YAKEEN NEET 2.0

2026

Laws of Motion

Physics Assignment solution 02

By- Manish Raj (MR Sir)

Sangharsh Assignment

$\boxed{\text{Laws of Motion - 2}}$

Question

(1)

Calculate the tension connecting the masses of 2 kg and 3 kg.

1. $T = 50\ N$
2. $T = 70\ N$
3. $T = 100\ N$
4. $T = 0$

$$a = \frac{100}{10} = 10\ m/s^2$$

$$\boxed{7kg} \xrightarrow{T'}$$

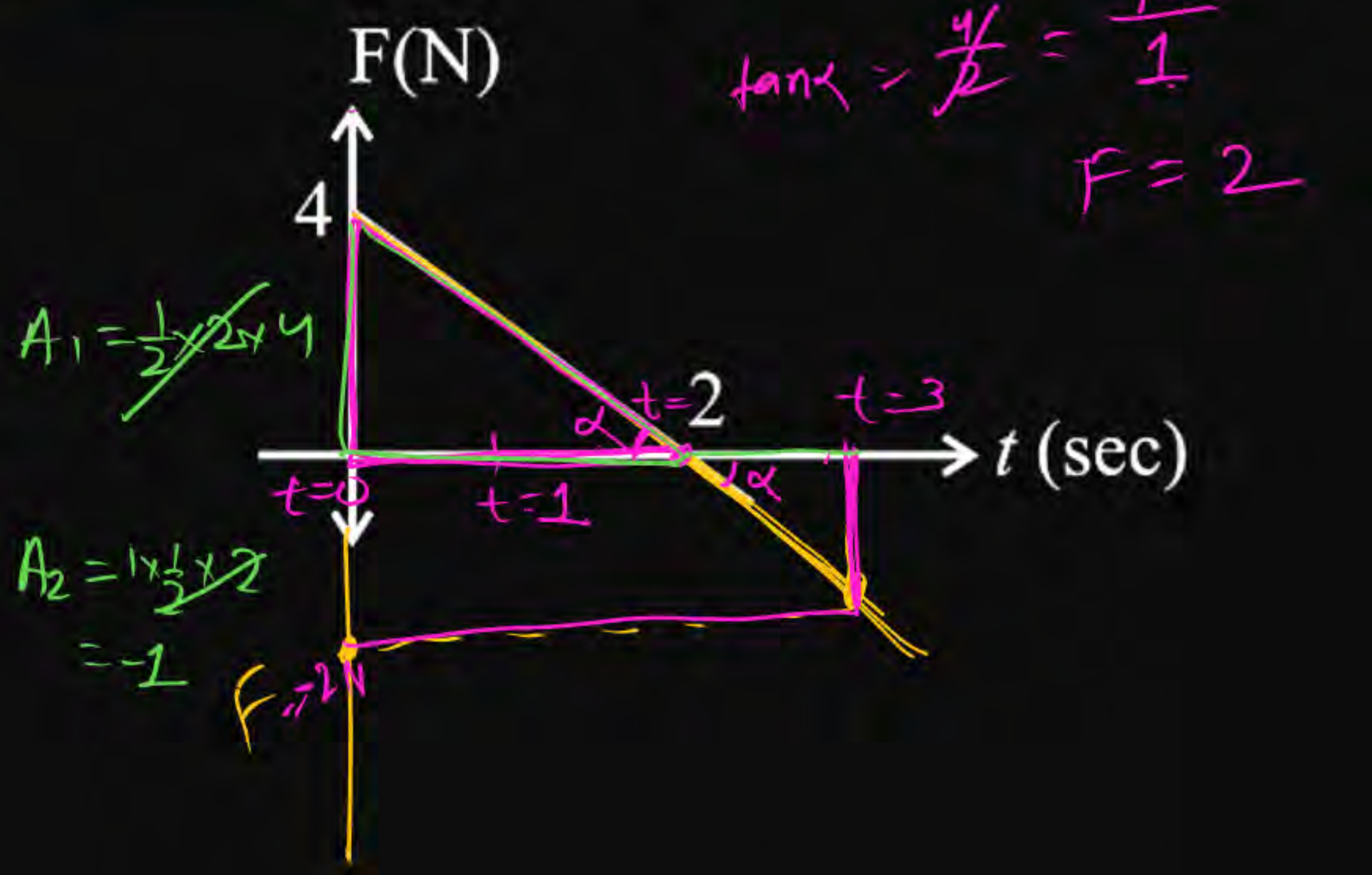
$\rightarrow a$

$$T' = 7 \times a = 7 \times 10 = 70\ N$$

Question 2

A body of mass 2 kg having an initial velocity u m/s is undergoing the motion as given in the F-t curve. Calculate its velocity in m/s after 3 second. F is along the line of u.

1. $u + 6$
2. $u + 3$
3. $u + 1.5$
4. $u + 1.33$



ΔP = Area of F/t graph

$m \Delta \vec{v} = 4 - 1$

$2[V_f - u] = 3$

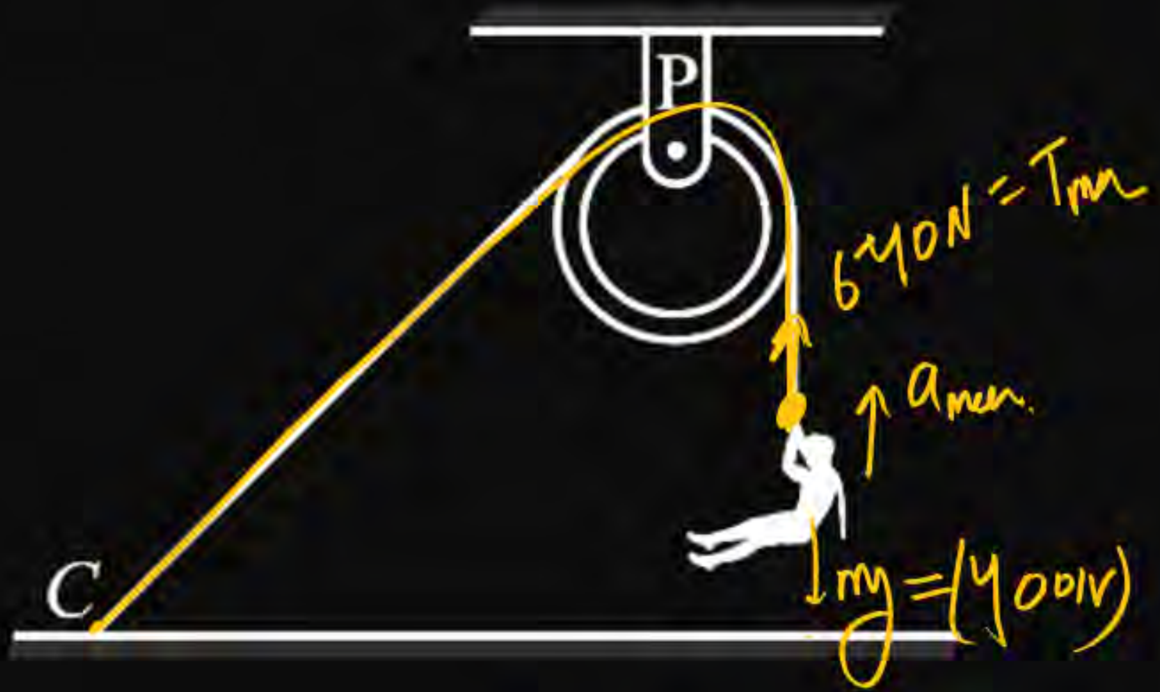
$V_f - u = 1.5$

$V_f = u + 1.5$

Question 3

One end of massless rope, which passes over a massless and frictionless pulley P is tied to a hook C. The other end is free. Maximum tension that the rope can bear is 640 N. With what value of maximum acceleration (in ms^{-2}) can a man of 40 kg climb up the rope? (Take $g = 10\ ms^{-2}$)

1. 16
2. 12
3. 8
4. 6 ✓



$640 - 400 = 40\, a_m$

$240 = 40\, a_m$

$a = 6\, m/s^2$

Question 4

When forces $\vec{F}_1, \vec{F}_2$ and $\vec{F}_3$ are acting on a particle of mass m such that $\vec{F}_2$ and $\vec{F}_3$ are mutually perpendicular, then the particle remains stationary. If the force $\vec{F}_1$ is now removed, then the acceleration of the particle is

F₁ (remove)

1. $-\frac{\vec{F}_1}{m}$ ✓
2. $\frac{\vec{F}_1}{m}$
3. $\frac{\sqrt{F_1^2 + F_2^2}}{m}$
4. $\frac{\vec{F}_3 - \vec{F}_2}{m}$

$\vec{F}_1 + \vec{F}_2 + \vec{F}_3 = 0$ — (1)

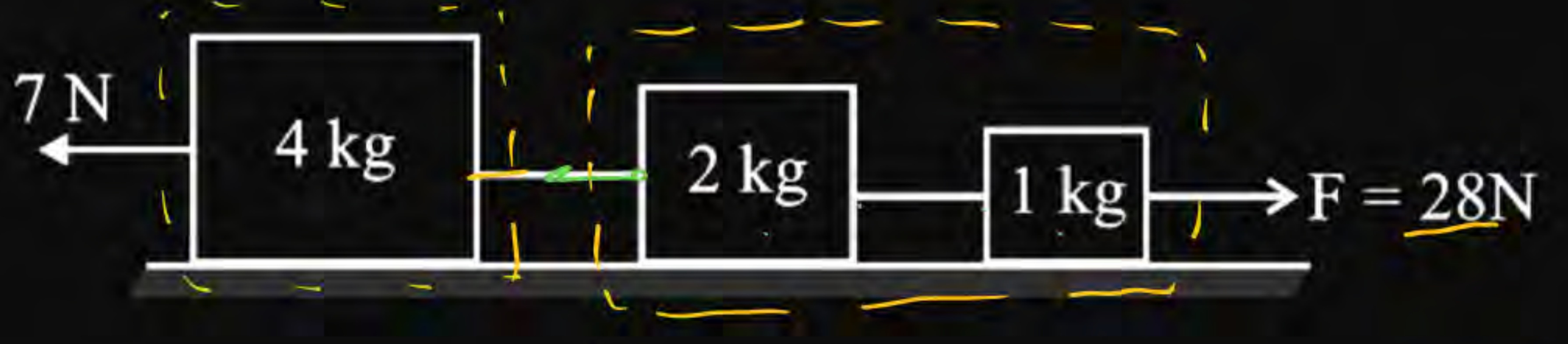
$(\vec{F}_2 + \vec{F}_3) = -\vec{F}_1$ ✓

$(\vec{F}_2 + \vec{F}_3) = m\vec{a}$

$\vec{a} = \frac{\vec{F}_2 + \vec{F}_3}{m} = \frac{-\vec{F}_1}{m}$

Question 5

In the arrangement shown in figure, the strings are ideal. The surface over which blocks are placed is smooth. The tension developed in the string between the blocks of 4 kg and 2 kg is



(1) 21 N

(2) 19 N

(3) 18 N

(4) 12 N

$a = \frac{28-7}{7} = \frac{21}{7} = 3\,m/s^2$

7N ← 4kg → T, a = 3

$(T-7) = 4\times3$

$T = 12+7$

T ← 3kg → 28

$28 - T = 3\times3$

$T = 28-9 = 19\,N$

Question 6

A man of mass m climbs up along massless rope with an acceleration of $\frac{g}{2}$. The force of contact between block and ground is (Mass of block = 3m)

(1) $3\,mg$

(2) $\frac{3}{2}mg$

(3) $\frac{5}{2}mg$

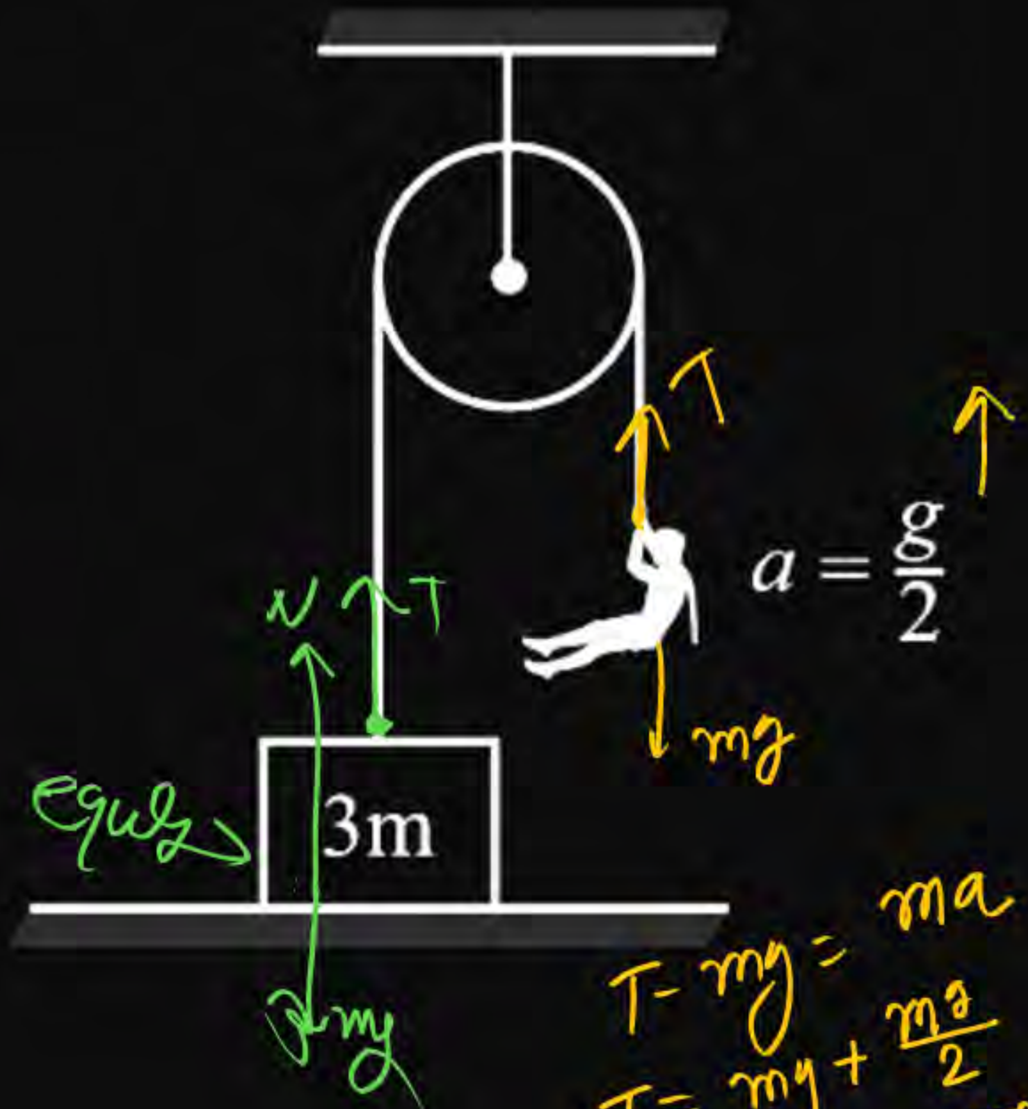
(4) $\frac{mg}{2}$

$N + T = 3mg$

$N = 3mg - T$

$= 3mg - \frac{3mg}{2}$

$= \frac{3mg}{2}$



$T - mg = ma$

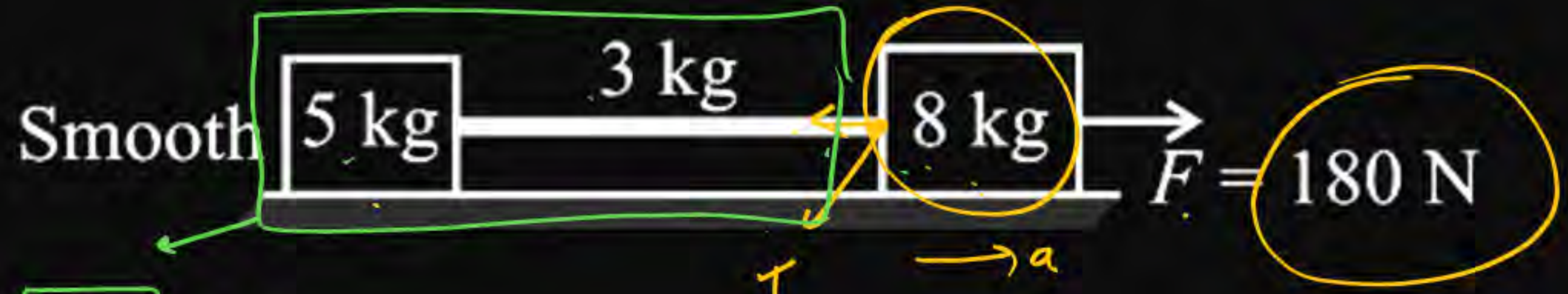
$T = mg + \frac{mg}{2}$

$= \frac{3mg}{2}$

Question 7

Two blocks of masses 8 kg and 5 kg are connected with a rod of mass 3 kg. The 8 kg mass is pulled with force of 180 N. The tension in rod at contact point of 8 kg block is

1. 22.5 N
2. 45 N
3. 90 N
4. 180 N



8kg → T

$T = ma$

$= \frac{8 \times 180}{16} = 90$

$180 - T = ma$

$a = \frac{180}{16}$

$T = 180 - ma$

$= 180 - \frac{8 \times 180}{16} = 90\,N$

Question 8

In the figure, the blocks A, B, C of mass m each have acceleration a_1, a_2 and a_3 respectively. F_1 and F_2 are external forces of magnitudes 2 mg and mg respectively.

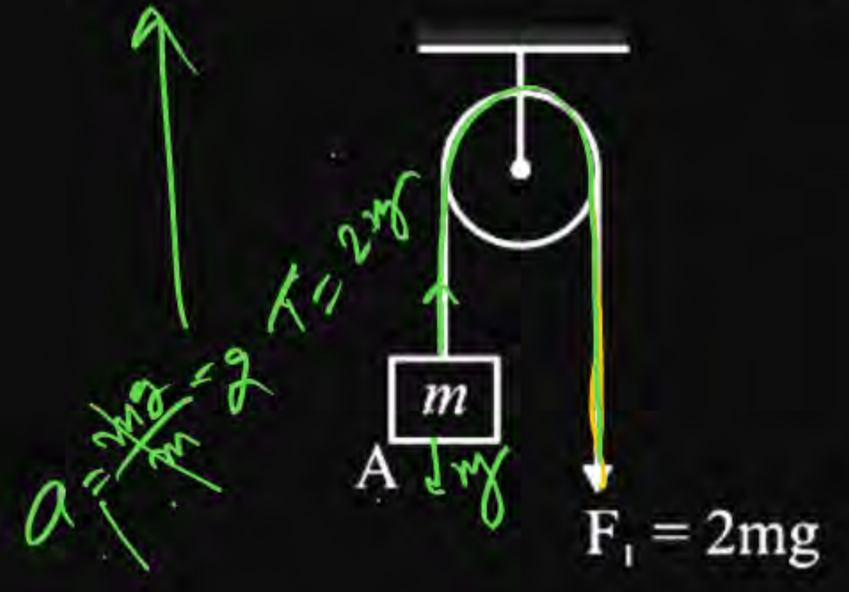
1. $a_1 = a_2 = a_3$
2. $a_1 > a_3 > a_2$
3. $a_1 = a_2;\ a_2 > a_3$
4. $a_1 > a_2;\ a_2 = a_3$

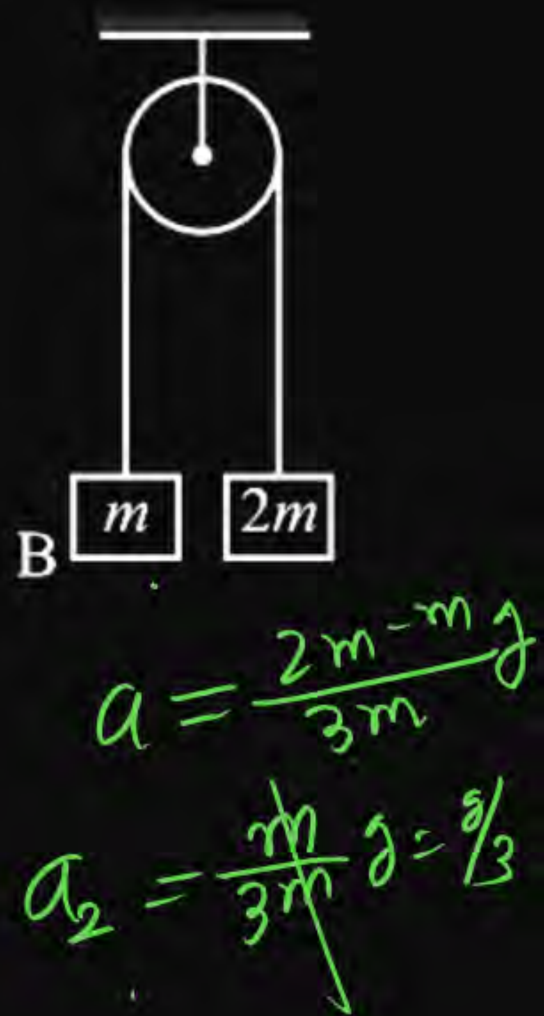
$a_1 > g$

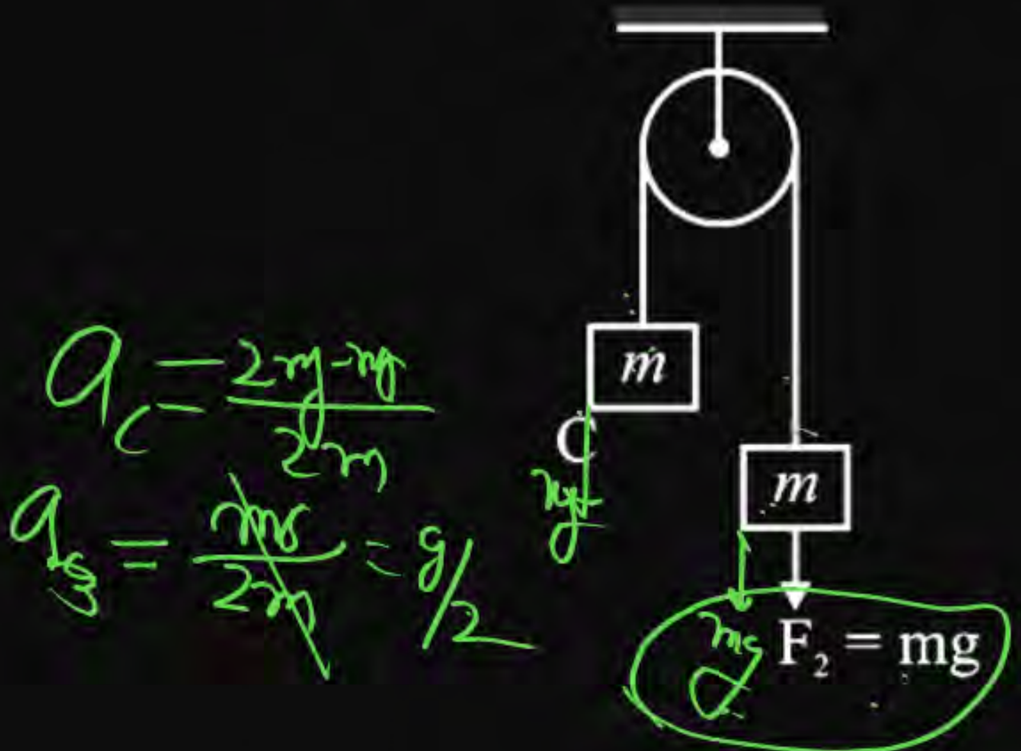
$a_2 = g/3$

$a_3 = g/2$

$\boxed{a_1 > a_3 > a_2}$

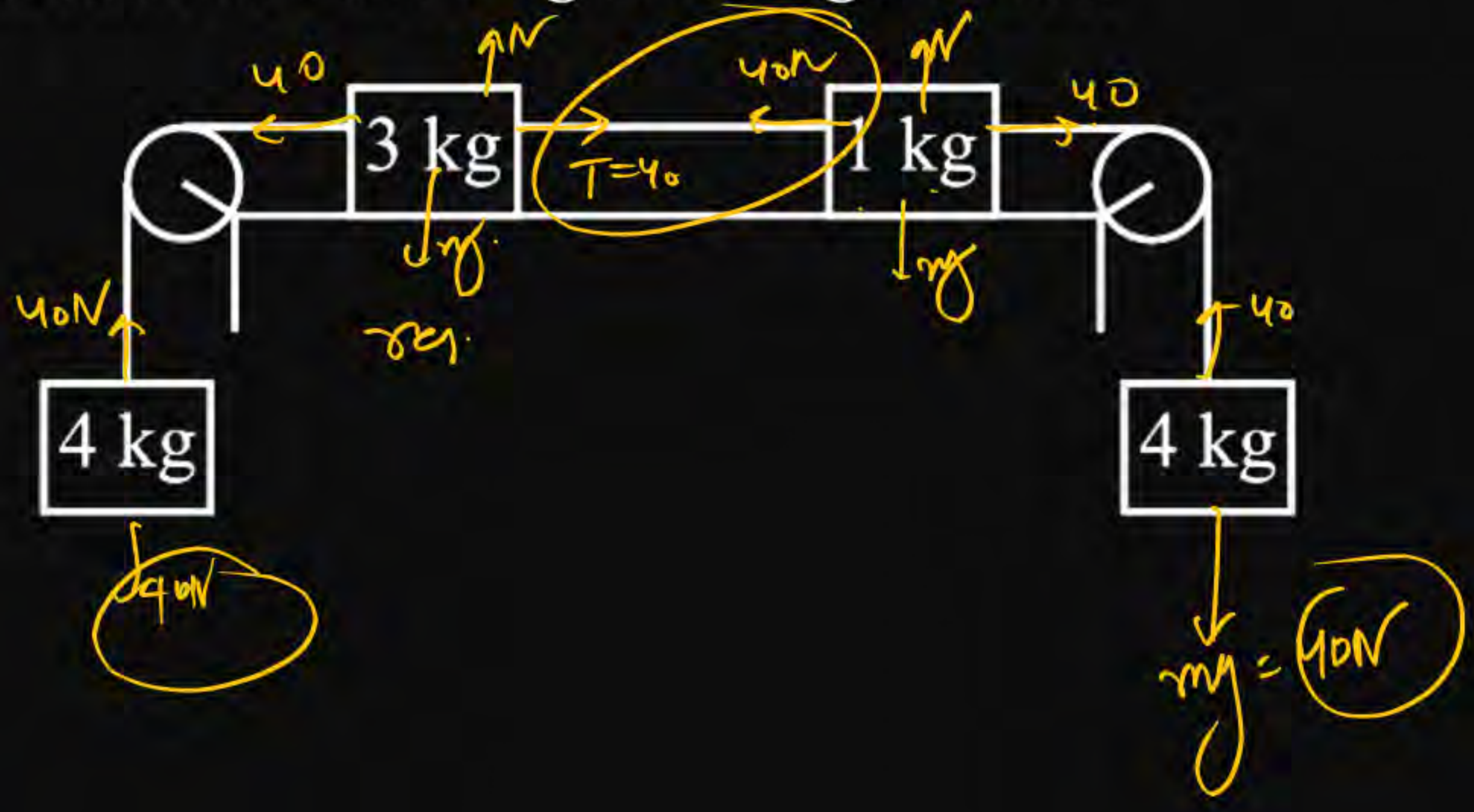






Question 9

Calculate the tension in the string connected between the 1 kg and 3 kg masses.



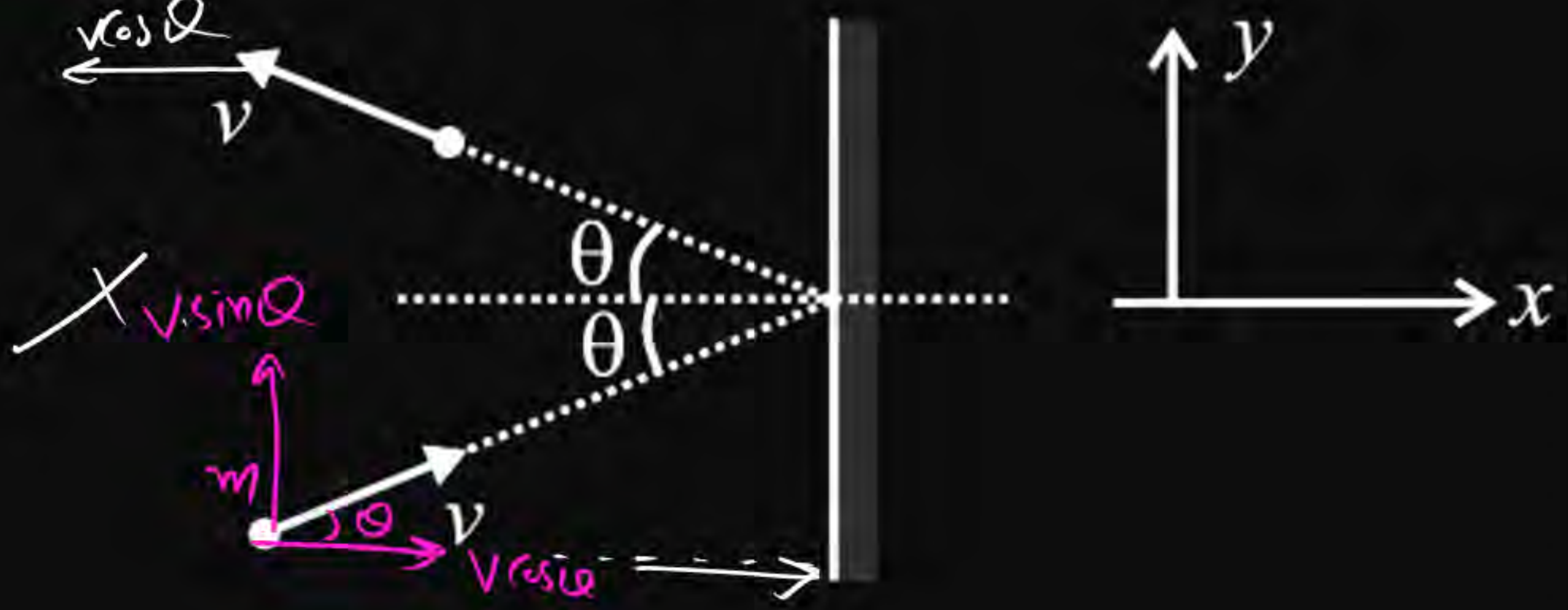
1. 30 N
2. 40 N ✓
3. 50 N
4. 60 N

$\boxed{a = 0}$

Question 10

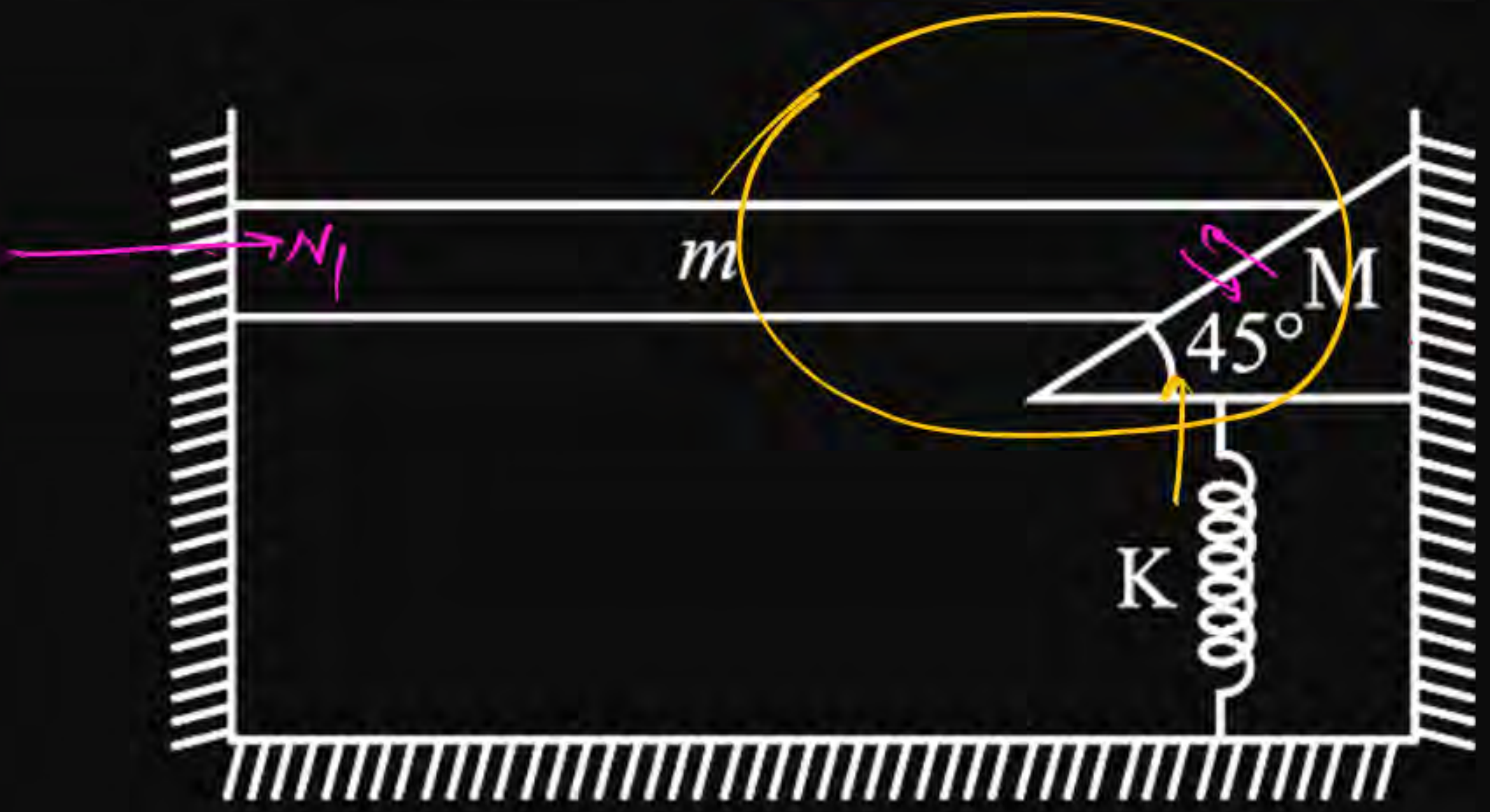
A particle of mass m moving with a velocity v strikes a wall at an angle of incidence θ and rebounds back as shown in the figure. Calculate change in momentum

1. $2mv\cos\theta(-\hat{i})$
2. $2mv\cos\theta(-\hat{j})$
3. $2mv\sin\theta(\hat{i})$
4. $2mv\sin\theta(-\hat{i})$



Question 11

In the shown figure all surfaces are smooth and system is in equilibrium. The compression in spring will be:

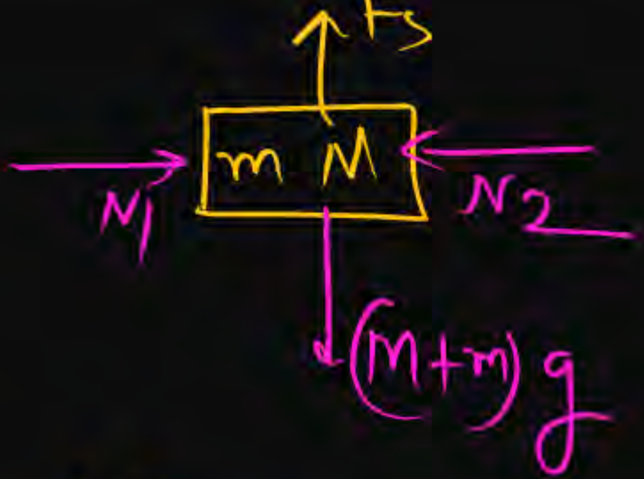


(1) $\dfrac{Mg}{K}$

(2) $\dfrac{(M+m)g}{K}$

(3) $\dfrac{\left(M+\frac{m}{\sqrt{2}}\right)g}{K}$

(4) $\dfrac{(M+m)g}{\sqrt{2}K}$



$\Sigma F_y = 0$

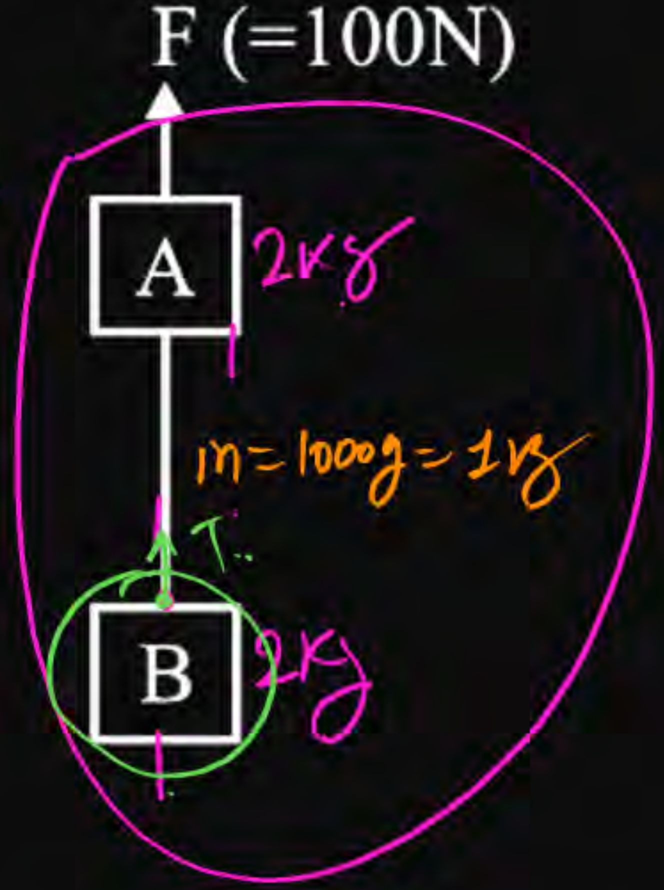
$(M+m)g = Kx$

$x = \dfrac{(M+m)}{g}$

Question

Consider the shown arrangement where the blocks A and B connected by means of a uniform string is being moved vertically up by the force F. Each block weighs 2 kg while the mass of string is 1000 gm. The tension at bottom of the string equals

1. 20 N
2. 40 N
3. 60 N
4. 270 N



$a = \frac{100-50}{5} = \frac{50}{5} = 10\,m/s^2$

$a = 10\,m/s^2$

$T - mg = ma$

$T = ma + mg$

$= 20 + 2 \times 10 = 40$

Question 13

A cabin of a ferries wheel has acceleration of 6 m/s^2 in a direction 60° with downward vertical as shown. A man of mass 80 kg is standing on a weighing machine inside the cabin. The reading of weighing machine will be ($g = 10\ m/s^2$)

1. 40 kg
2. 50 kg
3. $\boxed{56\ kg}$
4. 64 kg

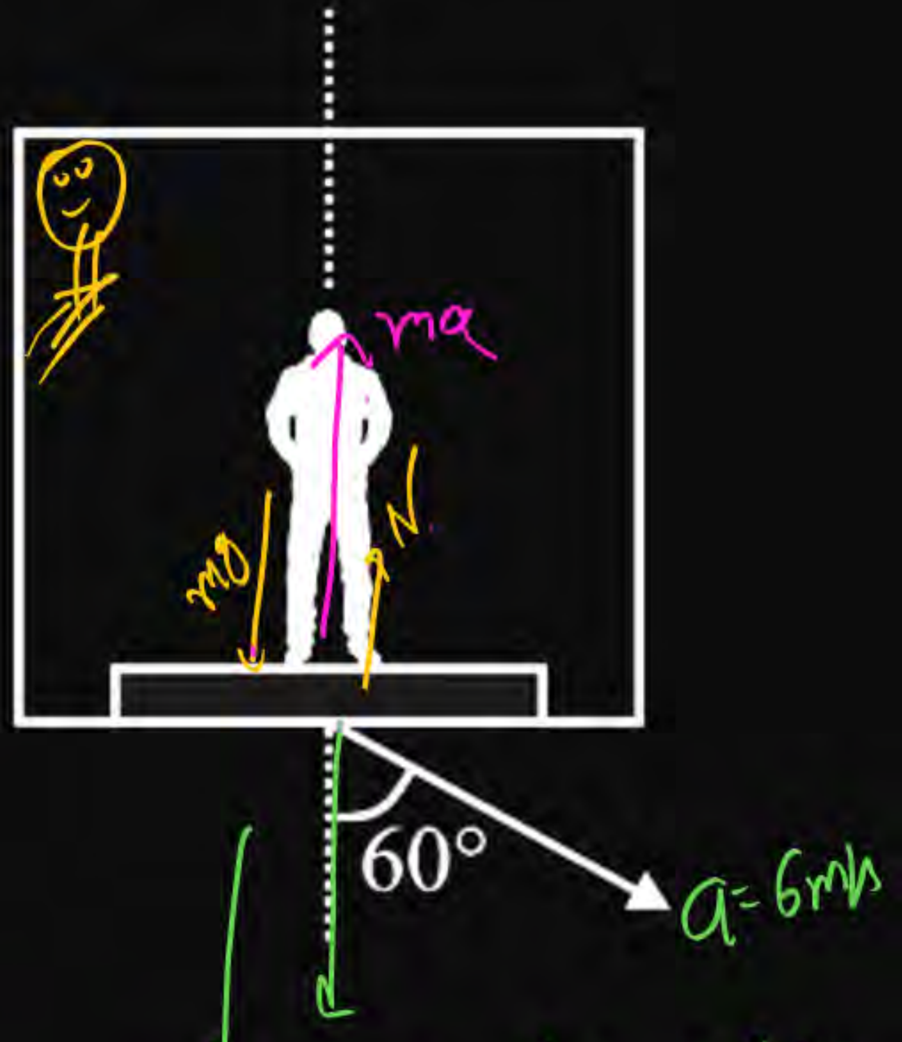
$$ma + N = mg$$

$$N = mg - ma$$

$$= m(g - a)$$

$$= 80(10 - 3)$$

$$= 80 \times 7$$



$$a_y = 6\cos 60 = 6 \times \frac{1}{2} = 3\ m/s^2$$

Question 14

A body moves with velocity $v = \ln x$ m/s where x is its position. The net force acting on body is zero at:

1. 0 m
2. $x = e^2$ m
3. $x = e$ m
4. $x = 1$m ✓

$V = \ln x$

$a = \frac{dv}{dt}$

$a = v\frac{dv}{dx}$

$a = \ln x \times \frac{1}{x}$

$F = ma$

$0 = m \ln x \frac{1}{x}$

$\frac{0}{m} x = \ln x$

$\ln x = 0$

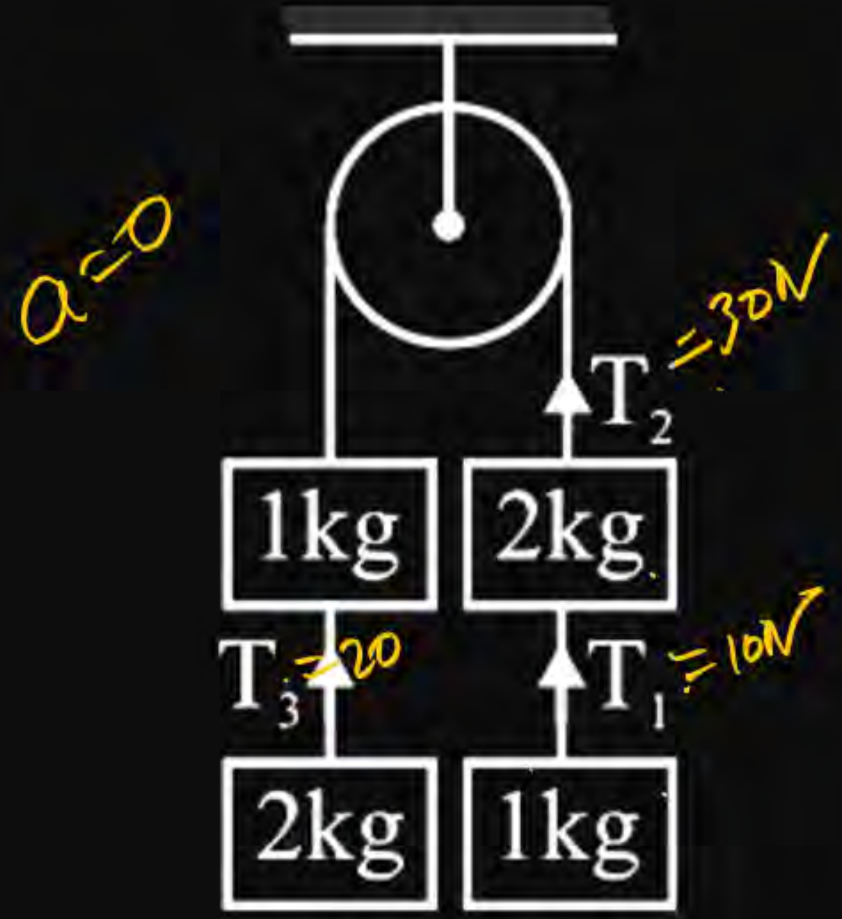
$\log_{10} x = 0$

$\log_{10} 1 = 0$ $\log_e 1 = 0$

Question 15

In the figure shown all the strings are massless and friction is absent everywhere. Choose the correct option.

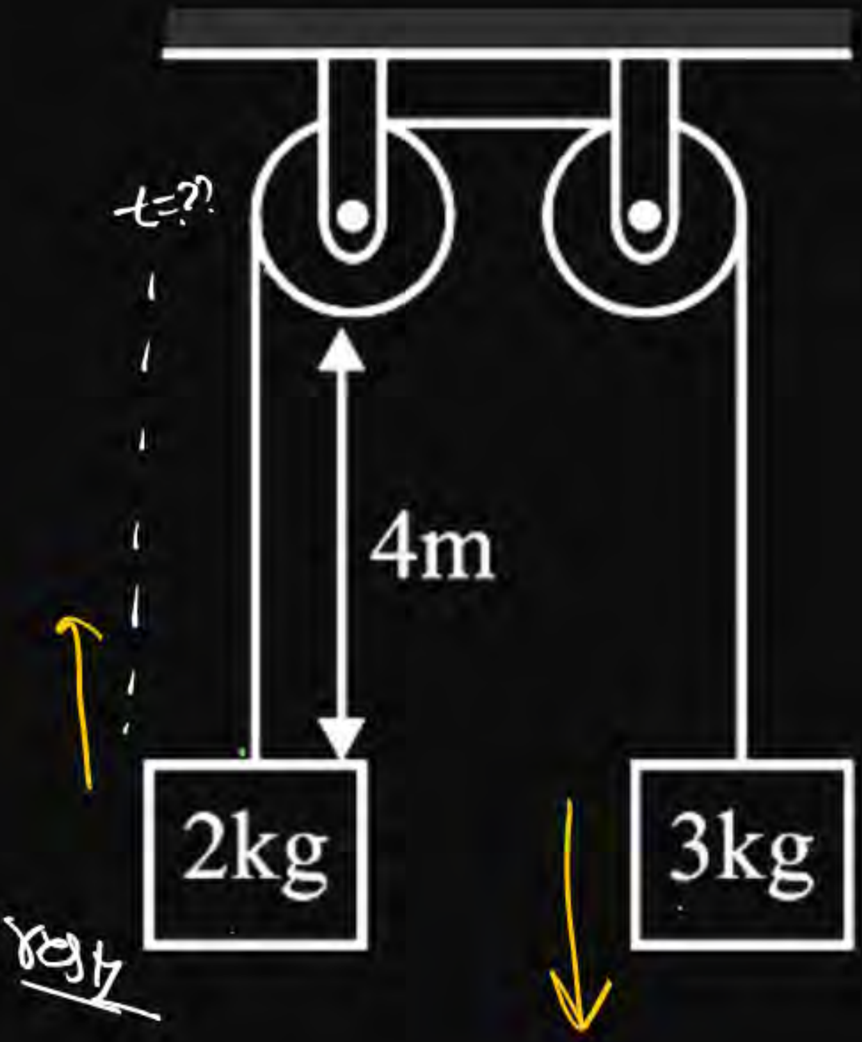
1. $T_1 > T_2 > T_3$
2. $\boxed{T_2 > T_1 > T_3}$ X
3. $T_2 > T_3 > T_1$ ✓
4. $T_3 > T_2 > T_1$



Question 16

How long it will take for the 2 kg block to strike the pulley after the system shown is released from rest?

1. 1s
2. 2s
3. 3s
4. 4s



$a = \left(\frac{3-2}{3+2}\right)10$

$= \frac{1}{\cancel{5}} \times \cancel{10}$ 2m/s

$u=0 \quad a=2$

$s = ut + \frac{1}{2}at^2$

$4 = 0 + \frac{1}{\cancel{2}} \cancel{2} t^2$

$t^2 = 4 \quad t = \sqrt{4} = 2$ sec

Question 1

JEE

A particle of mass 2 kg moves in free space such that its position vector varies with time as $\vec{r} = \left[(3 + 4t^2)\hat{\imath} + (2t)\hat{\jmath} + (3 - 6t)\hat{k}\right]m$, where t is in seconds. Net force acting on the particle is

$r = (3+4t^2)\,i + 2t\,\hat{j} + (3-6t)\,k$

$v = \frac{dr}{dt}$

$a = \frac{dv}{dt} =$

1. zero
2. parallel to x-axis
3. parallel to y-axis
4. time dependent

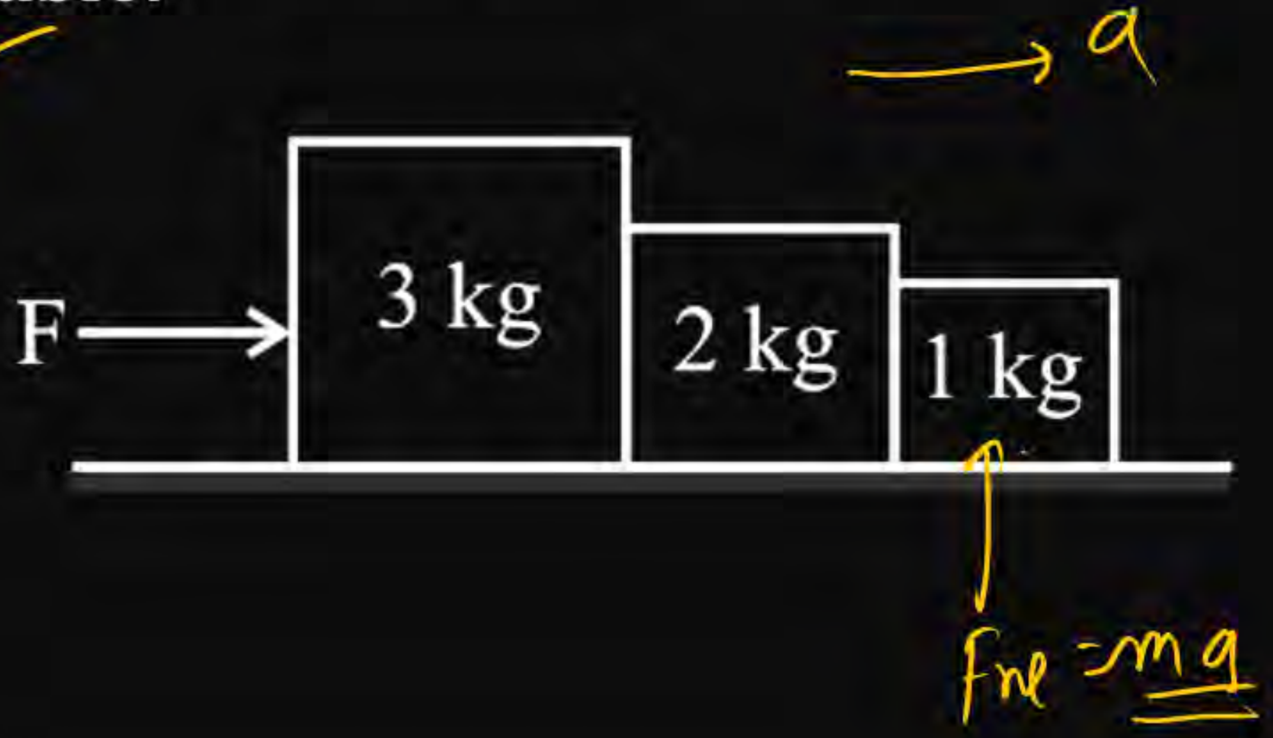
Question 18

Consider the following statement about the blocks shown in the diagram that are being pushed by a constant force on a frictionless table.

(i) All blocks move with the same acceleration.

(ii) The net force on each block is the same.

Which of these statement are/is correct



1. (i) only
2. (ii) only
3. both (i) and (ii)
4. neither (i) nor (ii)

Question 15

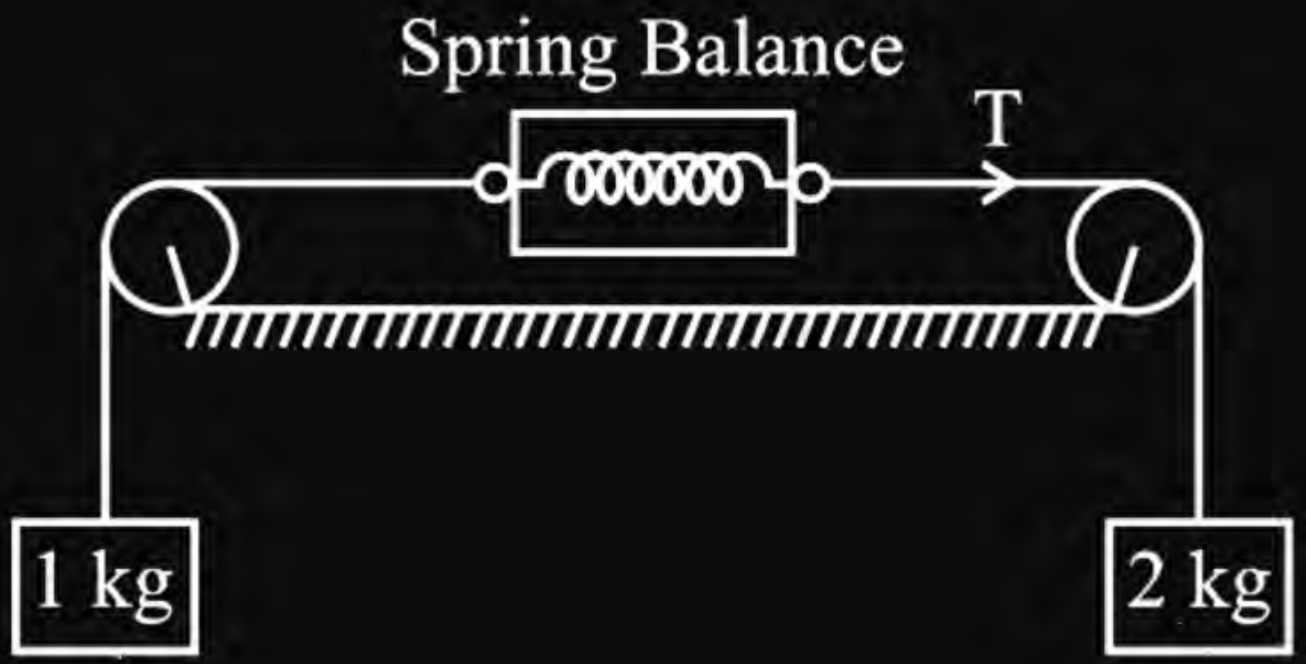
Reading of the spring balance, as shown in figure, is (assume all ideal cases and neglect friction, $g = 10\ \text{m/s}^2$)

(1) 20 N

(2) 10 N

(3) $\frac{40}{3}$ N ✓

(4) zero



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

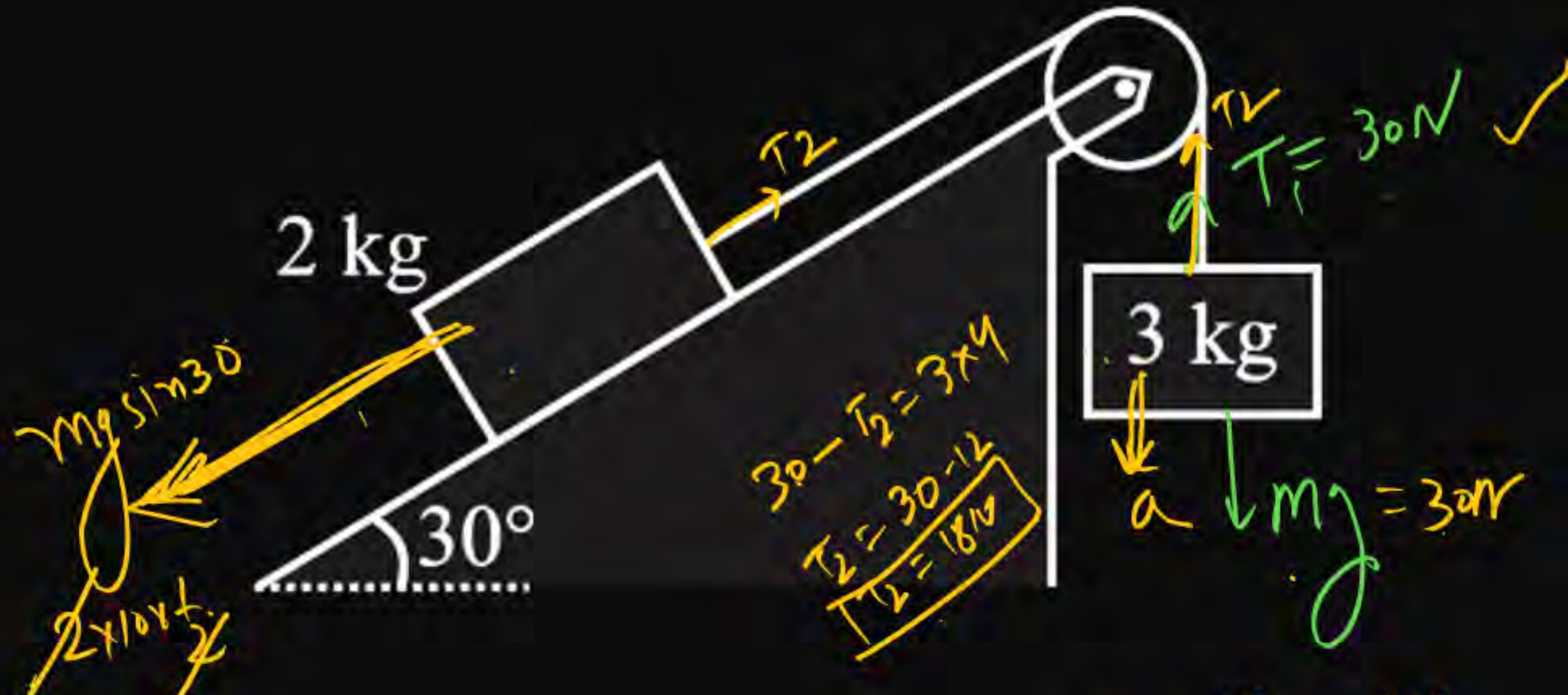
$$= \frac{2 \times 2 \times 1}{3} \times 10 = \frac{40}{3}$$

$$a = \frac{20 - 10}{3}$$

Question 20

In the arrangement shown, the 2 kg block is held to keep the system at rest. The string and pulley are ideal. When the 2 kg block is set free, by what amount the tension in the string changes?
$[g = 10\ \text{m/s}^2]$

1. Increase of 12 N
2. Decrease of 12 N
3. Increase of 18 N
4. Decrease of 18 N

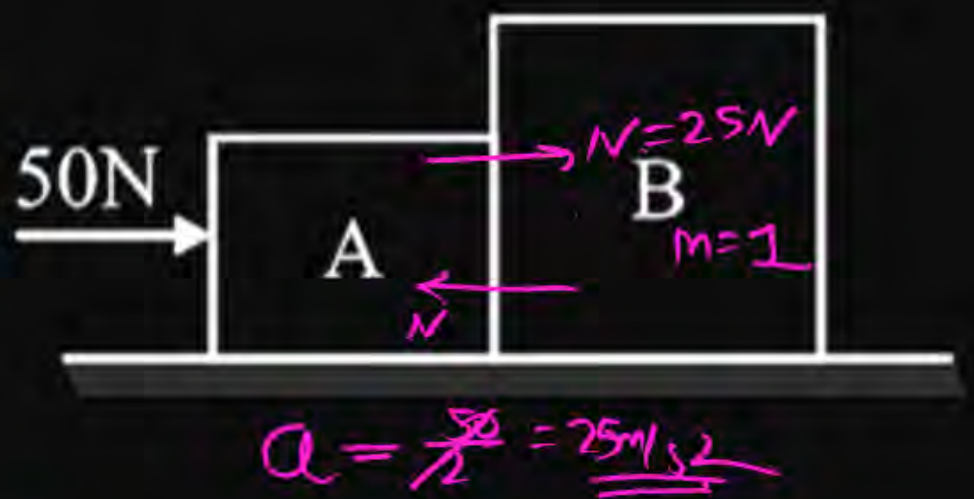


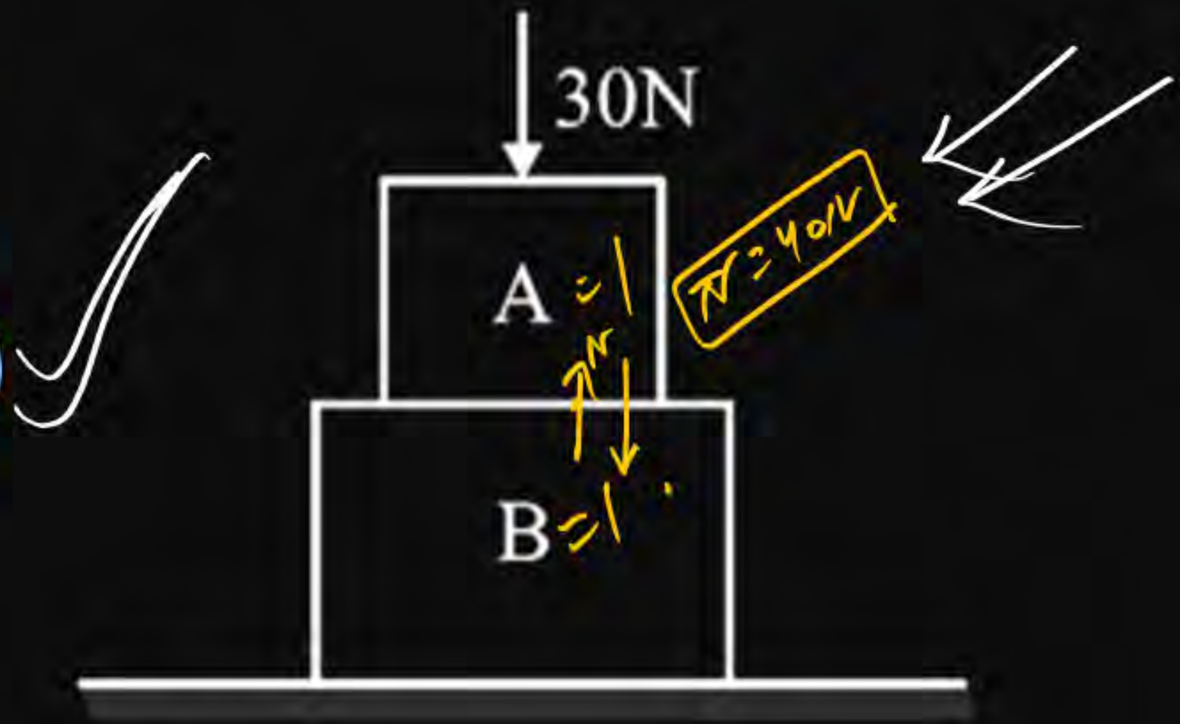
$\Delta T = T_i - T_f$
$= 30 - 18$
$= 12$

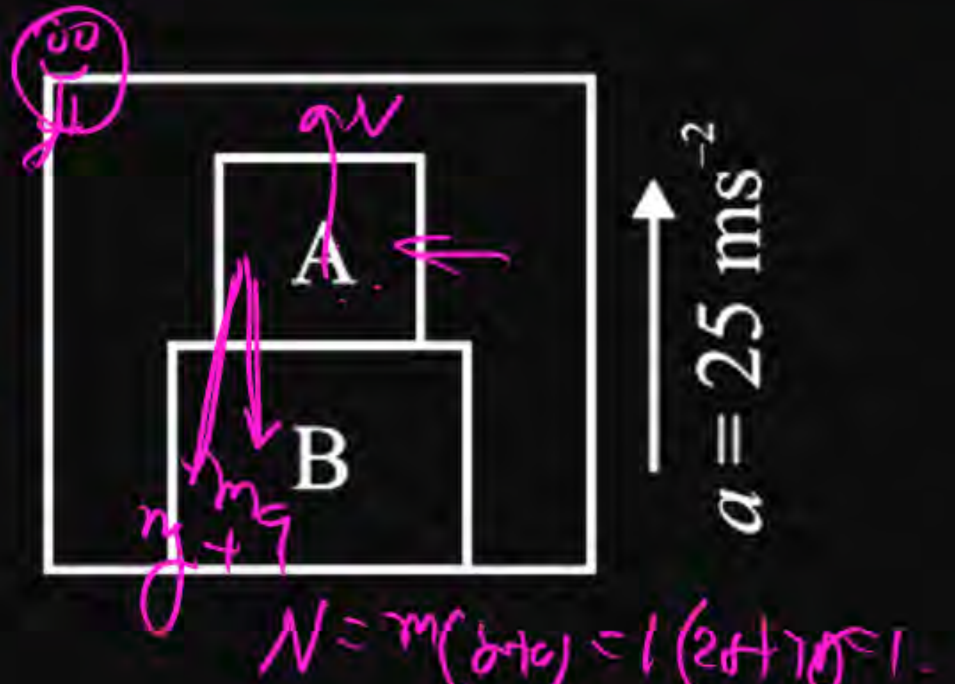
$a = \frac{30 - 10}{5} = \frac{20}{5} = 4\ \text{m/s}^2$

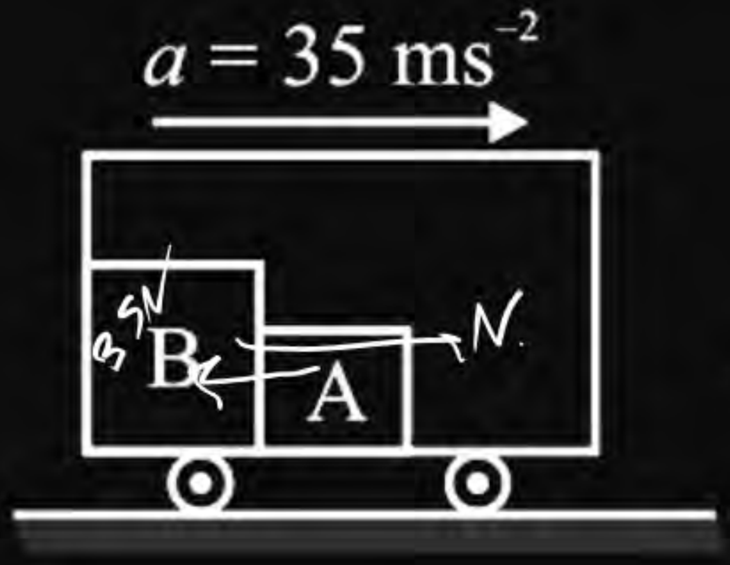
Question 2

In which of the following cases the contact force between A and B is maximum?
$(m_A = m_B = 1\text{ kg})$

1 

2 

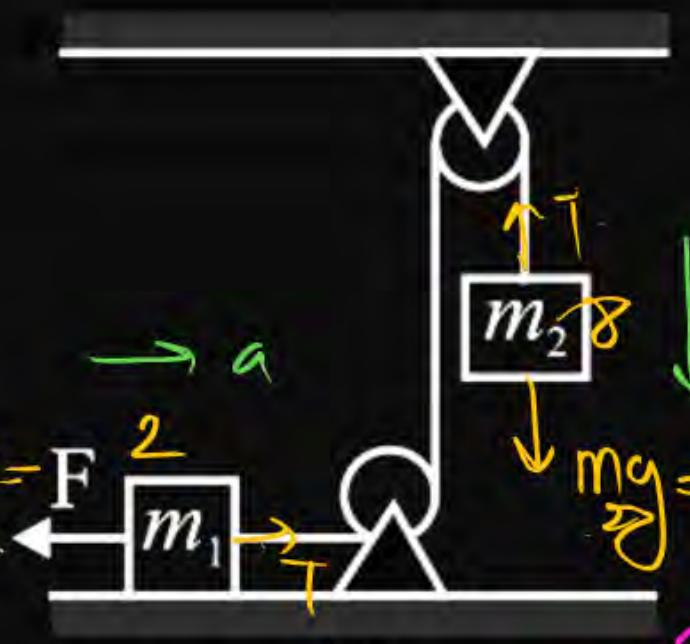
3 

4 

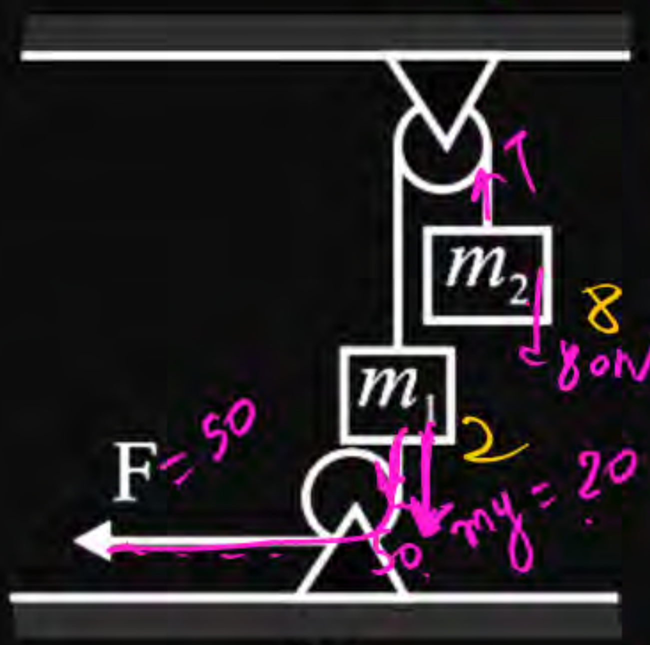
Question 22

The ratio of tensions in the string connected to the block of mass m_2 in figure-(a) and figure-(b) respectively is (friction is absent everywhere):
[m_1 = 2 kg, m_2 = 8 kg and F = 50 N].

1. 7 : 9 $\quad T_1 : T_2 = \cancel{56}^{\,7} : \cancel{72}^{\,9}$
2. 9 : 7
3. 2 : 7
4. 7 : 2



(a)



(b)

$$\frac{80-50}{m_1+m_2} = a$$

$$a_1 = \frac{30}{10} = 3\,m/s^2$$

$80 - T = ma$
$80 - T = 8 \times 3$
$\boxed{80 - 24 = T}$
$T = 56$

$80 - T = 8 \times 1$
$80 - 8 = T_2$
$T_2 = 72$

$$a = \frac{80-70}{10} = \frac{10}{10} = 1\,m/s^2$$

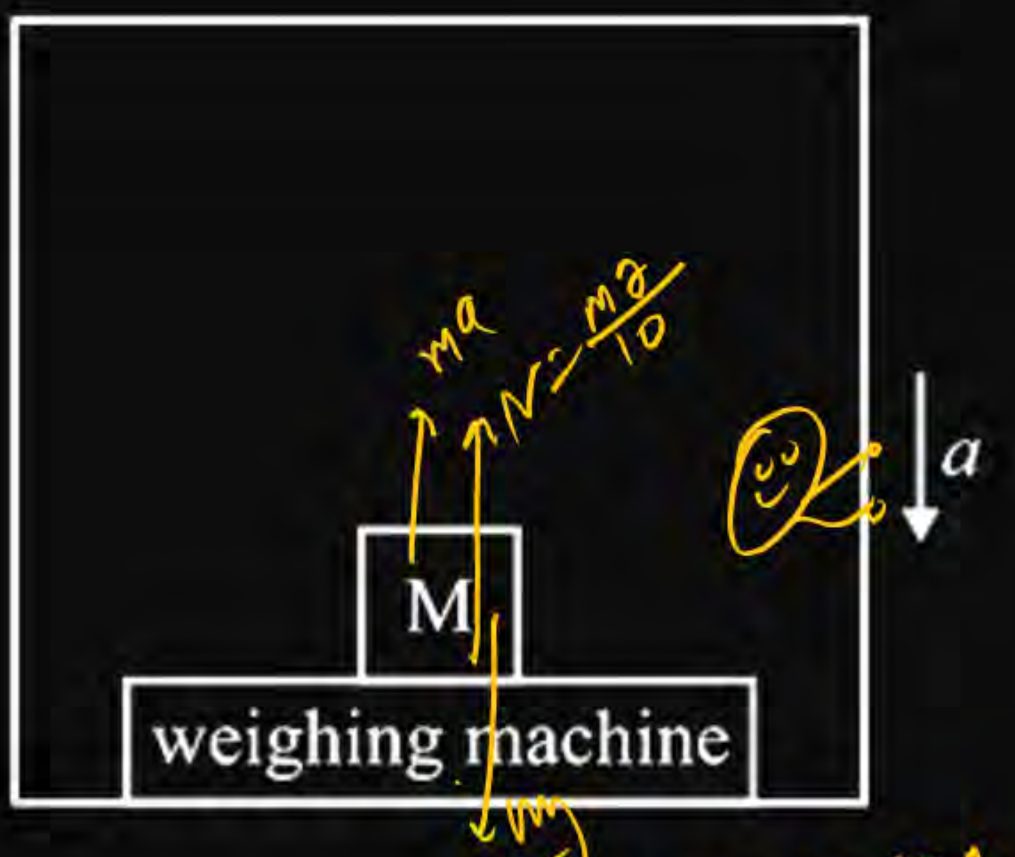
Question 23

With what acceleration 'a' shown the elevator descends so that the block of mass M exerts a force of $\frac{Mg}{10}$ on the weighing machine?
[g = acceleration due to gravity]

1. $-0.1\,g$
2. $0.1\,g$
3. $0.9\,g$ ✓
4. $-0.9\,g$

$$\cancel{m}a = \frac{9\cancel{m}g}{10}$$

$$a = \frac{9g}{10}$$



$$N + ma = mg$$

$$ma = mg - N = mg - \frac{mg}{10} = \frac{9mg}{10}$$

Question 24

A monkey weighing 10 kg is climbing up a light rope which passes over an ideal pulley. The other end of the rope is attached a 15 kg mass as shown in the figure. In order to raise the 15 kg mass off the ground the monkey should climb up

1. with constant acceleration $g/3$.
2. with an acceleration greater than $g/2$.
3. with an acceleration equal to $g/4$.
4. It is not possible because weight of monkey is lesser than the block.

$150 - 100 = 10a$

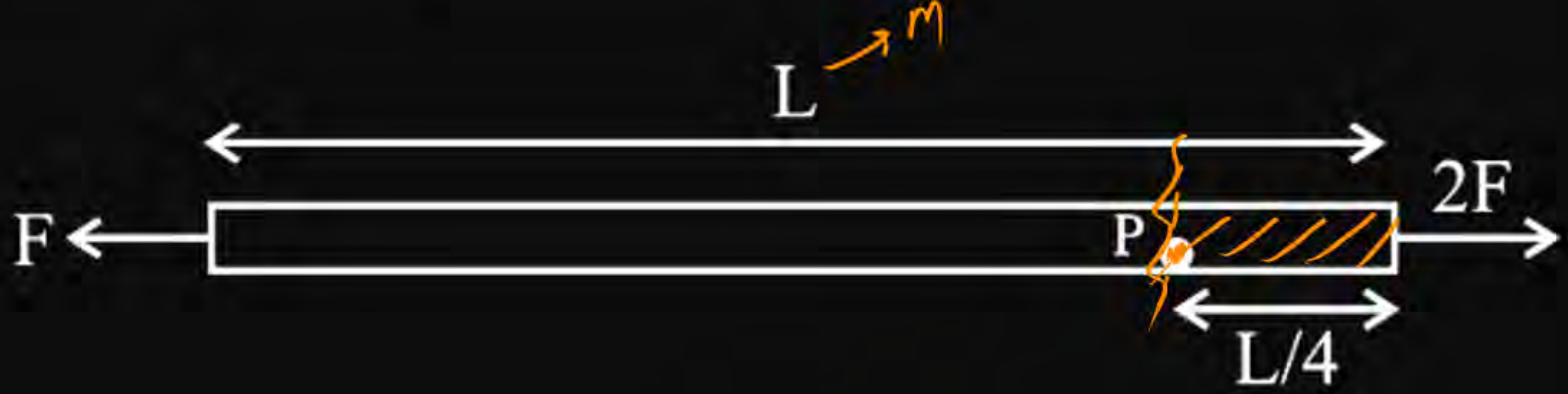
$50 = 10a$

$\boxed{a = 5}$

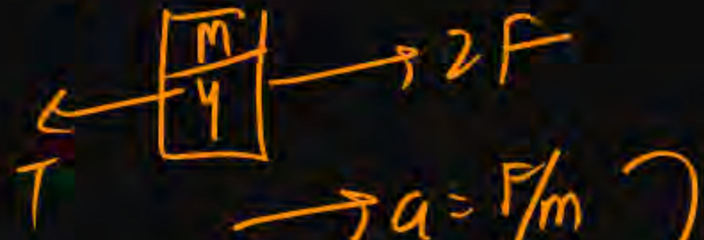
Question 25

A uniform rod of mass M and length L lies flat on a frictionless horizontal surface. Two forces F and 2F are applied along the length of the rod as shown. The tension in the rod at point P is

1. F
2. 3F
3. 5F/4
4. 7F/4



$a = \frac{2F - F}{m} = \frac{F}{m}$



$2F - T = ma$

fmd.

Question 26

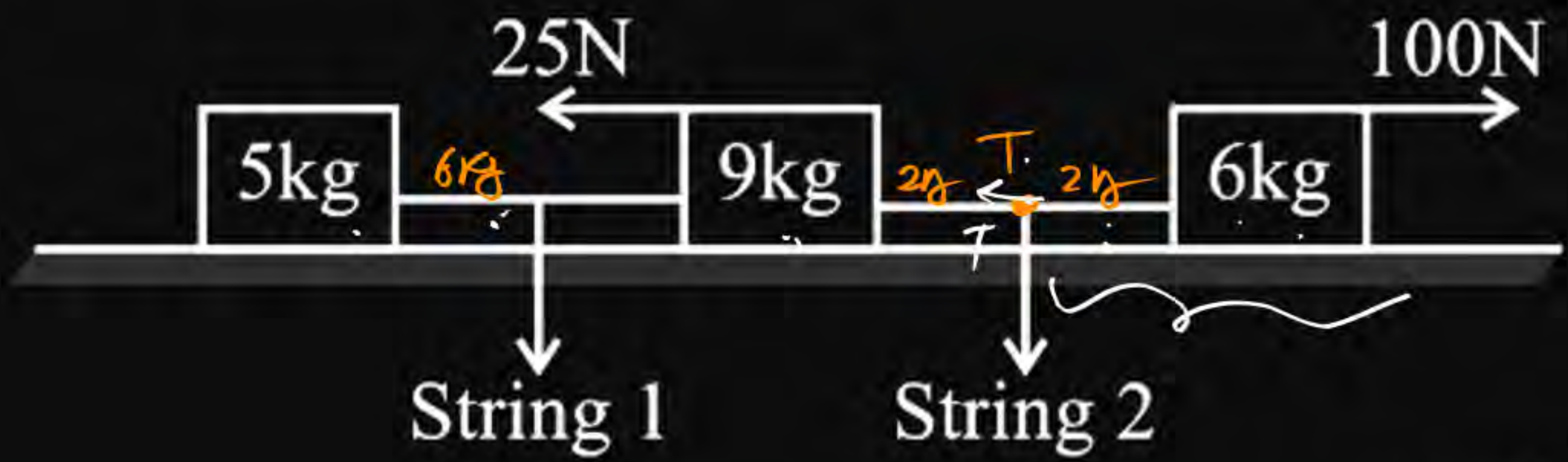
In the given figure tension at the mid-point of string-2. If mass of string-1 is 6 kg and mass of string-2 is 4 kg.

(1) 70 N

(2) 60 N

(3) 80 N

(4) 50 N



$100 - T = 8 \times a$

$a = \frac{75}{30}$

$T = 100 - 8a$

$= 100 - \cancel{8}^{4} \times \frac{\cancel{75}^{5}}{\cancel{30}_{15}}$

$= 100 - 20$

$= 80\,N$

Question 27

There is a long chain containing infinite link. If mass of links of chain is M, M/2, M/4, M/8, ..., then the net force on third link is:

1. 2F
2. F/2
3. F/4
4. F/8 ✓

$$a_{net} = \frac{F}{m + \frac{m}{2} + \frac{m}{4} + \frac{m}{8}}$$

G.P Sum

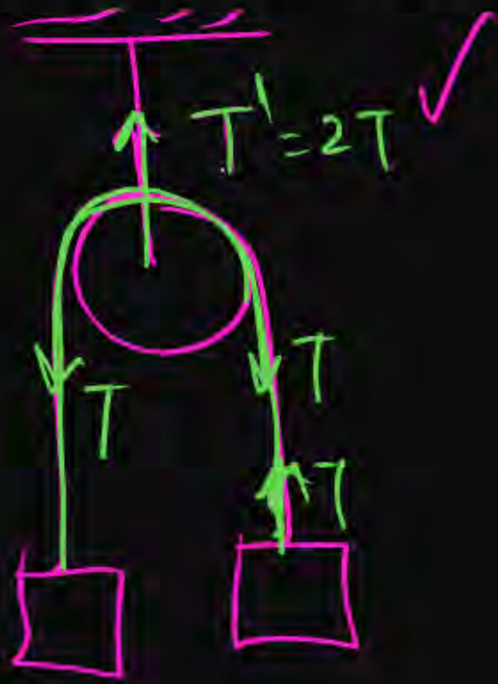
$$F_{net} = \frac{m}{4} a_{net} = \frac{\cancel{m}}{4} \times \frac{F}{2\cancel{m}}$$

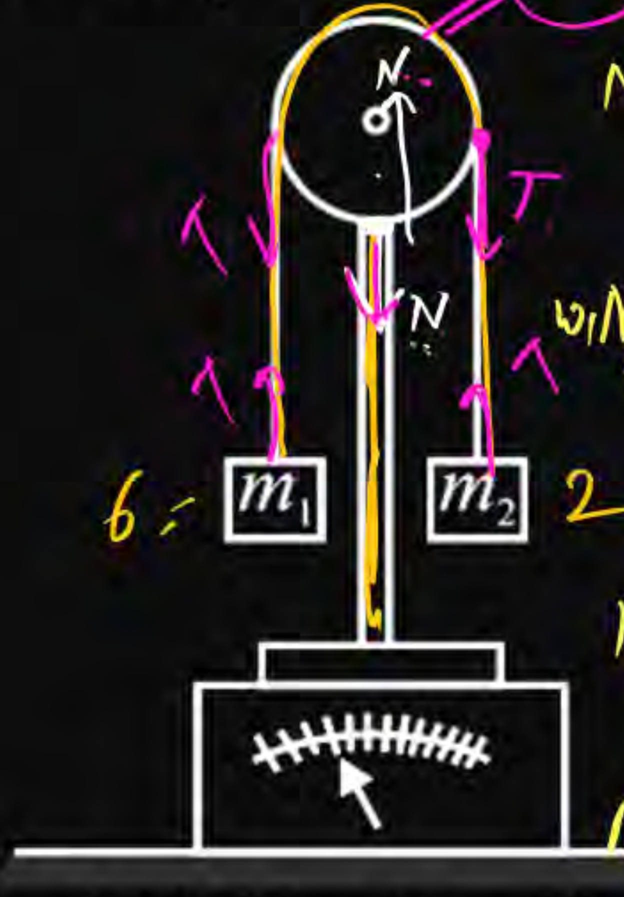
$$= \frac{F}{8}$$

Question 28

Two masses m_1 and m_2 which are connected with a light string, are placed over a frictionless pulley. This set up is placed over a weighing machine, as shown. Three combination of masses m_1 and m_2 are used, in first case $m_1 = 6$ kg and $m_2 = 2$ kg, in second case $m_1 = 5$ kg and $m_2 = 3$ kg and in third case $m_1 = 4$ kg and $m_2 = 4$ kg. Masses are held stationary initially and then released. If the readings of the weighing machine after the release in three cases are W_1, W_2 and W_3 respectively then:

1. $W_1 > W_2 > W_3$
2. $W_1 < W_2 < W_3$
3. $W_1 = W_2 = W_3$
4. $W_1 = W_2 < W_3$





Weighing Machine

$2T = N$

$N = 2\left[\frac{2m_1m_2}{m_1+m_2}\right]g$

$W_1\ N_1 = 2\left[\frac{6\times2}{8}\right] = \frac{12}{8}$

$N_2 = W_2 = \left[\frac{5\times3}{8}\right] = \frac{15}{8}$

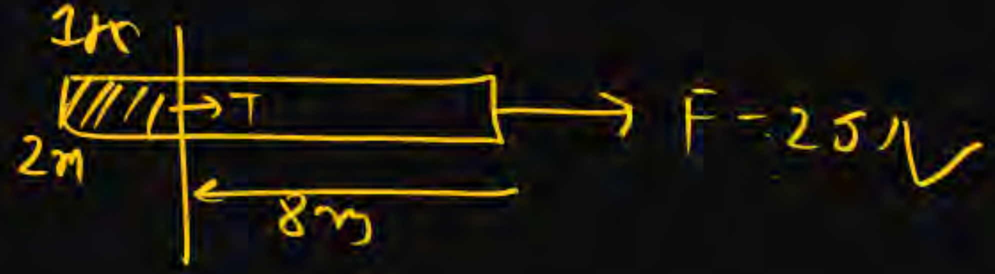
$N_3 = \frac{4\times4}{8} = \frac{16}{8}$

Question 27

Rope of length 10 m and linear mass density $\boxed{0.5\ kg/m}$ is lying lengthwise on a smooth horizontal floor. It is pulled by a force of 25 N. Tension in the rope at a point 8 m away from the point of application of force is:

1. 20 N
2. 15 N
3. 10 N
4. 5 N

$m' = 5\ kg$



$T = 1\ kg\ a$

$= 1 \times \frac{\cancel{25}}{\cancel{5}} = 5$

Question 30

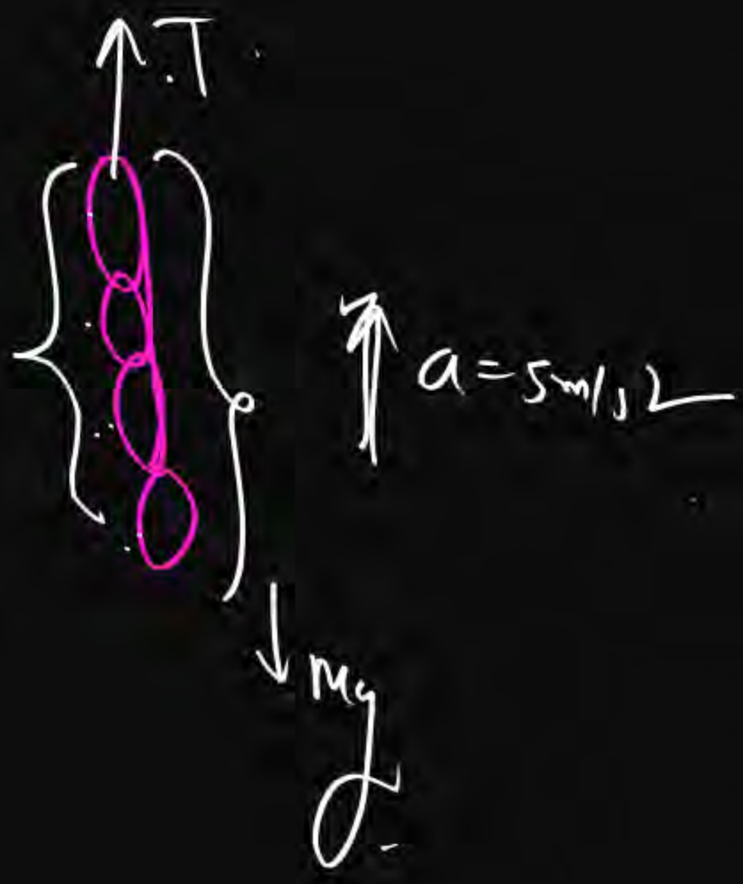
A chain consisting of 5 links of mass $\boxed{0.1\text{ kg}}$ each is lifted vertically upwards with a constant acceleration 5 m/s^2 as shown in figure. The force of interaction between the top link and the link immediately below it will be: ($g = 10\text{ m/s}^2$)

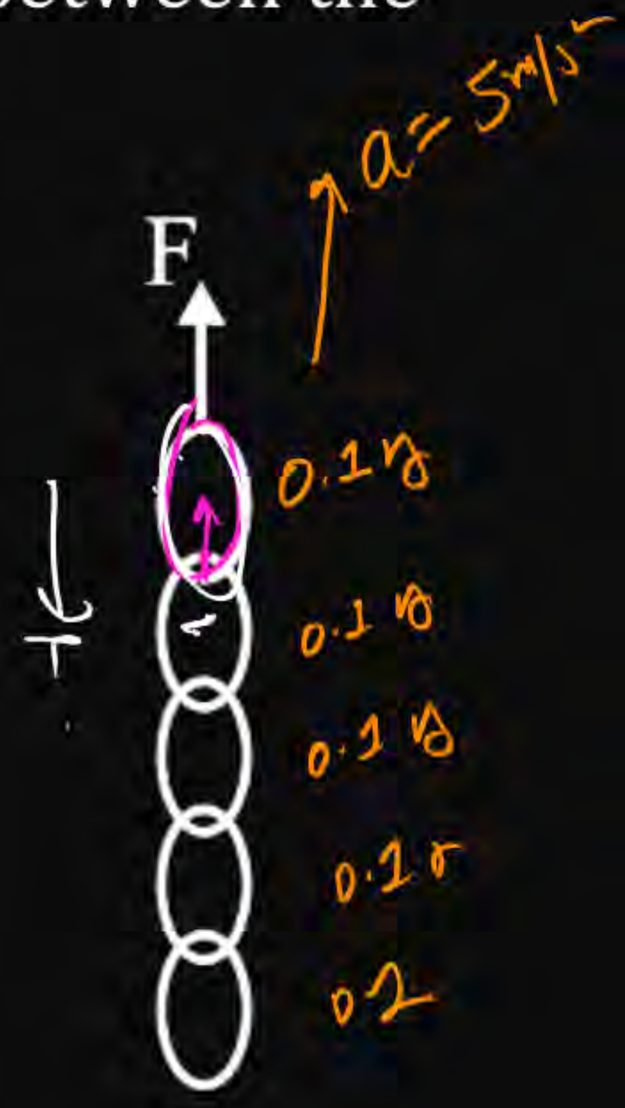
1. 6 N
2. 4 N
3. 3 N
4. 2 N

$$T - 0.4g = ma$$

$$T = 0.4g + 0.4\times 5$$

$$T = 4 + 2 = 6N$$

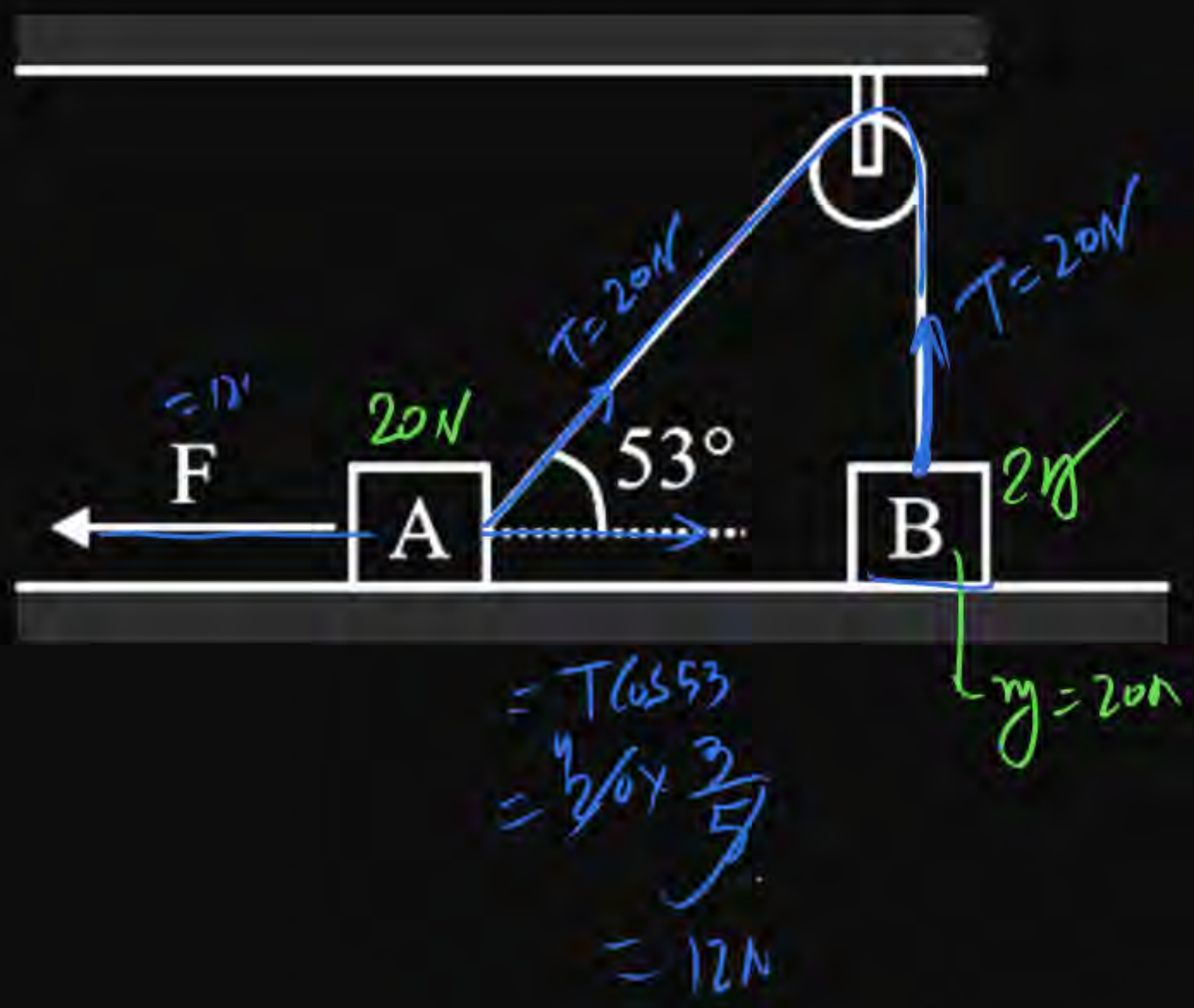




Question 3

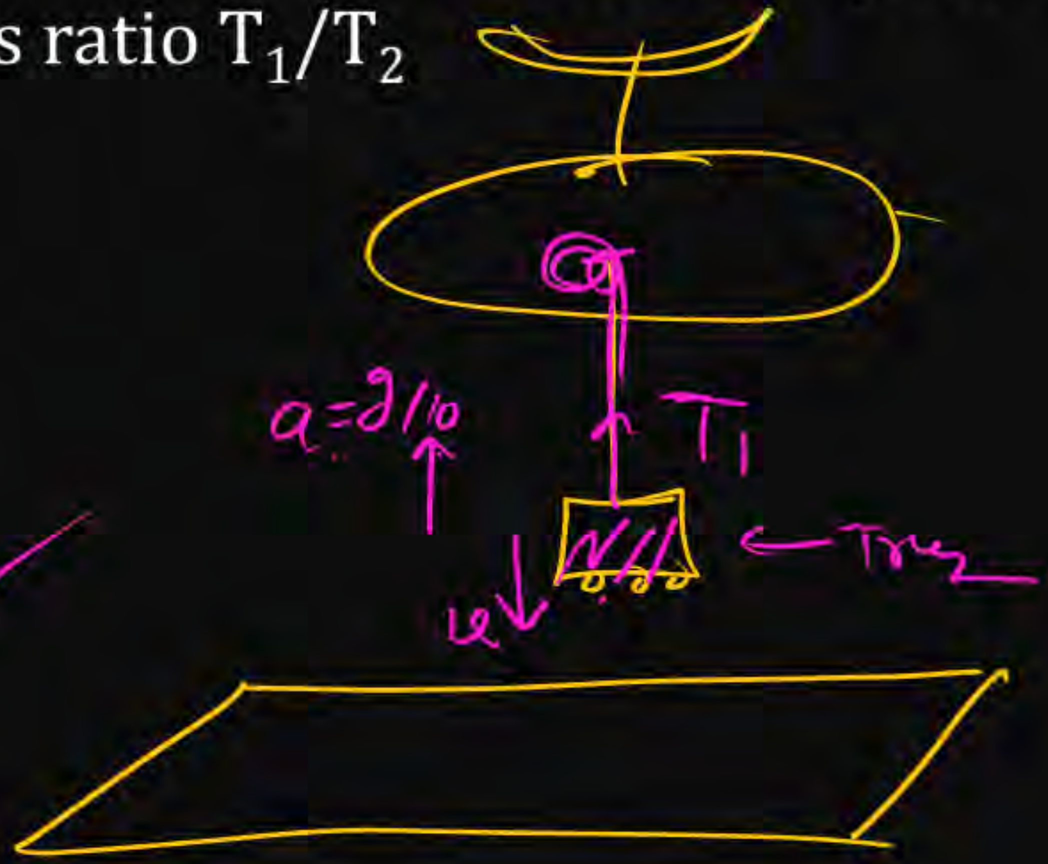
Two identical blocks A and B each of weight 20 N are placed on a frictionless horizontal plane. The portion of the string connected to B is vertical and that connected to A makes an angle of 53° with the plane. The minimum horizontal force F required to lift the block B is

1. 12 N
2. 16 N
3. 32 N
4. 36 N



Question 3

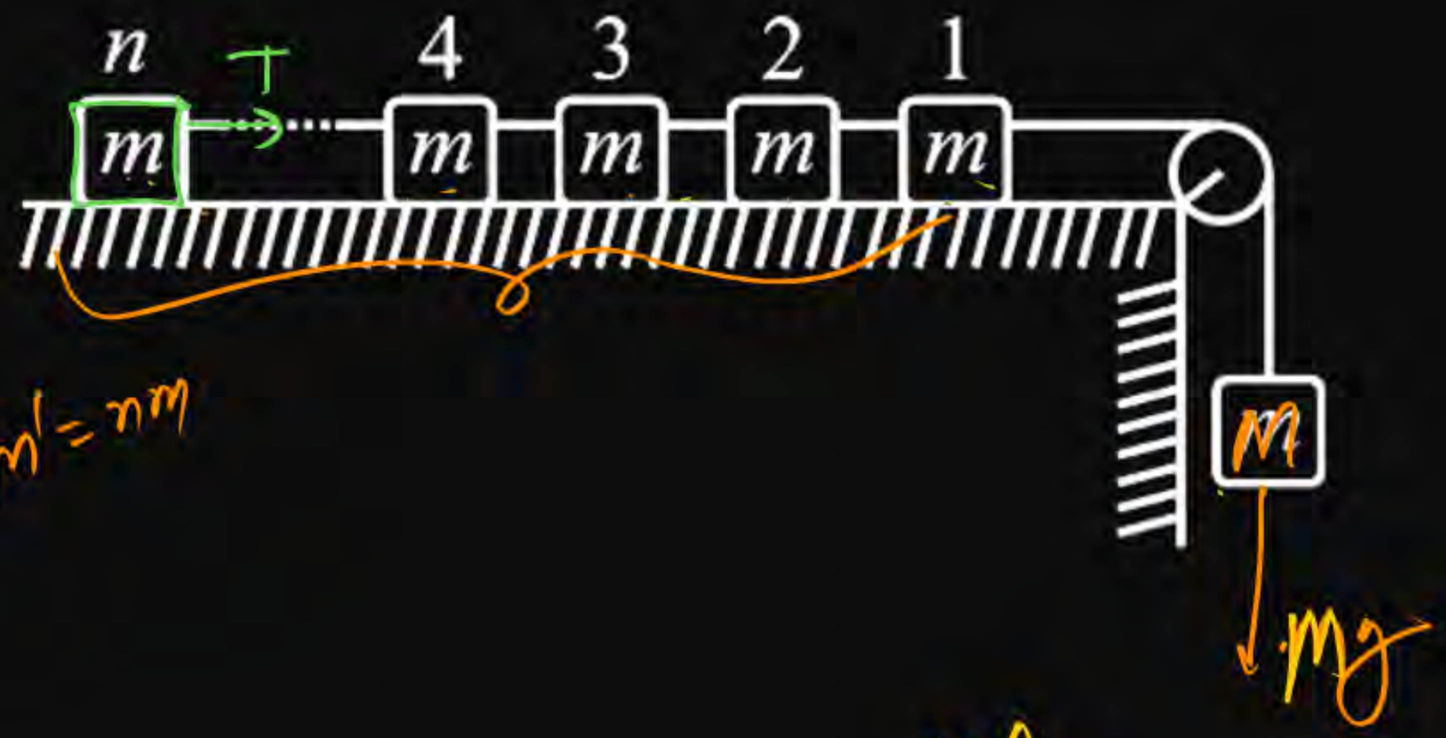
A helicopter of mass M is lowering a truck of mass m onto the deck of a ship. In first case the helicopter and the truck move downward together (the length of the cable remains constant). Tension in the cable is T_1 when their downward speed is decreasing at a rate of $g/10$. In second case when the truck gets close to the deck, the helicopter stops moving downward. While it hovers stationary, it lets out the cable so that the truck is still moving downward. If the truck is moving downward with a speed decreasing at rate of $g/10$, tension in string is now T_2. What is ratio T_1/T_2



1. 10/11
2. 9/11
3. 1
4. None

Question 33

In the given arrangement, n number of equal masses are connected by strings of negligible masses. The tension in the string connected to the n^{th} mass is:



1. $\dfrac{mMg}{nm+M}$
2. $\dfrac{mMg}{nmM}$
3. mg
4. mng

$m' = nm$

(Tension) $T = m \times a$

$T = \dfrac{m\,Mg}{(M+nm)}$

$a = \dfrac{Mg}{(M+nm)}$

Question

34

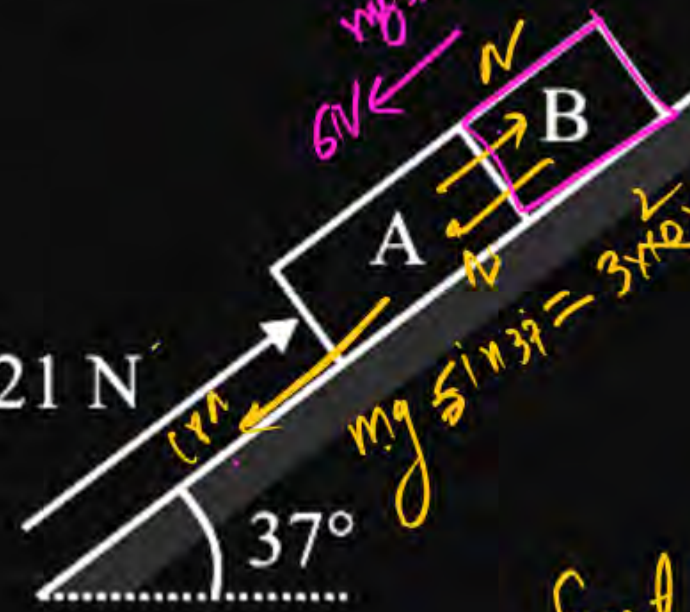
Blocks A and B of masses $\boxed{2\text{ kg and }1\text{ kg}}$ respectively are pushed up a frictionless slope by a 21 N force applied parallel to the slope as shown in the figure. Find the magnitude of the force of normal reaction between A and B. [$g = 10\text{ m/s}^2$]

(1) 7 N

(2) 5 N

(3) 9 N

(4) 3 N



$mg\sin 37 = 1\times 10\times \frac{3}{5} = 6\text{N}$

$mg\sin 37 = 3\times 10\times \frac{3}{5} = 9\times 2 = 18$

$F_{net} = 21 - 18 = 3$

$ma = 3$

$a = \frac{3}{3} = 1$

$N - 6 = 1\times 1$

$N = 7\text{N}$

Question

3

The system shown in the diagram is released from rest. Pulley and string are massless. Neglect friction everywhere. ($g = 10\ \mathrm{ms^{-2}}$)

1. Tension in the string during motion of both blocks is 20 N

2. Acceleration of blocks during motion is $5\ \mathrm{ms^{-2}}$

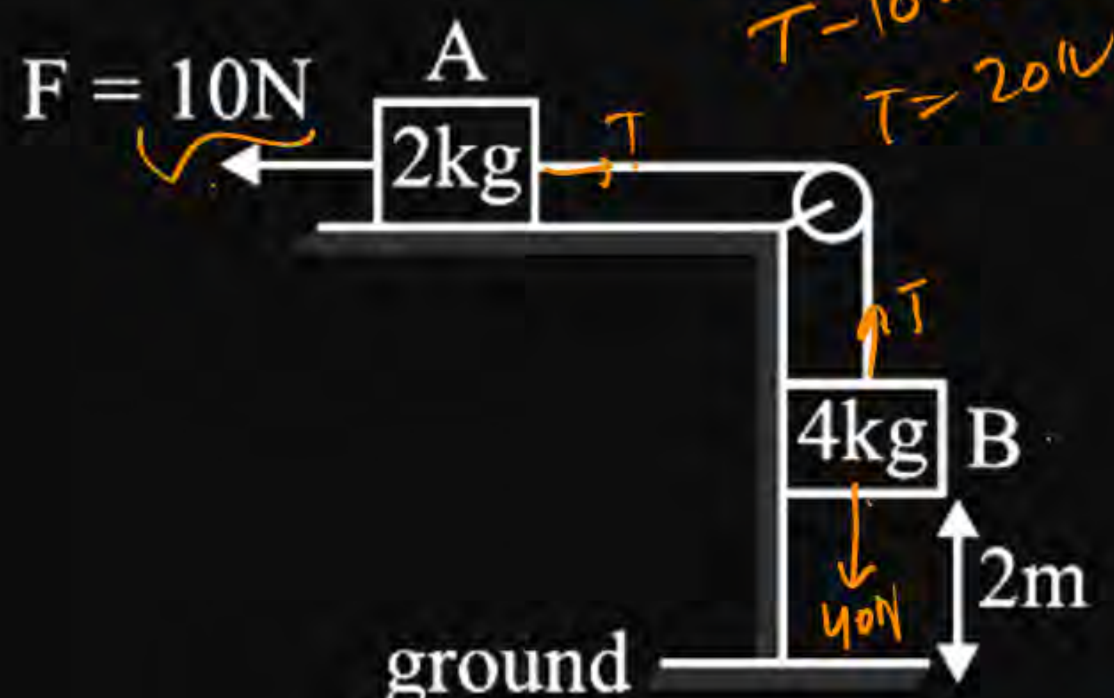
3. Block B reaches ground in $\frac{2}{\sqrt{5}} s$

4. All of the above statements are correct

$a = 5\ \mathrm{m/s^2}$

$T - 10 = 2 \times 5$

$T = 20\ \mathrm{N}$



$a = \frac{30}{6} = 5\ \mathrm{m/s^2}$

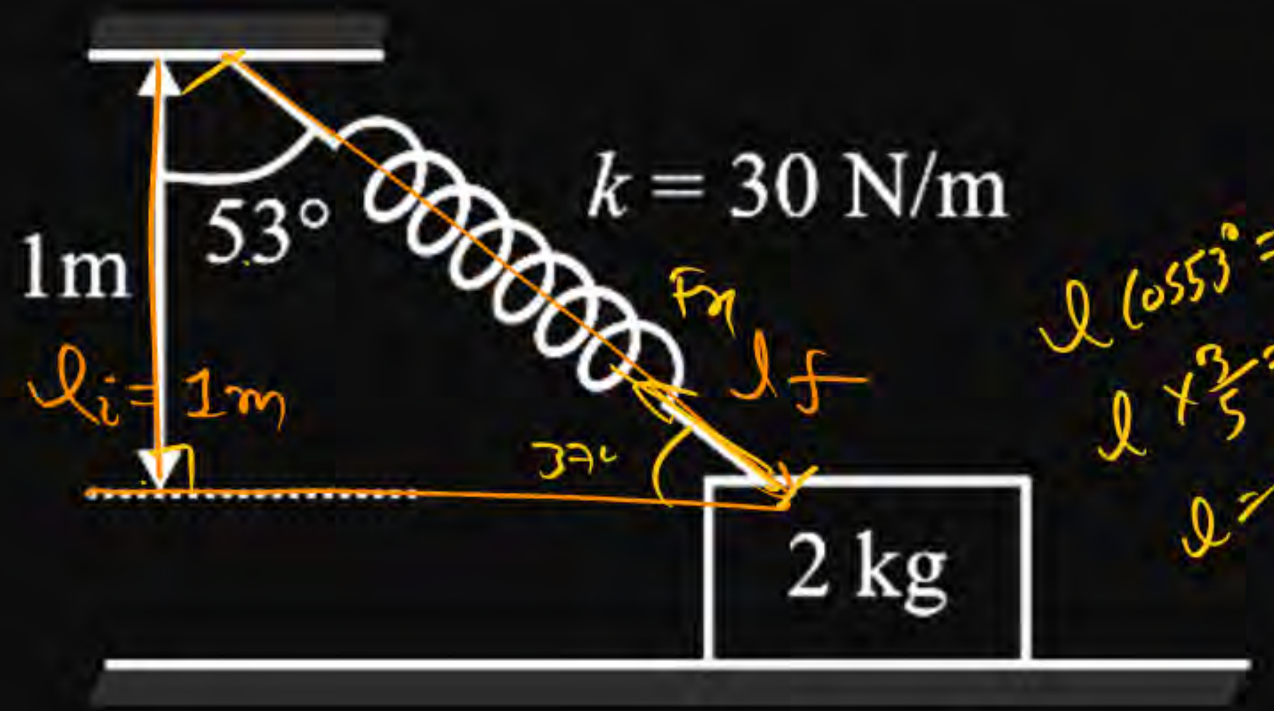
Question

36

The spring shown in the figure has a natural length of 1m. What is the initial acceleration of the block when released?

(Horizontal acc.)

1. $4\ m/s^2$
2. $6\ m/s^2$
3. $8\ m/s^2$ ✓
4. $2\ m/s^2$



$l\cos 53^\circ = 1$

$l \times \frac{3}{5} = 1$

$l = \frac{5}{3}$

elongation $= l_f - l_i$

$= \frac{5}{3} - 1$

$= \left(\frac{2}{3}\right) m$

$\boxed{F_x = Kx}$

$(F_x)_x = m a_x$

$F_s \cos 37 = ma$

$K x \cos 37 = ma$

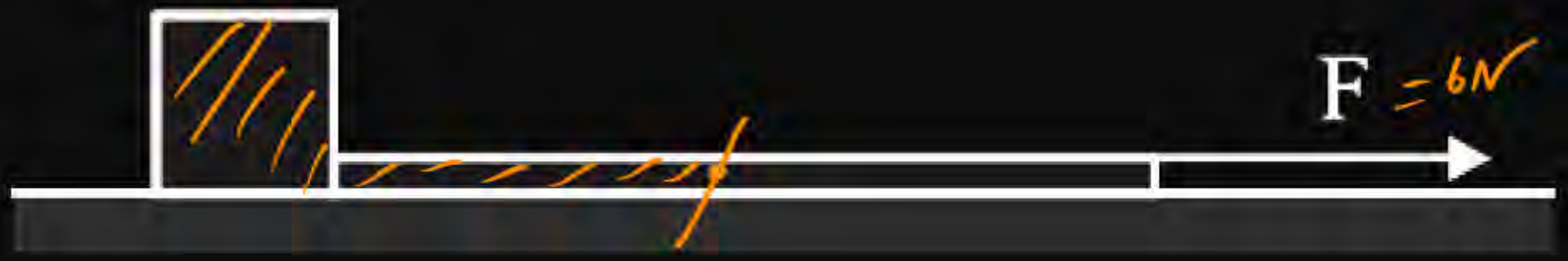
$\cancel{30}^{10} \times \frac{2}{\cancel{3}} \times \frac{4}{5} = \cancel{2}a$

$\boxed{a = 8\ m/s^2}$

Question

उत्त

A uniform rope of mass 1.0 kg is connected with a box of mass 2.0 kg, which is placed on a smooth horizontal surface. The free end of the rope is pulled horizontally by a force 6 N. Find the tension at the midpoint of the rope.



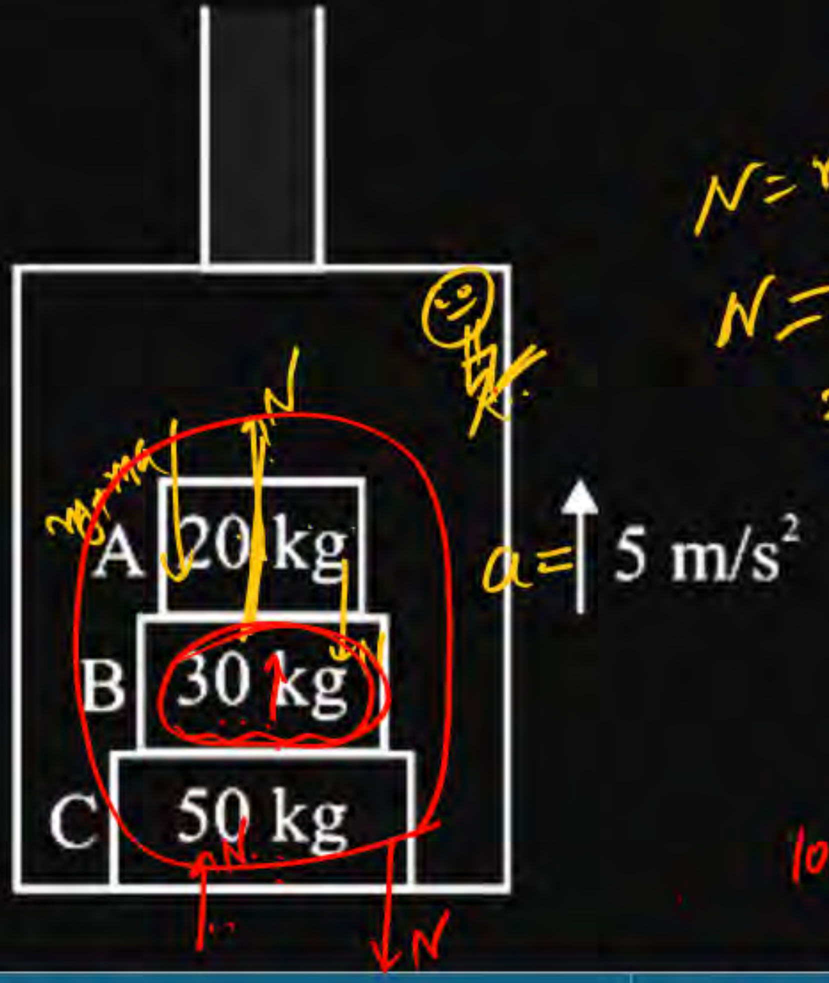
1. 4 N
2. 1 N
3. 5 N
4. 2 N

Question

28

In shown situation elevator is moving upward with acceleration of $5\ m/s^2$.

1. (A)-P; (B)-Q (C)-S (D)-T
2. (A)-Q; (B)-Q (C)-R (D)-T
3. (A)-P; (B)-R (C)-S (D)-S
4. (A)-Q; (B)-R (C)-R (D)-T



$N = m(g+a)$

$N = 20(10+5)$

$= 20 \times 15$

$= 300$

$100g + 100a = N$

$N = 100(15)$

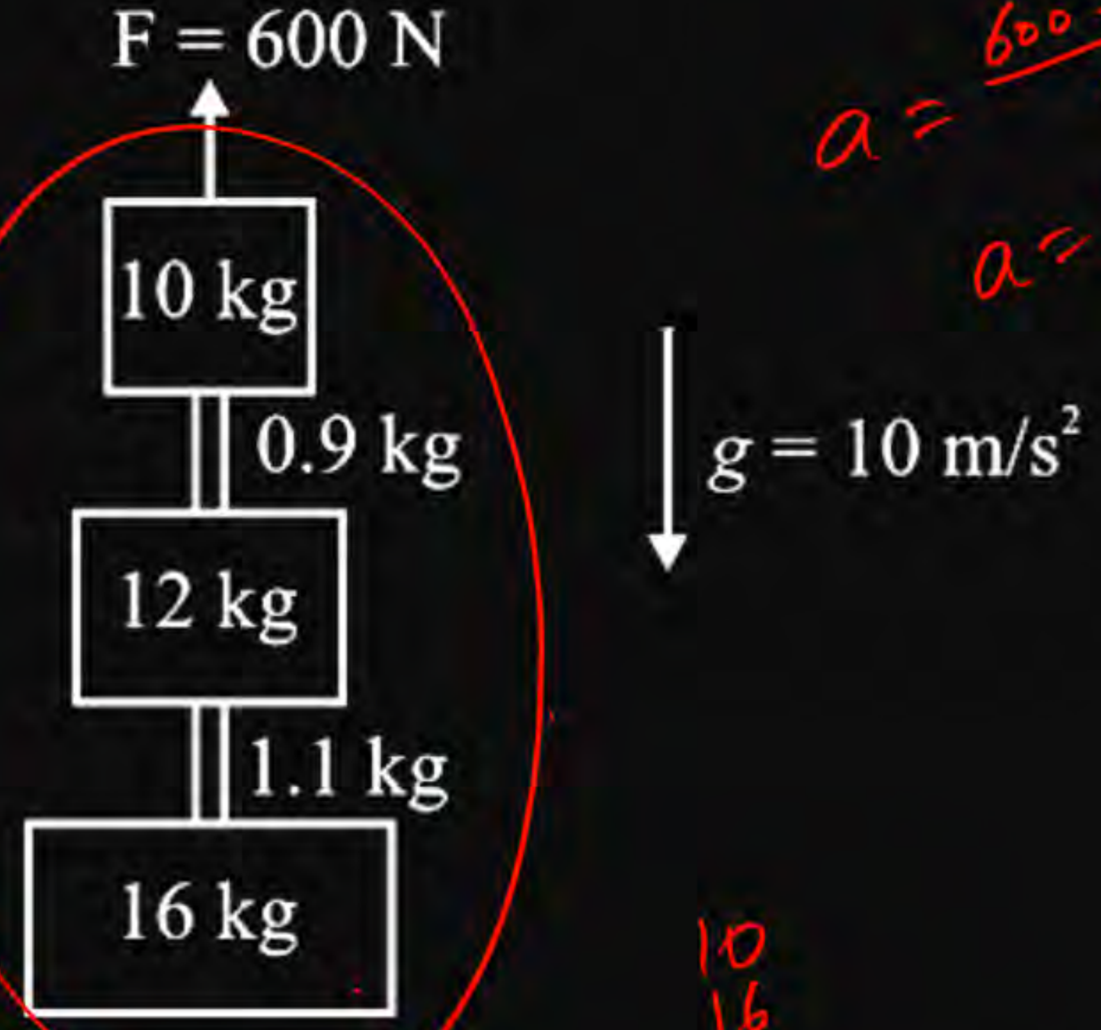
	Column-I	Column-II	
(A)	Net force acting on B	(P)	150 N
(B)	Normal reaction between A and B	(Q)	300 N
(C)	Normal reaction between B and C	(R)	450 N
(D)	Normal reaction between C and elevator	(S)	750 N
		(T)	1500 N

Question

37

The three blocks shown in figure are connected by two heavy uniform ropes. An upward force of 600 N is applied as shown in figure. What is the acceleration of the system?

1. $15\ \text{m/s}^2$
2. $5\ \text{m/s}^2$
3. $10\ \text{m/s}^2$
4. None of these



$a = \frac{600 - 400}{40}$

$a = \frac{200}{40} = 5$

10
16
12
2

40

Question 40

A force F = $(10t)$N is applied on pulley P_1 as shown in the figure, where t is time in seconds. Find the time when block A loses contact with floor. [Assume pulleys and strings to be massless]

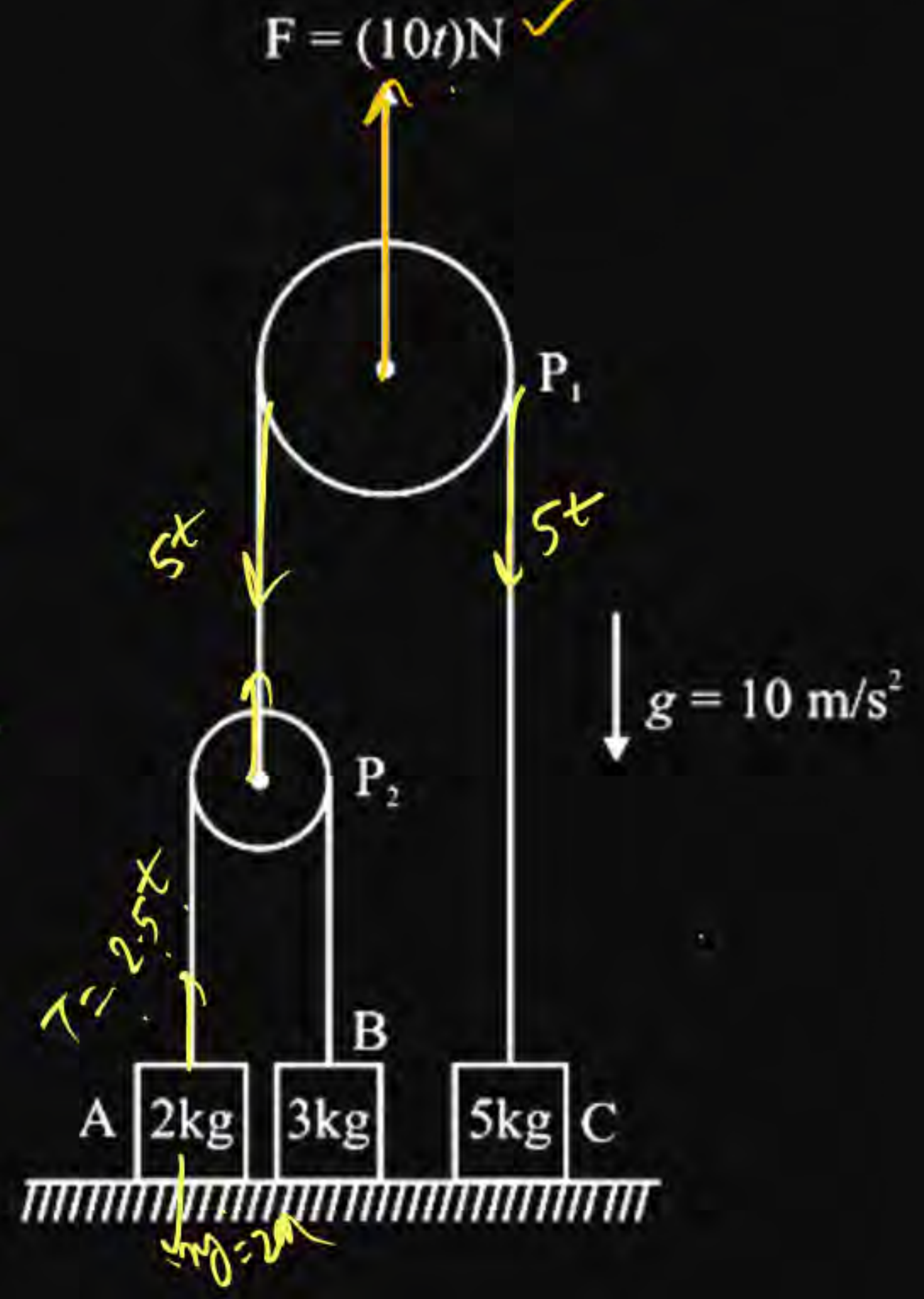
1. 2s
2. 4s
3. 8s
4. 10s

$2.5t = 20N$

$t = \frac{20}{2.5} = \frac{20}{\frac{25}{10}}$

$= \frac{200}{25}$

$= 8$



THANK
YOU