MIND MAP FOR JEE ASPIRANTS

Physics

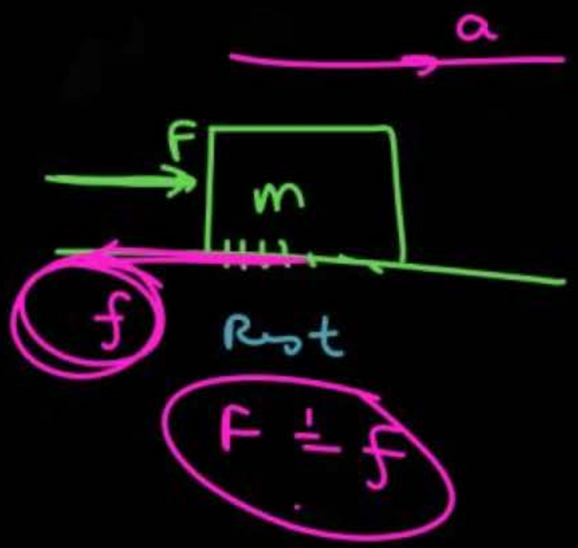
Friction

By- Saleem Ahmed Sir

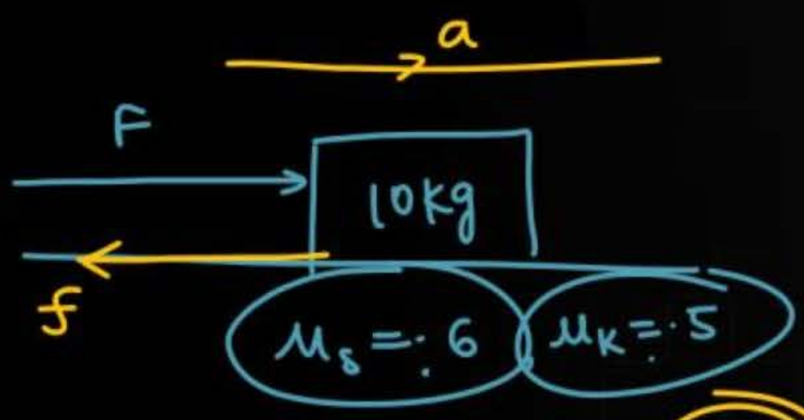
friction

→ static ⇒ $(f_s)_{max} = \mu_s N$

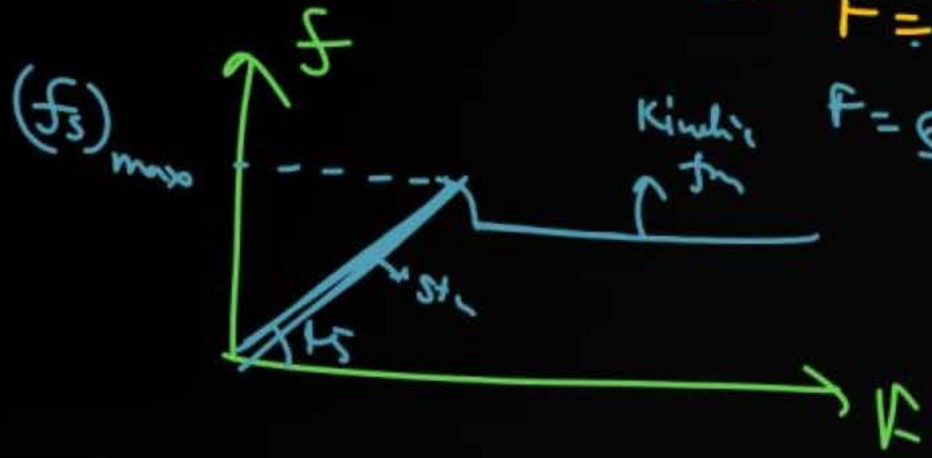
→ kinetic fric ⇒ $f_k = \mu_k N = \text{Const}$



Initial rest

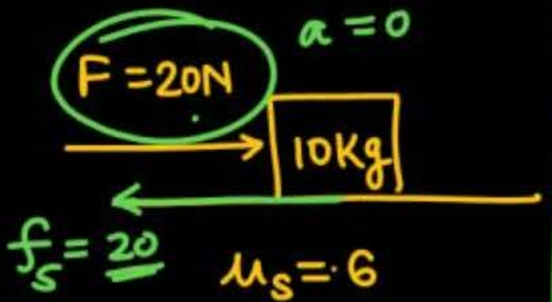


$(f_s)_{max} = .6 \times 100 = \underline{60}$



	a	f
$F = 10$	0	10 पीछे
$F = 20$	0	20 "
$F = 30$	0	30
$F = 40$	0	40
$F = 50$	0	50
$F = 59.999$	0	59.9999
$F = \underline{60.1}$	✓	$f_k = 50$
	$\frac{60.1 - 50}{10}$	
	$= \underline{1.01}$	

Static friction

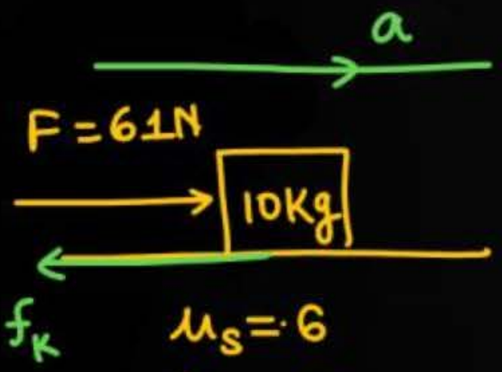


$\mu_s = .6$

$\mu_k = .5$

$(f_s)_{max} = 60$

$f_k = 50$

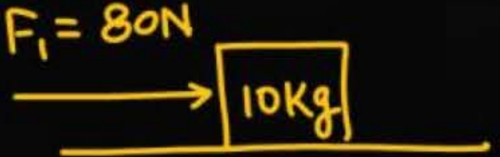


$\mu_s = .6$

$\mu_k = .5$

$a = \frac{61 - 50}{10}$

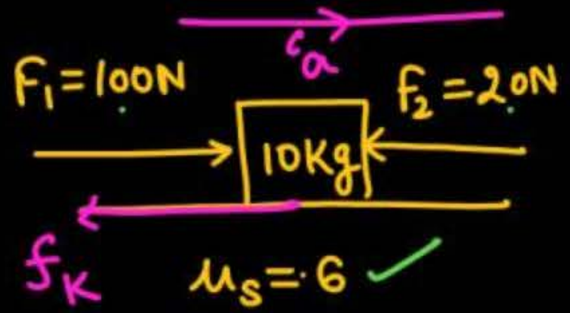
$f_k = 50$



$\mu_s = .6$

$\mu_k = .5$

$a = 3$

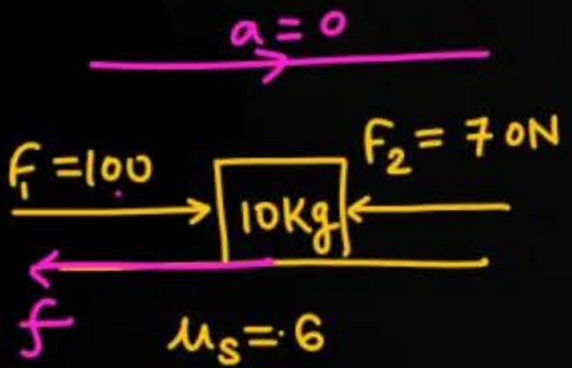


$\mu_s = .6$ ✓

$\mu_K = .5$

$$a = \frac{100 - 20 - 50}{10}$$

$$= 3$$



$\mu_s = .6$

$\mu_K = .5$

$a = 0$

$f = 30 = f_s$

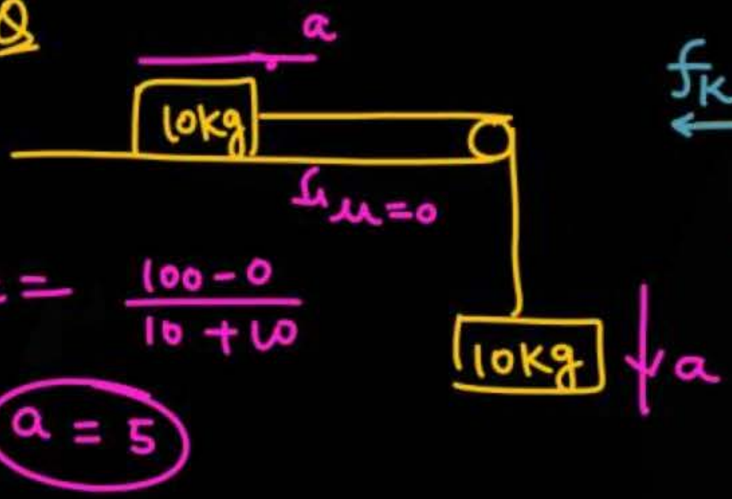
$\mu_s = .6$

$\mu_K = .5$

$a = 0$

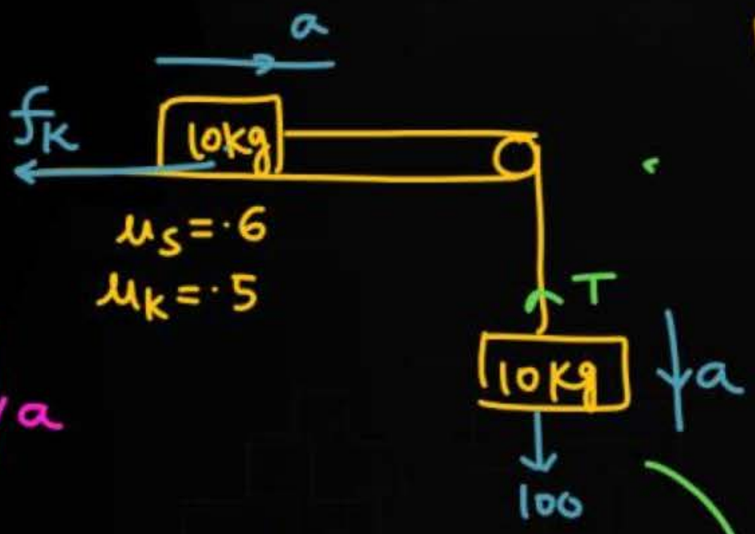
$f = 0$

Q



$$a = \frac{100 - 0}{10 + 10}$$

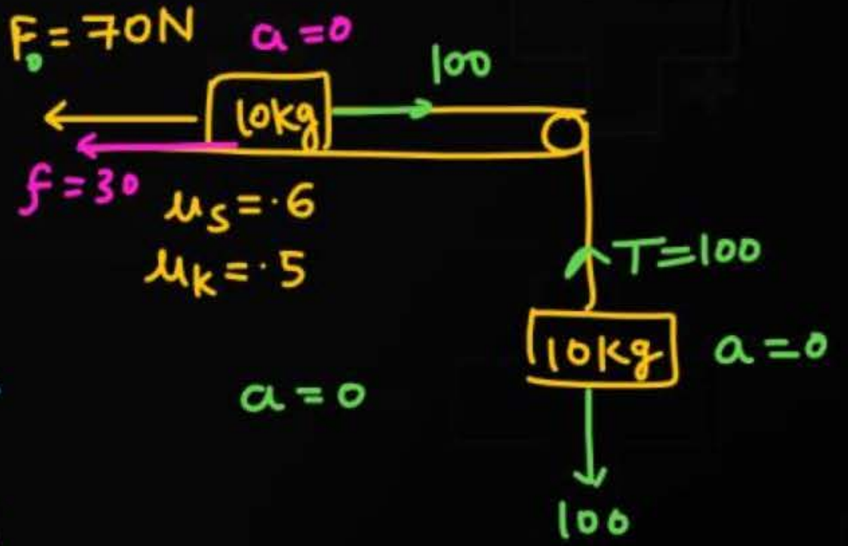
$a = 5$

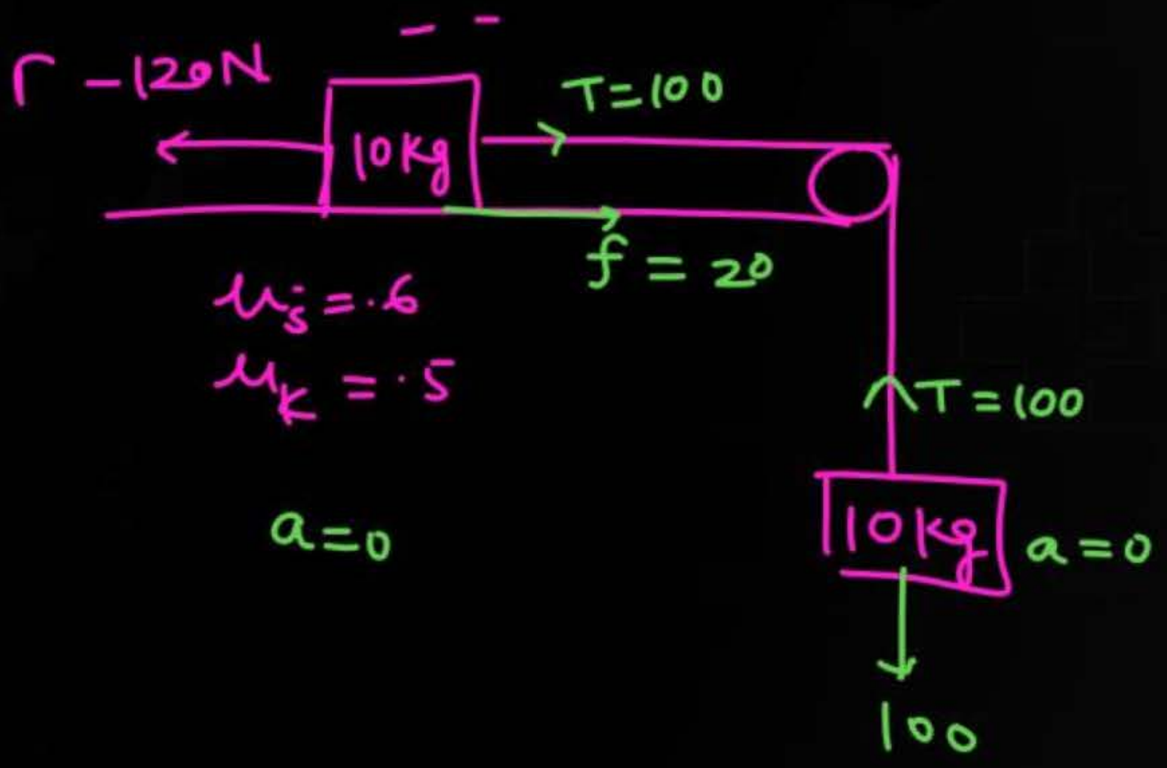


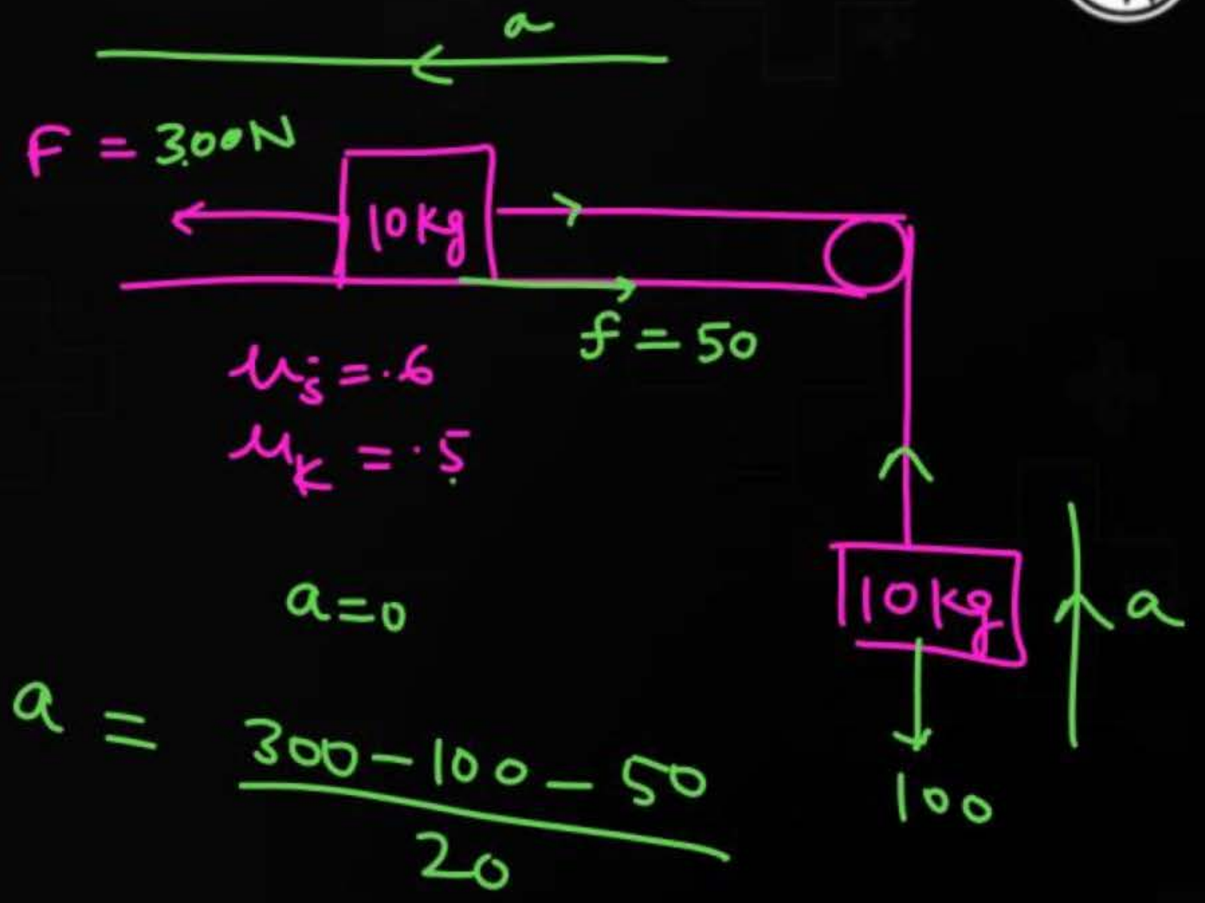
$$a = \frac{100 - 50}{10 + 10}$$

$f = 50$

$100 - T = 10a$

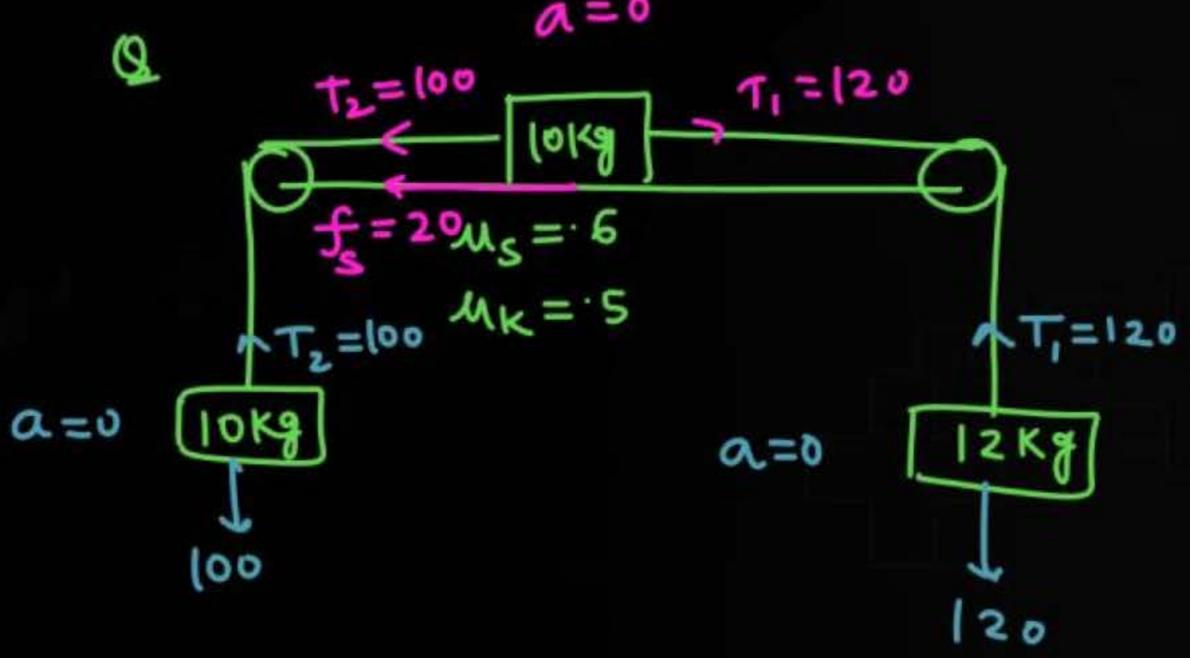


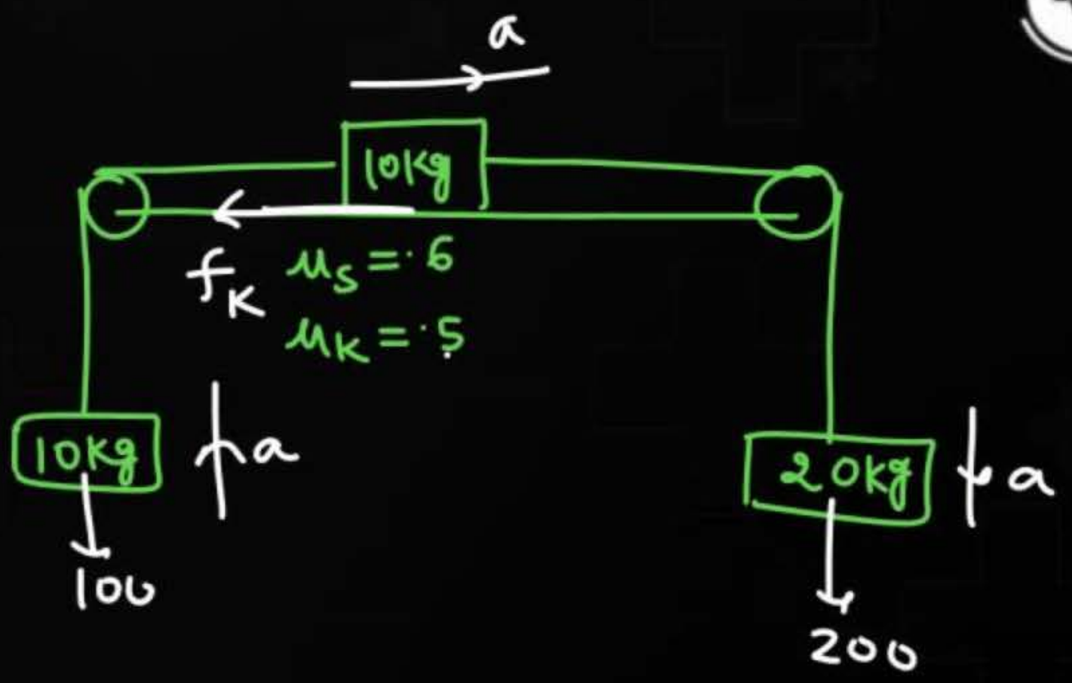




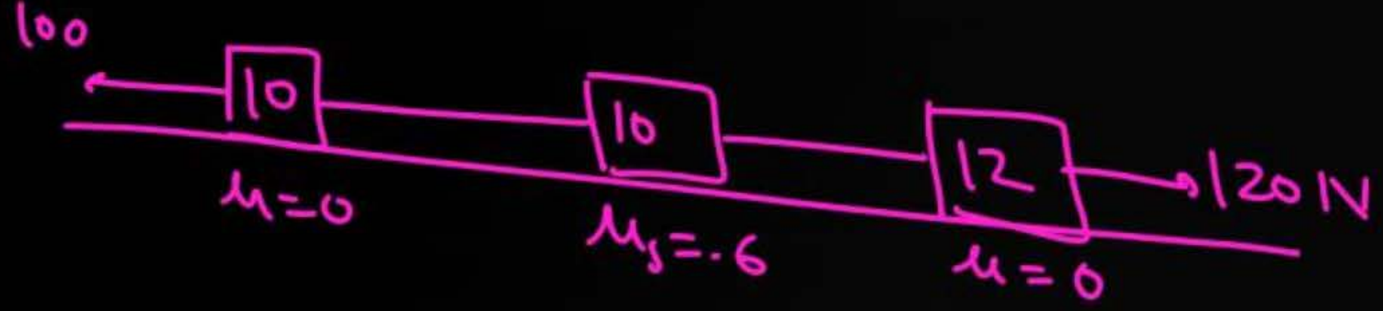
$$a = \frac{300 - 100 - 50}{20}$$

Q

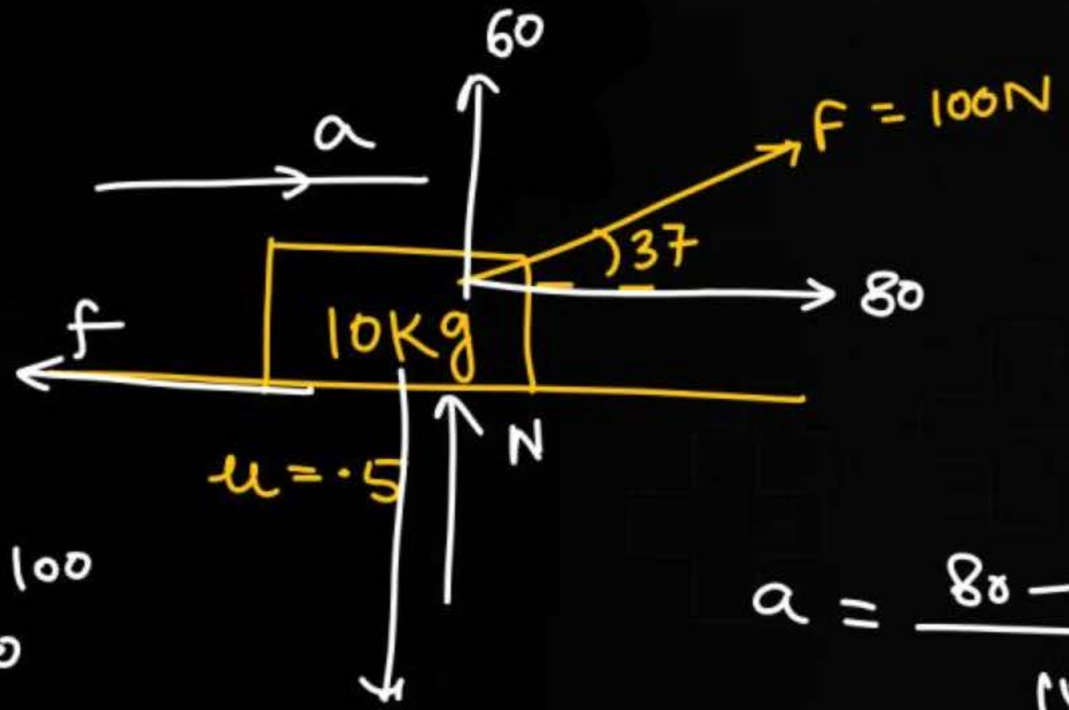




$$a = \frac{200 - 100 - 50}{10 + 10 + 20}$$



Q



$N + 60 = 100$

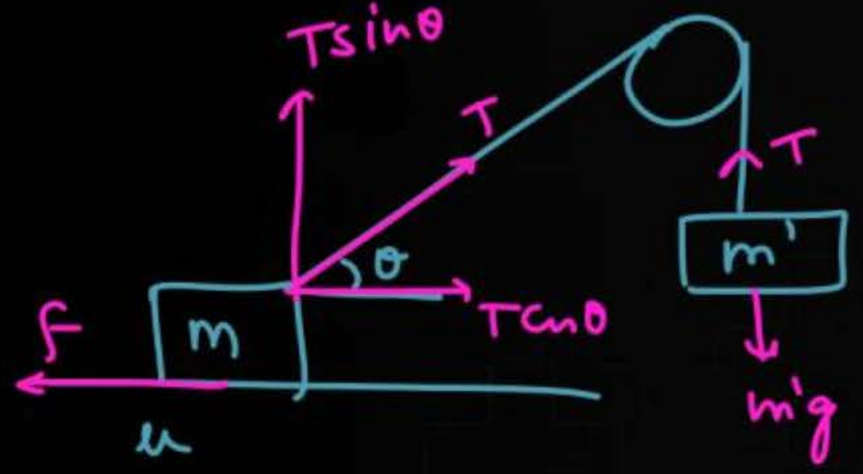
$N = 40$

$$a = \frac{80 - f}{10}$$

$f = \mu N$

$= .5 \times 40 = 20$

Q



$(m')_{min\ value}$ so that m move

$T\cos\theta \geq (f_s)_{max}$

$T\cos\theta \geq \mu(mg - T\sin\theta)$

In the figure shown a ring of mass M and a block of mass m are in equilibrium. The string is light and pulley P does not offer any friction and coefficient of friction between pole and M is μ. The frictional force offered by the pole on M is

(A) Mg directed up

(B) μmg directed up

(C) $(M-m)g$ directed down

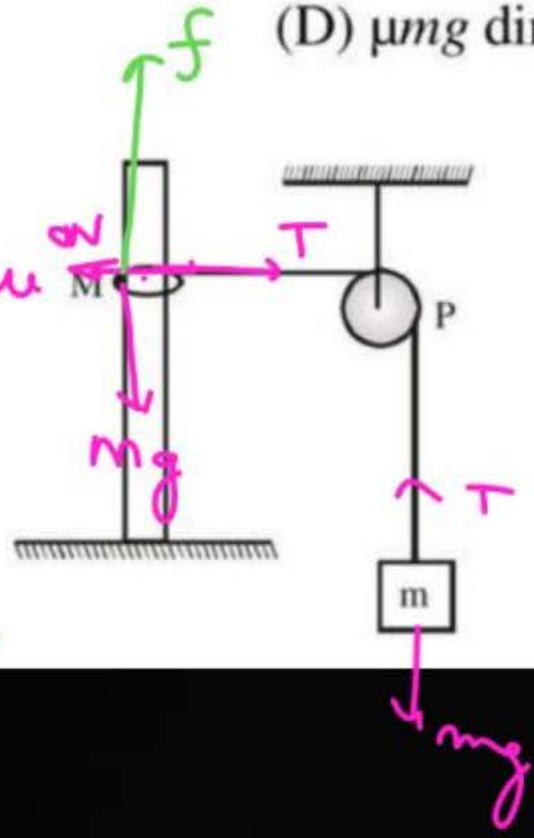
(D) μmg directed down

μMg ✗

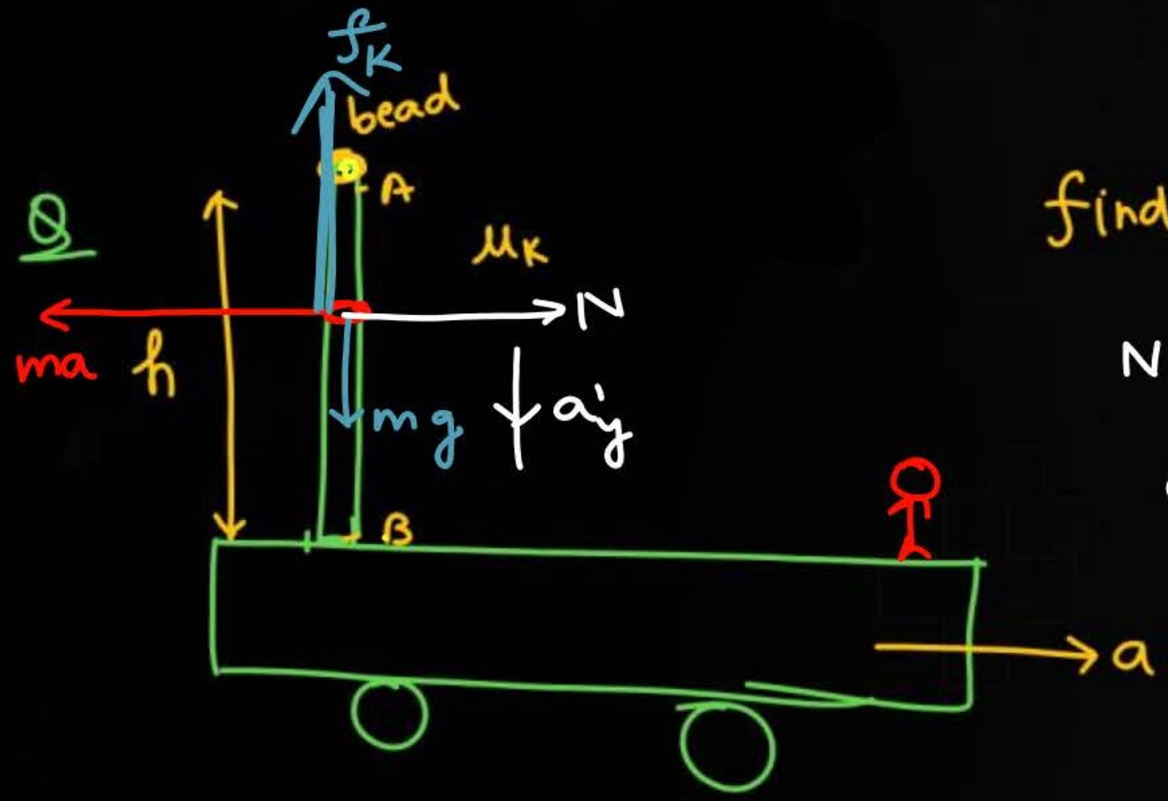
$T = N = mg$

$f = \mu N = \mu T$

$= \mu mg$



$f = Mg$

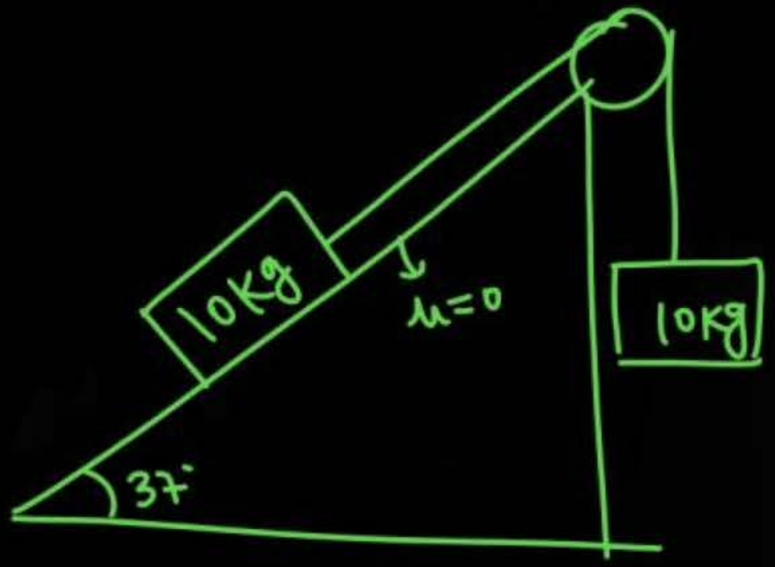


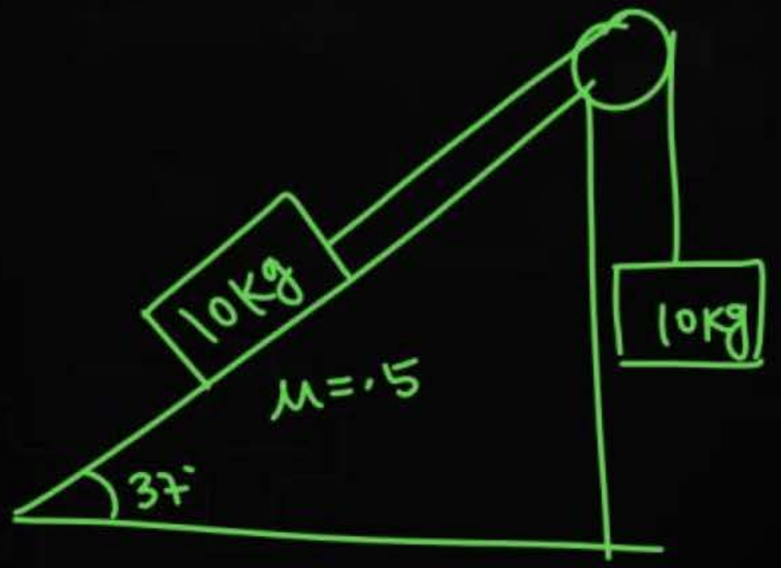
find time taken by bead to reach B from A

$N = ma$

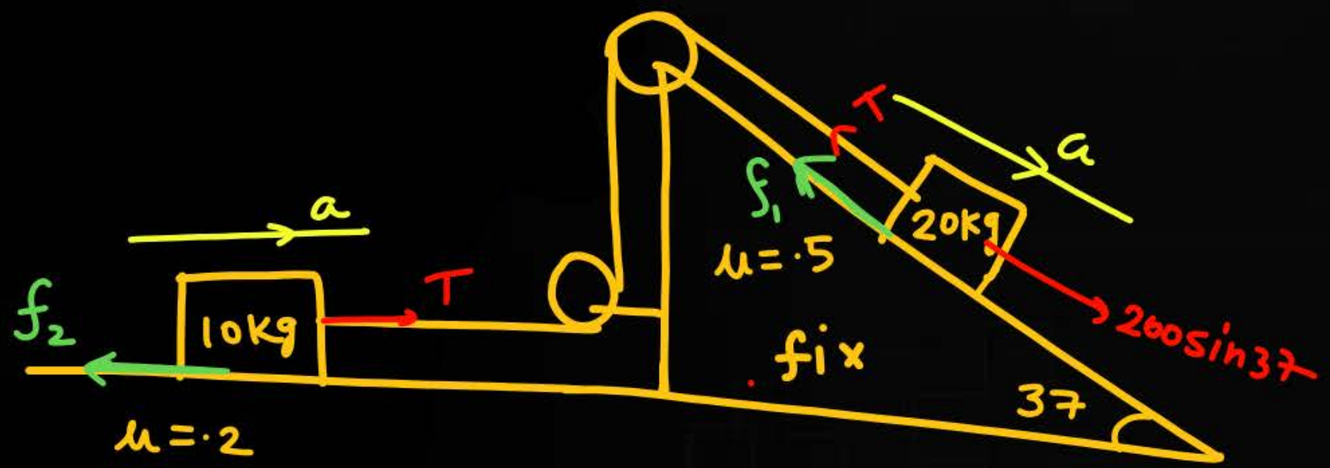
$$a'_y = \frac{mg - f}{m} = \frac{mg - \mu ma}{m}$$

$$h = 0 + \frac{1}{2} \times a'_y t^2$$


10kg
μ=0
10kg
37°


10kg
μ=.5
10kg
37°

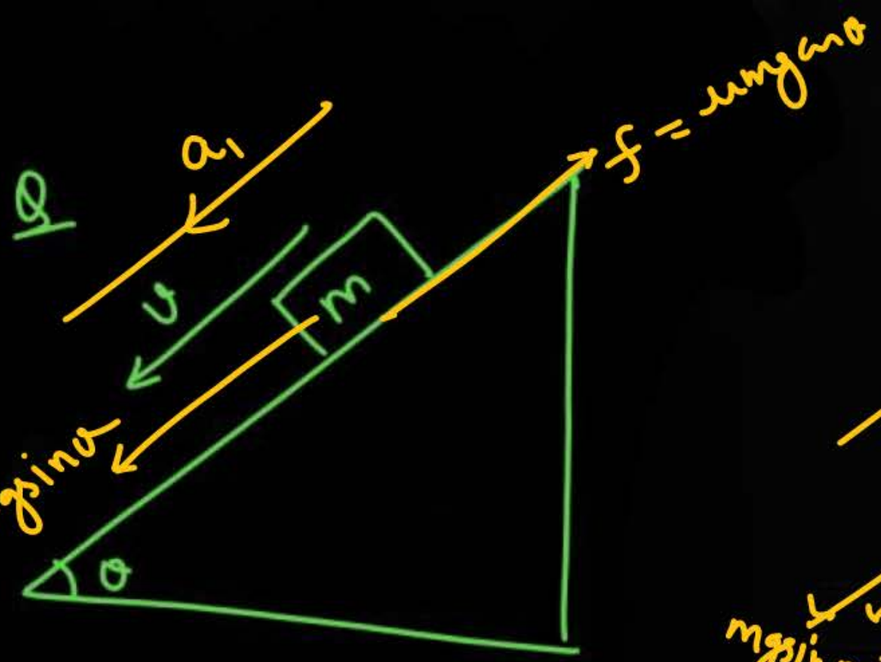
Q



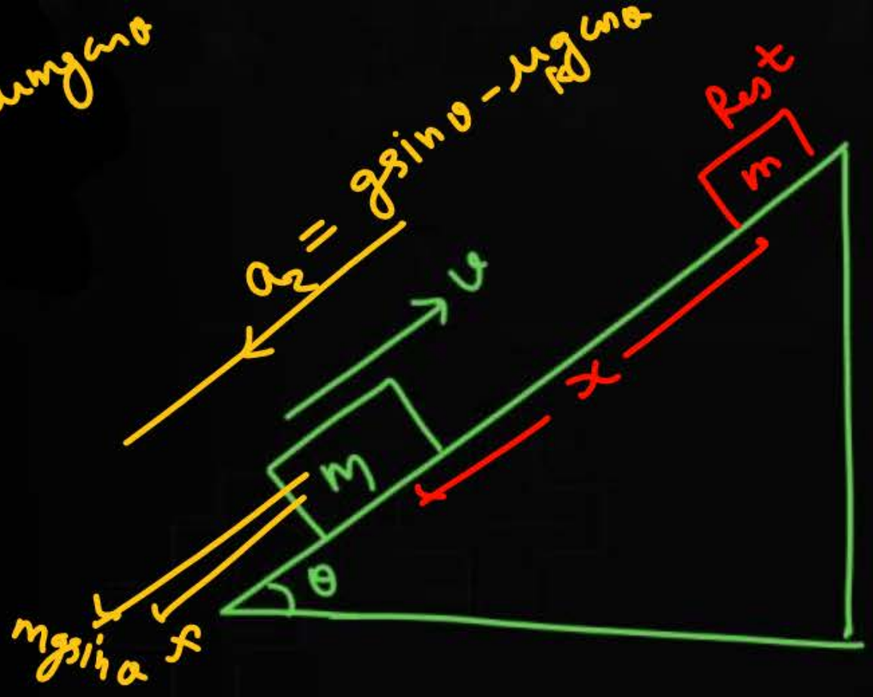
$200\sin37 - f_1 - T = 20a$

$T - f_2 = 10a$

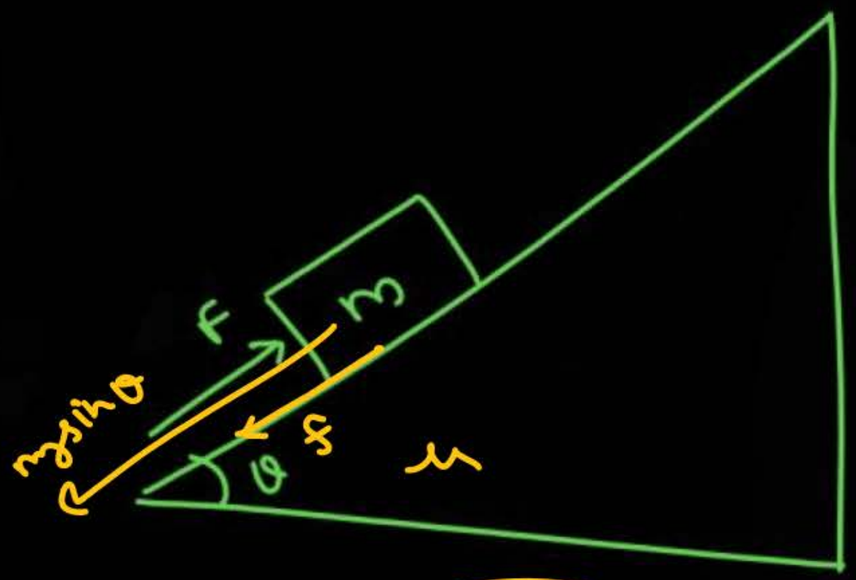
$$a = \frac{200\sin37 - .5 \times 200\cos37 - .2 \times 100}{30}$$



$a_1 = g\sin\theta - \mu g\cos\theta$

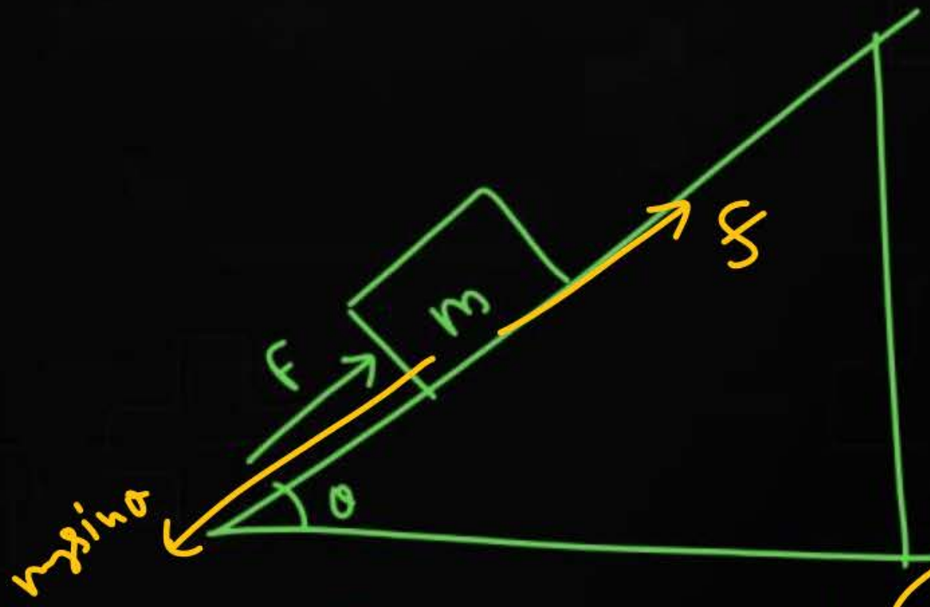


$a_2 =$



F_{min} to slide up

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

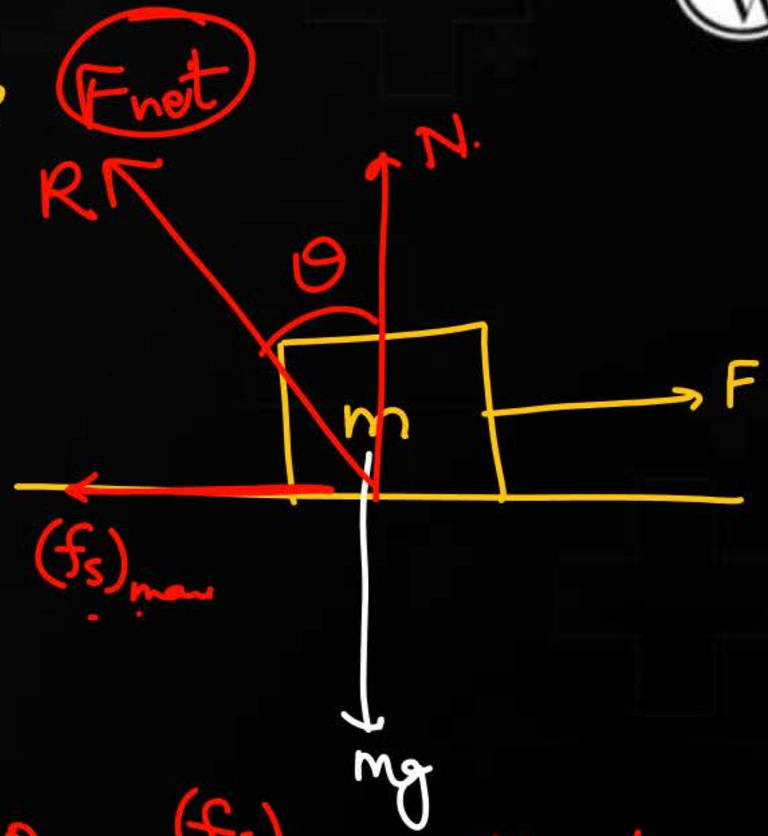


F_{min} to prevent slipping down

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

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

Angle of repose



$mg\sin\theta = \mu_s mg\cos\theta$

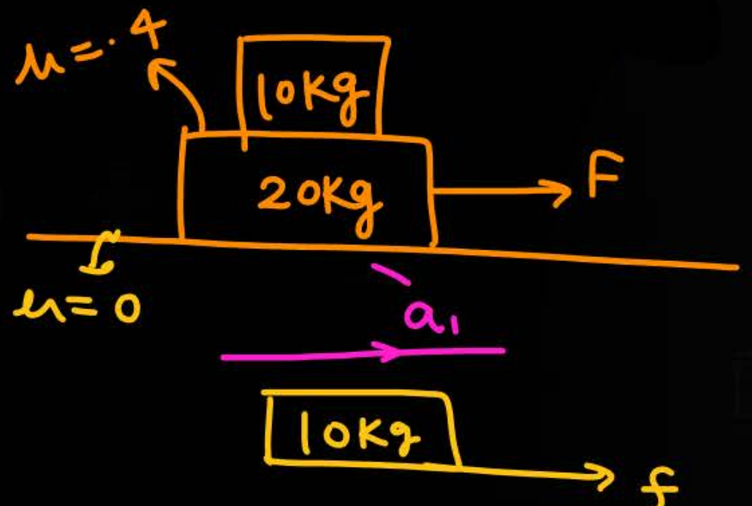
$\mu_s = \tan\theta$

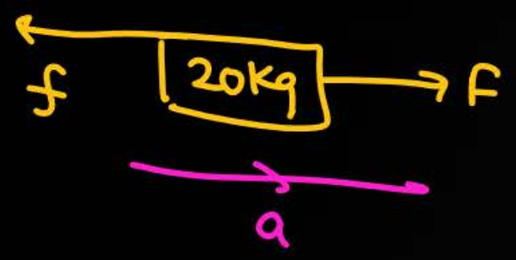
$\theta = \tan^{-1}\mu_s$

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

$= \mu_s$

Q





① Find $(a_{common})_{max}$ so that both move together with same acc $= 4$

② Find f_{max} so that both move together with same acc. $= 120$

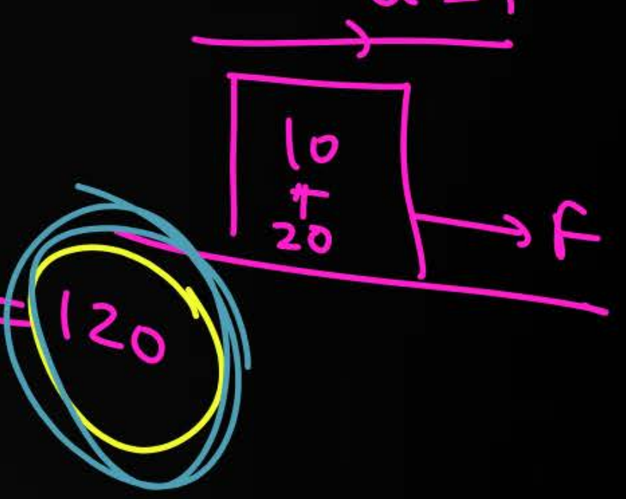
$f_{max} = .4 \times 100 = 40$

$a_1 = \frac{f}{m_1}$

$(a_1)_{max} = \frac{f_s}{m_1} = \frac{40}{10} = 4$

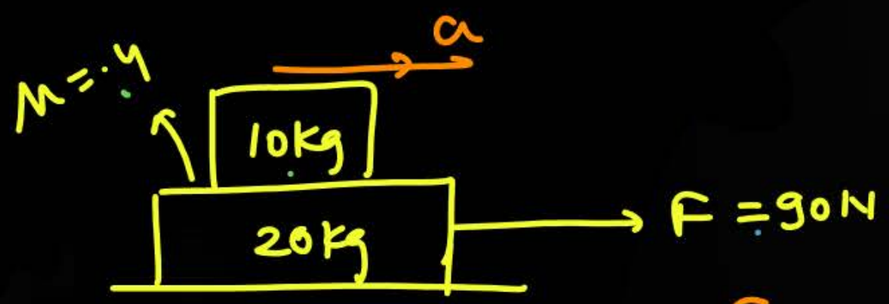
$(a_c)_{max} = 4$

$F = 30 \times 4 = 120$



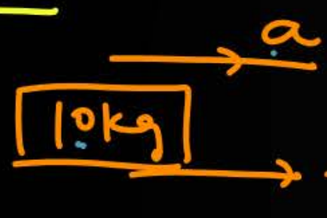
- $F \leq 120$
  $a_1 = a_L$, No slipping
  Soln - 3
- $F > 120$
  $a_1 \neq a_2$
  Slipping

$F < 120 \Rightarrow$ साथ में

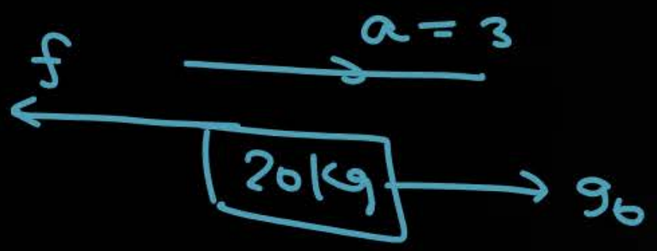


$90 = (10+20)a$

$a = 3$



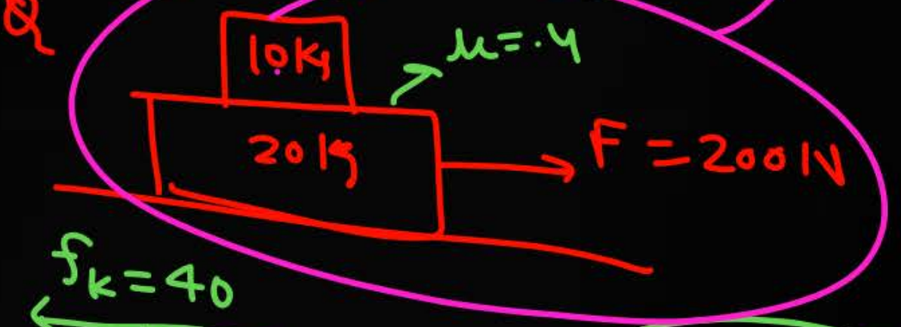
$f = 10 \times a = 10 \times 3 = 30$

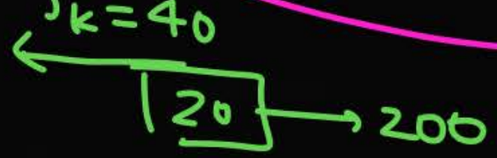


$90 - f = 20 \times 3$

$f = 30$

Q





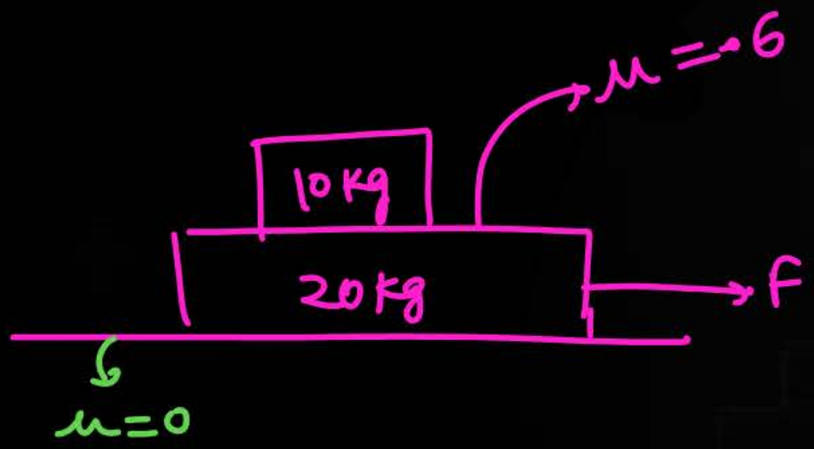
$F_{net} = m_1a_1 + m_2a_2$

$200 = 10 \times 4 + 20 \times 8$

$200 = 40 + 160$

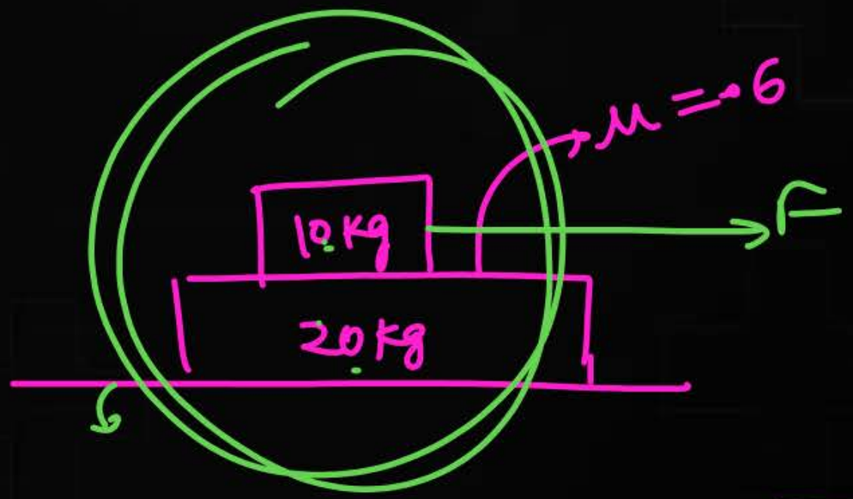
$a_{ऊपर} = 4$

नीचे $= 8$



$F \leq 180$ साथ में

$F > 180$ $\rightsquigarrow a_1 \neq a_2$

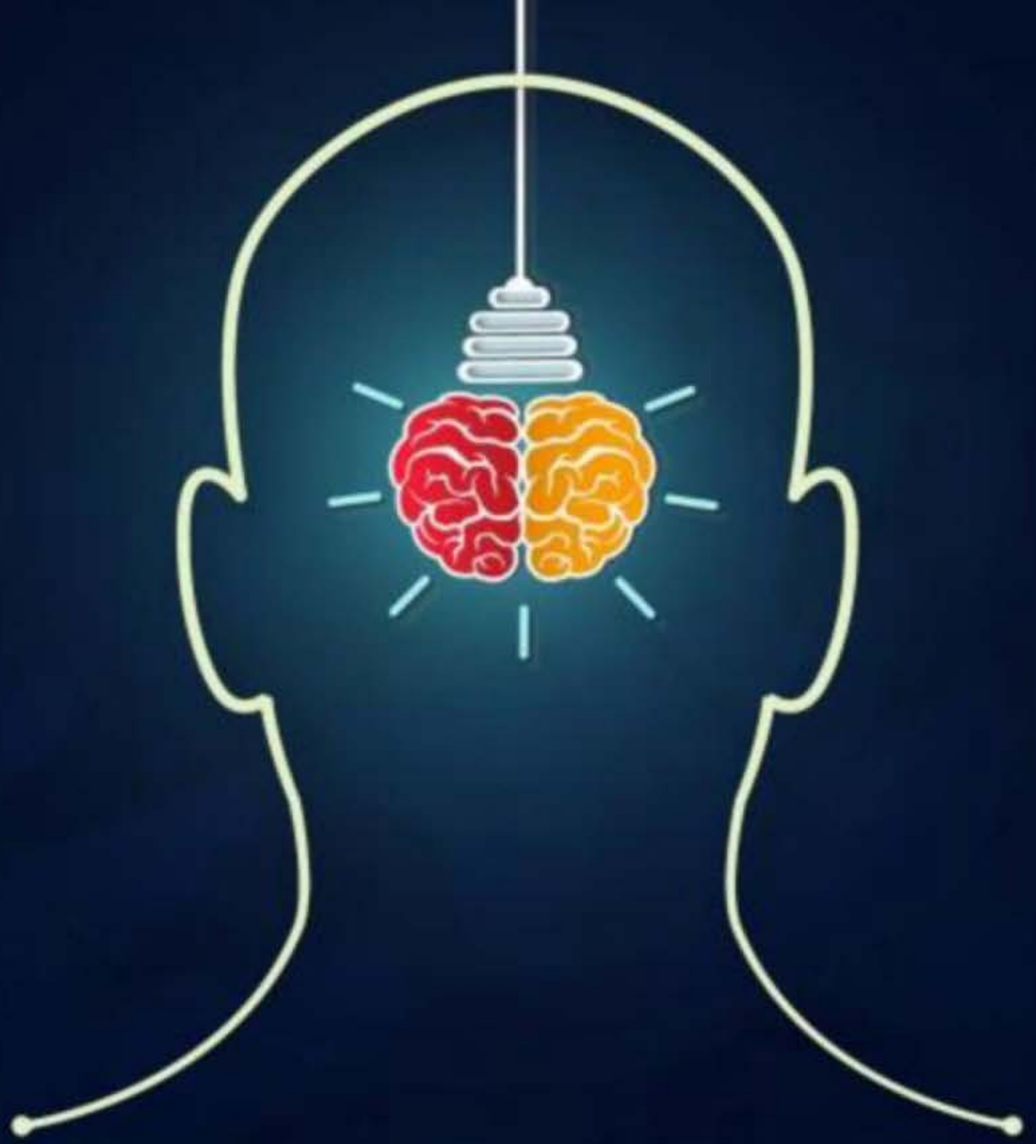


$(f_s)_{max} = 60$

20kg → f

$F = 30 \times 3$

$F \leq 90$ तक



THANK YOU