

# PRAYAS

## JEE 2025



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Lecture - 10

Physics

### Laws Of Motion

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# Topics *to be covered*

1 *wedge Constraint*

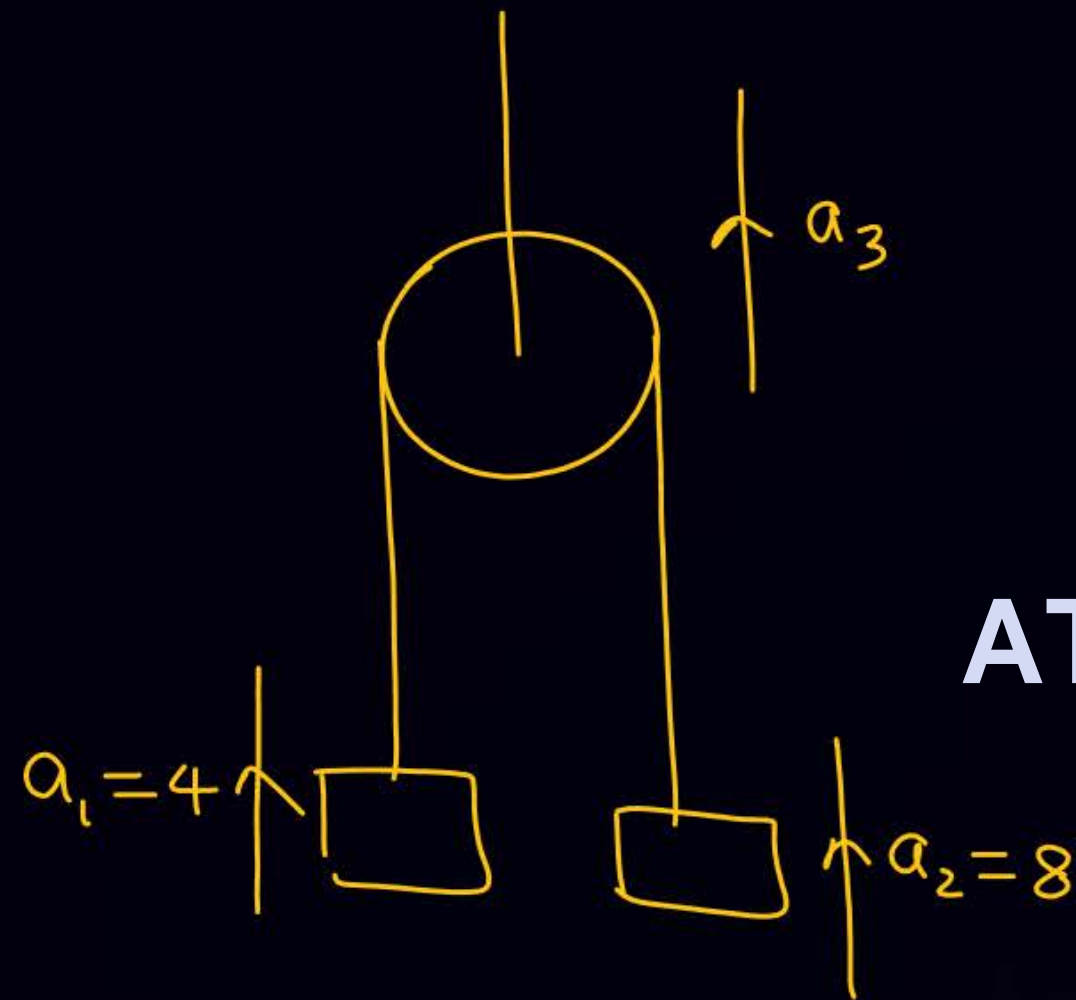
2 *friction*

3

4

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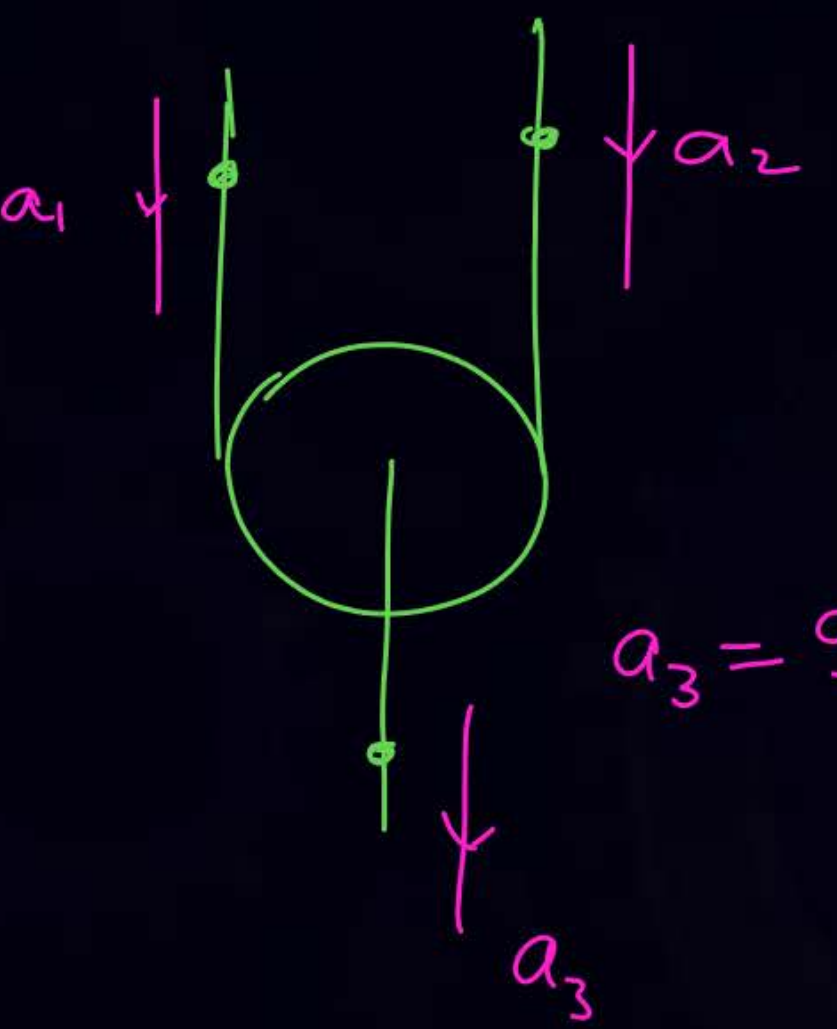
# Results



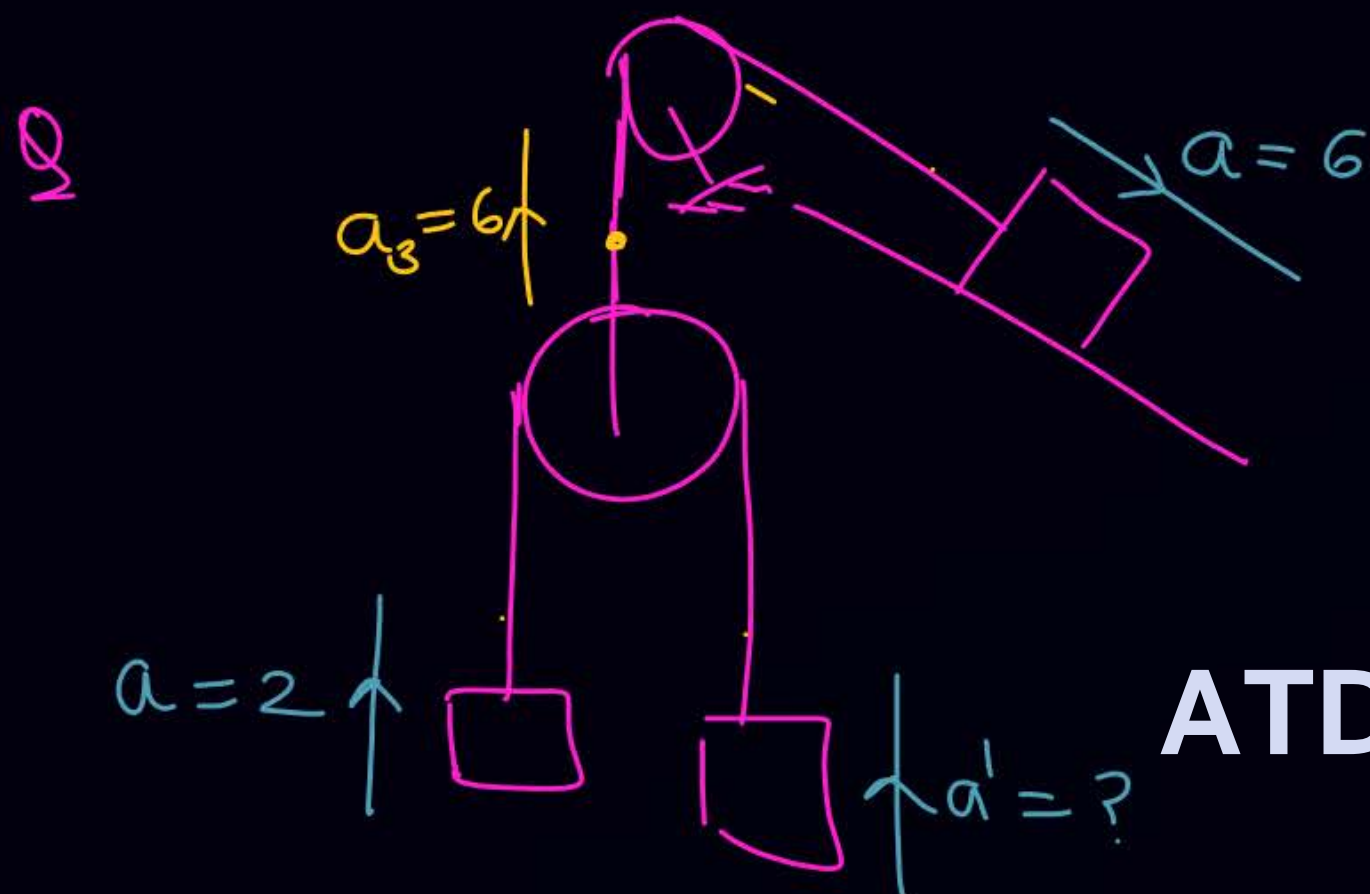
$$\frac{a_1 + a_2}{2} = a_3$$

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



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



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

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

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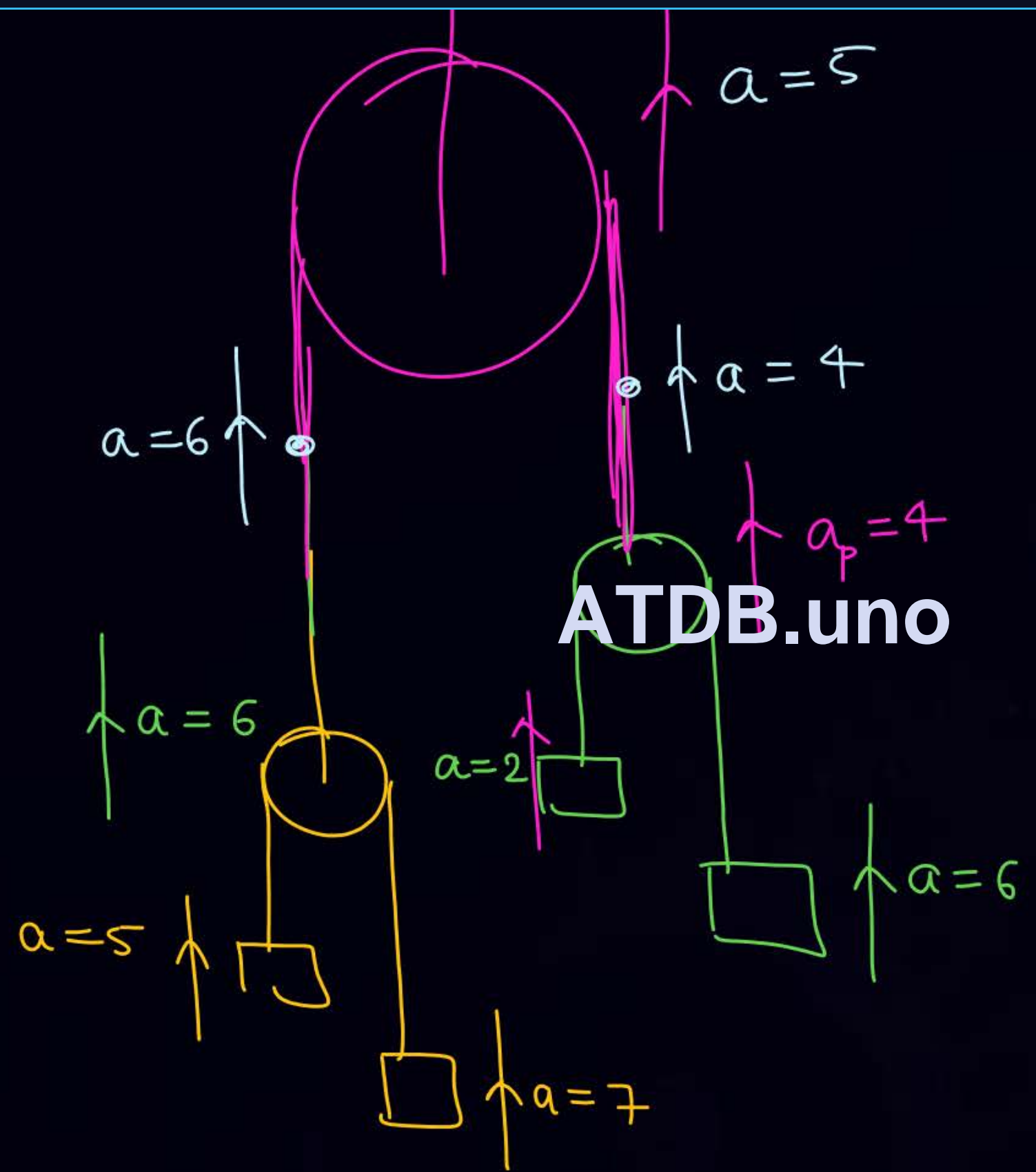
$$a_3 = \frac{a_1 + a_2}{2}$$

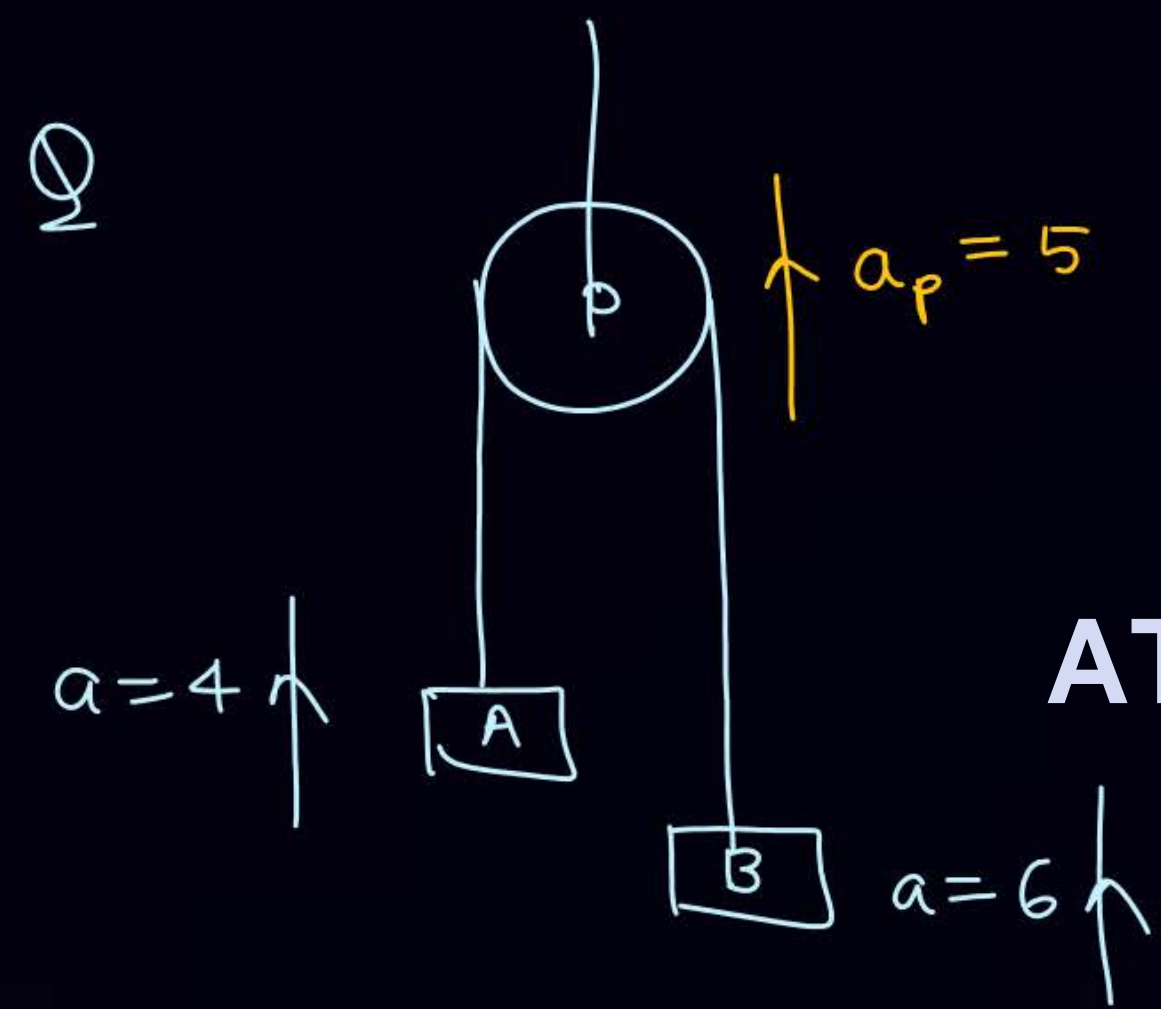
$$6 = \frac{2 + a'}{2}$$

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



Q

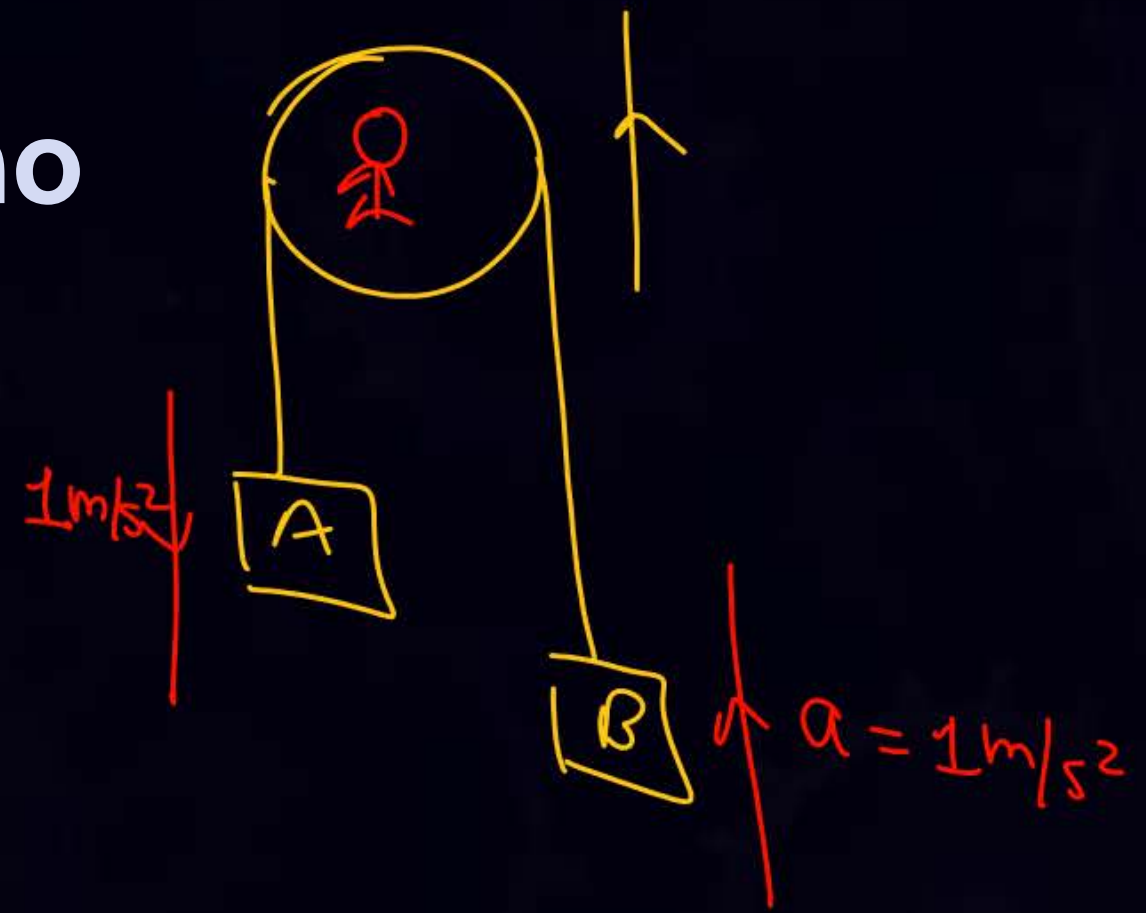




$$\vec{a}_{A/P} = \vec{a}_A - \vec{a}_P = 4 - 5 = -1$$

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

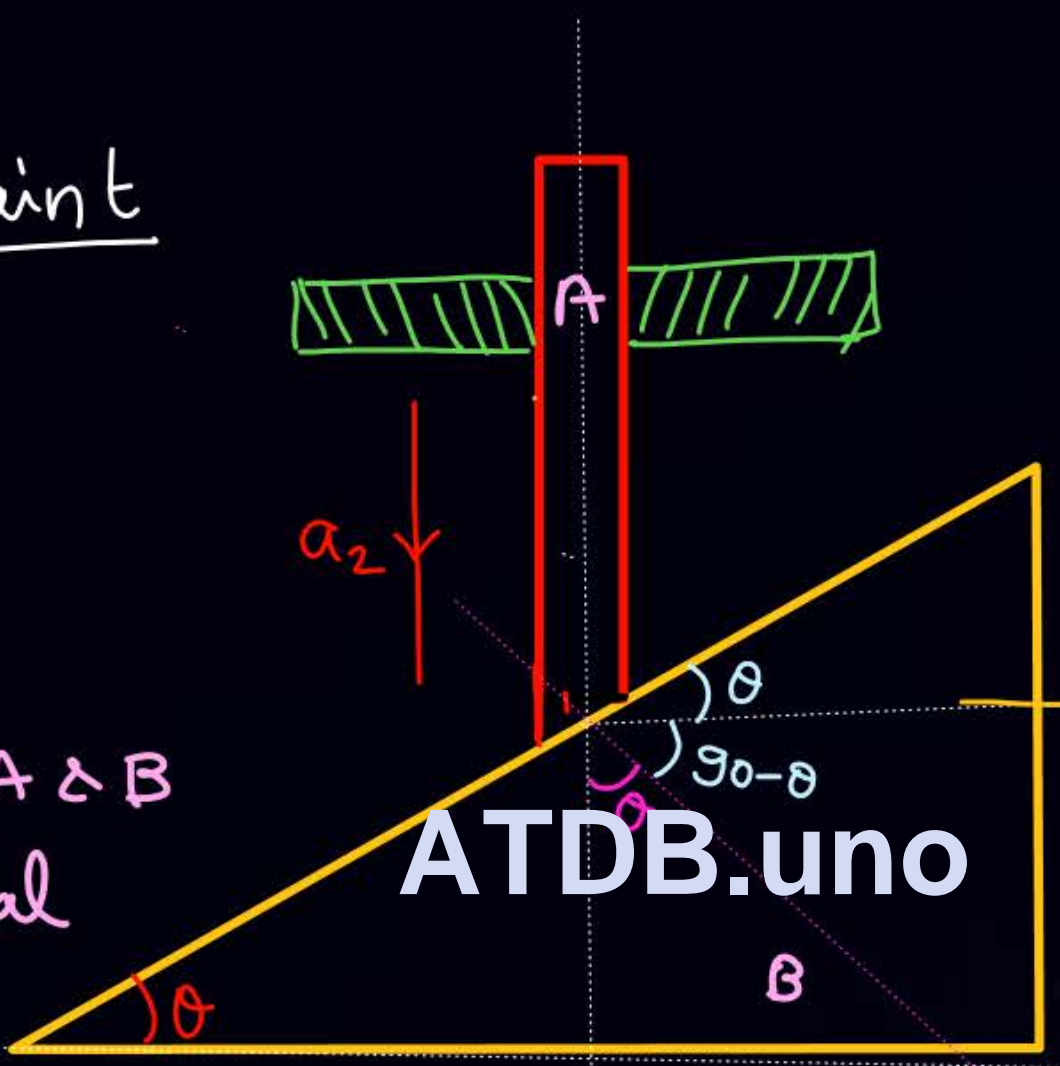
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# Wedge constraint

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



$$m-2$$

$$\vec{N}_1 \cdot \vec{a}_1 + \vec{N}_2 \cdot \vec{a}_2 = 0$$

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

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

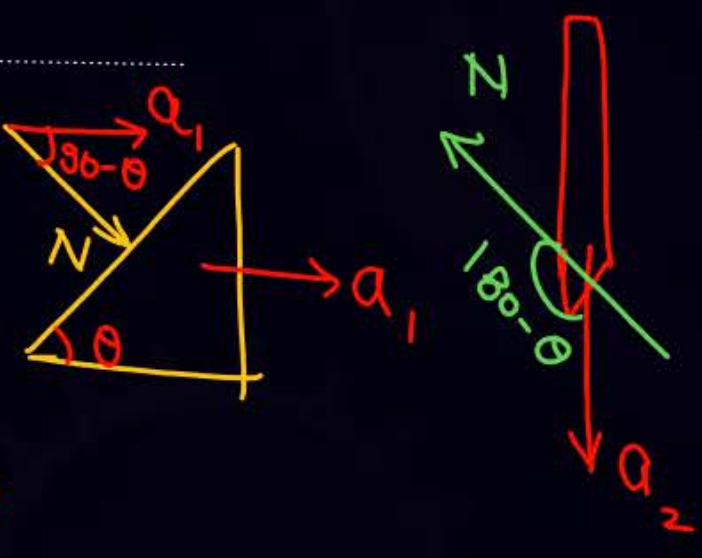
$$a_2 = a_1 \tan\theta$$

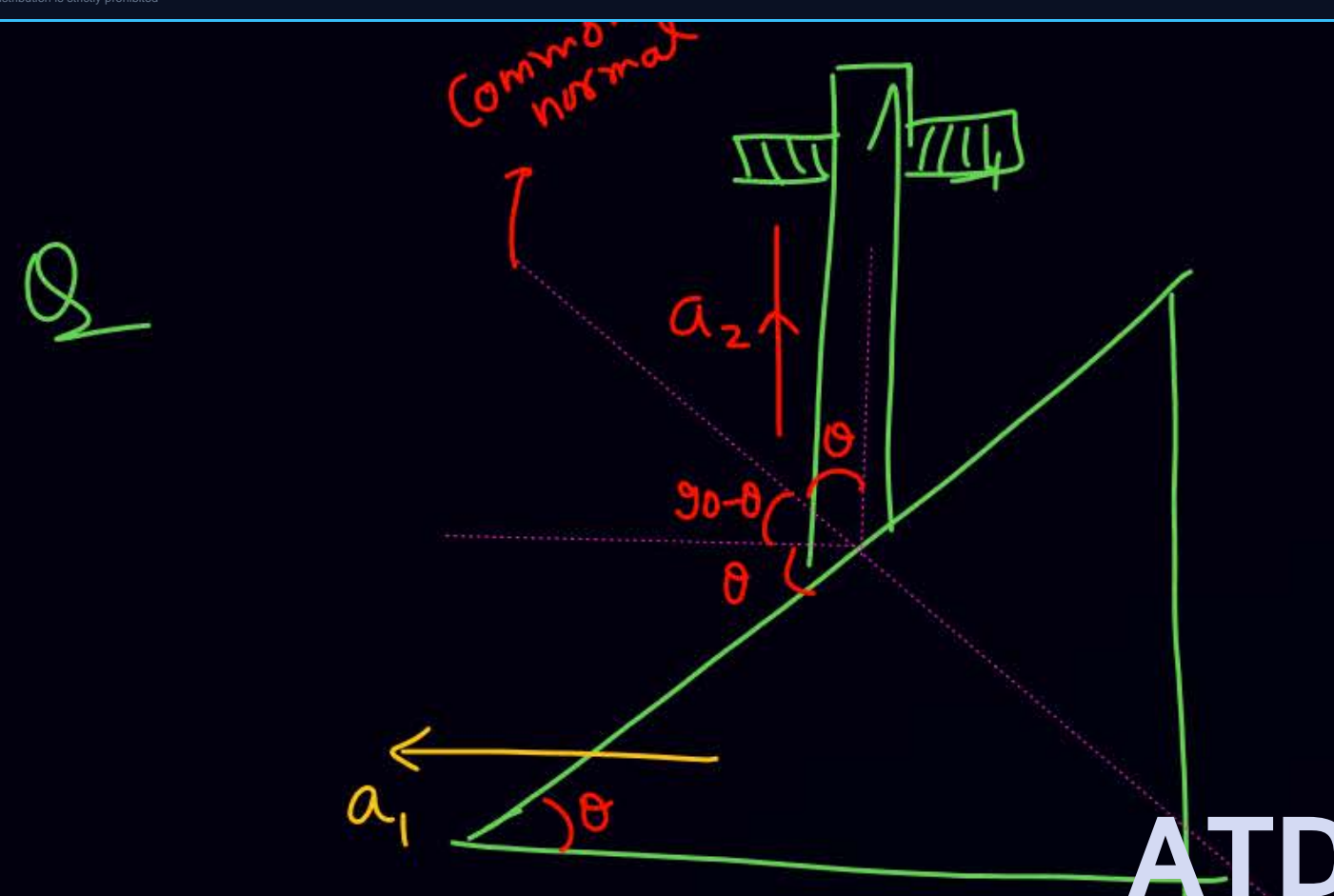
$$a_1 \cos(90-\theta) = a_2 \cos\theta$$

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

$$a_2 = a_1 \tan\theta$$

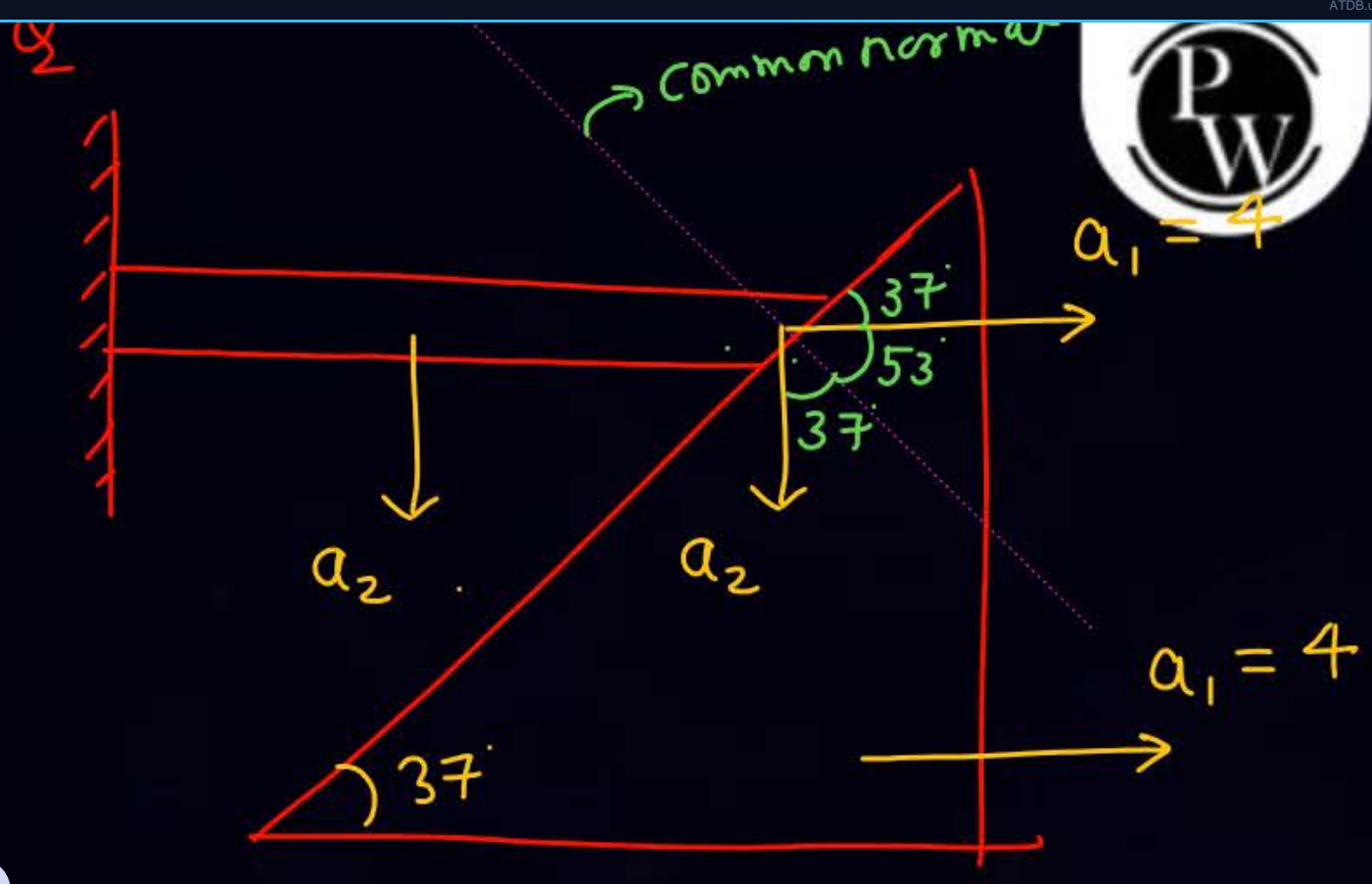
→ सुलभ  
common normal





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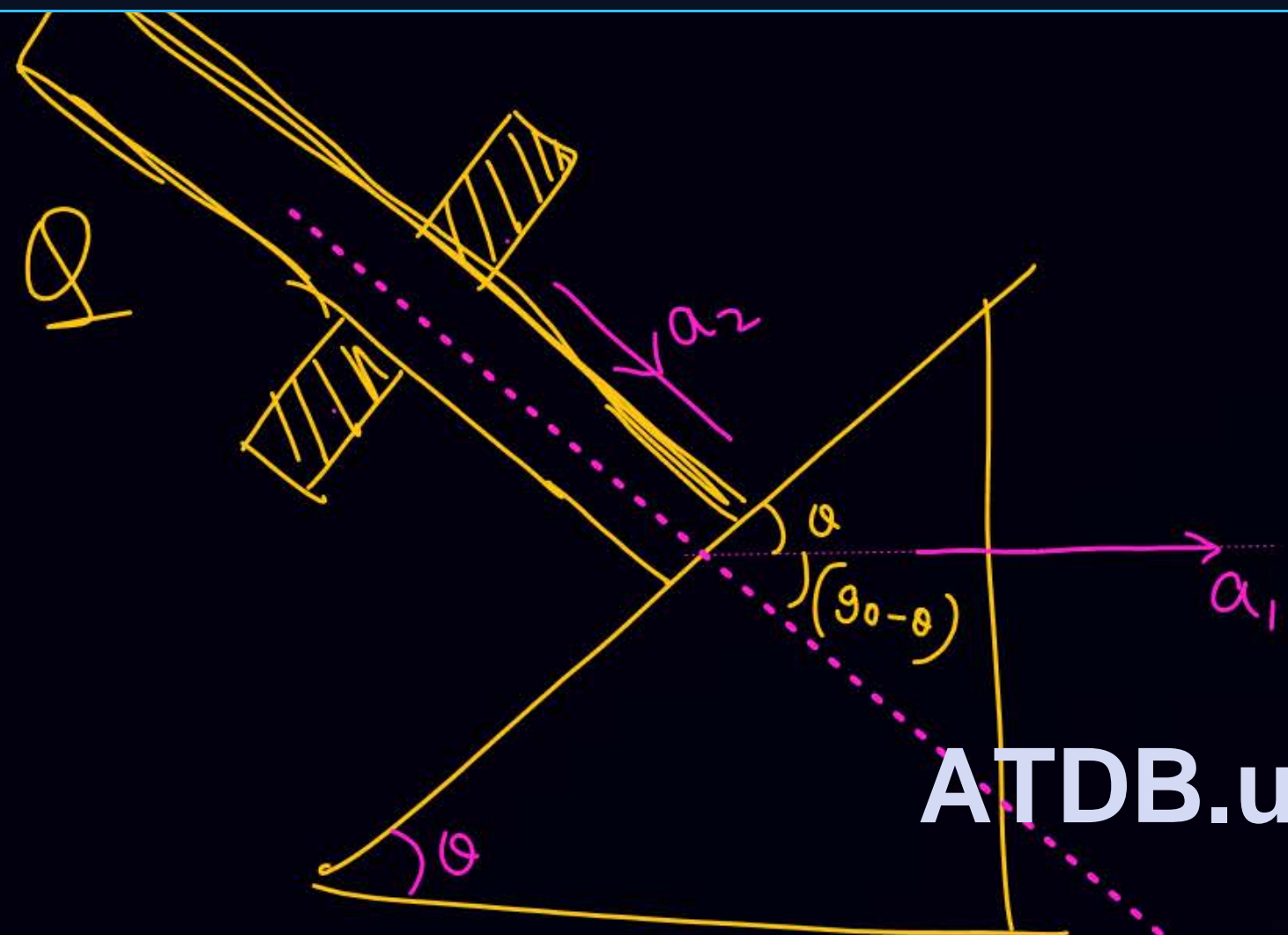
$$a_1 \cos(90 - \theta) = a_2 \cos \theta$$



$$a_2 \cos 37 = a_1 \cos 53$$

$$4a_2 = 4 \times 3$$

$$a_2 = 3$$



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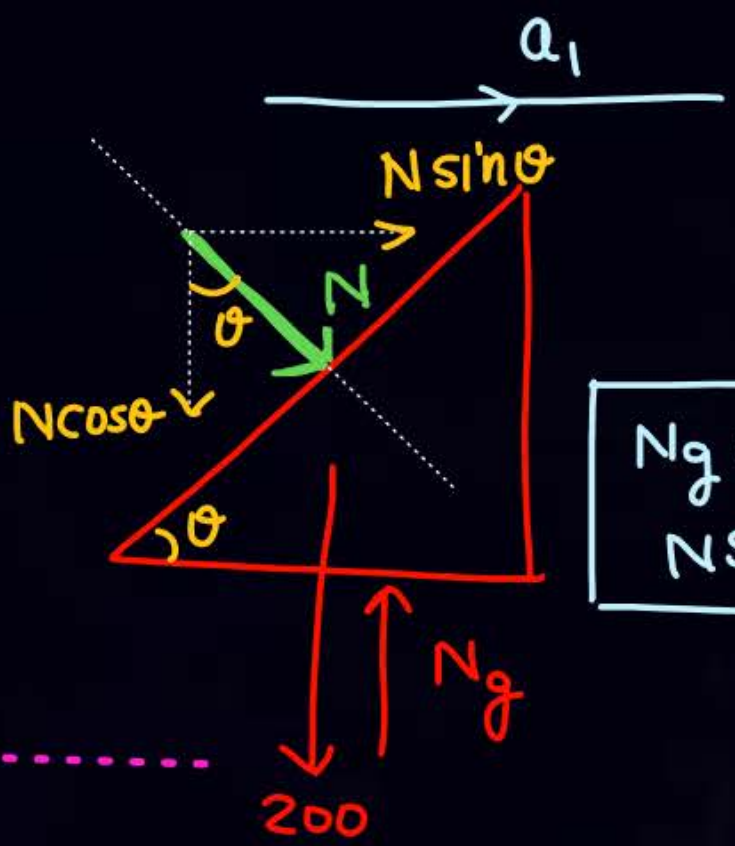
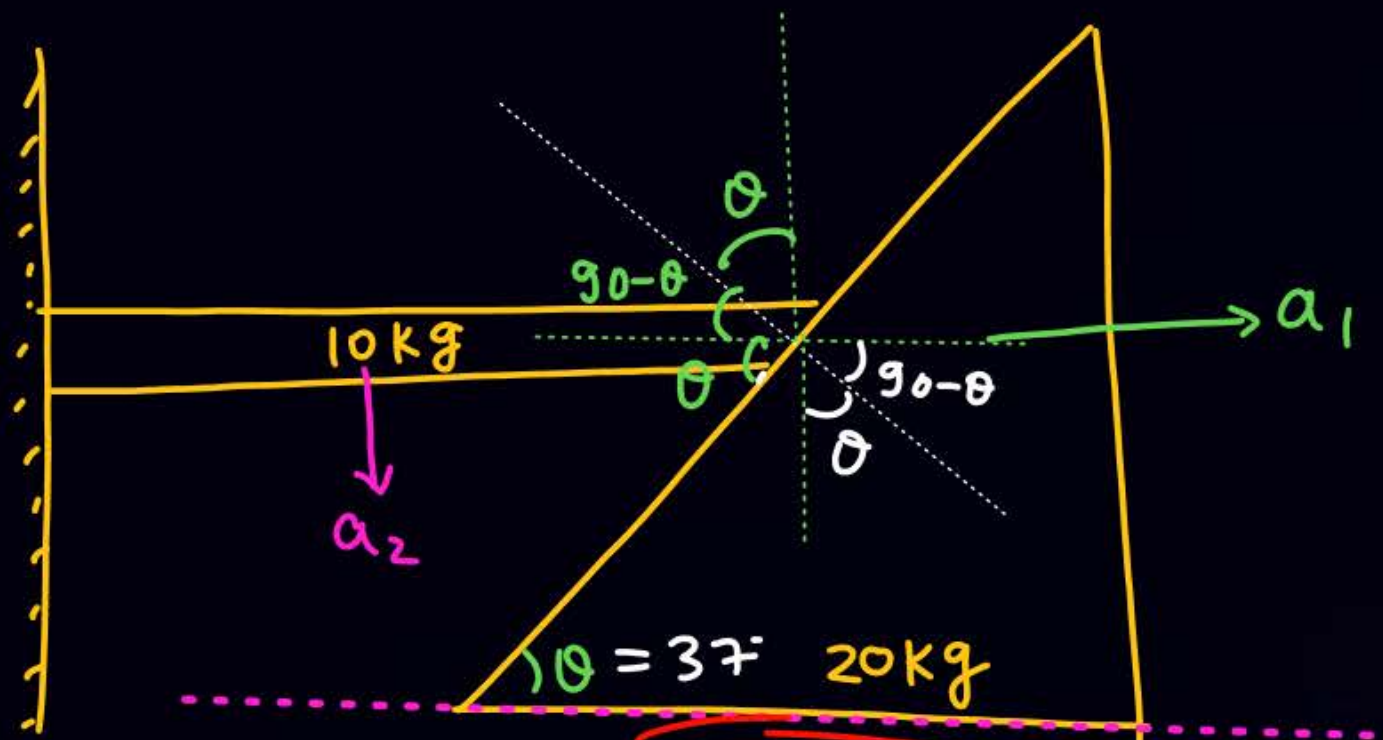
$$a_1 \cos(90 - \theta) = a_2$$

$$a_2 = a_1 \sin \theta$$



JA  
Q

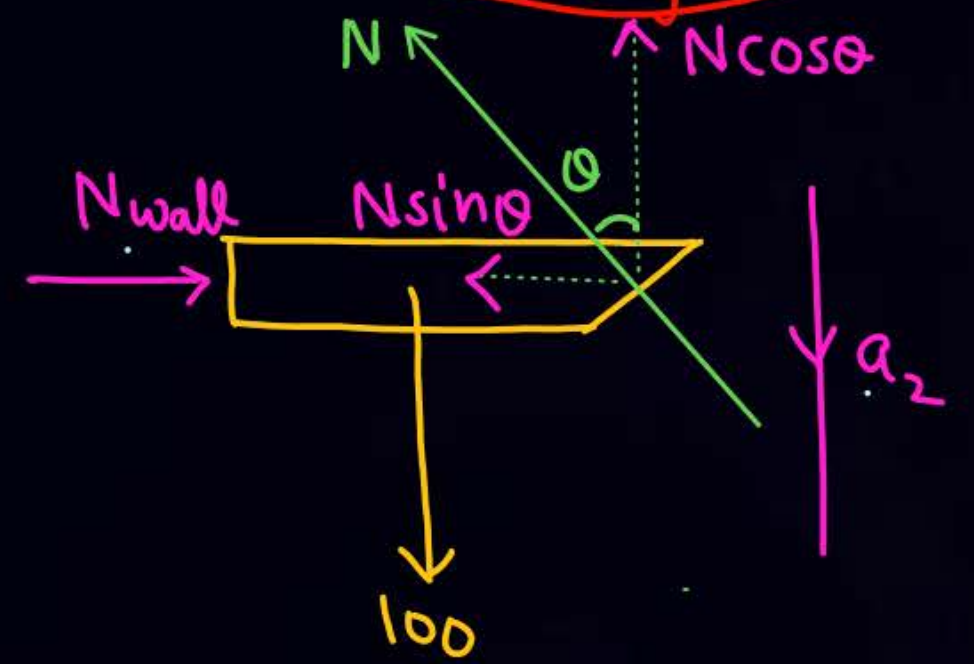
- ① Find acc of block
- ②  $N_{wall}$ ,  $N_{ground}$



$$N_g = 200 + N \cos \theta$$

$$N \sin \theta = 20 a_1$$

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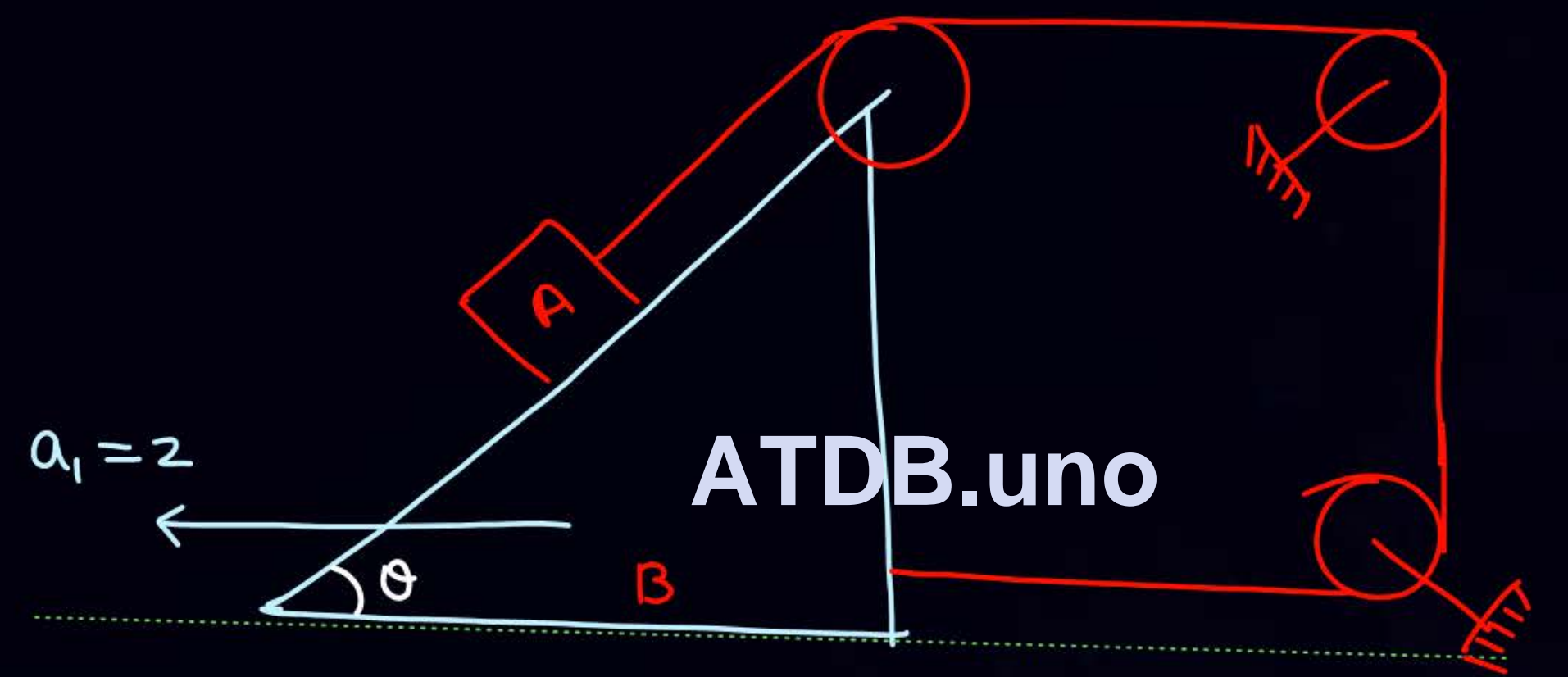
$$N_{wall} = N \sin \theta$$

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

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



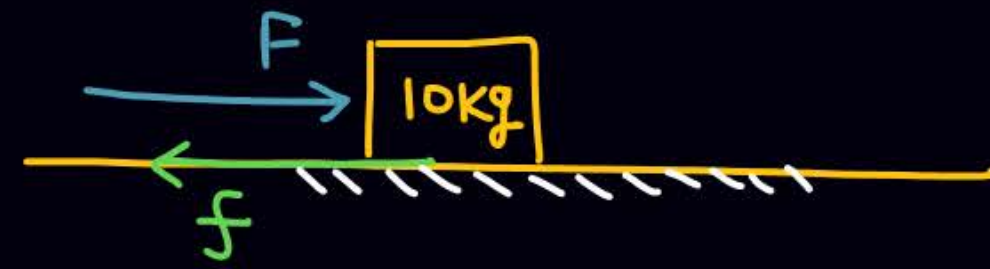
h.w  
Q  
JA



acc of A wrt ground  
is vertically upward.  
find  $\theta, a_A, a_{A/B}$

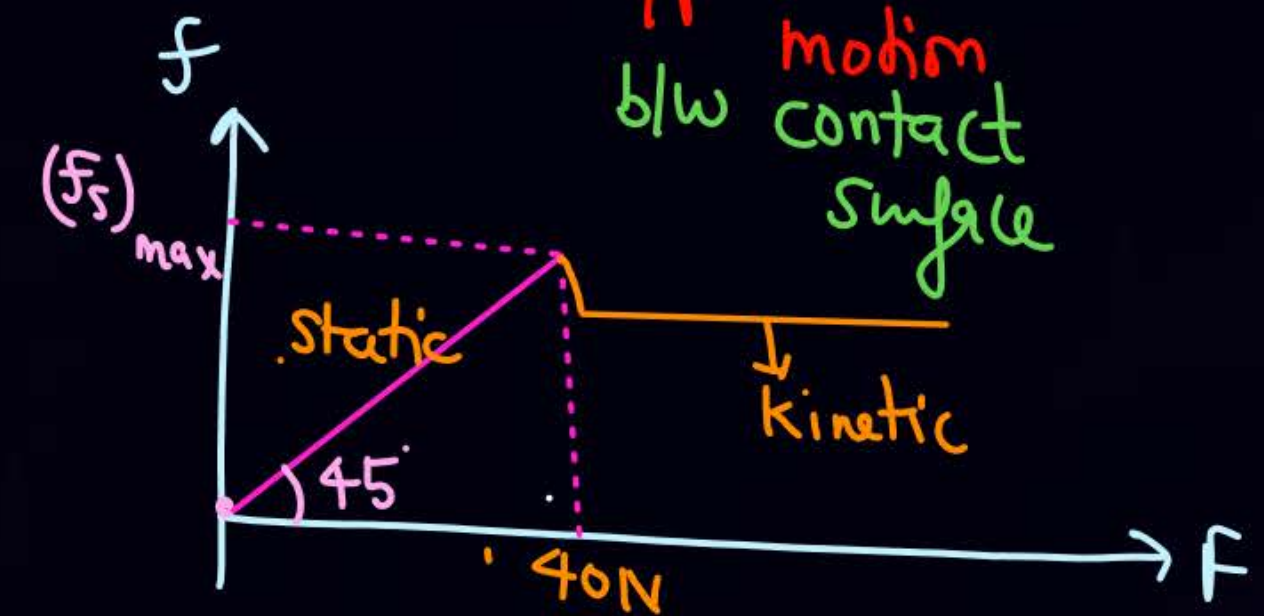


# Friction



friction  $\rightarrow$  ~~oppose motion~~

oppose relative motion b/w contact surface



F	observe a	f
0	0	0
2	0	2 (पैसे)
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 ✓	$f_k = 30$

$\mu_s = 0.4$   
 $\mu_k = 0.3$

static  $f_{static} \rightarrow$  variable self adjust

move ✓  
 $a = \checkmark$   
 $f_{kinetic} \rightarrow$  const



## Static friction

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

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

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

↳ coeff. of static friction

- $f_s \rightarrow$  Variable selfadjusting

- It act where there is no relative motion b/w contact surface

## Kinetic friction

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

$$f_k \propto N$$

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

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

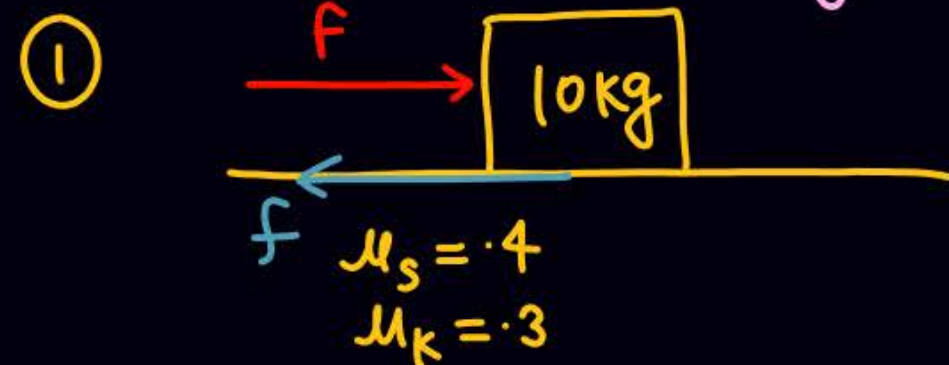
SKC

$\propto$

/



find a & friction  
Initially rest



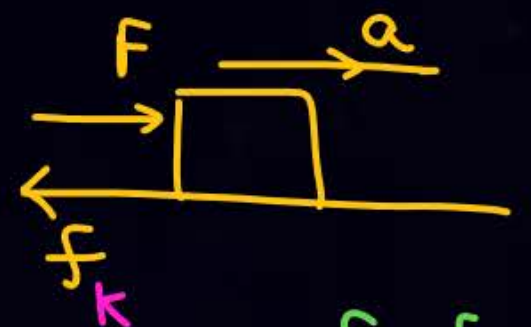
$N = 100, (f_s)_{max} = \mu_s N = 0.4 \times 100 = 40$

$f_k = \mu_k N = 0.3 \times 100 = 30$

① If  $F = 10\text{ N}$   
 $a = 0$   
 $f = 10$  (पीछे)

② If  $F = 20\text{ N}$   
 $a = 0$   
 $f = 20$  (पीछे)

③ If  $F = 50\text{ N}$  slide ✓

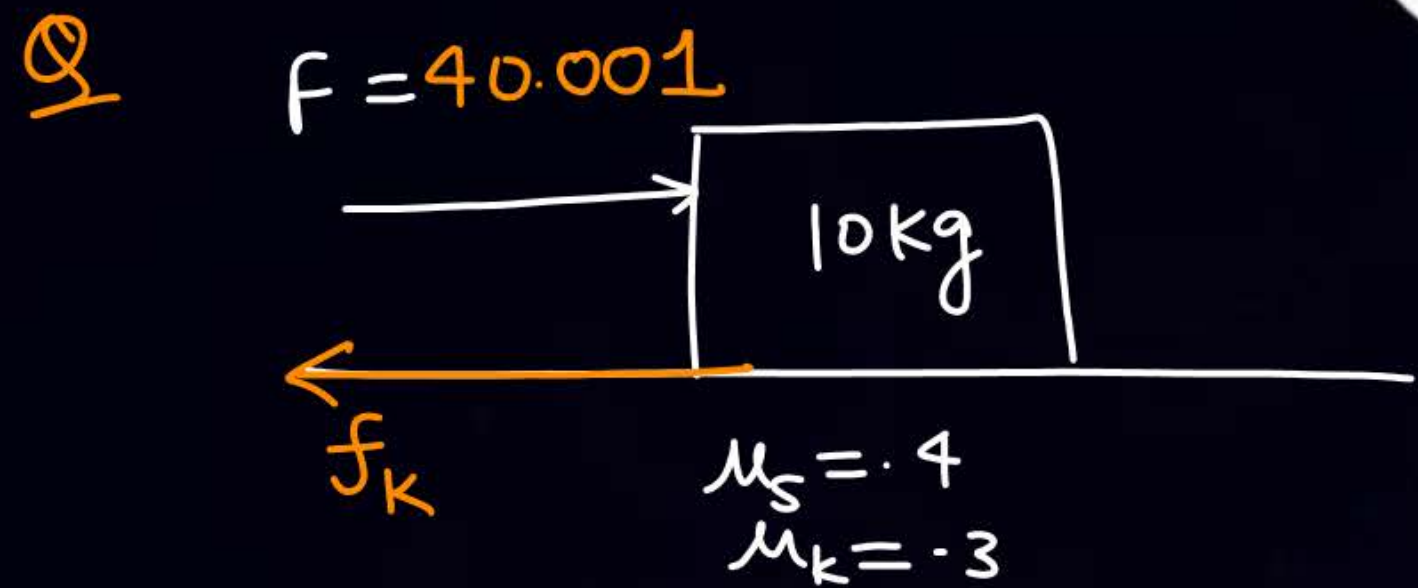
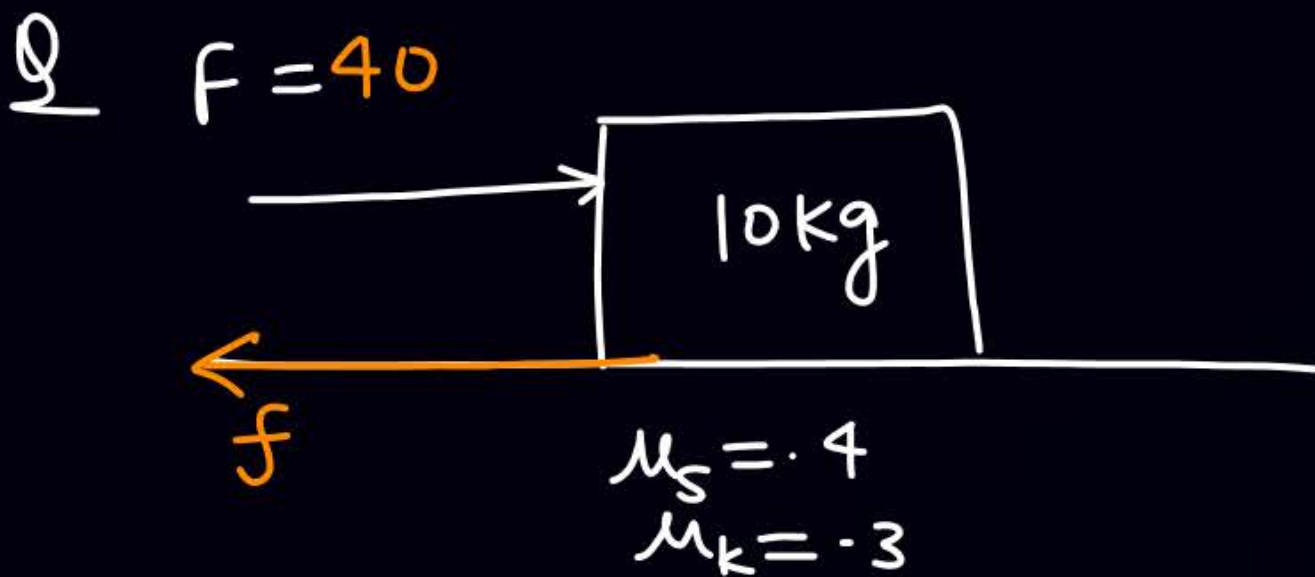


$a = \frac{F - f_k}{m} = \frac{50 - 30}{10}$

$a = 2$

④  $F = 70\text{ N}$   
 $a$

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

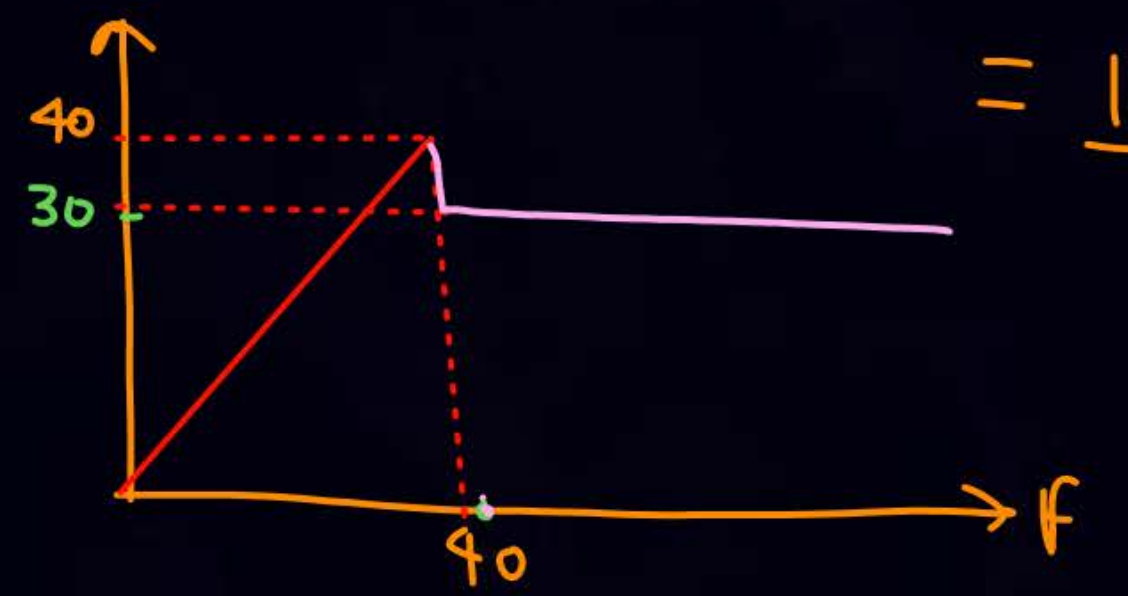


$f_k = 30$ ,  $(f_s)_{max} = 40$   
 $a = 0$

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

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





## Home Work

— solve yesterday Jm PYQ given to you

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# THANK YOU

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