YAKEEN NEET 2.0

2026

Laws of Motion

PHYSICS | Lecture 14

By - Saleem Ahmed Sir

Todays Goal

Questions on Friction

$y = 0$

$y = ax - \frac{bx^2}{2}$

$R = ?$

$\frac{2a}{b}$

7:49

Mentions · ___your___queen__46 59m

15. The equation of a projectile is $y = ax - \frac{bx^2}{2}$, its horizontal range is (where x is horizontal and y is vertical distance)

(1) $\frac{2a}{b}$

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

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

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

$ax - \frac{bx^2}{2} = 0$

@saleem.nitt Sir please thora hint da do samaj nhi aa raha hai Yakeen 2.0

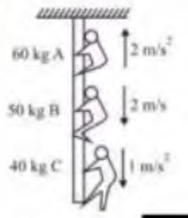
Add to your story

Send message...

1:21 5G 33

Mehboob Tirwith K

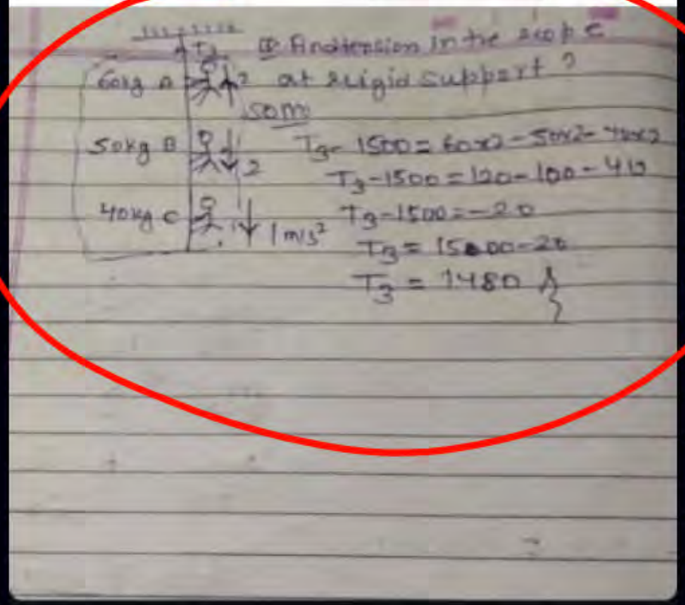
Tension in the rope at the rigid support is: (g = 10 m/s^2)



(A) 760 N
(B) 1360 N
(C) 1580 N
(D) 1620 N

Sir aapke method se bna rahe hain toh ans glat aara hai pls check once 😔

@saleem.nitt



Send message...

Q1 A particle is moving with a constant speed along a straight-line path. A force is not required to:

(1) increase its speed.

(2) decrease the momentum.

(3) change the direction.

(4) keep it moving with uniform velocity.

Q2 The spring balance inside a lift suspends an object. As the lift begins to ascent, the reading indicated by the spring balance will:

(1) increase.

(2) decrease.

(3) remain unchanged.

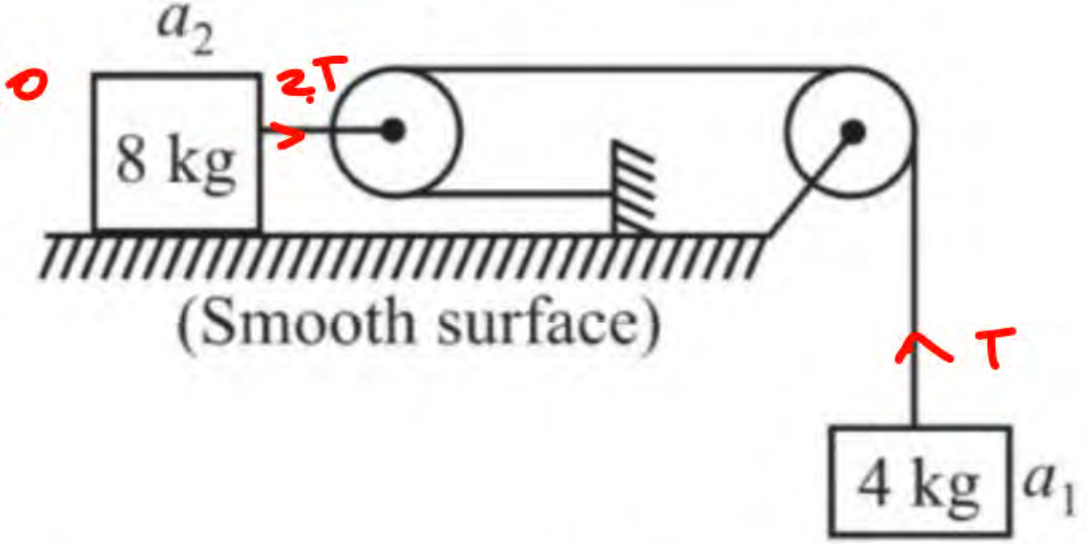
(4) depend on the speed of ascend.

Q3 A ball of mass 150 g starts moving with an acceleration of 20 m/s^2. When hit by a force, which acts on it for 0.1 sec. The impulsive force is:

(1) 0.5 N-s (2) 0.1 N-s

(3) 0.3 N-s (4) 1.2 N-s

Q4 If pulleys shown in the diagram are smooth and massless and a_1 and a_2 are acceleration of blocks of mass 4 kg and 8 kg respectively, then:



$2a_2 + a_1 = 0$

(1) $a_1 = a_2$

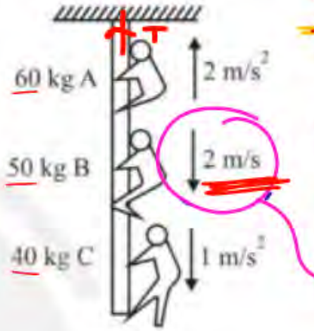
(2) $a_1 = 2a_2$

(3) $2a_1 = a_2$

(4) $a_1 = 4a_2$

Q5 A force of 100 dynes acts on mass of 5 gm for 10 sec. The velocity produced is:

Q6 Tension in the rope at the rigid support is: ($g = 10$ m/s^2)



T − 1500 = 60 × 2 − 50 × 2 − 40 × 1

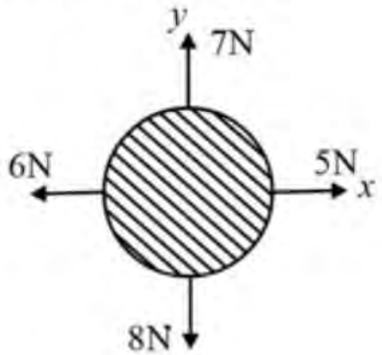
T = 1480

T = 1580

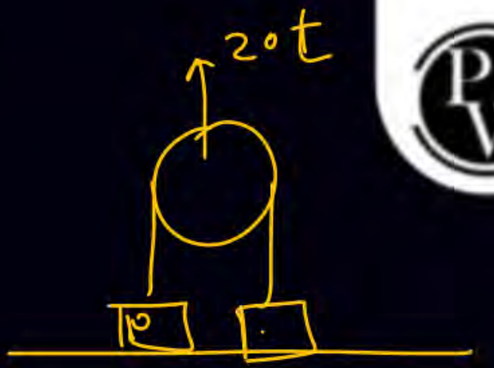
Const eq ?

(1) 760 N
(2) 1360 N
(3) 1580 N
(4) 1620 N

Q7 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?

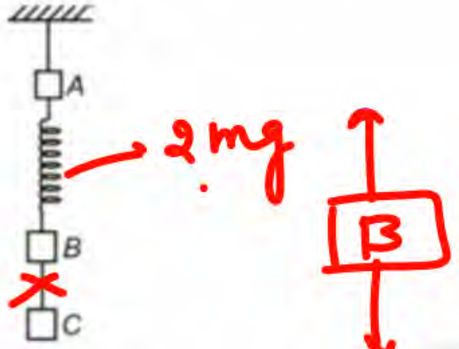


(1) $\sqrt{2}$N, 45°



F = m a

and an ideal spring. Initially the system was in equilibrium. At any instant the lower most string is cut, then acceleration of block B just after cutting the string is



(1) g
(2) $\frac{g}{2}$
(3) $\frac{2g}{3}$
(4) Zero

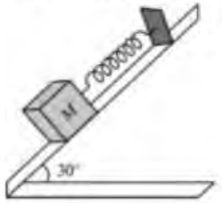
Q14 A 10 g bullet moving at 200 m/s stops after penetrating 5 cm of wooden plank. The average force exerted on the bullet will be:
(1) 2000 N
(2) –2000 N
(3) +4000 N
(4) –4000 N

Q15 A block of mass m kg is kept on a weighing machine in an elevator. If the elevator is retarding upward by a ms^{-2}, the reading of weighing machine is: (in kgf)
(1) mg
(2) $m(g - a)$
(3) $m\left(1 - \frac{a}{g}\right)$
(4) $m(g + a)$

(2) $\sqrt{2}\text{N}, 135^\circ$
(3) $\frac{2}{\sqrt{3}}\text{N}, 30^\circ$
(4) $2\text{N}, 45^\circ$

Q8 A cracker rocket is ejecting gases at a rate of 0.05 kg/s with a velocity 400 m/s. The accelerating force on the rocket is:
(1) 20 dyne
(2) 20 N
(3) 200 N
(4) Zero

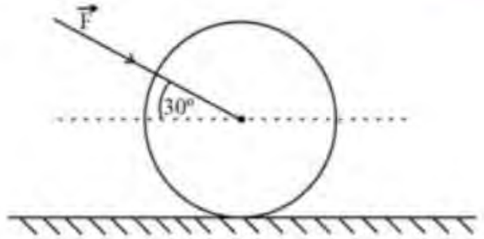
Q9 A body of mass 5 kg is suspended by a spring balance on an inclined plane as shown in figure. The spring balance measure.



(1) 50 N
(2) 25 N
(3) 500 N
(4) 10 N

Q10 An object of mass 1 kg moving on a horizontal surface with initial velocity 8 m/s comes to rest after 10 s. If one wants to keep the object moving on the same surface with velocity 8 m/s the force required is:
(1) 0.4 N
(2) 0.8 N
(3) 1.2 N
(4) Zero

Q11 As shown in figure, a 70 kg garden roller is pushed with a force of $\vec{F} = 200\ \text{N}$ at an angle of 30° with horizontal. The normal reaction on the roller is (Given $g = 10\ \text{ms}^{-2}$).



(1) $800\sqrt{2}\ \text{N}$
(2) $600\ \text{N}$
(3) $800\ \text{N}$
(4) $200\sqrt{3}\ \text{N}$

Q12 Match **List-I** with **List-II**:
A man of mass *m* is on the floor of a lift then match the following.

List-I		List-II	
(A)	Lift is moving up with acceleration *a*	(I)	Apparent weight is greater than true weight
(B)	Lift is moving down with acceleration *a*	(II)	Apparent weight is zero
(C)	Lift is moving with uniform velocity	(III)	Apparent weight is equal to true weight
(D)	Lift is freely falling	(IV)	Apparent weight is less than true weight

Choose the **correct** answer from the options given below:
(1) A-II, B-III, C-IV, D-I
(2) A-I, B-IV, C-III, D-II
(3) A-II, B-IV, C-III, D-I
(4) A-III, B-II, C-IV, D-I

Q8 A cracker rocket is ejecting gases at a rate of 0.05 kg/s with a velocity 400 m/s. The accelerating force on the rocket is:

(1) 20 dyne

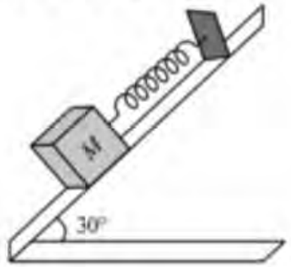
(2) 20 N

(3) 200 N

(4) Zero

400 × 5/100

Q9 A body of mass 5 kg is suspended by a spring balance on an inclined plane as shown in figure. The spring balance measure.



(1) 50 N

(2) 25 N

(3) 500 N

(4) 10 N

Q10 An object of mass 1 kg moving on a horizontal surface with initial velocity 8 m/s comes to rest after 10 s. If one wants to keep the object moving on the same surface with velocity 8 m/s the force required is:

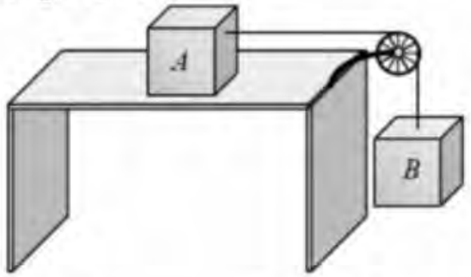
(1) 0.4 N

(2) 0.8 N

(3) 1.2 N

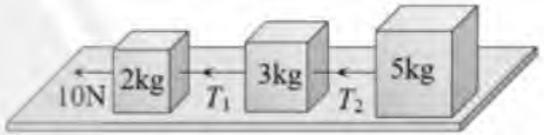
(4) Zero

other end. The acceleration of the system is:
(given $g = 10\ ms^{-1}$)



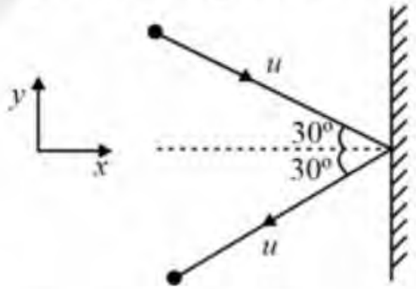
(1) $100\ ms^{-2}$ (2) $3\ ms^{-2}$
(3) $10\ ms^{-2}$ (4) $30\ ms^{-2}$

Q17 Three blocks of masses 2 kg, 3 kg and 5 kg are connected to each other with light string and are then placed on a frictionless surface as shown in the figure. The system is pulled by a force F = 10 N, then tension T_1 =

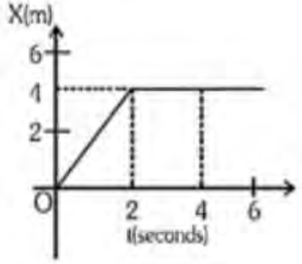


(1) 1 N (2) 5 N
(3) 8 N (4) 10 N

Q18 A billiard ball strikes a rigid wall as shown in fig and reflects without any change in speed. What is the magnitude of change in momentum?



(1) $\sqrt{3}$mu (2) $\sqrt{2}$mu



(1) $0 \cdot 2\ \mathrm{kg} - \mathrm{m/s}$
(2) $-0.2\ \mathrm{kg} - \mathrm{m/s}$
(3) $0 \cdot 1\ \mathrm{kg} - \mathrm{m/s}$
(4) $-0.4\ \mathrm{kg} - \mathrm{m/s}$

Q20 A bullet of mass 5 g is shot from a gun of mass 5 kg. The muzzle velocity of the bullet is 500 m/s. The recoil velocity of the gun is:
(1) 0.5 m/s
(2) 0.25 m/s
(3) 1 m/s
(4) data is insufficient

Q21 A monkey of mass 20 kg is holding a vertical rope. The rope will not break when a mass of 25 kg is suspended from it but will break if the mass exceeds 25 kg. What is the maximum acceleration with which the monkey can climb up along the rope: $\left(g = 10\ \mathrm{m/s^2}\right)$
(1) $10\ \mathrm{m/s^2}$
(2) $25\ \mathrm{m/s^2}$
(3) $2.5\ \mathrm{m/s^2}$
(4) $5\ \mathrm{m/s^2}$

Q22 An object will continue moving uniformly until:

(1) the resultant force acting on it begins to decrease.

(2) the resultant force on it is zero.

(3) the resultant force is at right angle to its rotation.

(4) the resultant force on it is increased continuously.

Q23 The linear momentum 'p' of a body moving in one dimension varies with time according to the equation $p = a + bt^2$, where a and b are positive constants. The net force acting on the body is:

(1) proportional to t^2

(2) a constant.

(3) proportional to t.

(4) inversely proportional to t.

Q24 Three equal weights A, B and C of mass 2 kg each are hanging on a string passing over a fixed frictionless pulley as shown in the figure. The tension in the string connecting weights B and C is:

(1) [illegible]

(2) 13 N

(3) 3.3 N

(4) 19.6 N

Q25 Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R:

Assertion A: No force is required by the body to change its state of rest or motion.

Reason R: In motion with uniform velocity, acceleration will be zero.

In the light of the above statements, choose the **correct** answer from the options given below:

(1) A is true but R is false.

(2) A is false but R is true.

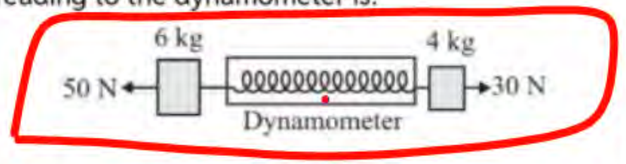
(3) Both A and R are true and R is the correct explanation of A.

(4)

$p = a + bt^2$

$f = 0 + 2bt$

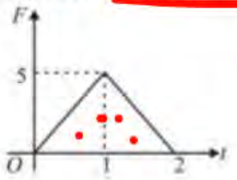
Q26 A dynamometer D is attached to two blocks of masses 6 kg and 4 kg as shown in the figure. The reading to the dynamometer is:



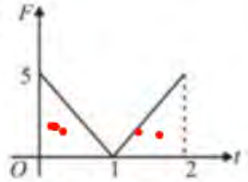
(1) 18 N
(2) 28 N
(3) 38 N
(4) 48 N

Q27 In which of the following graphs, the total change in momentum is zero?

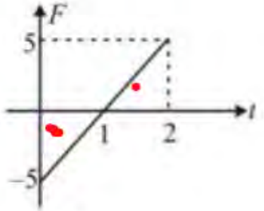
(1)



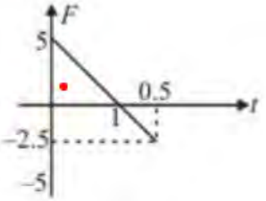
(2)



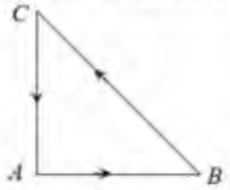
(3)



(4)

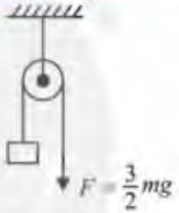


are represented in magnitude and direction by the three sides of a triangle *ABC* (as shown). The particle will now move with velocity.



(1) $\vec{v}$ remaining unchanged.
(2) less than $\vec{v}$.
(3) greater than $\vec{v}$.
(4) in the direction of the largest force *BC*.

Q29 In the arrangement shown, the mass *m* will ascend with an acceleration: (Pulley and rope are massless)



(1) Zero
(2) $g/2$
(3) g
(4) $2g$

Q30 Given below are two statements:

Statement-I: Linear momentum of a body changes even when it is moving uniformly in a circle.

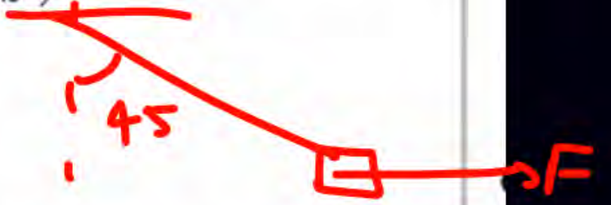
Statement-II: Force required to move a body uniformly along a straight line is zero.

In the light of the above statements, choose the most appropriate answer from the options given below:

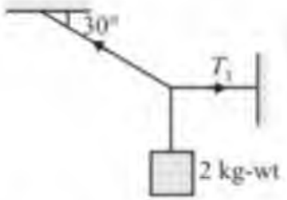
(1) Statement I is correct but Statement II is incorrect.
(2) Statement I is incorrect but Statement II is correct.
(3) Both Statement I and Statement II are correct.

Q31 A mass of 10 kg is suspended vertically by a rope from the roof. When a horizontal force is applied on the rope at some point, the rope deviated at an 45° at the roof point. If the suspended mass is at equilibrium, the magnitude of the force applied is *(g = 10 ms⁻²)*

(1) 200 N
(2) 140 N
(3) 70 N
(4) 100 N



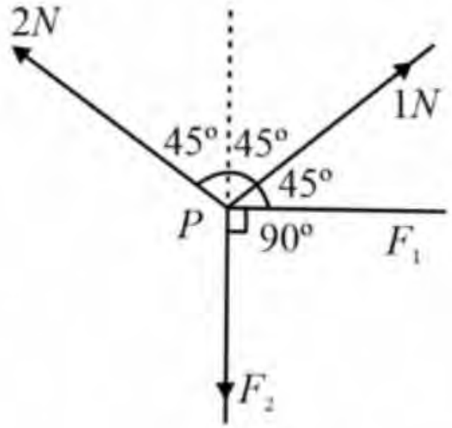
Q32 A body of weight 2 kg is suspended as shown in the figure. The tension T_1 in the horizontal string (in kg wt) is:



(1) $\frac{2}{\sqrt{3}}$
(2) $\frac{\sqrt{3}}{2}$
(3) $2\sqrt{3}$
(4) 2

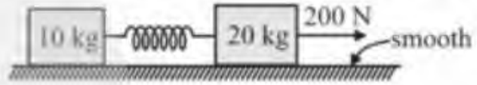
Q33 A block of mass *M* placed inside a box descends vertically with acceleration *'a'*. The block exerts a force equal to one-fourth of its weight on the floor of the box. The value of *'a'* will be:

(1) g/4
(2) g/2
(3) 3g/4
(4) g



(1) 3 (2) 4
(3) 5 (4) 6

Q35 Two masses of 10 kg and 20 kg respectively are connected by a massless spring as shown in fig. A force of 200 N acts on the 20 kg mass. At the instant shown in the figure 10 kg mass has acceleration 12 m/s^2 towards right. The acceleration of 20 kg mass at this instant is:



(1) 12 m/s^2 (2) 4 m/s^2
(3) 10 m/s^2 (4) Zero

Q36 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:

(1) 12 Ns (2) 6 Ns
(3) 36 Ns (4) 3 Ns

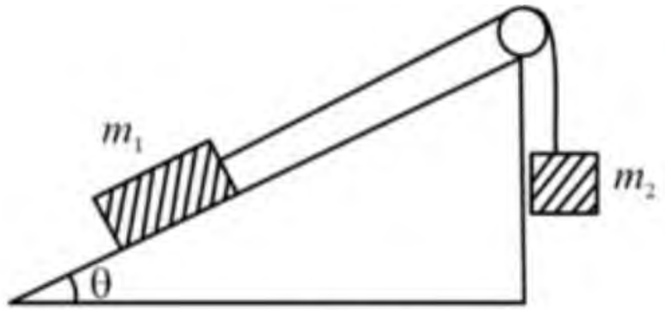
(1) g/4
(2) g/2
(3) 3g/4
(4) g

Q34 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 = _____.

Q37 Two bodies of masses $m_1 = 5kg$ and $m_2 = 3kg$ are connected by a light string going over a smooth light pulley on a smooth inclined plane as shown in the figure. The system is at rest. The force exerted by the inclined plane on the body of mass m_1 will be:

[Take $g = 10\ ms^{-2}$]



(1) 30 N
(2) 40 N
(3) 50 N
(4) 60 N

NEET

An object is subjected to a force in the north-east direction. To balance this force, a second force should be applied in the direction.

(1) North-East
(2) South
(3) South-West
(4) West

Q42 Given below are two statements:

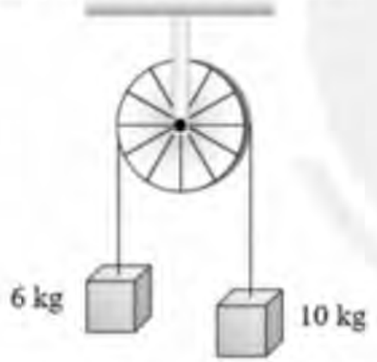
Statement-I: Mass is a measure of inertia of the body in linear motion.

Q38 A force $\vec{F} = \left(40\hat{i} + 10\hat{j}\right)N$ acts on a body of mass 5 kg. If the body starts from rest, its position vector $\vec{r}$ at time $t = 10$s, will be:

(1) $\left(100\hat{i} + 100\hat{j}\right)m$ (2) $\left(400\hat{i} + 100\hat{j}\right)m$

(3) $\left(400\hat{i} + 400\hat{j}\right)m$ (4) $\left(100\hat{i} + 400\hat{j}\right)m$

Q39 A light string passes over a frictionless pulley. To one of its ends a mass of 6 kg is attached. To its other end a mass of 10 kg is attached. The tension in the thread will be:



(1) 24.5 N (2) 2.45 N

(3) 79 N (4) 73.5 N

Q40 A particle of mass 0.3 kg is subjected to a force $F = -kx$ with $k = 15\,\mathrm{N/m}$. What will be its initial acceleration if it is released from a point 20 cm away from the origin.

(1) 5 m/s^2 (2) 10 m/s^2

(3) 3 m/s^2 (4) 15 m/s^2

Q41

An object is subjected to a force in the north-east direction. To balance this force, a second force should be applied in the direction.

(1) North-East (2) South

(3) South-West (4) West

Q42 Given below are two statements:

Statement-I: Mass is a measure of inertia of the body in linear motion.

Statement-II: Greater the mass, greater is the force required to changes its state of rest or of uniform motion.

In the light of the above statements, choose the most appropriate answer from the options given below:

(1) Statement I is correct but Statement II is incorrect.

(2) Statement I is incorrect but Statement II is correct.

(3) Both Statement I and Statement II are correct.

(4) Both Statement I and Statement II are incorrect.

Q43 A light string passing over a smooth light pulley connects two blocks of masses m_1 and m_2 (where $m_2 > m_1$). If the acceleration of the system is $\frac{g}{\sqrt{2}}$, then find the ratio of the masses $\frac{m_1}{m_2}$ is:

(1) $\frac{\sqrt{2}-1}{\sqrt{2}+1}$ (2) $\frac{1+\sqrt{5}}{\sqrt{5}-1}$

(3) $\frac{1+\sqrt{5}}{\sqrt{2}-1}$ (4) $\frac{\sqrt{3}+1}{\sqrt{2}-1}$

Q44 A bullet of mass 20 g has an initial speed of 1 ms^{-1}, just before it starts penetrating a mud wall of thickness 20 cm. If the wall offers a mean resistance of 2.5×10^{-2} N, the speed of the bullet after emerging from the other side of the wall is close to:

(1) 0.4 ms^{-1} (2) 0.1 ms^{-1}

(3) 0.3 ms^{-1} (4) 0.7 ms^{-1}

NEET

Q45 For a car moving on the road it will be considered to be at rest with respect to the

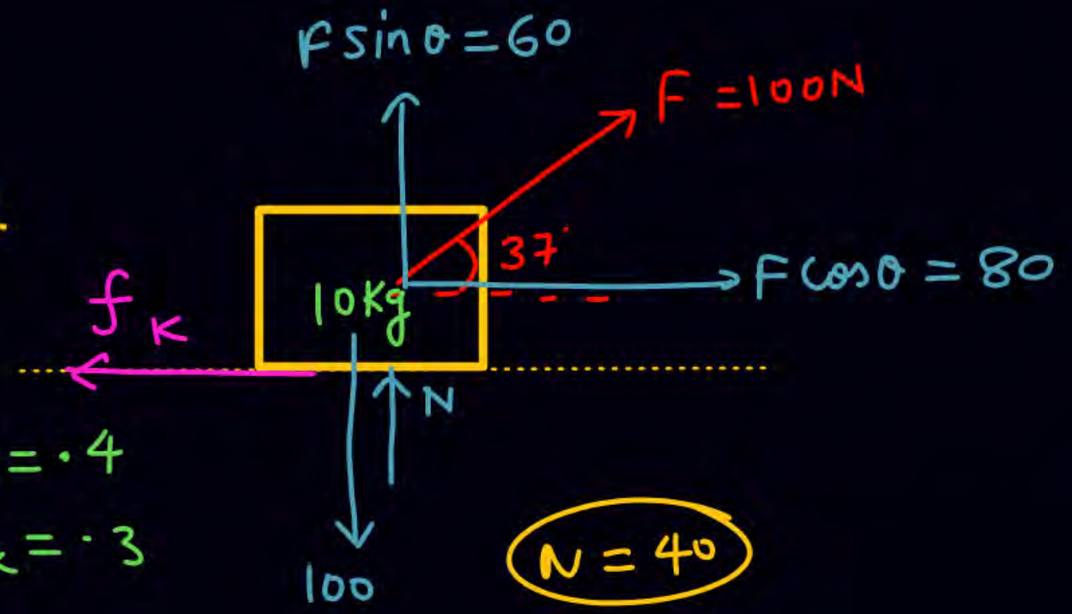
(1) Frame of reference attached to the ground

(2) Frame of reference attached to a person sitting inside the car

(3) Frame of reference attached to a person outside the car

(4) None of the above

Q



$\mu_s = \cdot 4$

$\mu_k = \cdot 3$

$N = 40$

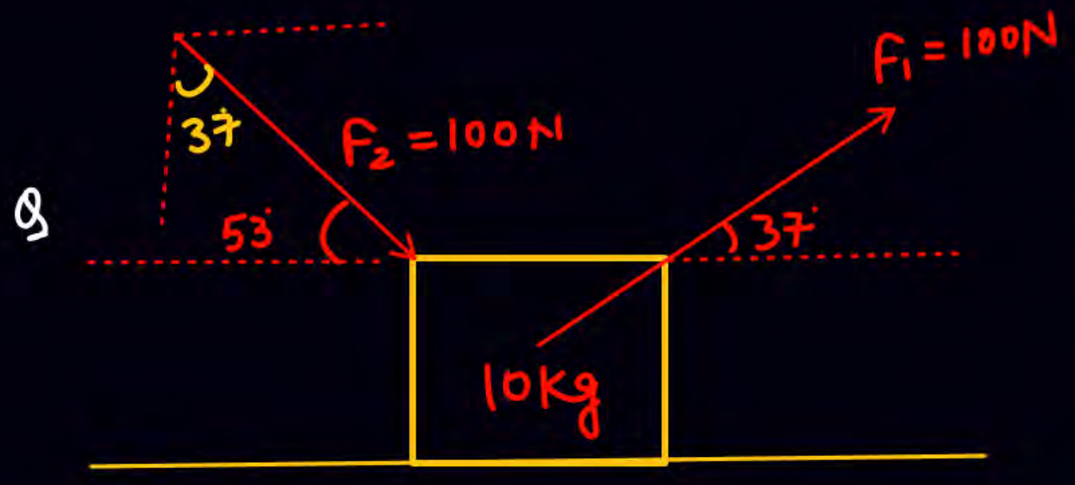
$(f_s)_{max} = \cdot 4 \times 40$

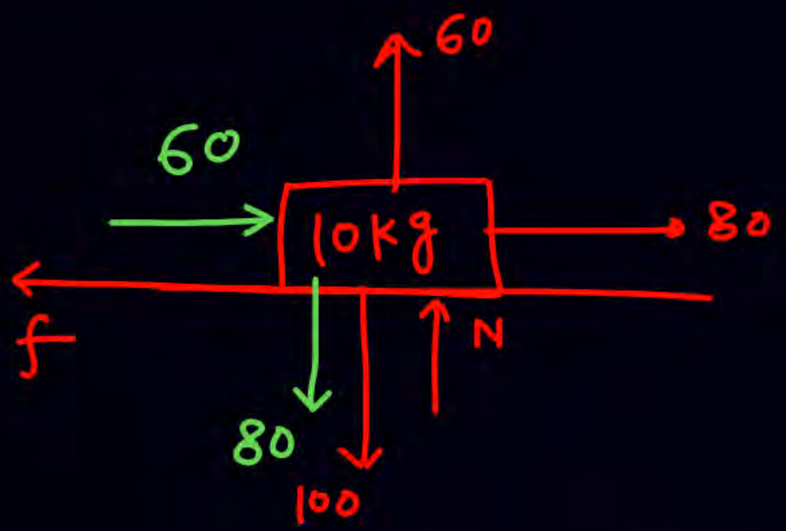
$= 16$

$a = \frac{80 - 16}{10} = 6.4$

$a = \frac{80 - f_k}{m} = \frac{80 - \cdot 3 \times 40}{10}$

$a = 6.8$





$\mu_s = .4$

$\mu_k = .3$

$N + 60 = 80 + 100$

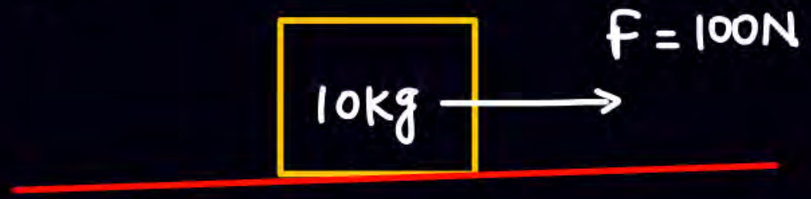
$\boxed{N = 120}$

$$a = \frac{80 + 60 - 36}{10} = \underline{10.4}$$

$f_k = \mu_k N = .3 \times 120$

$= 36$

Q



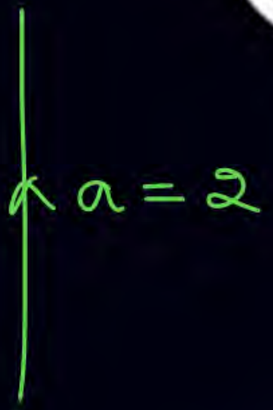
$\mu_s = .4$

$\mu_k = .3$

$$a = \frac{100 - 30}{10}$$

$$a = 7$$

(b)



(1) acc. of block.

sssQ (2) If at $t = 0$, block at rest find velocity of block at $t = 5$ sec

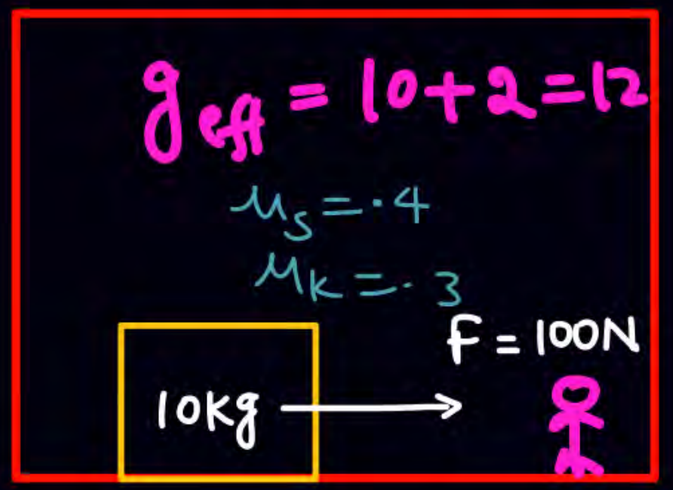
(b)

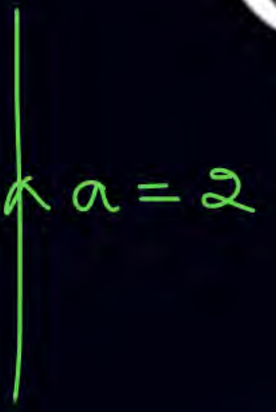
$N = mg_{eff} = 10 \times 12 = 120$

$(f_s)_{max} = 120 \times .4 = 48$

$a = \dfrac{100 - .3 \times 120}{10} = 6.4 = a_{block/lift}$

$\vec{a}_{block} = 6.4\hat{i} + 2\hat{j}$





(1) acc. of block.

Ans ~~$6.4\ m/s^2$~~

sssQ (2) If at $t=0$, block at rest find velocity of block at $t=5$ sec

$\vec{v} = 32\hat{i} + 10\hat{j}$

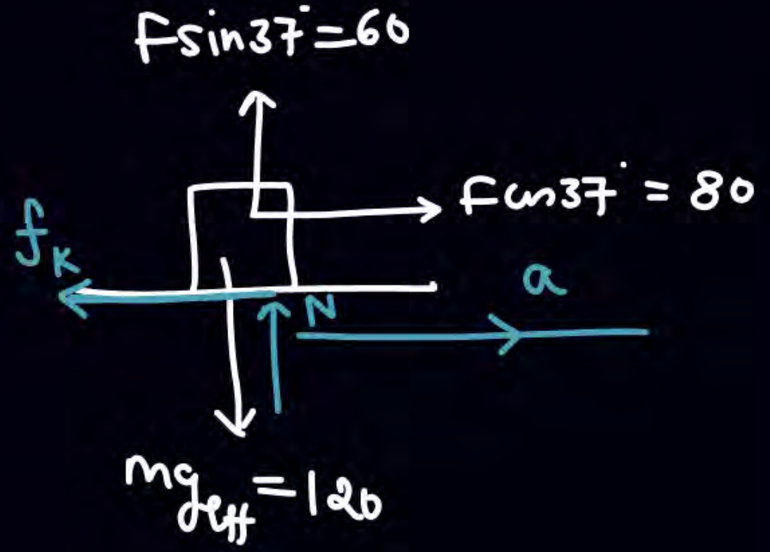
x

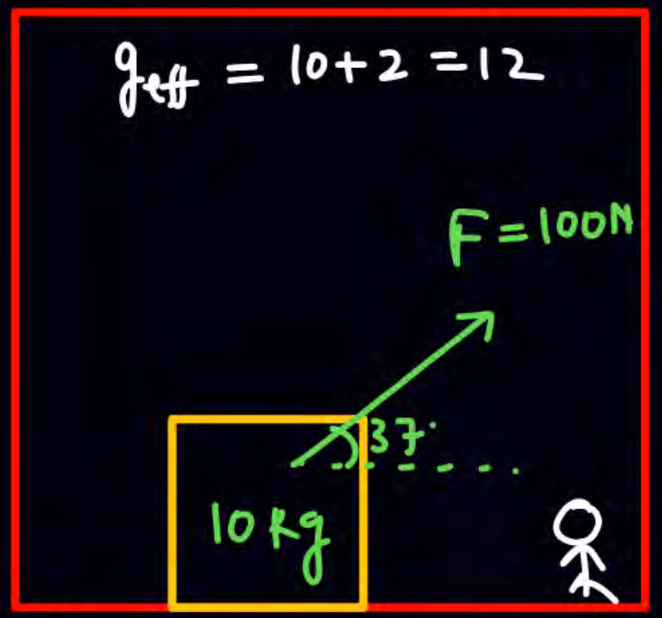
$v = u + at = 0 + 6.4 \times 5$

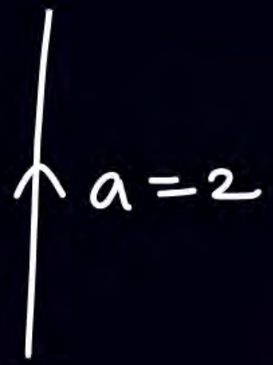
$v_x = 32\ m/s$

Q

find acc of block wrt ground.







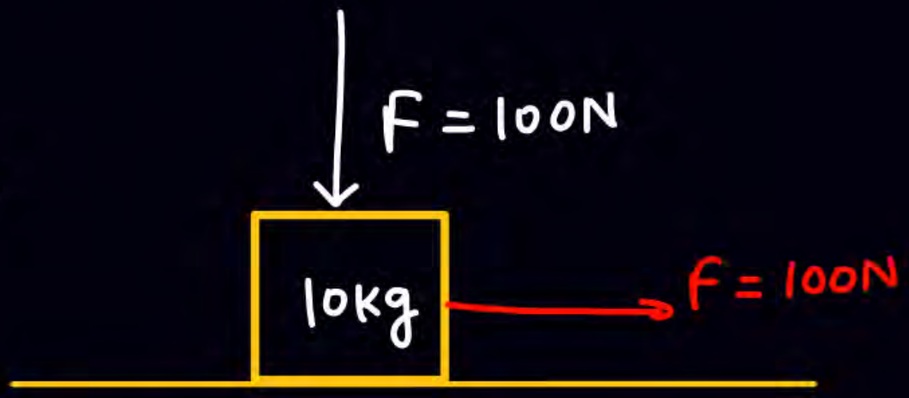
$\mu_s = .4$

$\mu_k = .3$

$N = 60$, $\quad a = \dfrac{80 - .3 \times 60}{10} = 6.2$

$\vec{a}_{block} = 6.2\hat{i} + 2\hat{j}$

Q



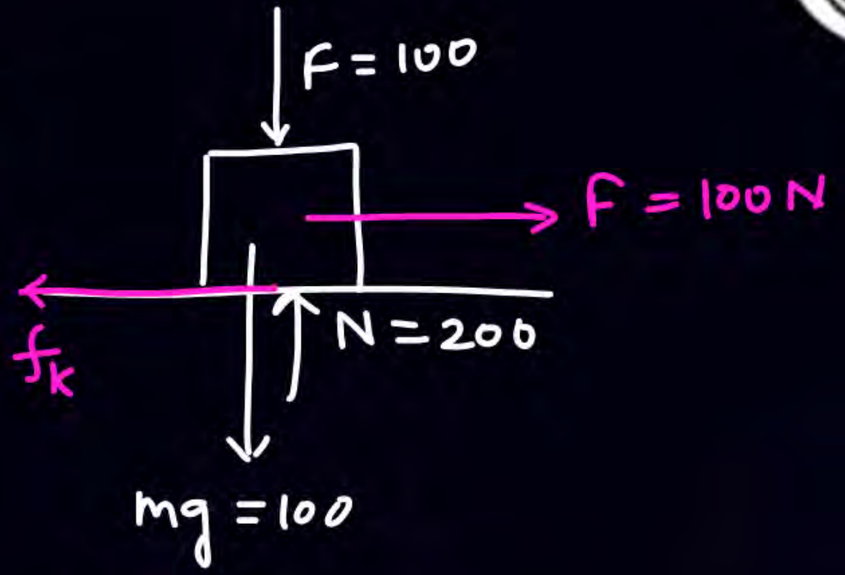
$\mu_s = 0.4$

$\mu_k = 0.3$

$N = 200$

$a =$

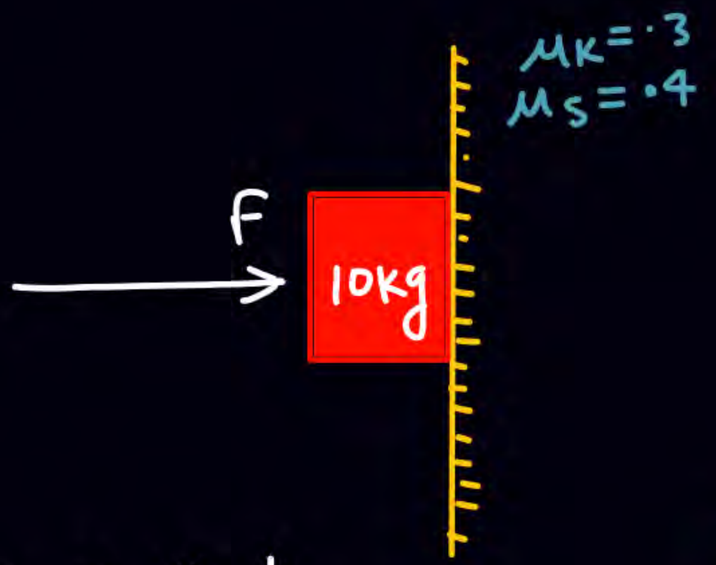
Sol^n



$$a = \frac{100 - 0.3 \times 200}{10} = 4$$

EXPNEET 26

Q



Langup.

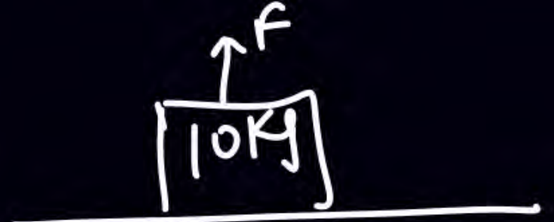
① Find F_{min} so that block remains at rest.

or

Find F_{min} so that block does not slide.

→ Same Ans.

② Find F_{max} for which block slide/move.



Flipcart method

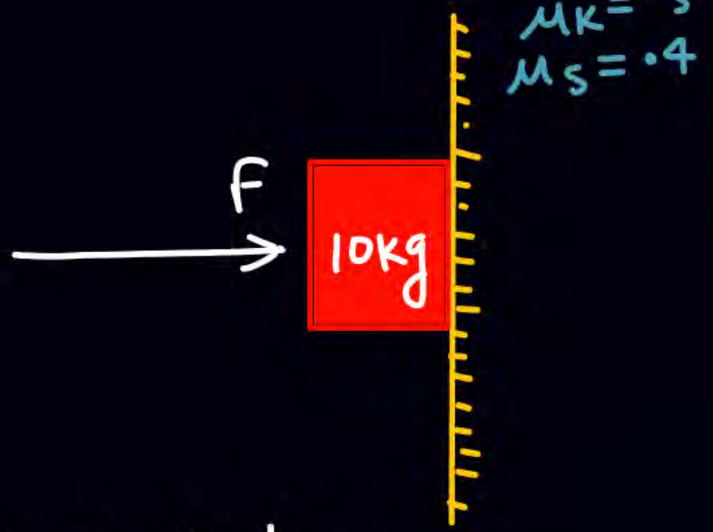
iphone ⟶ 2 Lack

① Acc. में min kitne rupye hone chahiye Ki phone buy kar paye ⇒ 2L

② Acc. में max kitne rupye hone chahiye Ki phone buy Nahi kar paye ⇒ 2L

EXPNEET 26

Q



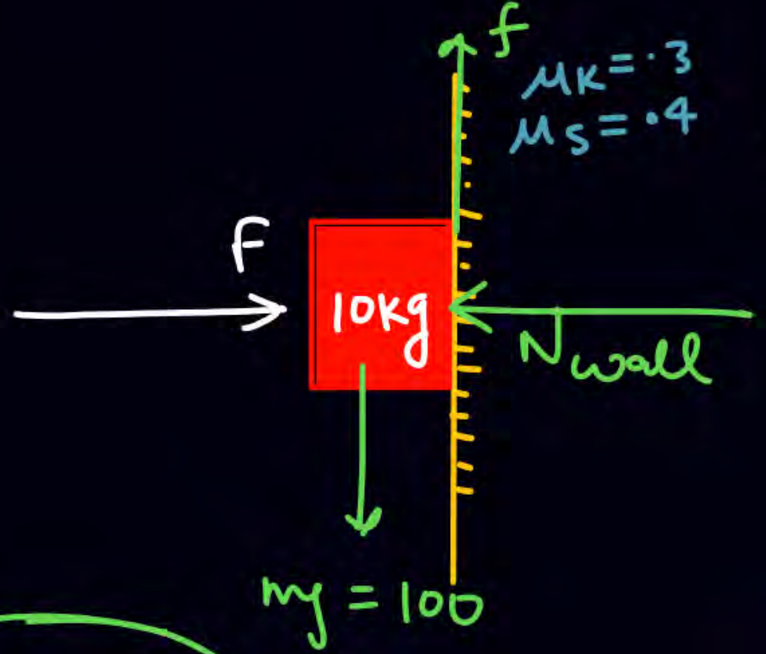
Langup.

① Find F_{min} so that block remains at rest.

or

Find F_{min} so that block does not slide. → Same Ans.

② Find F_{max} for which block slide/move.



$N_{wall} = F$

Root पर रहे.

$100 \leq (f_s)_{max}$

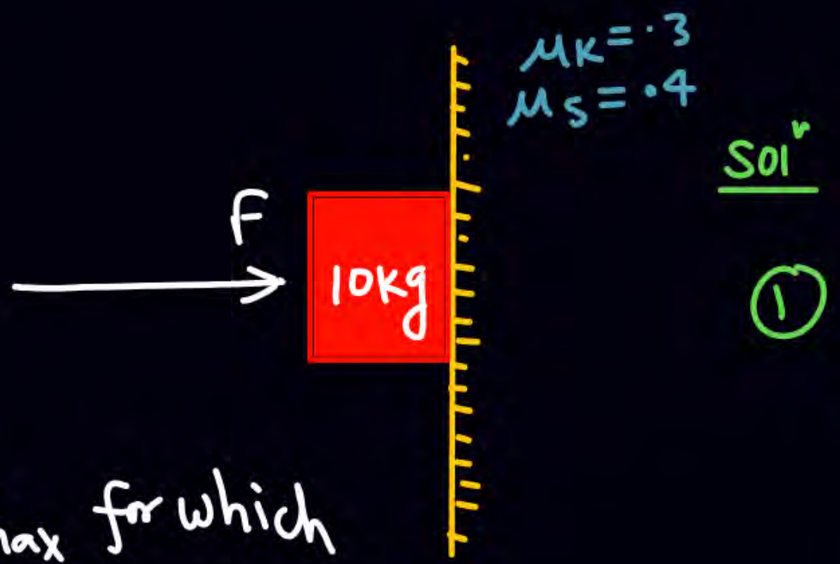
$100 \leq .4 \times N$

$100 \leq .4F$

$F \geq 250$

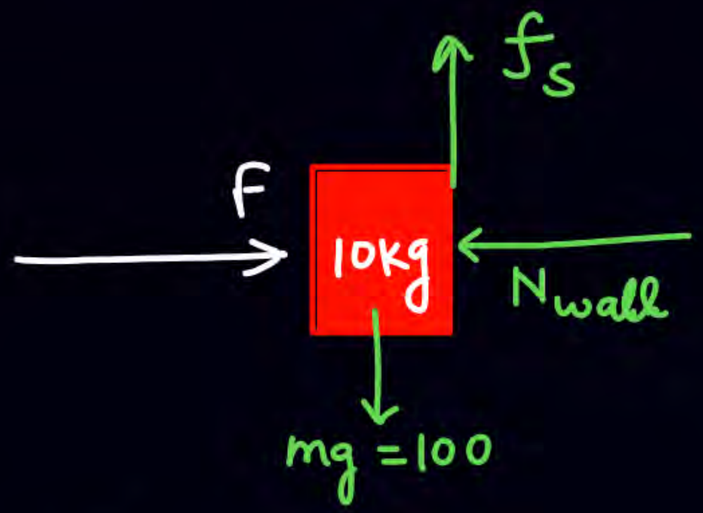
EXPNEET 26

Q



Sol

①



② Find F_{max} for which block slide/move

$F = N_{wall}$

$100 > (f_s)_{max}$ (move)

$100 > \mu_s N$

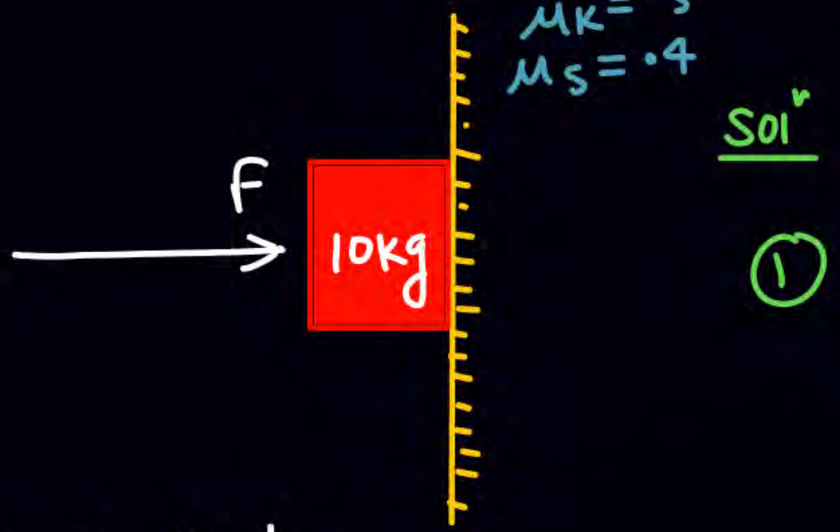
$100 > .4 \times F$

$F < 250$

Ans 250

EXPNEET 26

Q



Sol^n

①

Langup.

① Find F_{min} so that block remains at rest.

or

Find F_{min} so that block does not slide. → Same Ans.

② Find F_{max} for which block slide/move.

$f_s = mg$

$\mu_s \times F = 100$

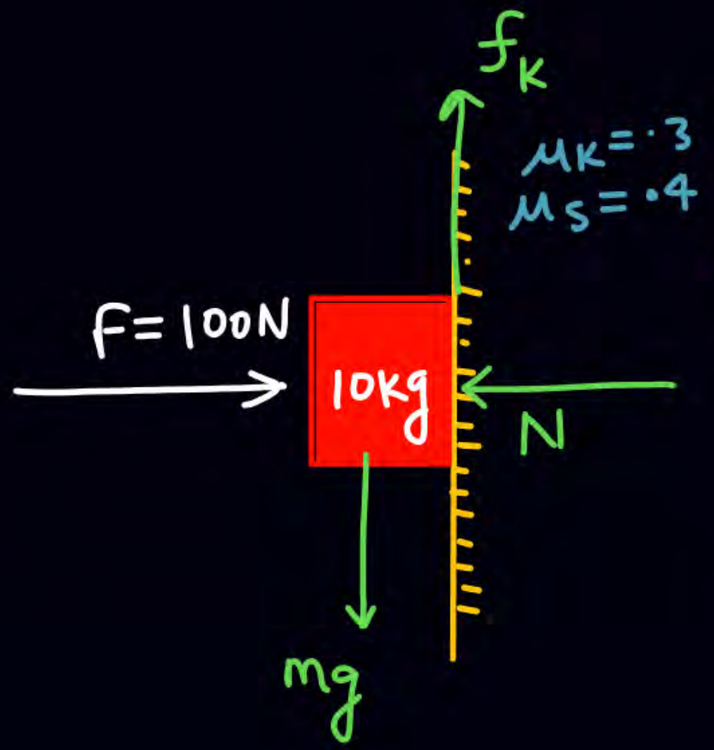
$.4 \times F = 100$

$F = 250$

F = 0, गिर जाएगा
F कम लगाओगे तो गिर जाएगा

EXPNEET 26

Q



find acc. of block.

$N = F = 100$

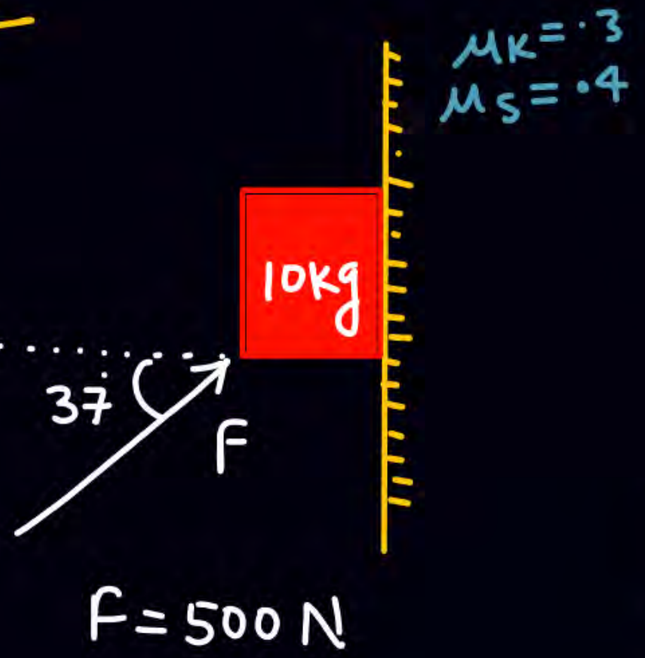
S

$a = \frac{mg - f}{m} = \frac{100 - .3 \times 100}{10}$

$= 7$

EXPNEET 26

Q

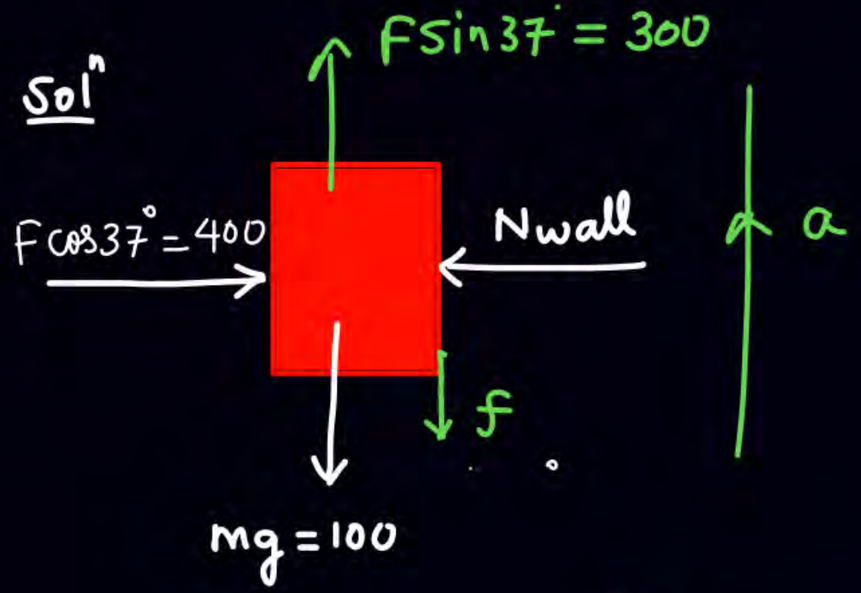


$F = 500\ N$

① find acc. of block $= 8$

② contact force

Sol^n



$N_{wall} = 400$

$(f_s)_{max} = .4 \times 400 = 160$

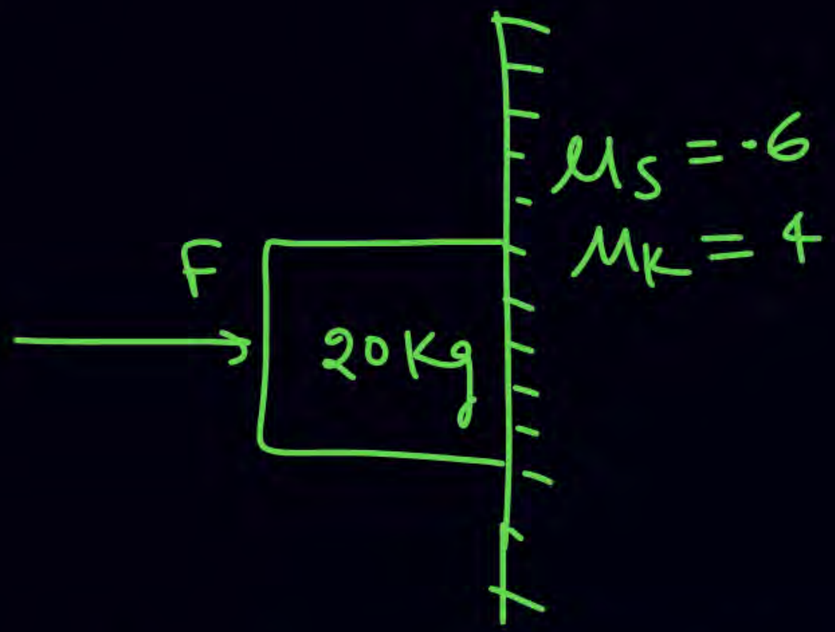
$f_k = .3 \times 400 = 120$

$$a = \frac{300 - 100 - f_k}{10} = \frac{300 - 100 - 120}{10} \Rightarrow a = 8$$

$$\text{Contact force} = \sqrt{f^2 + N^2} = \sqrt{(400)^2 + (120)^2}$$

Rough copy

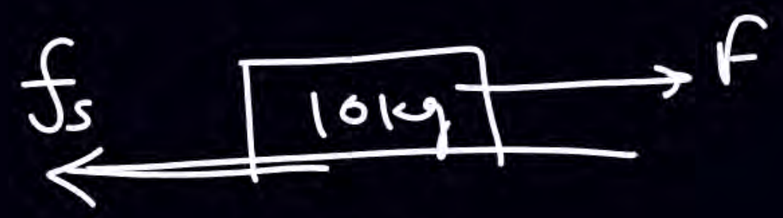
Q



① F_{min} So that rest पर रहे

$200 = .6 \times F$

$F = \frac{2000}{6} = \frac{1000}{3}$



$\mu_s = 0.4$

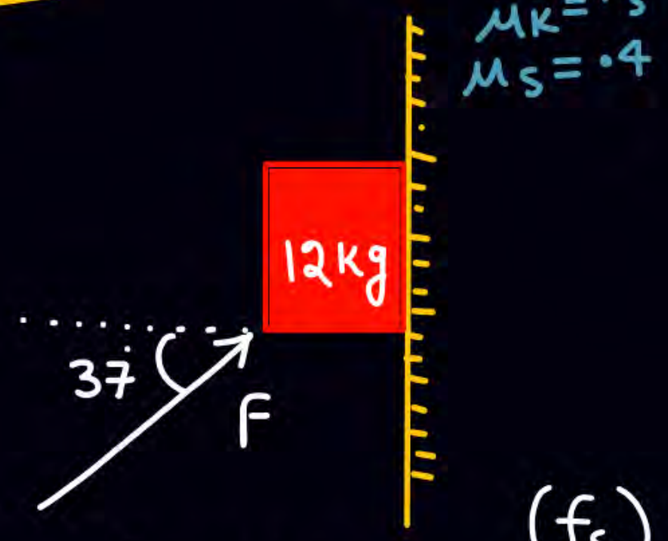
$(f_s)_{max} = 40$

$F \leq 40$ (move नहीं करे)

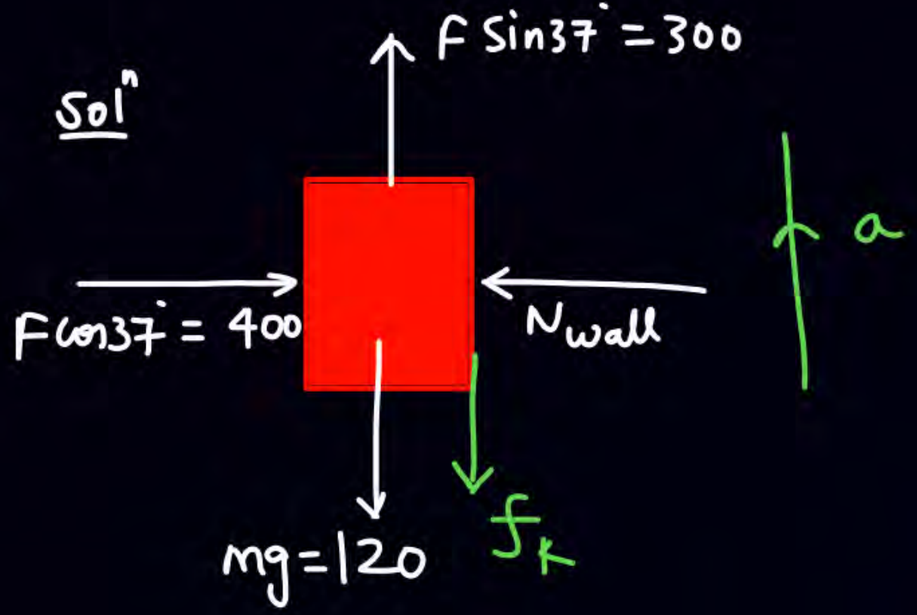
$F \leq (f_s)_{max}$

EXPNEET 26

Q



Sol^n



$(f_s)_{max} = .4 \times 400$

$= 160$

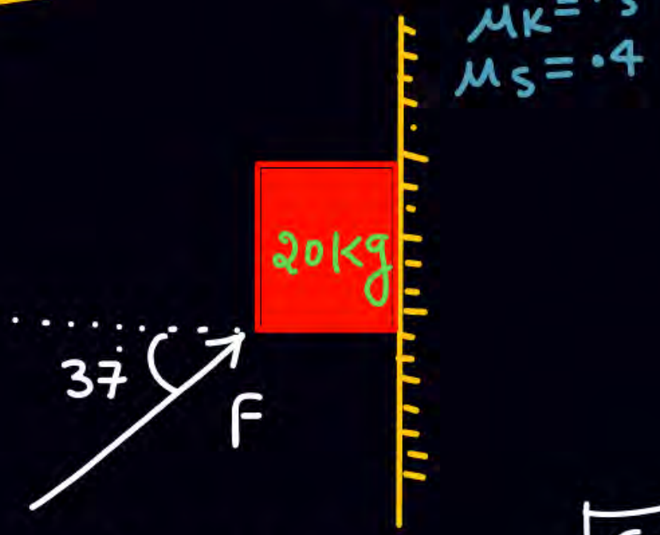
$$a = \frac{300 - 120 - f_k}{m}$$

$$a = \frac{300 - 120 - .3 \times 400}{12}$$

$$\boxed{a = 5}$$

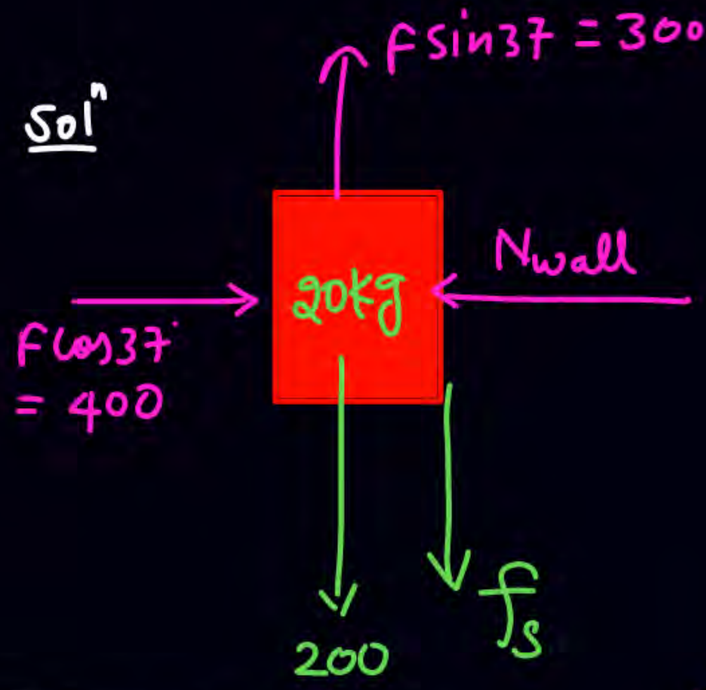
EXPNEET 26

Q



$F = 500\ N$

Sol^n



$$(f_s)_{max} = .4 \times 400 = 160$$

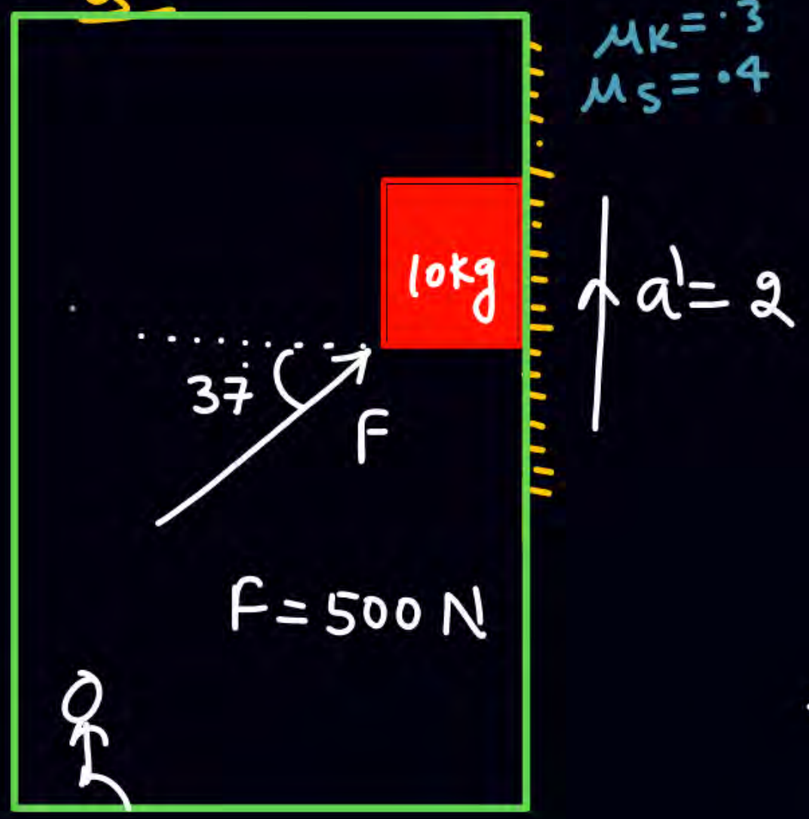
$$a = 0$$

$$f_s = 100$$

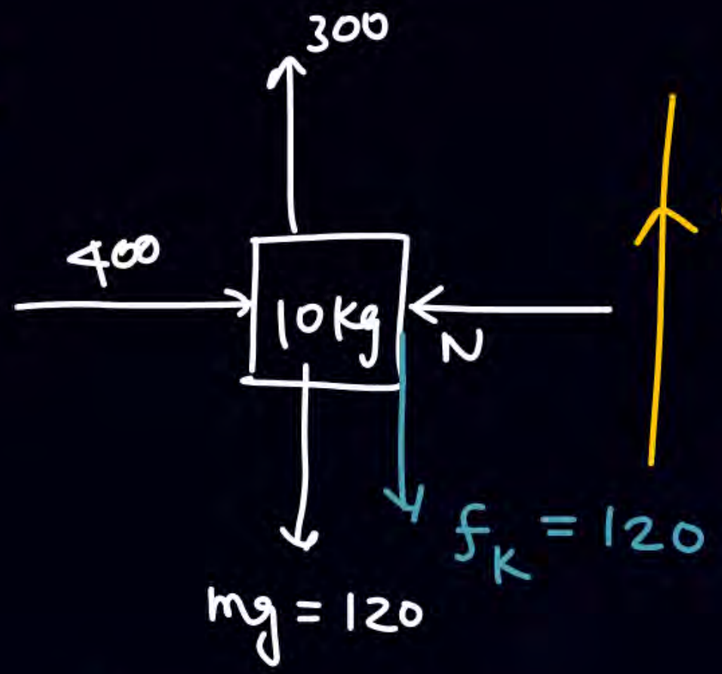
Contact force $= \sqrt{100^2 + (400)^2}$

EXPNEET 26

SSB



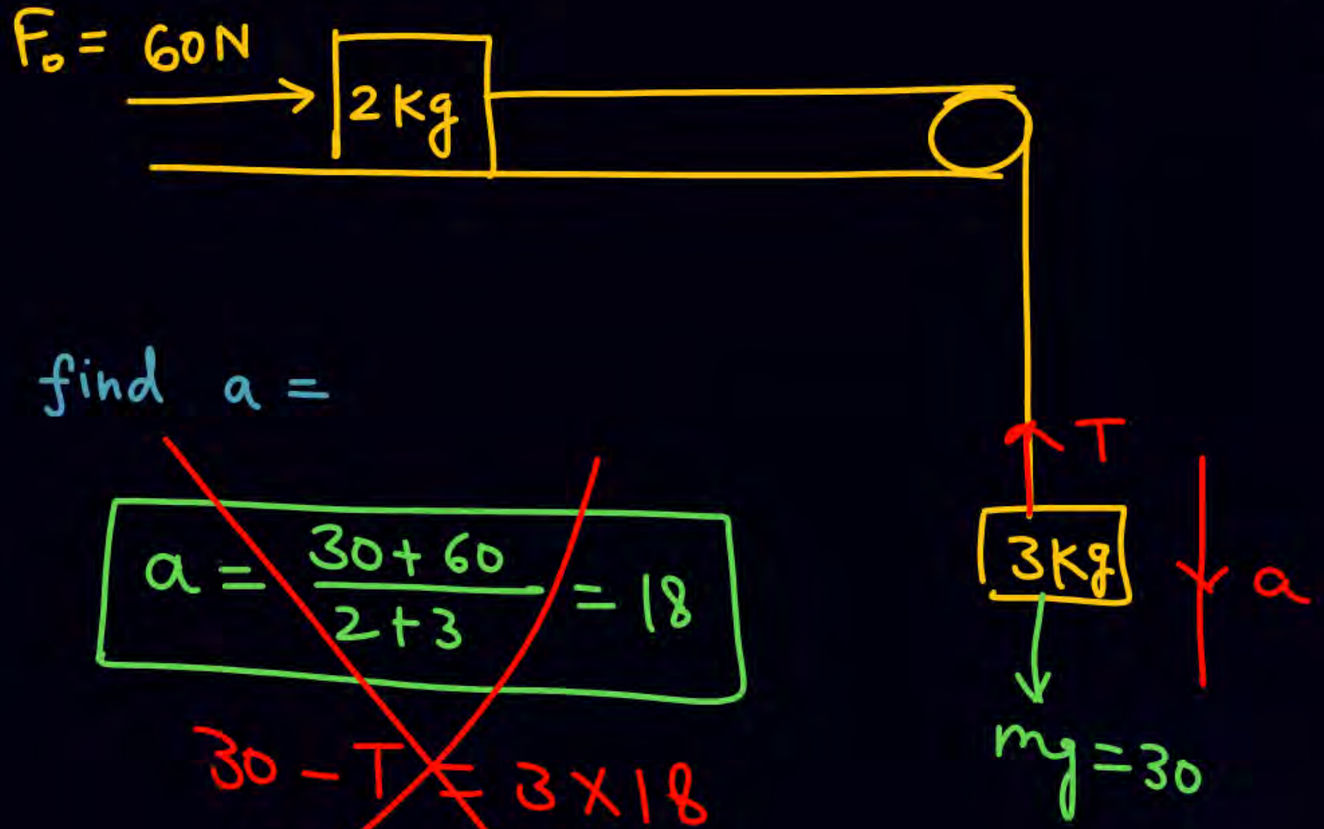
Sol^n



$$a = \frac{300 - 120 - 120}{10} = 6 = a_{block/lift}$$

$$a_{block} = 6\hat{j} + 2\hat{j} = 8\hat{j}$$

SSSQ



find a =

$$a = \frac{30+60}{2+3} = 18$$

$30 - T = 3 \times 18$

$T = 30 - 54 = -24$

$T < 0$, $T = 0$

(b)

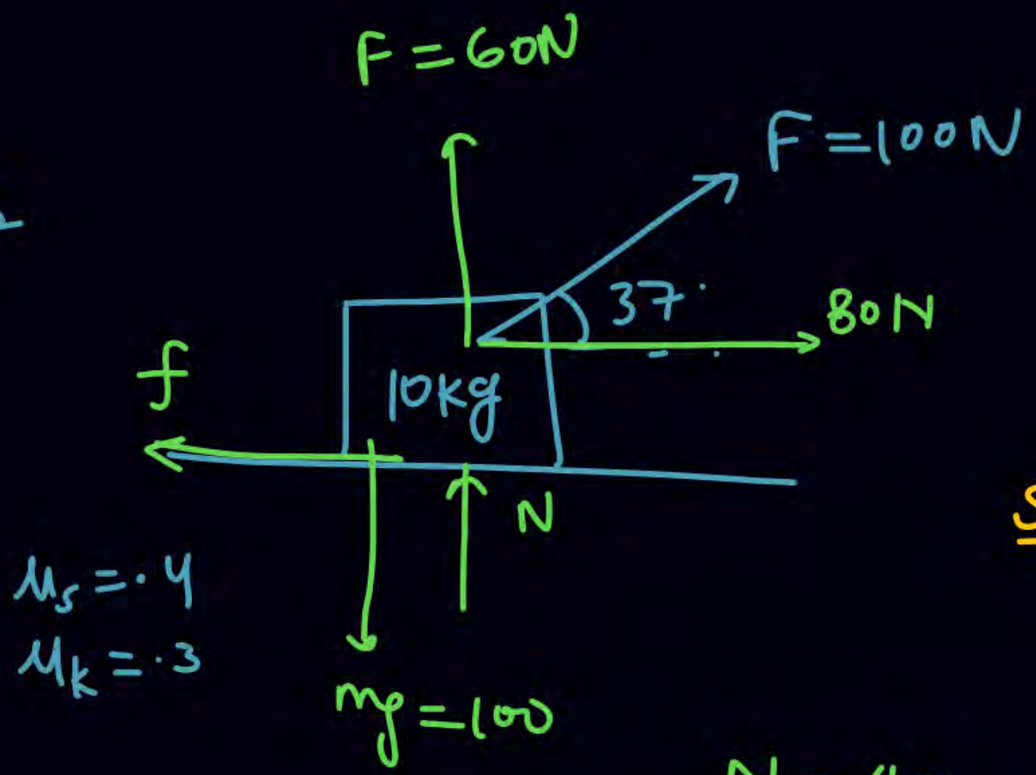
$T = 0$,

$$a = \frac{30-T}{3} = \frac{30-0}{3}$$

$$\boxed{a = 10}$$ a_{cc} of 3kg

a_{cc} of 2kg $\Rightarrow \frac{60}{2} = 30\ m/s^2$

Q



find Contact force.

Sol^n

$$\sqrt{(40)^2 + (12)^2} = 4\sqrt{109}$$

$$N = 40$$

$$f_k = .3 \times 40 = 12$$

QUESTION

An object of mass 5 kg is thrown vertically upwards from the ground. The air resistance produces a constant retarding force of 10 N throughout the motion. The ratio of time of ascent to the time of descent will be equal to: [Use $g = 10\ ms^{-2}$] **[June 24, 2022 (II)]**

1. 1 : 1
2. $\sqrt{2} : \sqrt{3}$
3. $\sqrt{3} : \sqrt{2}$
4. 2 : 3

Ans: (2)

QUESTION

The initial mass of a rocket is 1000 kg. Calculate at what rate the fuel should be burnt so that the rocket is given an acceleration of 20 ms^{-2}. The gases come out at a relative speed of 500 ms^{-1} with respect to the rocket: [Use $g = 10\ m/s^2$] **[Aug. 26, 2021 (I)]**

1. $6.0 \times 10^2\ kg\ s^{-1}$
2. $500\ kg\ s^{-1}$
3. $10\ kg\ s^{-1}$
4. $60\ kg\ s^{-1}$

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:

[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

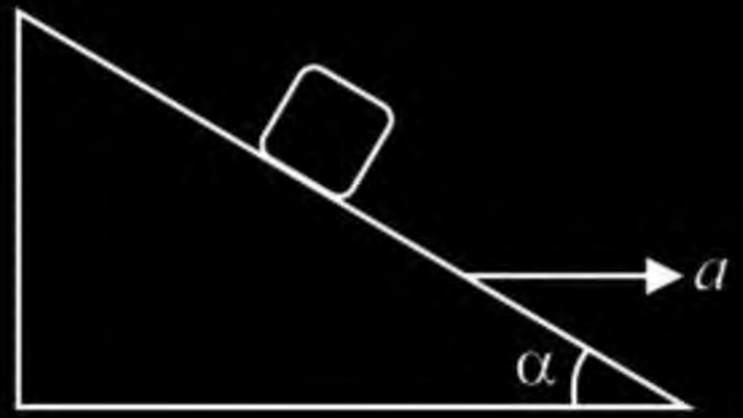
A boy pushes a box of mass 2 kg with a force $\vec{F} = (20\hat{\imath} + 10\,\hat{\jmath})$N on a frictionless surface. If the box was initially at rest, then _____ m is displacement along the x-axis after 10 s.

[Feb. 26, 2021 (I)]

Ans: (500)

QUESTION

A block is kept on a frictionless inclined surface with angle of inclination 'α'. The incline is given an acceleration 'a' to keep the block stationary. Then a is equal to. **[2005]**



1. g cosec α
2. $g/\tan\alpha$
3. $g \tan\alpha$
4. g

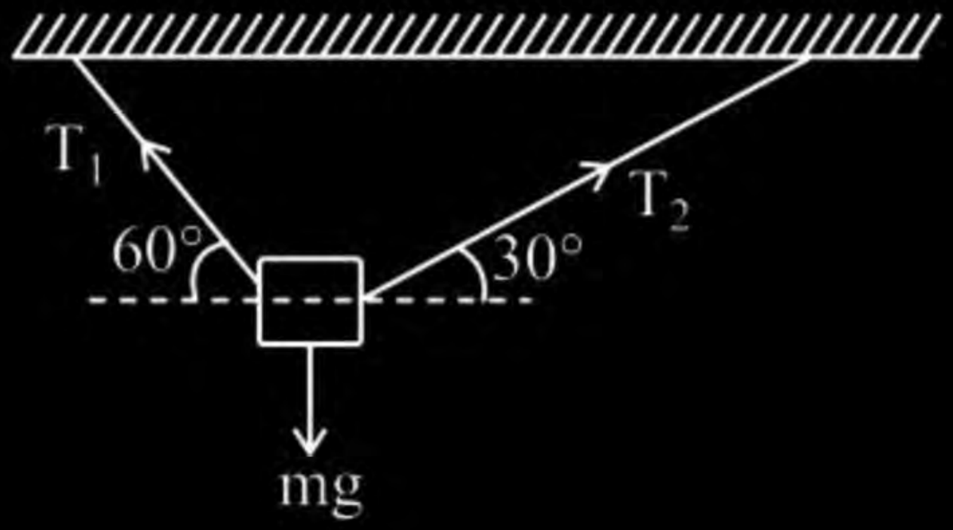
Ans: (3)

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):

[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

A massless spring gets elongated by amount x_1 under a tension of 5N. Its elongation is x_2 under the tension of 7N. For the elongation of $(5x_1 - 2x_2)$, the tension in the spring will be:

[Jan. 23, 2025 (II)]

1. 15 N
2. 20 N
3. 11 N
4. 39 N

Ans: (3)

QUESTION

A light unstretchable string passing over a smooth light pulley connects two blocks of masses m_1 and m_2. If the acceleration of the system is $g/8$, then the ratio of the masses m_2/m_1 is:

[April 9, 2024 (I)]

1. 9 : 7
2. 4 : 3
3. 5 : 3
4. 8 : 1

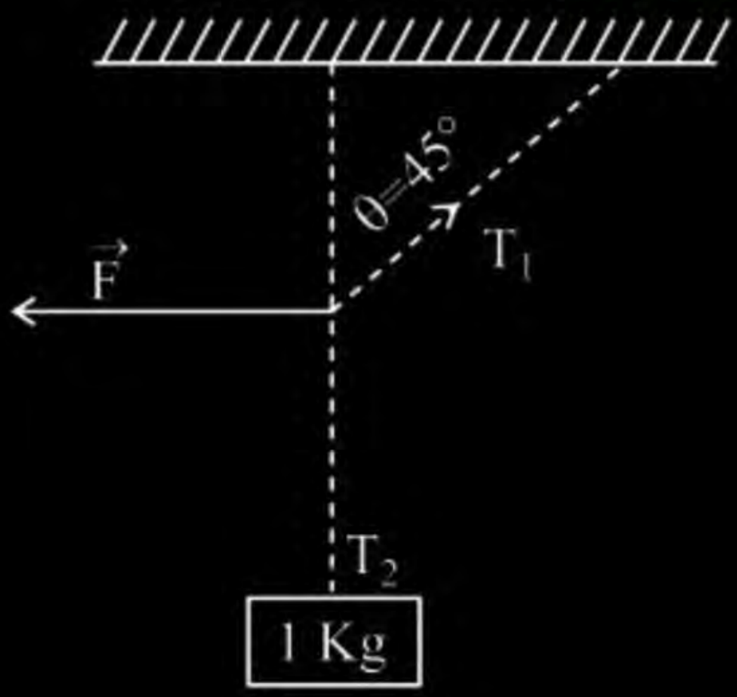
Ans: (1)

QUESTION

A 1 kg mass is suspended from the ceiling by a rope of length 4m. A horizontal force 'F' is applied at the mid point of the rope so that the rope makes an angle of 45° with respect to the vertical axis as shown in figure. The magnitude of F is:

[April 9, 2024 (II)]

1. $\frac{10}{\sqrt{2}}$ N
2. 1 N
3. $\frac{1}{10 \times \sqrt{2}}$ N
4. 10 N



Ans: (4)

QUESTION

A light string passing over a smooth light pulley connects two blocks of masses m_1 and m_2 (where $m_2 > m_1$). If the acceleration of the system is $g/\sqrt{2}$, then the ratio of the masses m_1/m_2 is:

[April 6, 2024 (I)]

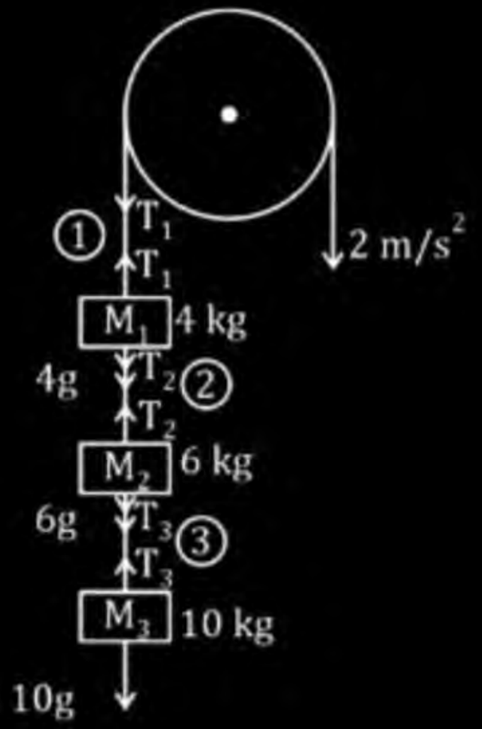
1. $\frac{\sqrt{2}-1}{\sqrt{2}+1}$
2. $\frac{1+\sqrt{5}}{\sqrt{5}-1}$
3. $\frac{1+\sqrt{5}}{\sqrt{2}-1}$
4. $\frac{\sqrt{3}+1}{\sqrt{2}-1}$

Ans: (1)

QUESTION

Three blocks M_1, M_2, M_3 having masses 4 kg, 6 kg and 10 kg respectively are hanging from a smooth pully using rope 1, 2 and 3 as shown in figure. The tension in the rope 1, T_1 when they are moving upward with acceleration of 2 ms^{-2} is _____ N.
(if $g = 10\ m/s^2$).

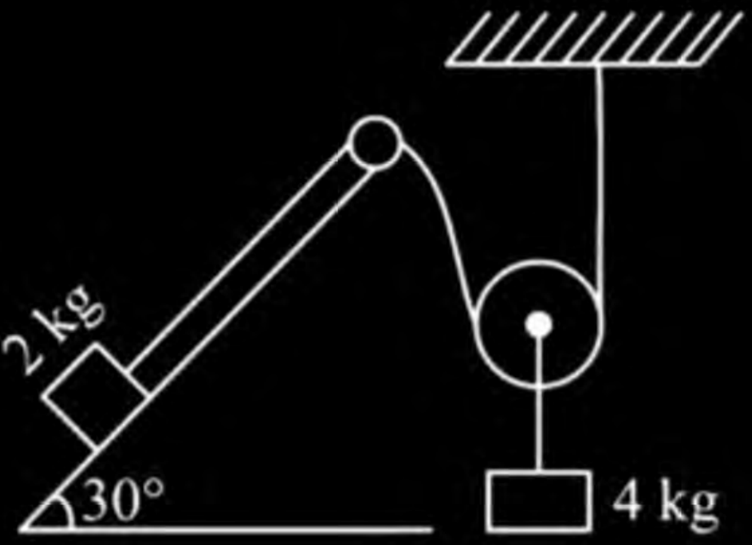
[April 5, 2024 (I)]



Ans: (240)

QUESTION

All surfaces shown in figure are assumed to be frictionless and the pulleys and the string are light. The acceleration of the block of mass 2 kg is: **[Jan 30, 2024 (I)]**

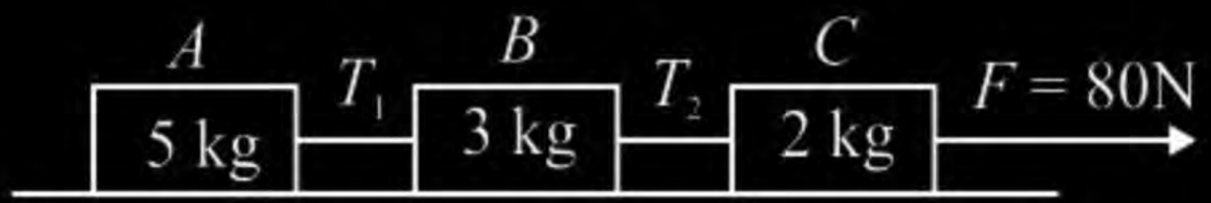


1. g
2. $g/3$
3. $g/2$
4. $g/4$

Ans: (4)

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)]**



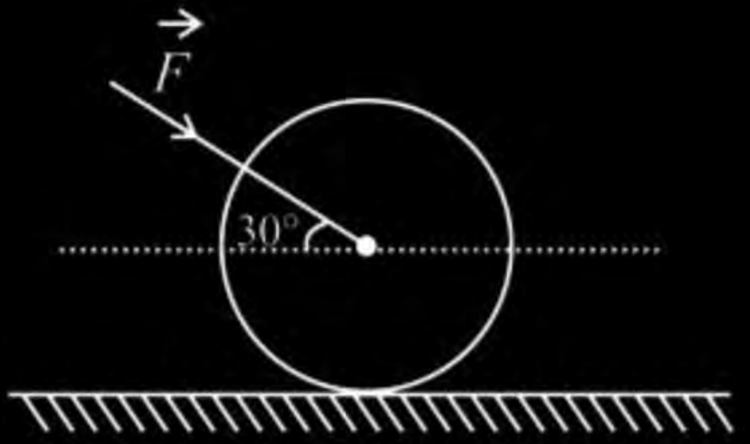
1. 40 N, 64 N
2. 60 N, 80 N
3. 88 N, 96 N
4. 80 N, 100 N

Ans: (1)

QUESTION

As shown in figure, a 70 kg garden roller is pushed with a force of $\vec{F} = 200$ N at an angle of 30° with horizontal. The normal reaction on the roller is _____.
(Given $g = 10\ ms^{-2}$).

[Jan 31, 2024 (I)]



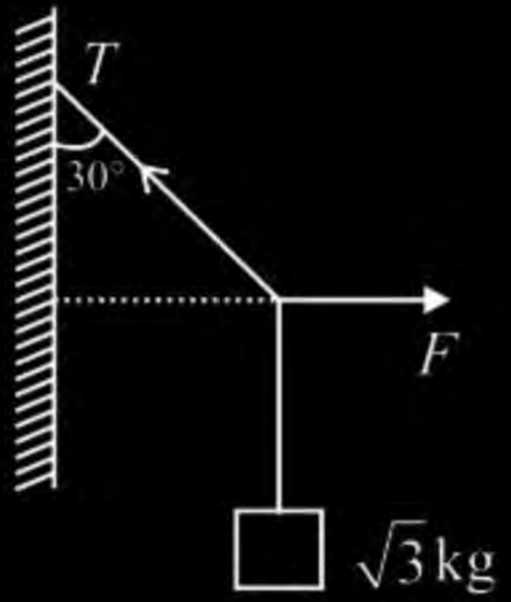
1. $800\sqrt{2}$N
2. 600 N
3. 800 N
4. $200\sqrt{3}$ N

Ans: (3)

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 $g = 10\ ms^{-2}$)

[Jan 30, 2023 (II)]



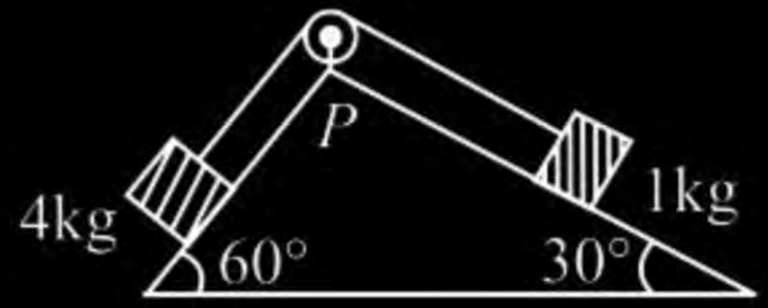
1. 20 N
2. 25 N
3. 10 N
4. 15 N

Ans: (1)

QUESTION

As per given figure, a weightless pulley P is attached on a double inclined frictionless surface. The tension in the string (massless) will be: (if $g = 10\ m/s^2$).

[24 January 2023 - Shift 1]



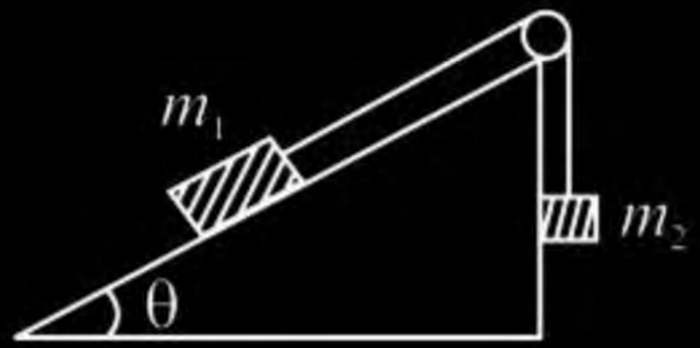
1. $(4\sqrt{3}+1)$N
2. $4(\sqrt{3}+1)$N
3. $4(\sqrt{3}-1)$N
4. $(4\sqrt{3}-1)$N

Ans : (2)

QUESTION

Two bodies of masses $m_1 = 5$ kg and $m_2 = 3$ kg are connected by a light string going over a smooth light pulley on a smooth inclined plane as shown in the figure. The system is at rest. The force exerted by the inclined plane of the body of mass m_1 will be: [Take $g = 10\ ms^{-2}$].

[July 29, 2022 (II)]



1. 30 N
2. 40 N
3. 50 N
4. 60 N

Ans : (2)

QUESTION

A block 'A' takes 2 s to slide down a frictionless incline of 30° and length 'l', kept inside a lift going up with uniform velocity 'v'. If the incline is changed to 45°, the time taken by the block, to slide down the incline, will be approximately:

[July 27, 2022 (II)]

1. 2.66 s
2. 0.83 s
3. 1.68 s
4. 0.70 s

Ans : (3)

QUESTION

A monkey of mass 50 kg climbs on a rope which can withstand the tension (T) of 350 N. If monkey initially climbs down with an acceleration of 4 m/s^2 and then climbs up with an acceleration of 5 m/s^2. Choose the correct option (g = 10 m/s^2).

[July 26, 2022 (I)]

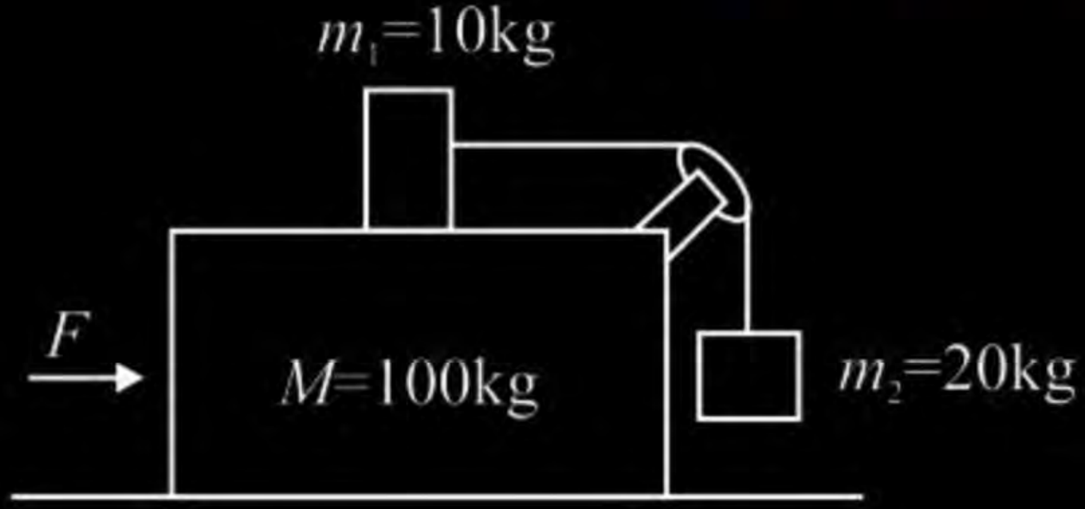
1. T = 700 N while climbing upward
2. T = 350 N while going downward
3. Rope will break while climbing upward
4. Rope will break while going downward

Ans : (3)

QUESTION

Three masses $M = 100$ kg, $m_1 = 10$ kg and $m_2 = 20$ kg are arranged in a system as shown in figure. All the surface are frictionless and strings are inextensible and weightless. The pulleys are also weightless and frictionless. A force F is applied on the system so that the mass m_2 moves upward with an acceleration of 2 ms^{-2}. The value of F is: (Take $g = 10$ ms^{-2}).

[July 26, 2022 (I)]



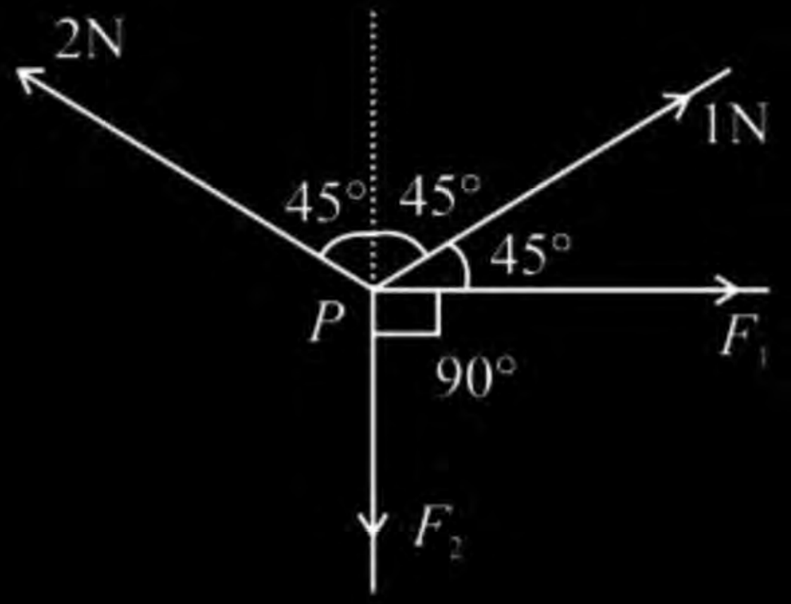
1. 3360 N
2. 3380 N
3. 3120 N
4. 3240 N

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 $x =$ _____.

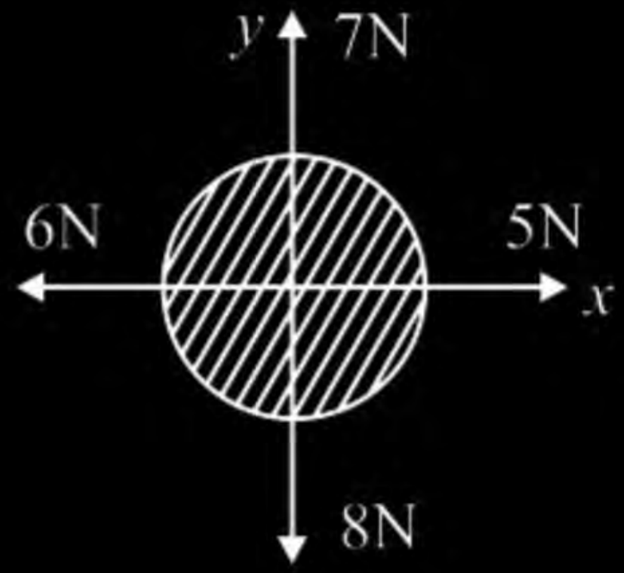
[July 25, 2022 (I)]



Ans : (3)

QUESTION

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

A block of mass M placed inside a box descends vertically with acceleration 'a'. The block exerts a force equal to one-fourth of its weight on the floor of the box. The value of 'a' will be _____.

[June 29, 2022 (II)]

1. $\frac{g}{4}$
2. $\frac{g}{2}$
3. $\frac{3g}{4}$
4. g

Ans : (3)

QUESTION

A person is standing in an elevator. In which situation, he experiences weight loss?

[June 26, 2022 (I)]

1. When the elevator moves upward with constant acceleration
2. When the elevator moves downward with constant acceleration
3. When the elevator moves upward with uniform velocity
4. When the elevator moves downward with uniform velocity

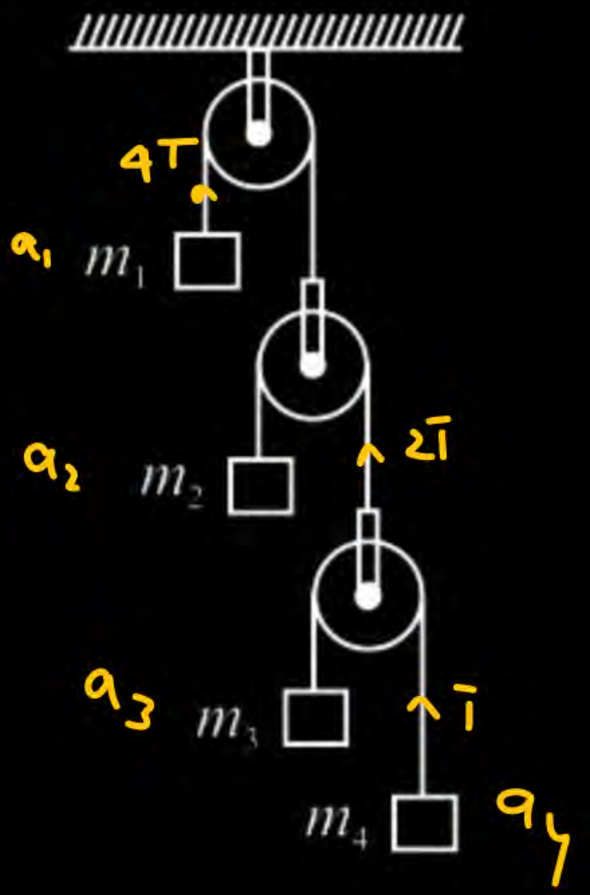
Ans: (2)

QUESTION

In the arrangement shown in figure a_1, a_2, a_3 and a_4 are the acceleration of masses m_1, m_2, m_3 and m_4 respectively. Which of the following relation is true for this arrangement?

[June 26, 2022 (II)]

1. $4a_1 + 2a_2 + a_3 + a_4 = 0$
2. $a_1 + 4a_2 + 3a_3 + a_4 = 0$
3. $a_1 + 4a_2 + 3a_3 + 2a_4 = 0$
4. $2a_1 + 2a_2 + 3a_3 + a_4 = 0$

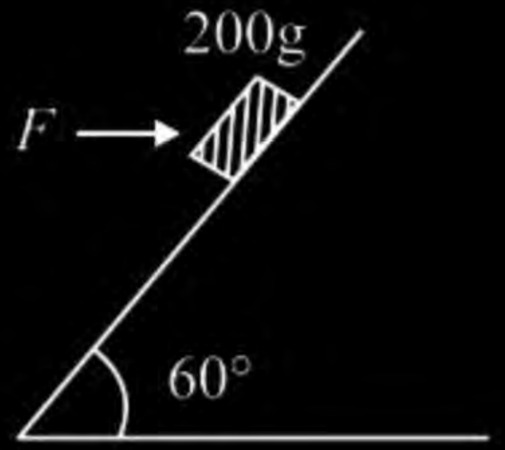


Ans : (1)

QUESTION

A block of mass 200 g is kept stationary on a smooth inclined plane by applying a minimum horizontal force $F = \sqrt{x}N$ as shown in figure. The value of x = _____.

[June 25, 2022 (II)]



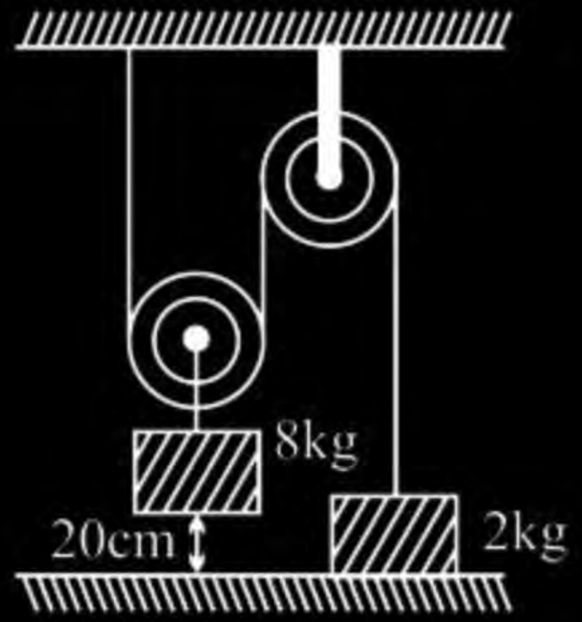
Ans : (12)

QUESTION

The boxes of masses 2 kg and 8 kg are connected by a massless string passing over smooth pulleys. Calculate the time taken by box of mass 8 kg to strike the ground starting from rest. (use $g = 10\ m/s^2$).

[Aug. 27, 2021 (II)]

1. 0.34 s
2. 0.2 s
3. 0.25 s
4. 0.4 s



Ans : (4)

QUESTION

A person standing on a spring balance inside a stationary lift measures 60 kg. The weight of that person if the lift descends with uniform downward acceleration of $1.8\ m/s^2$ will be _____ N. $[g = 10\ m/s^2]$. **[Feb. 26, 2021 (I)]**

Ans : (492)

QUESTION

Two blocks of mass $M_1 = 20$ kg and $M_2 = 12$ kg are connected by a metal rod of mass 8 kg. The system is pulled vertically up by applying a force of 480 N as shown. The tension at the mid-point of the rod is:

[Online April 22, 2013]

1. 144 N
2. 96 N
3. 240 N
4. 192 N

Ans : (4)

FRICTION

QUESTION

A cubic block of mass m is sliding down on an inclined plane at $60°$ with an acceleration $g/2$, of, the value of coefficient of kinetic friction is: **[April 7, 2025 (I)]**

1. $\sqrt{3}-1$
2. $\sqrt{3}/2$
3. $\sqrt{2}/3$
4. $1-\frac{\sqrt{3}}{2}$

Ans : (1)

QUESTION

A given object takes n times the time to slide down 45° rough inclined plane as it takes the time to slide down an identical perfectly smooth 45° inclined plane. The coefficient of kinetic friction between the object and the surface of inclined plane is:

[April 8, 2024 (II)]

1. $1-\frac{1}{n^2}$
2. $1-n^2$
3. $\sqrt{1-\frac{1}{n^2}}$
4. $\sqrt{1-n^2}$

Ans : (1)

QUESTION

A heavy box of mass 50 kg is moving on a horizontal surface. If co-efficient of kinetic friction between the box and horizontal surface is 0.3 then force of kinetic friction is:

[April 5, 2024 (II)]

1. 14.7 N
2. 147 N
3. 1.47 N
4. 1470 N

Ans : (2)

QUESTION

A 2 kg brick begins to slide over a surface which is inclined at an angle of 45° with respect to horizontal axis. The co-efficient of static friction between their surfaces is:

[April 4, 2024 (II)]

1. 1
2. $1/\sqrt{3}$
3. 0.5
4. 1.7

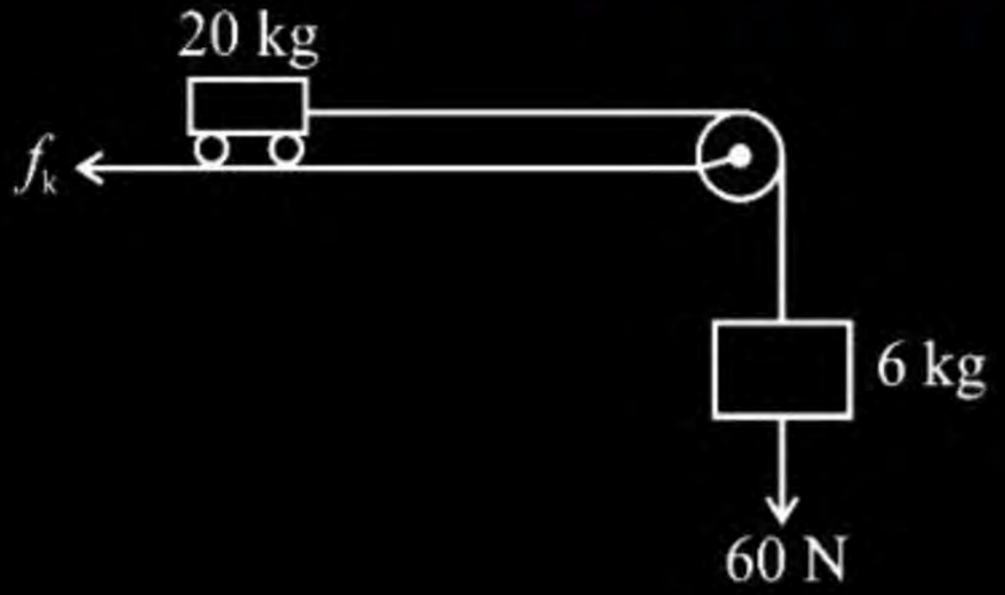
Ans : (1)

QUESTION

Consider a block and trolley system as shown in figure. If the coefficient of kinetic friction between the trolley and the surface is 0.04, the acceleration of the system in ms^{-2} is:

(Consider that the string is massless and unstretchable and the pulley is also massless and frictionless):

[Feb. 1, 2024 (I)]



1. 3
2. 4
3. 2
4. 1.2

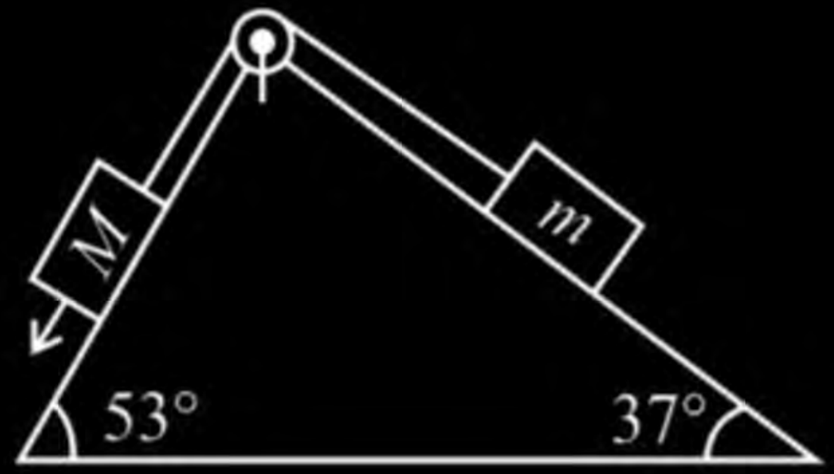
Ans : (3)

QUESTION

In the given arrangement of a doubly inclined plane two blocks of masses M and m are placed. The blocks are connected by a light string passing over an ideal pulley as shown. The coefficient of friction between the surface of the plane and the blocks is 0.25. The value of m, for which M = 10 kg will move down with an acceleration of $2\ m/s^2$, is:

(take $g = 10\ m/s^2$ and $\tan 37° = 3/4$)

[Jan. 31, 2024 (I)]



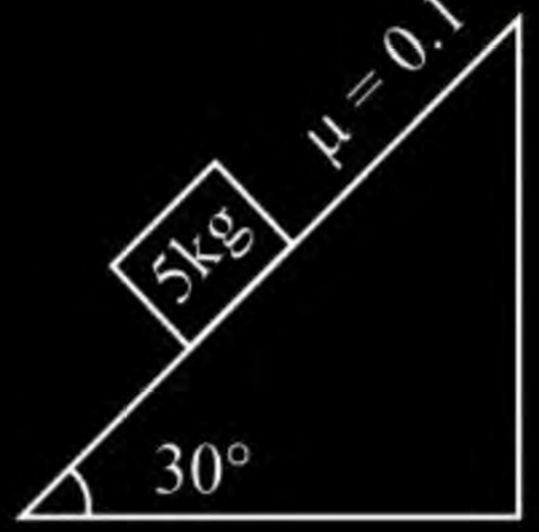
1. 6.5 kg
2. 4.5 kg
3. 2.25 kg
4. 9 kg

Ans : (2)

QUESTION

A block of mass 5 kg is placed on a rough inclined surface as shown in the figure. If $\vec{F}_1$ is the force required to just move the block up the inclined plane and $\vec{F}_2$ is the force required to just prevent the block from sliding down, then the value of $|\vec{F}_1| - |\vec{F}_2|$ is: [Use $g = 10\ m/s^2$].

[Jan. 31, 2024 (II)]



1. $25\sqrt{3}$N
2. $5\sqrt{3}$N
3. $\frac{5\sqrt{3}}{2}$N
4. 10 N

Ans : (2)

QUESTION

A block of mass m is placed on a surface having vertical cross section given by $y = x^2/4$. If coefficient of friction is 0.5, the maximum height above the ground at which block can be placed without slipping is:

[Jan. 30, 2024 (II)]

1. 1/4 m
2. 1/2 m
3. 1/6 m
4. 1/3 m

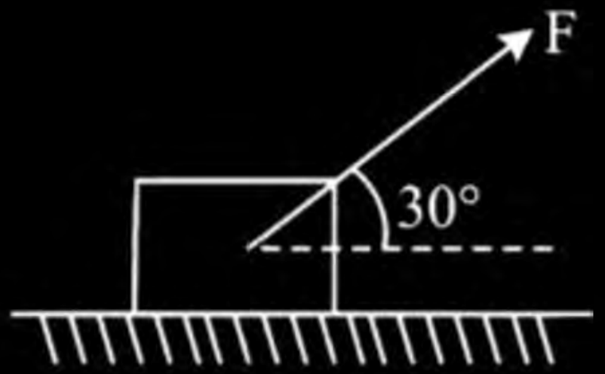
Ans : (1)

QUESTION

As shown in the figure a block of mass 10 kg lying on a horizontal surface is pulled by a force F acting at an angle 30°, with horizontal. For $\mu_s = 0.25$, the block will just start to move for the value of F: [Given $g = 10\ ms^{-2}$]

[Feb. 1, 2023 (I)]

1. 20 N
2. 33.3 N
3. 25.2 N
4. 35.7 N



Ans : (3)

QUESTION

A body of mass 10 kg is moving with an initial speed of 20 m/s. The body stops after 5 s due to friction between body and the floor. The value of the coefficient of friction is: (Take acceleration due to gravity $g = 10\ ms^{-2}$)

[Jan.29, 2023 (I)]

1. 0.2
2. 0.3
3. 0.5
4. 0.4

Ans : (4)

QUESTION

A block of mass m slides down the plane inclined at angle $30°$ with an acceleration $g/4$. The value of coefficient of kinetic friction will be:

[Jan. 29, 2023 (I)]

1. $\frac{2\sqrt{3}+1}{2}$
2. $\frac{1}{2\sqrt{3}}$
3. $\frac{\sqrt{3}}{2}$
4. $\frac{2\sqrt{3}-1}{2}$

Ans : (2)

QUESTION

The time taken by an object to slide down 45° rough inclined plane is n times as it takes to slide down a perfectly smooth 45° incline plane. The coefficient of kinetic friction between the object and the incline plane is _____. **[Jan. 29, 2023 (II)]**

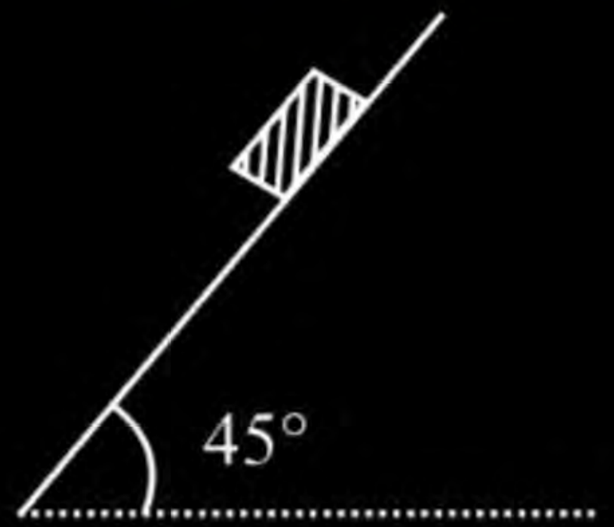
1. $\sqrt{\frac{1}{1-n^2}}$
2. $\sqrt{1-\frac{1}{n^2}}$
3. $1+\frac{1}{n^2}$
4. $1-\frac{1}{n^2}$

Ans : (4)

QUESTION

Consider a block kept on an inclined plane (inclined at 45°) as shown in the figure. If the force required to just push it up the incline is 2 times the force required to just prevent it from sliding down, the coefficient of friction between the block and inclined plane (μ) is equal to:

[Jan. 25, 2023 (II)]



1. 0.33
2. 0.60
3. 0.25
4. 0.50

Ans : (1)

QUESTION

A block of mass M slides down on a rough inclined plane with constant velocity. The angle made by the incline plane with horizontal is θ. The magnitude of the contact force will be:

[July 27, 2022 (II)]

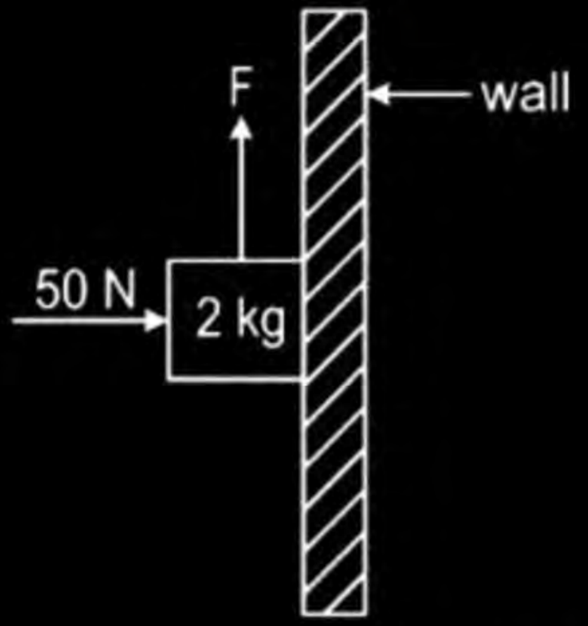
1. Mg
2. $Mg\cos\theta$
3. $\sqrt{Mg\sin\theta + Mg\cos\theta}$
4. $Mg\sin\theta\sqrt{1+\mu}$

Ans : (1)

QUESTION

A 2 kg block is pushed against a vertical wall by applying a horizontal force of 50 N. The coefficient of static friction between the block and the wall is 0.5. A force F is also applied on the block vertically upward (as shown in figure). The maximum value of F applied, so that the block does not move upward, will be: **[June 30, 2022 (I)]**

1. 10 N
2. 20 N
3. 25 N
4. 45 N



Ans : (4)

QUESTION

A block of mass 40 kg slides over a surface, when a mass of 4 kg is suspended through an inextensible massless string passing over frictionless pulley as shown below. The coefficient of kinetic friction between the surface and block is 0.02. The acceleration of block is _____.

(Given $g = 10\ ms^{-2}$)

[June 29, 2022 (II)]

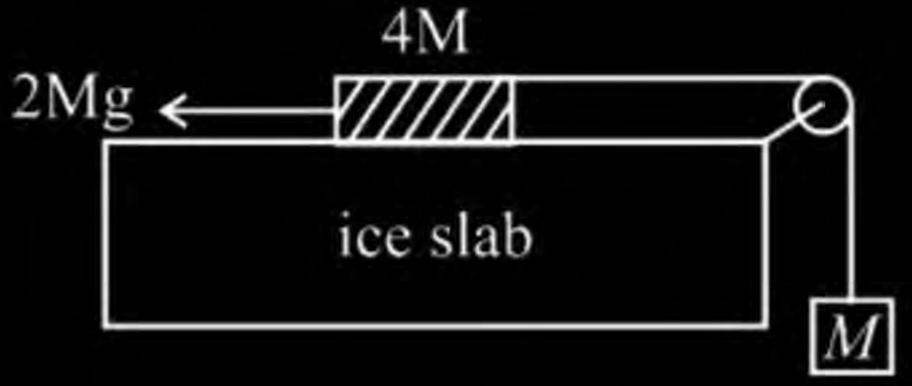
1. $1\ ms^{-2}$
2. $1/5\ ms^{-2}$
3. $4/5\ ms^{-2}$
4. $8/11\ ms^{-2}$

Ans : (4)

QUESTION

A hanging mass M is connected to a four times bigger mass by using a string-pulley arrangement. as shown in the figure. The bigger mass is placed on a horizontal ice-slab and being pulled by 2Mg force. In this situation tension in the string is $x/5$ mg for $x =$ _____. Neglect mass of the string and friction of the block (bigger mass) with ice slab. (Given g = acceleration due to gravity)

[June 28, 2022 (I)]



Ans : (6)

QUESTION

A body of mass 1 kg rests on a horizontal floor with which it has a coefficient of static friction $\frac{1}{\sqrt{3}}$. It is desired to make the body move by applying the minimum possible force F N. The value of F will be.
(Round off to the Nearest Integer)
[Take $g = 10\ ms^{-2}$].

[March 17, 2021 (II)]

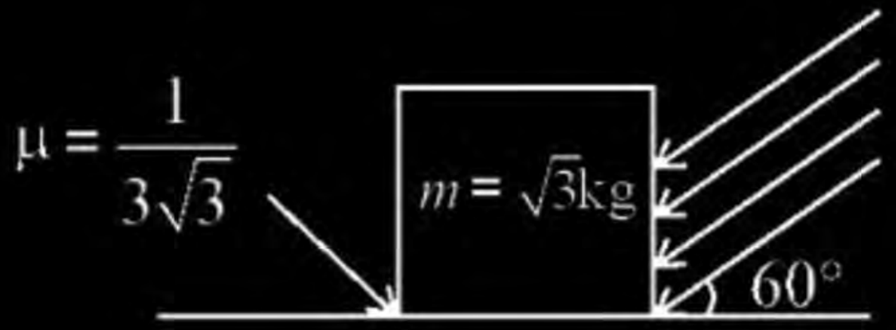
Ans : (5)

QUESTION

As shown in the figure, a block of mass $\sqrt{3}$ kg is kept on a horizontal rough surface of coefficient of friction $\frac{1}{\sqrt{x}}\left(\frac{\alpha^2-1}{\alpha^2}\right)$. The critical force to be applied on the vertical surface as shown at an angle 60° with horizontal such that it does not move, will be $3x$. The value of x will be:

$[g = 10\ \text{m/s}^2; \sin 60° = \frac{\sqrt{3}}{2}; \cos 60° = \frac{1}{2}]$

[Feb. 26, 2021 (I)]



Ans : (3.33)

QUESTION

An inclined plane is bent in such a way that the vertical cross-section is given by $y = \frac{x^2}{4}$ where y is in vertical and x in horizontal direction. If the upper surface of this curved plane is rough with coefficient of friction $\mu = 0.5$, the maximum height in cm at which a stationary block will not slip downward is _____ cm. **[Feb. 24, 2021 (I), 2003]**

Ans : (25)

QUESTION

The coefficient of static friction between a wooden block of mass 0.5 kg and a vertical rough wall is 0.2. The magnitude of horizontal force that should be applied on the block to keep it adhere to the wall will be _____ N. $[g = 10\ ms^{-2}]$

[Feb. 24, 2021 (I)]

Ans : (25)

Home work

- Qus are attached.
- JmPYQ qus sheet (homework 25 qus only)
  - 3, 6, 4, 23, 47, 48, 52, 54, 55, 56, 57
    58, 59, 60, 61, 63, 64, 65, 68, 70, 71,
    75, 85, 93, 109, 111,

(Join telegram)

THANK YOU