YAKEEN NEET 2.0

2026

Laws of Motion

PHYSICS | Lecture 11

By - Saleem Ahmed Sir

Todays Goal

Concept Clearity on Psuedo Force and G eff

Friction Introduction

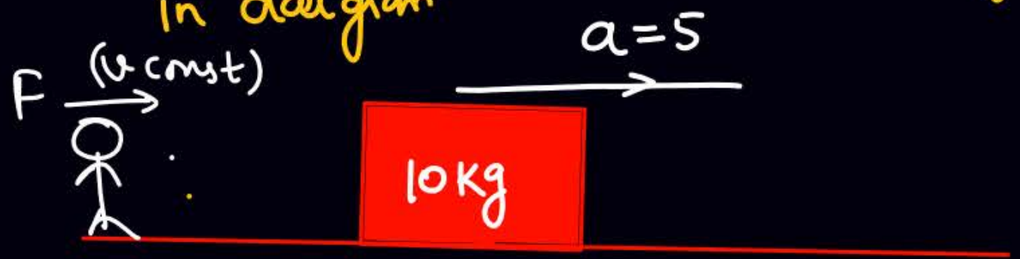
- HCV ⟶ 90%. ✓
- JM ⟶ 90%. ✓

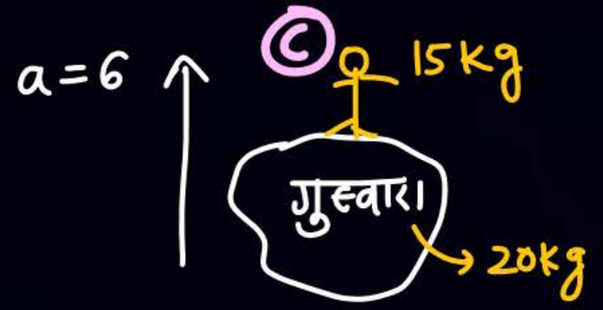
NEET ⟶ 100%.

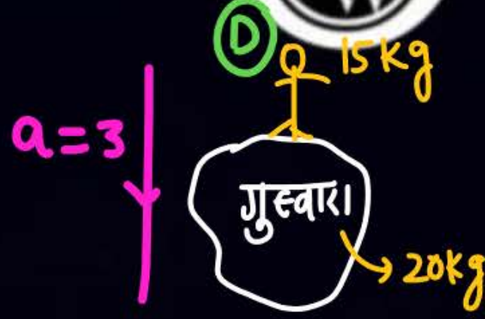
JA ⟶ ✓

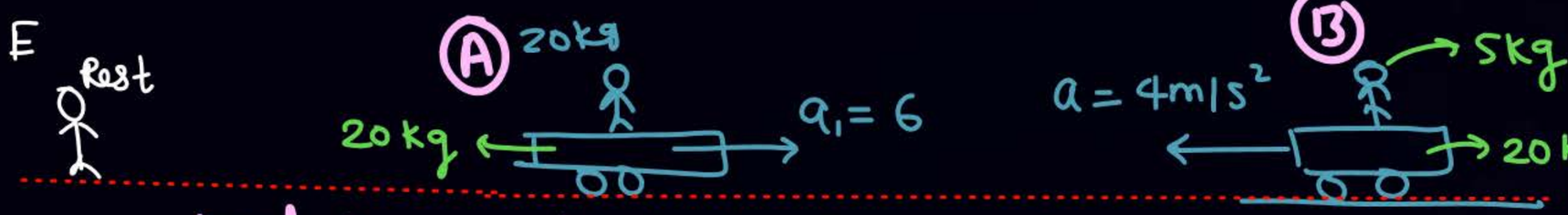
⟶ Based ques. 1 liner qus / formula oriented / 1 step qus.

SSSQ Q A block of mass 10kg is moving with acc $a = 5\ m/s^2$ as shown in daigram









Psedo force on block in frame of A $= m_{block}\, a_A = -10 \times (6\hat{i}) = -60\hat{i}$

" " " B $= -10 \times (-4)\hat{i} = 40\hat{i}$

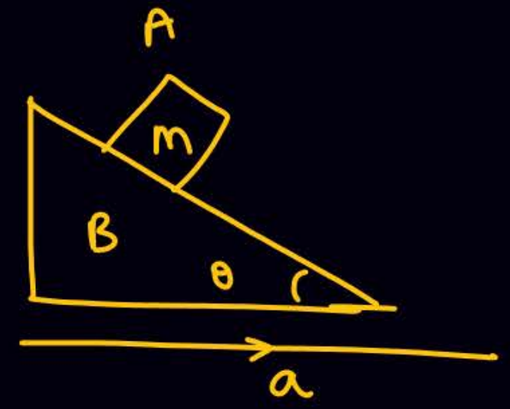
" " " C $= -10 \times 6\hat{j} = -60\hat{j}$

" " " D $= -10 \times (-3\hat{j}) = 30\hat{j}$

" " " E $= 0$

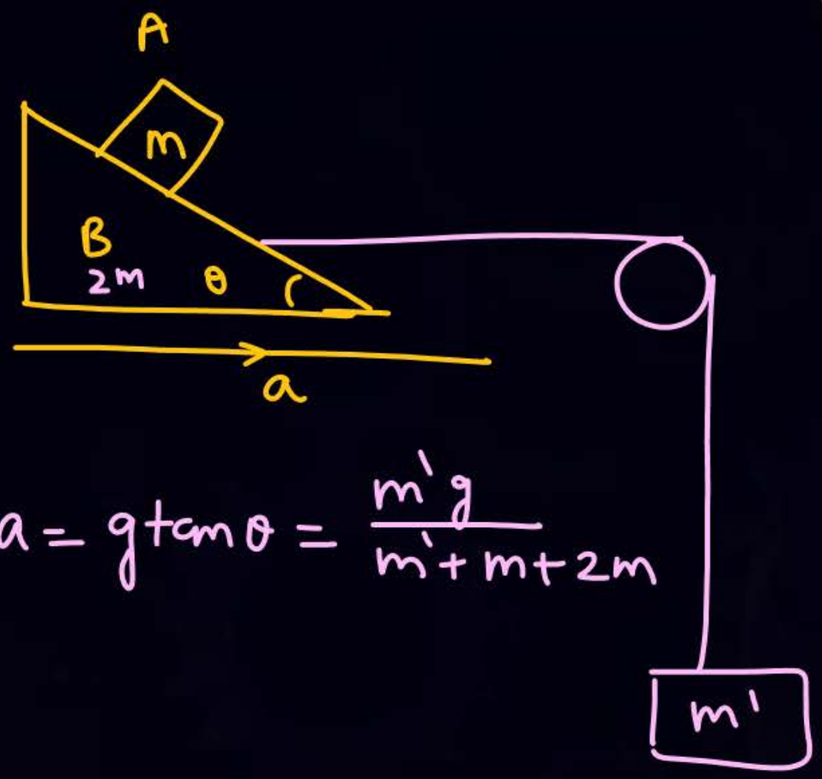
" " " F $= m_{block}\, a_{ground} = 10 \times 0 = 0$

Q



$a = ?$ so that A remains at rest wrt wedge.

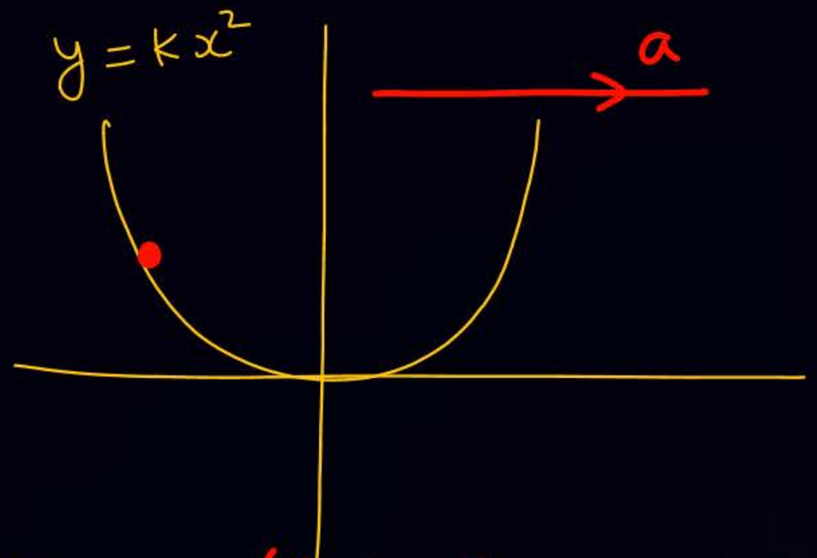
$$\boxed{a = g\tan\theta}$$



$$a = g\tan\theta = \frac{m'g}{m'+m+2m}$$

Exp. neet

Q find a so that bead remains at rest wrt wise

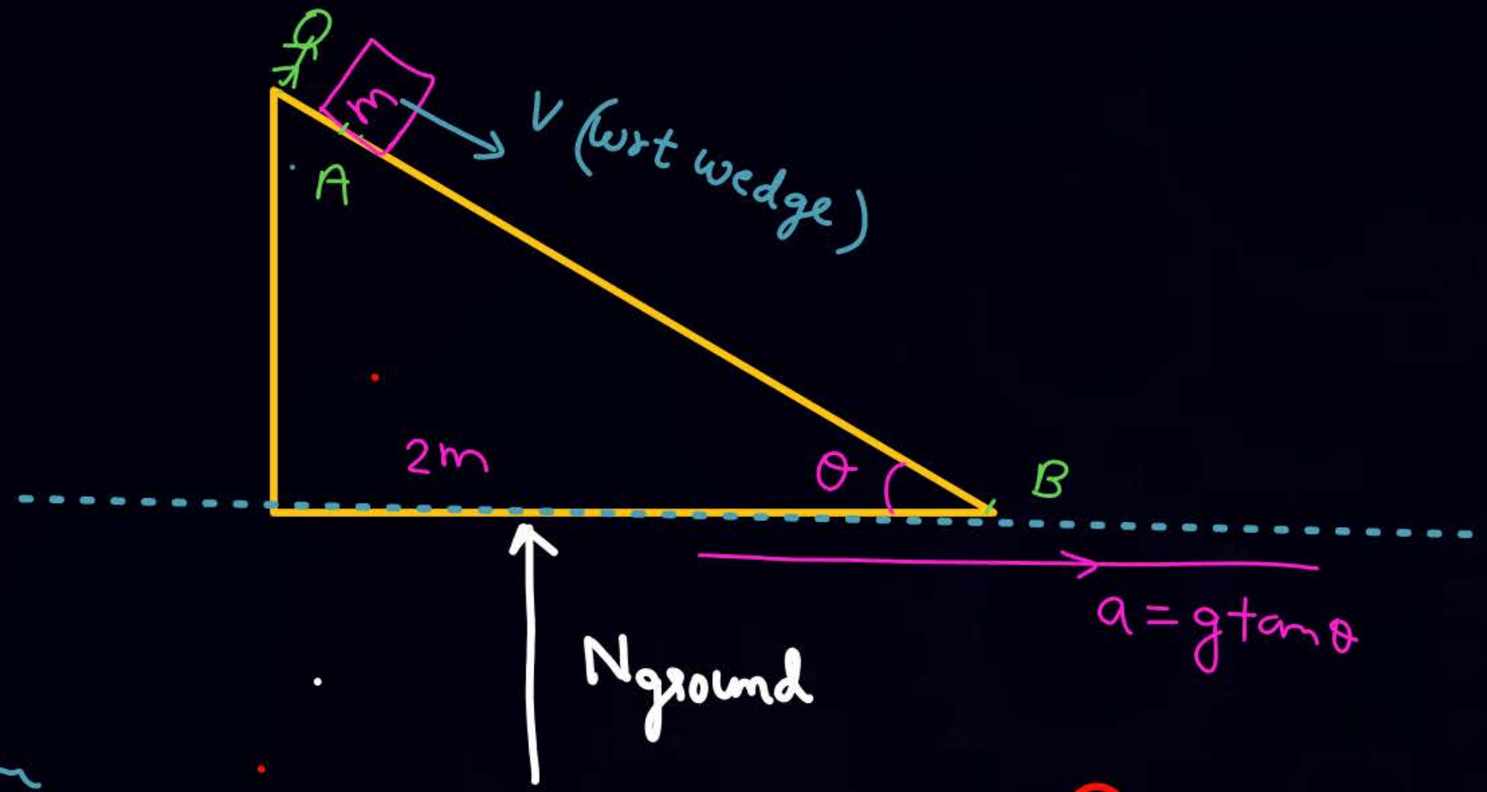


$a = g\tan\alpha = g\left(\frac{dy}{dx}\right)$, (magnitude)

$a = g\,k(2x)$

$x =$

Q



① $AB = l$

$$t_{A \to B} = \frac{l}{V}$$

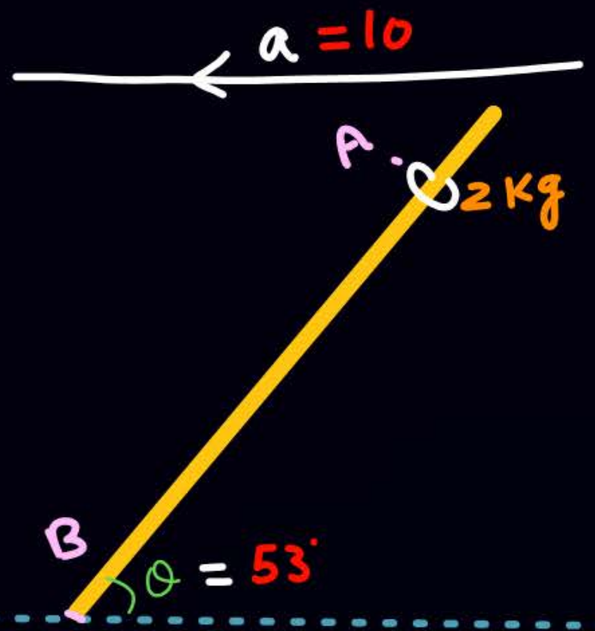
$$\text{time} = \frac{\text{Distn}}{\text{Speed}}$$

② $N_{ground} = 3mg$

(y) $\Rightarrow N_y - 3mg = m_1 a_1 + m_2 a_2$

SSSA

Q



Rod is moving with Const acc. by keeping a const on ground.

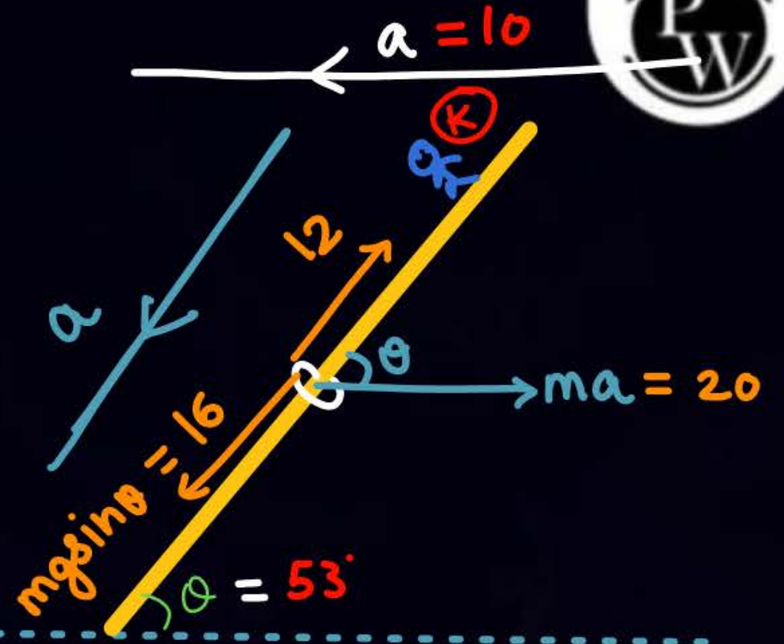
Find $a_{ring/rod} = ?$

SSSA

(b) $t_{A\to B} = ?$, $AB = 4m$

$AB = 0 + \frac{1}{2} \times 2 \times t^2$

$t = 2\ sec$

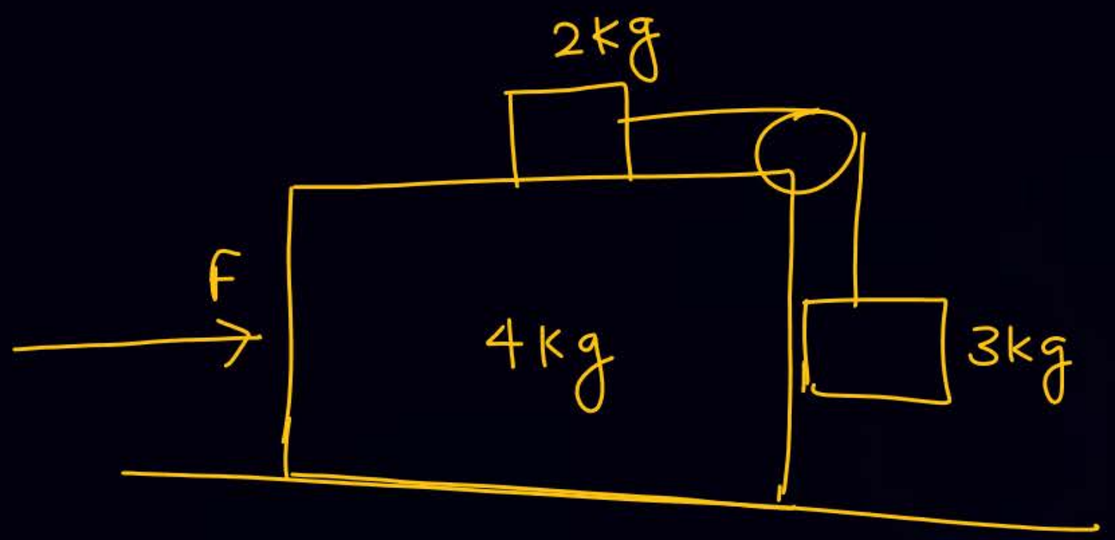


$a = \frac{16-12}{2} = 2$ = Kaddu gaay wale me batayi

$= a_{ring/rod}$

Q

find value of F so that block remains at rest wrt box.



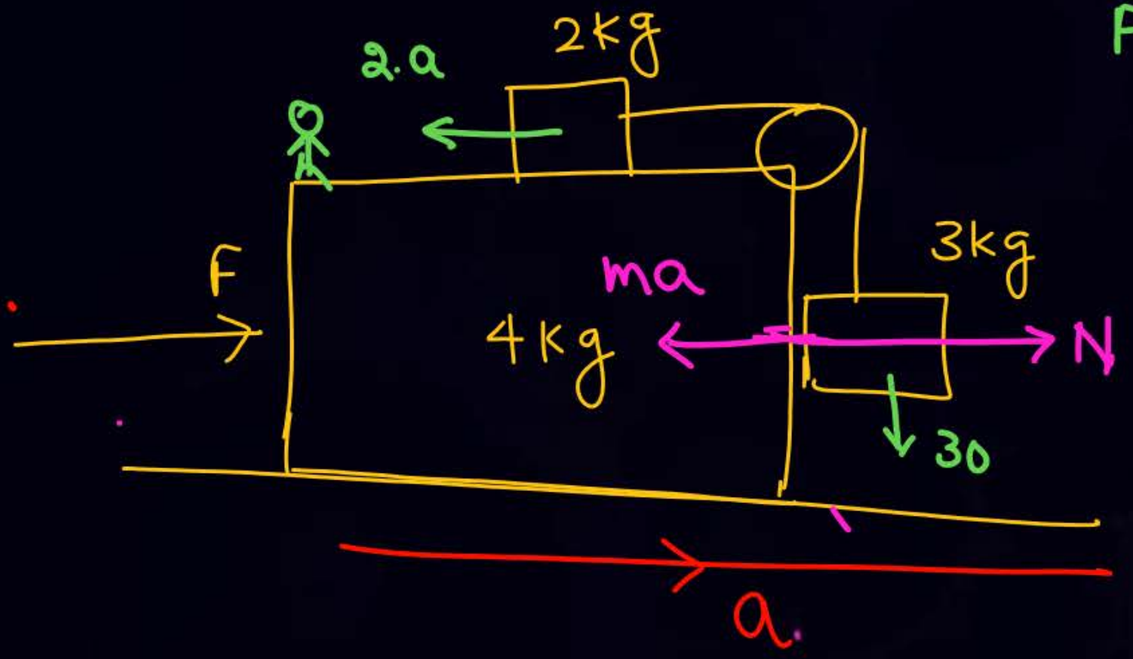
Sol^n

$30 = 2a$

$\boxed{a = 15}$

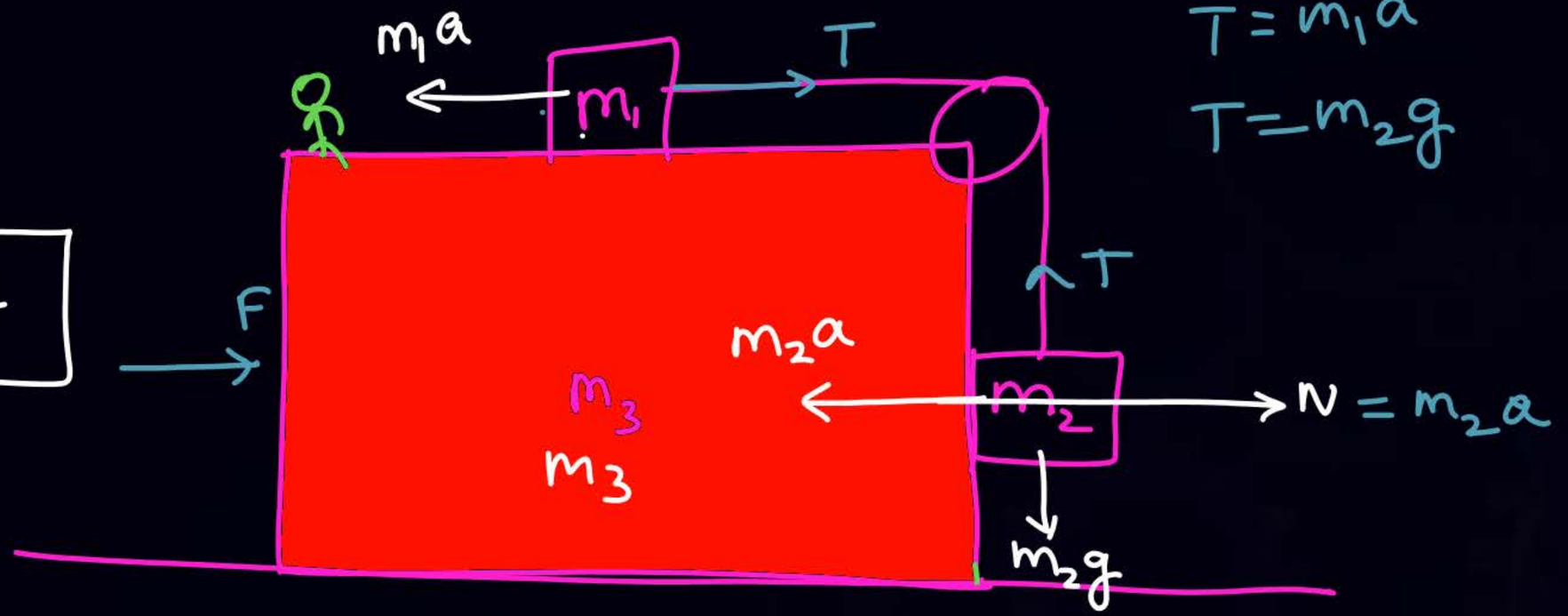
$F = (4+2+3) \times 15$

$\boxed{F = 135}$



$F = m_1a_1 + m_2a_2 + m_3a_3$

$\boxed{N = 45}$



$T = m_1a$

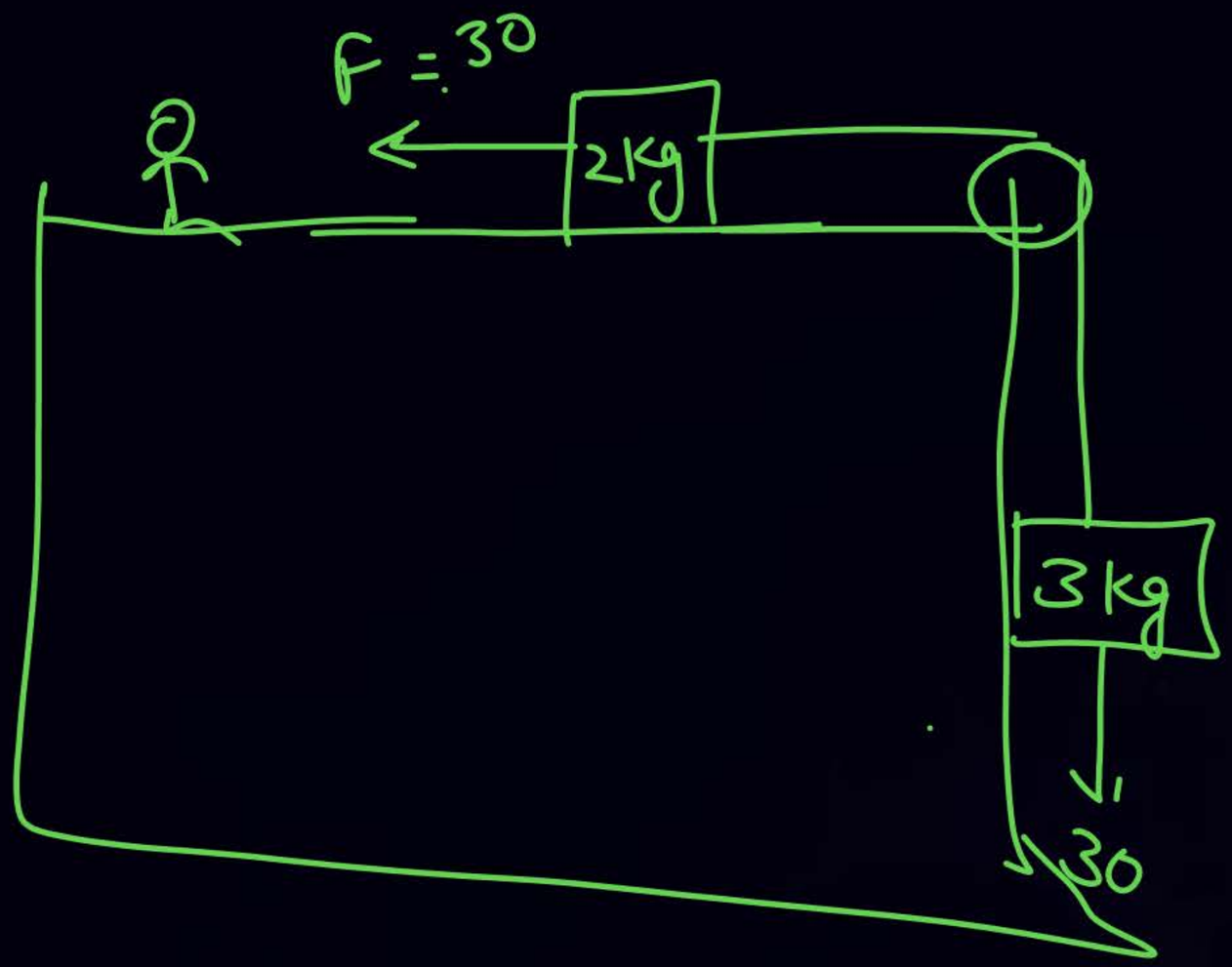
$T = m_2g$

$m_1a = m_2g$

$$\boxed{a = \frac{m_2}{m_1}g}$$

$F = m_1a + m_2a + m_3a$

$F = (m_1 + m_2 + m_3)a$.


F = 30
2kg
3kg
30

Beast mode.

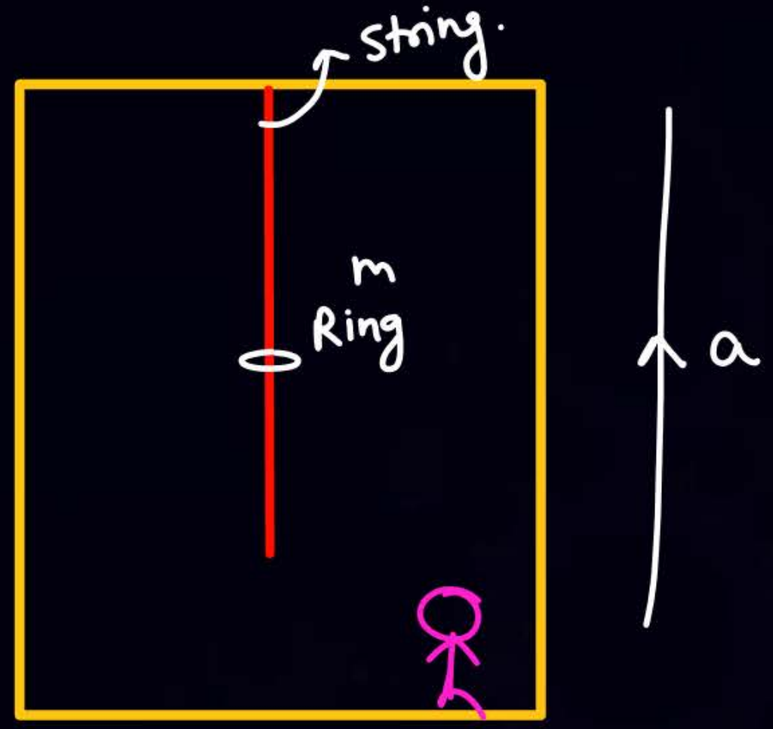
Q

If acc. of ring wrt lift is 'a' downward. Find tension.

Soln wrt lift

$mg + ma - T = ma$

$T = mg$

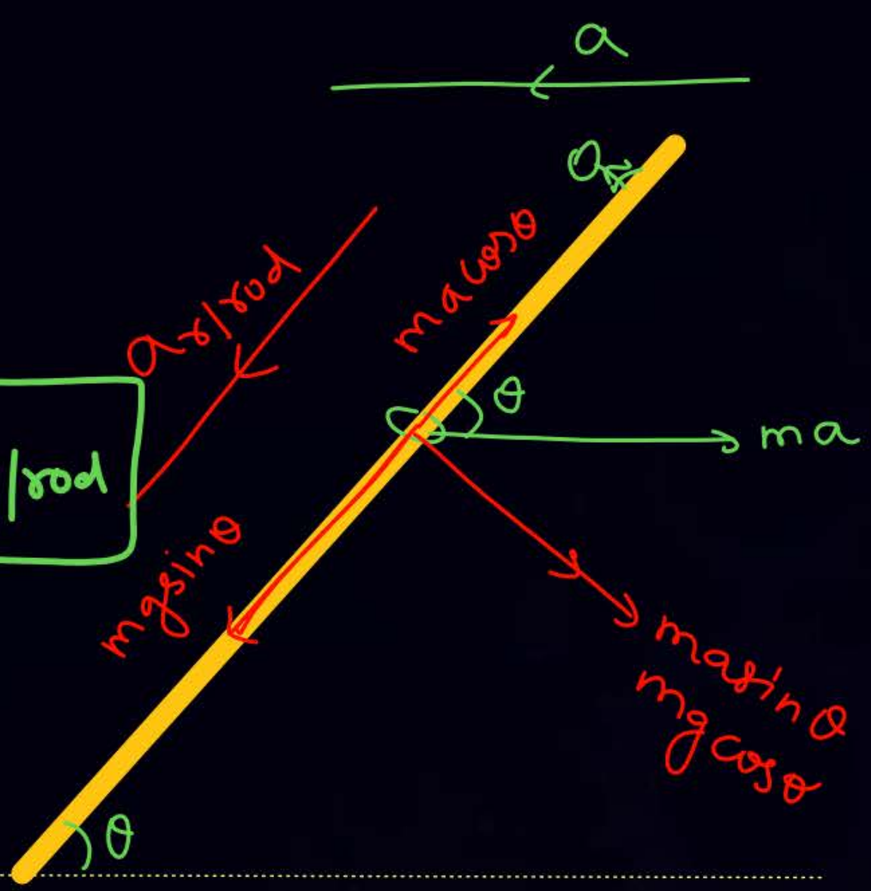


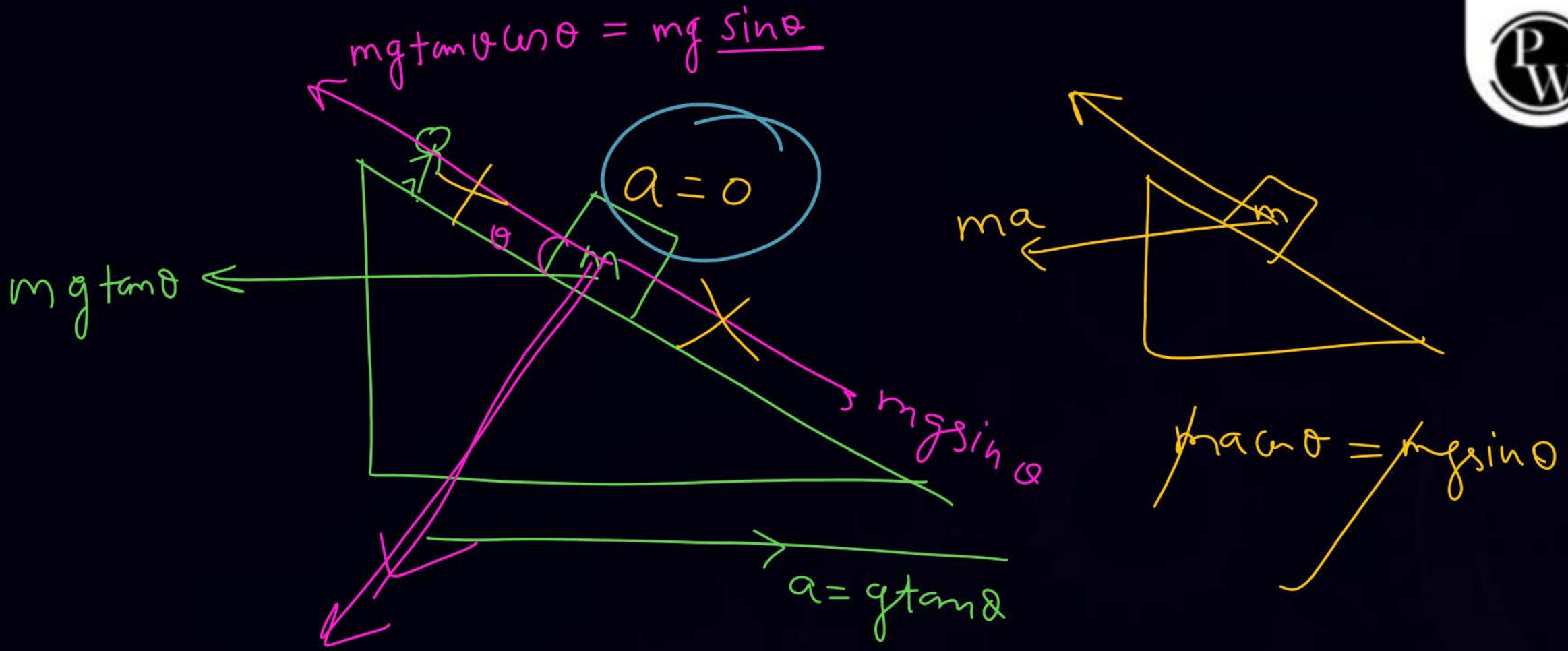
$$mg\sin\theta - ma\cos\theta = m a_{ring/rod}$$

$$a_{ring/rod} = g\sin\theta - a\cos\theta$$

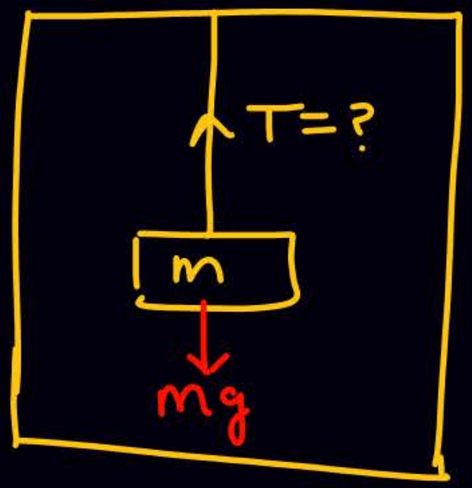
$$= 10\times\frac{4}{5} - 10\times\frac{3}{5}$$

$$= 2$$

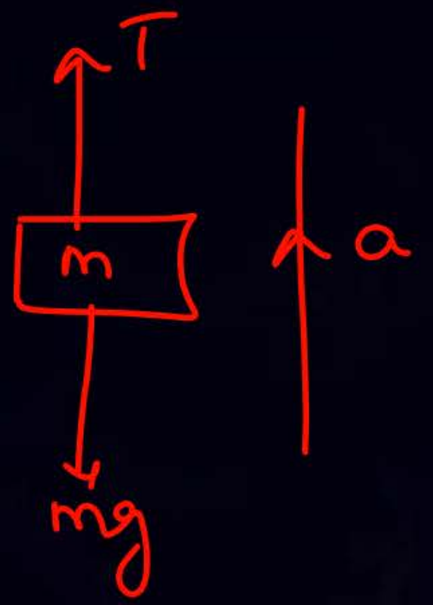



mg tanθ cosθ = mg sinθ
a = 0
θ
m
mg tanθ
mg sinθ
a = g tanθ
ma
m
ma cosθ = mg sinθ

Q



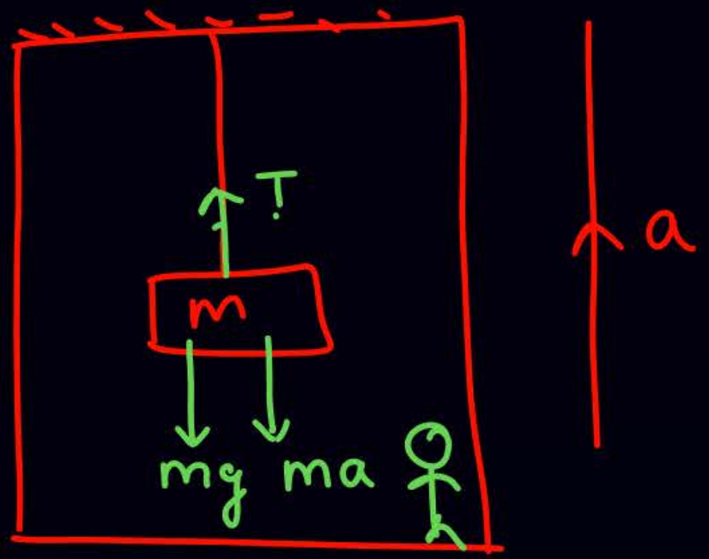
wrt ground



$$T - mg = ma$$

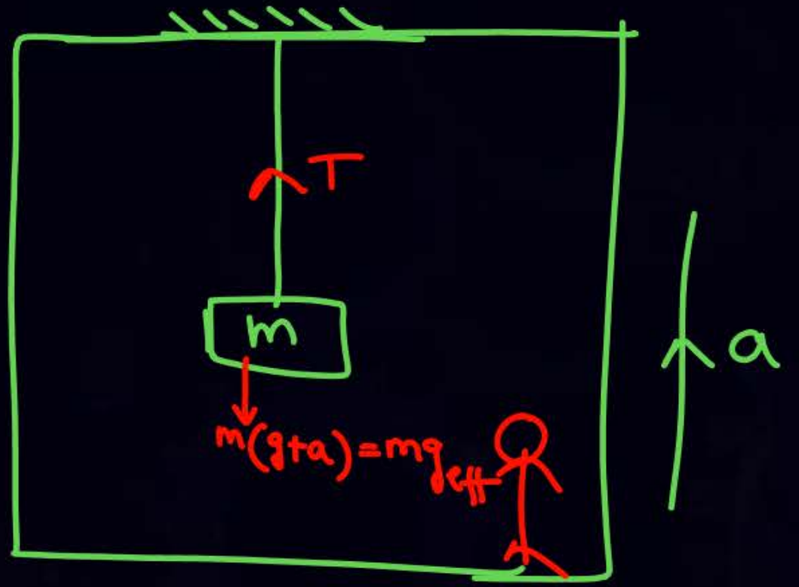
$$\boxed{T = mg + ma}$$

wrt lift



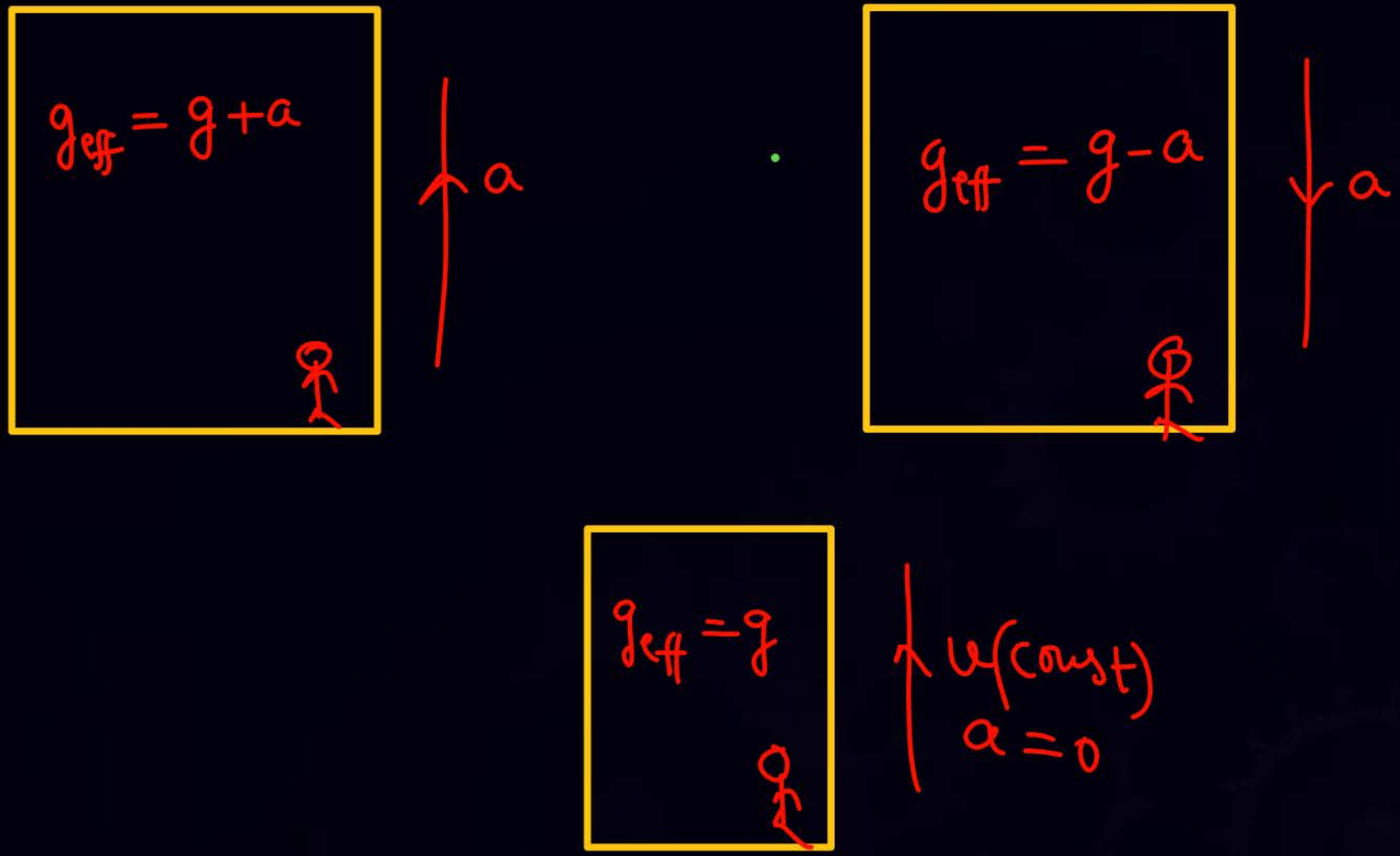
$$T = mg + ma = m(g+a)$$

$$T = m g_{eff}.$$



$$T = m g_{eff}$$

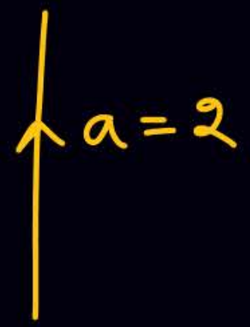
$$T = m(g+a)$$


$g_{eff} = g + a$
a
$g_{eff} = g - a$
a
$g_{eff} = g$
v (const)
a = 0

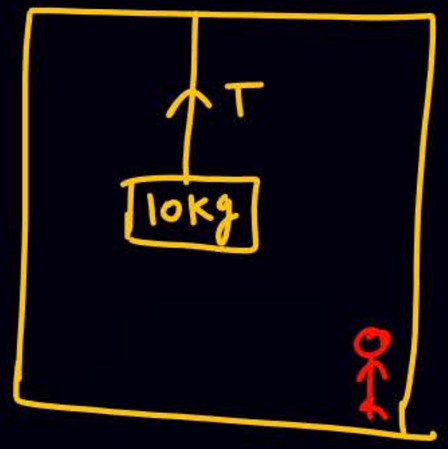
$g_{eff} = g + a$

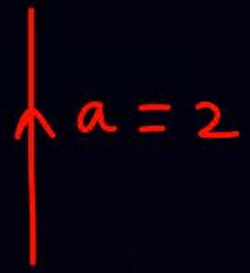
$= 10 + 2$

$= 12$

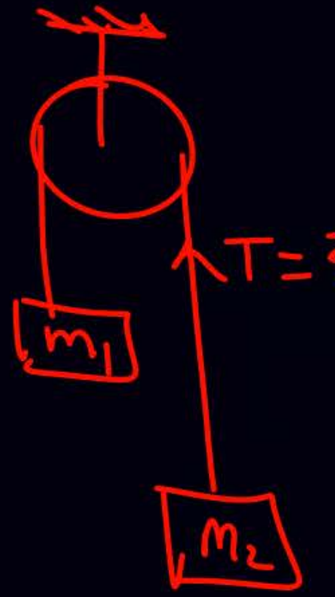


(1)

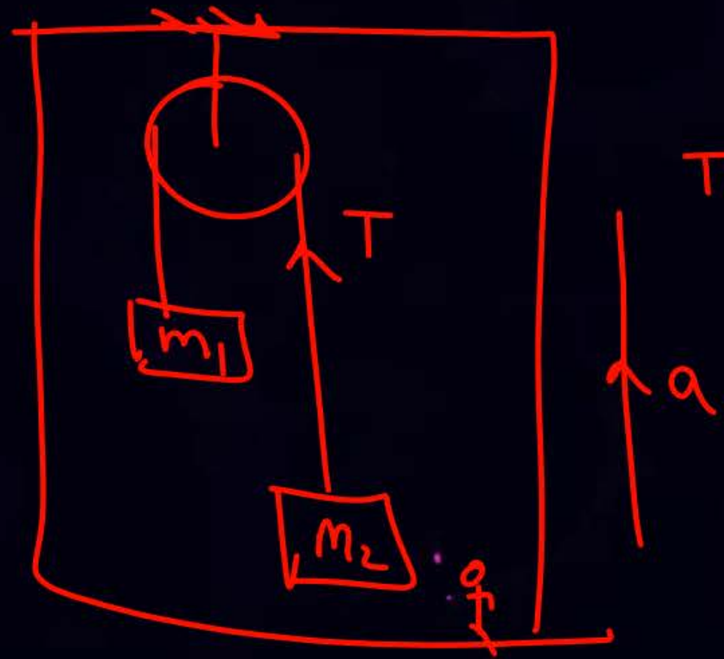




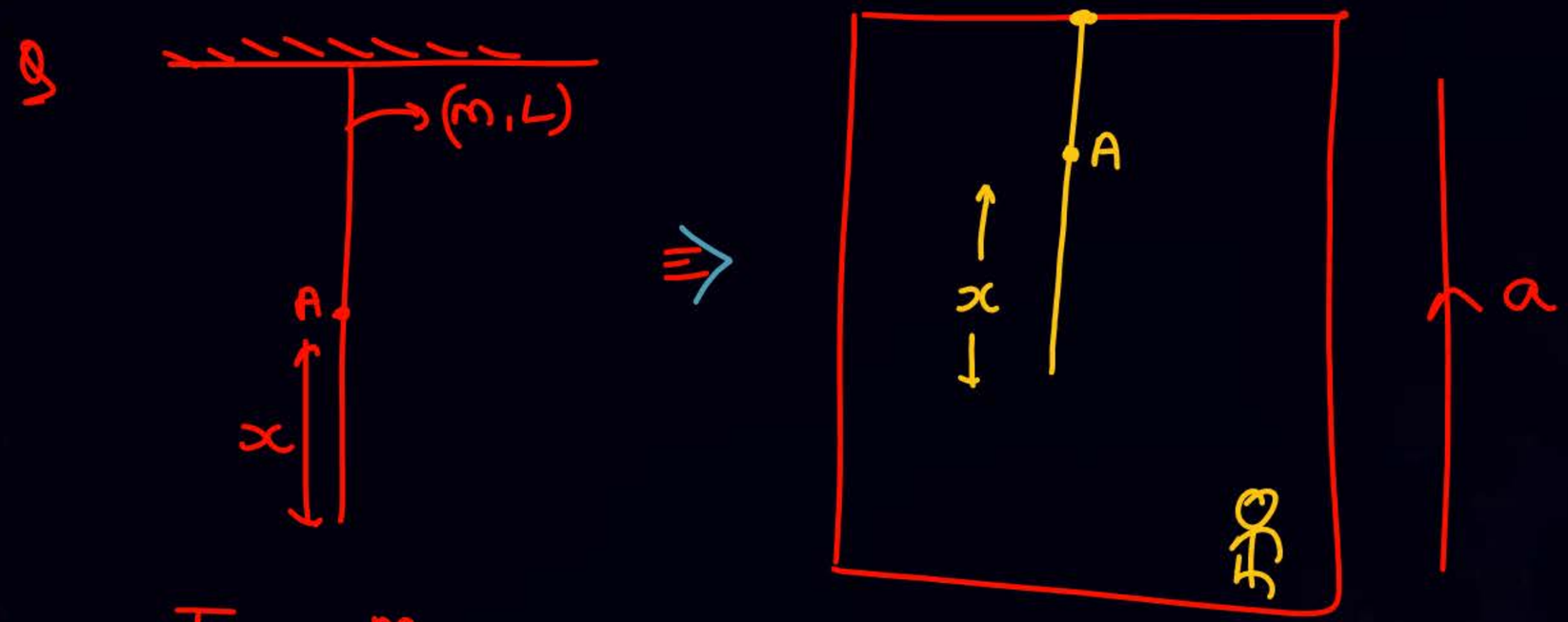
$T = mg_{eff} = 10 \times 12 = 120$



$T = \frac{2m_1m_2}{m_1+m_2} g$



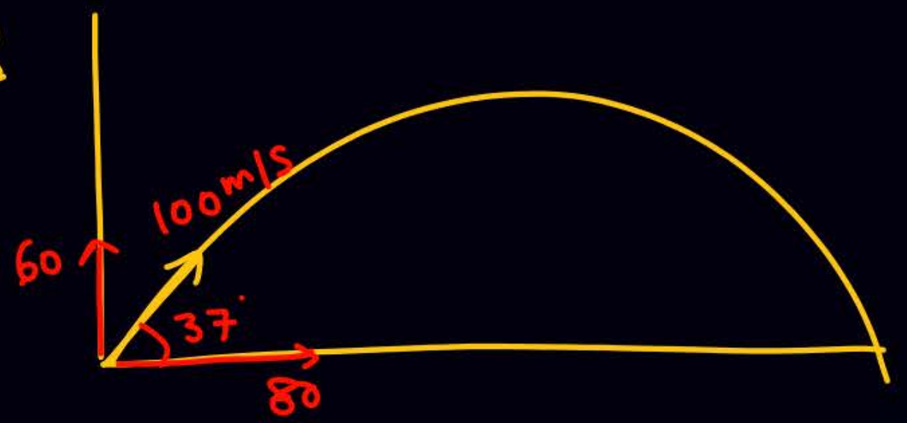
$T = \frac{2m_1m_2}{m_1+m_2} (g+a)$



$$T_A = \frac{m}{L} x g$$

$$T_A = \frac{m}{L} x (g + a)$$

Q



$T = 6+6 = 12$

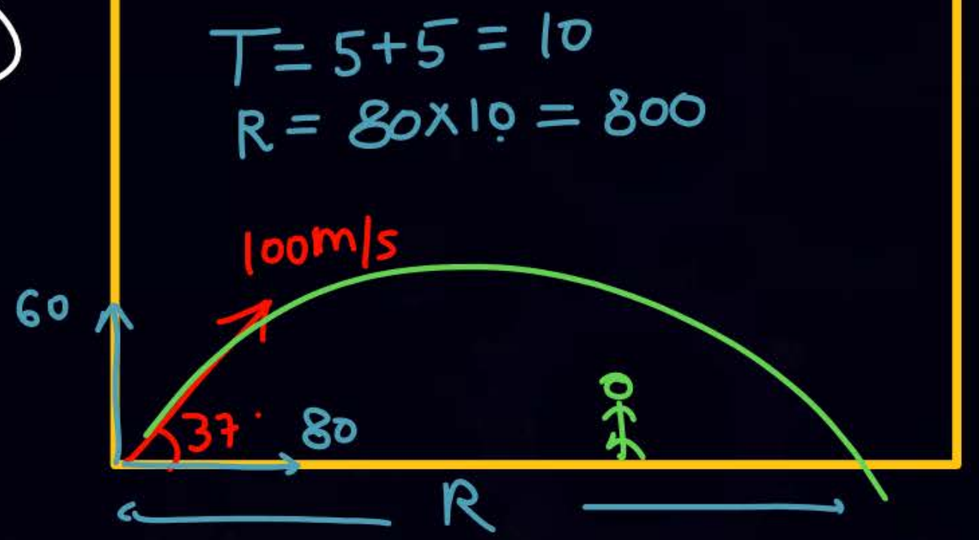
$R = 12 \times 80 = 960.$

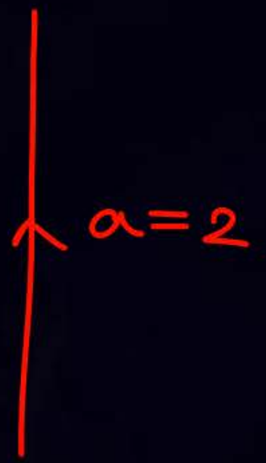
$\Rightarrow$

$g_{eff} = g + a = 12$

$T = 5+5 = 10$

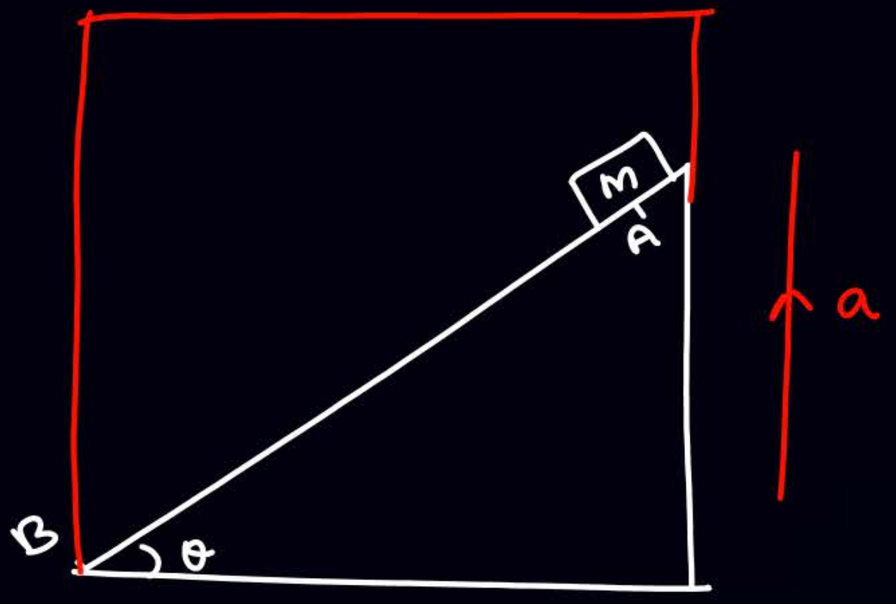
$R = 80 \times 10 = 800$





HCV

Q

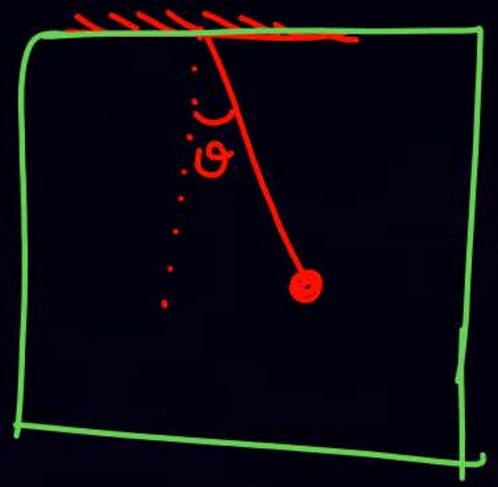


$t_{A\to B} = ?$

$$AB = 0 + \frac{1}{2}(g+a)\sin\theta\, t^2$$

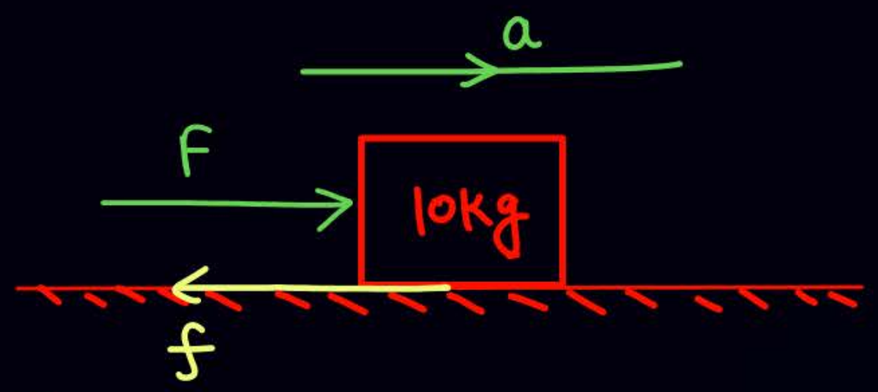
$$t = \sqrt{\frac{2AB}{(g+a)\sin\theta}}$$

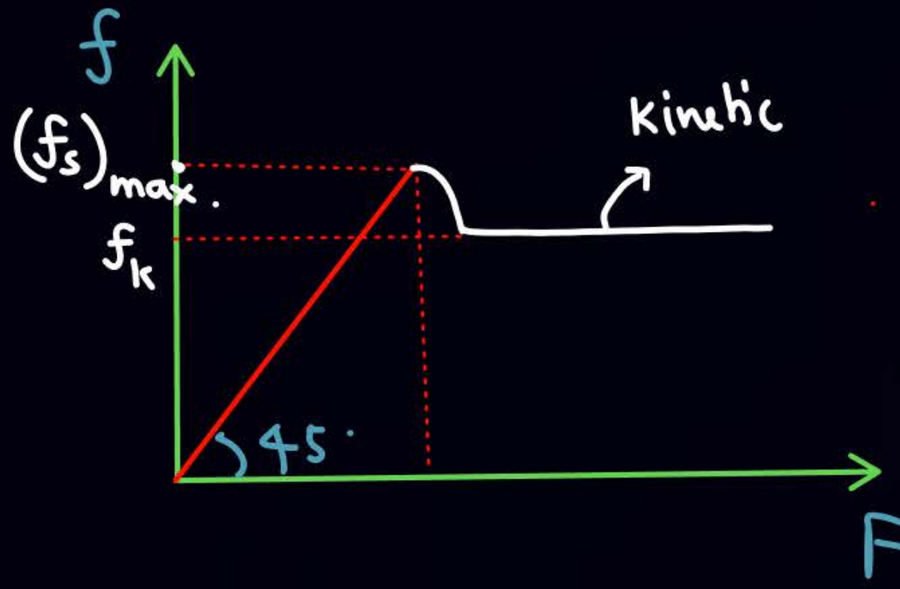
Q



$$T = 2\pi\sqrt{\frac{l}{g+a}}$$

Frictim





F	a (observe)	frictim
0	0	0
1N	0	1 N
2N	0	2 N
10N	0	10N
20N	0	20
40	0	40
59.99	0	59.99
60	0	60
60.001	✓	f
61	✓	f
70	✓	f
80	✓	f

F = f(peeche)

Static frictim
- variable value

Kinetic friction
Const.

Static friction

- It oppose motion ✗
- It oppose relative motion

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

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

Kinetic friction

- It oppose relative motion

$f_k \propto N$

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

Static Friction

It is variable force and self adjusting force.

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

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

μ_s → coeff of static friction

note it

- ★ It oppose relative motion b/w contact surface
- ★ $(f_s)_{max}$ = limiting friction
- ★ Independent on area of contact.

Kinetic Friction

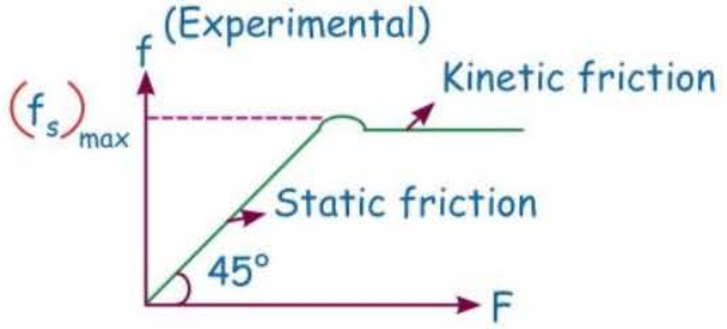
- It opposes the relative motion b/w contact surface

$$f_k \propto N$$

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

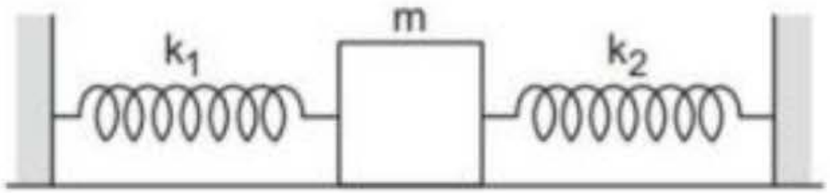
μ_k → Coeff of kinetic friction

- ★ It's value is constant and independent of area of contact surface.



HW

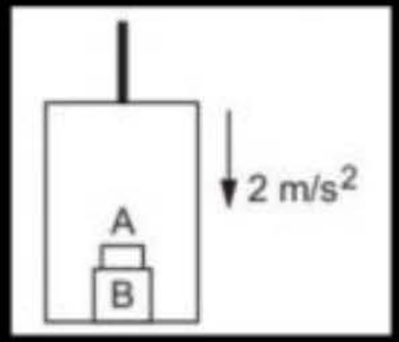
Both the springs shown in figure are unstretched. If the block is displaced by a distance x and released, what will be the initial acceleration?



Ans: $\frac{(k_1 + k_2)x}{m}$ opposite to the displacement

H/W

The elevator shown in figure (5-E5) is descending with an acceleration of 2 m/s^2. The mass of the block A is 0·5 kg. What force is exerted by the block A on the block B ?



Ans: (4 N)

H/W

A pendulum bob of mass 50 g is suspended from the ceiling of an elevator. Find the tension in the string if the elevator (a) goes up with acceleration 1·2 m/s^2, (b) goes up with deceleration 1·2 m/s^2, (c) goes up with uniform velocity, (d) goes down with acceleration 1·2 m/s^2, (e) goes down with deceleration 1·2 m/s^2 and (f) goes down with uniform velocity.

Ans: (a) 0.55 N, (b) 0.43 N, (c) 0.49 N,
(d) 0.43 N, (e) 0.55 N, (f) 0.49 N

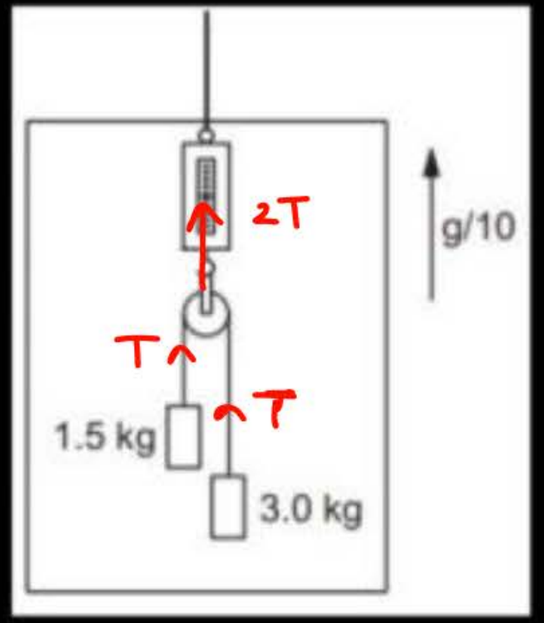
H/W

A person is standing on a weighing machine placed on the floor of an elevator. The elevator starts going up with some acceleration, moves with uniform velocity for a while and finally decelerates to stop. The maximum and the minimum weights recorded are 72 kg and 60 kg. Assuming that the magnitudes of the acceleration and the deceleration are the same, find (a) the true weight of the person and (b) the magnitude of the acceleration. Take $g = 9{\cdot}9\ \text{m/s}^2$.

$N = m g_{eff}$

Ans: 66 kg and 0.9 m/s^2

Find the reading of the spring balance shown in figure (5-E6). The elevator is going up with an acceleration of $g/10$, the pulley and the string are light and the pulley is smooth.



$$2 \times \left(\frac{2m_1m_2}{m_1+m_2}\right)\left(g+\frac{g}{10}\right)$$

$$\Downarrow\Downarrow\Downarrow$$

$$2T$$

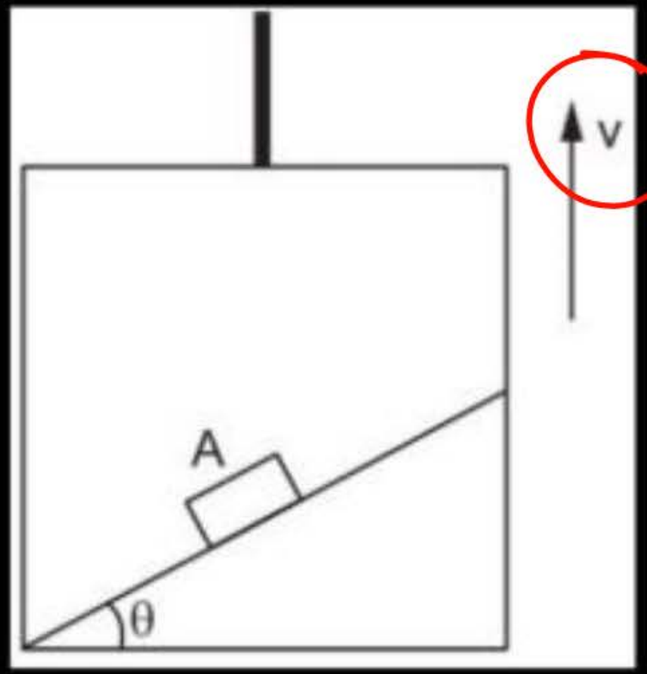
Ans: (4.4 kg)

A block of 2 kg is suspended from the ceiling through a massless spring of spring constant $k = 100$ N/m. What is the elongation of the spring? If another 1 kg is added to the block, what would be the further elongation?

H.W

Ans: (0.2 m, 0.1 m)

A block A can slide on a frictionless incline of angle θ and length l, kept inside an elevator going up with uniform velocity v (figure 5-E22). Find the time taken by the block to slide down the length of the incline if it is released from the top of the incline.

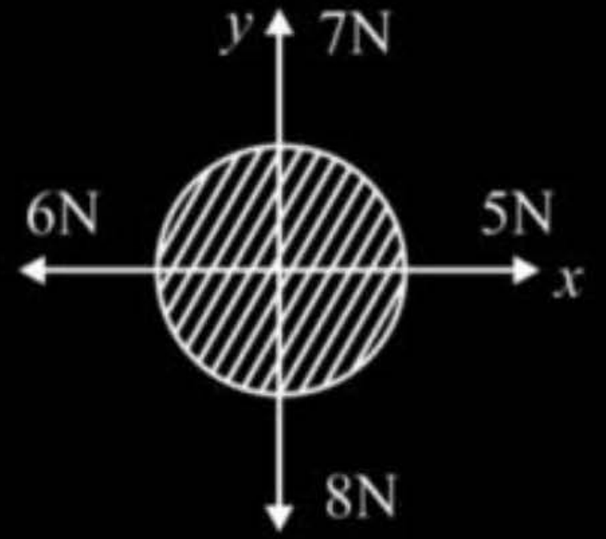


Ans: $\sqrt{\frac{2l}{g \sin \theta}}$

QUESTION

For a free body diagram shown in the figure, the four forces are applied in the 'x' and 'y' directions. What additional force must be applied and at what angle with positive x-axis so that the net acceleration of body is zero?

[July 25, 2022 (II)]



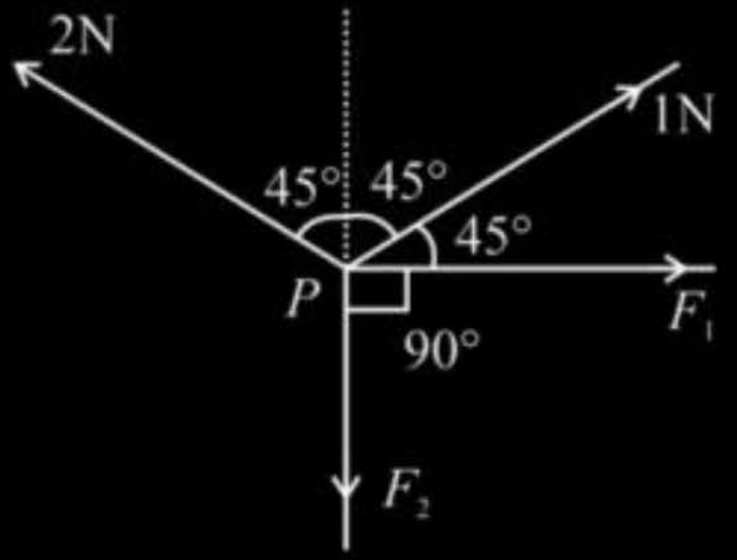
1. $\sqrt{2}$ N, 45°
2. $\sqrt{2}$ N, 135°
3. $\frac{2}{\sqrt{3}}$ N, 30°
4. 2 N, 45°

Ans : (1)

QUESTION

Four forces are acting at a point P in equilibrium as shown in figure. The ratio of force F_1 to F_2 is $1 : x$ where $x =$ _____.

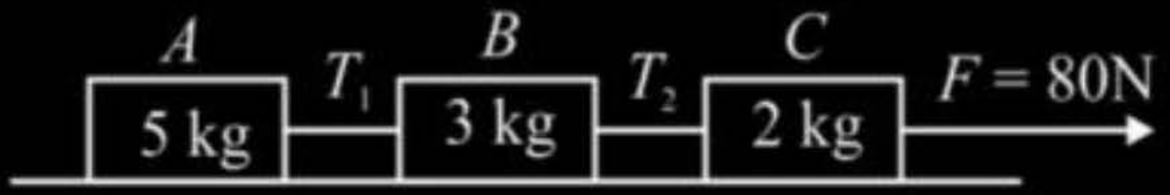
[July 25, 2022 (I)]



Ans : (3)

QUESTION

Three blocks A, B and C are pulled on a horizontal smooth surface by a force of 80 N as shown in figure. The tensions T_1 and T_2 in the string are respectively. [Jan 30, 2024 (II)]



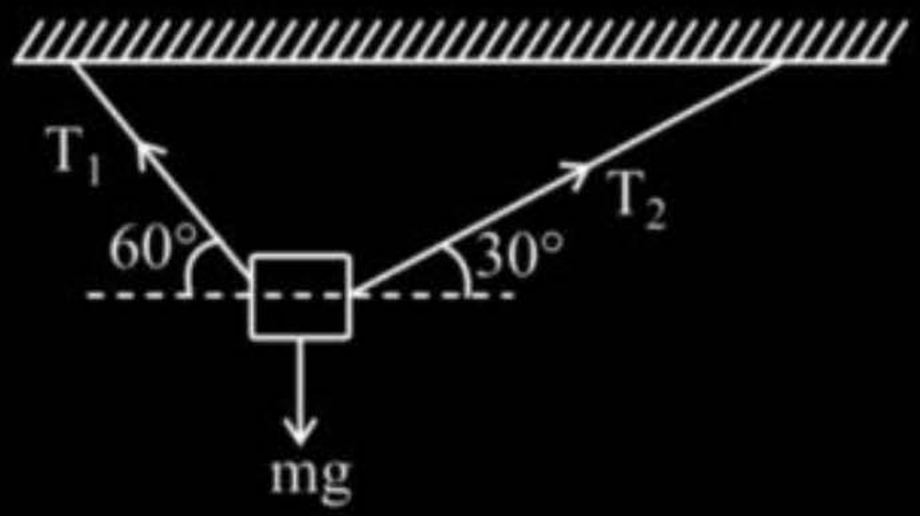
1. 40 N, 64 N
2. 60 N, 80 N
3. 88 N, 96 N
4. 80 N, 100 N

Ans: (1)

QUESTION

A body of mass 1 kg is suspended with the help of two strings making angles as shown in figure. Magnitudes of tensions T_1 and T_2, respectively, are (in N):

[April 2, 2025 (II)]



1. $5, 5\sqrt{3}$
2. $5\sqrt{3}, 5$
3. $5\sqrt{3}, 5\sqrt{3}$
4. $5, 5$

Ans: (2)

3 3

4 5

Ans: (4)

QUESTION

A bullet 10 g leaves the barrel of gun with a velocity of 600 m/s. If the barrel of gun is 50 cm long and mass of gun is 3 kg, then value of impulse supplied to the gun will be:

[April 13, 2023 (I)]

1 12 Ns

2 6 Ns

3 36 Ns

4 3 Ns

Ans: (2)

QUESTION

Three forces $F_1 = 10$ N, $F_2 = 8$ N, $F_3 = 6$ N are acting on a particle of mass 5 kg. The forces F_2 and F_3 are applied perpendicularly so that particle remains at rest. If the force F_1 is removed, then the acceleration of the particle is:

[April 12, 2023 (I)]

1 2 ms^{-2}

2 0.5 ms^{-2}

3 4.8 ms^{-2}

4 7 ms^{-2}

Ans: (1)

QUESTION

An average force of 125 N is applied on a machine gun firing bullets each of mass 10 g at the speed of 250 m/s to keep it in position. The number of bullets fired per second by the machine gun is:

[April 11, 2023 (I)]

1 5

2 50

3 100

4 25

Ans: (2)

QUESTION

A body of mass 500 g moves along x-axis such that it's velocity varies with displacement x according to the relation $v = 10\sqrt{x}\ ms^{-1}$ the force acting on the body is:

[April 11, 2023 (II)]

1 166 N

QUESTION

An object with mass 500 g moves along x-axis with speed $v = 4\sqrt{x}$ m/s. The force acting on the object is:

[April 7, 2025 (II)]

1. 8 N
2. 5 N
3. 6 N
4. 4 N

Ans: (4)

QUESTION

A force $\vec{F} = (40\hat{i} + 10\hat{j})$N acts on a body of mass 5 kg. If the body starts from rest, its position vector $\vec{r}$ at time = 10 s, will be:

[NCERT: PL-54 | July 25, 2021 (II)]

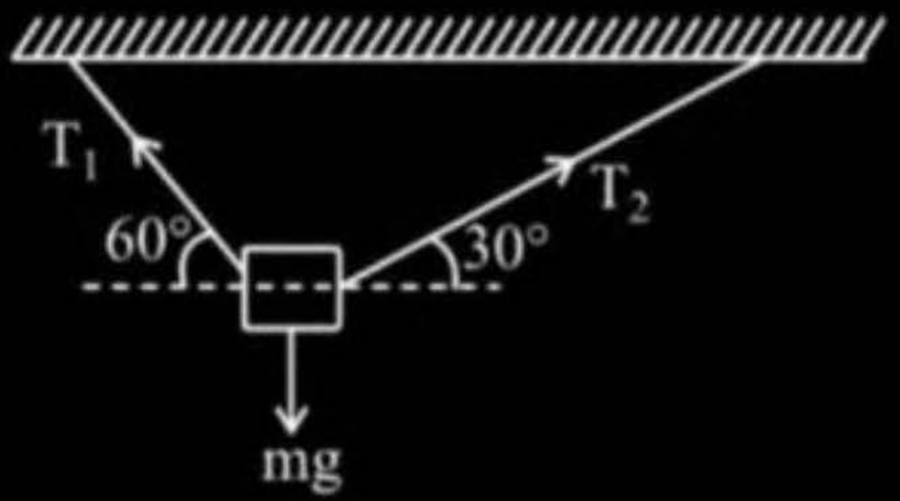
1. $(100\hat{i} + 400\hat{j})m$
2. $(100\hat{i} + 100\hat{j})m$
3. $(400\hat{i} + 100\hat{j})m$
4. $(400\hat{i} + 400\hat{j})m$

Ans: (3)

QUESTION

A body of mass 1 kg is suspended with the help of two strings making angles as shown in figure. Magnitudes of tensions T_1 and T_2, respectively, are (in N):

[NCERT: PL-65 | April 2, 2025 (II)]



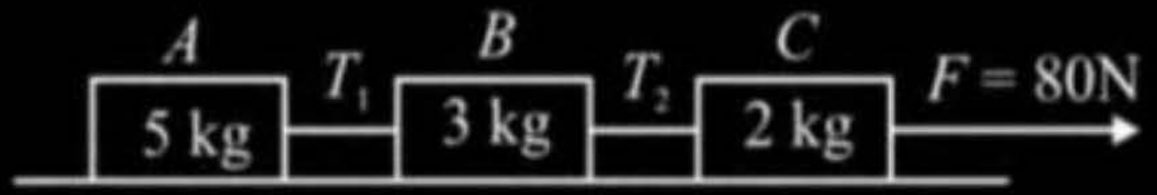
1. $5, 5\sqrt{3}$
2. $5\sqrt{3}, 5$
3. $5\sqrt{3}, 5\sqrt{3}$
4. $5, 5$

Ans: (2)

QUESTION

Three blocks A, B and C are pulled on a horizontal smooth surface by a force of 80 N as shown in figure. The tensions T_1 and T_2 in the string are respectively.

[NCERT: PL-65 | Jan 30, 2024 (II)]



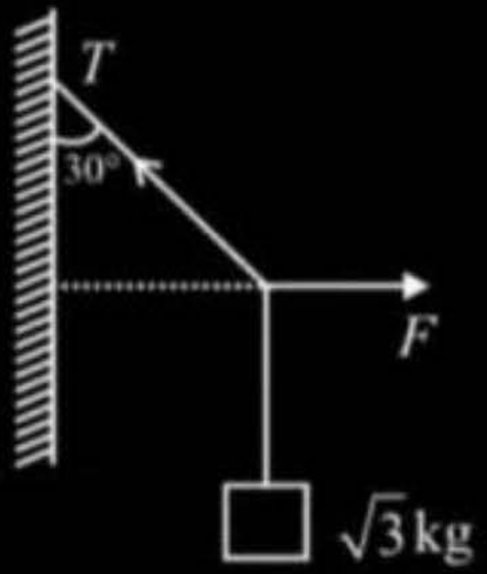
1. 40 N, 64 N
2. 60 N, 80 N
3. 88 N, 96 N
4. 80 N, 100 N

Ans: (1)

QUESTION

A block of $\sqrt{3}$ kg is attached to a string whose other end is attached to the wall. An unknown force F is applied so that the string makes an angle of 30° with the wall. The tension T is: (Given $g = 10\ ms^{-2}$)

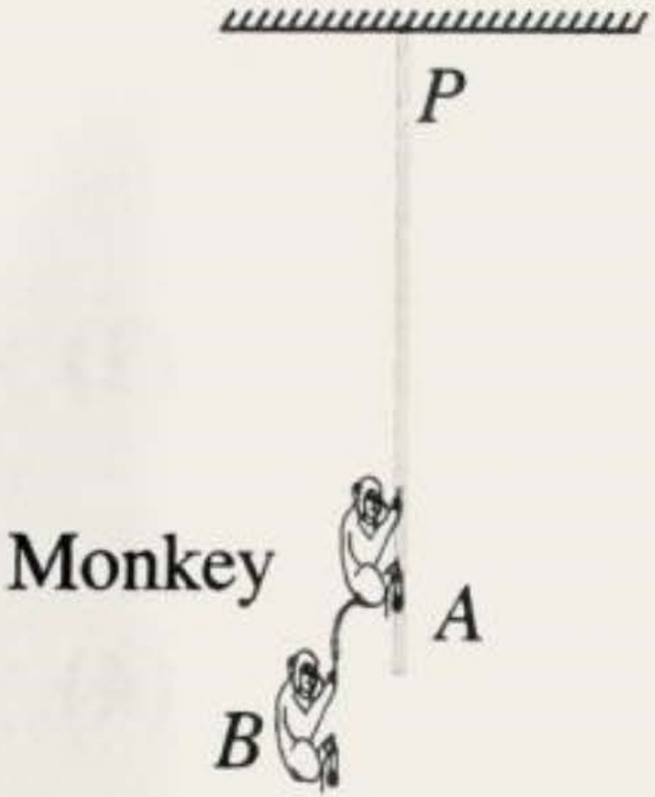
[NCERT: PL-58, 59 | Jan 30, 2023 (II)]



1. 20 N
2. 25 N
3. 10 N
4. 15 N

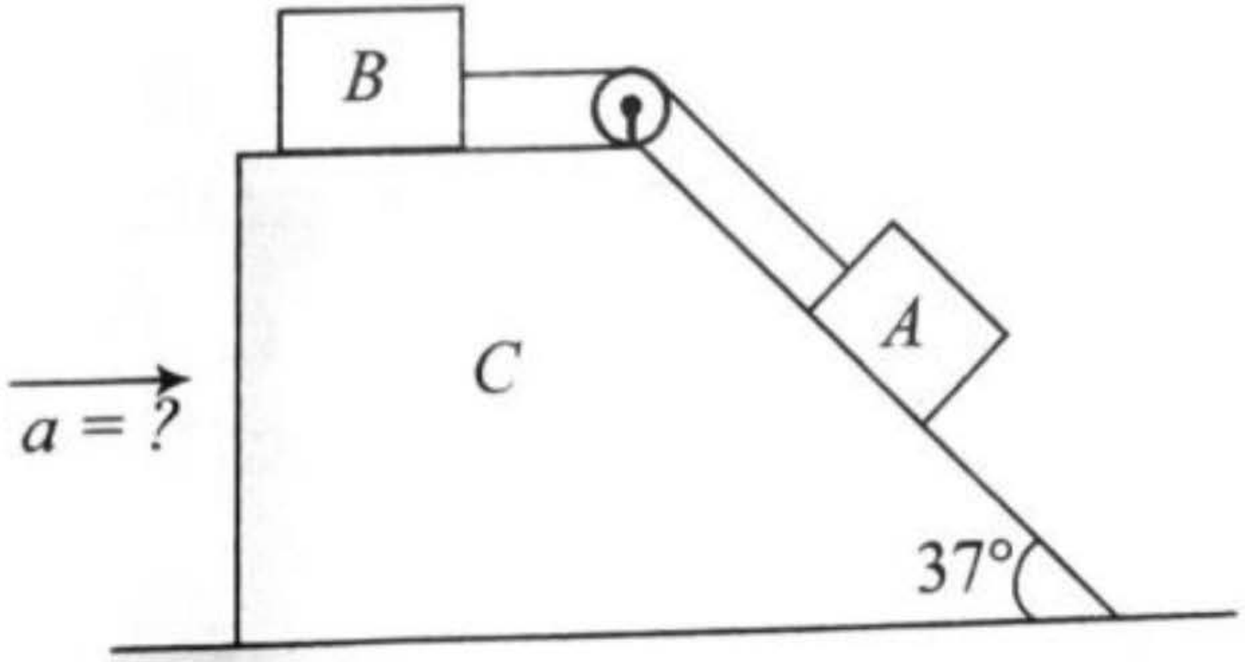
Ans: (1)

A monkey A (mass = 6 kg) is climbing up a rope tied to a rigid support. The monkey B (mass = 2 kg) is holding on the tail of monkey A. If the tail can tolerate a maximum tension of 30 N, what maximum force should monkey A apply on the rope in order to carry monkey B with it? ($g = 10\ \mathrm{m\,s^{-2}}$)



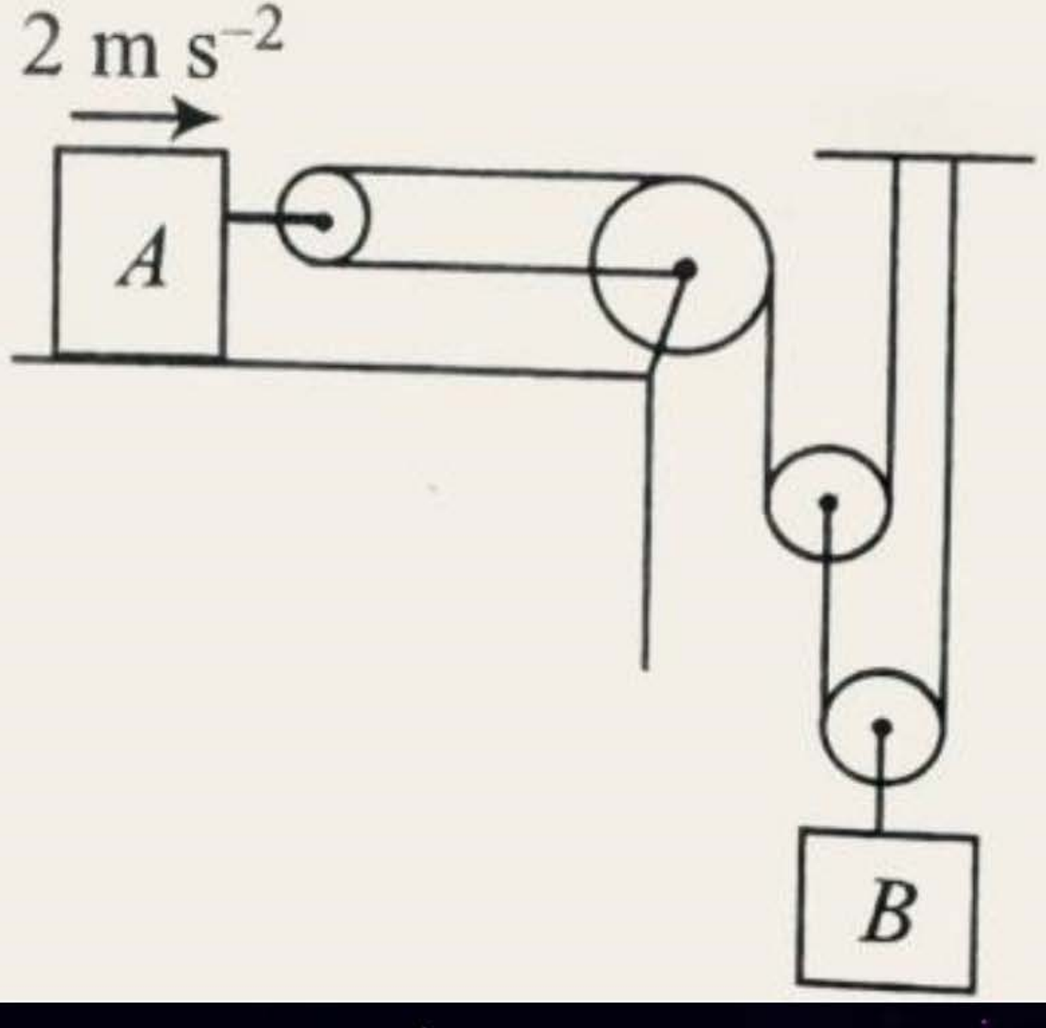
Ans 120

The upper surface of block C is horizontal and its right part is inclined to the horizontal at angle 37°. The mass of blocks A and B are $m_1 = 1.4$ kg and $m_2 = 5.5$ kg, respectively. Neglect friction and mass of the pulley. Calculate acceleration a with which block C should be moved to the right so that A and B can remain stationary relative to it.



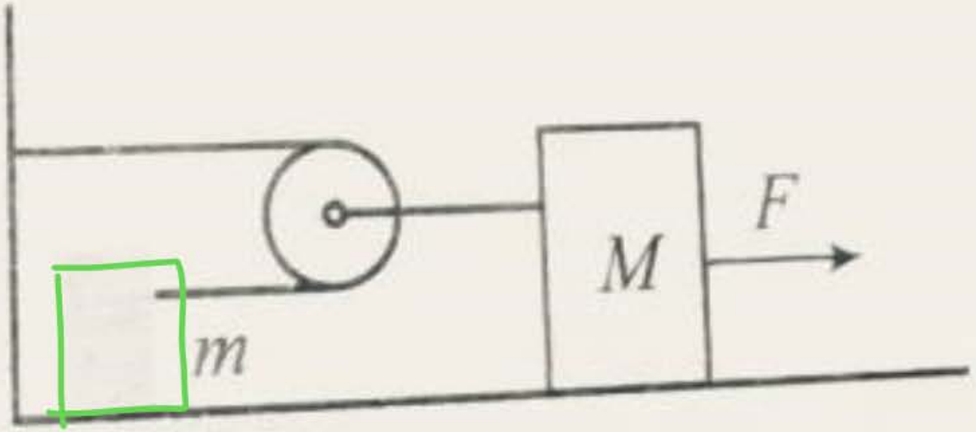
AW 1.82

In the given figure, find the acceleration of B, if the acceleration of A is $2\ \mathrm{m\,s^{-2}}$.

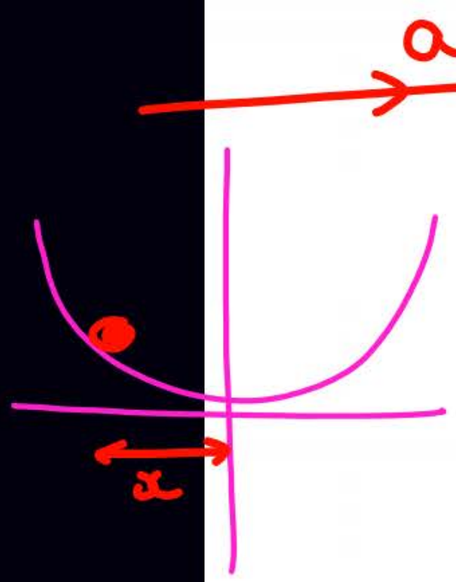


Ans - 1

6. Find the acceleration of blocks in the given figure. The pulley and the strings are massless.



23. A piece of wire is bent in the shape of a parabola $y = kx^2$ (y-axis vertical) with a bead of mass m on it. The bead can slide on the wire without friction. It stays at the lowest point of the parabola when the wire is at rest. The wire is now acceleration parallel to the x-axis with a constant acceleration a. The distance of the new equilibrium position of the bead, where the bead can stays at rest with respect to the wire, from the y-axis is



JEE Adv. 2009

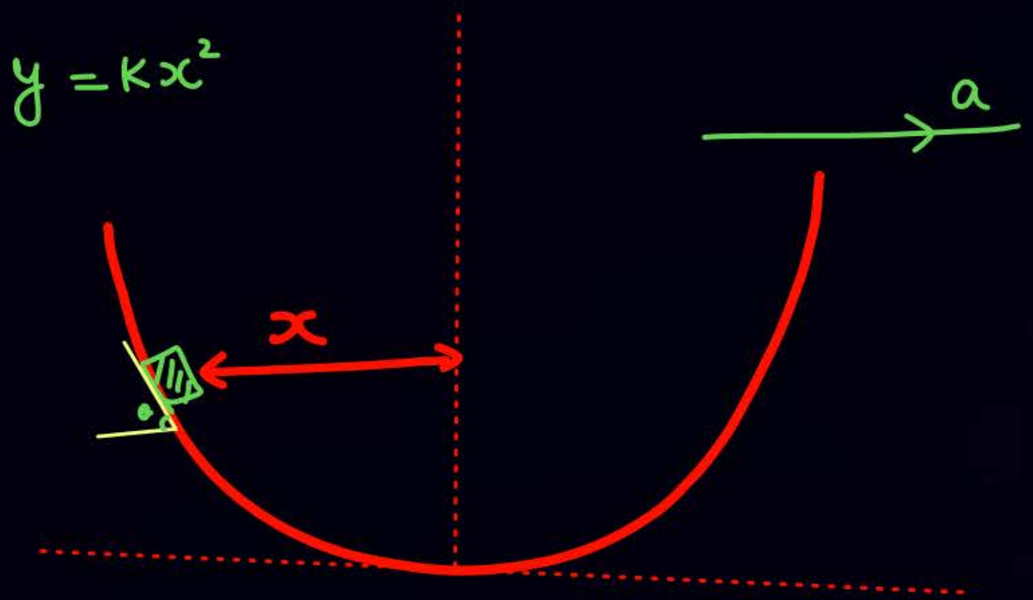
[2009]

(1) $\frac{a}{gk}$

(2) $\frac{a}{2gk}$

(3) $\frac{2a}{gk}$

(4) $\frac{a}{4gk}$



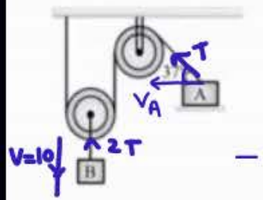
$a = g \tan\theta$

$\Rightarrow a = g\, 2kx$

$\Rightarrow x = \dfrac{a}{2gk}$

Sir Question bahut easy par concept nhi aa rha pakad me

In the figure shown block B moves down with a velocity $10\ \mathrm{m/s}$. The velocity of A in the position shown is



$-2T \times 10 + T V_A \cos 37 = 0$

(A) $12.5\ \mathrm{m/s}$
(B) $25\ \mathrm{m/s}$
(C) $6.25\ \mathrm{m/s}$
(D) None of these

Home work

- Ques are attached
- PYQ NEET sheet Motion in a plane (KPP_PYQ)

join it

THANK YOU