YAKEEN NEET 2.0

2026

Laws of Motion

Physics | Lecture - 13

By- Manish Raj (MR Sir)

Topics to be covered

1. # Questions on friction.
2.
3.
4.

Sanghar Assignment – 2

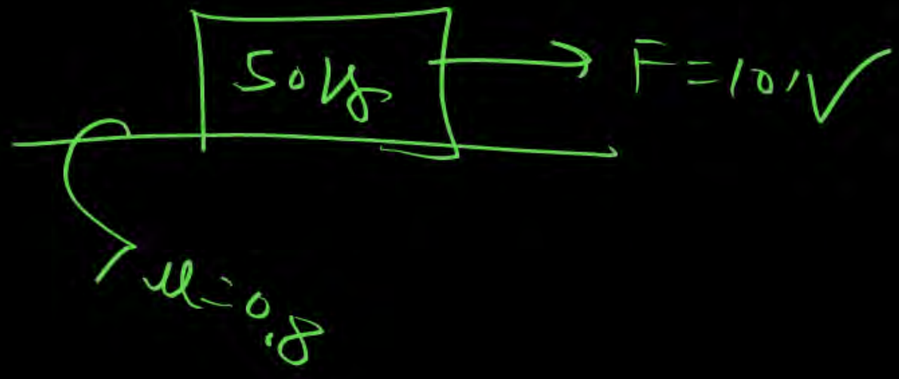
(a) Yes (40%) ✓

(b) NO (60%) ✗

friction kab active hota hai

Jab sliding ki tendency ya sliding contact surface par no

$f_r = 0$



MR* Box for Questions on friction

① find Normal rxn (*)

② find $f_{limiting} = \mu_s N$

friction ki aukad.

③ Compaire b/w $f_{limiting}$ & $F_{applied}$

④ $f_{limiting} > F_{applied}$.

• (rest) $a_{cm} = 0$

$F_{(friction)static} = F_{applied}$

⑤ $f_{limiting} < F_{applied}$

(motion)

$f_{Kinetic} = \mu_k N$

$a = \frac{(F_{net})}{m}$

⑥ $f_{limiting} = F_{applied}$

(*) about to motion

Critical rate wale question.

$f_{limiting} = \mu N$

for 40 Question

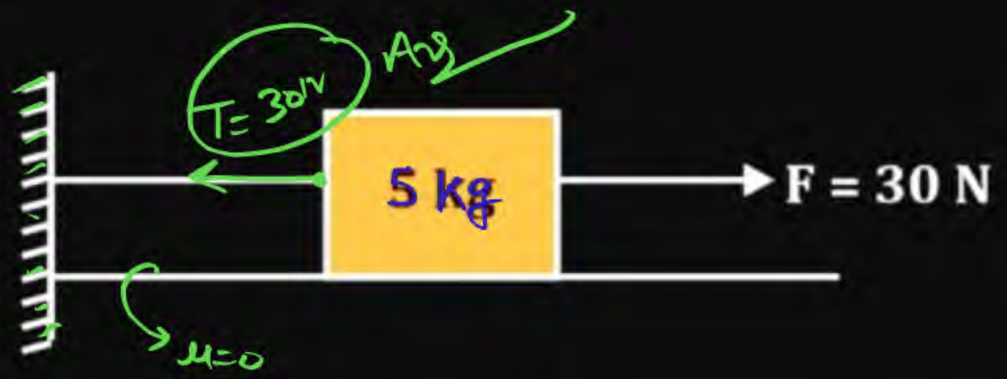
- Class Question
- DPP
- MR Physics / Modules /
- Mahamaya (JEE main + NEET)

for all 45 - Question,

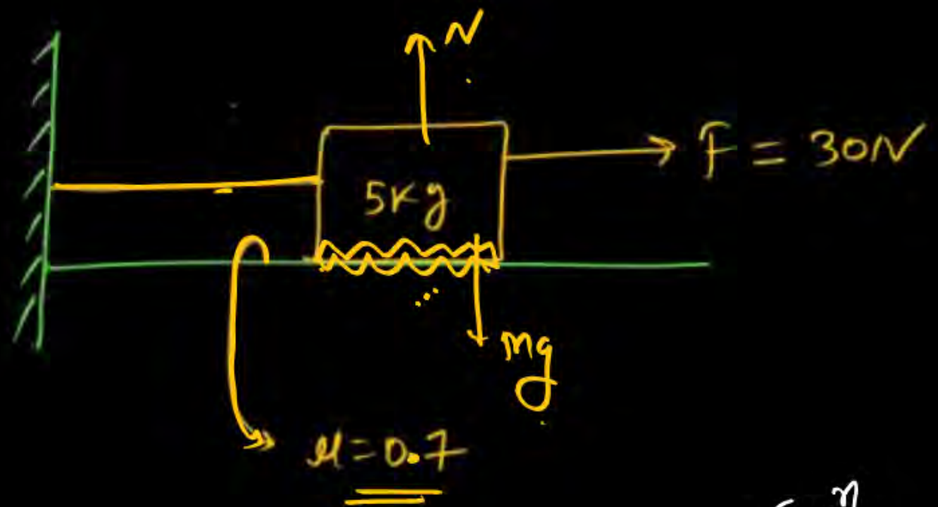
- Class Question
- DPP
- MR Physics
- Sanghavi + Mahamu

Question 1

Find Tension in string .....



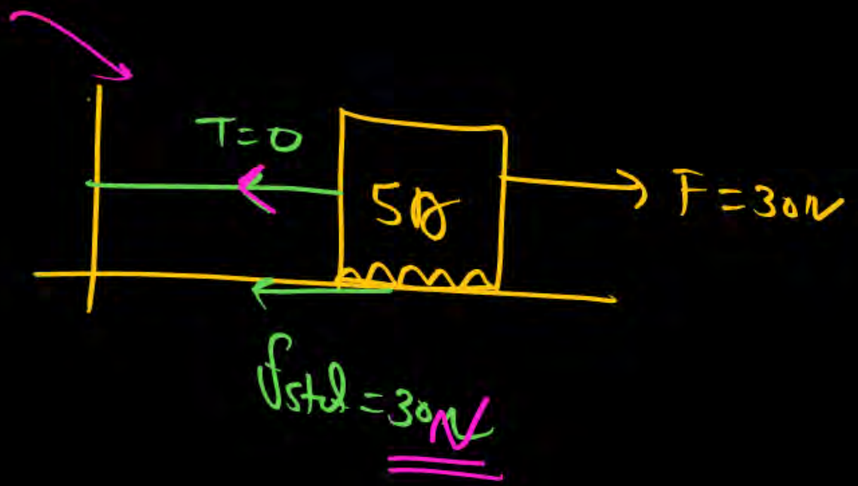
(2)



Soln $f_{lim} = \mu N$

$= \frac{7}{10} \times 50$

$f_{lim} = 35N$ ✓



Question 3

An object of mass 1 kg moving on a horizontal surface with initial velocity 8 m/s comes to rest after 10 s. If one wants to keep the object moving on the same surface with velocity 8 m/s the force required is

1. 0.4 N
2. 0.8 N
3. 1.2 N
4. Zero

$u = 8\ m/s$

$V = 0$

$$a = \frac{v-u}{t} = \frac{0-8}{10}$$

$$F = ma = 1 \times \left(\frac{-8}{10}\right)$$

$$= 0.8\ N$$

Question 4

A heavy box is slid across a rough floor with an initial speed of 4 m/s. It stoops moving after 8 seconds. If the average resisting force of friction is 10 N, the mass of the box (in kg) is:

1. 40
2. 20
3. 5
4. 2.5

$u = 4\ m/s$

$t = 8\ sec$

$a = \frac{v-u}{t} = \frac{0-4}{8} = -\frac{1}{2}$

$f = ma$

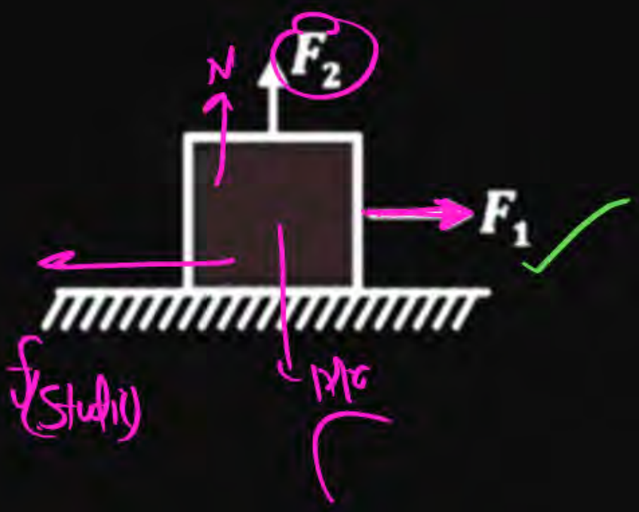
$10 = m\frac{1}{2}$

$m = 20\ kg$

Question 5

In the figure shown, horizontal force F_1 is applied on a block but the block does not slide. Then as the magnitude of vertical force F_2 is increased from zero the block begins to slide; the correct statement is

1. The magnitude of normal reaction on block increases
2. Static frictional force acting on the block increases
3. Maximum value of static frictional force decreases
4. All of these



Question 6

The limiting friction between two bodies in contact is independent of

1. Nature of the surface in contact
2. The area of surfaces in contact
3. Normal reaction between the surfaces
4. The materials of the bodies

Question 1

Which of the following is self-adjusting force?

1. Static friction
2. Limiting friction
3. Kinetic friction
4. Rolling friction

Question 8

Which is a suitable method to decrease friction?

1. Polishing
2. Lubrication
3. Ball bearing
4. All of these

Question 9

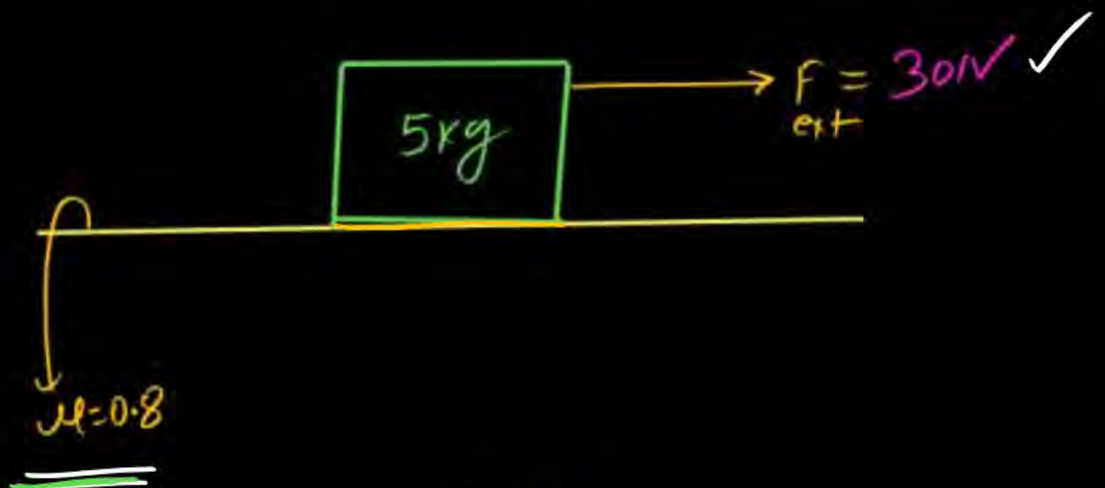
Maximum force of friction is called

1. Limiting friction ✓
2. Static friction
3. Sliding friction
4. Rolling friction → Roll^{n}

$$f_{limiting} > f_{Kinet} > f_{Rolling}$$

Note लिखो

10. Find Contact force b/w ground & Block :—



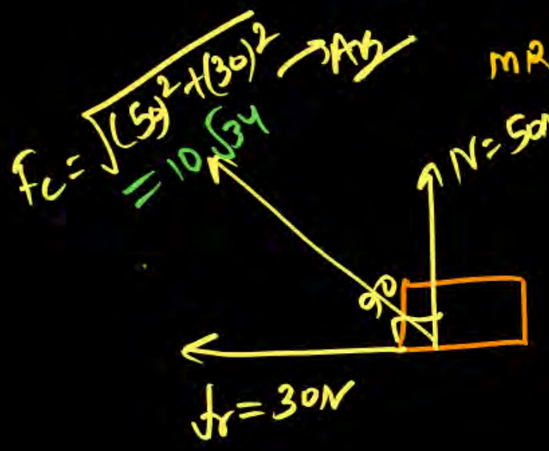
40N ✗

Contact force = 50N ✗

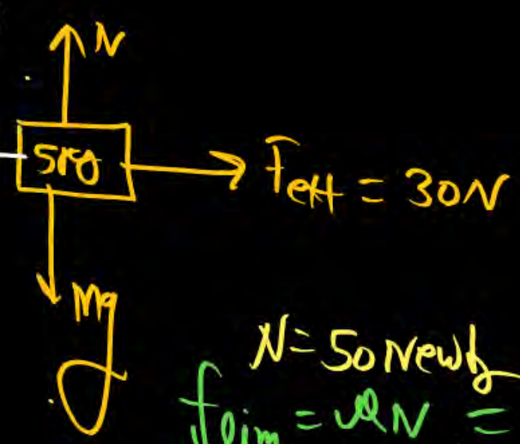
$f_c = \sqrt{(50)^2 + (30)^2}$ → Ans

$= 10\sqrt{34}$

mg Scam.



Soln



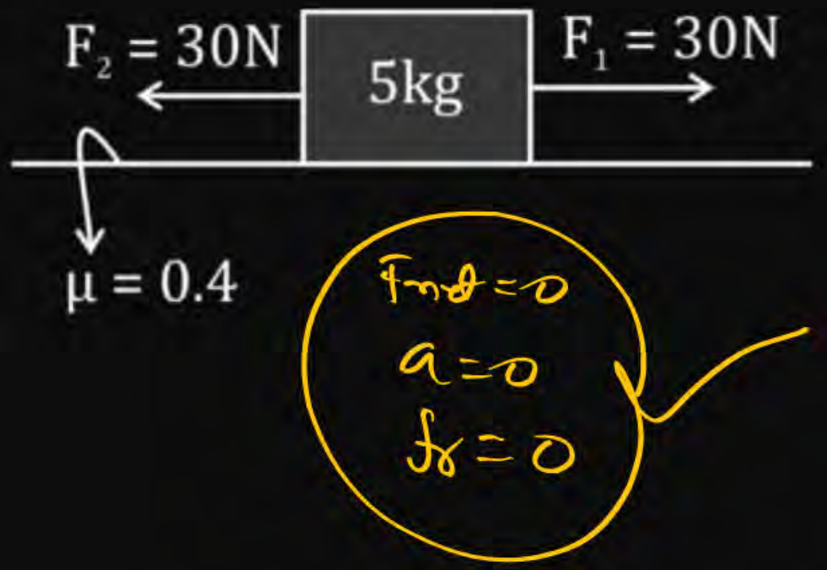
→ object at rest ✓ → friction = (static) = 30N

$N = 50$ Newton

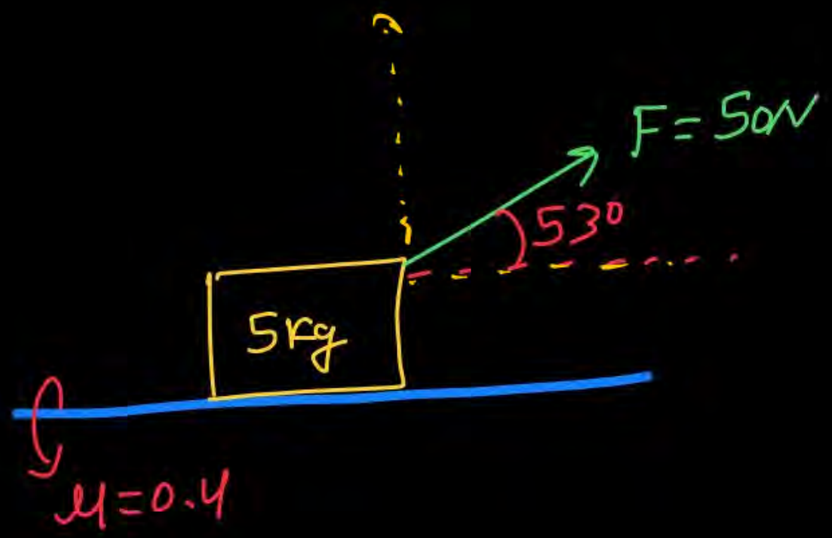
$f_{lim} = \mu N = \frac{8}{10} \times 50 = 40N$

Question 11

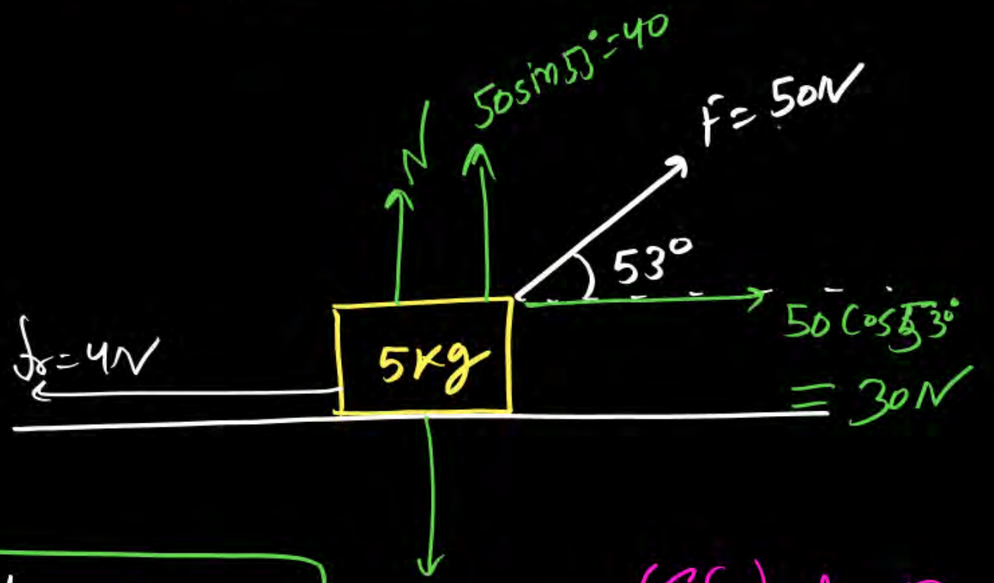
Find acceleration and friction.



(Q) लिखो



Find acc^n and friction.



$$a = \frac{30-4}{5} = \frac{26}{5}\ m/s^2$$

$= 5.2\ m/s^2$

$(\Sigma F_y)_{mid} = 0$

$40 + N = 50$

$N = 10$ Newton

$f_{kinetic} = f_{limit} = \mu N$

$= \frac{4}{10} \times 10 = 4N$

(Q) Find range of force applied by (MR) to keep the object at rest.

* friction force tendency of motion ke opposite lagta hai

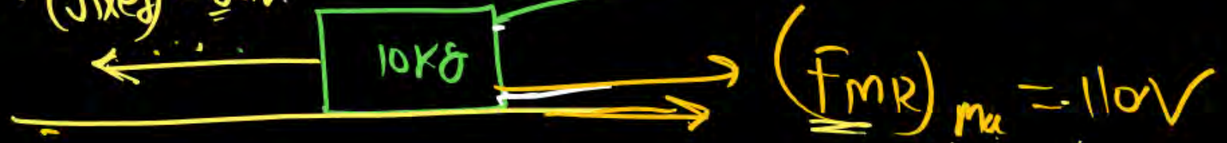
$10N \leq F_{MR} \leq 110N$

Ans

MR* Box

Jab tak unbalance Jo tendency of motion create karta hai wo friction se kam ye equal hai tab tak object rest me rahega.

Soln $F_{(fixed)} = 60N$

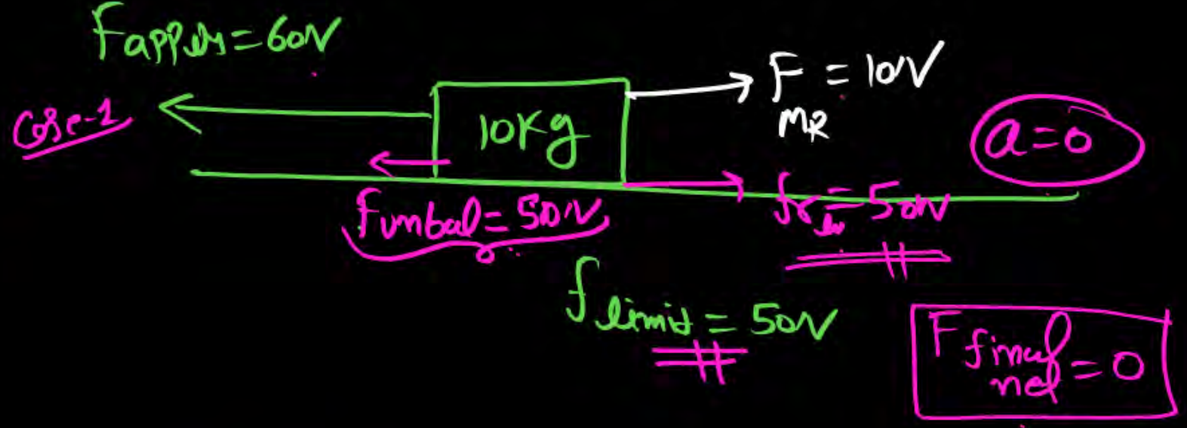


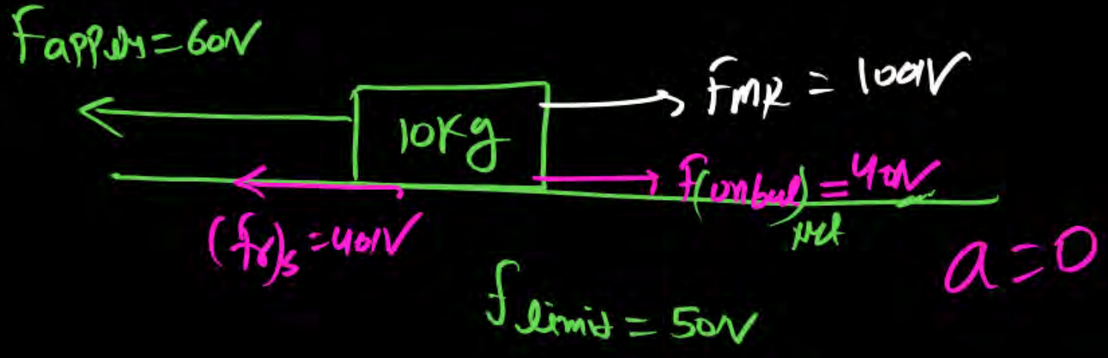
$f_{limit} = \mu N$

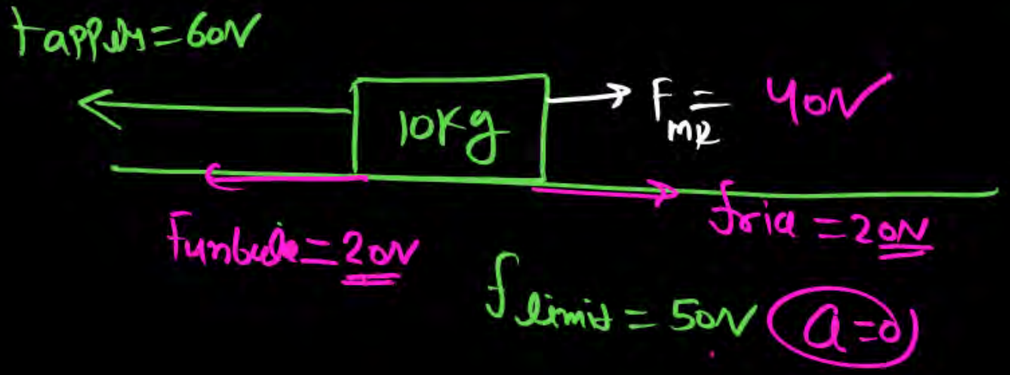
$= 0.5 \times 100$

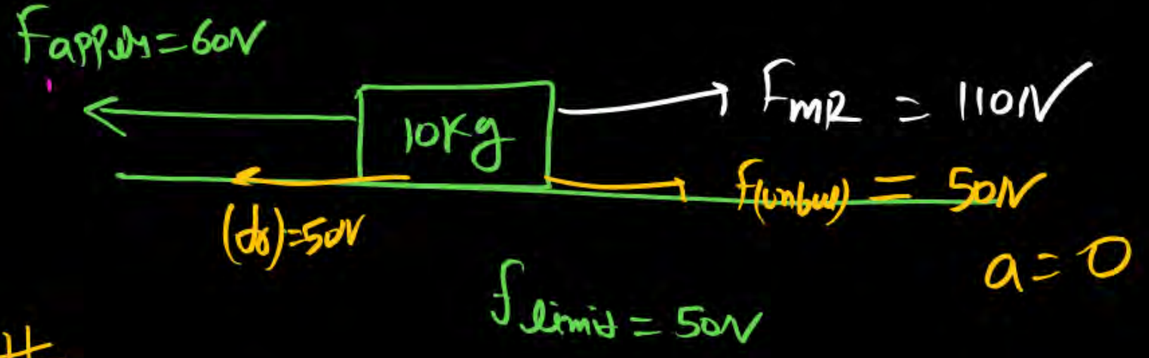
$= \frac{5}{10} \times 100 = 50N$

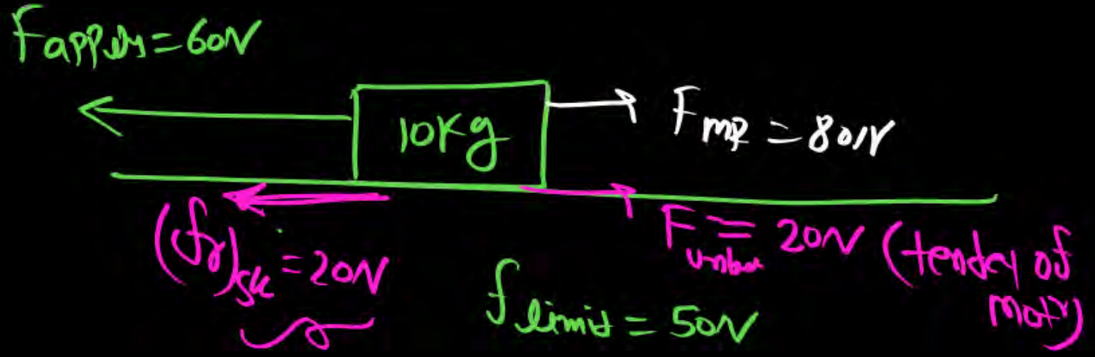
± Jab 2-force lag raha hai to Force unbalance se f_{limit} ko compare kro

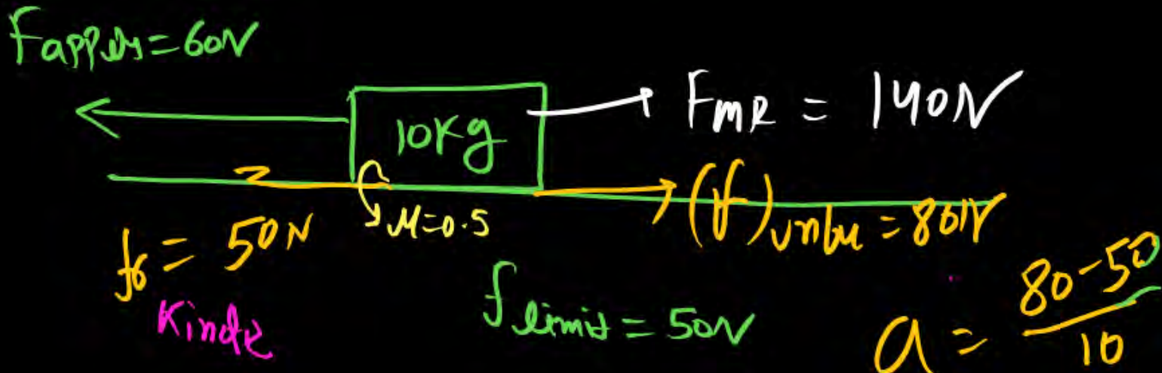

$f_{applied} = 60N$
Case-1
10kg
$F_{MR} = 10N$
$a = 0$
$f_{unbal} = 50N$
$f_{r_{kin}} = 50N$
$f_{limit} = 50N$
$F_{final\ net} = 0$


$f_{applied} = 60N$
10kg
$f_{MR} = 100N$
$f_{(unbal)} = 40N$
net
$(f_r)_s = 40N$
$f_{limit} = 50N$
$a = 0$

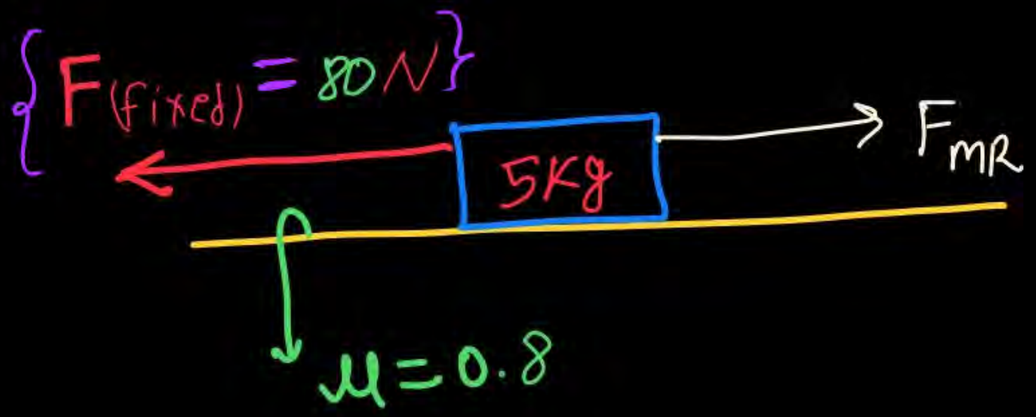

$f_{applied} = 60N$
10kg
$F_{MR} = 40N$
$f_{unbal} = 20N$
$f_{rkin} = 20N$
$f_{limit} = 50N$
$a = 0$


$f_{applied} = 60N$
10kg
$F_{MR} = 110N$
$f_{(unbal)} = 50N$
$(f_s) = 50N$
$f_{limit} = 50N$
$a = 0$


$f_{applied} = 60N$
10kg
$F_{MR} = 80N$
$F_{unbal} = 20N$ (tendency of motion)
$(f_s)_{st} = 20N$
$f_{limit} = 50N$

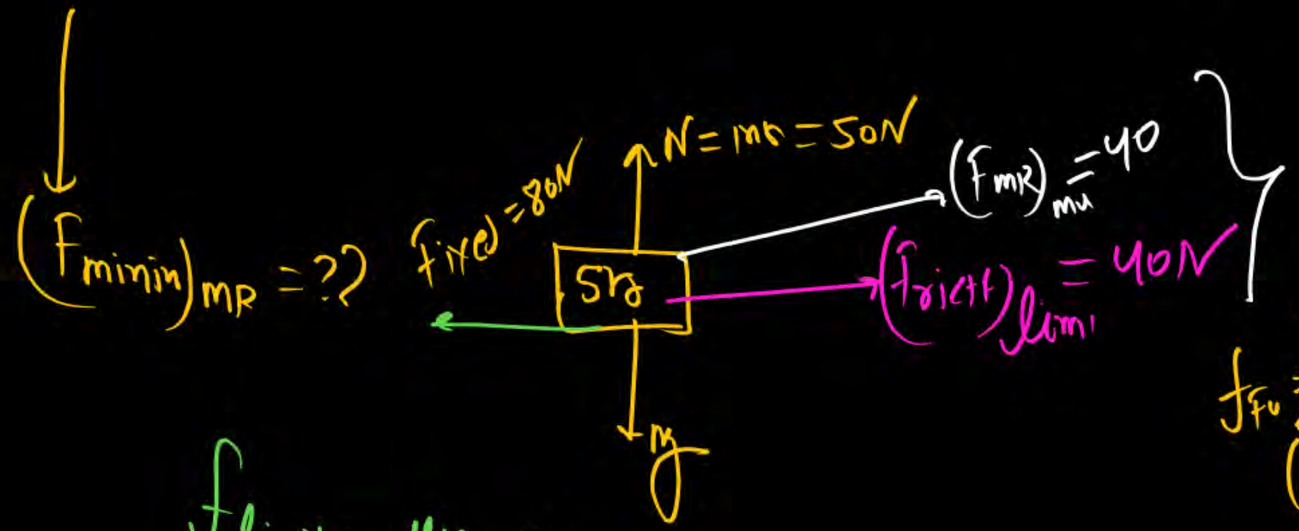

$f_{applied} = 60N$
10kg
$F_{MR} = 140N$
$f_k = 50N$
Kinetic
$\mu = 0.5$
$(f)_{unbl} = 80N$
$f_{limit} = 50N$
$a = \frac{80-50}{10}$

Find range of force applied by (MR) to keep the object at rest.



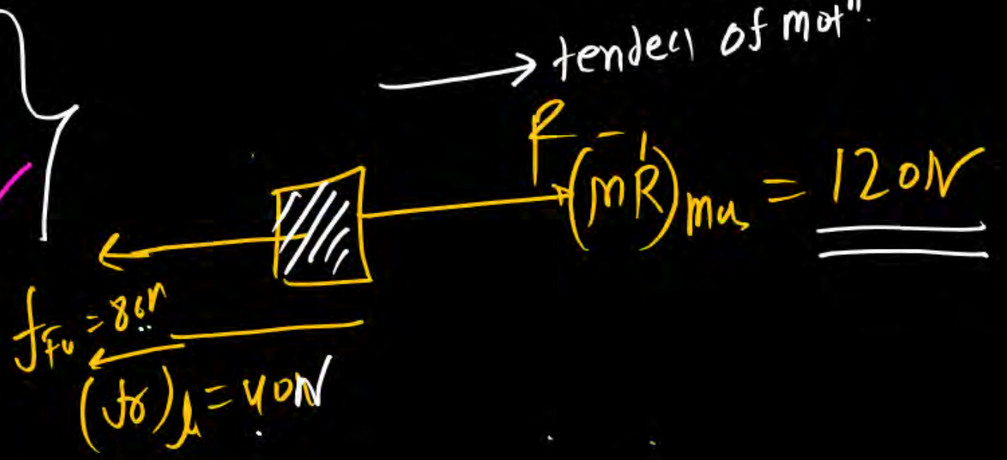
$f_{(MR)min} = 40N$

$f_{(MR)max} = 120N$

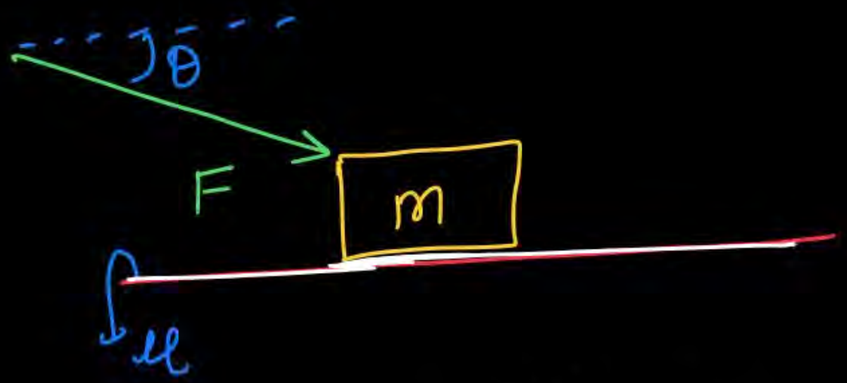


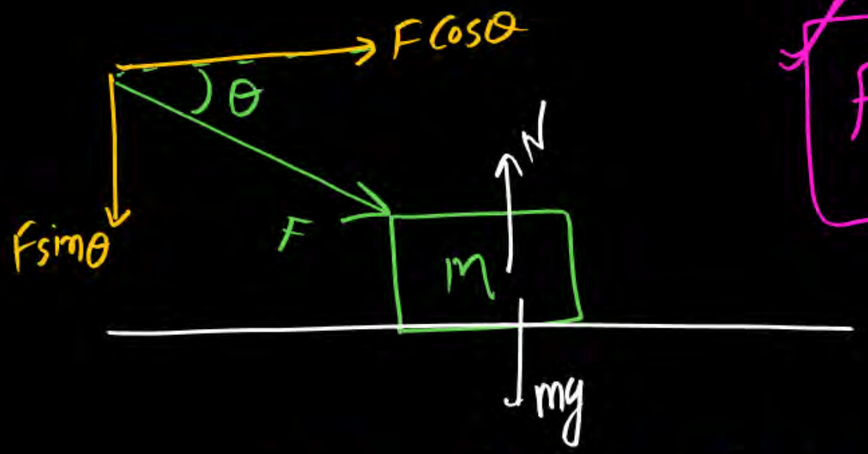
$f_{limit} = \mu N = \frac{8}{10} \times 50$

$= 40N$



Force is acting at angle θ then find F so that just about to slit ✓✓





$$F = \frac{\mu mg}{\cos\theta - \mu\sin\theta}$$

Sol^n $\quad \Sigma F_y = 0$ $\quad (\Sigma F_n = 0)$ just about mn

$$N = mg + F\sin\theta \quad \text{---} ①$$

$f_{limit} = \mu N$

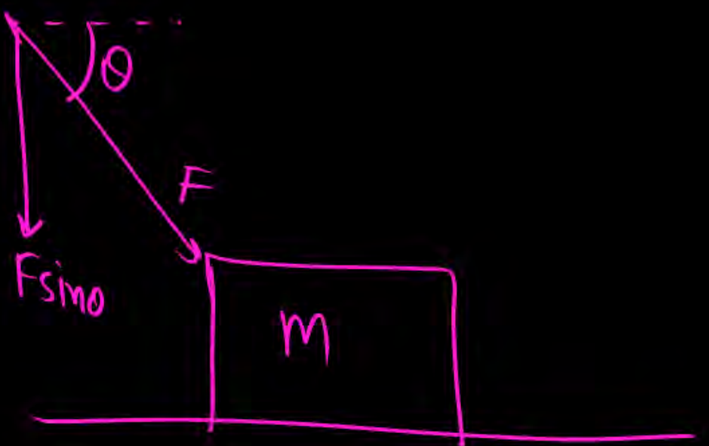
$F_{limit} = \mu(mg + F\sin\theta)$

$F\cos\theta = f_{\mu_s} = \mu N$

$F\cos\theta = \mu(mg + F\sin\theta)$

$F\cos\theta = \mu mg + \mu F\sin\theta$

$F(\cos\theta - \mu\sin\theta) = \mu mg$

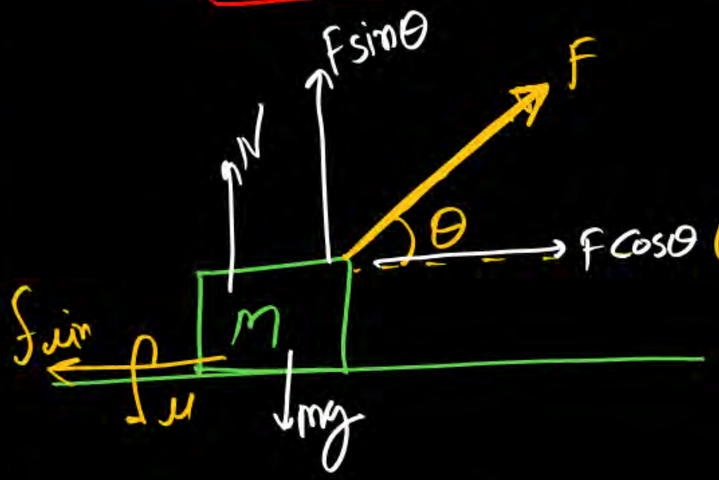


$$F = \frac{\mu mg}{\cos\theta - \mu\sin\theta}$$

$$P = a\sin\theta + b\cos\theta$$

$$P_{max} = \sqrt{a^2+b^2}$$

(Q) Find minimum force to move this object:—



$$\Sigma F_y = 0$$

$$F\sin\theta + N = mg$$

$$N = mg - F\sin\theta \quad -(1)$$

$(\Sigma F_x = 0)$ Just balance

$$\mu N = F\cos\theta$$

$$\mu(mg - F\sin\theta) = F\cos\theta$$

$$\mu mg - \mu F\sin\theta = F\cos\theta$$

$$\mu mg = F(\cos\theta + \mu\sin\theta)$$

$$F_{min} = \frac{\mu mg}{(\cos\theta + \mu\sin\theta)}$$

$$F_{minimum} = \frac{\mu mg}{(\cos\theta + \mu\sin\theta)_{P_{max}}}$$

$$P_{max} = \cos\theta + \mu\sin\theta$$

$$P_{max} = \sqrt{1^2 + \mu^2}$$

$$F_{min} = \frac{\mu mg}{\sqrt{1+\mu^2}}$$ Ans

(2) find θ in above Prob^m so that f will be minimum

$$f_{min} = \frac{\mu mg}{(\cos\theta + \mu\sin\theta)_{max} = P_{max}}$$ (मानना)

$$P_{max} = \cos\theta + \mu\sin\theta$$

if $\frac{dP}{d\theta} = 0$ the P_{max}

$$\frac{dP}{d\theta} = -\sin\theta + \mu\cos\theta = 0$$

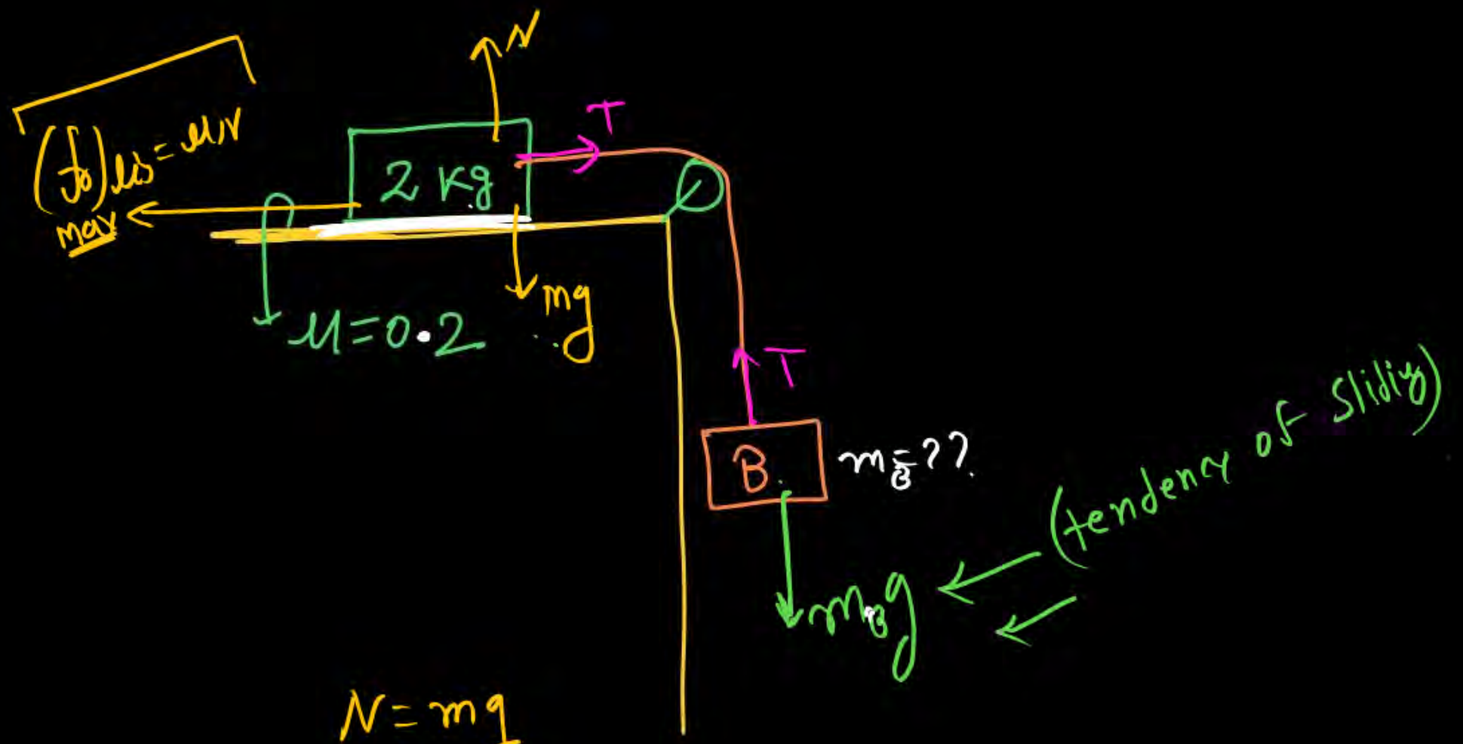
$$\mu\cos\theta = \sin\theta$$

$$\tan\theta = \mu$$

$$\theta = \tan^{-1}(\mu)$$

at $\theta = \tan^{-1}(\mu)$
force will be minimum

(Q) find maximum value of B so that Block does not slide.



$N = mg$

$N = 20 \rightarrow (1)$

$f_{limit} = \mu N = \frac{2}{10} \times 20$

$= 4N$

Just about to move

$\mu N = m_B g$

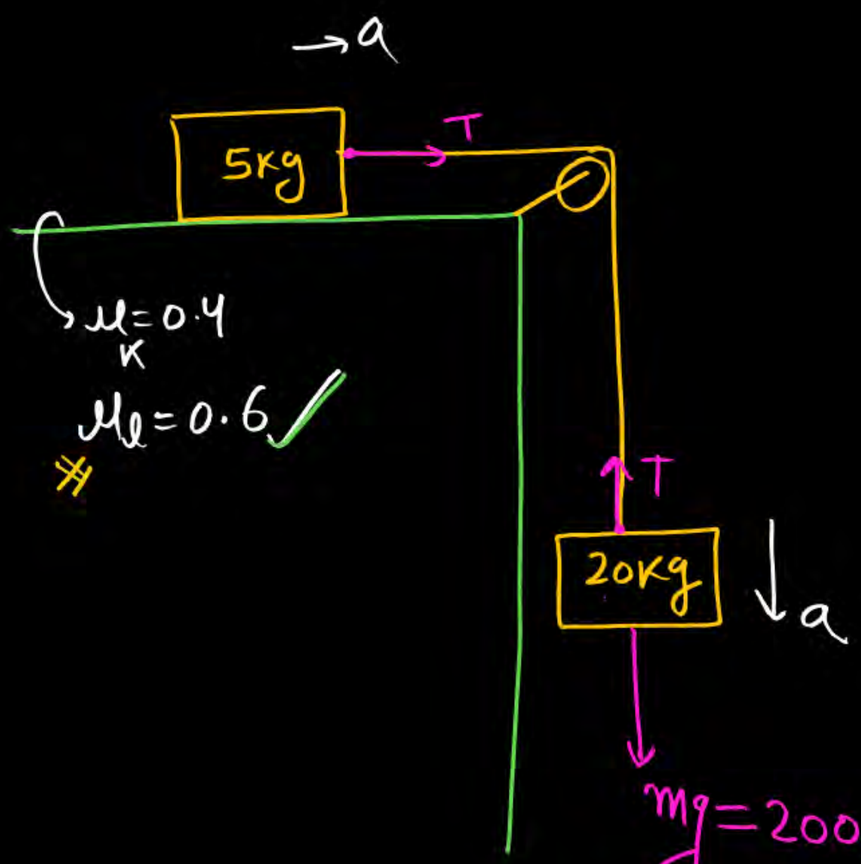
$m_B = \frac{4}{g} = \frac{4}{10}$

$m_B = 0.4\,kg$

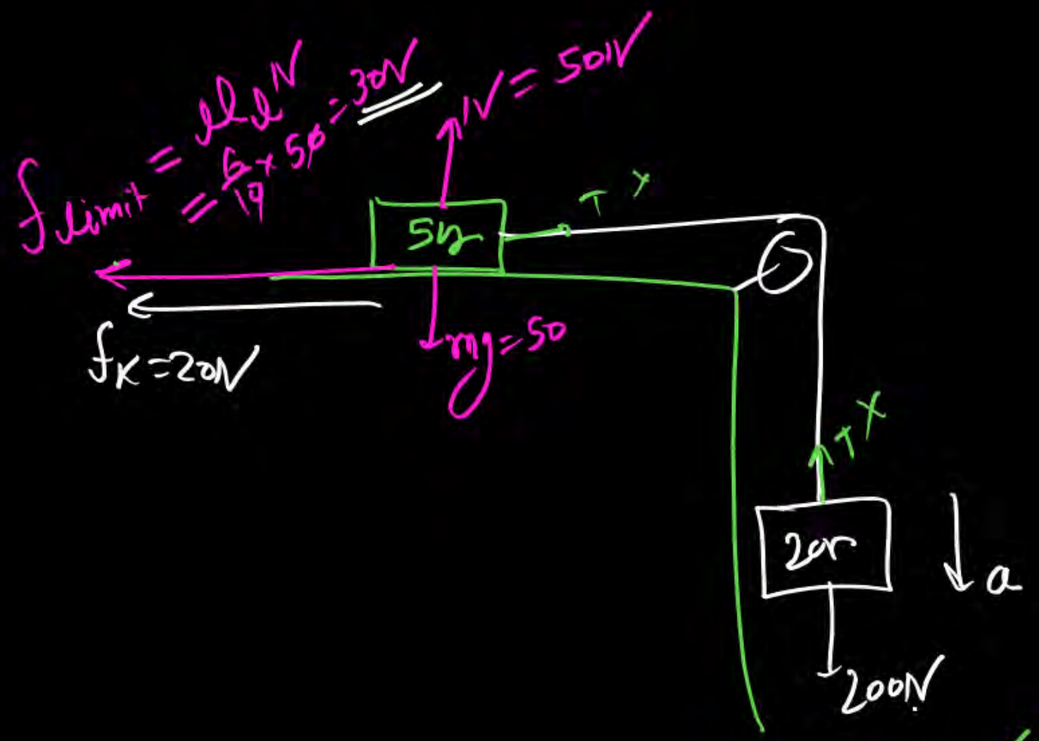
(NEET)

mA* Chalane wala force (tendency of motion) = $(f_s)_{limit}$ Rokne wala force

find Tension in string and acc^n of object:



$mg = 200$ Newton (tendecy of motion)



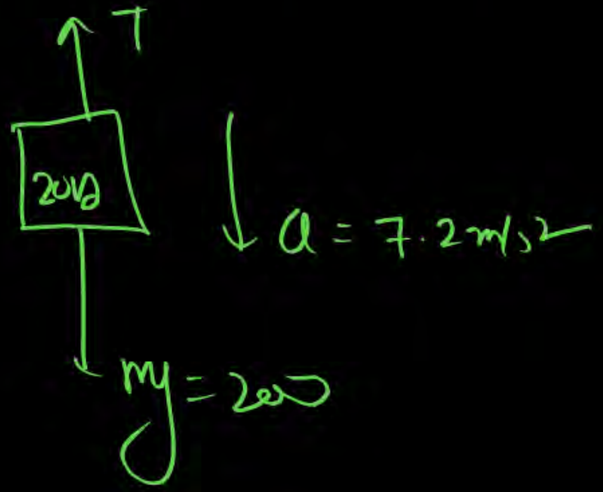
$a = \frac{200 - 30}{25}$ ✗

$f_{kinetic} = \mu_k N = \frac{4}{10} \times 50 = 20N$

$a = \frac{200 - 20}{25} = \frac{180}{25}$ m/s²

$= 7.2$ m/s²

for Tension Draw FBD of 20Kg



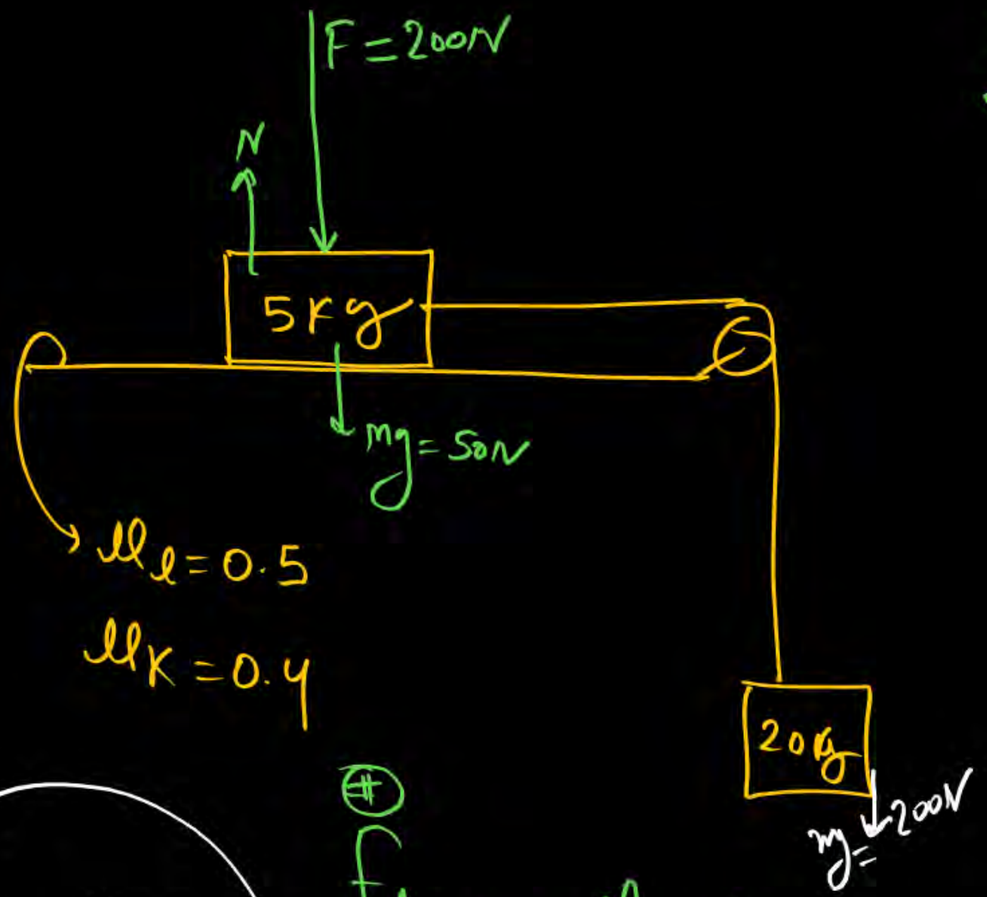
$200 - T = ma$

$$200 - T = 20 \times 7.2\ m/s^2$$

$T = 56$ newton

(Q) find acc^n & friction of 5kg

Soln



$f_{k_{inf}} = \frac{4}{10} \times 250$

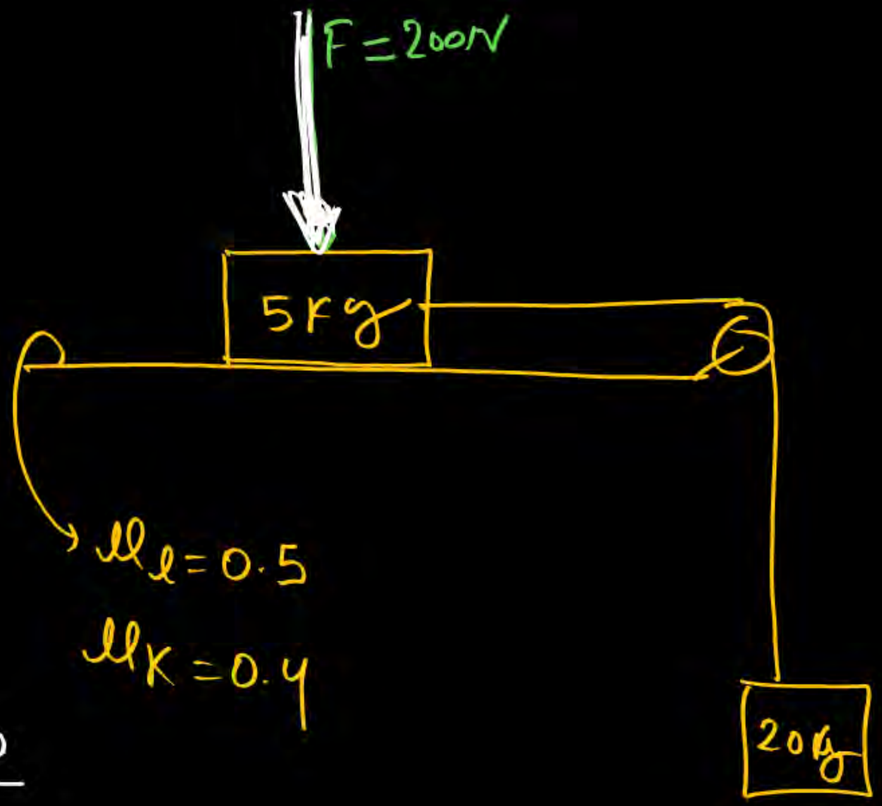
$= 100N$ Ans

(+)

$f_{limit} = \mu_s N$

$= \frac{5}{10} \times 250$

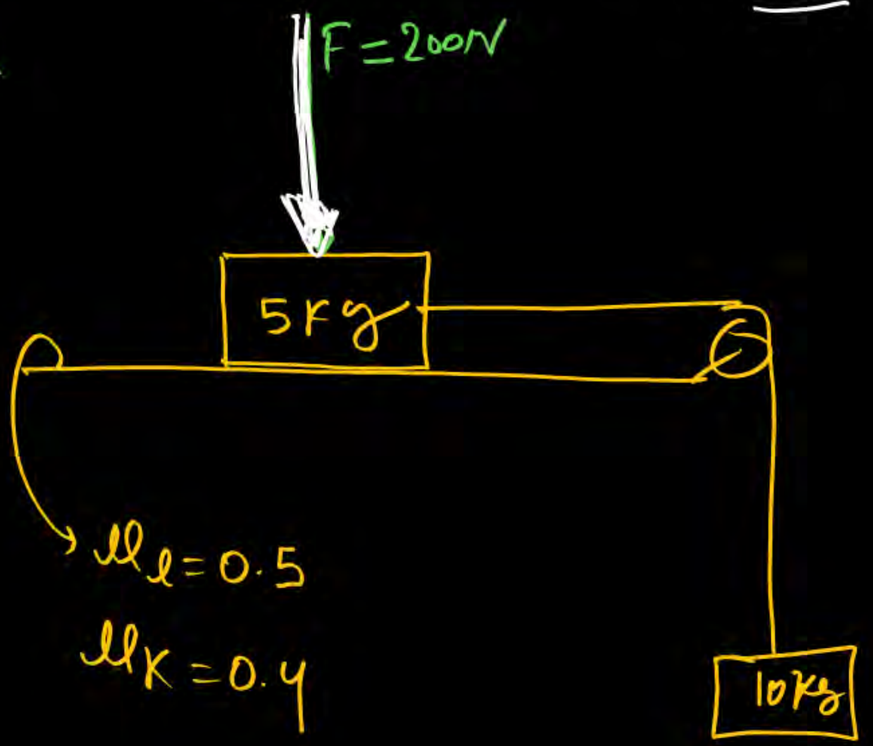
$f_{limit} = 125N$



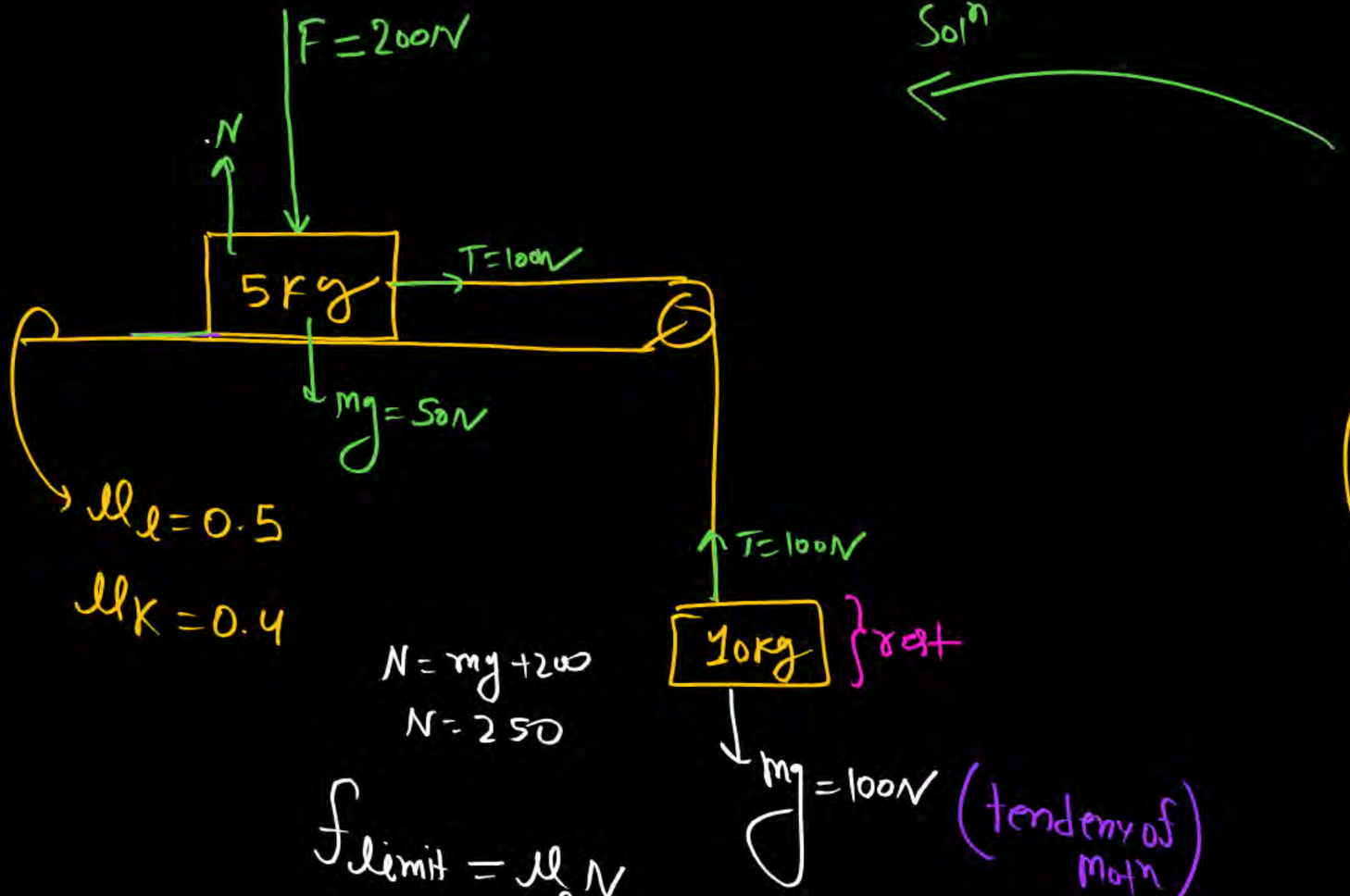
$a = \frac{200 - 100}{25}$

$= \frac{100}{25} = 4 m/s^2$ Ans

(Q) find acc^n & friction of 5kg



Soln



rest

$N = mg + 200$

$N = 250$

$f_{limit} = \mu_s N$

$= \frac{5}{10} \times 250$

$f_{limit} = 125N$ अधिक

rotne wala force

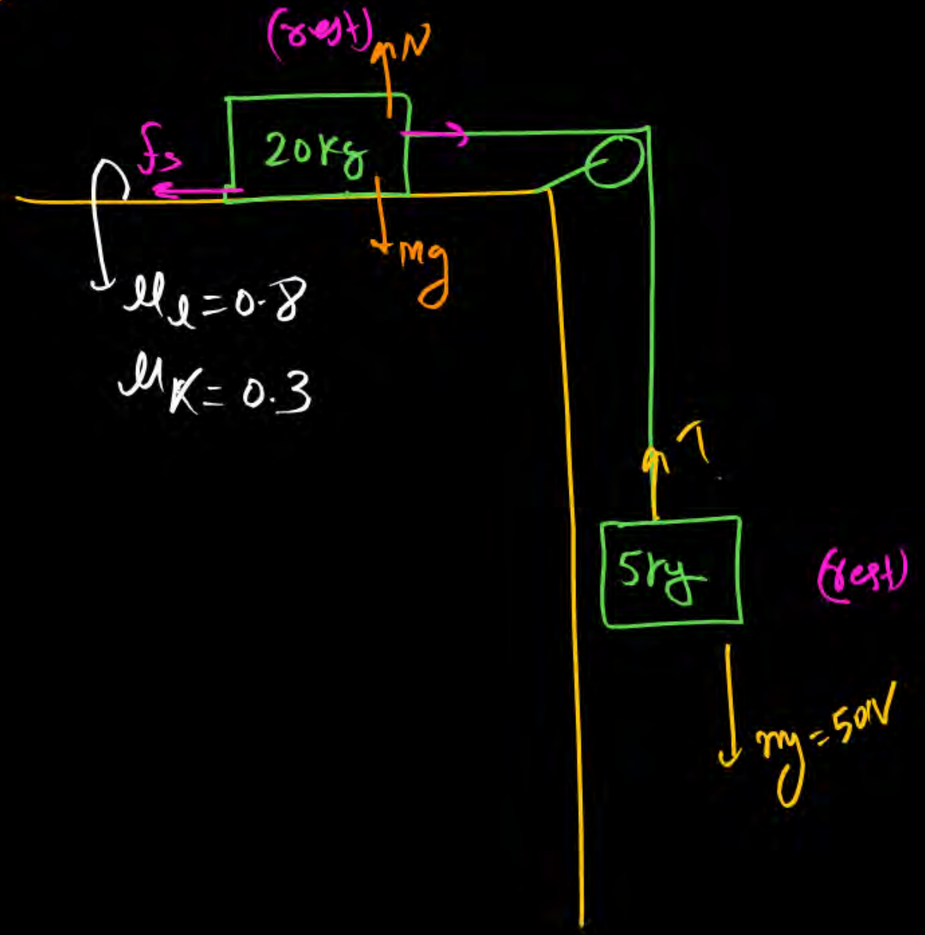
(tendency of motion)

$a = 0$

Static friction

friction = 100N

Q



Soln

$f_{limit} = \mu N$

$= \frac{8}{10} \times 200$

$= 160N$

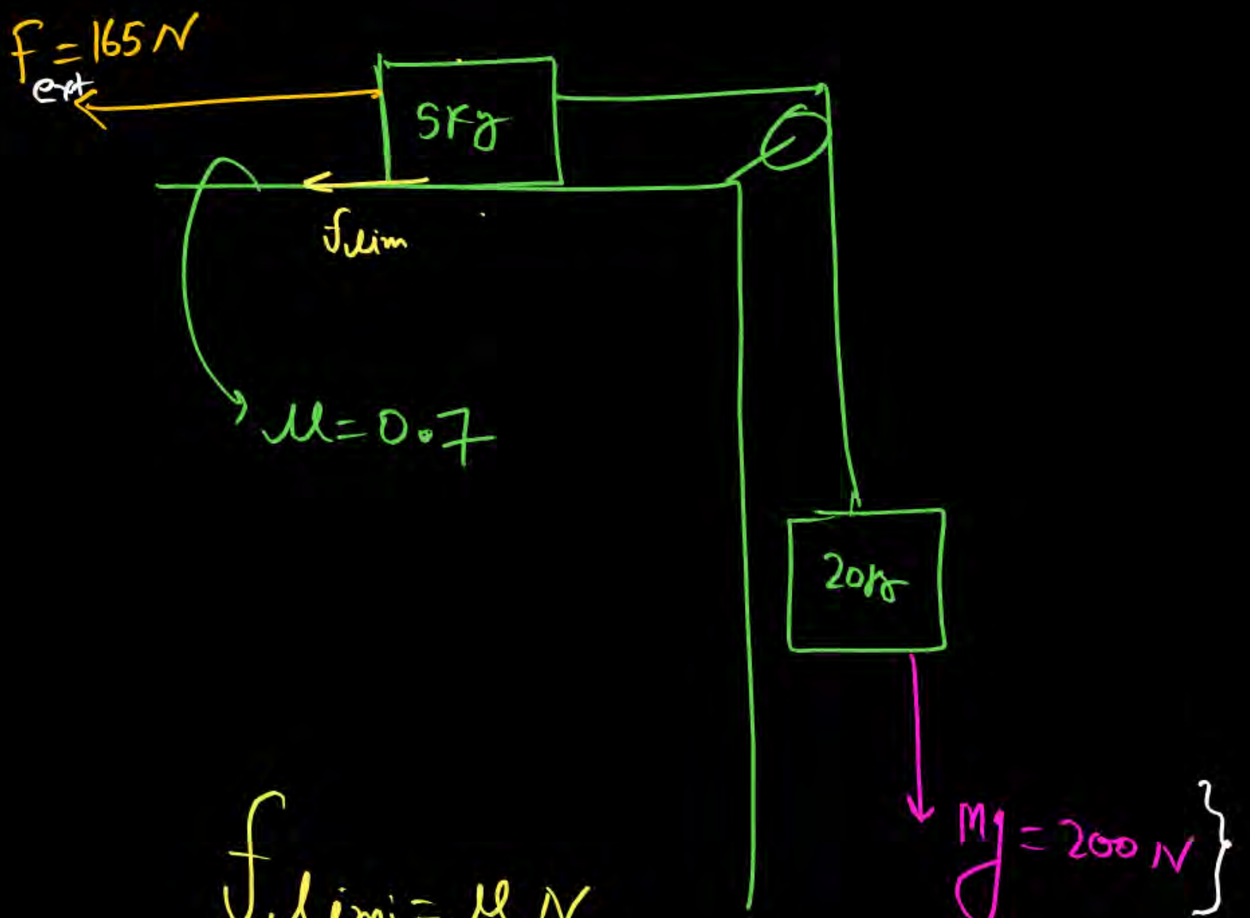
$a = 0$

Static friction ✓

$T = 50N$

$f_{stat} = 50N$

(6) find acc^n & friction force ??

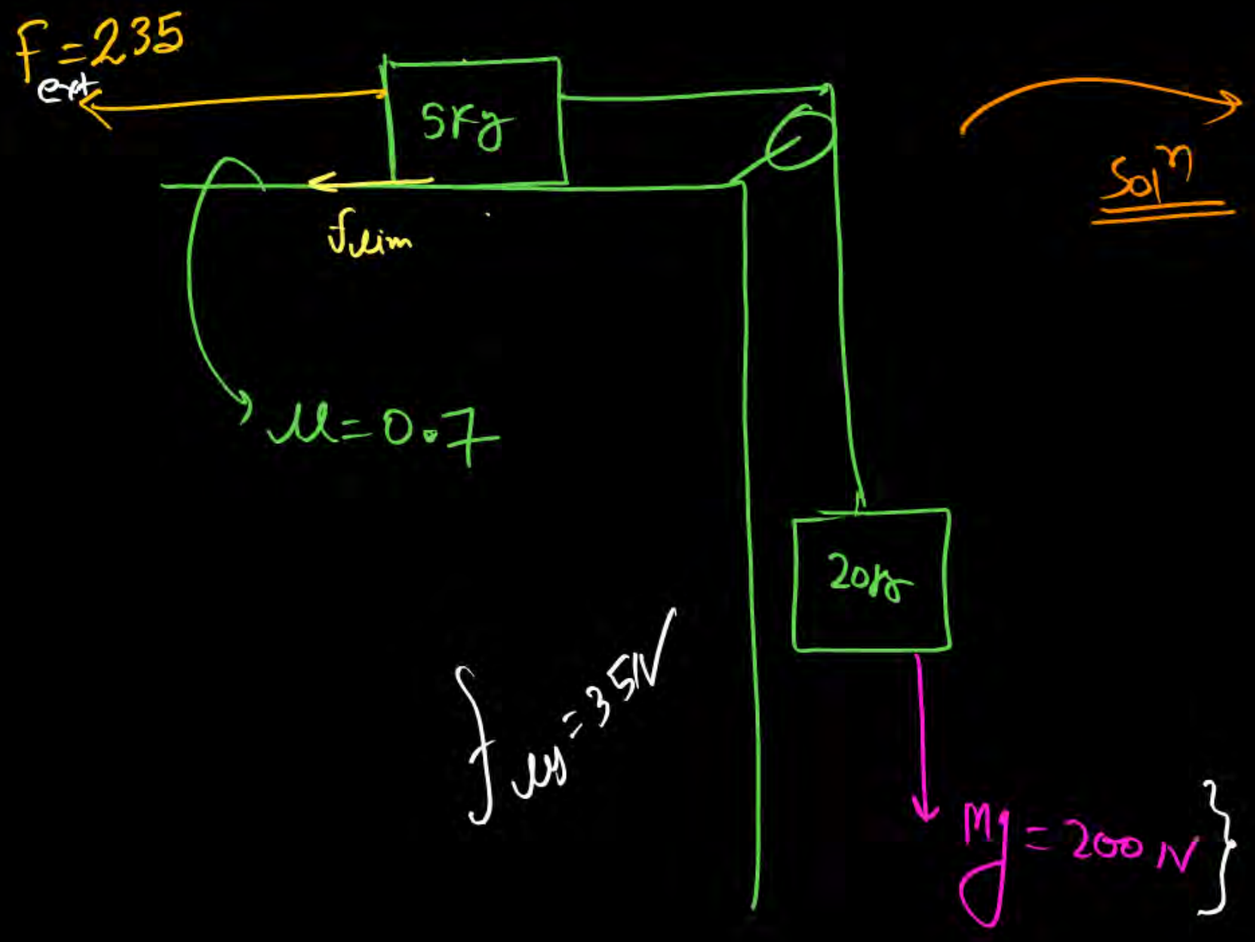


$$f_{limi} = \mu N$$
$$= \frac{7}{10} \times 50$$
$$= 35\,Newt$$

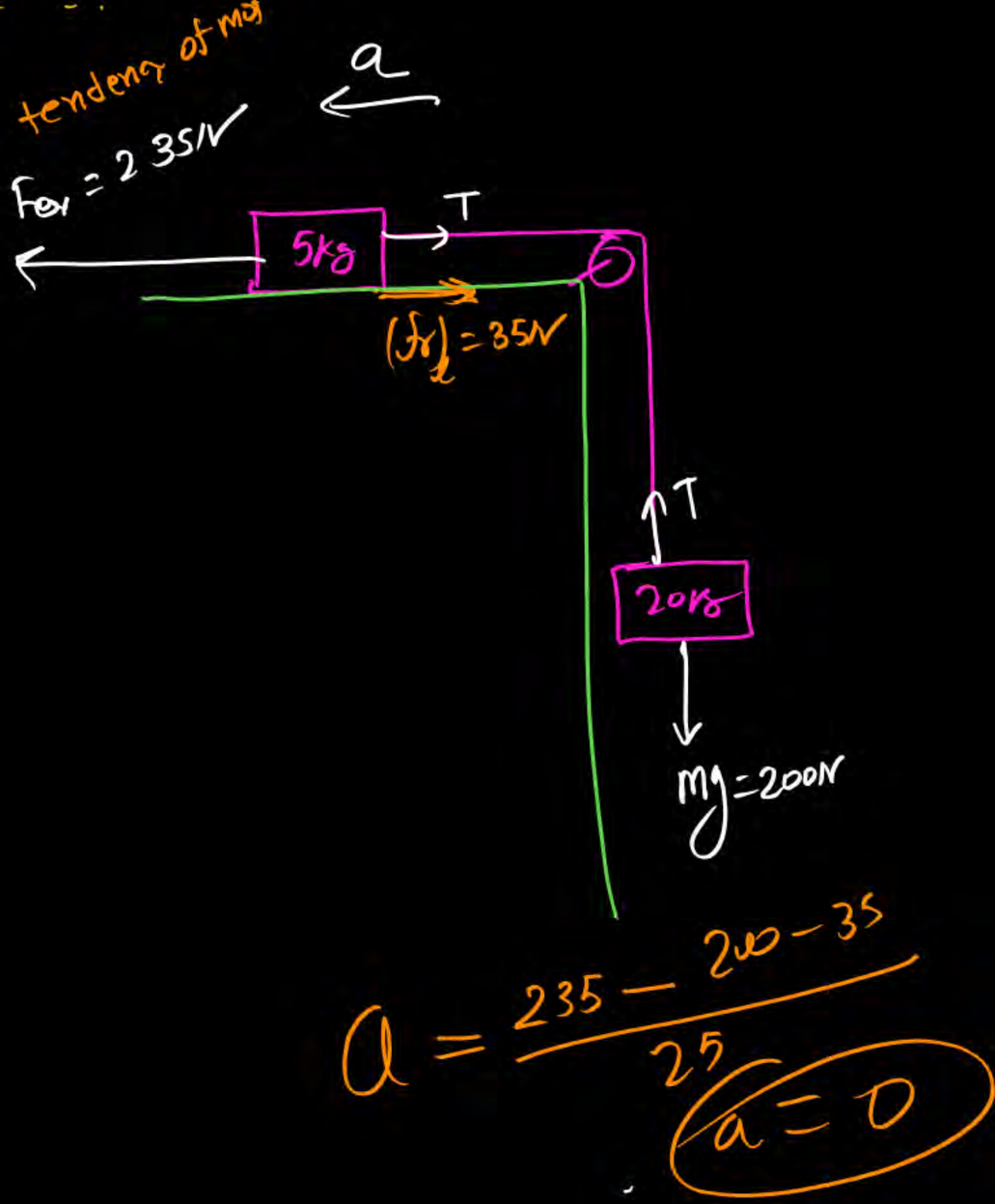
$$a = \frac{200 - 165 - 35}{25}$$

$a = 0$

(e) find acc^n & friction force ??



Soln

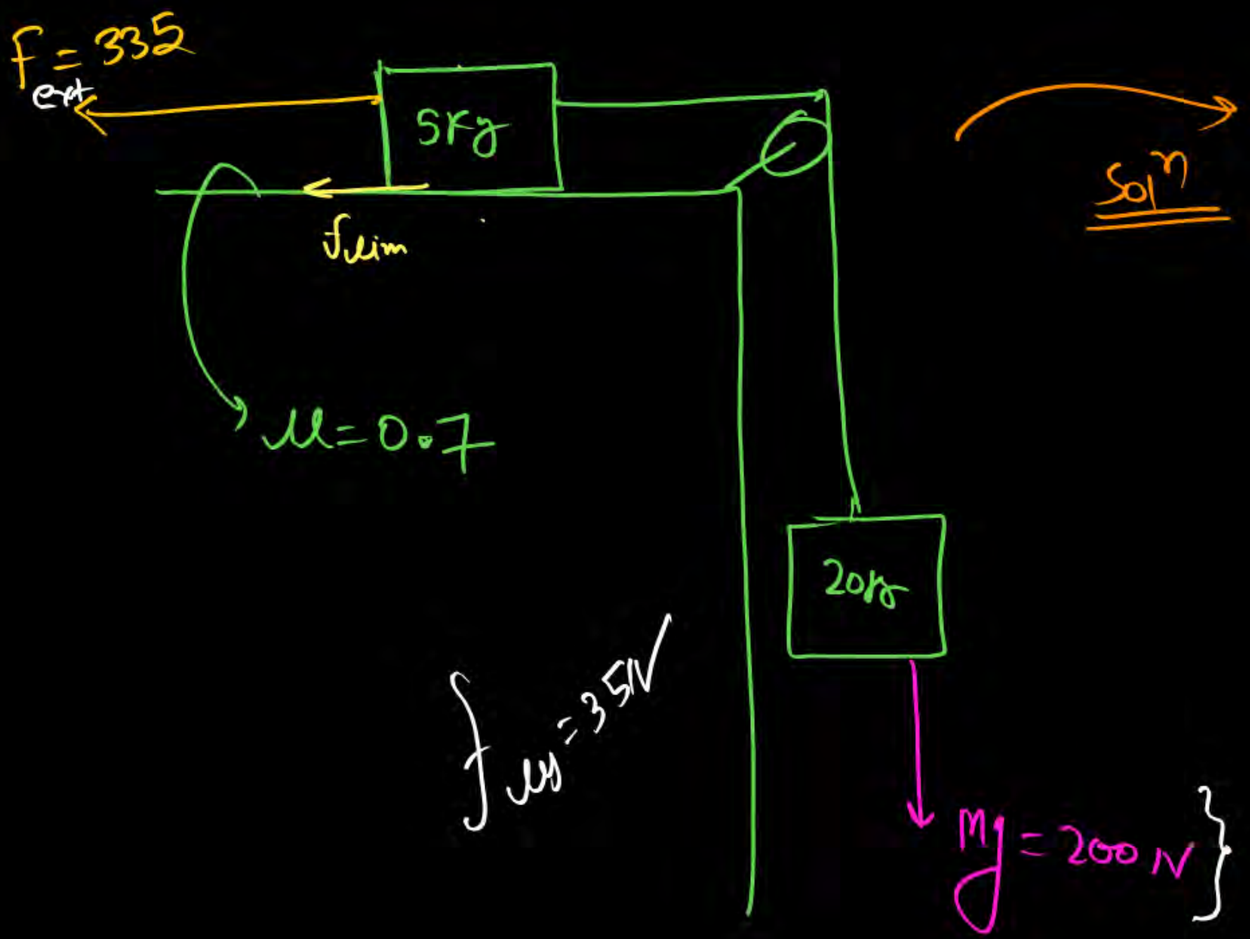


$$a = \frac{235 - 200 - 35}{25}$$

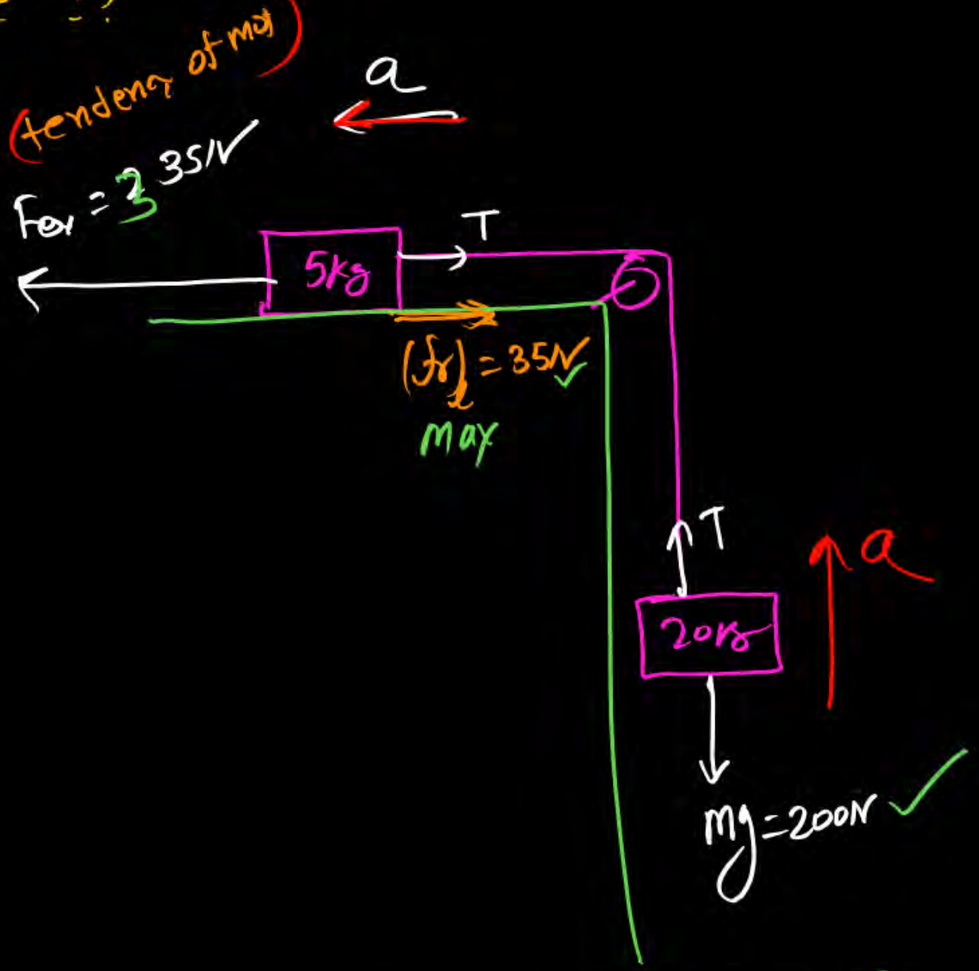
$a = 0$

(8) घर पर जिसका होना

find acc^n & friction force ??



Soln

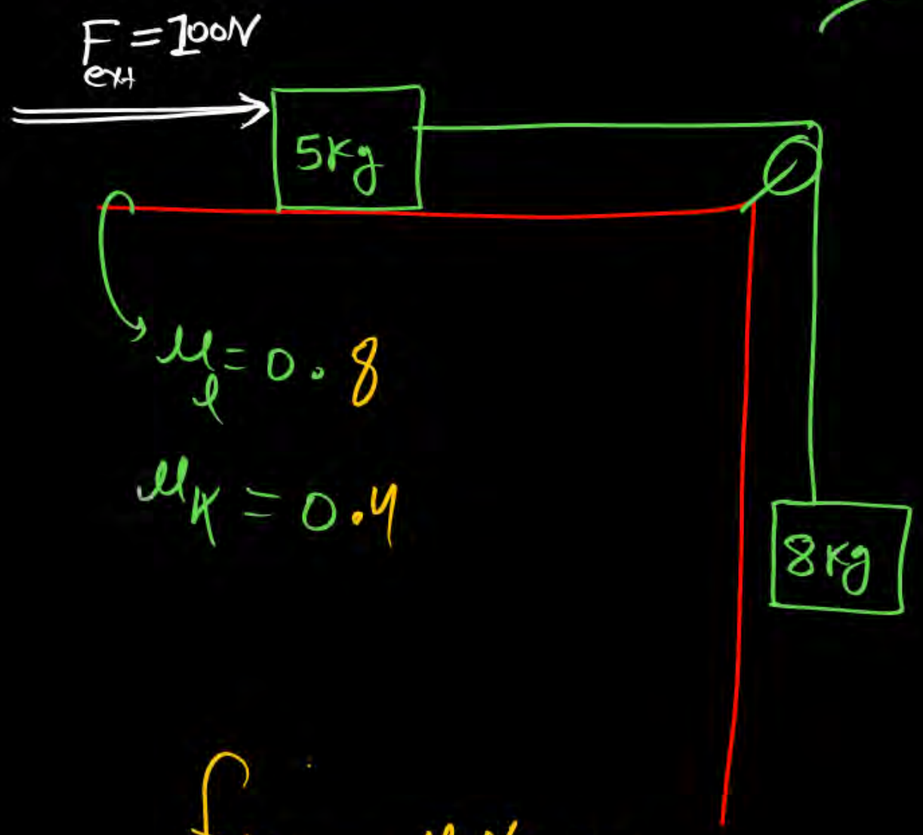


$$a = \frac{335 - 200 - 35}{20+5}$$

$$= \frac{100}{25} = 4\ m/s^2$$

Find acc^n & friction

Soln

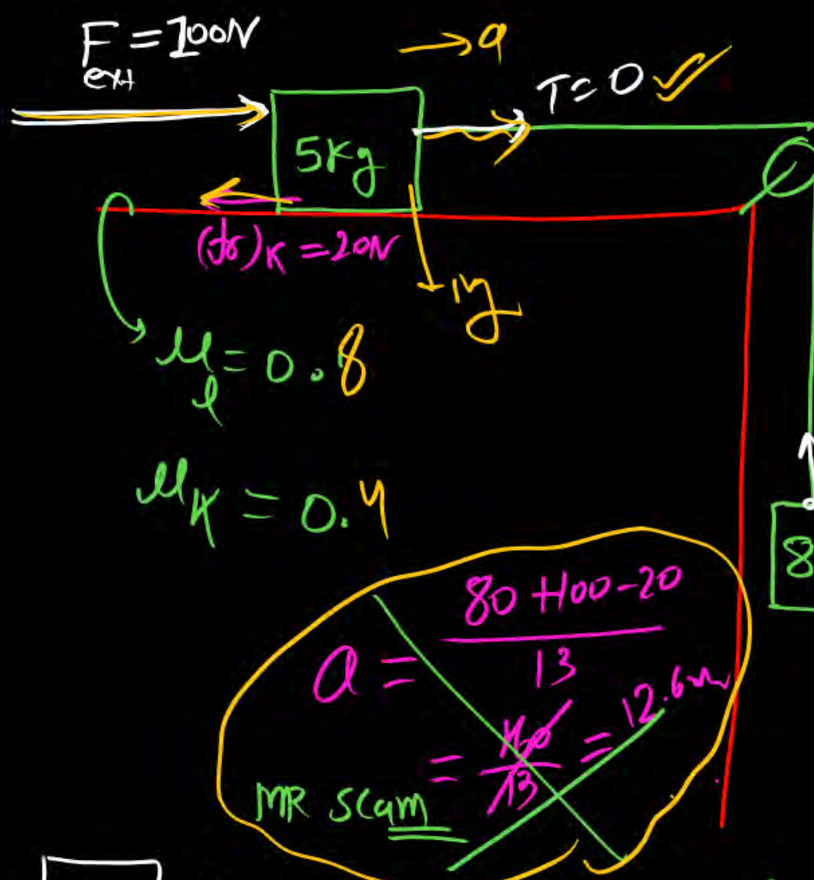


$f_{lim} = \mu_s N = 40N$

$f_{K_{max}} = \mu_K N = \frac{4}{10} \times 50$

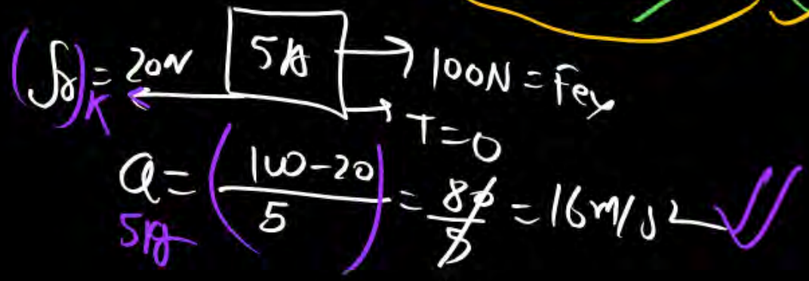
$= 20$

at this instant



$a = \frac{80 + 100 - 20}{13} = \frac{160}{13} = 12.6$

MR scam

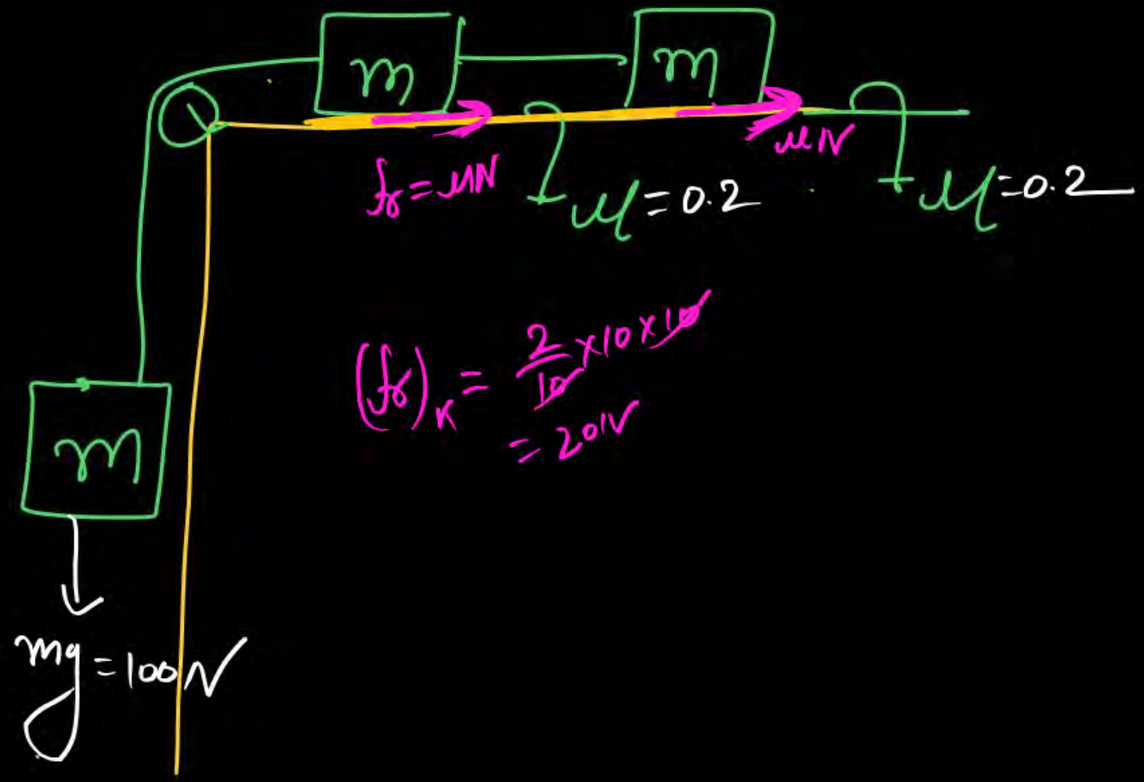


$a_{5kg} = \left(\frac{100-20}{5}\right) = \frac{80}{5} = 16 m/s^2$

$(a_{8kg}) = 10 m/s^2$ downw

(NEET)

If $m = 10kg$ & $\mu = 0.2$ //



$(f_k)_K = \frac{2}{10} \times 10 \times 10$

$= 20N$

Soln

$$a = \frac{100 - 20 - 20}{10 + 10 + 10}$$

$$= \frac{60}{30}$$

$$\boxed{a = 2 m/s^2}$$

Question

A block A of mass m_1 rests on a horizontal table. A light string connected to it passes over a frictionless pulley at the edge of table and from its other end another block B of mass m_2 is suspended. The coefficient of kinetic friction between the block and the table is μ_k. When the block A is sliding on the table, the tension in the string is

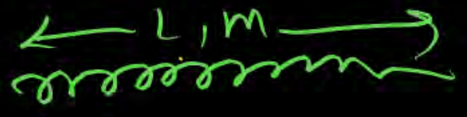
[AIMPT-2015]

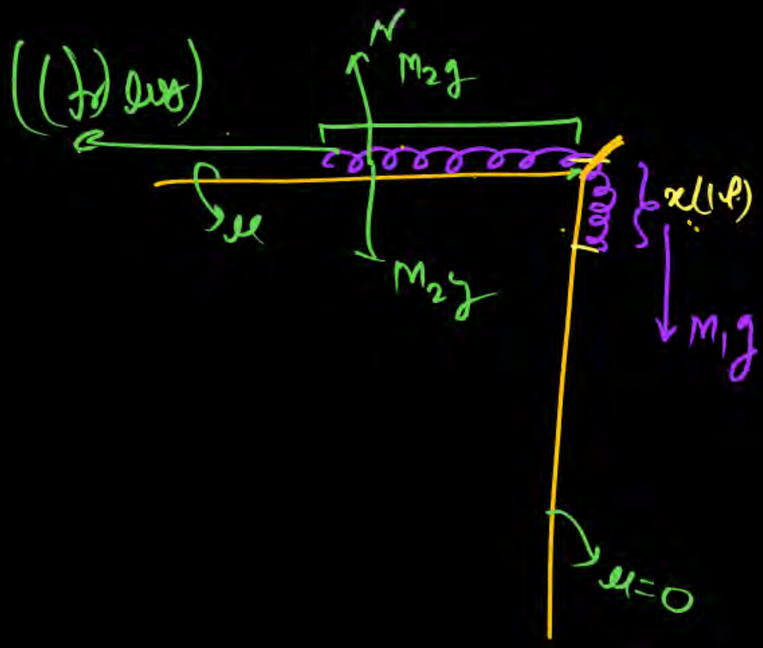
1. $\frac{(m_2 + \mu_k m_1)g}{(m_1 + m_2)}$
2. $\frac{(m_2 - \mu_k m_1)g}{(m_1 + m_2)}$
3. $\frac{m_1 m_2(1 + \mu_k)g}{(m_1 + m_2)}$
4. $\frac{m_1 m_2(1 - \mu_k)g}{(m_1 + m_2)}$

Chain Prob^m

{NEET}

A chain of 'mass (M, L)' placed on rough table then find minimum length of hanging part, so that chain start sliding.





$L \longrightarrow M$

$1 \longrightarrow \frac{M}{L}$

$x \longrightarrow \frac{M}{L}x$

$(L-x) \longrightarrow \frac{M}{L}(L-x)$

m_1g (tendency of motion) $= (\mu N)_{\text{Rokega}}$

$m_1g = \mu m_2 g$

$\frac{M}{L}x = \mu \frac{M}{L}(L-x)$

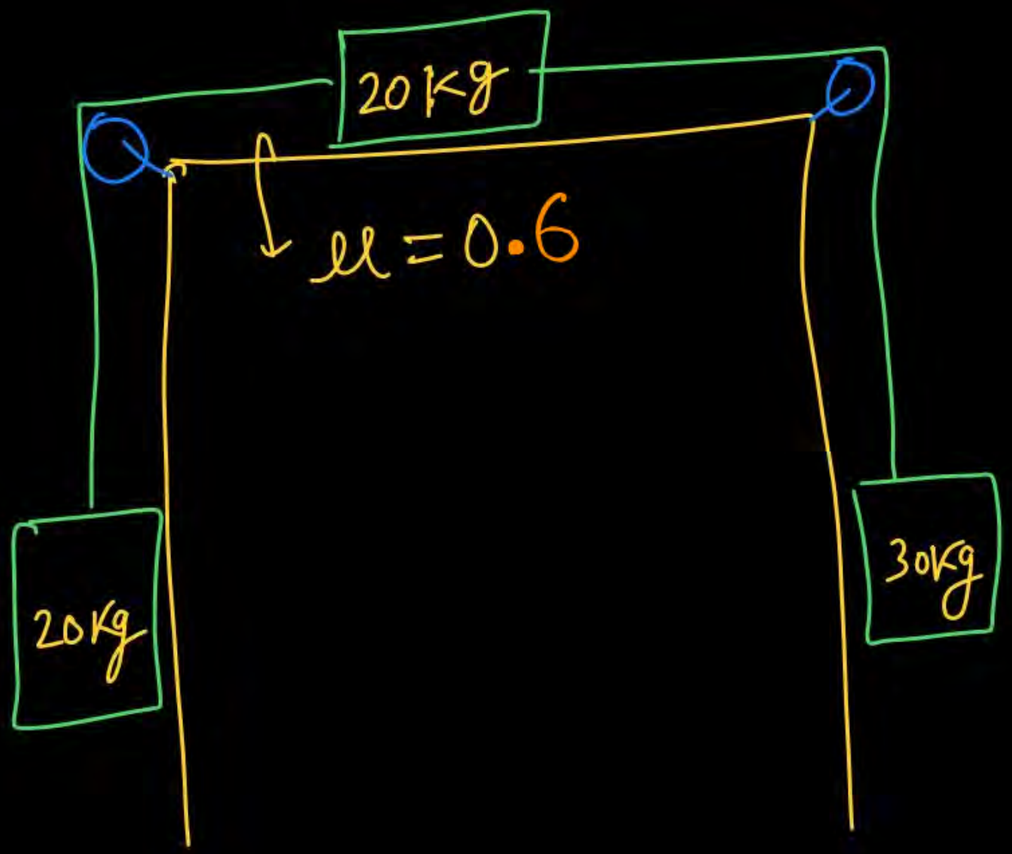
$x = \mu(L-x)$

$x = \mu L - \mu x$

$x + \mu x = \mu L$

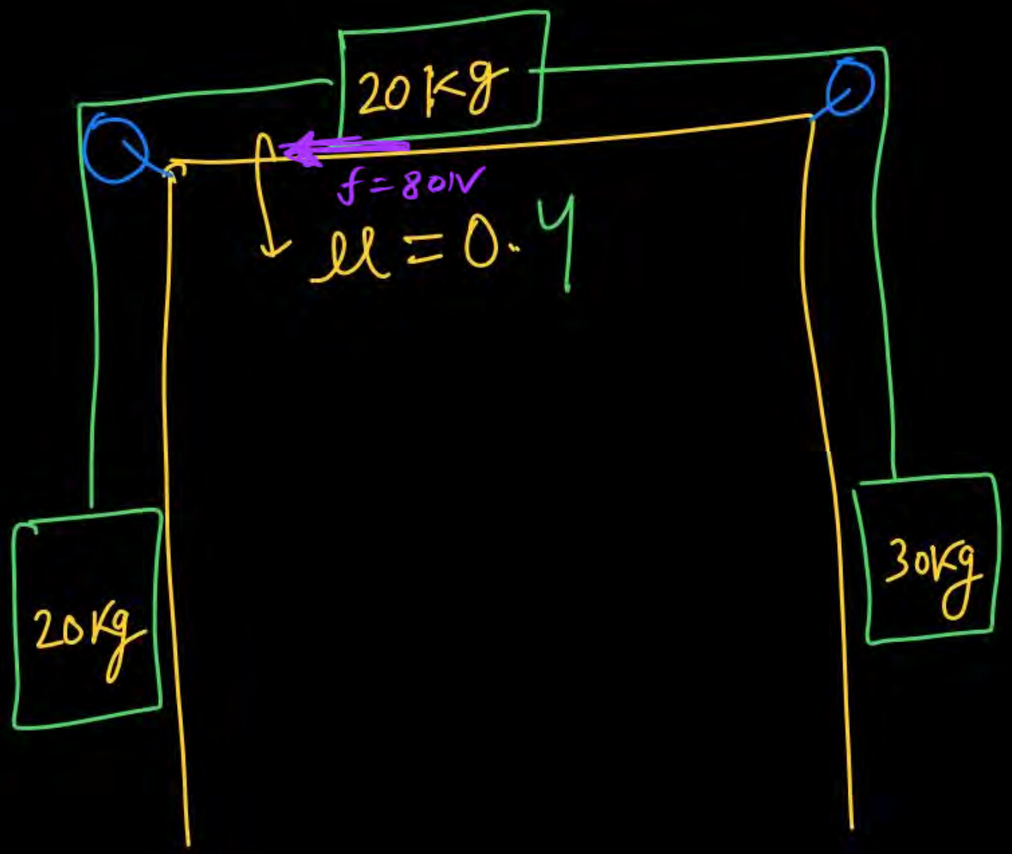
$x = \frac{\mu L}{1+\mu}$

H/W (1)



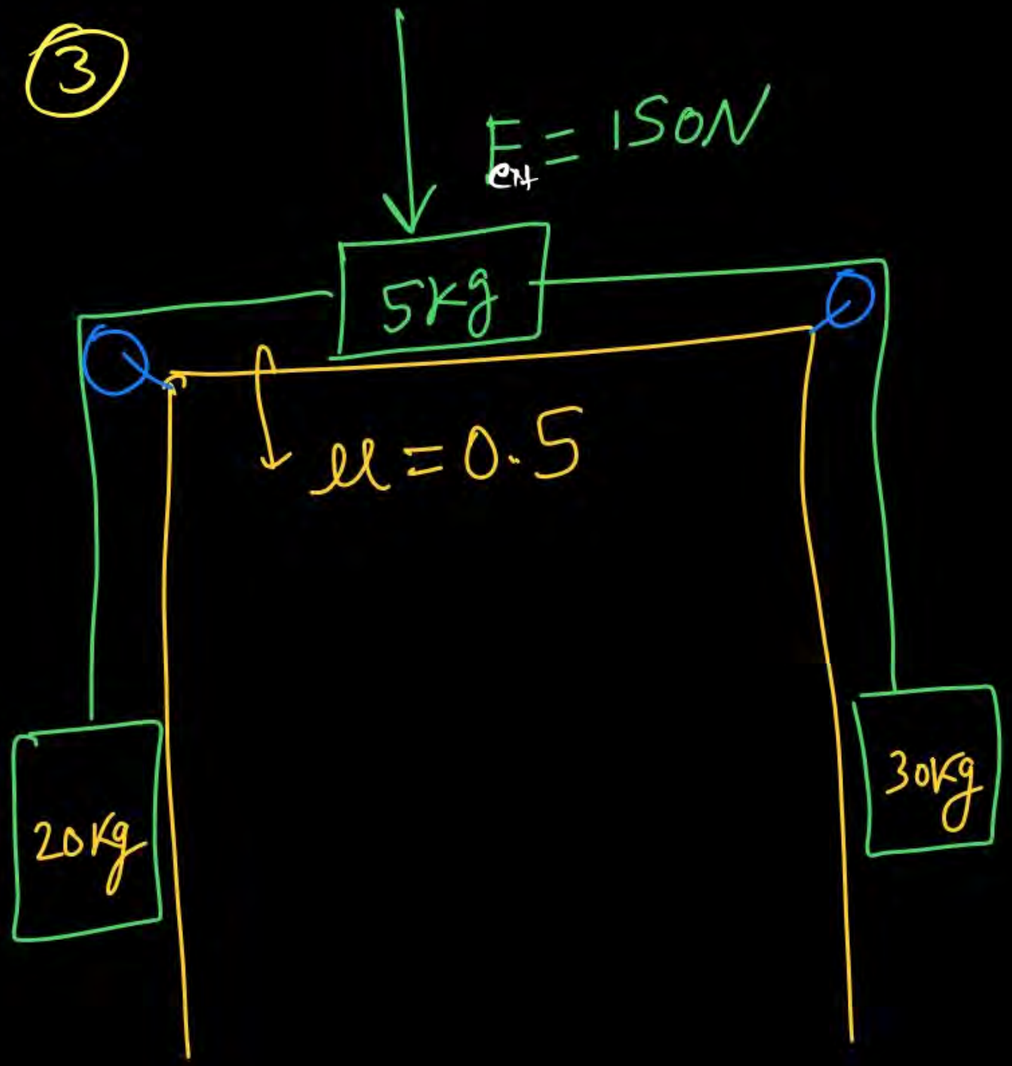
$$f_{limit} = \mu N$$
$$= \frac{6}{10} \times 200$$
$$= 120N$$

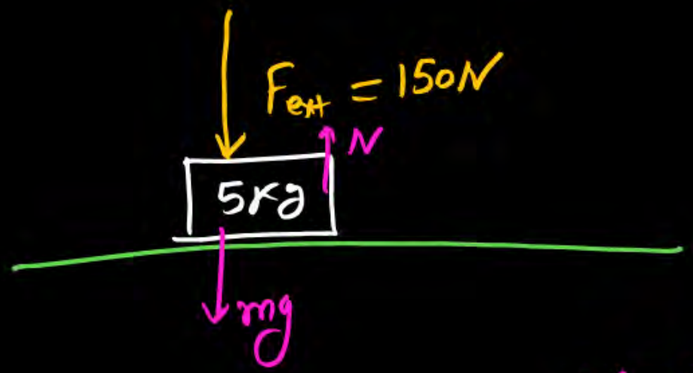
② H/W



$$f_{limiting} = \mu N$$
$$= \frac{4}{10} \times 200$$
$$= 80N$$

(3)





$N = mg + F_{ext}$

$N = 150 + 50$

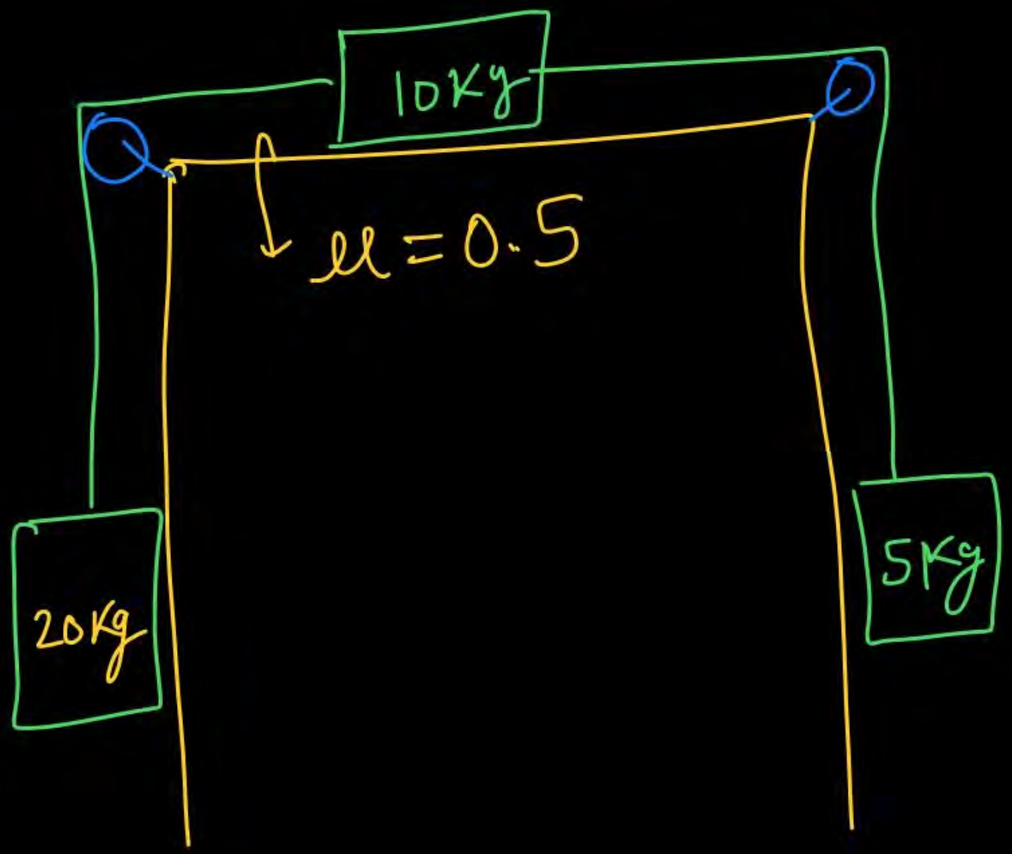
$N = 200N$

$f_{lim} = \mu N$

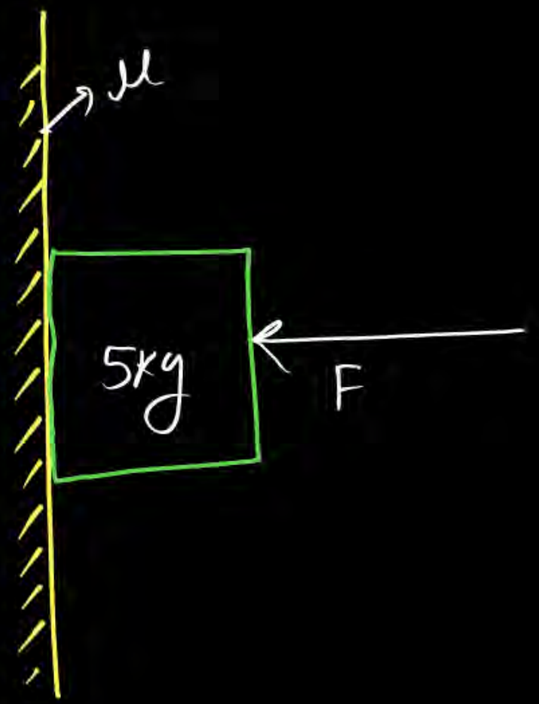
$= \frac{5}{10} \times 200$

$f_{lim} = 100N$

(5) H/W



(6)



object is at rest in given fig! —
then find (i) Normal by wall on object

(ii) friction force on 5kg.

H/w → Do all 6-Question

→ DPP

→ Sanghosh assignment - 3

THANK YOU