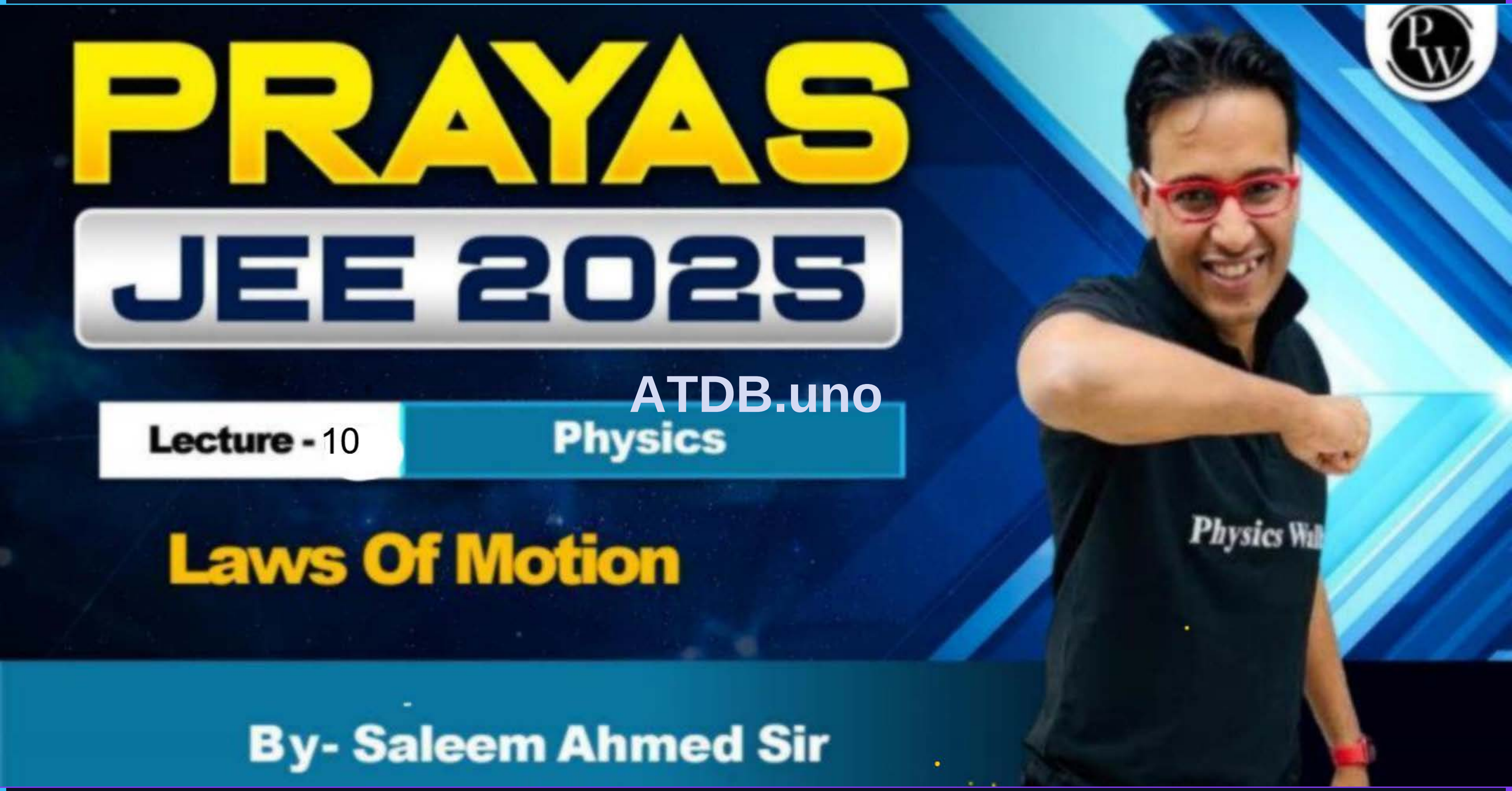
PRAYAS

JEE 2025

Lecture - 10

Physics

Laws Of Motion

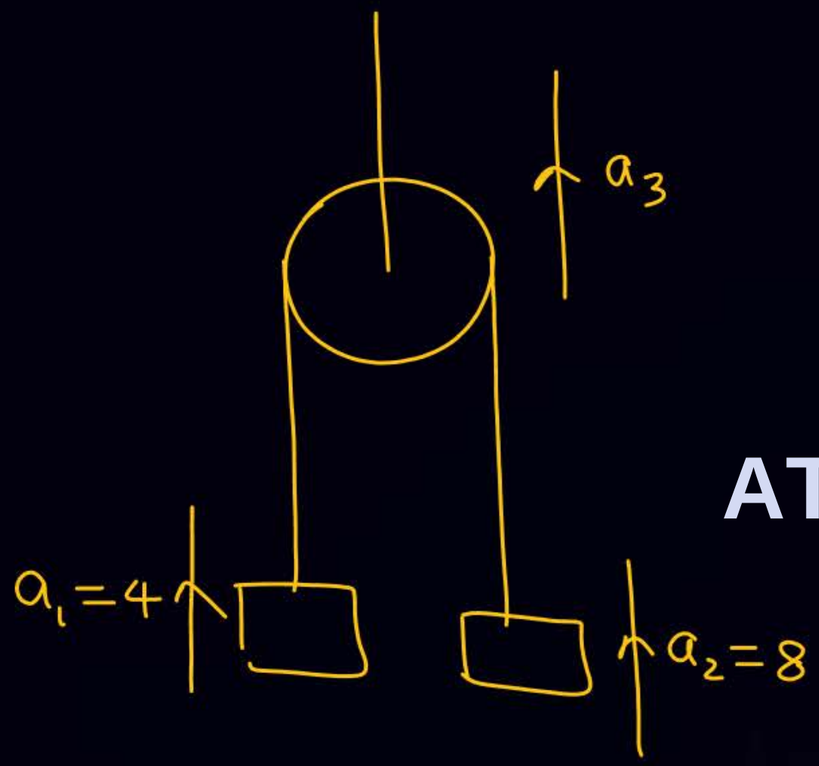


By- Saleem Ahmed Sir

Topics to be covered

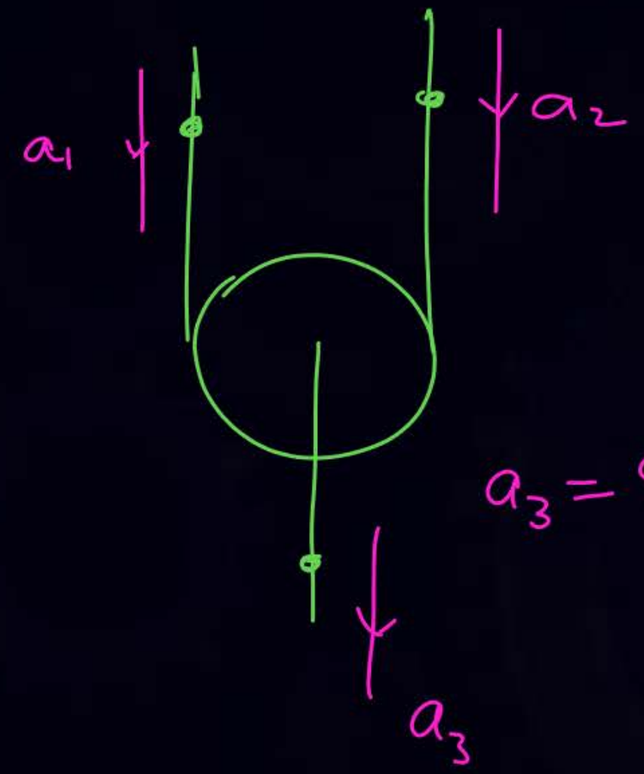
1. wedge Constraint
2. friction
3.
4.

Results



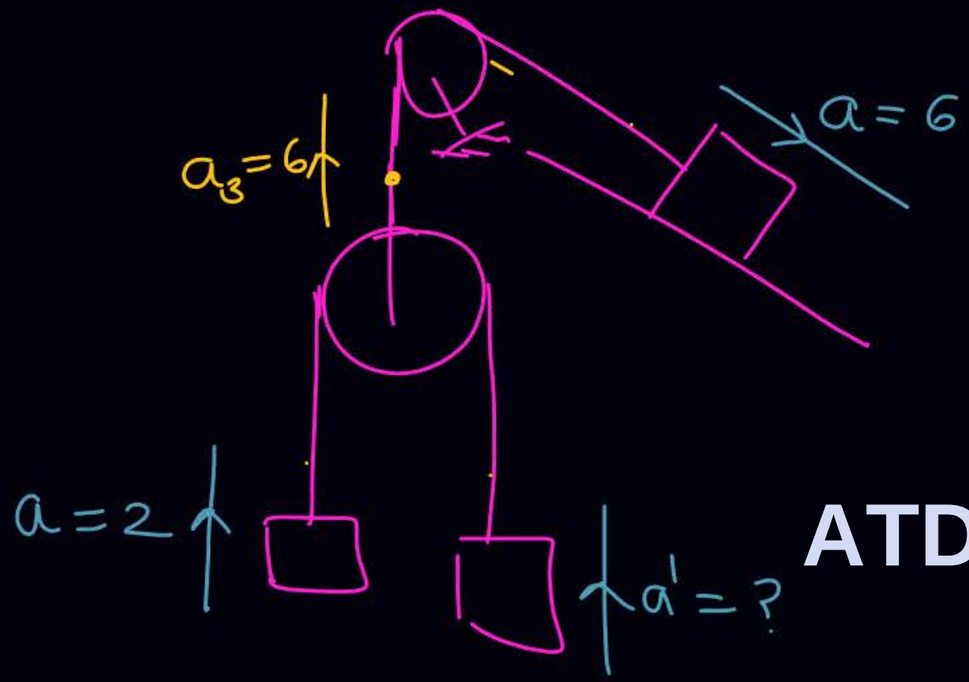
$$\frac{a_1 + a_2}{2} = a_3$$

$$a_3 = \frac{8+4}{2} = 6$$



$$a_3 = \frac{a_1 + a_2}{2}$$

Q



$$-2T \times 6 + T \times 2 + Ta' = 0$$

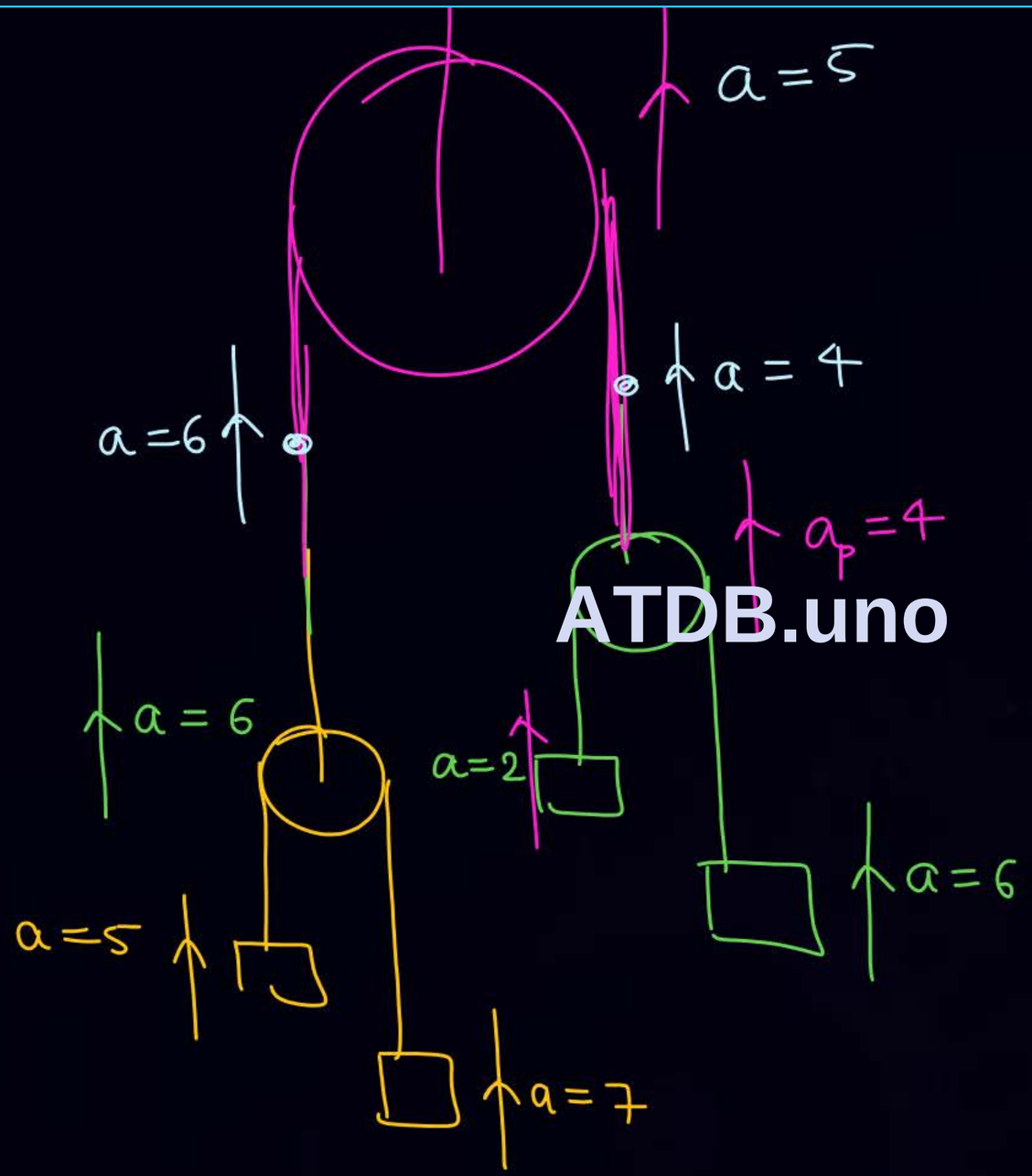
$$\boxed{a' = 10}$$

$$a_3 = \frac{a_1 + a_2}{2}$$

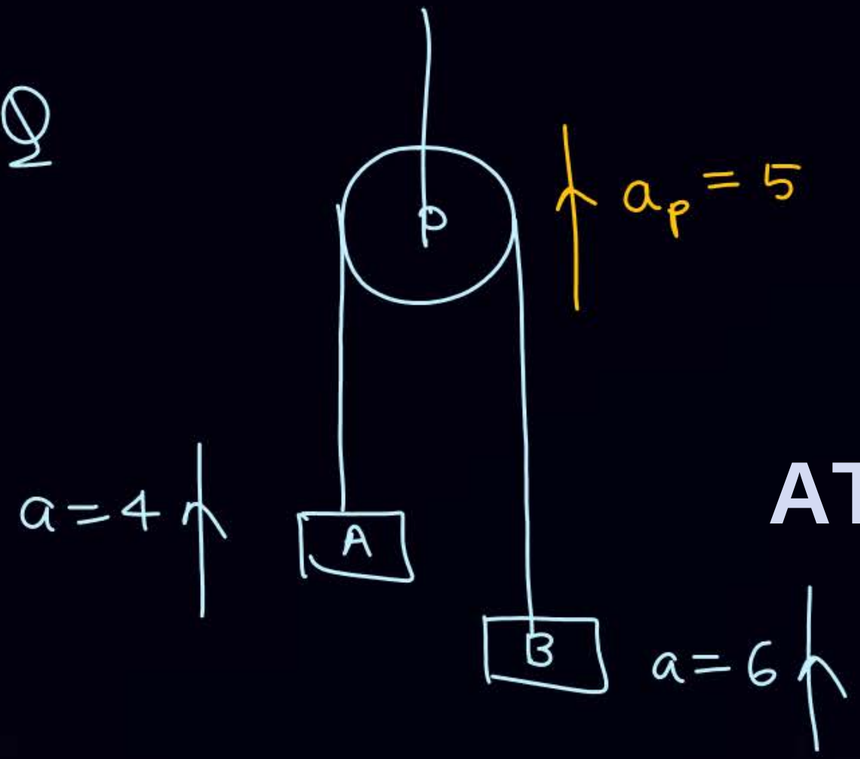
$$6 = \frac{2 + a'}{2}$$

$$a' = 10$$

Q

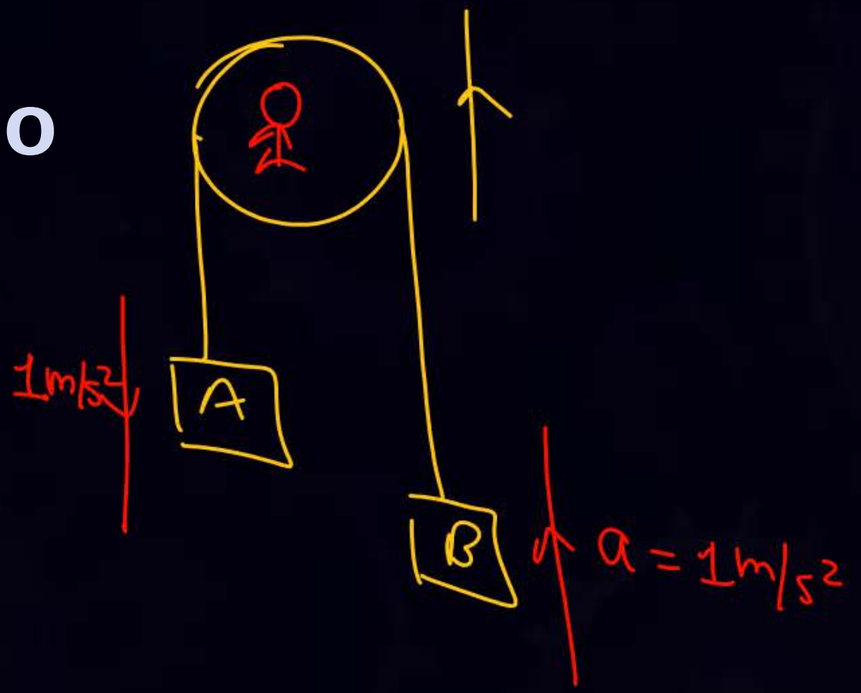


Q



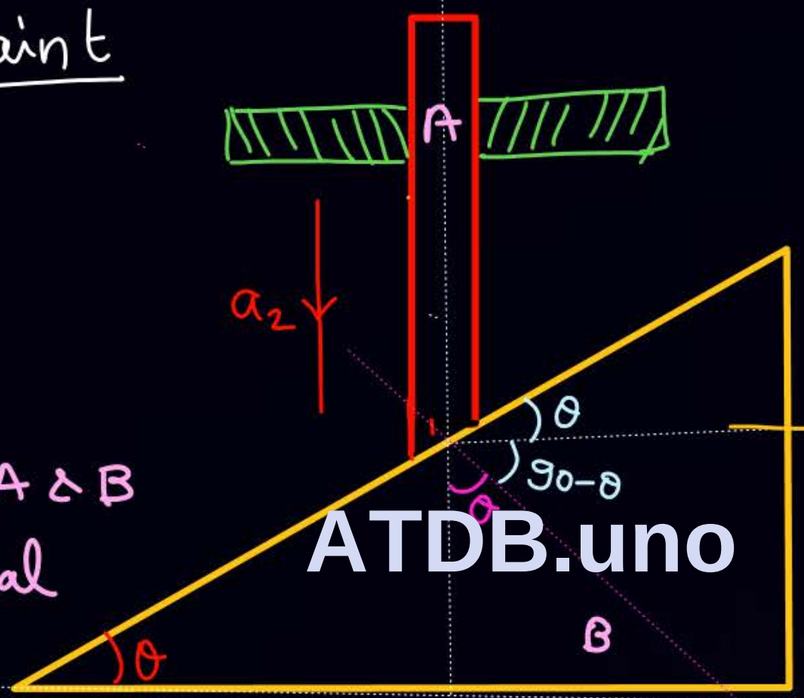
$$\vec{a}_{A/P} = \vec{a}_A - \vec{a}_P = 4 - 5 = -1$$

$$\vec{a}_{B/P} = \vec{a}_B - \vec{a}_P = 6 - 5 = 1$$



Wedge constraint

- Relative motion along common normal will be zero.
- Component of acc of A & B towards common normal will be same / equal.



$$a_1\cos(90-\theta) = a_2\cos\theta$$

$$a_1\sin\theta_2 = a_2\cos\theta$$

$$\boxed{a_2 = a_1\tan\theta}$$

गुत्थी

common normal

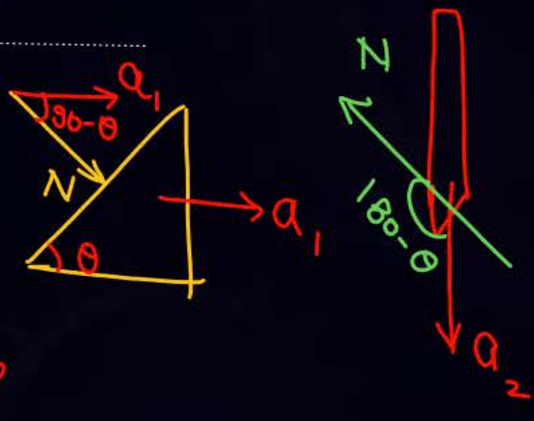
m-2

$$\vec{N_1}\cdot\vec{a_1} + \vec{N_2}\cdot\vec{a_2} = 0$$

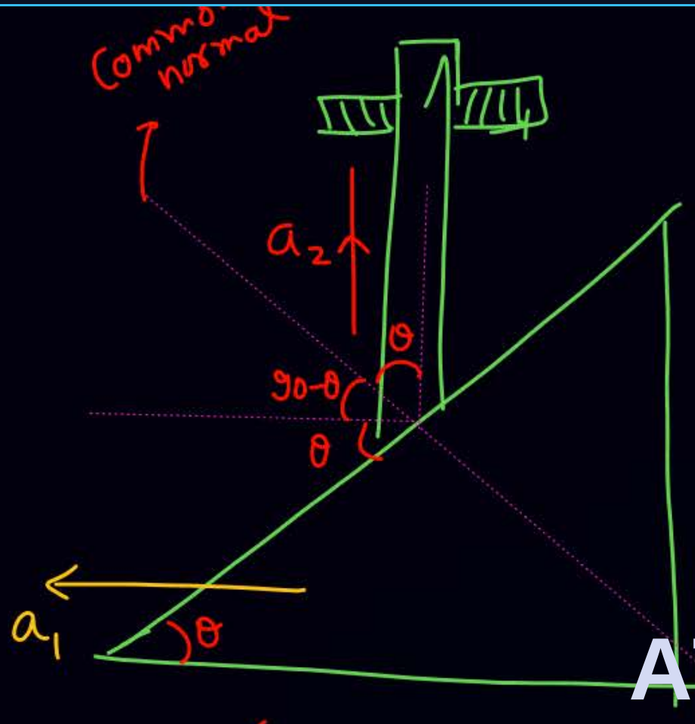
$$N a_1\cos(90-\theta) + N a_2\cos(180-\theta) = 0$$

$$a_1\sin\theta - a_2\cos\theta = 0$$

$$\boxed{a_2 = a_1\tan\theta}$$

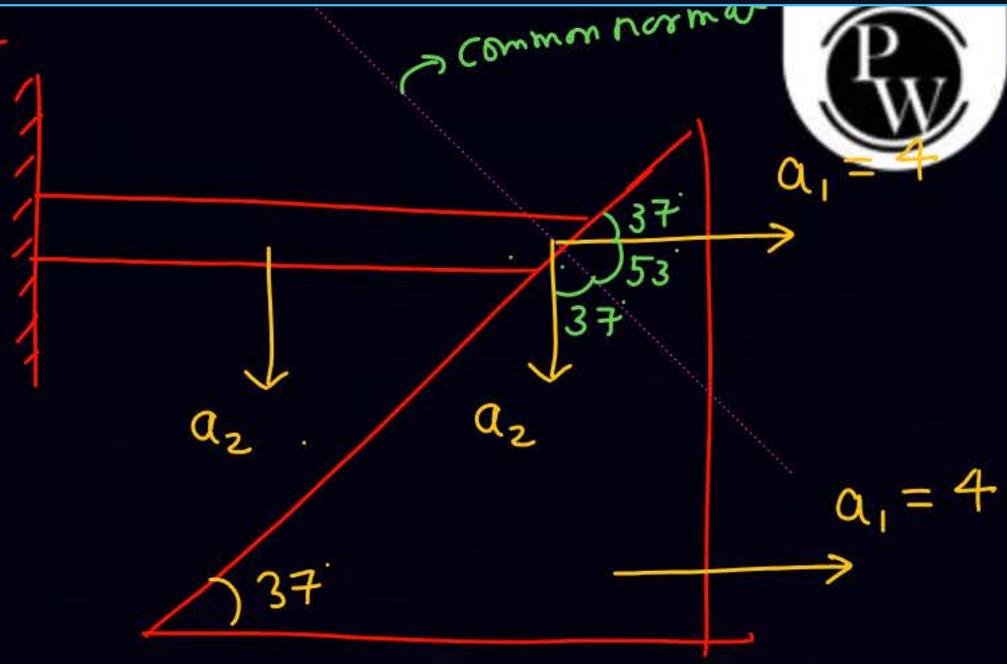


Q2



$a_1 \cos(90-\theta) = a_2 \cos\theta$

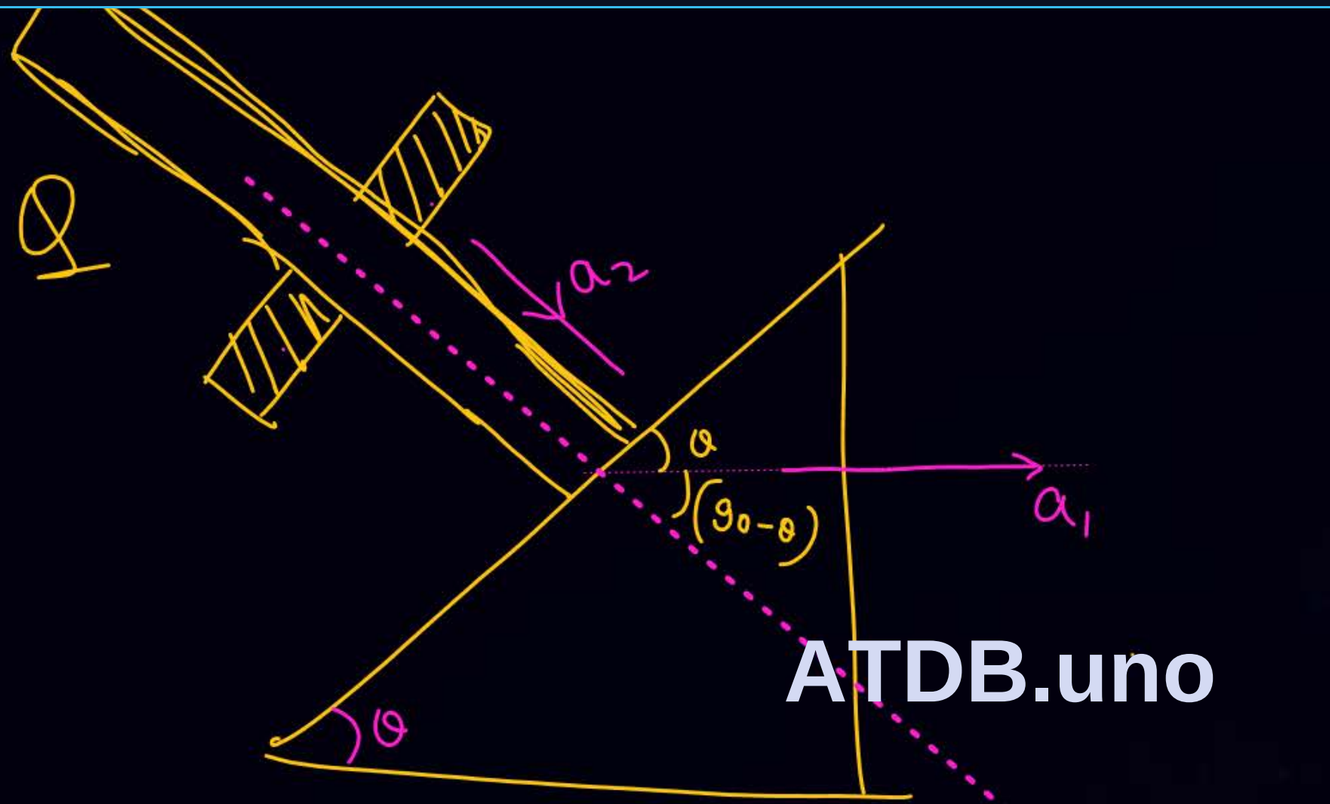
Q2



$a_2 \cos 37 = a_1 \cos 53$

$4a_2 = 4 \times 3$

$a_2 = 3$



$$a_1 \cos(90-\theta) = a_2$$

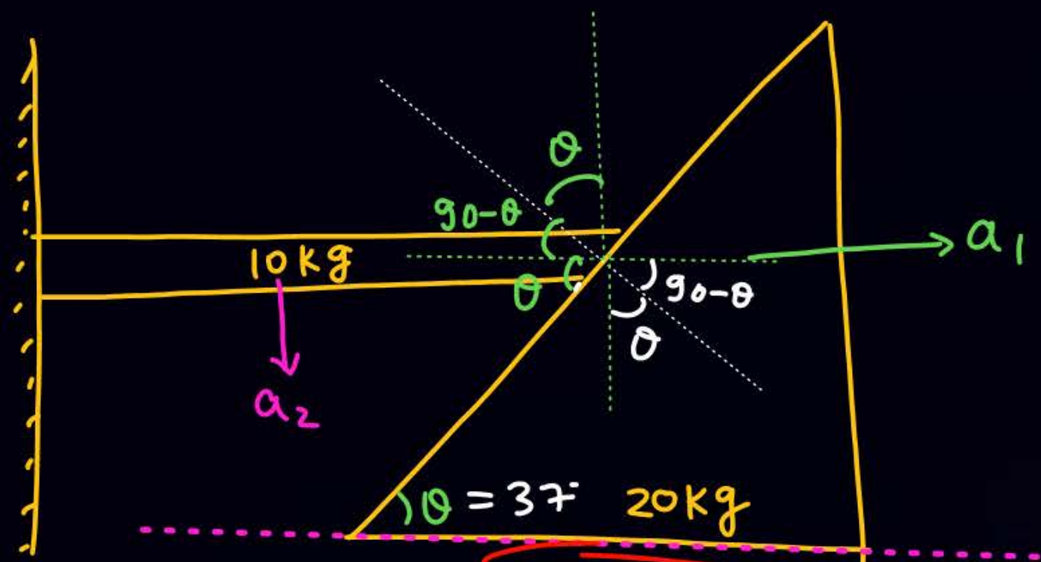
$$a_2 = a_1 \sin\theta$$

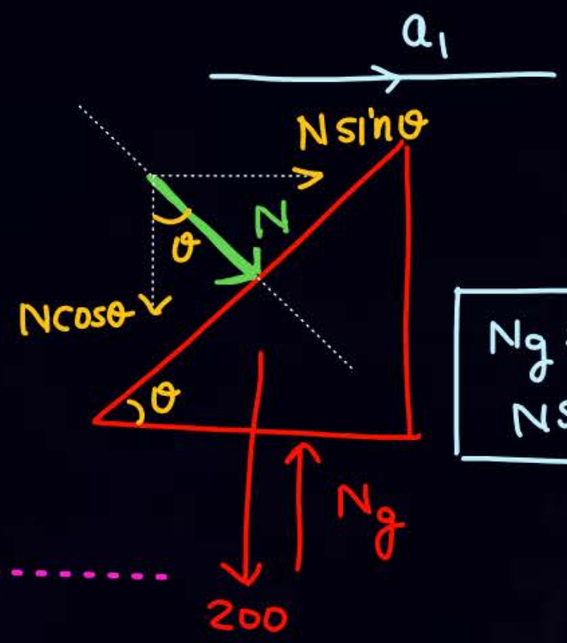
JA

Q

① Find acc of block

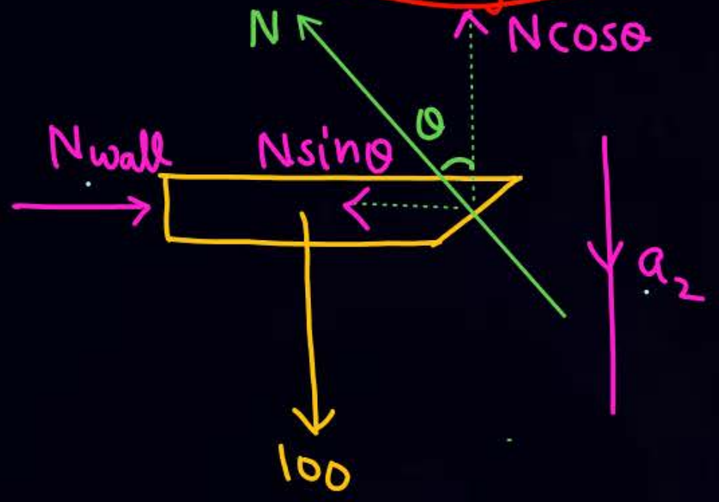
② N_{wall}, N_{ground}





$N_g = 200 + N\cos\theta$

$N\sin\theta = 20a_1$



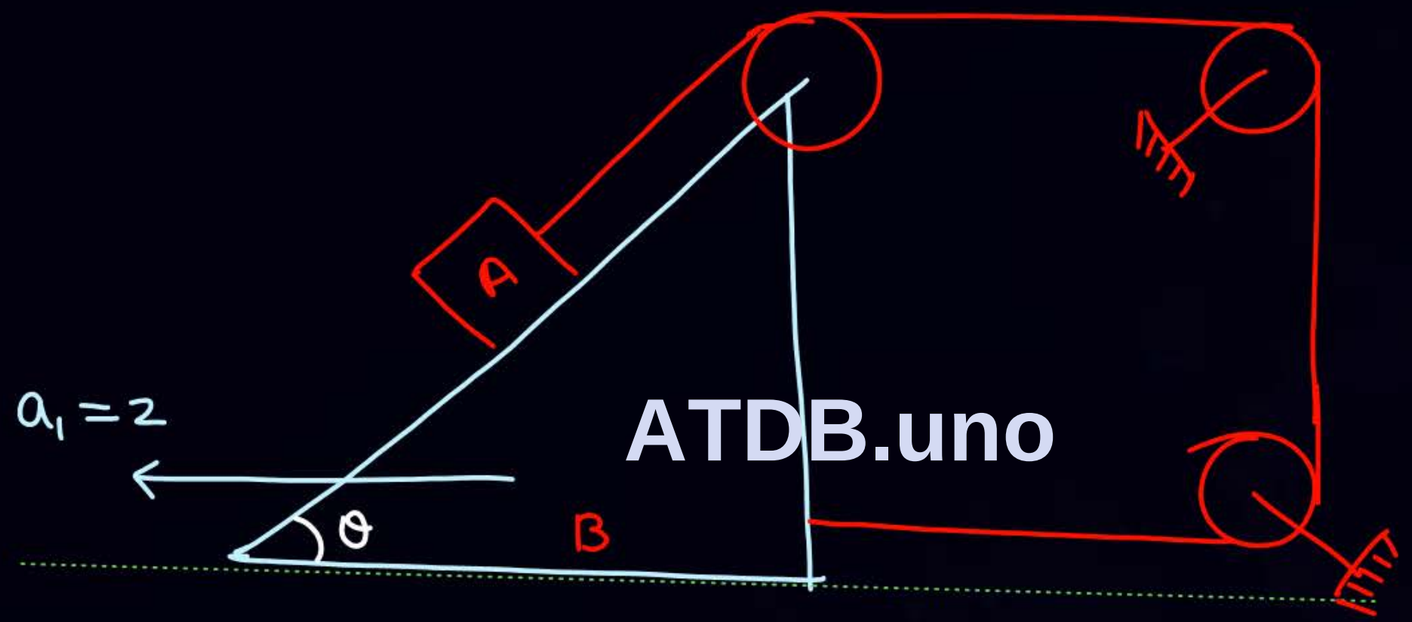
$N_{wall} = N\sin\theta$

$100 - N\cos\theta = 10a_2$

$a_1\cos(90-\theta) = a_2\cos\theta$

H.W

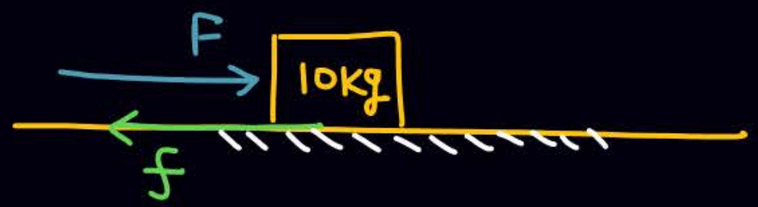
JA



a_{cc} of A wrt ground is vertically upward.

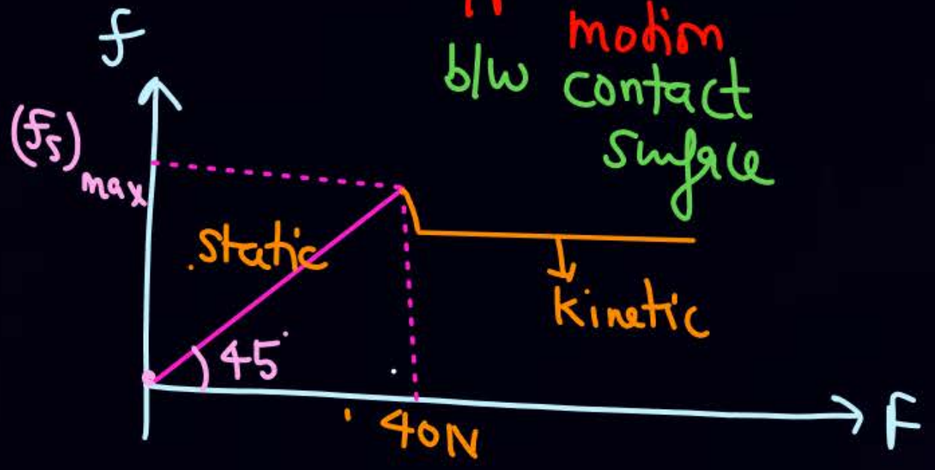
find θ, a_A, $a_{A/B}$

Friction



friction ⟶ ~~oppose motion~~

⟶ oppose relative motion b/w contact surface



F	observe a	f
0	0	0
2	0	2 (पीछे)
4	0	4 "
10	0	10
20	0	20
30	0	30
39	0	39
39.999	0	39.999
40	0	$40 = (f_s)_{max}$
40.001	a ✓	$f_k = 30$
41	a ✓	$f_k = 30$
50	a ✓	$f_k = 30$
60	a ✓	$f_k = 30$
70	a ✓	$f_k = 30$
∴		∴

$\mu_s = \cdot 4$

$\mu_k = \cdot 3$

static

f_{static} ⟶ variable self adjust

move ✓

$a = ✓$

$f_{kinetic}$ ⟶ Const

Static friction

- It oppose relative motion
- It has an upper limit $(f_s)_{max}$

$$(f_s)_{max} \propto N$$

$$(f_s)_{max} = \mu_s N$$

$\mu_s \longrightarrow$ coff. of Static friction

- $f_s \longrightarrow$ Variable Selfadjusting
- It act where there is no relative motion blw contact surface

Kinetic friction

- It oppose the relative motion
- It value is constant.

SKC

$$f_k \propto N$$

$$f_k = \mu_k N = \text{Const}$$

- It act when there is relative motion b/w Contact surface.

find a & fnchon

Initially rest

① 

$\mu_s = \cdot 4$

$\mu_k = \cdot 3$

$N = 100, \quad (f_s)_{max} = \mu_s N = \cdot 4 \times 100 = 40$

$f_k = \mu_k N = \cdot 3 \times 100 = 30$

① If $F = 10\ N$

$a = 0$

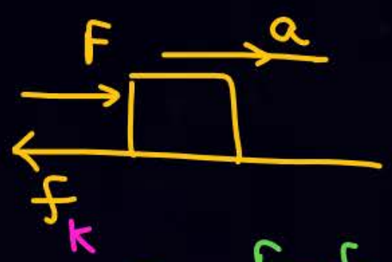
$f = 10$ (पीछे)

② If $F = 20N$

$a = 0$

$f = 20$ (पीछे)

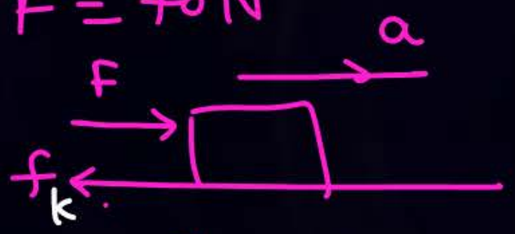
③ If $F = 50N$ slide ✓



$$a = \frac{F - f_k}{m} = \frac{50 - 30}{10}$$

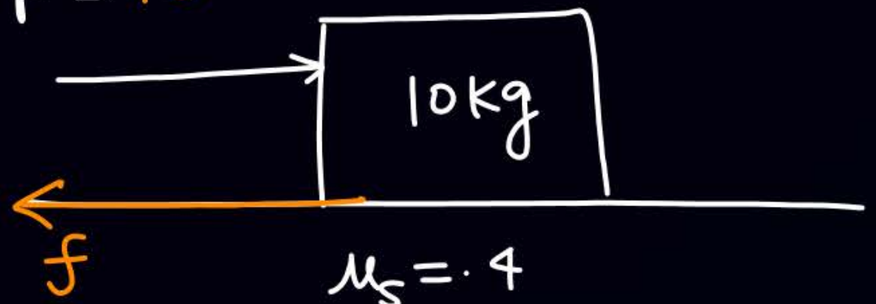
$a = 2$

④ $F = 70\ N$



$$a = \frac{70 - 30}{10} = 4$$

Q $F = 40$

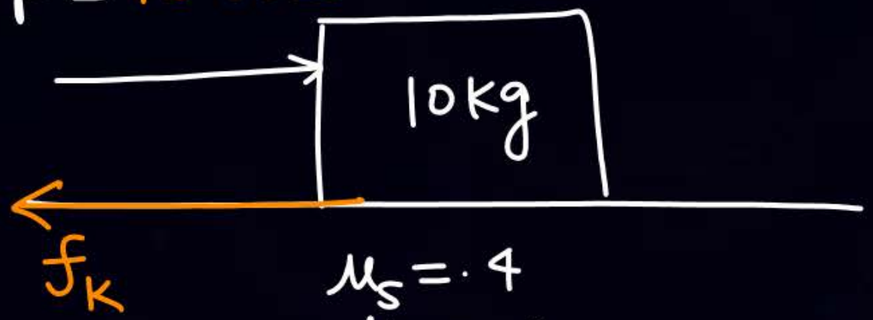


$\mu_s = .4$
$\mu_k = .3$

$f_k = 30$, $(f_s)_{max} = 40$

$a = 0$

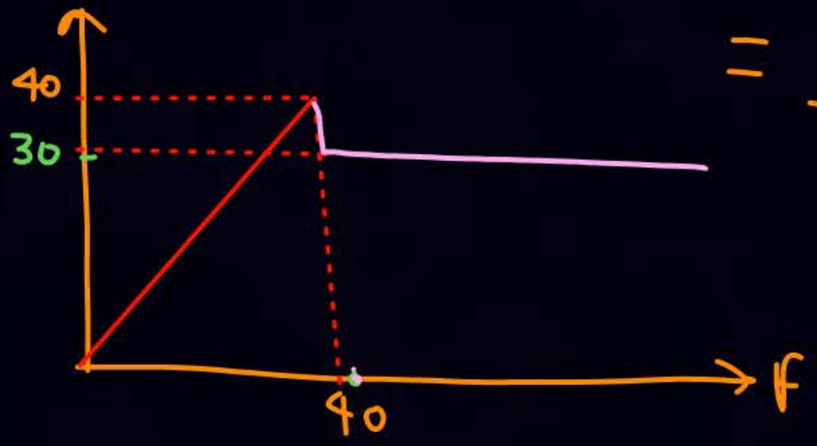
Q $F = 40.001$



$\mu_s = .4$
$\mu_k = .3$

$a = \frac{F - f_k}{m} = \frac{40.001 - 30}{10}$

$= \frac{10.001}{10} = 1.001$



Home Work

— Solve yesterday JM PYQ given to you