3. In the above problem, tension in the string = ?

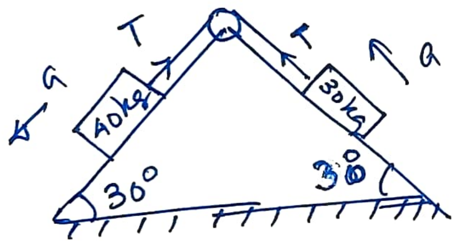
$$M_2 g \sin\beta - T = M_2 a \Rightarrow T = M_2 g \sin\beta - M_2 a$$

$$T = M_2 g \sin\beta - M_2 \times \left(\frac{M_2 g \sin\beta - M_1 g \sin\alpha}{M_1 + M_2}\right)$$

$$= \frac{M_1 M_2 g \sin\beta + \cancel{M_2^2 g \sin\beta} - \cancel{M_2^2 g \sin\beta} + M_1 M_2 g \sin\alpha}{M_1 + M_2}$$

$$= \frac{M_1 M_2 g (\sin\beta + \sin\alpha)}{M_1 + M_2} \quad \boxed{\text{Ans (a)}}$$

4. Two masses 40 kg and 30 kg ..... The tension in the string ?



acc of the blocks = $\dfrac{\text{Unbalanced load}}{\text{Total mass}}$

$$a = \frac{(40 \sin 30^\circ - 30 \sin 30^\circ) g}{40 + 30}$$

$$a = \frac{(40 - 30) \times \frac{1}{\cancel{2}} \times \cancel{10}\,5}{70}$$

$$a = \frac{50}{70} = \frac{5}{7} (m/s^2) = \boxed{0.7\, m/s^2} \quad \text{--- (1)}$$

So, tension : $m_1 g \sin 30^\circ - T = m_1 a$

$$\therefore T = m_1 g \times \frac{1}{2} - m_1 a = 40 \times \cancel{10}\,5 \times \frac{1}{\cancel{2}} - 40 \times \frac{5}{7}$$

$$= 200 - \frac{200}{7} = 200 \times \frac{6}{7} = 171 \text{ if } g = 10\, m/s^2$$

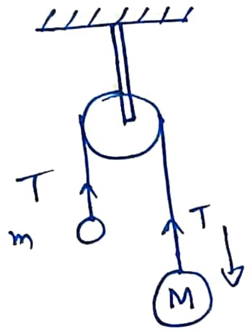
but if $g = 9.8\, m/s^2$, $T = 40 \times 9.8 \times \frac{1}{2} - 40 \times 0.7$

$\boxed{T = 168 (N)}$ $\boxed{\text{Ans : d}}$

5. Acc of the blocks in the above problem is,

$a = 0.7\, m/s^2$ from eq (1) $\boxed{\text{Ans : c}}$

(6) In the arrangement shown ....



$M >> m$. The tension T in the string suspended from the ceiling is:

$$Mg - T = Ma \quad \text{and} \quad T - mg = ma$$

$$T = mg + ma$$

$$\therefore Mg - mg - ma = Ma$$

$$\cancel{\frac{M(g-a)}{(M+m)} \cdot a} \quad (M-m)g = (M+m)a$$

$$\therefore a = \frac{(M-m)g}{(M+m)}.$$

So, tension eq is, $T - mg = ma$

$$T = mg + \frac{m(M-m)g}{(M+m)} = \frac{(mM + \cancel{m^2} + mM - \cancel{m^2})g}{M+m}$$

$$T = \frac{2mM}{M+m} g$$

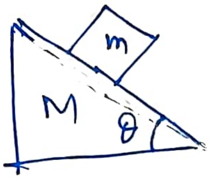
Dividing ~~t~~ numerator and deno. by M,

$$T = \left(\frac{2mM/M}{\frac{M+m}{M}} \right) g \Rightarrow T = \frac{2mg}{\left(1 + \frac{m}{M}\right)}.$$

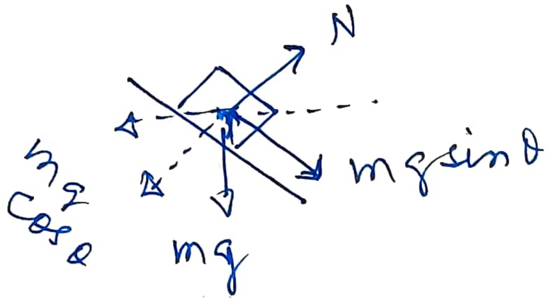
but $\frac{m}{M} << 1$ as $m << M$.

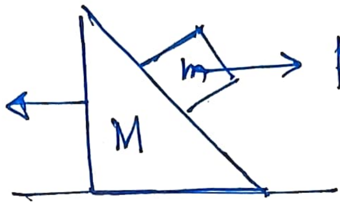
So, $\boxed{T = 2mg}$

1. A smooth block of mass . . . . the system is released from rest, then the normal reaction between the block and the wedge is?

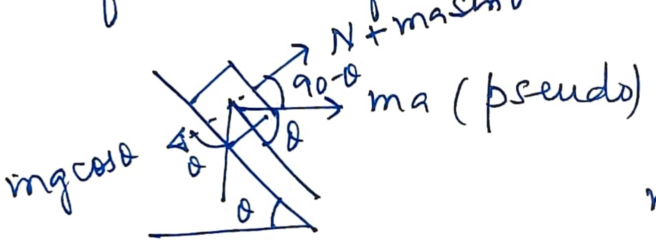


Block M will go at the back so, let it have acc a.





In the non inertial frame, that is in the frame of block M,



As the block is in equilibrium perpendicular to the wedge, we can write

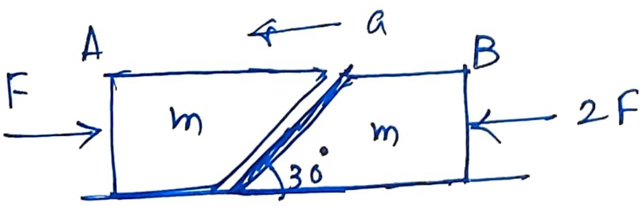
$$mg\cos\theta = N + ma\sin\theta.$$

$$\therefore N = mg\cos\theta - ma\sin\theta.$$

As a can not be −ve because the block M is constrained to move to the left.

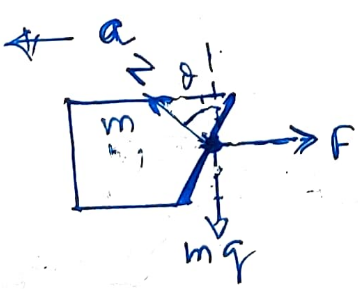
So ans: N is less than $mg\cos\theta$ $\boxed{\text{Ans } b}$

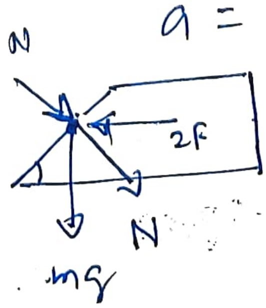
2. Two blocks: . . . . Normal reaction betn the blocks?



Let the acc of the blocks be a to the left. Then

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





For left block,

$$N\sin\theta - F = ma$$

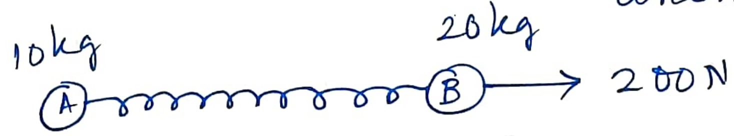
$$N\cdot\frac{1}{2} = F + \cancel{m}\times\frac{F}{2\cancel{m}}$$

$$\frac{N}{2} = \frac{3F}{2}$$

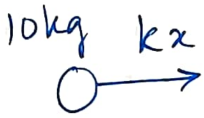
$\therefore \boxed{N = 3F}$ $\boxed{\text{Ans d}}$

L–9 P – 6.9

1. Two masses of 10 kg and 20 kg .... At the instant when 10 kg mass has acc of 12 m/s², acc of 20 kg = ?



FBD :



∴ Eq of motion for 10 kg,

$kx = m a_A$

$kx = 10 \times 12 = 120$ N.

Eq of motion of 20 kg,

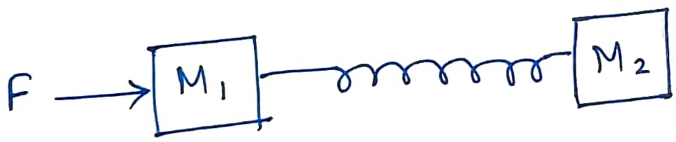
$200 - kx = 20 a_B$

$200 - 120 = 20 a_B$

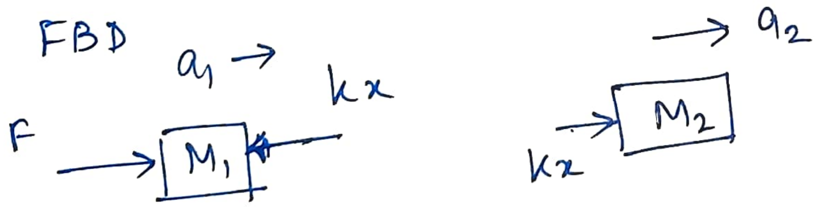
$a_B = \frac{80}{20} = \boxed{4\ m/s^2}$

$\boxed{\text{Ans: b}}$

2. Two blocks of mass M_1 and M_2 ......
acceleration of M_2 ?



FBD



$a_1 = \frac{F - kx}{M_1}$

or $M_1 a_1 = F - kx$

$kx = -M_1 a_1 + F$

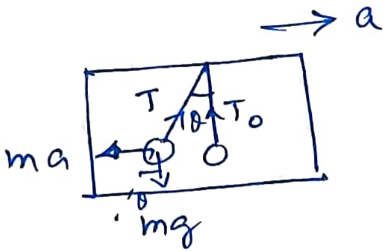
For M_2

$kx = M_2 a_2$

$\therefore a_2 = \frac{kx}{M_2} = \frac{-M_1 a_1 + F}{M_2}$

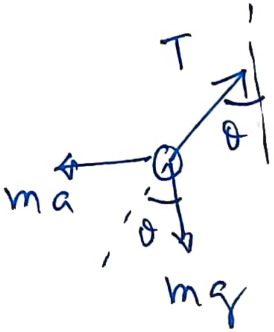
$\boxed{a_2 = \frac{F - M_1 a_1}{M_2}}$ $\boxed{\text{Ans d}}$

3. A small sphere is suspended .....



Initially $T_0 = mg$

When the car moves, a pseudo force ma acts on the ball leftwards as shown. In equilibrium,



$$T = mg\cos\theta + ma\sin\theta$$

$T > T_0$ as $a > 0$.

$\boxed{\text{Ans } c}$

4. Tension generated in the string in the above problem is,

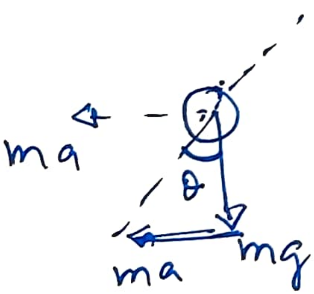
From fig in prob. 4,

$$T = m\sqrt{a^2+g^2}$$ — Ans. (c).

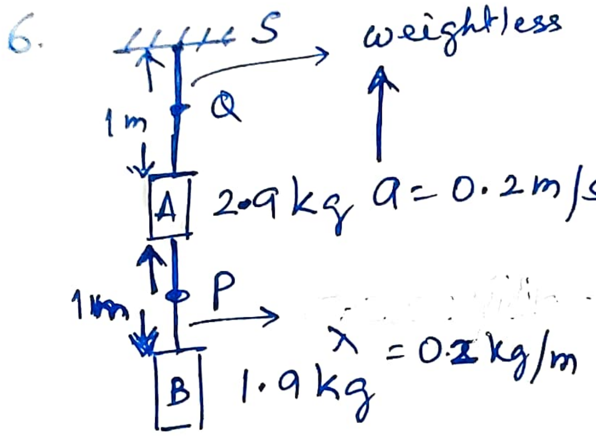
5. In the above problem, the inclination of the string with the verticle is,

From the fig,

$$\tan\theta = \frac{ma}{mg} \Rightarrow \theta = \tan^{-1}\left(\frac{a}{g}\right).$$

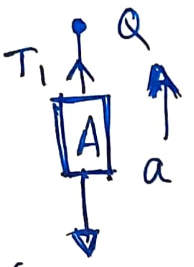


$\boxed{\text{Ans : a}}$

6. 

Two blocks of masses $m_1 = 2.9$ kg and $m_2 = 1.9$ kg are suspended ...... The tension at the mid points of lower and upper wire respectively are:

FBD:



$(2.9+1.9+0.1)\,g$
(mass of rope betn A − B)

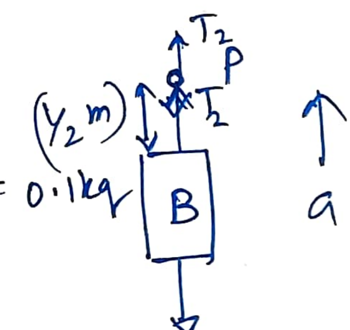
For block A: At Q, tension is T

$$T_1 - (2.9+1.9+0.2)g = (2.9+1.9+0.2)\,a$$

$$\therefore T_1 = 5(g+a)$$

$$= 5(9.8+0.2)$$

$$\boxed{T_1 = 50\text{ N}}$$



$(1.9+0.1)\,g$
Mass of 0.5 m of rope

$$T_2 - (1.9+0.1)g = (1.9+0.1)\,a$$

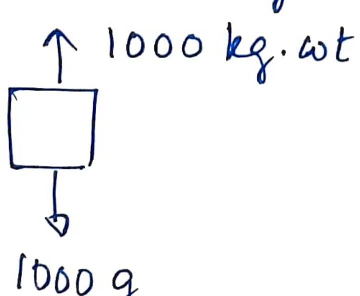
$$\therefore T_2 = 2(g+a) = 2(9.8+0.2)$$

$$\boxed{T_2 = 20\text{ N}}$$

Ans. (b) but correction in options:

(a) 20 N, 30 N (b) 50 N, 20 N
(c) 20 N, 20 N (d) 50 N, 50 N.

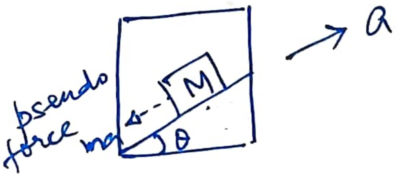
7. If the tension in the cable of 1000 kg wt elevator is 1000 kg weight, the elevator



In this case, acc has to be zero, as $F_{net} = 0$
So, it may be at rest or in uniform motion.

$\boxed{\text{Ans (d)}}$

8. A block of mass M is placed on a smooth....

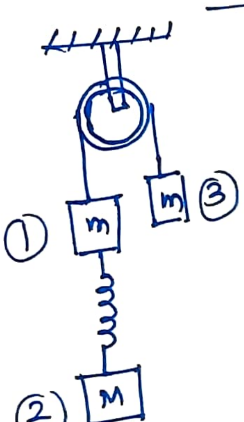


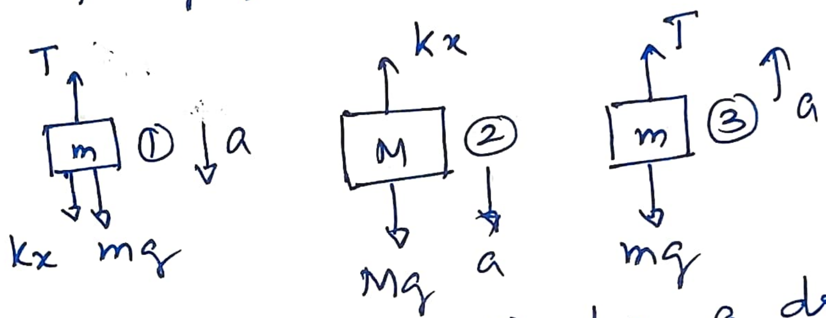
Now, The mass M will experience a pseudo force a in The dir^n down The plane.

Hence total acc. $= a + g\sin\theta$ <u>Ans: b</u>

9. The system shown in fig is released from rest (The spring gets elongated), ...

<u>FBD:</u>





Let acc of mass ① be a downwards,

Then, (kx is spring force)

For block ③

$T - mg = ma$ —①

for block ①

$mg + kx - T = ma$ —②

& for block ②

$Mg - kx = Ma$ —③

From ①, $T = mg + ma$; Eq ② becomes,

$mg + kx - (mg + ma) = ma$

$\therefore \cancel{mg} + kx - \cancel{mg} - ma = ma \Rightarrow kx = 2ma.$

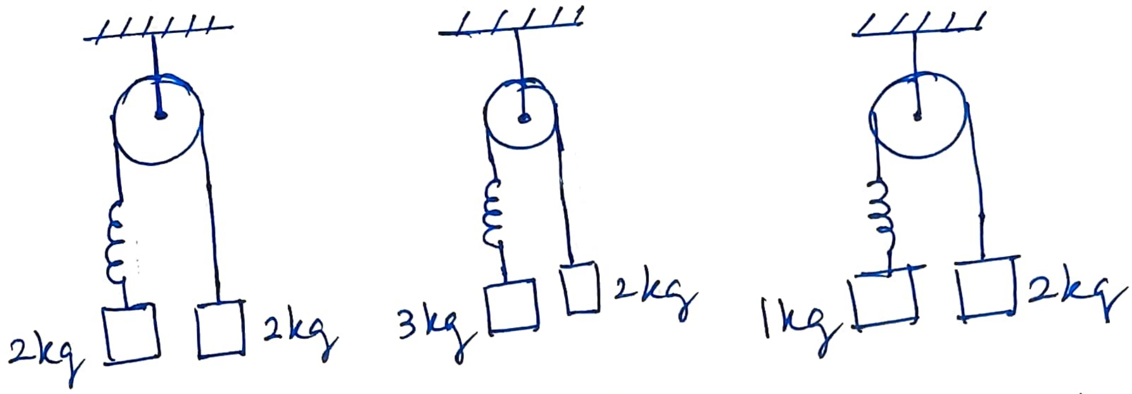
$\therefore$ Eq ③ becomes, $Mg - 2ma = Ma.$

$\therefore Mg = (M + 2m)\,a \Rightarrow \boxed{a = \frac{M}{(M+2m)}g}$

So, in all cases described in The options (a) to (d) The ~~acc~~ acc is present, means spring force acts, i.e. the spring gets elongated.

Hence most correct option is $\boxed{(d)}$

10. Same spring is attached in 2 kg, 3 kg and 1 kg blocks in three different cases . . . Then,



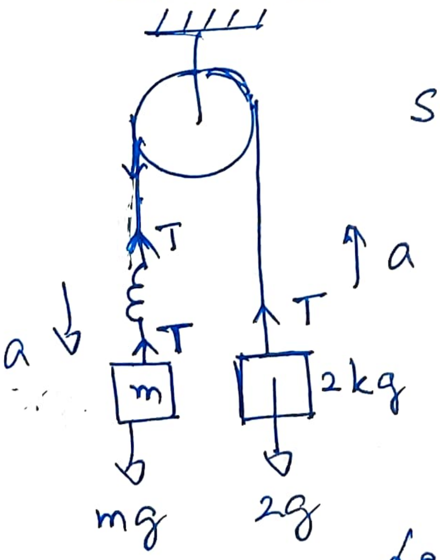
→ Here we have to find relation between the extensions in the spring x_1, x_2 and x_3 in the three cases.

We also know that tension in the string $\propto kx$

i.e. $T \propto kx$.

- So, lets find tensions T_1, T_2, T_3 in each case.
- Also observing that on RHS of each pulley, a mass of 2 kg is hanging and on LHS, different masses are hanging. Let us solve a general case considering mass m on LHS, as shown.

Let acc be downwards as shown.



So, $T - 2g = 2a$ and $mg - T = ma$

Equating value of acc, $a = \frac{T - 2g}{2} = \frac{mg - T}{m}$

Solving,

$$mT - 2mg = 2mg - 2T$$

$$(m+2)T = 4mg \Rightarrow \boxed{T = \frac{4mg}{m+2}}$$

Let us now calculate tension in each case,

when $m = 2kg$, $T_1 = \frac{4 \times 2g}{4} = 2g$

" $m = 3kg$, $T_2 = \frac{4 \times 3g}{5} = 2.4g$

" $m = 1kg$, $T_3 = \frac{4g}{3} = 1.33g$

Now, as $T \propto x$

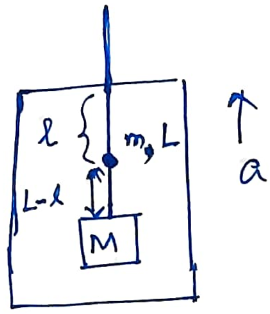
$T_2 > T_1 > T_3$

So

$x_2 > x_1 > x_3$

$\boxed{\text{Ans: b}}$

11. An elevator accelerates upwards ....



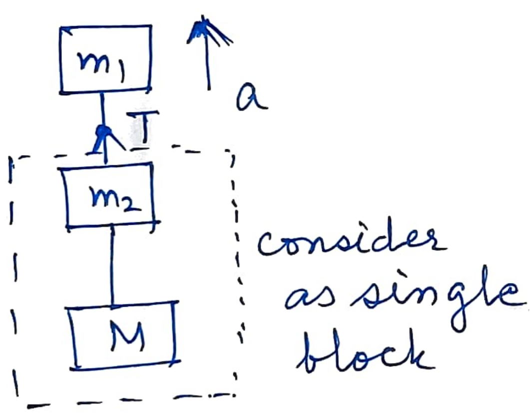
FBD: Consider mass/length for the string as λ

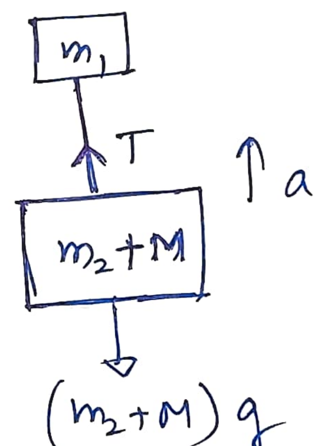
$$\lambda = \frac{m}{L}$$

$\therefore$ Mass of length $l = m_1 = \frac{m}{L} \times l$

and mass of " $(L-l) = m_2 = \frac{m}{L}(L-l)$.

Hence string can be replaced by two blocks of mass m_1 and m_2 separated (tied) with massless string. Hence, fbd becomes,





So, for (m_2+M) block, eq of motion becomes,

$$T - (m_2+M)g = (m_2+M)a$$

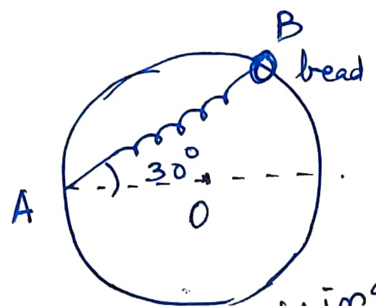
$$\therefore \quad T = (m_2+M)(g+a)$$

$$\therefore \quad \frac{T}{(m_2+M)} - g = a; \quad a = \frac{T}{\frac{m}{L}(L-l)+M} - g$$

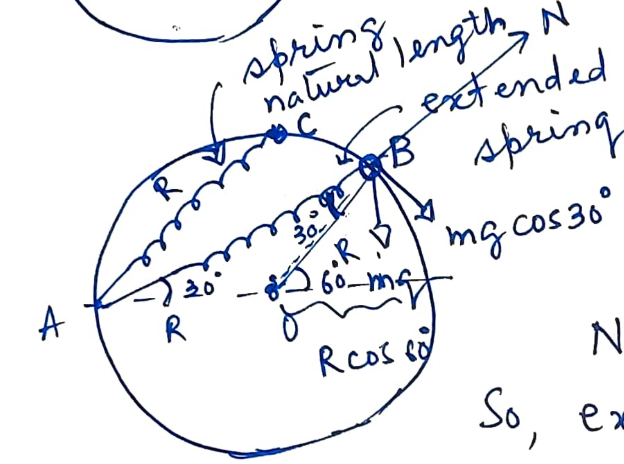
$$\therefore \boxed{a = \frac{T}{M + m - \frac{ml}{L}} - g} \quad \ldots \text{Ans (a)}$$

12. A bead of mass m . . . . $k = \frac{(\sqrt{3}+1)\,mg}{R}$

The normal reaction just after the bead is released to move is,



Let us find L (extended length of the spring) using geometry:



$L\cos 30^\circ = R + R\cos 60^\circ \Rightarrow \frac{3R}{2} \times \frac{1}{\cos 30^\circ} = L$

Natural length $= R$ . . . given.

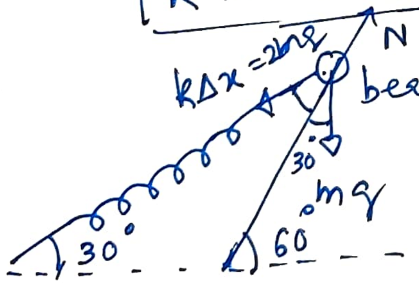
So, extension in the spring

$$\Delta x = L - R = \frac{3R}{\cancel{2}} \times \frac{\cancel{2}}{\sqrt{3}} - R = (\sqrt{3}-1)R.$$

Now, spring force $k\Delta x = \frac{(\sqrt{3}+1)\,mg}{\cancel{R}}(\sqrt{3}-1)\cancel{R}$

$\boxed{k\Delta x = 2mg}$; where m: mass of the bead.

So,



On the bead, normal reaction must be acting along the radius, as shown.

Along the radius, the forces must balance as no motion is allowed in that dirⁿ.

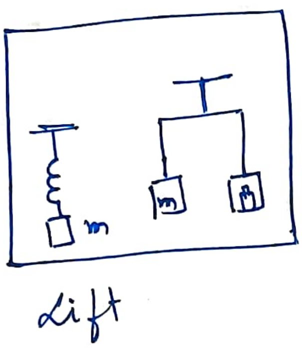
$N - 2mg\cos 30^\circ + mg\cos 30^\circ = 0$

$N = 3 \times mg\cos 30^\circ = 3 \times mg\frac{\sqrt{3}}{2} = \boxed{\frac{3\sqrt{3}\,mg}{2}}$

Ans d

L - 10 : P 6.10

1. A spring balance . . . . then

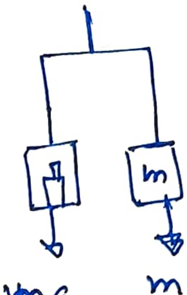


In the lift's frame, for spring

$T = ma + mg$

$\boxed{T = m(a+g)}$

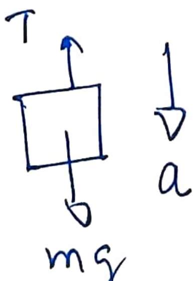
In physical balance,



On physical balance, on both the pans a pseudo force will act as shown. So, its equilibrium will not get disturbed. However in case of spring balance, its tension force (spring force) will increase due to pseudo force. So, $\boxed{\text{option (d)}}$

2. A 60 kg ma stands . . . .

→ Since the scale reading ~~con~~ becomes 50 kg, the lift must be moving downwards with some acceleration. (i.e. constt. motion downwards) and if suddenly stopped will come back to the original reading.



$mg - T = ma$

$T = m(g-a)$

So, $T_{new} = 50g$ (new reading)

and when $a = 0$, $T = mg = 60g$.

$\boxed{\text{Ans: d}}$

3. A particle of mass is at rest . . . .

$F(t) = F_0 \cdot e^{-bt}$; Its speed ?

$a = \frac{F_0}{m} e^{-bt} \Rightarrow \frac{dv}{dt} = \frac{F_0}{m} \cdot e^{-bt}$

Integrating, $\int dv = \int \frac{F_0}{m} \cdot e^{-bt} \, dt$

$v(t) = \frac{F_0}{m} \left(\frac{e^{-bt}}{-b} \right) \cdot e^{-bt} + c$ — ①

Now at $t=0$, $v=0$ so, evaluating c from this,

$0 = -\frac{F_0}{mb} e^{-b \times 0} + c \Rightarrow c = \frac{F_0}{m.b} e^0 = \frac{F_0}{mb}$.

∴ ① becomes,

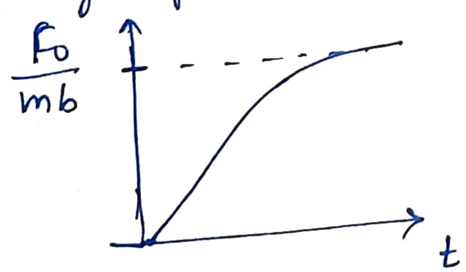
$v(t) = -\frac{F_0}{mb} e^{-bt} + \frac{F_0}{mb} = \frac{F_0}{mb} (1 - e^{-bt})$

So, the graph is : At $t=0$, $v(t) = v(0) = A(1 - e^{-b.0})$

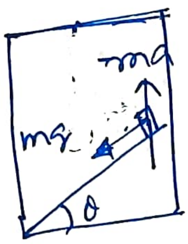
∴ $v(0) = \frac{F_0}{mb}(1-1) = 0$

At $t \to \infty$, $v(\infty) = \frac{F_0}{mb}(1 - e^{-b.\infty}) = \frac{F_0}{mb}(1-0) = \frac{F_0}{mb}$.

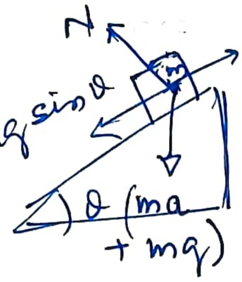
So, graph (b)



4. A smooth inclined plane . . .



↓ dec. of lift



Note: Moving down with dec. means the lift is acc upwards. So, pseudo force acts ~~on~~ downwards

$ma \sin\theta$

$= m \left[g \sin\theta + a \sin\theta \right]$

$a_d = (g+a) \sin\theta \downarrow$

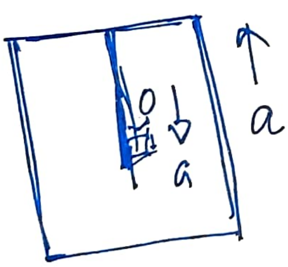
∴ Using $s = ut + \frac{1}{2}at^2$

$L = 0 + \frac{1}{2} \times (g+a) \sin\theta \cdot t^2$

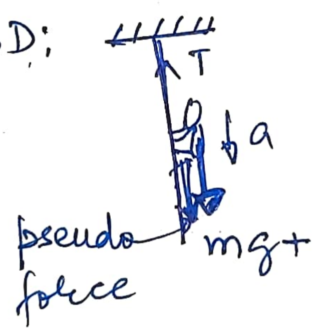
∴ $t = \sqrt{\dfrac{2L}{(g+a)\sin\theta}}$ $\boxed{\text{Ans. a}}$

5. A man of mass m slides down a rope . .

. . . is,



FBD:



∴ $mg - T = ma + ma$

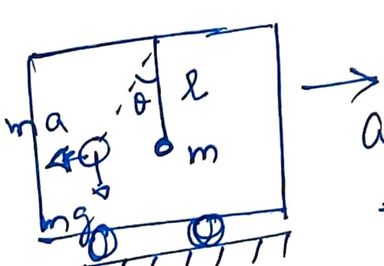
$mg + ma + ma = T$

$\boxed{T = m(g + 2a)}$

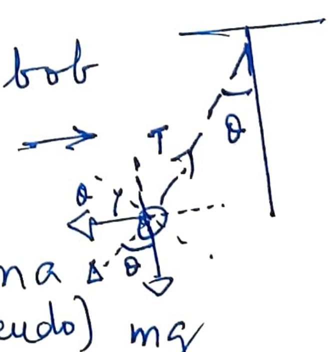
Ans: (b)

6. When ~~a~~ the trolley shown in the fig

- - - - acc of the bob

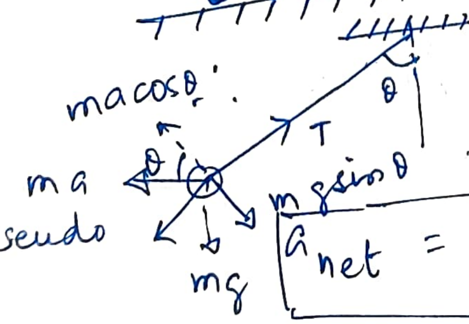


Forces on the bob are as shown →



$\Sigma F = m\, a_{net}$

Acc. of the bob w.r.to trolley

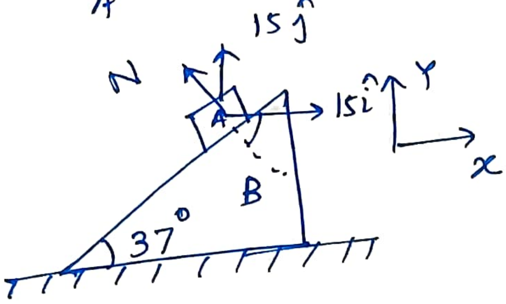


$\boxed{a_{net} = \dfrac{mg \sin\theta - ma \cos\theta}{m}}$; $a_{net} = g \sin\theta - a \cos\theta$

$\boxed{\text{Ans : c}}$

7. In the fig shown, the acc of A is

$\bar{a}_A = +15\hat{i} + 15\hat{j}$ (m/s²).



Normal reaction N_A on wedge B = N_B applied on A.

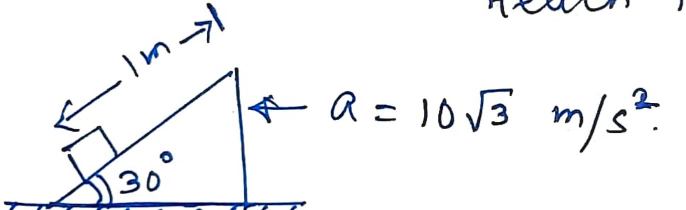
$15\cos 53^\circ - 15\cos 37^\circ = a\cos 53^\circ$

$\cancel{15}^{3} \times \frac{3}{\cancel{5}} - \cancel{15}^{3} \times \frac{4}{\cancel{5}} = a \times \frac{3}{5}$

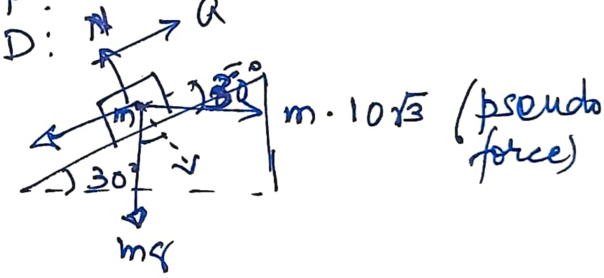
$9 - 12 = \frac{3}{5}a \Rightarrow -\frac{15}{3} = a \Rightarrow a = -5\ m/s^2$.

or $a_{wedge} = -5\hat{i}$ $\boxed{\text{Ans: d}}$

8. In The fig, The wedge is pushed with an acc. of $10\sqrt{3}$ m/s² ... Time taken by The block to reach the top?



FBD:



Eq of motion of The block along the plane ~~mg sinθ~~

$-\cancel{m}g\sin\theta + \cancel{m} \times 10\sqrt{3}\cos 30^\circ = \cancel{m}a$

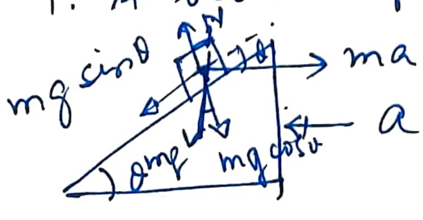
$-\cancel{10}^{5} \times \frac{1}{\cancel{2}} + \cancel{10}^{5}\sqrt{3} \times \frac{\sqrt{3}}{\cancel{2}} = a \Rightarrow a = 15 - 5 = 10\ m/s^2$.

Hence using $s = l = ut + \frac{1}{2}at^2$ along The plane

As $u = 0$, $1 = 0 + \frac{1}{2} \times 10 \times t^2 \Rightarrow t^2 = 1/5$; $\boxed{t = \frac{1}{\sqrt{5}}\ (s).}$

Ans (b)

9. A block of mass m is placed on a smooth ...



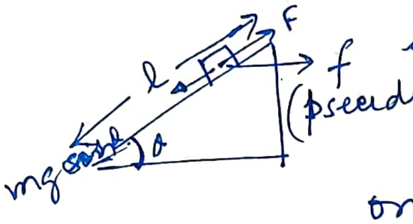
Since The block does not slide down,

$mg\sin\theta = ma\cos\theta$

$N\cos\theta = mg$

So, vertical force $N\cos\theta = mg$. $\boxed{\text{Ans: c}}$

10. The horizontal acc that should be ...



$\sin\theta = \frac{1}{l}$

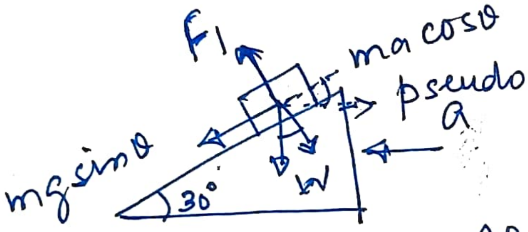
To keep object of mass m stationary on the inclined plane,

$F = mg\sin\theta$ but $F = f\cos\theta$

$f\cos\theta = mg\sin\theta$ or $a\cos\theta = g\sin\theta$

$\therefore a = g\tan\theta = \frac{g}{\sqrt{l^2-1}} \cdot 1 = \frac{g}{\sqrt{l^2-1}}$ $\boxed{\text{Ans (a)}}$

11. A block is kept on a smooth ....



In equilibrium: when wedge moves,

$F_1 = mg\cos\theta + ma\sin\theta$ — (1)

Now, The inclined plane stops, so, pseudo force stops acting on m.

Hence, $F_2 = mg\cos\theta$ — (2)

$$\frac{F_1}{F_2} = \frac{\cancel{m}g\cos30° + \cancel{m}a\sin30°}{\cancel{m}g\cos30°} \quad \text{— (3)}$$

Now, to evaluate a, using horintal compo:

In equilibrium:

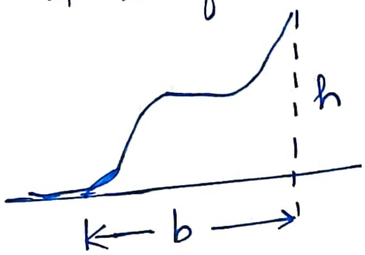
$\cancel{m}g\sin\theta = \cancel{m}a\cos\theta \implies a = g\tan\theta = 10\times\tan30°$

$\boxed{a = \frac{10}{\sqrt{3}}\ m/s^2}$.

$$\text{So, } \frac{F_1}{F_2} = \frac{\cancel{10}\times\frac{\sqrt{3}}{\cancel{2}} + \frac{\cancel{10}}{\sqrt{3}}\times\frac{1}{\cancel{2}}}{\cancel{10}\times\frac{\sqrt{3}}{\cancel{2}}} = \frac{3+1}{\sqrt{3}\cdot\sqrt{3}} = \boxed{\frac{4}{3}}$$ $\boxed{\text{Ans b}}$

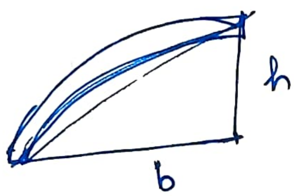
One or more options are correct

12. A uniform rope of linear density λ . . . .



Normal reaction by rope on the tube? due to its wt.

The rope will fall on the tube and will have length $= \sqrt{b^2+h^2}$.



Wt. of the rope $= \lambda . g . \sqrt{b^2+h^2}$ down.

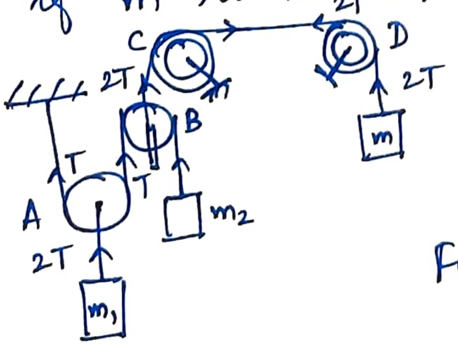
So, Normal reac^n on The tube

$= \lambda g \sqrt{b^2+h^2}$

Ans (c)

Also (d) → Non-zero.

14. For the situation shown in fig, ... Find m (in kg) if m is in equilibrium. (take $m_1 = 2kg$, $m_2 = 1 kg$)



~~For~~ For A, in equilibrium,

$2T = m_1 g \Rightarrow \boxed{T = 10 N}$

$2T = 20$

For D, to be in equilibrium,

$2T = m g \Rightarrow 2 \times 10 = m \times 10$

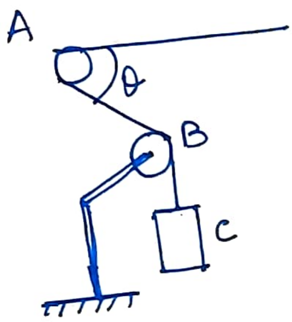
$\therefore \boxed{m = 2kg}$

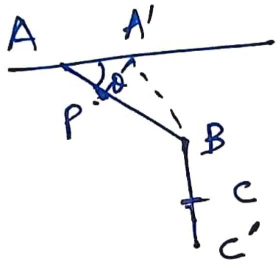
Next, if the boy applies no force on the string i.e. $T=0$, Then eq ②'

$$N - mg = ma$$

Now if $T=0$, the plate and the boy will fall down with acc $= g$. ~~So~~, option (b) and (d) are incorrect.

8. A smooth ring of mass m .... As the ring starts sliding ....





Let $A \to A'$ and $C \to C'$ in 't'.

$$AB + BC = A'B + BC'$$

$$AP + PB + \cancel{BC} = A'B + \cancel{BC} + CC'$$

also $PB = A'B$, So,

$$AP = CC'$$

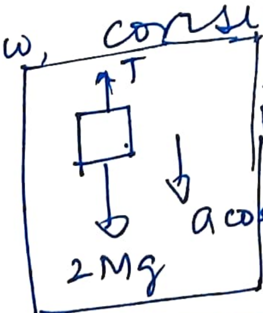
Now $\underbrace{AA'\cos\theta}_{\text{for ring}} = \underbrace{CC'}_{\text{for block}}$

Differentiating w. r. to time, $\dfrac{AA'\cos\theta}{\Delta t} = \dfrac{CC'}{\Delta t}$

∴ If the velo of block is v downwards, Then $V = \dfrac{CC'}{\Delta t}$. Then, $\dfrac{AA'}{\Delta t}$ is ~~velo~~ velo of the ring (v'), Then

$$V\cos\theta = V' \rightarrow \text{Ans (d) is correct.}$$

Now, consider block as system,



So, $2Mg - T = 2Ma\cos\theta$

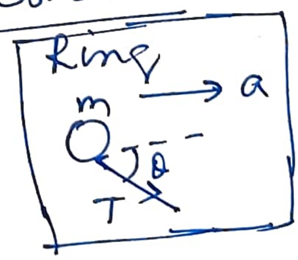
From ①

$$2\cancel{M}g - \frac{\cancel{M}a}{\cos\theta} = 2\cancel{M}a\cos\theta$$

$$2g\cos\theta - a = 2a\cos^2\theta$$

$$\boxed{\frac{2g\cos\theta}{(1+2\cos^2\theta)} = a}$$

option (a) is correct.



$$T\cos\theta = Ma.$$

$$T = \frac{Ma}{\cos\theta} \quad \text{①}$$

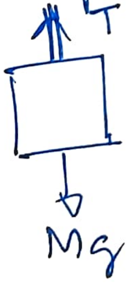
Now, acc of the block $= a\cos\theta$

$= \dfrac{2g\cos^2\theta}{1+2\cos^2\theta}$ option (b) is incorrect.

Now

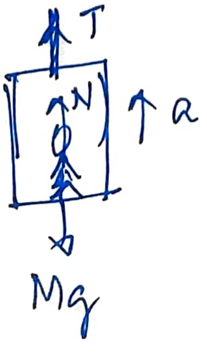
$T = \dfrac{Ma}{\cos\theta} = \dfrac{M}{\cancel{\cos\theta}} \cdot \dfrac{2g\cancel{\cos\theta}}{(1+\cos^2\theta)} = \dfrac{2Mg}{1+2\cos^2\theta}$ Ans (d) is correct

10. If The tension in The cable.... The elevator may be



$T = Mg$ So, $a = 0$ So, options (c) and (d) are correct

11. The force exerted by the floor....



$N - Mg = Ma$

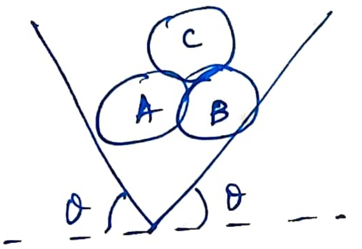
So, $N = Mg + Ma$; $N > Mg$

i.e acc. is +ve upwards

i.e. options (a) and (b)

Three identical rigid .... $\tan\theta = \frac{1}{3\sqrt{n}}$.
for the system not to collapse. Find n.

condition of collapse will be

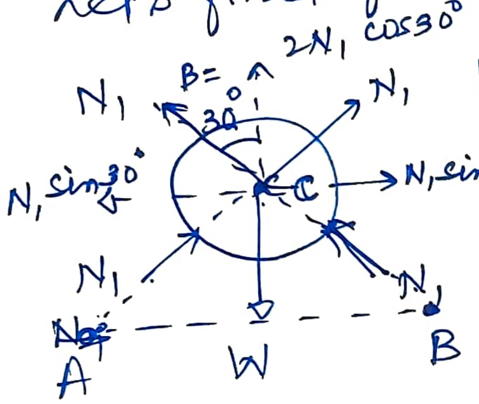


$\boxed{N_{AB} = 0}$

So, we should work on this condition.

So, lets find θ in this condition.

Lets first find fbd of C.



N_1 = Normal reac^n from B and C on A

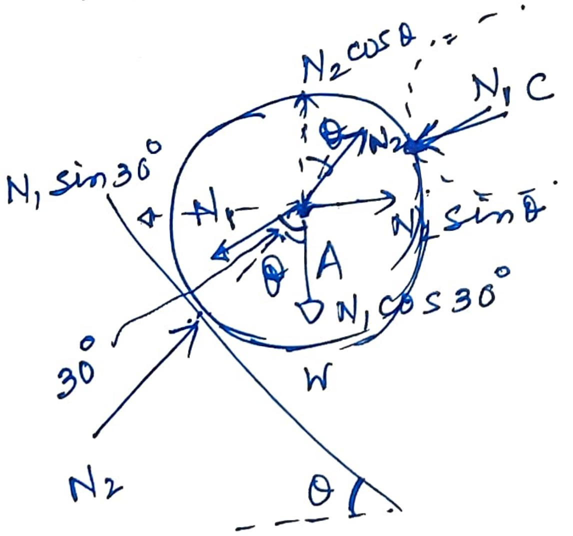
In equilibrium $\boxed{2N_1 \cos 30^\circ = W}$ — ①

where $\beta = 30^\circ$ due to the fact that centres of the spheres form an equilateral Δ. So all angles are 60°

$\beta = \frac{60}{2} = 30^\circ$.

From ①, $N_1 = \frac{W}{2\cos 30^\circ} = \frac{W}{\frac{2\sqrt{3}}{2}} = \frac{W}{\sqrt{3}}$ — ②

Now, on A, fbd



Resolving the forces on A,

Along X axis,

$N_2 \sin\theta = N_1 \sin 30^\circ$

$N_2 \sin\theta = \frac{W}{\sqrt{3}} \times \frac{1}{2}$ — ③

Along Y axis,

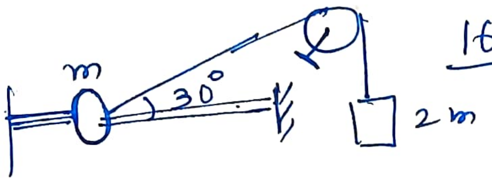
$N_1 \cos 30^\circ + W = N_2 \cos\theta$

$\frac{W}{\sqrt{3}} \times \frac{\sqrt{3}}{2} + W = N_2 \cos\theta$ — ④

$\therefore$ ③/④ $\tan\theta = \frac{\frac{W}{2\sqrt{3}}}{\frac{3}{2}W} \Rightarrow \boxed{\frac{1}{3\sqrt{3}} = \tan\theta}$

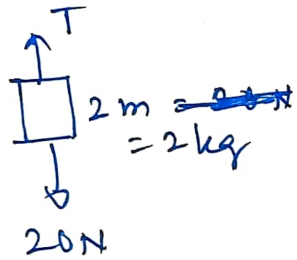
But $\tan\theta = \frac{1}{3\sqrt{n}} = \frac{1}{3\sqrt{3}}$; $\boxed{n = 3}$

Passage :- A smooth ring of mass = 1 kg can slide .... The ring is released from rest as shown in the fig.



16. The tension in the string at the instant shown in the fig ?

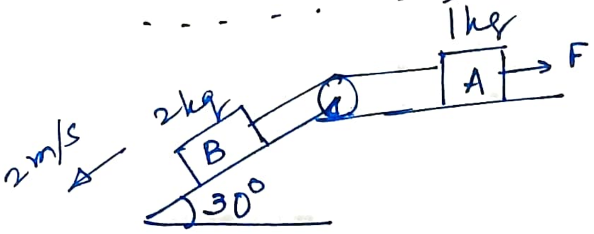
Just released means velo and acc of ring and block are zero. Then for block,



$\boxed{T = 20\ N}$

Two smooth blocks A of mass 1 kg and B . . . . The

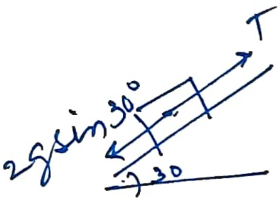
19. Find acc of block A:



Initially $V_B = 2$ m/s down the plane.

A force F is applied on block A so that block B reverses its dir^n of motion after 3(s).

→ When B is moving down with constt velo $V_B = 2$ m/s, no force acts on it. i.e



$T = 2g \sin 30°$

$T = 2 \times 10 \times \frac{1}{2} = 10$ N. initially.

Now, when F starts to act, T changes to T'.

Also, a deceleration acts on B, so as to make $v_f = 0$ for a moment before changing its dir^n of motion. So,

$v = u + at \Rightarrow 0 = 2 + a \times 3 \Rightarrow a = -\frac{2}{3}$ m/s^2

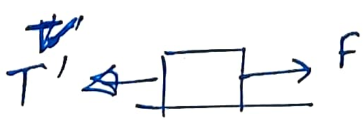
So, ans b

20. Now, tension in the string will be

$T' - T = m \times \left(\frac{2}{3}\right) \Rightarrow T' = T + 2 \times \frac{2}{3} = 10 + \frac{4}{3} = \frac{34}{3}$

$T' = 11.33$ N. Ans: b

21. For block A,



$F - 11.33 = 1 \times \frac{2}{3}$

$\therefore F = \frac{34}{3} + \frac{2}{3} = \frac{36}{3} = 12$ N.

Ans: d