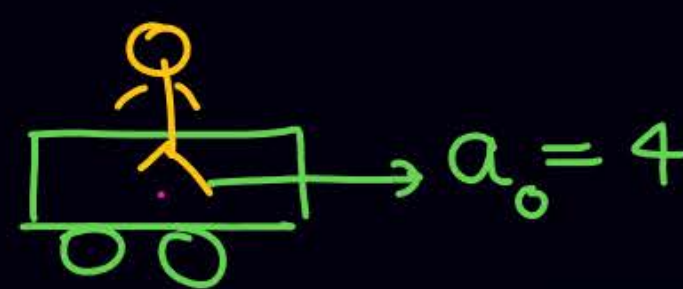


psedo force



$(F = 100, m = 10\text{kg})$   
 $F = ma$

$ma_0$   
 Pseudo force

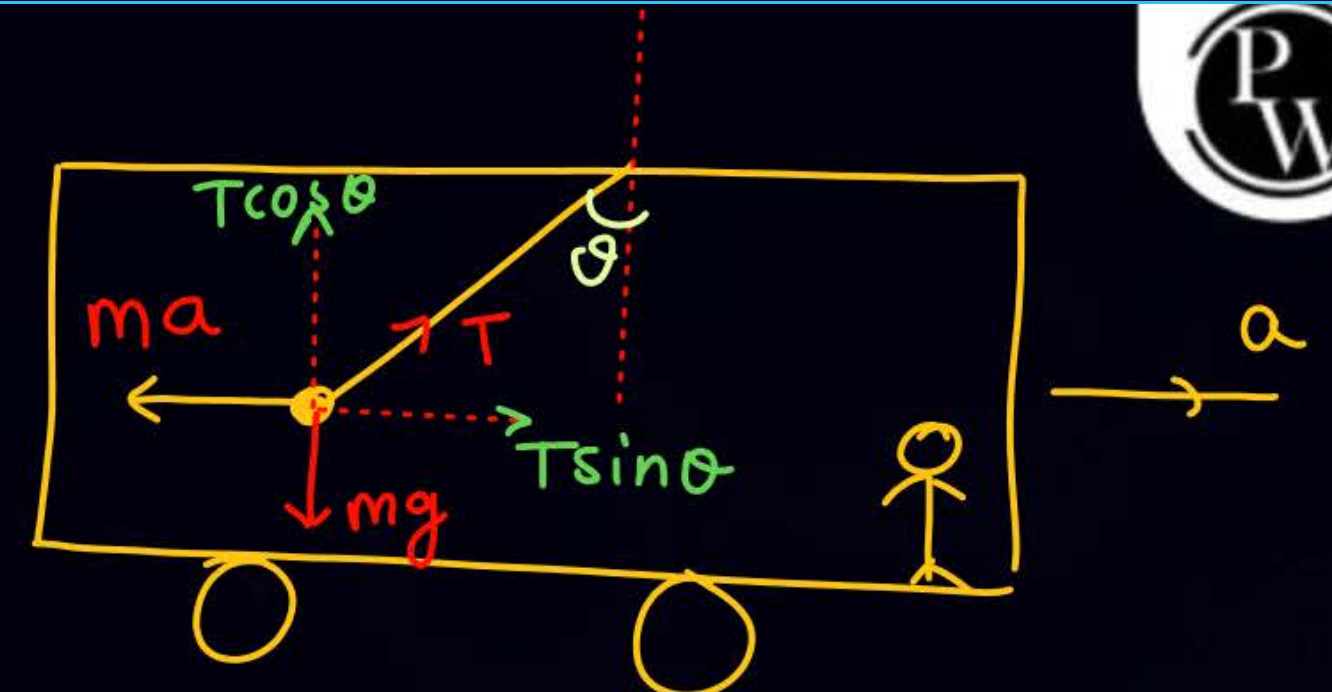
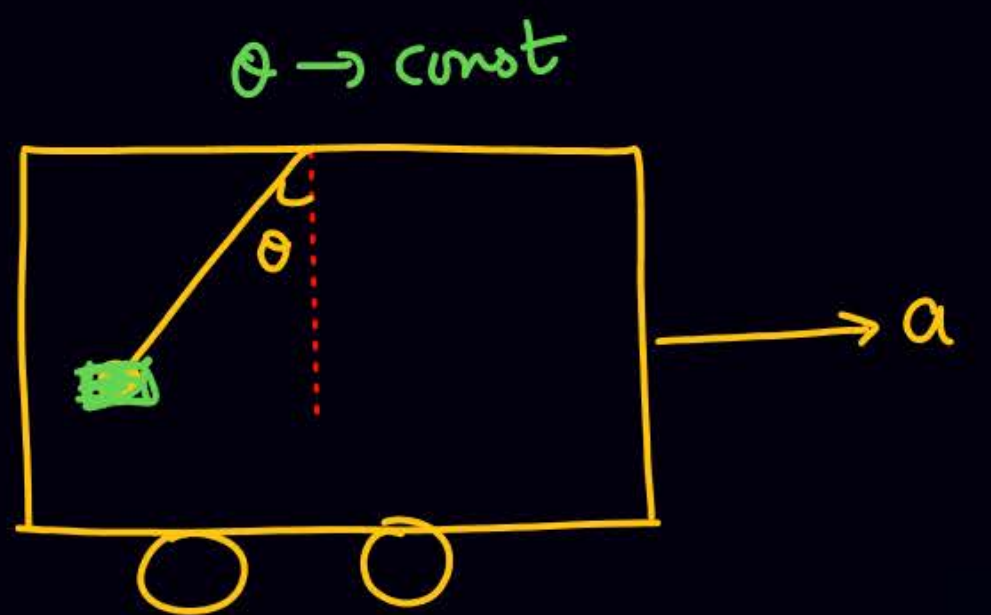


$F = m \times (a - a_0)$

$F - ma_0 = m(a - a_0)$

~~$F - ma_0 = ma - ma_0$~~

$F = ma$



find  $\theta = ?$

wrt ground

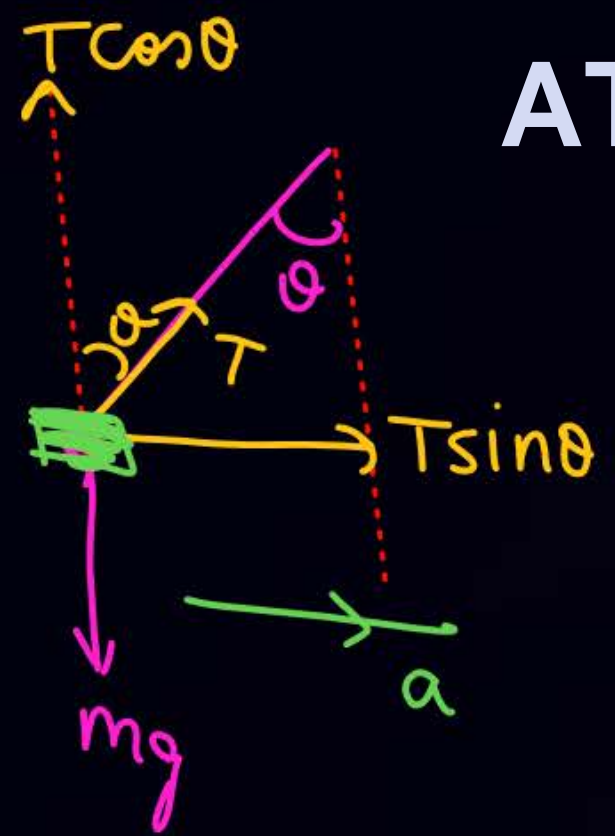
$$T \cos \theta = mg$$

$$T \sin \theta = ma$$

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

$$(a = g \tan \theta)$$



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$$T \sin \theta = ma$$

$$T \cos \theta = mg$$

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

$$a = g \tan \theta$$



## Home work

— DPP 05

- module H.W given yesterday

- PYQ will start from tommarow.

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# THANK YOU

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