PHYSICS

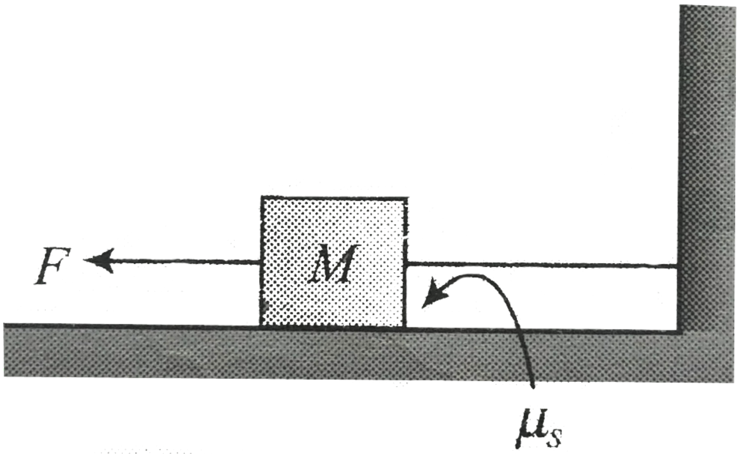
BOOKS - CENGAGE PHYSICS (HINGLISH)

NEWTON'S LAWS OF MOTION 2

Illustration

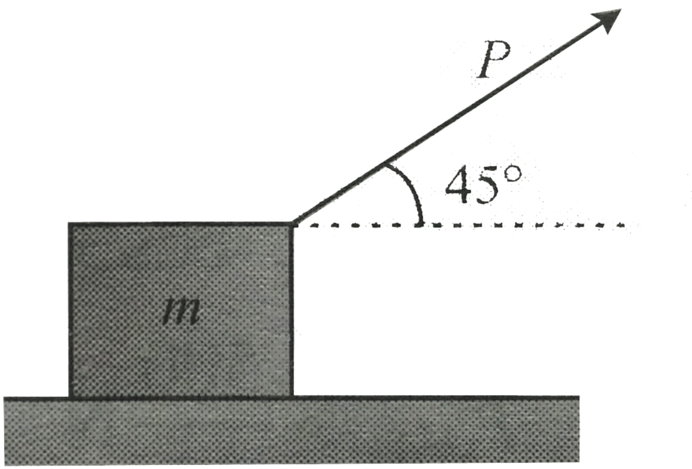
1. A block of weight $100N$ lying on a horizontal surface just beging to when a horizontal to move when a horinzontal force of $25N$ acts on it Determine the coeffcent of static friction

2. In Fig force F is gradually increased from zero Draw the graph between applied force F and tension T is the string . The coefficient of string friction between the block and the ground is μ_s



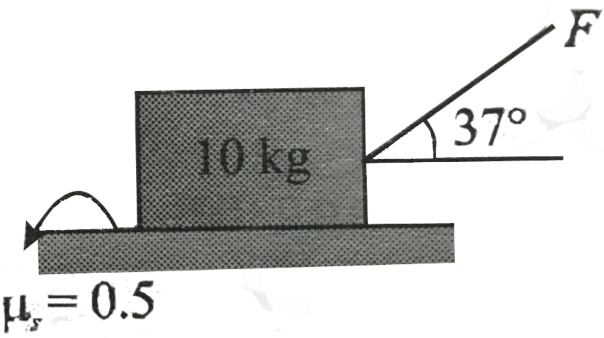
Watch Video Solution

3. Find the least pulling force which acting at an angle of 45° with the horizontal will slide a body weighing $5kg$ along a rough horizontal surface . The coefficient of friction $\mu_s = \mu_k = 1/3$ If a force of doude this is applied along the same direction , find the resulting acceleration of the block



Watch Video Solution

4. Force F is graduallly increased from zero .Determine whether the block will first slide or lift up?



A. Slide

B. Lift

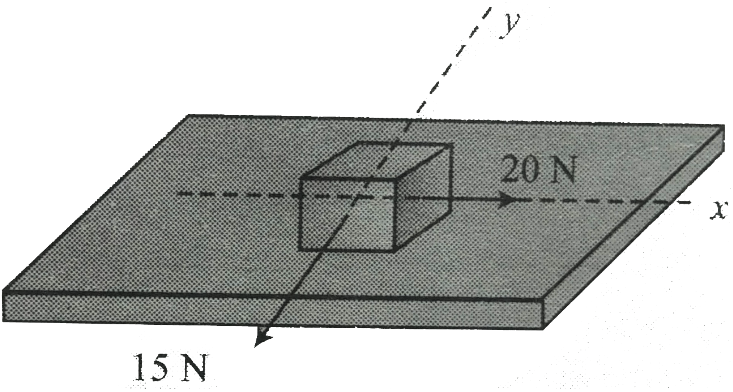
C. Cannot be determined

D. None of the above

Answer: A

Watch Video Solution

5. In Figure an object of mass $M = 10kg$ is kept on a rough table as seen from above forces are appling on it as shown . Find the direction of static friction if the object does not move $(Take \mu = 0.4)$

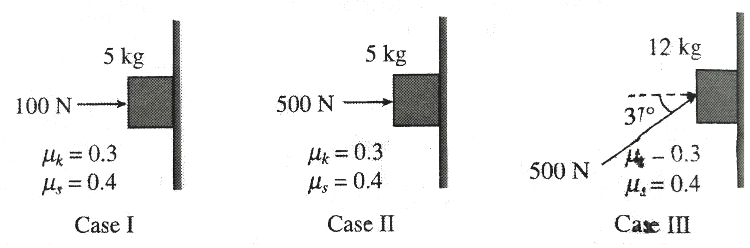


Watch Video Solution

6. A block of mass 2 kg is pushed against a rough vertical wall with a force os 40 N. Coefficient of static friction being 0.5. Another horizontal force is 15 N, is applied on the block in a direction paralle to the wall. Will the block move? If yes in which direction? If no, find the frictional force exerted by the wall on the block.

Watch Video Solution

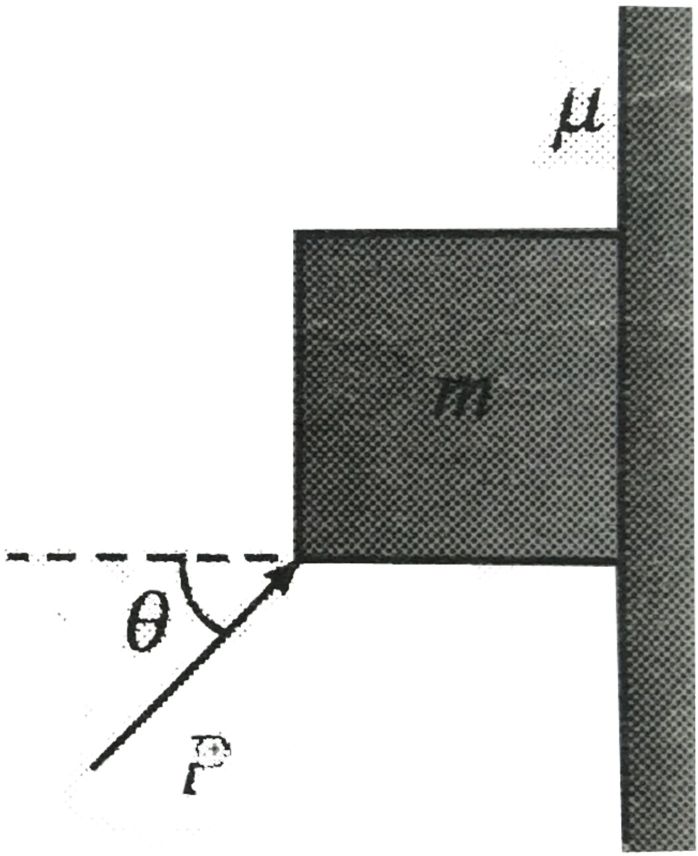
7. Determine the magnitude of frictional force and acceleration of the block in each of the following cases :



Watch Video Solution

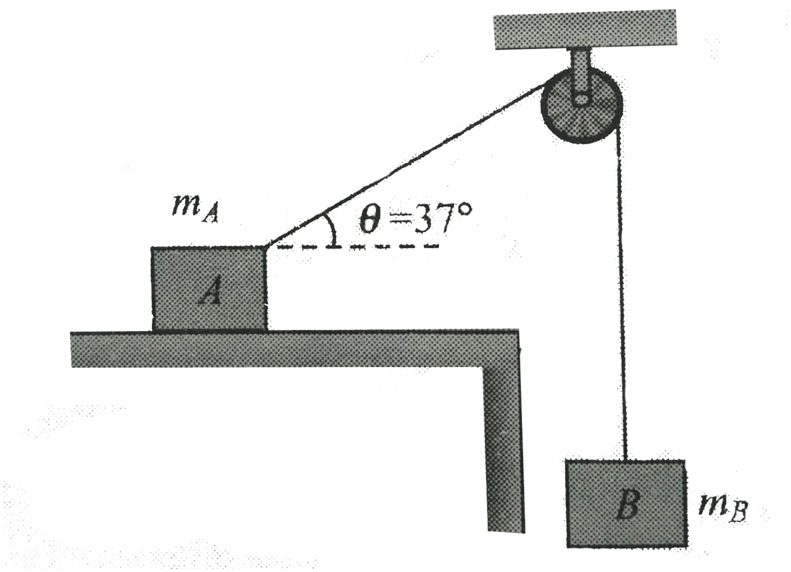
8. A block of mass m is supported on a rough wall by applying a force in figure Coefficient of static friction between block and wall is μ

For what range of value of p , the block remain in static equilibrium ?



Watch Video Solution

9. Two blocks A and B are connected by a light inextensible string passing over a fixed smooth pulley as shown in figure The coefficient of friction between the block A and B the horizontal table is $\mu = 0.5$. If the block A is just , find ratio of the masses of the blocks



A. $\frac{12}{5}$

B. $\frac{11}{5}$

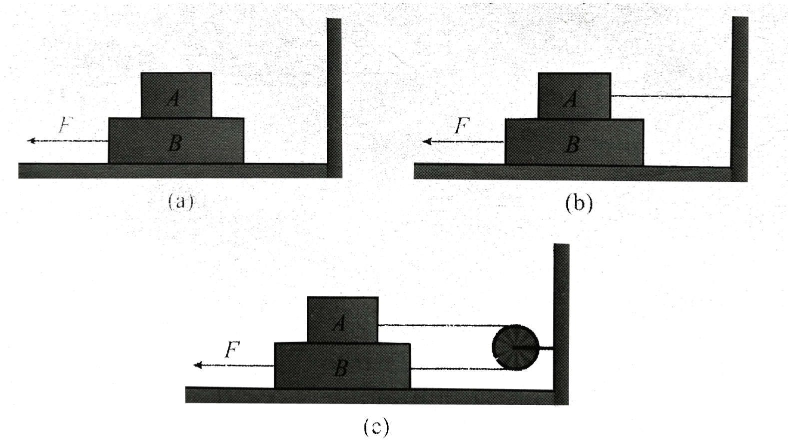
C. $\frac{13}{5}$

D. $\frac{17}{5}$

Answer: B

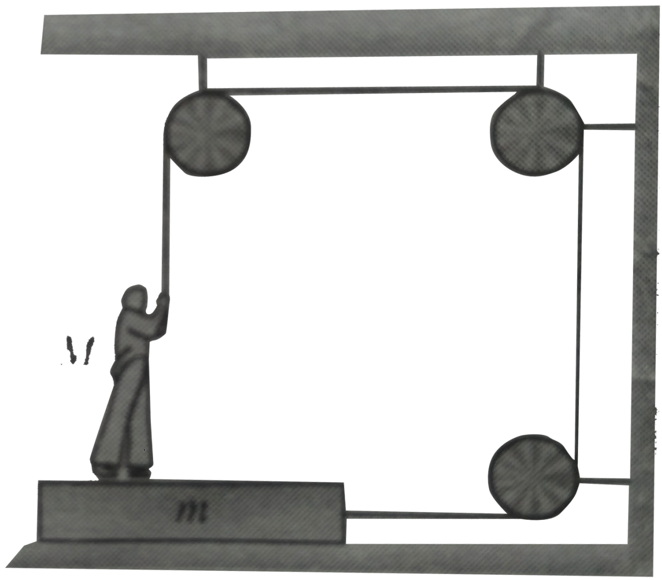
Watch Video Solution

10. Block A weighs $4N$ and block weigh $8N$ The coefficient of kinetic friction is 0.25 for all surface find the force F to slide B at a constant speed when (a)A rest on B and moves with it (b) A is held at rest and (c)A and B are connected by a light cord passing over a smooth putting as shown in fig 7.31 (a - c) restively.



Watch Video Solution

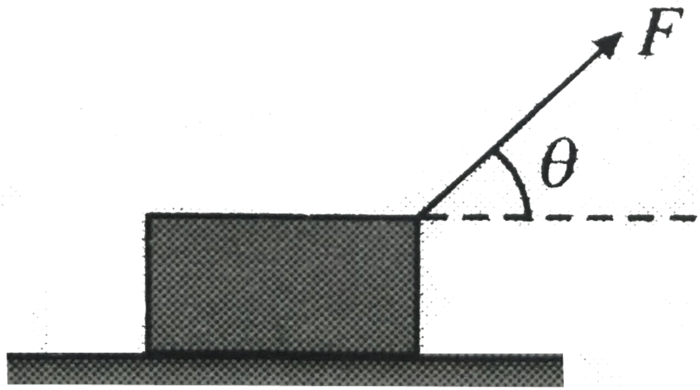
11. The friction coefficient between the board and the floor shown in figure is μ Find the maximum force that the man can exert on the rope so that the board does not slip on the floor



Watch Video Solution

12. A block of mass m lying on a horizontal surface (coefficient of static friction $= \mu_s$) is to be brought into motion by a pulling force F At what angle θ with the horizontal should the force F be applied so that its

magnitude is minimum ? Also find the minimum magnitude



Watch Video Solution

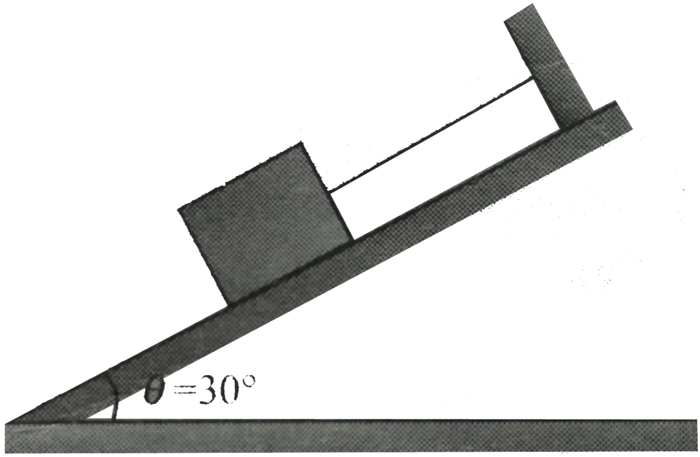
13. A block of mass M is kept on as rough horizontal surface. The coefficient of static friction between the block and the surface is μ. The block is to be pulled by applying a force to it. What minimum force is needed to slide the block? In which direction should this force act?

Watch Video Solution

14. A block lying on an inclined plane has a weigh of $50N$ .It just beings to side down when inclination of plane with the horizontal is 30° find the coefficient of static plane friction .

Watch Video Solution

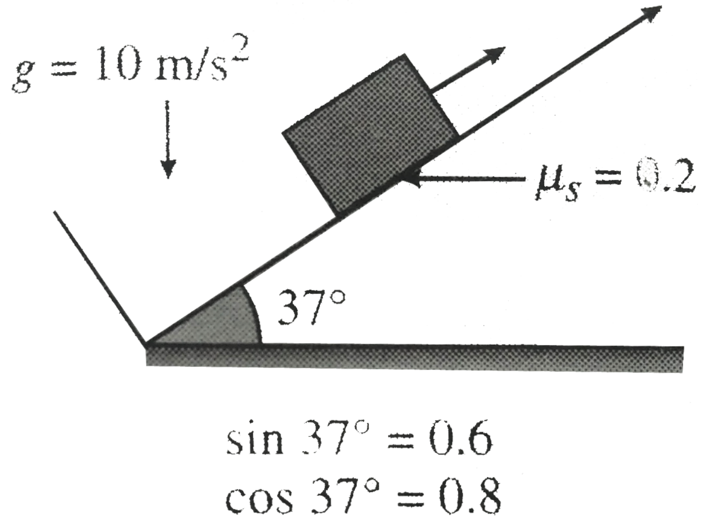
15. A block of mass $1kg$ is placed on a rough inclined plane at angle $\theta = 45^{\circ}$ will horizontal . The block is connected with a straight as straight as shown in figure if $\mu = 3/4$ find the tension in string



Watch Video Solution

16. An object of mass $10kg$ is to be kept at rest on an inclined plane making an angke of 37° to the horizontal by appling a force F along the plane upwards as shown in figure . The coefficent of static fiction between the object and the plane is 0.2 Find the magnitude of force F

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



Watch Video Solution

17. A $5 - kg$ block sides down a plane inclined at 30° to the horizontal. Find

(a) The acceleration of the block if the plase is frictionless

b. The acceleration if the coefficient of kinetic friction is

$1/2\sqrt{3}$

Watch Video Solution

18. A $5kg$ block is projected upwards with an initial speed of $10ms^{-1}$ from the bottom of a plane inclined at 30° with horizontal . The coefficient of kinetic friction between the block and the plane is 0.2

a. How far does the block move up the plane ?

b. How long does it move up the plate ?

c. After time from its projection does the block again come to the bottom ? What speed does it arrive?

Watch Video Solution

Watch Video Solution

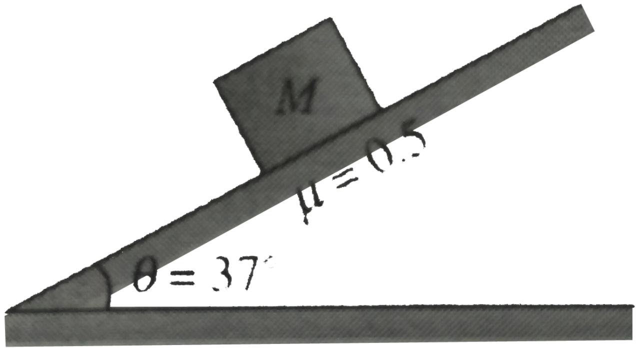
19. A block of mass $M = 10kg$ is placed inclined plane , inclined at angle $\theta = 37^\circ$ with horizontal The coefficient of friction between the block and inclined is $\mu = 0.5$

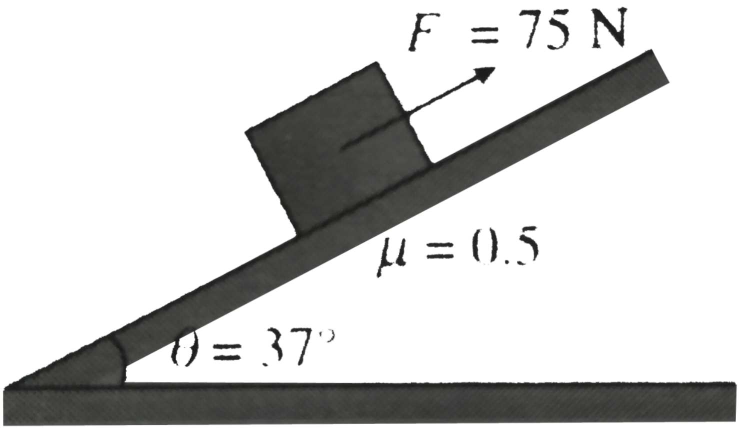
a. Calculate the acceleration of the block when it is released

b. Now a force $F = 75N$ is appling on block as shown find out the acceleration of the block If the block is initially at rest .

c. In case (b), how much force should be added to $75N$ force so that block the starts to move up the incline.

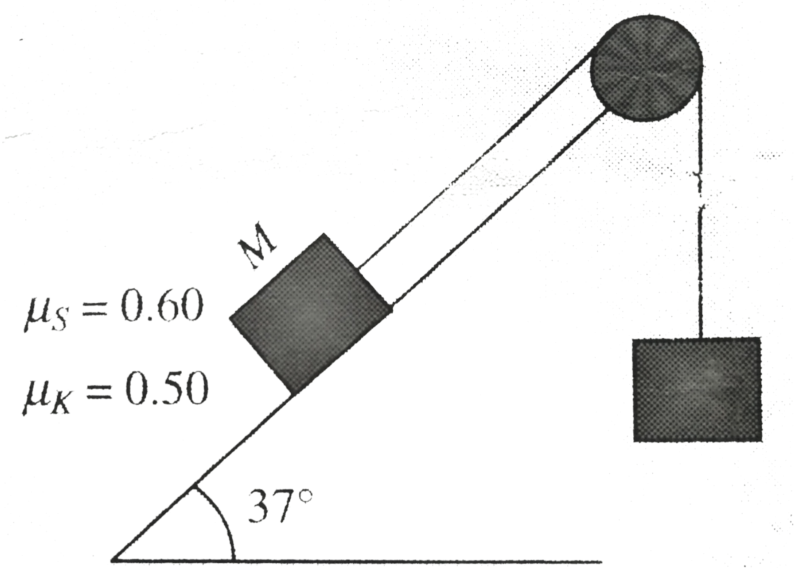
d. In case (b), what is the minimum force by which $75N$ force should be replaced with so that the block does not move?





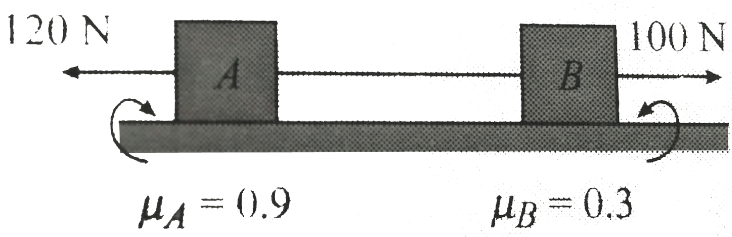
Watch Video Solution

20. Two block M and and m are arranged as shows in figure . If $M = 50kg$ then determine the minimum and maximum value of mass of block the heavy block M stationary



Watch Video Solution

21. Two block A and B of mass $m_A = 10kg$ and $m_A = 20kg$ are place on rough horizontal surface . The blocks are connected with a string. If the coefficient of fraction between block A and ground is $\mu_A = 0.9$ and between block B and ground is $\mu_B = 0.3$ and the tension in the string in situation as shown in fig force $120N$and $100N$ start acting when the system is at rest?



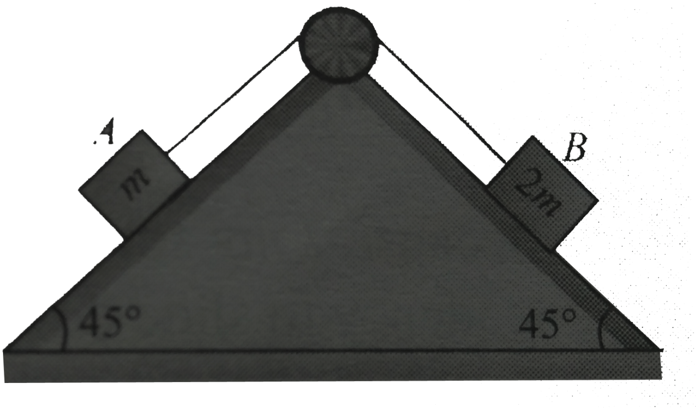
Watch Video Solution

22. Block A of mass m and block B of mass $2m$ are placed on a fixed triangular wedge by means of a light and inextensible string and a frictionless pulley as shown in fig . The wedge is inclined at 45° to the horizontal on both sides . The coefficient of friction between the block $A$and the wedge is $2/3$ and that between the block B and the wedge is $1/3$ .If the system of A and B is released from rest then find .

a. the acceleration of A

b. tension in the string

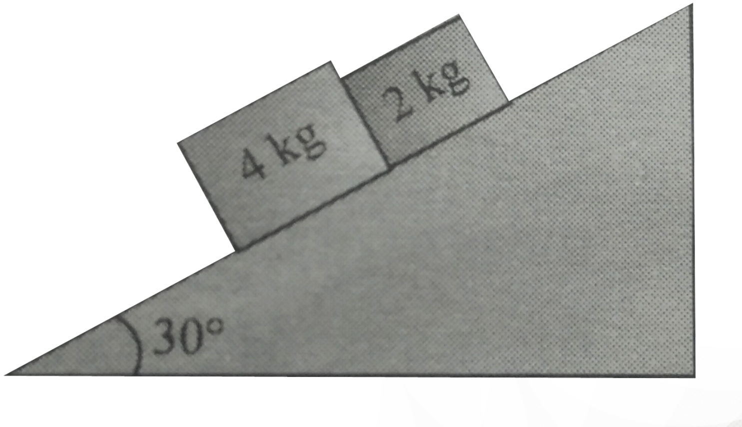
c.the magnitude and direction of the frictional force acting on A



Watch Video Solution

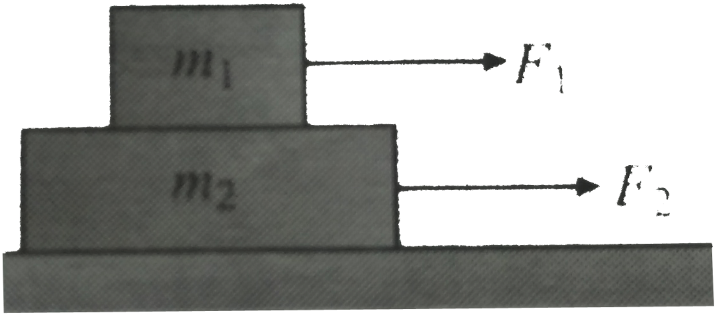
23. Figure shown two blocks in contact sliding down an inclined surface of inclination 30°. The block of mass $2kg$and the incline is $\mu_1 = 0.20$ and the incline is $\mu_2 = 0.30$ .Find the acceleration of $2.0kg$ block (in

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



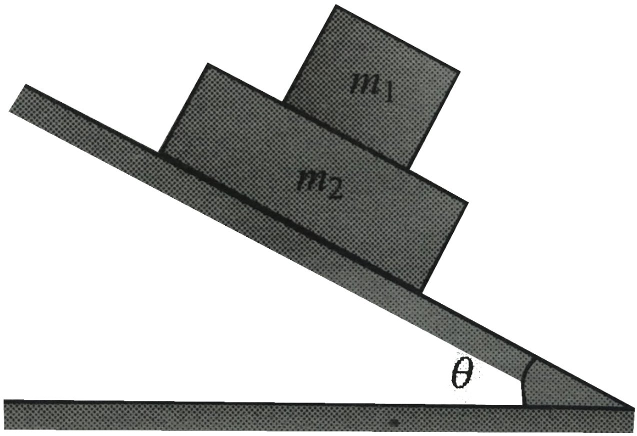
Watch Video Solution

24. Two blocks m_1 and m_2 are acted upon by the forces F_1 and F_2 as shown in figure . If no relative sliding between is smooth , find the static friction between the blocks. Make necessary assumptions and discuss different cases.



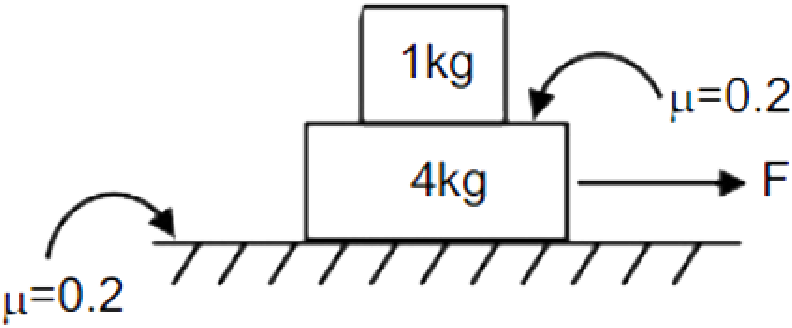
Watch Video Solution

25. In fig Block m_2 is loaded on block m_1 . If there is no relative sliding between the block and the inclined plane is smooth , find the friction force between the block



Watch Video Solution

26. There are two block as shown in the figure of masses $1kg$ and $4kg$. Friction coefficient between any two surfaces are 0.2 then find maximum value of horizontal force F so that both blocks moves together.

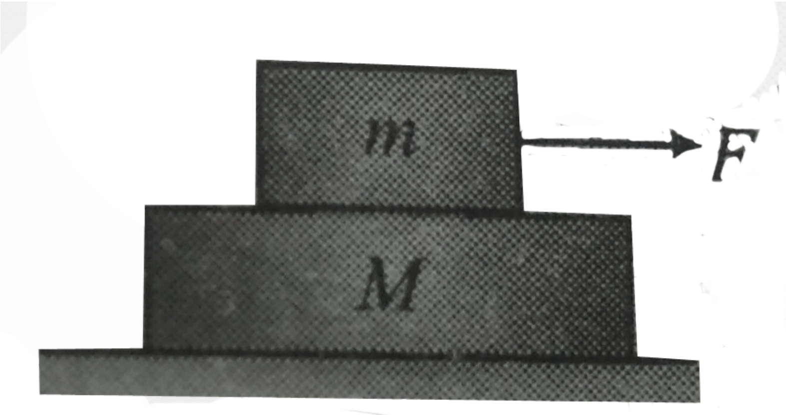


Watch Video Solution

27. Let as consider the next case in the previous illustration when there is no friction between ground and M . The coefficient of static and kinetic friction are μ_2 and μ_1, respectively, and force F acts upper block as shown in figure

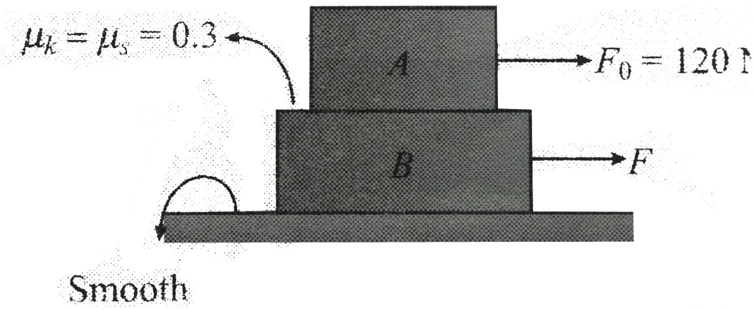
a. What is the maximum possible value of F so that the system moves together ?

b . If there is releative sliding between M and m then calculate acceleration of M and m



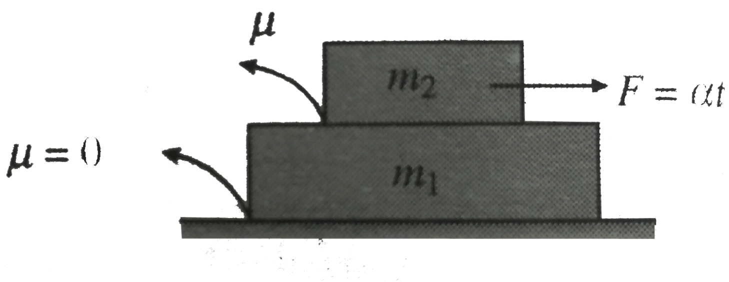
Watch Video Solution

28. Two blocks A and B of mass $10kg$ and $20kg$ respectivelly, are arranged as shown in figure In the figure given a constant force $F_0 = 120N$act on block A and a force zero discoss the direction and nature of friction force and the acceleations of the block for different value of F



Watch Video Solution

29. In the Fig force $F = \alpha t$ is applied on the block of mass m_2. Here α is a constant and t is the time .Find the acceleration of the block Also draw the acceleration time graph of both the block



Watch Video Solution

30. The masses of the blocks A, B and C shown in fig (a) are $4kg$, $2kg$ and $2kg$ respectively Block A moves with an acceleration of $2.5ms^{-2}$

a. Block C is removed from its in position and placed on block A (b). What is now the acceleration of block C ?

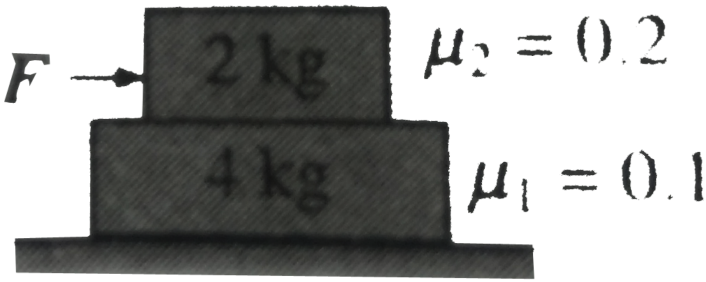
b. The position of the block A and B subsequently interchanged find the new acceleration of C .The coefficient of friction in the same for all the conect surface

Watch Video Solution

31. In the situation shown in fig

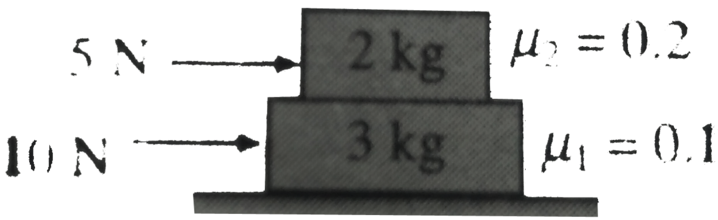
a. What minimum force F will make any part or whole system move?

b. Find the acceleration of two blocks and value of friction at the two surface if $F = 6N$



Watch Video Solution

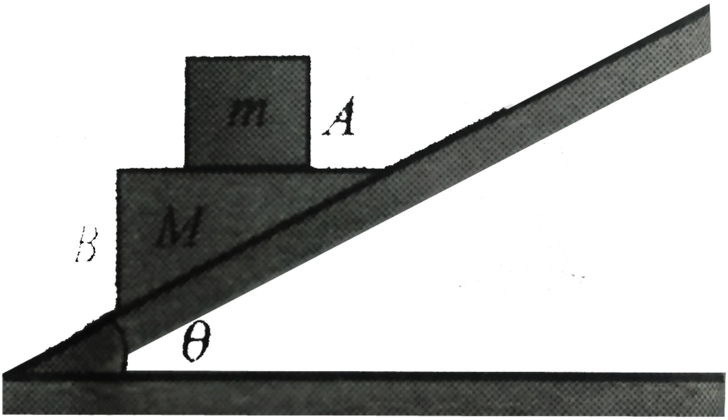
32. (a) Find the acceleration of the two block shown in figuer (b) Find the friction force between alll contant surface



Watch Video Solution

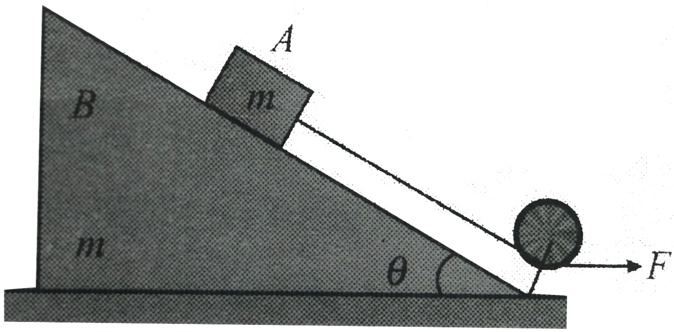
33. The coefficient of friction between the block A of mass m and the triangular wedge B of mass M is μ.

There in no friction between the wedge and the plane if the system (block $A +$ wedge B) is released so that there is no stiding between A and B find the inclination θ



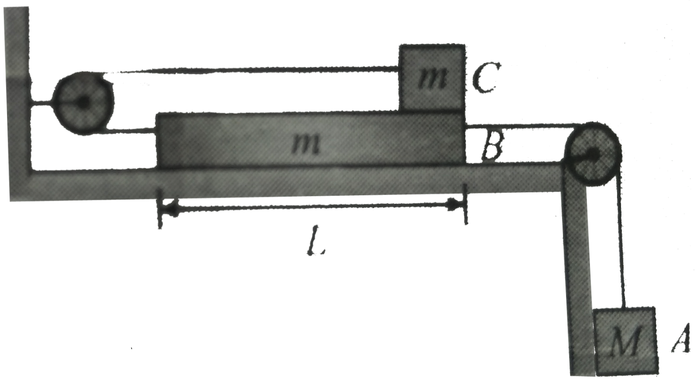
Watch Video Solution

34. A block A of mass$m$ which is placed a rough inclined face of a wedge of same mass being pulled through light string and with force F as shown in figure The coefficient of friction between inclined face and block A is μ while there is no friction between the ground and wedge it the whole system moves with same acceleration then find the value of F



Watch Video Solution

35. Given the setup shown in Fig Block A, B and C have masses $m_A = M$ and $m_B = m_C = m$. The strings are assumed maseless and unstreichable, and the pulleys frictionless .There is no friction between block B and the support table, but there is friction between blocks B and C, denoted by a given coefficient μ



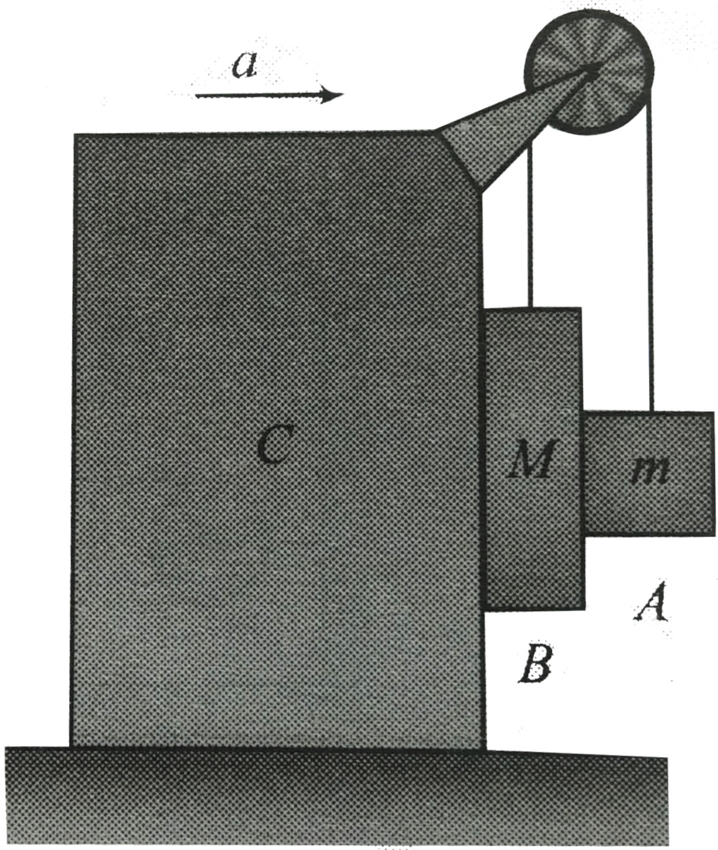
a . In terms the given find (i) the acceleration of block A and B

b. Suppose the system is released from rest with block C near the right end of block B as shown in the above figure. If the the length L of block B is given, what is the speed of block C as it reached the left end of block B ? Tear the size of C as small

c. If the mass of block A is less then some critical value, the blocks will not accelerate when released from rest. Write down as expression for that critical mass.

Watch Video Solution

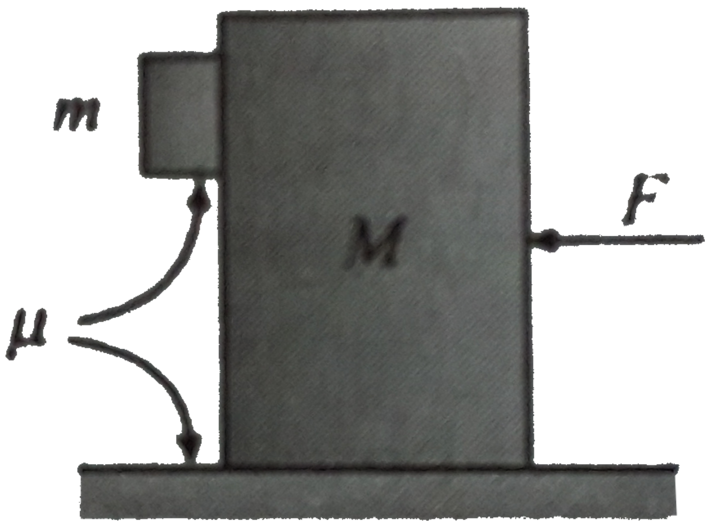
36. The pulley of the system shown in Fig is massless and frictionless and thread and thread is inextensible Then horizontal surface over which block C is smooth while for all the remaining surface is μ



Calculate minimum acceleration a with which the system should be moved to the right so that suspented block A(mass m) and B (mass M and $M > m$)can remain stationary relative to C

Watch Video Solution

37. In Fig the co - efficient of friction between the walls of block of mass m and the plank of mass M is μ The same co- efficient of friction is there between the plank and the horizontal floor The force F is of $100N$ and the masses m and M are of $1kg$ and $3kg$ respectively Find the value of μ.If the block does not slip along the wall of the plank

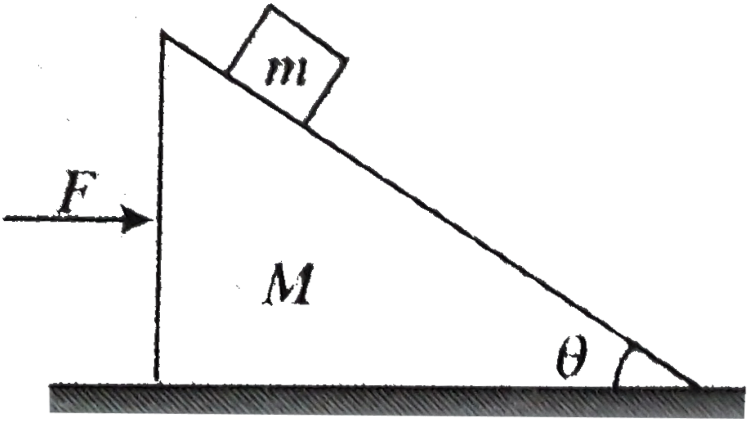


Watch Video Solution

38. The block of mass M and are arrenged as the situation in fig is shown.The coefficient of friction between two block is $\mu$and that between the bigger block and the ground is μ find the acceleration of the block

Watch Video Solution

39. A bar of mass m is placed on a triangular block of mass M as shown in figure The friction coefficient between the two surface is μ and ground is smooth find the minimum and maximum horizontal force F required to be applied on block so that the bar will not slip on the inclined surface of block



Watch Video Solution

40. A block of mass $1kg$ is tied to a string of length $1m$ the other end of which is fixed The block is moved on a smooth horizontal table with constant speed $10ms^{-1}$. Find the tension in the string

Watch Video Solution

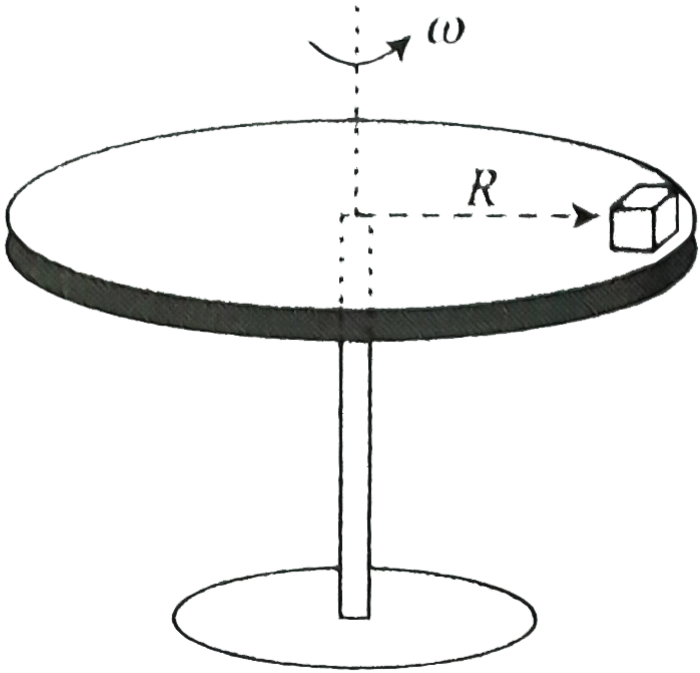
41. The ball of mas m moves with speed v againest a smooth , fixed vertical circular groove of radius R kept on smooth horizontal surface find the

a. normal reaction of the floor or the ball.

b. normal reaction of the vertical wall on the ball.

Watch Video Solution

42. A block of mass m is kept on the edge of a horizontal turn table of radius R which is rotating with constant angular verticle ω (along with the block) about its axis . If coefficient of friction is μ, find the friction force between block and table.



Watch Video Solution

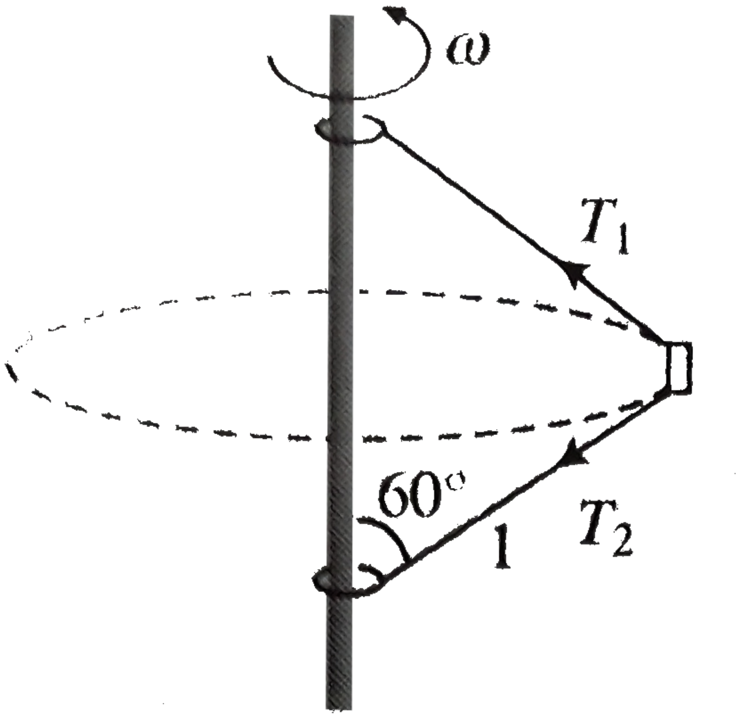
43. A car of mass m moving over a convex bridge of radius r .Find the normal reaction acting on car when it is at bighest point the bridge.

Watch Video Solution

44. A car of mass m moving over a concave bridge of radius r .Find the normal reaction acting on car when it is at lowest point the bridge

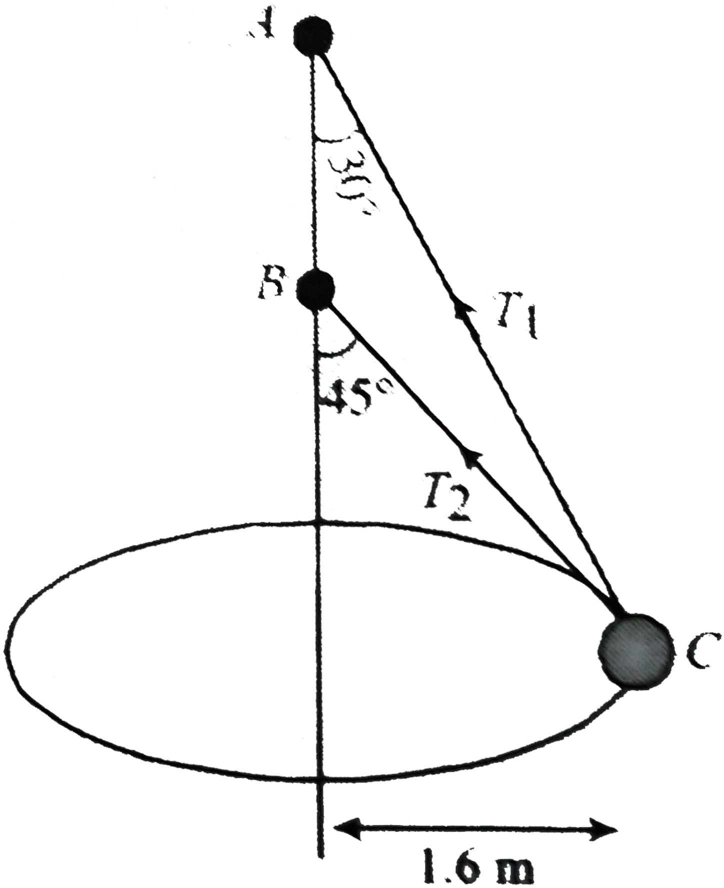
Watch Video Solution

45. A small block is connected to one of two identical massless strings of lengtth $16\frac{2}{3}cm$ each with their ends fixed to a verticle rod If the ratio of tensions T_1/T_2 is 4 : 1 ,then what will be the angular velocity of the block ? Take $g = 9.8 m s^{-2}$



Watch Video Solution

46. Two wires AC and BC are tied at C of small sphere of mass $5 kg$ which revolves at a constant speed v in the horizontal circle of radius $1.6 m$ Find the maximum value of v



Watch Video Solution

47. A turn has a radius of $10m$ if a vehicle goes round it at an average speed of $18km/h$, what should be the proper angle of banking?

A. $\theta = \tan^{-1}\left(\frac{1}{2}\right)$

B. $\theta = \tan^{-1}\left(\frac{1}{3}\right)$

C. $\theta = \tan^{-1}\left(\frac{1}{4}\right)$

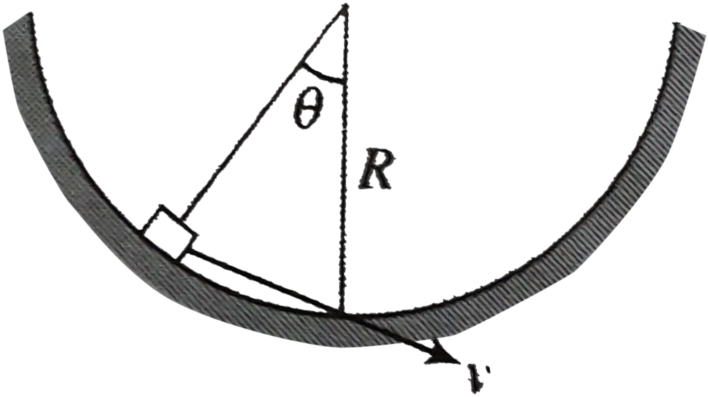
D. $\theta = \tan^{-1}\left(\frac{3}{4}\right)$

Watch Video Solution

48. A turn of radius 20 m is banked for the vehicles going at a speed of 36km/h. If the coefficient of static friction between the road and the tyre is 0.4, what are the possible speeds of a vehicle so that it neither slips down nor skids up?

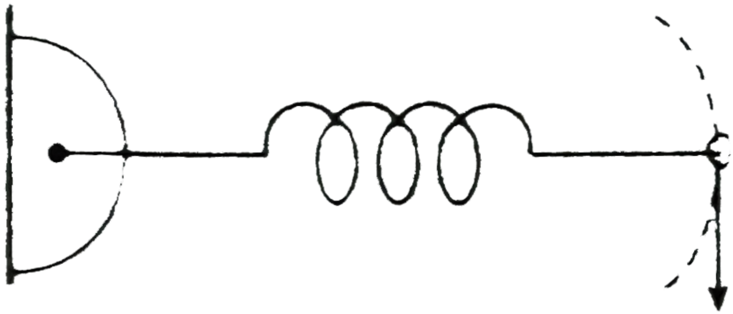
Watch Video Solution

49. A coin is pushed down tangentially from an angular position θ on a cylindrical surface , with a velocity v as shown in figure If the coefficient of friction the coin and surface is μ find the tangential acceleration of the coin



Watch Video Solution

50. A particle of mass m is moving with a constant speed v in a circular path in a smooth horizontal plate (plan of the paper) by a spring force as shown in figure If the natural length of the spring is l_0 and stiffeness of the spring is k find the elongation of the spring



Watch Video Solution

51. A hemispherical bowl of radius R si set rotating abouv its axis of symmetry whichis kept vertical. A small blcok kept in the bowl rotates with the bowl without slippingn on its surface. If the surfaces of the bowl is mooth, and the abgel made by the radius through the block with the vertical is θ, find the angular speed at which the bowl is rotating.

Watch Video Solution

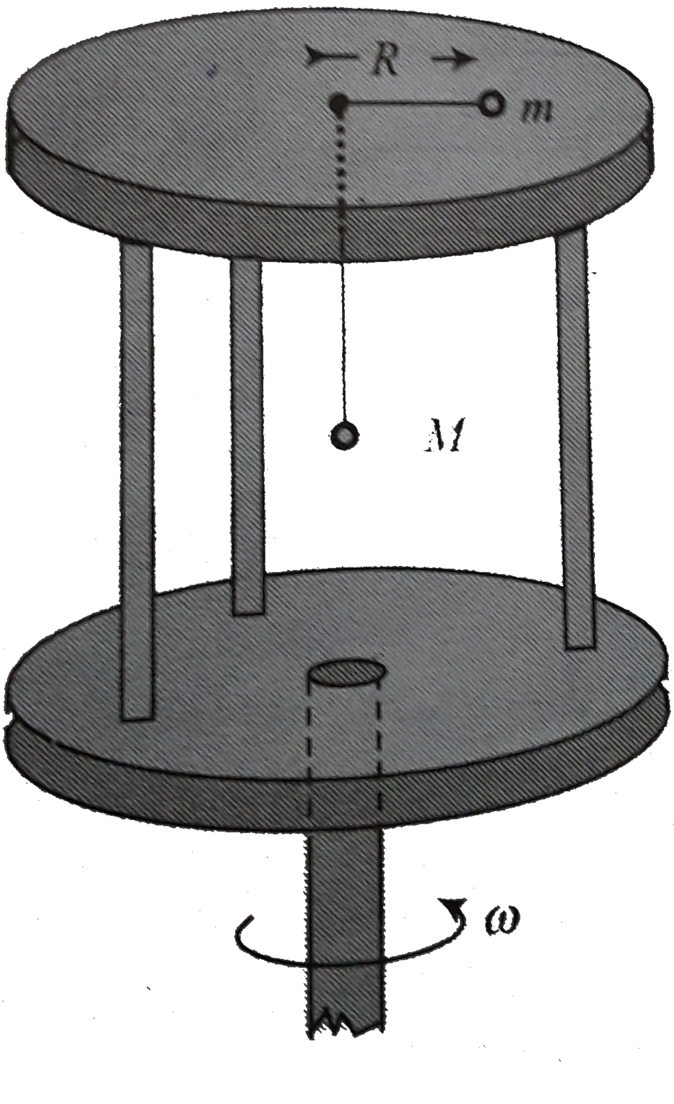
52. A block of mass m is kept on rough horizontal turn table at a distance r from the center of table. The coefficient of friction between torn table and block is μ Now the turn - table starts rotating with uniform angular acceleration a

a. Find the time after which slipping accure between block and turn - table

b. Find the angle made by friction force at the point of slipping

Watch Video Solution

53. A particle of mass m connected with a hanging bob of mass M by an inextensible string is stationary relative to the rotating platform . The coefficient of static friction between the particle and platform is μ



Find the

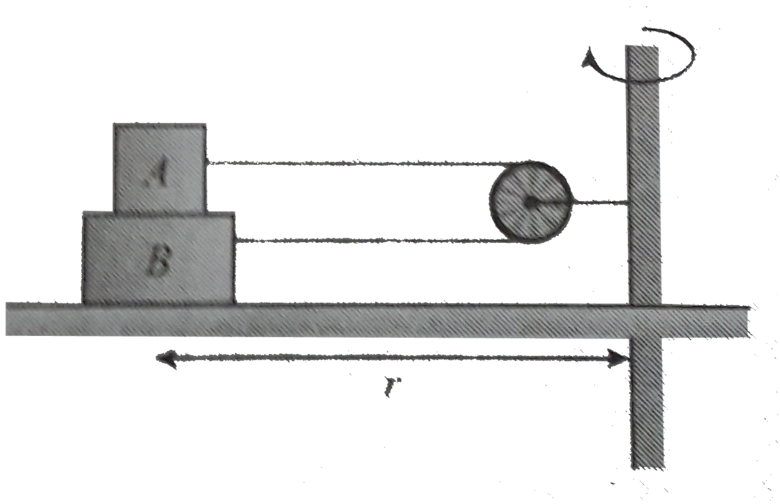
a. maximum angular speed ω_1

b. maximum angular speed ω_2

$(f \text{ or } M > \mu m)$

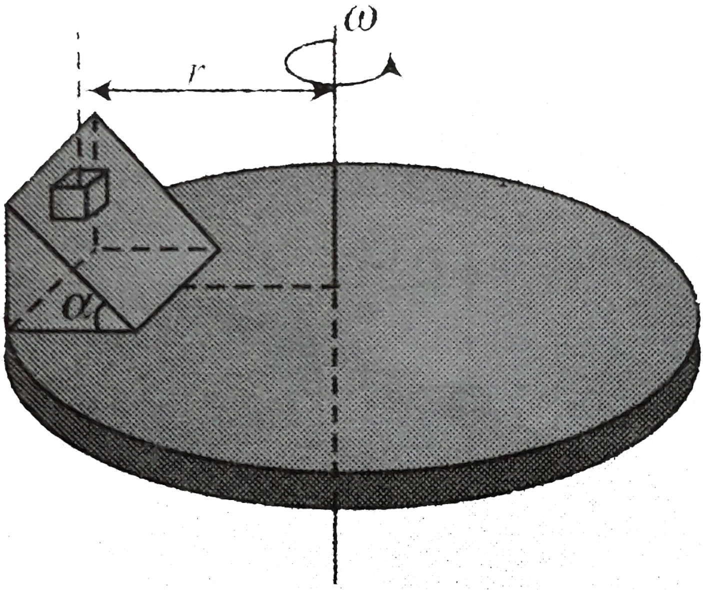
Watch Video Solution

54. In fig two block of mass m_A and m_B are rotating at radius r kept on a rough table consider friction (μ) between all the contact surface pulley is frictionless determine the angular speed of the turn table for which the blocks just begin to slide



Watch Video Solution

55. An inclined plane of angule a is fixed onto a horizontal turntable with its line of greater slope in same plane as a diameter of forntable .A small block is placed on the inclined plane a distance r from the axis the coefficient of fraction between the block and the inclined plane is μ The turntable along with incline plane spins about its axis with constant minimum angular velocity ω



a. Find an capression for the minimum angular velocity ω to prevent the block from sliding down the plane in term of g, r, μ and the plane ω

b. Now a block of mass but having coefficient friction (with inclined plane)2μ is kept instead of the original block . find the radius of friction force acting between block and incline now to the friction force active in part (a)

Watch Video Solution

56. A motorcycle has to move with a constant speed on an overbridge which is in the form of a circular arc of radius R and has a total length L. Suppose the motorcycle starts from the highest point.

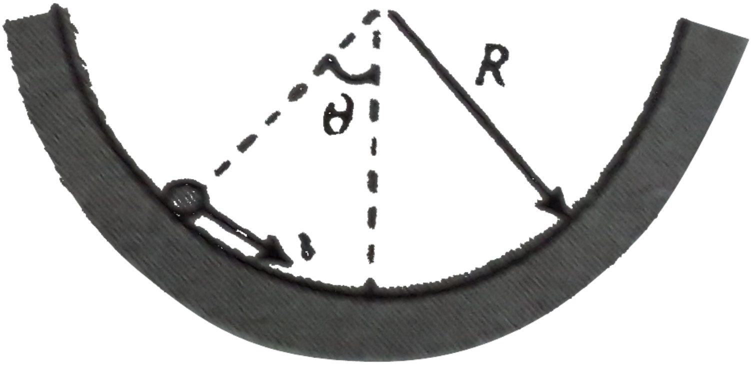
a. what can its maximum velocity be for which the contact with the road is not broken at the highest point?

b. If the motorcycle goes at speed $\frac{1}{\sqrt{2}}$ times the maximum found in part a. where will it lose the contact with the road?

c. What maximum uniform speed can it maintain on the bridge if it does not lose contact anywhere on the bridge?

Watch Video Solution

57. A coin is pushed down tangentially from position θ on a cylindrical surface with a velocity v as shown in Fig. If the coefficient of friction between the coin and surface is μ find the tangential acceleration of the coin

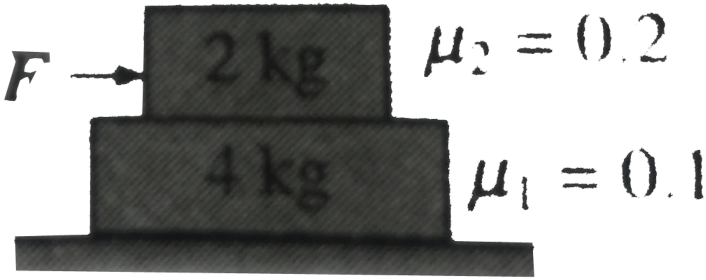


Watch Video Solution

58. In the situation shown in fig

a. What minimum force F will make any part or whole system move?

b. Find the acceleration of two blocks and value of friction at the two surface if $F = 6N$



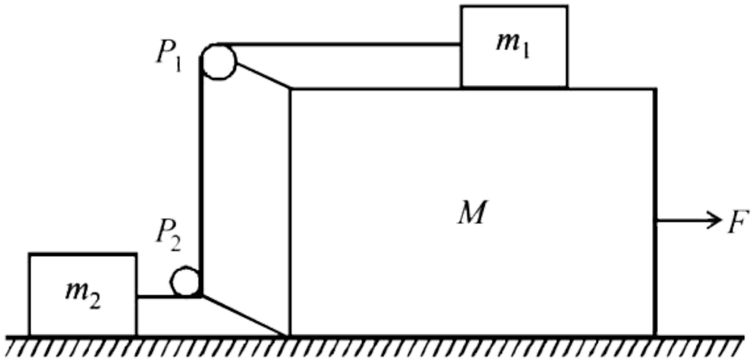
Watch Video Solution

59. A block of mass $1kg$ is tied to a string of length $1m$ the other end of which is fixed The block is moved on a smooth horizontal table with constant speed $10ms^{-1}$. Find the tension in the string

Watch Video Solution

Solved Examples

1. In the figure masses m_1, m_2 and M are 20 kg, 5kg and 50kg respectively. The coefficient of friction between M and ground is zero. The coefficient of friction between m_1 and M and that between m_2 and ground is 0.3. The pulleys and the strings are massless. The string is perfectly horizontal between P_1 and m_1 and also between P_2 and m_2. The string is perfectly vertical between P_1 and P_2. An external horizontal force F is applied to the mass M. Take $g = 10m/s^2$.



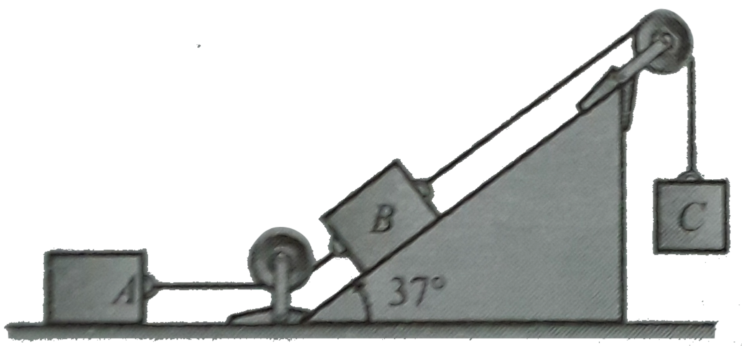
(a) Draw a free body diagram for mass M, clearly showing all the forces.

(b) Let the magnitude of the force of friction between m_1 and M be f_1 and that between m_2 and ground be f_2. For a particular F it is found that $f_1 = 2f_2$. Find f_1 and f_2. Write equations of motion of all the masses.

Find F, tension in the spring and acceleration of masses.

Watch Video Solution

2. Blocks A, B and C are placed as shown in Fig and connected by the rops of negligible mass . Both A and B weigh $25.0N$ each , and the coefficient of kinetic friction between each and the surface is 0.35 blocks C descends with constant velocity .



a. Draw two separate free- body diagrams showing the forces acting on A and B

b. Find the tension in the rope connecting blocks A and B

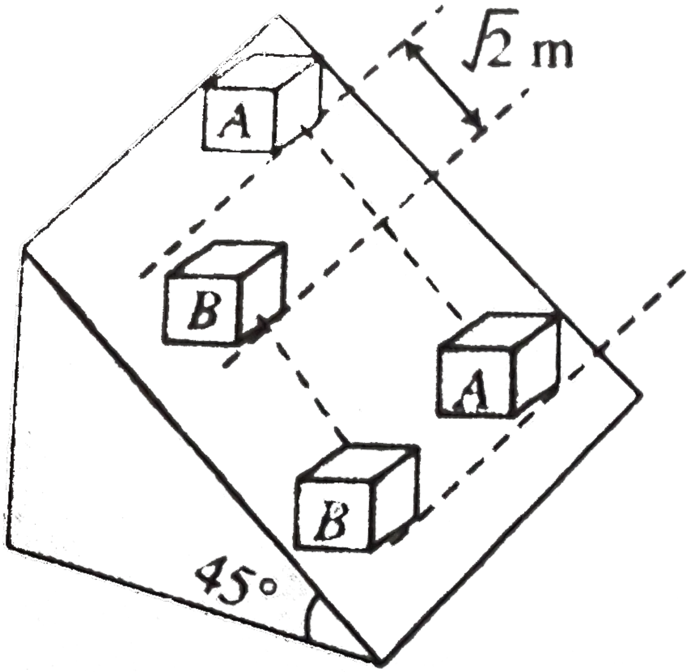
c. What is the weight of blocks C?

d. If the rope connecting A and B were cut, what would be the acceleration of C?

Watch Video Solution

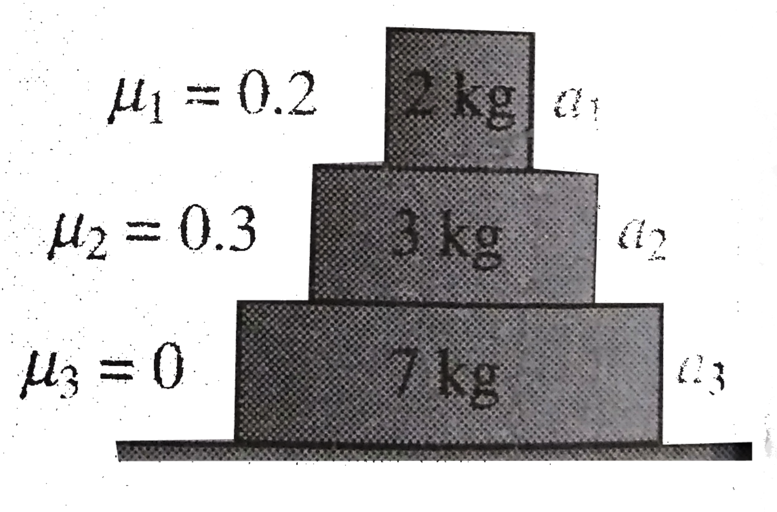
3. Two blocks A and B of equal masses are placed on rough inclined plane as shown in Fig. When and where will the two blocks come on the same line on the inclined plane if they are released simultaneously ? Initilly the blocks A is $\sqrt{2}m$ behind the block B

.Coefficient of kinetic friction for the block A and B are 0.2 and 0.3 respectively $(g = 10ms^{-2})$



Watch Video Solution

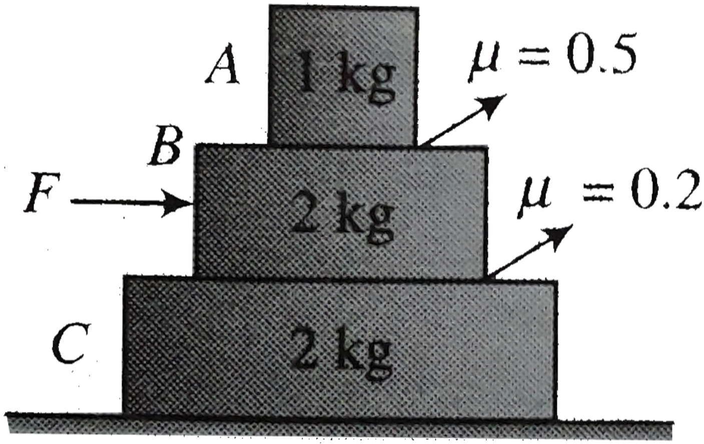
4. Find the acceleration a_1, a_2 and a_3 of the three blocks shown in Fig if a horizontal force of $10N$ is applied on



(a) $2kg$ blocks, (b) $3kg$ blocks and (c) $7kg$ blocks (Take $g = 10ms^{-2}$)

Watch Video Solution

5. In the sitution shown in figure there is no friction between $2kg$ and ground.



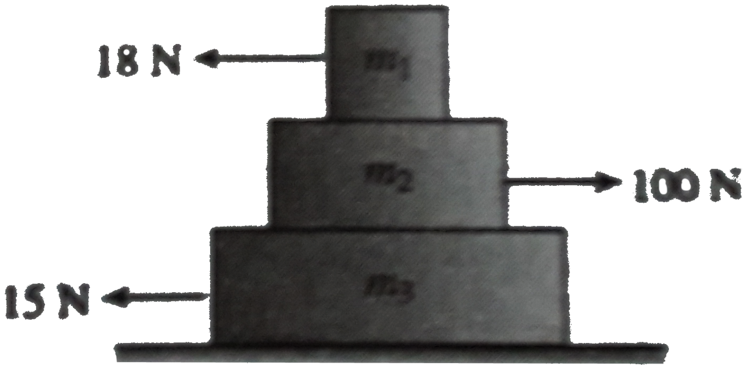
a. For what maximum value of force F can all three blocks move together?

b. Find the value of force F at which sliding starts at other rough surfaces.

c. Find acceleration of all blocks, nature and value of friction force for the following values of force F (i) $10N$ (ii) N and (iii) $25N$

Watch Video Solution

6. Consider three blocks placed one over the other as shown in Fig. Let as now pull the blocks with the force of magnitudes $18N, 100N$ and $15N$ Take $m_1 = m_2 = m_3 = 10kg$ If the coefficient of static and kinetic friction between all contacting surface are $\mu_g = 0.2$ respectively find the



(a) Acceleration of the block s

(b) Friction at each surface

Watch Video Solution

7. A track consists of two circular pars ABC andCDE of equal rdius 100 m and joined smoothly as shown in figure.Each part sutends a right ngle at its centre. A cycle weighing 100 kg together with rider travels at a constant speed of 18 km/h on the track. A. Findteh nromal contct force by tehroad on the cycle whenit is at B and at D. b.Findteh force of friction exerted by the track on the tyres when the cycle is at B,C and D. c. Find the normal force between teh road and teh cycle just before and just after the cycle crosses C. d. What should be the minimum friction coefficient between the road and the tyre, which will ensure that teh cyclist can move with constant speed? Take $g = 10\frac{m}{s^2}$

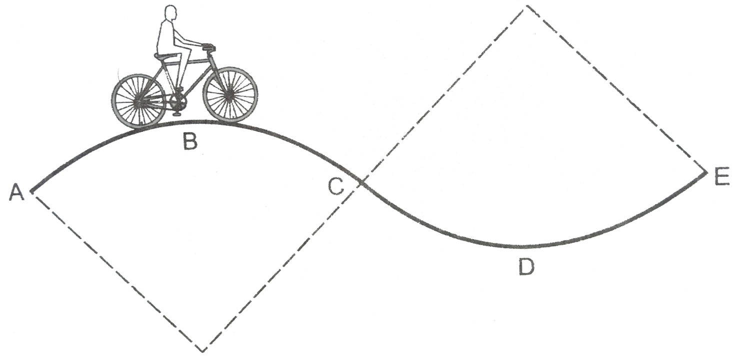
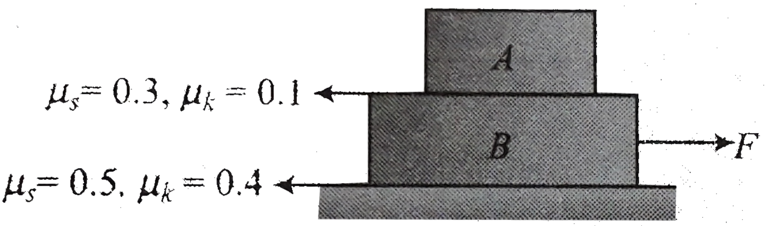


Figure 7-E1

Watch Video Solution

8. Two blocks $A(m_A = 5kg)$ and $B(m_B = 15kg)$ are placed as shown in Fig A variable force $F = 200$ starts actsing from time $t = 0$ on lower bolck B just large anough to Determine the force F to make block B sliding out from between the blocks A and the ground at this instant , plot a graph between acceleration of both the blocks and time

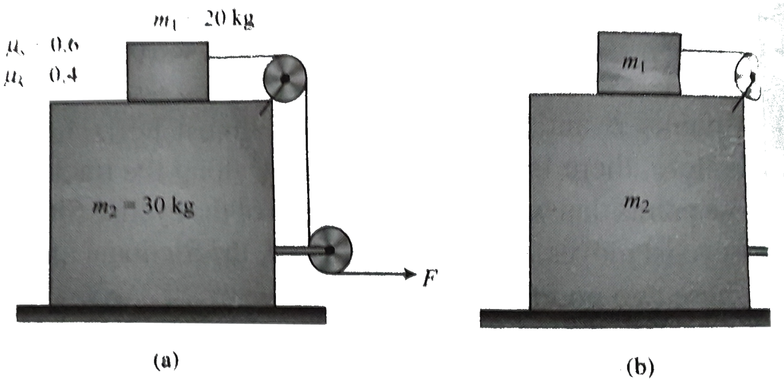


Watch Video Solution

9. A block of mass $m_1 = 20kg$ as placed on a wedge of mass $m_2 = 30kg$ rest on a smooth flooras shpwn in Fig (a) . Friction exists between block and wedge.

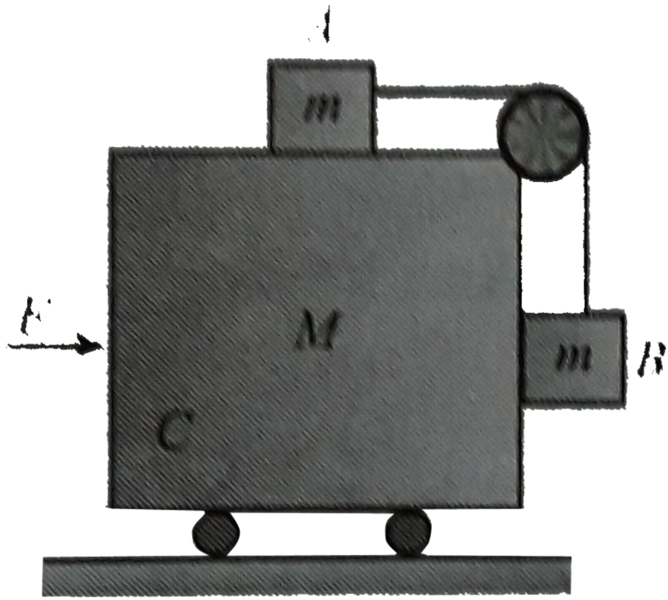
a. Find the acceleration of each block if (i) $F = 180N$ and (ii) $F = 400N$

b. Solve the problem if force $F = 180N$ is direction upwards as shown in Fig (b)



Watch Video Solution

10. Consider the situation shown in Fig. The hirizontal surface below the bigger block is smooth the coefficient of friction between the block is μ find the minimum and the maximum force F that can be applied in order to keep the smaller blocks at rest with respoct to the bigger block



Watch Video Solution

11. A metal ring of mass m and radius R is placed on a smooth horizontal table and is set rotating about its own axis in such a way that each part of the ring moves with a speed v. Find the tension in the ring.

Watch Video Solution

12. A thin uniform copper rod of length l and mass m rotates uniformly with an angular velocity ω in a horizontal plane about a vertical axis passing through one of its ends. Determine the tension in the rod as a function of the distance r from the rotation axis. Find the elongation of the rod.

Watch Video Solution

Exercise 7.1

1. A block weighing $20N$ rests on a horizontal surface . The coefficient of static friction between the block and surface is 0.4 and the coeffiecient of kinetic frictioni 0.20

a.How much is the friction force excerted on the block?

b. How much will the friction force be if a horizontal force of $5N$ is exerted on the block?

c. What is the minimum force that will start the block in motion ?

d. What is the minimum force that will keep the block in motion once is has been started ?

e. If the horizontal force is $10N$ what is the friction force?

Watch Video Solution

2. A block of mass m rests on a rough floor . The coefficient of friction between the block and the floor is μ

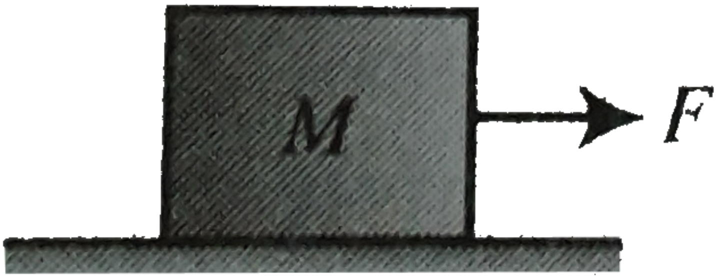
a. Two boys apply force P at an angle θ to the horizontal. One of them pushes the block , the other one pulls. Which one would reqire less efferts to cause impending motion of the block?

b. What is the minimum force required to move the block by pulling it ?

c. Shown that the block is pushes at a certain angle θ_0 it cannot be moved fro whatever the value of P be

Watch Video Solution

3. What is the value of friction f for the following value of applied force F ?

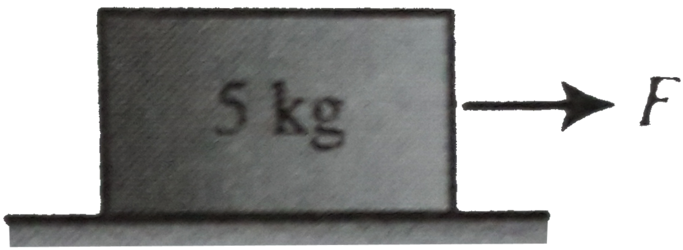


a. $1N$ b.$2N$ c.$3N$ d.$4N$ e$20N$

Assume the coefficient of friction to be $\mu_s = 0.3 : \mu_k = 0.25$ Mass of the body is $m = 1kg$. (Assume $g = 10ms^{-2}$)

Watch Video Solution

4. A block of mass $5kg$ rests on a rough horizontal surface. It is found that a force of $10N$ is required to make the block just move However , once the motion begains, a force of only $8N$ is enough to maintain the motion find the coefficient of kinetic and static friction between the block and the horizontal surface

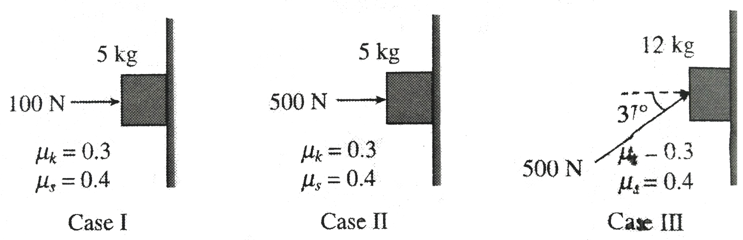


Watch Video Solution

5. A body of mass m is kept on a rough horizontal surface of friction coefficient m . A force P is applied horizontally , but the body is not moving .Find the net force F excerted by the surface on the body .

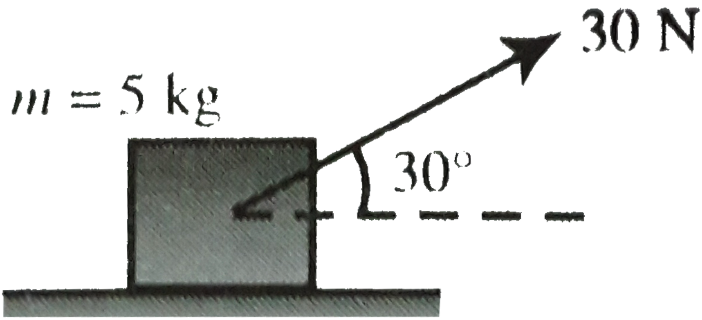
Watch Video Solution

6. Determine the magnitude of frictional force and acceleration of the block in each of the following cases :



Watch Video Solution

7. A $5kg$ box is moving staright across the floor at a constant speed by a force of $30N$ as shown in figure

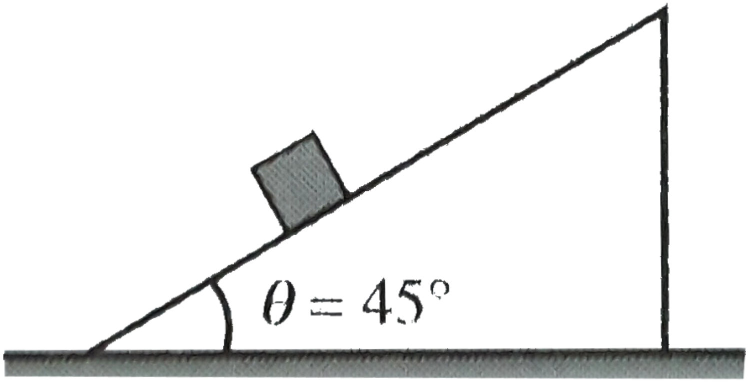


a. How large a friction force impends the motion of the box ?

b. Find μ_k between the box and the floor

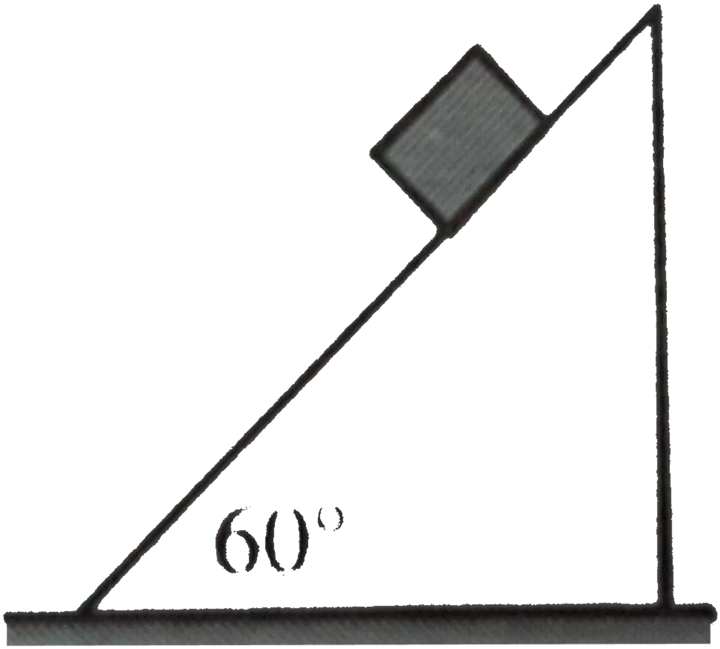
Watch Video Solution

8. A block of mass $m = 3kg$ slides on a rough inclined plane of cofficient of friction 0.2 Find the resultant force offered by the plane on the block



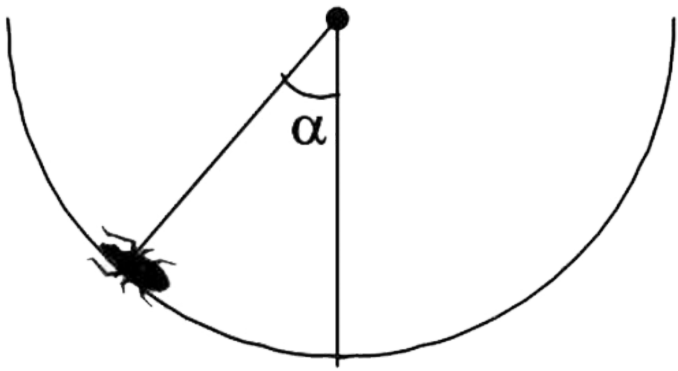
Watch Video Solution

9. A block slides down on inclined plane (angle of inclination 60°) with an accelration $g/2$ Find the coefficient friction



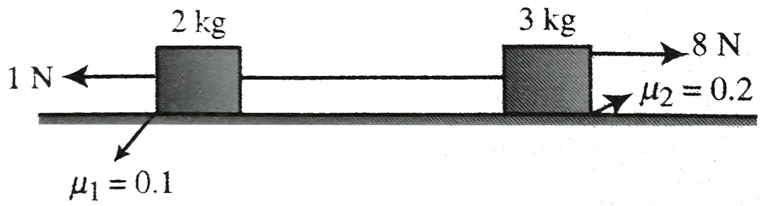
Watch Video Solution

10. An insect craws up a hemispherical surface very slowly (see fig.). The coefficient of friction between the insect and the surface is $1/3$. If the line joining the center of the hemispherical surface to the insect makes an angle α with the vertical, the maximum possible value of α is given by



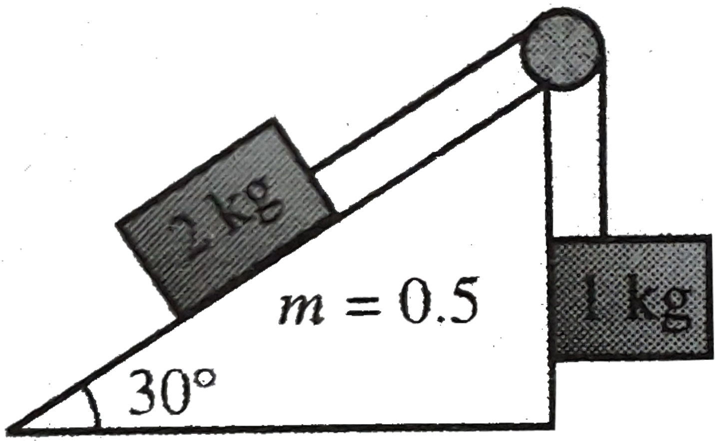
Watch Video Solution

11. In Fig if f_1, f_2 and T are the friction forces on $2kg$ block $3kg$ block and tension in the string respectively the find their value initially before applying the forces tension in string was zero



Watch Video Solution

12. Find the friction on the the $2kg$ block in the arrangement shown in figure



Watch Video Solution

Watch Video Solution

13. A goods train has 25 compartments. Will the tension in coupling between the fourth and fifth compartment be the same as that in the coupling between the 21st and the 22nd compartments ?

Watch Video Solution

14. A box of bananas weighing $40.0N$rests on a horizontal surface is 0.40 and the coefficient of kinetic friction is 0.20

a. If no horizontal force is applied to the box and the box is at rest , how large is the friction force excered on the box ?

b. What is the magnitude of the friction forces if a monkey applies a horizontal force of $6.0N$ to the box and the box is initial at rest?

c. What minimum horizontal force must the monkey apply to start the box in motion ?

d. What minimum horizontal force must the monkey apply to keep the box moving at constant velocity once it has been starts?

e. If the monkey applies a horizontal force of $18.0N$ What is the magnitude of the friction force and what is the box's acceleration ?

Watch Video Solution

15. A mass of mass $60kg$ is pulling a mass M by an inextensible light rope passing through a smooth and massless pulley as shown in figure. The coefficient of friction between the mass and ground is $\mu = 1/2$ find the maximum value of M that can be pulled on the ground

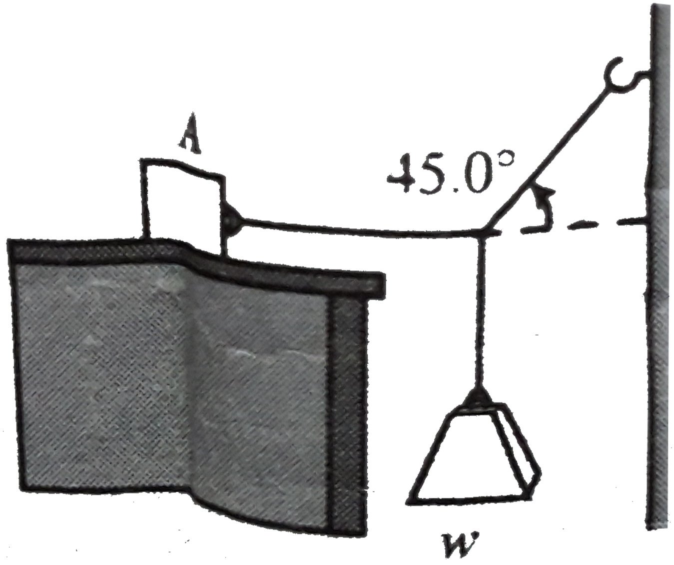
Watch Video Solution

16. a. Block A , as shown in figure weight $60.0N$ The coefficient of static friction between the block and the surface on which it rest is 0.25 .The system is in equlibrium .Find the friction for excerted on block A

b. Find the maximum weight w for which the system will remain in equlibrium

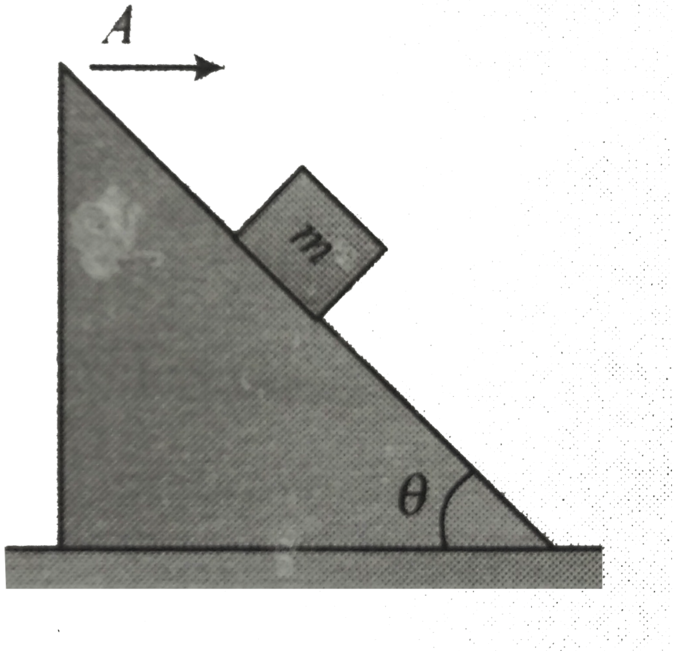
Watch Video Solution

17. If the coefficient of friction between M and the inclined surfaces is $\mu = 1/\sqrt{3}$ find the minimum mass m of the rod so that the of mass $M = 10kg$ remain stationary on the inclined plane



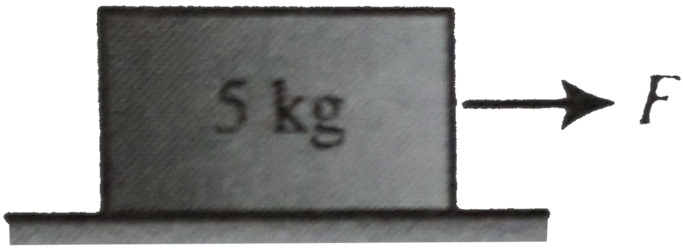
View Text Solution

18. A block of mass m is placed on an inclined plane. With what acceleration A towards right should the system move on a horizontal surface so that m does not slide on the surface of inclined plane? Also calculate the force supplied by wedge on the block. Assume all surfaces are smooth.



Watch Video Solution

19. A block of mass $5kg$ rests on a rough horizontal surface. It is found that a force of $10N$ is required to make the block just move However , once the motion begains, a force of only $8N$ is enough to maintain the motion find the coefficient of kinetic and static friction between the block and the horizontal surface

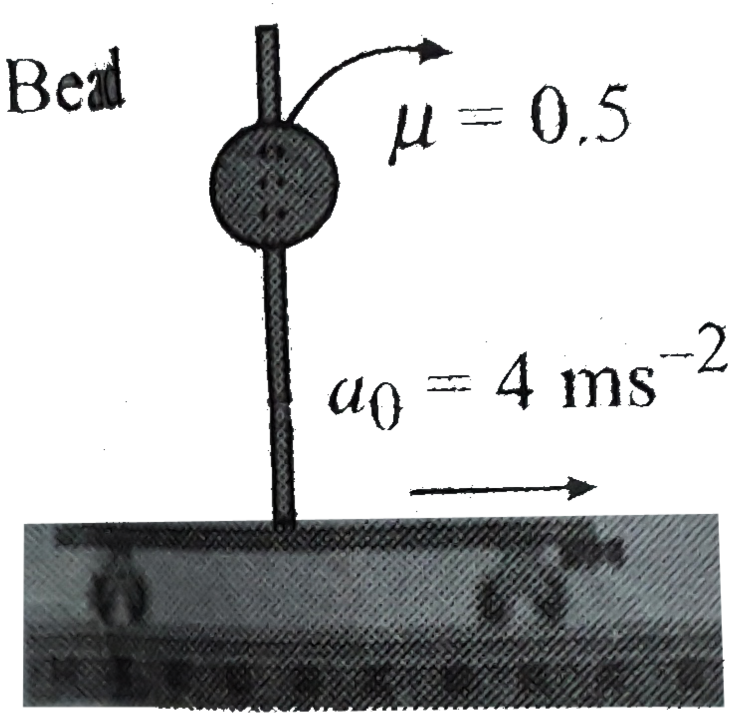


Watch Video Solution

20. A thin rod of length $1m$ is fixed in a vertical position inside a train, which is moving horizontally with constant acceleration $4ms^{-2}$.A bead can slide on the rod and friction coefficient between them is 0.5. If the bead is released from rest at the top of the rod , it will reach the bottom in

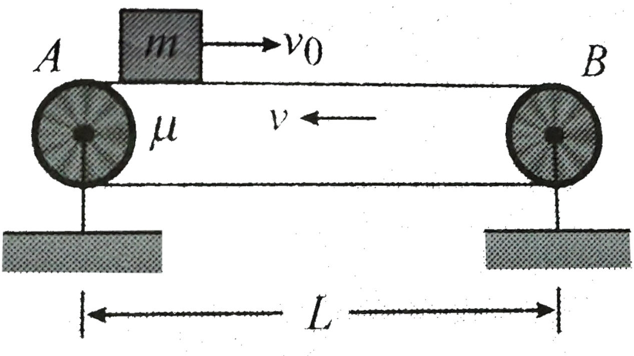
Watch Video Solution

21. With what minimum velocity should be projected from left end A toward end B such that it reaches the other end B of conveyer belt moving with constant velocity v The friction coefficient between block and belt is μ



Watch Video Solution

22. A block mass $m = 2kg$ is accelerating by a force $F = 20N$ applied on a smooth light pully as shown in fig 7.86 If the coefficient of kinetic friction between the block and the surface is $\mu = 0.3$ find its acceleration



Watch Video Solution

23. A uniform chain of length L and mass M overhangs a horizontal table with its two third part n the table. The friction coefficient between the table and the chain is μ. Find the work done by the friction during the period the chain slips off the table.

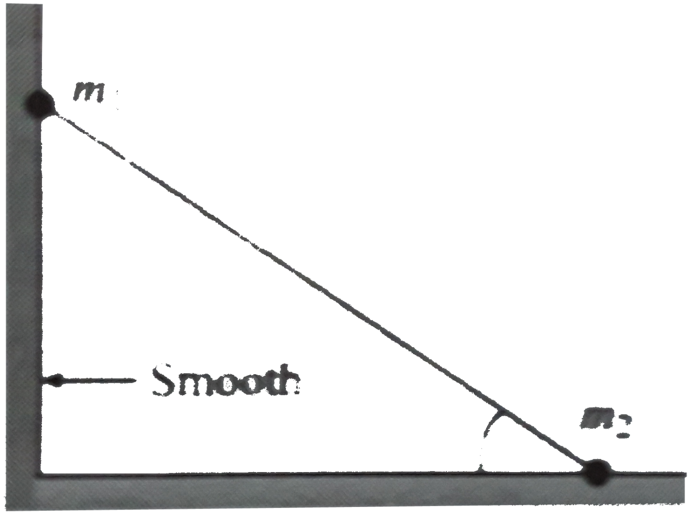
Watch Video Solution

24. Two small spheres of masses m_1 and m_2 are connected by a light right rod.The system is placed between a rought floor and smooth verticle wall as shown in Fig. The co-efficent of friction between the floor and the sphere of mass m_2 isμ .Find the minimum value of θ so that the system of masses does not slip

Watch Video Solution

25. Two blocks of masses $m_1 amdm_2$ connected by a string and placed on an rough inclined plane having coefficient of friction μ is shown in fig 7.89 Find the

retio of masses m_1 / m_2 so that



a. the block m_1 start moving downward

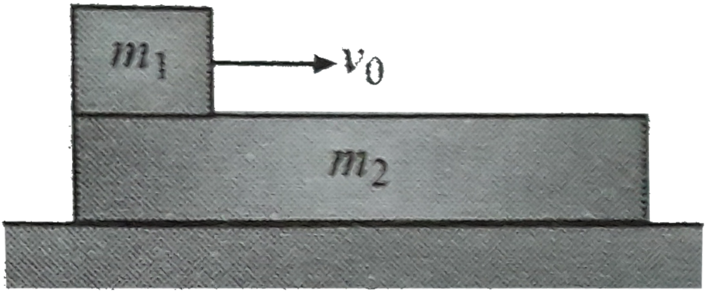
b. the block m_1 start moving upwnward

c. no motion takes plane

Watch Video Solution

Exercise 7.2

1. A block of mass $1kg$ is horizontal thrown with a velocity of $10ms^{-1}$ on a stationary long of mass $2kg$ whose surface has a $\mu = 0.5$. Plane rest on friction surface find the time when m_1 comes to rest w.r.t. plane



Watch Video Solution

2. In Fig. initialy the system is at rest .Find out minimum value of $F$for which sliding start between the two

blocks Given$m_A = 10kg$ and $m_B = 20kg$

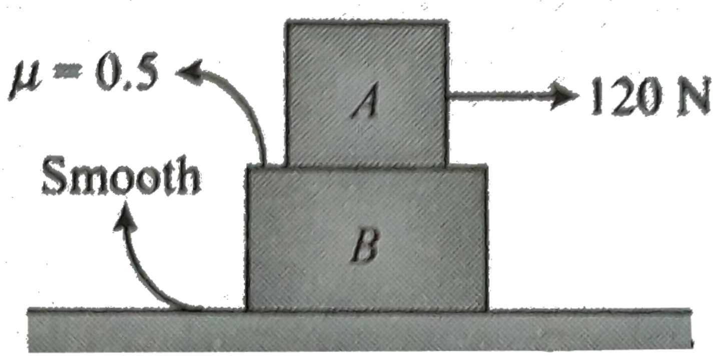
Watch Video Solution

3. Find the acceleration of the two blocks The system is initaily at rest the friction coefficient are as in fig 7.138 Given $m_A = m_B = 10kg$

Watch Video Solution

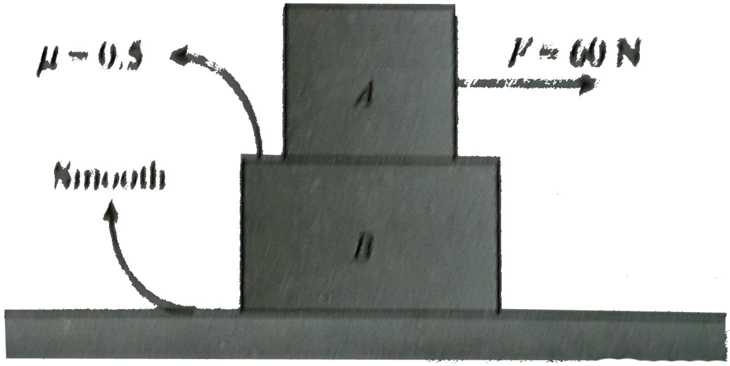
4. Find the acceleration of the two blocks . The system is initialy at rest and the friction are as shown in fig

.Given $m_A = m_B = 10kg$



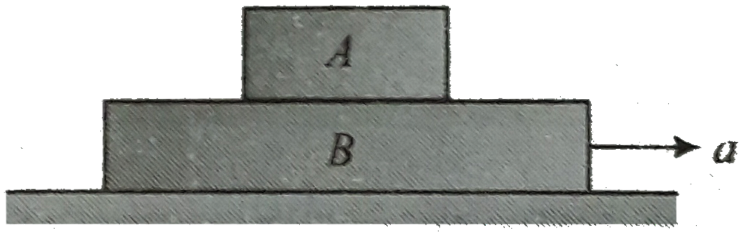
Watch Video Solution

5. Find the acceleration of the two blocks The system initally at rest and the friction coefficient are as shown in fig 7.140? Also find maximum F for which two blocks will move togather Given $m_A = 10kg$ and $m_B = 20kg$



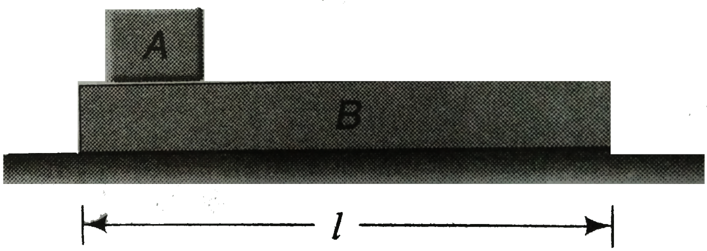
Watch Video Solution

6. The block A is kept over a plan B. The maximum horizontal acceleration of the system in order to prevent slipping of A over B is $a = 2ms^{-2}$ find the coefficient of friction between A and B



Watch Video Solution

7. Figure shows a small block A of mass m kept at the left end of a plank B of mass $M = 2m$ and length l . The system can side on a horizontal road. The system is started towards right with the initial velocity v. The friction coefficient between the road and the plank is $1/2$ and that between the plank and the block is $1/4$. Find

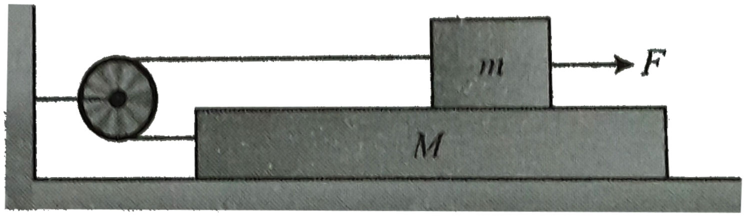


(a) the time elapsed before the block separates from the plank

(b) displacement of block and plank relative to ground till that moment.

Watch Video Solution

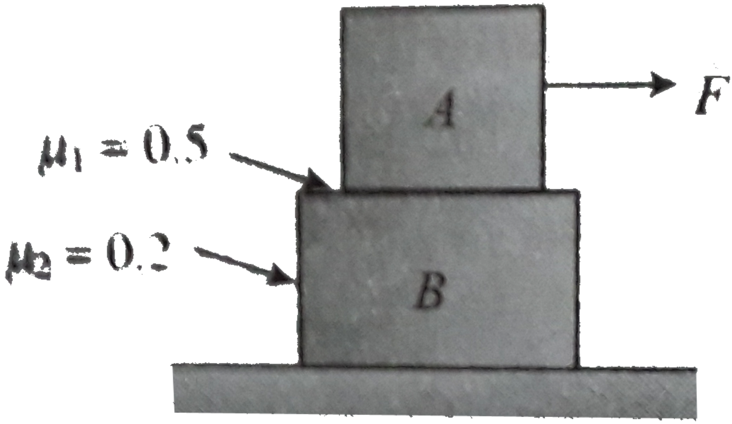
8. A small block of mass m is placed on a plank of masss M .The block is connected to plank with the help of a light string passing over a light smooth pulley shown in fig. The co-efficient of static friction between the plank is μ The co-efficient of friction between the plank and the horizontal force F applied on the block of mass m can make block not to slide relatively?



Watch Video Solution

9. Two block A and B are arrenged as shown in figure $(m_A = 5kg$ and $m_B = 10kg)$ Find the acceleration of

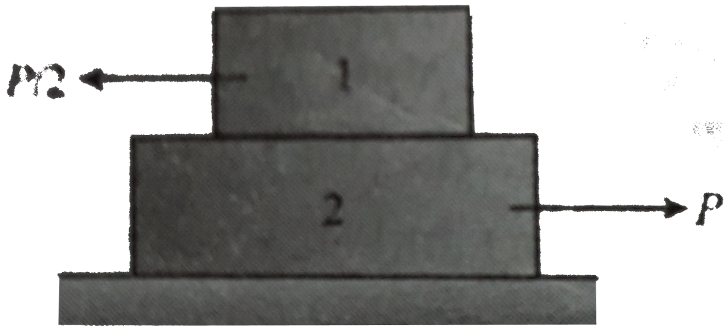
blocks if $F = 40N$



Watch Video Solution

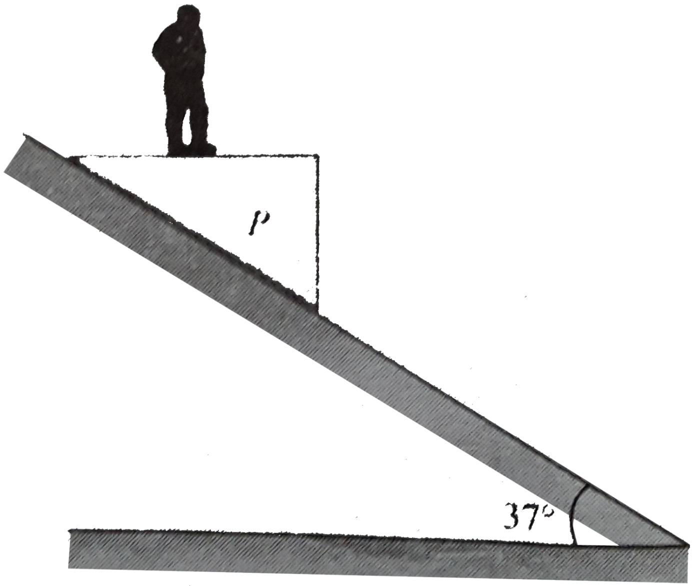
10. In Fig block 1 is placed on top of block 2 .Both of then have a mass of $1kg$ The coefficient of friction between block 1 and 2 are $\mu_s = 0.75$ and $\mu_k = 0.60$ The table is frictionless A force $p/2$ is applied on block 1 in the left and force P on block 2 to the right .Find

the minimum value of p such that sliding accore between the two blocks



Watch Video Solution

11. A mass of $80kg$ stands on a horizontal weight machine of negligible mass , attached to a massless platform P that sliding down at 37° incline. The weight machine reads $72kg$ the man is always at rest weight machine calculate



a. the vertical acceleration of the man.

b. the coefficient of kinetic friction μ between platform and incline.

A. $\frac{13}{24}$

B. $\frac{15}{24}$

C. $\frac{11}{24}$

D. $\frac{17}{24}$

Answer: A

Watch Video Solution

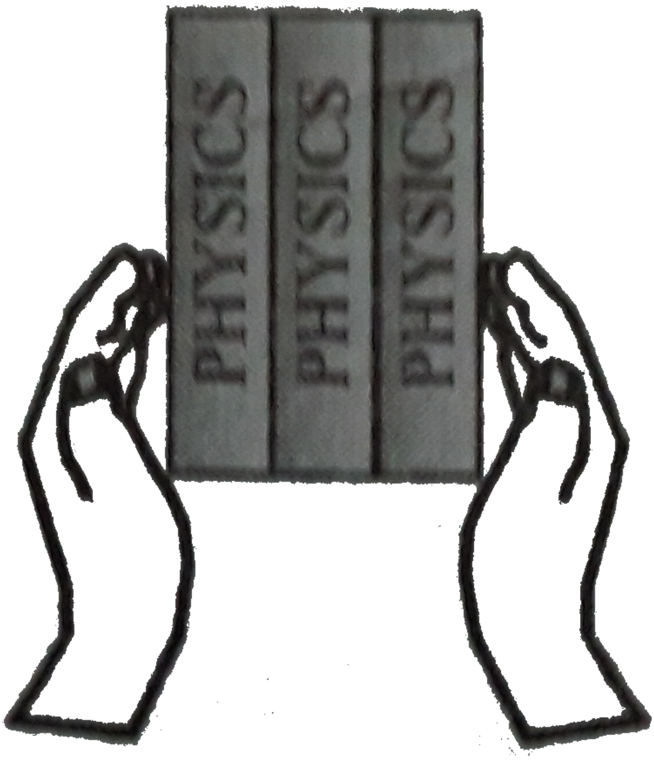
12. A block of mass$m_1 = 1kg$ is horizontally thrown with a velocity of $v = 10m/s$ on a statonary long plank of mass$m_2 = 2kg$ whose surface has $\mu = 0.5$ plank rest on friction surface find the time when the block comes to rest w.r.t plank

Watch Video Solution

13. A side of a simplified form of verticle latch B is as shown in figure The lower member A can pushed forward in its horizontal channel . The slide of the channels are smooth , but at the interfaces of A and of which are at 45° with the horizontal there exists a static coefficient of friction $\mu = 0.4$ what is the minimum valueforce F that must be applied horizontal to A to start motion of the latch B

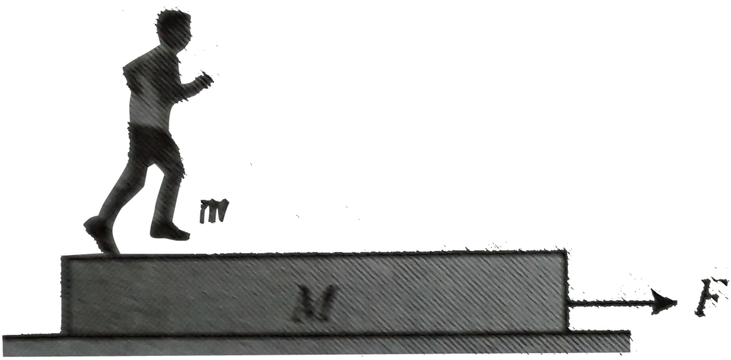
Watch Video Solution

14. Find minimum normal force to be each hand to hold there identical books in verticle position Each books has mass m and the value of coefficient of friction between the books as well as between hand and the book is μ



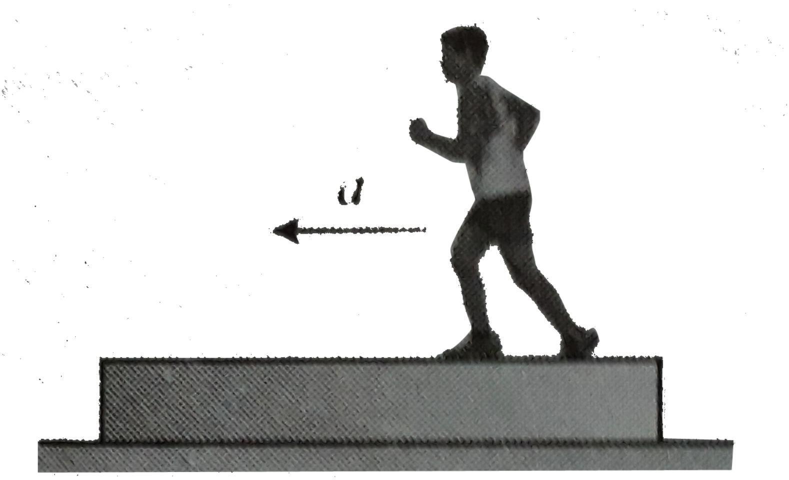
Watch Video Solution

15. A plank of mass M is placed on a rough horizontal force F is applied on it A man of mass m rens on the plank find the acceleration of the man so that the plank does not move on the surface . The coeffcent of friction between the plank and the surface is μ Assume that the man does not slip on the plank



Watch Video Solution

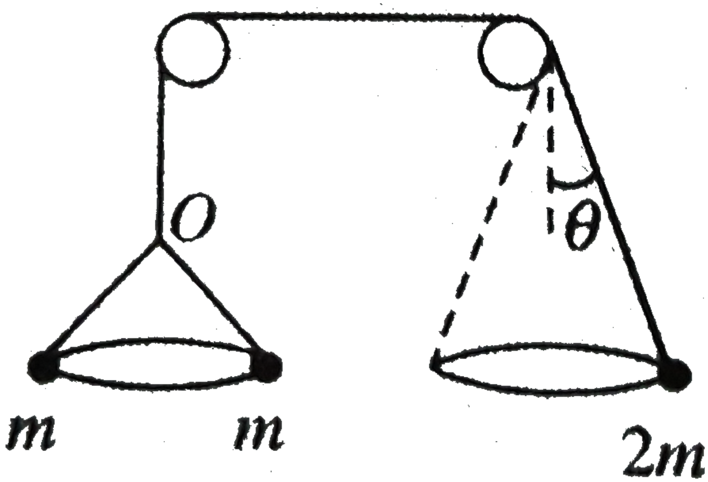
16. A man of mass m is moving with a constant acceleration a w.r.t plank is .The plank less on a smooth horizontal floor If the mass of plank m then calculate the acceleration of plank and man w.r.t ground and frictional force extended by plank on man



Watch Video Solution

Exercise 7.3

1. Three masses are atteched to strings rotaing in the horizontal plank .The string pass over two naine as shown in fig will this system be in equilibrium



Watch Video Solution

2. Can force determine the direction of motion ? Direction of acceleration ?

Watch Video Solution

3. Your are riding on a Ferris wheel that is rotating with a constant speed . The car in which you are riding always maintain its correct upward orientation , it does not invert.

a. What is the direction of the normal force on you form the seat when you are at the top of the wheel ?

i. upward ii. downward .iii. impossible to determine

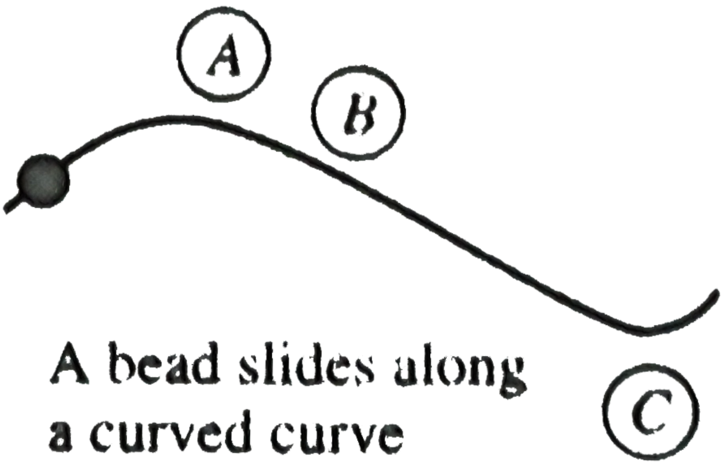
b. From the same choices, what is the direction of the net force on you when you are at the top of the wheel?

Watch Video Solution

4. A bead slide freely along a curved wire lying on a horizontal surface at constant speed as shown in Fig

a. Draw the vectors repesenting the force exerted by the wire on the bead at point A ,B and C

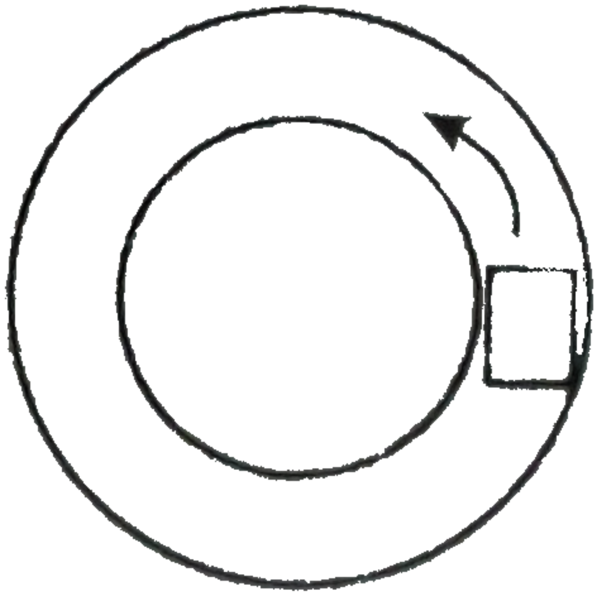
b. Suppose the bead in figure speeds up with constant tangential acceleration as it moves toward the right Draw the vector representing the force on the bead at point A B and C



A bead slides along a curved curve

Watch Video Solution

5. A smooth block loosely fits in a circular tube placed on a horizontal surface . The block moves along the tube (fig) Which wall (inner or outer) will exert a non zero normal contact force on the block?



Watch Video Solution

6. An amusement park ride consist of a large verticle cylinder that spins about its axis first fast enough that any person inside is held up againest the wall when the is μ_s and the radius of the cylider is R

a. Shown that maximum period of revolation neccessary to keep the person from falling is $T = \left(4\pi^2 \mu_s / g\right)^{1/2}$

b. Obtain a numerical value for taking $R = 4.00m$ and $\mu_s = 0.400$. How many revolations per minute does the cylinder make?

c.If the rate of revolation of the cylinder is make to be some what larger what happens to the magnitude of each one of the forces acting on the person ? What happens to the motion of the person ?

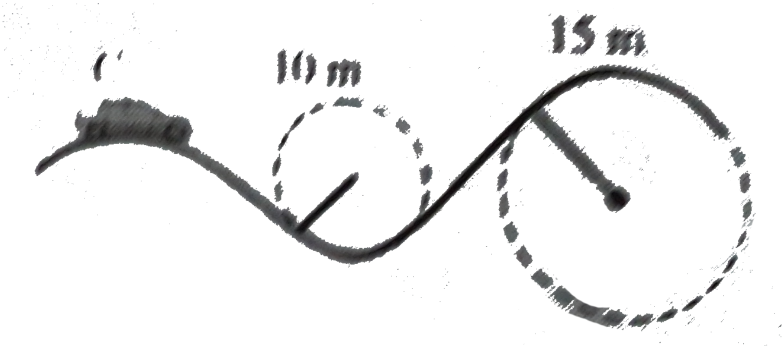
d.If instead the cylinder rate revolation is made to be somewhat smaller what happens to the magnitude happens to the motion of the person ?

Watch Video Solution

7. Tarzan $(m = 85.0kg)$ tries to cross a river by swinging on a vine . The vine is $10.0m$ just and his speed at the bottom of the swing (as he just clears the water) will be $8.00ms^{-1}$ Tarzan does not know that the vine hasa breaking strenght of $1000N$ Does he make it across the river safely ?

Watch Video Solution

8. A roller -coaster car a mass of $500kg$ when fully loaded with passengers

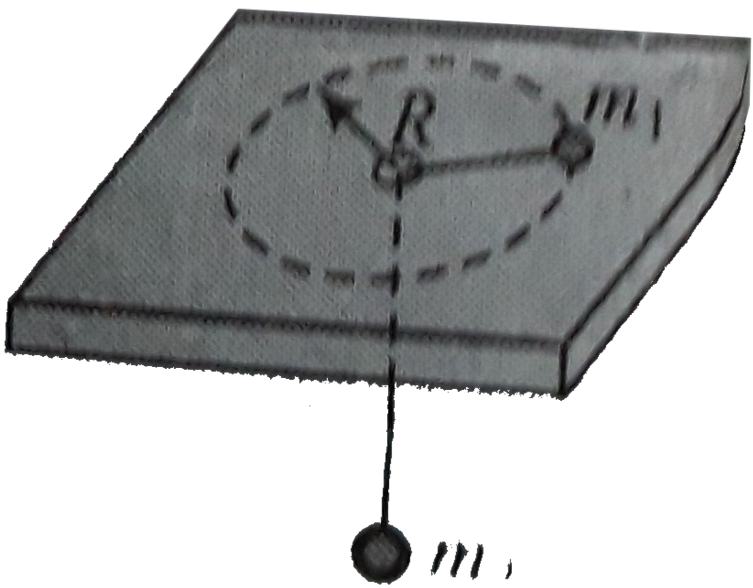


a. If the vehicle has a speed of $20.0ms^{-1}$ at point what is the force exerted by the track on the car at this point ?

b. What is the maximum speed the vehicle can have point B and still remain on the track?

Watch Video Solution

9. An air puck of mass m_1 is tied to a string allowed to revolved in a circle of radius R on a frictionless horizontal table . The other end of the string passes through a small hole in the centre of the table , and a load of mass m_2 is tied to the string? The suspended load remains in equilibrium while the pack on the tabletop revolves.



a. Find the tension in the string

b. Find the radial force acting on the puck

c. Find the speed of the puck

d. Qualitaively describe what will happen in the monsion of the puck if the value of m_2 is somewhat increased by placing an additional load on it.

e.Qualitaively describe what will happen in the monsion of the puck if the value of m_2 is instead decreased removing a part from the hanging load.

Watch Video Solution

10. A sleeve A can slide freely along a smooth rod bent in the shape of a half circle of radius R .The system is set in rotaion with a constant angular velocity ω about a vertical axis OO' .Find the angle θ corresponding to the steady position of the sleeve

Watch Video Solution

11. A ball suspended by a thread swings ia a vertical plane so that its acceleration in the extreme position and lowest position are equal. The angle θ of thread deflection in the extreme position will be

Watch Video Solution

12. A simple pendulum is oscillating with angular displacement 90° For what angle with vertical the acceleration of bob direction horizontal?

Watch Video Solution

13. A ceiling fan has a diameter (of the circle through the outher edges of three blocks) of $120cm$ and rpm 1500 at fall speed consider a partical of mass $1g$ stiking at the outer end of a blade.

a. How much force does it experience the fan runs at falll speed ?

b.Who exerts this force on the partical ?

c. How much force does not the particle exert on the blade along its surface?

Watch Video Solution

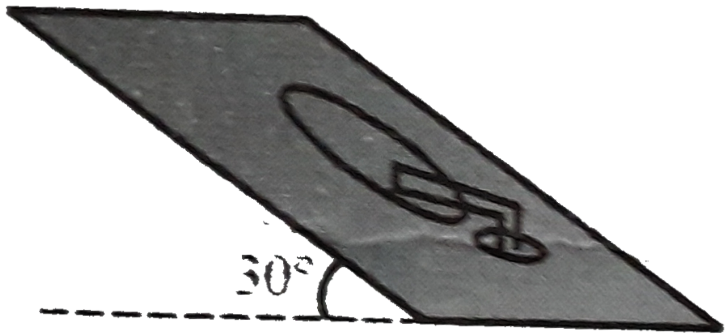
14. A block of mass m is kept on a horizontal ruler . The friction coefficient between the ruler and the block is m . The ruler is fixed at one end the block is at a distance L from the fixed end . The ruler is rotated about the fixed end in the horizontal plane through the fixed end

a. What can the maximum angular speed be for which the block does not slip?

b. If the angular speed of the ruler is uniform increase from zero at an angular acceleration a at angular speed will the block slip?

Watch Video Solution

15. An old record player of $15.0cm$ radius at $33.0\text{rev}\ \overset{1}{\min}$ while mounted on a 30° incline as shown in figure



a. If a mass m can be placed anywhere on the rotaing record , where is the most critical place on the disc where slipping might occur ?

b.Calculate the least possible coefficient of friction that must exist if no slipping occurs.

Watch Video Solution

16. A $60 - kg$ woman is on a large vertical swing of radius $20m$. The swing rotates with constant speed

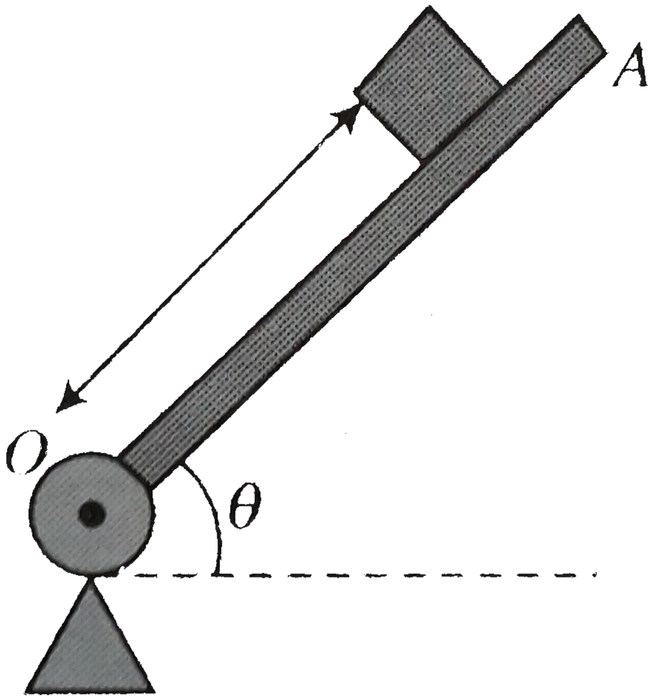
a. At what speed would she feel weightless at the top?

b. At this speed what is her apparent weight at the bottom?

Watch Video Solution

17. A rod OA rotates about a horizontal axis through O with a constant aniclockwise velocity $\omega = 3reds^{-1}$. As it passes the position $\theta = 0$, a small block of mass m is placed on it at a radial distance $r = 450mm$ if the

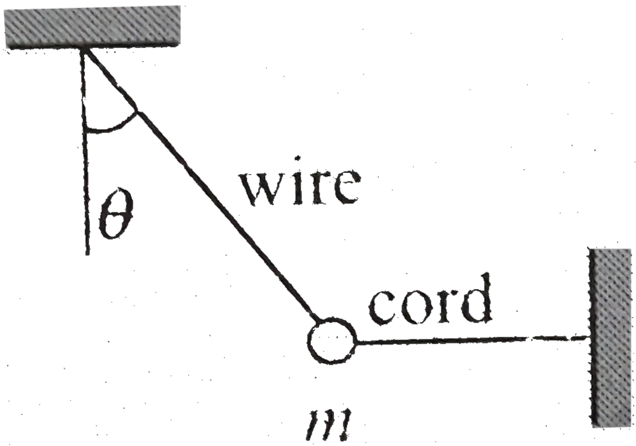
block is observed to slip at $\theta = 50^\circ$. Find the coefficient of static friction between the block and the rot



(Given that $\sin 50^\circ = 0.766, \cos 50^\circ = 0.64)$

Watch Video Solution

18. A small mass m and its supporting wire because a simple pendulum when the horizontal cord is cut . Find the ratio of the tension in the supporting wire immediately after the cord is cut to the tension in the wire before the cord is cut



Watch Video Solution

19. A simple pendulum is constructed by attaching a bob of mas m to a string of length L fixed at its upper end. The bob oscillates in a vertical circle. It is found that the speed of the bob is v when the string makes an angle θ with the vertical. Find the tension in the string at this instant.

Watch Video Solution

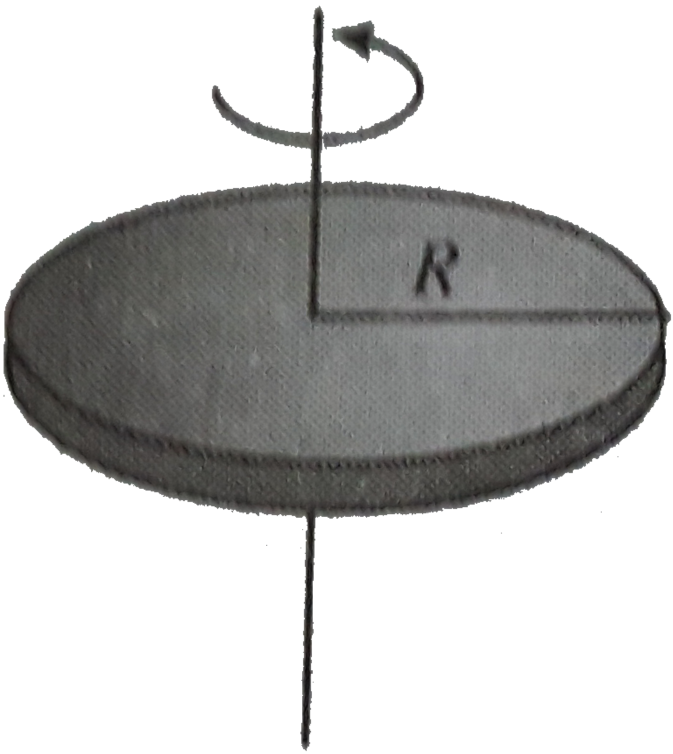
20. A car is moving with uniform speed over a circular bridge of radius R which subtends an angle of 90° at its center. Find the minimum posible speed so that the car can cross the bridge without losing the contact any where

Watch Video Solution

21. A block of mass m fitted with a light spring of stiffness k and natural length l_0 kept on a smooth radial groove made on a disc rotaing with a constant angular axis . If the block is released slowly . Find the maximum elongation of the spring

Watch Video Solution

22. A disc of radius R rotates from rest about a vertical axis with a constant angular acceleration such that a coin placed with a tangenitial between a as shown in figure If the coefficient of static friction between the coin and disc is μ_s .Find the velocity of the before it start sliding relative as the disc

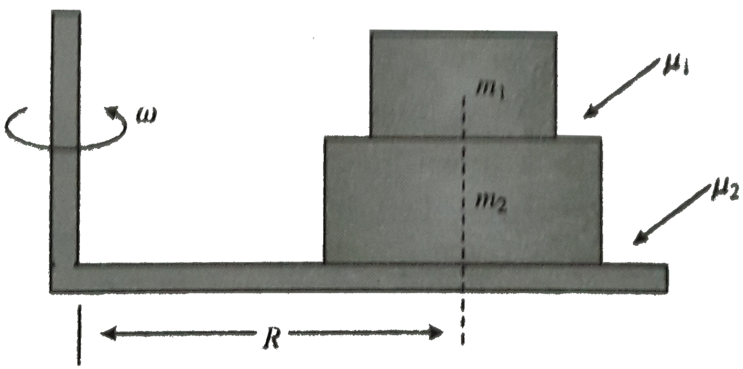


Watch Video Solution

23. There are two blocks of masses m_1 and m_2, m_1 is placed on m_2 on a table which is rotating with an angular velocity ω about the vertical axis . The coeffcent of friction between the block is μ_1 and between m_2 and table is $\mu_2(\mu_1 < \mu_2)$ if block are placed at distance R from the axis of ratation , for relative sliding between the surface in contact , find the

a. friction force at the contacting surface

b. maximum angular speed ω

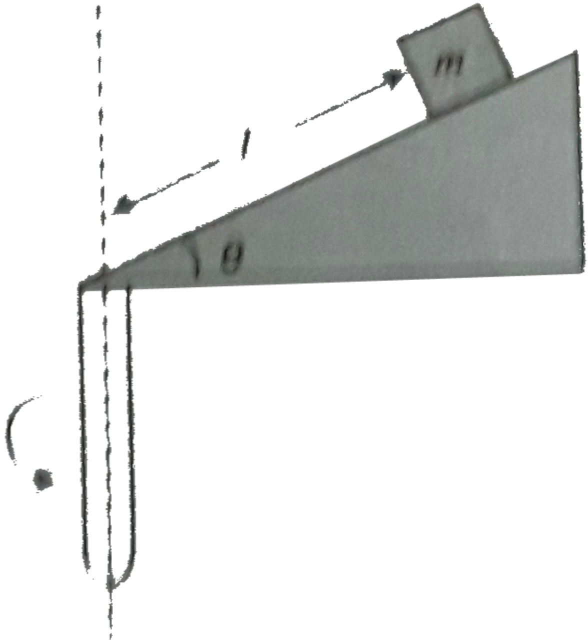


Watch Video Solution

24. A small wedge whose base is horizontal is fixed to a vertical rod as shown in fig . The sloping side of the weidgeis frictionless and the wedge is span with a constant angular speed ω about vertical axis as shown in the fig find the

a. value of angular speed ω for which the block of mass m just does not slide down the wedge.

b. normal reaction on the block by wedge when block does not slip relative to wedge.



Watch Video Solution

25. A table with smooth horizontal surface is turning at an angular speed ω about its axis. A groove is made on the surface along a radius and a particle is gently placed inside the groove at a distance a from the centre. Find the speed of the speed of the particle as its distance from teh centre becomes L.

Watch Video Solution

26. A table with smooth horizontal surface is fixed in a cabin that rotates with a uniform angular velocity ω in a circular pathof radius R. A smooth groove AB of length $L(< < R)$ is made on the surface of the table. The groove makes an angleθ with the radius OA of the circle in which the cabin rotates. A small particle is kept at the point A in the groove and is released to move along AB. Find the time taken by tehparticle to reach the point B.

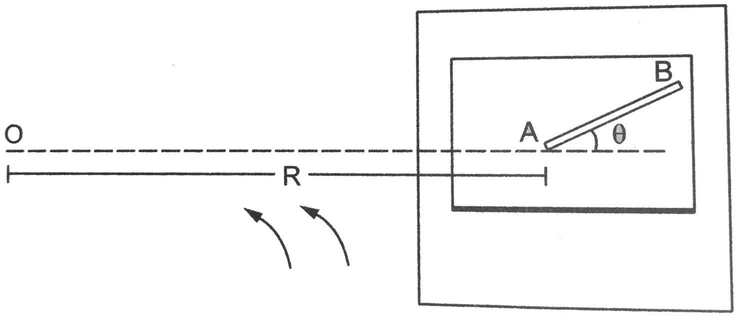
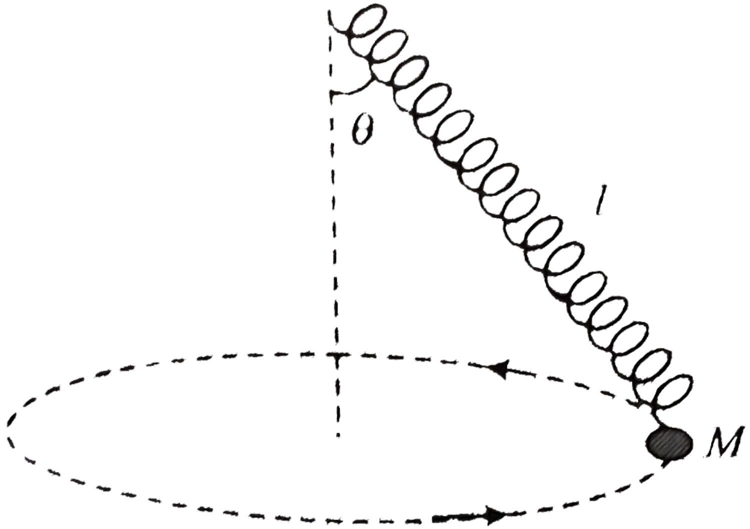


Figure 7-E3

Watch Video Solution

27. A child is swinging a ball of mass M around on a light spring which has spring constant k. The ball describes a horizontal circle. The stretched spring has a length a horizontal circle. The stretched spring has a length l and makes an angle θ with the vertical as shown in fig. the acceleration due to gravity is g neglect air resistance.



a. In terms of only the given quantities , what is the magnitude of force F that the spring exerts on man M ?

b.In terms of F, $k$and $l$what is the natural length l_0 of the spring i.e. the length of the spring when it is not steched?

c. In terms of F, l, M and B what is the speed v of the ball?

Watch Video Solution

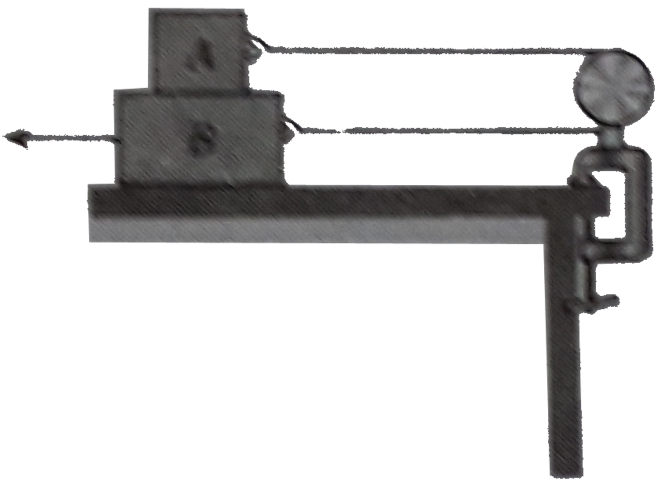
Subjective

1. A block of mass $m = 4kg$ is placed over a rough inclined plane as shown in fig . The coefficient of friction between the block and the plane $\mu = 0.5$ A force $F = 10N$ is applied on the block at an angle of 30°. Find the contact force between the block and the plane.

k

Watch Video Solution

2. Block A as shown in figure weight $1.40N$ and block B weight $4.20N$ The coefficient of kinetic friction between all surface is 0.30 Find the magnitude of the horizontal force (in N) necessary to drag block B to the left at constant speed if A and B are connected by a light , flexible cord passing around a fixed , frictionless pulled.



Watch Video Solution

3. Two block , with masses m_1 and m_2 are staked as shown in fig and placed on a frictionless horizontal surface . There is a friction between the two block .An external force of magnitude F is applied to the top block at an angle α below the horizontal . The coefficient of friction between m_1 and m_2 are μ_s

b. If the two blocks move together, find their acceleration

b . Calculate the maximum value of force so that blocks will move together

Watch Video Solution

4. Block A has a mass of $30kg$ and block B a mass of $15kg$. The coefficient of friction between all surface of contact are $\mu_s = 0.15$ and $\mu_s = 0.10$ Knowing that $\theta = 30^\circ$ and that the magnitude of the force F applied to block A is $250N$ Determine (a) acceleration of block A and (b) the tension in the rope

View Text Solution

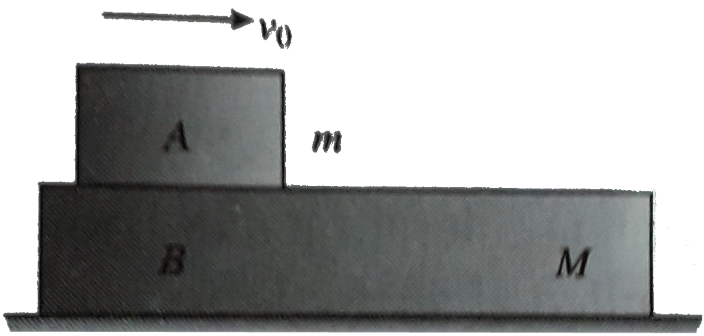
5. Block A weight $20kg$ placed on a smooth surface. Weight B of $2kg$ is mounted on the block . The coefficient of friction between the block and the weight is 0.25 Calculate the acceleration of the block and the weightand also the frictional force between the block and the weight when a horizontal force $2N$ applied to the weight as shown in fig What will these quantities be if the horizontal force is $20N$? $\left(g = 10ms^{-2}\right)$

Watch Video Solution

6. In figure find the acceleration of m assuming that there is friction between m and M and all other surface are smooth and pulleys light and $\mu =$ coefficient of friction between m and M

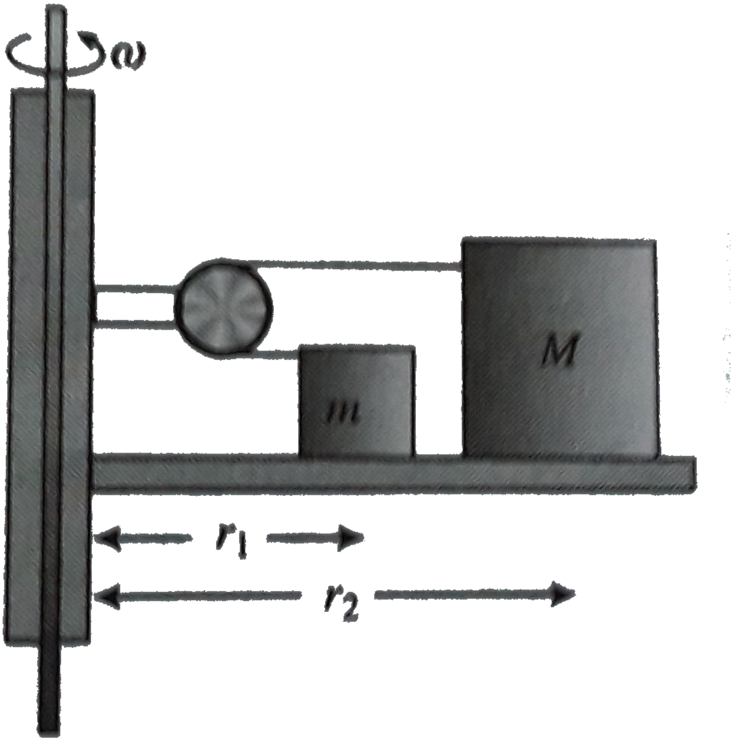
View Text Solution

7. The masses of the block A and B are m and M Between A and B there is a constant force F but B can slide frictionlessly on the horizontal surface A is set in motion with velocity v_0 while B is at rest . What is the distance moved by A relative to B before they move with the same velocity



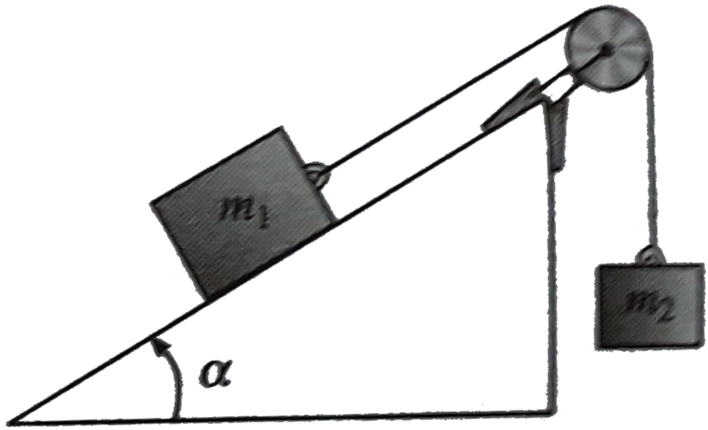
Watch Video Solution

8. Two block of masses m and M are connected by a chord passing around a frictionless pulley which is attached to a rotating frame , which rotates about a vertical axis with an angular velocity ω If the coefficient of friction between the two masses and the surface are μ_1 and μ_2 respectively determine the value of ω at which the block starts sliding radially $(M > m)$



Watch Video Solution

9. A block with mass m_1 is placed on an inclined plane with slope angle α and is connected to a second hunging block with mass m_2 by a cord passing over a small . Friction less pulley as shown in fig 7.247 . The coefficient of static friction is μ_2 and the coefficient of kinetic friction is μ_s



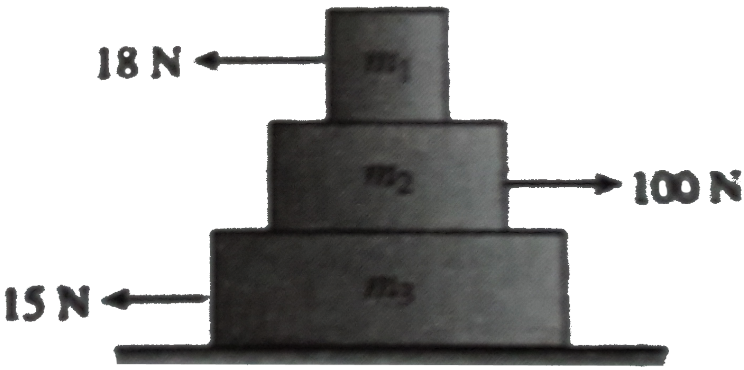
a. Find the mass m_2 for which block m_1 moves up plane at constant speed once it is set in motion

b. Find the mass m_2 for which block m_1 moves down the plane at constant speed once it is set in motion

c.For what range of m_2 will the blocks remain at rest if they are released from rest?

Watch Video Solution

10. Consider three blocks placed one over the other as shown in Fig. Let as now pull the blocks with the force of magnitudes $18N, 100N$ and $15N$ Take $m_1 = m_2 = m_3 = 10kg$ If the coefficient of static and kinetic friction between all contacting surface are $\mu_g = 0.2$ respectively find the

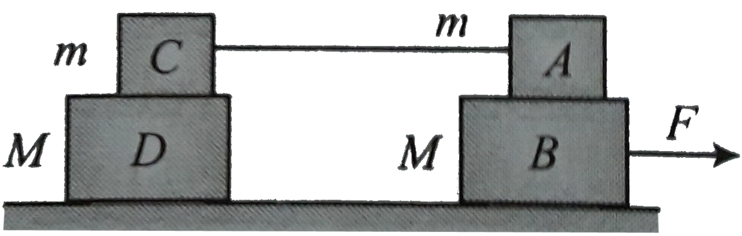


(a) Acceleration of the block s

(b) Friction at each surface

Watch Video Solution

11. Four block are arranged on a smooth horizontal surface as shown in figure .The masses of the blocks are given (see the fig) The coefficient of static friction between the top and the bottom blocks is μ_s What is the maximum value of the horizontal force F applied to one of the bottom blocks as shown that makes all four block with the same acceleration ?

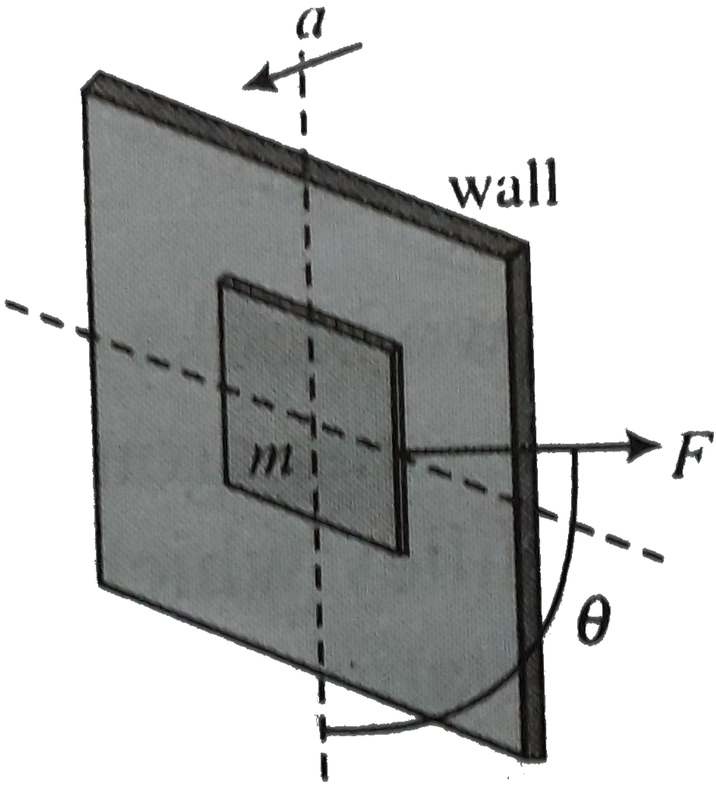


Watch Video Solution

12. A block of mass m is pressed against a wall which is moving with an acceleration a as shown in figure If the block is pulled at an angle θ with downward vertical by a force F and it does not slide relative to the wall . Find the

a. friction force between the block and wall

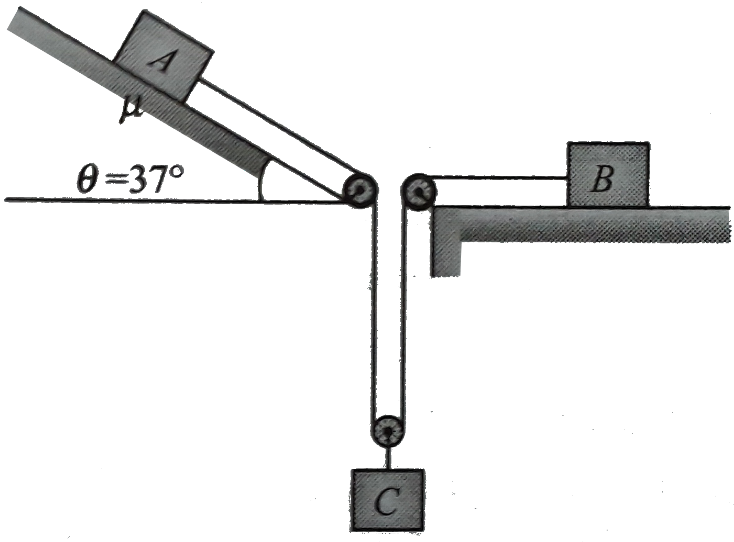
b.inimum magnitude of F so as to cayse a relative sliding between the block and wall



Watch Video Solution

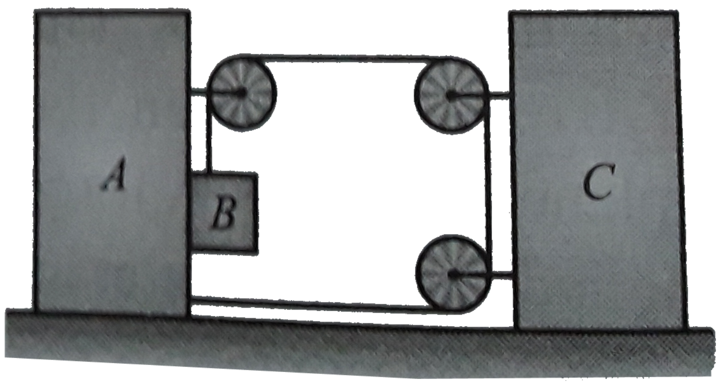
13. In the arrangement shown in figure pulleys are mass of block A,b and C is $m_1 = 5kg m_2 = 4kg$ and

$m_3 = 2.5kg$ respectively .Co-efficient acceleration of friction for both the plane is $\mu = 0.50$ Calculate acceleration of which block when system is released from rest



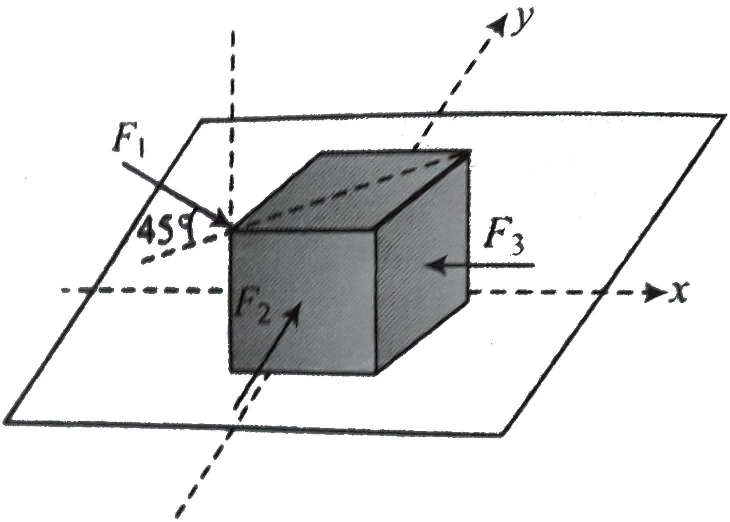
Watch Video Solution

14. In the arrangement shown in figure mass of blocks A,B and C is $18.5kg.8kg$ and $1.5kg$ respectively . The bottom surface of A is A is smooth while coefficient of friction that between block A and C is $\mu_1 = 1/3$ between B and floor is $\mu_2 = 1/5$ System is relased from rest $r = 0$ and pulley are light and friction Calculate acceleration of block A ,B and C



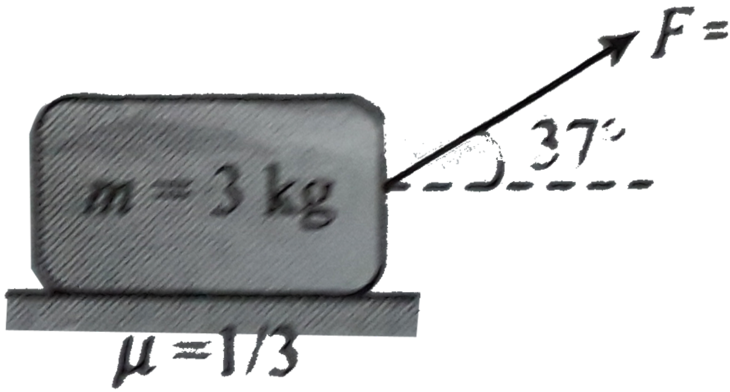
Watch Video Solution

15. A cubical block is experiencing three forces $F_1 = 20N$ acts at angle 45° with horizontal and lies in diagram plane of the cube $F_2 = 30N$ acts along y- axis and $F_3 = 40N$ acts in x- direction as shown in fig find the friction force acting on the block if it is at rest



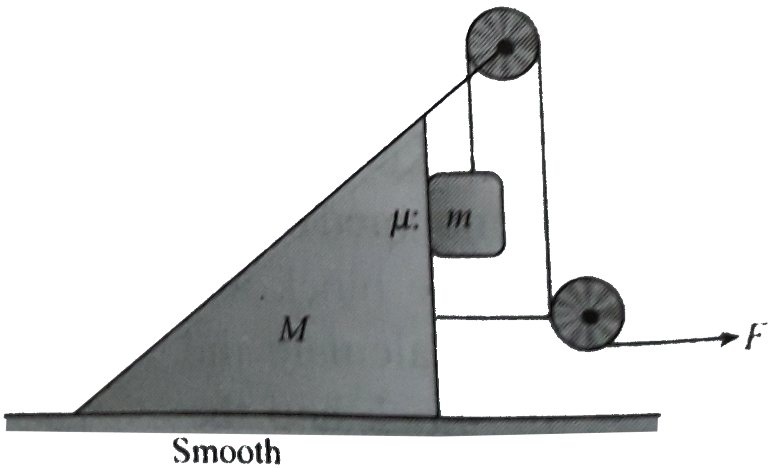
Watch Video Solution

16. A block of mass $m = 3kg$ is resting over a rough horizontal surface having coefficient of friction $\mu = 1/3$ The block is pulled to the right by appliying a force F inclined at angle 37° with the horizontal as shown in fig .The forceincreases with time according to law $F = 2r$ newton Calculate its velocity v at $t = 10s\left(g = 10ms^{-2}\right)$



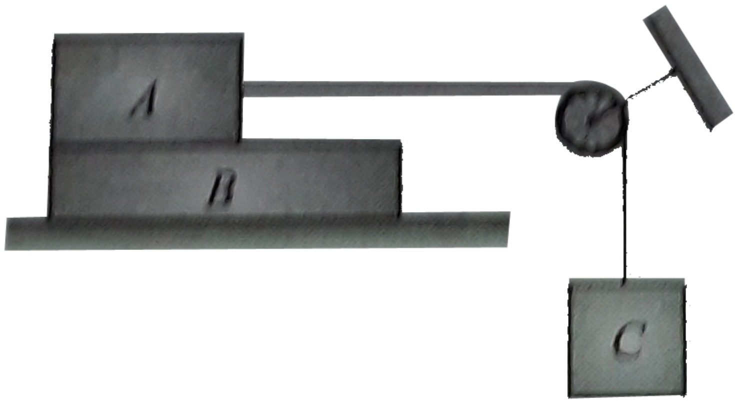
Watch Video Solution

17. The mass of the wedge shown in fig is $M = 4kg$ and that of block is $m = 1kg$ The horizontal surface beneath the wedge is smooth while the wedge and block is equal to $\mu = 0.1$ Taking $g = 9.8ms^{-2}$ and assuming pulley to be massless and friction . calculate maximum possible value of force F upto while the block will remain stationary relative to the wedge



Watch Video Solution

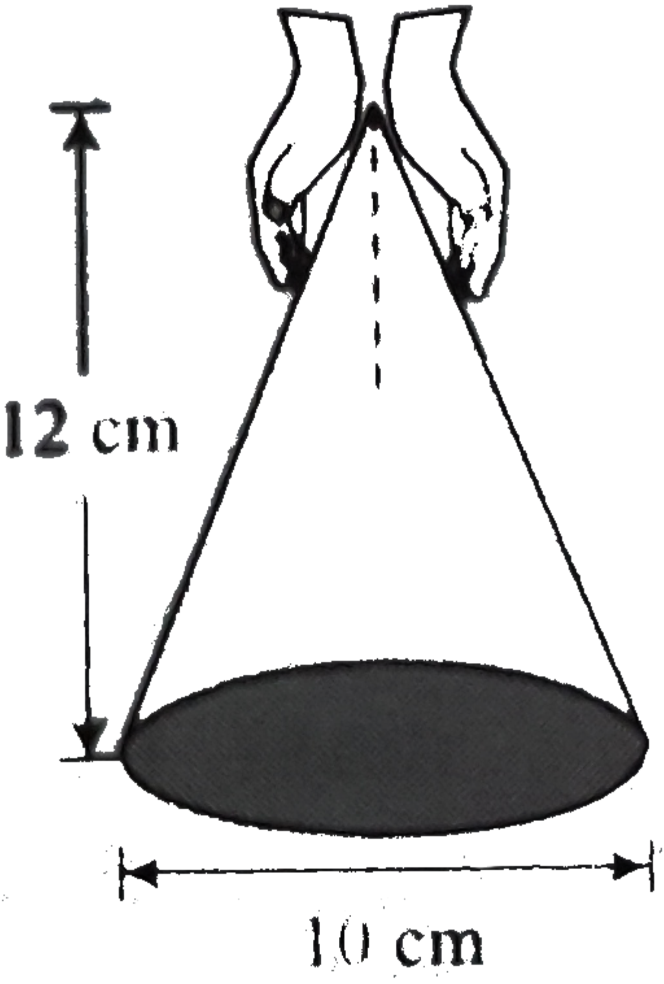
18. Calculate the maximum possible value of mass m_0 of block C upto which blockA will remain stationary relative to B .If the length of block B is equal to $l = 50cm$ and mass of block C is $m_3 = 2m_0$ then calculate the time l when block A will topple from block B .If the system is released from rest



Watch Video Solution

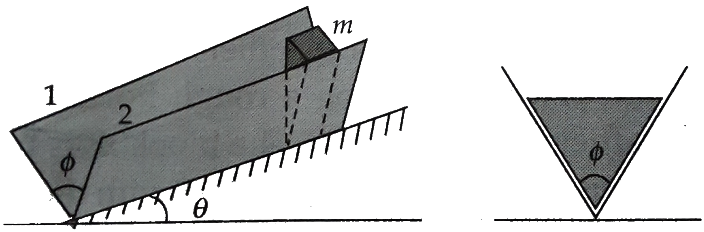
19. With two hands you hold a cone motionless upside doen , as shown in figure The mass of the cone is

$(m = 1kg)$ and the coefficient of static friction between you fingers and the cone is $(\mu = 0.5)$ what is the minimum normal force you must applywith each hand in order to hold up the cone? Consider only translational equilibruim



Watch Video Solution

20. A prismatic block of mass m is kept on a groove . The bottom line of the groove makes an angle θ with horizontal . The angle between is ϕ If the groove is symmetrical with the normal to the inclined plane containing the bottom line of the groove



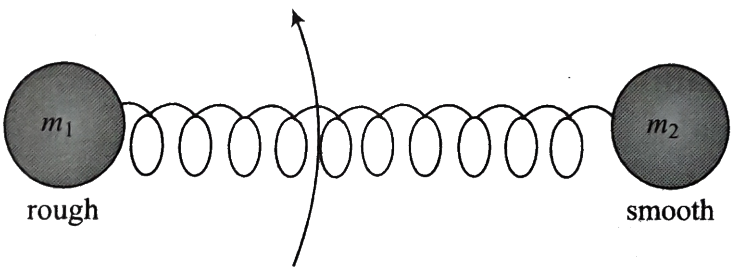
a. Find the coefficient of friction μ_0 between the block and groove so that the block begins to slide.

b. If $\mu > \mu_0$ find the friction force on the block.

c. If $\mu < \mu_0$ find the acceleration of the block.

Watch Video Solution

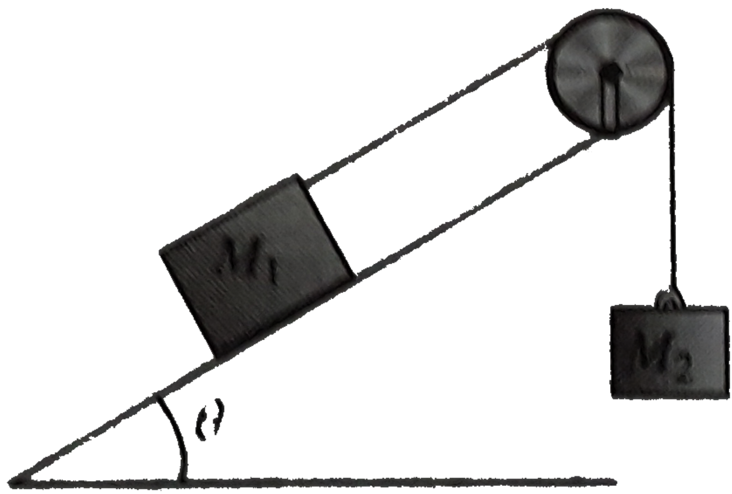
21. A block of mass m_1 connected with another of mass m_2 by a light spring of natural length l_0 and stiiffness k is kept stationary on a rough horizontal surface . The coefficient of friction between m_1 and surface is μ and the block m_2 is smooth .The block m_2 is moved with certain the block m_1 in horizontal plane Find the (a) maximum to m_1 and (b) acceleration of m_2 in part(a)



Watch Video Solution

Single Correct

1. Two block of masses M_1 and, M_2 are connected with a string which passed over a smooth pulley . The mass M_1 is placed on a tough inclined plane as shown in figure .The coefficient of friction between and block and the inclined plane is μ what should be the minimum mass M_2 so that the block M_1 slides upwards?



A. $M_2 = M_1(\sin\theta + \mu\cos\theta)$

B. $M_2 = M_1(\sin\theta - \mu\cos\theta)$

C. $M_2 = \dfrac{M_1}{\sin\theta + \mu\cos\theta}$

D. $M_2 = \dfrac{M_1}{\sin\theta - \mu\cos\theta}$

Answer: a

Watch Video Solution

2. A box of mass $8kg$ placed on a rough inclined plane of inclened θ its downward motion can be prevented by applying an upward pull F and it can be made to slide upward appliying a force $2F$ .The coefficient of friction between the box and the inclined plane is

A. $(\tan\theta)/3$

B. $3\tan\theta$

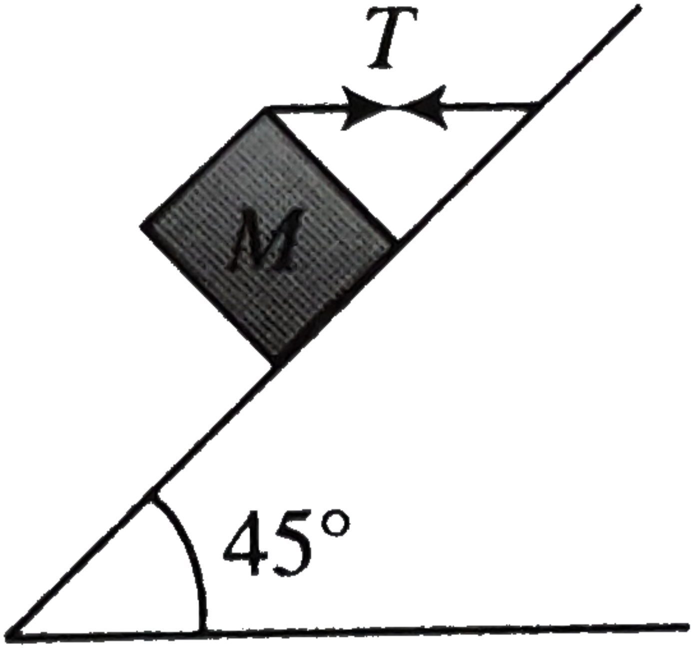
C. $(\tan\theta)/2$

D. $2\tan\theta$

Answer: A

Watch Video Solution

3. A block of mass $15kg$ is resting on a rough inclined plane as shown in figure ,The block is tied by a horizontal string which has a tension $50N$ The coefficient of contact is



A. $1/2$

B. $2/3$

C. $3/4$

D. $1/4$

Answer: A

Watch Video Solution

4. A horizontal force just sufficient to move a body of mass $4kg$ lying on a rought horizontal surface is applied on it .The coefficient of static and kinetic friction the body and the surface are 0.8 and 0.6 respectively If the force contines to act even after the block has started moving the acceleration of the block in ms^{-2} is $\left(g = 10ms^{-2}\right)$

A. $1/4$

B. $1/2$

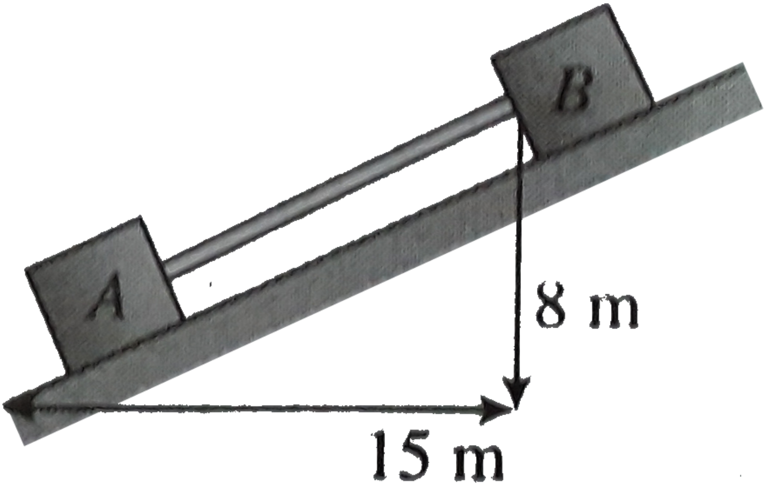
C. 2

D. 4

Answer: c

Watch Video Solution

5. Blocks A and B in the Fig are connected by a bar of negligible weight .Mass of each block is $170kg$ and $\mu_A = 0.2$ and $\mu_B = 0.4$ where μ_A and $\mu_B$are the coefficient of limiting friction between bloock and plane calculate the force developed in the bar $(g = 10ms^{-2})$



A. $150N$

B. $75N$

C. $200N$

D. $250N$

Answer: a

Watch Video Solution

6. The upper half of an inclined plane with inclination ϕ is perfectly smooth while the lower half is rough. A body starting from rest at the top will again come to rest at the bottom if the coefficient of friction for the lower half is given by

A. $2\tan\phi$

B. $\tan\phi$

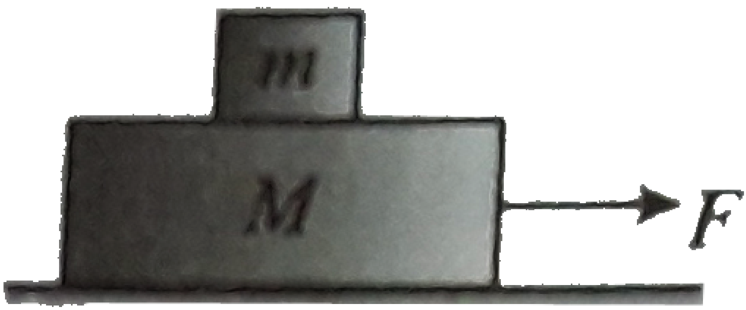
C. $2\sin\phi$

D. $2\cos\phi$

Answer: a

Watch Video Solution

7. A block of mass m is placed on another block of mass M which itself is lying on a horizontal surface .The coefficient of friction between two blocks is $\mu_1$and that between the block of mass M and horizontal surfece is μ_2 What maximum horizontal force can be applied to the lower block move without separation?



A. $(M+m)(\mu_2-\mu_1)g$

B. $(M-m)(\mu_2-\mu_1)g$

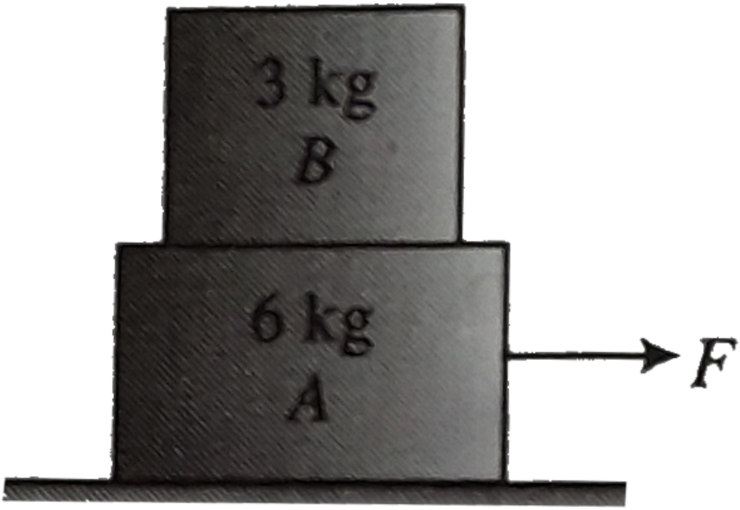
C. $(M-m)(\mu_2+\mu_1)g$

D. $(M+m)(\mu_2+\mu_1)g$

Answer: d

Watch Video Solution

8. Two block A and B of masses $6kg$ and $3kg$ rest on a smooth horizontal surface as shown in figure If coefficient of friction between A and Bb is 0.4 the maximum horizontal force which can make them move without separation is



A. $72N$

B. $40N$

C. $36N$

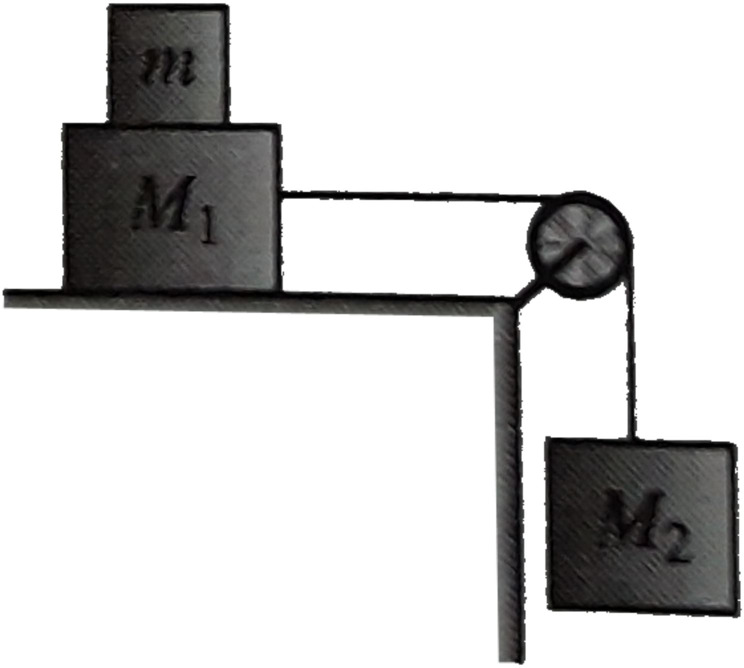
D. $20N$

Answer: C

Watch Video Solution

Watch Video Solution

9. Two block of masses M_1 and M_2 are connected with a string passing over a pulley as shown in figure The block M_1 lies on a horizontal surface friction between the block M_1 and the horizontal surface is μ The system accelerates. What additional mass m should be plased on the block M_1 so that the system does not accelerate ?



A. $\frac{M_2 - M_1}{\mu}$

B. $\frac{M_2}{\mu} - M_1$

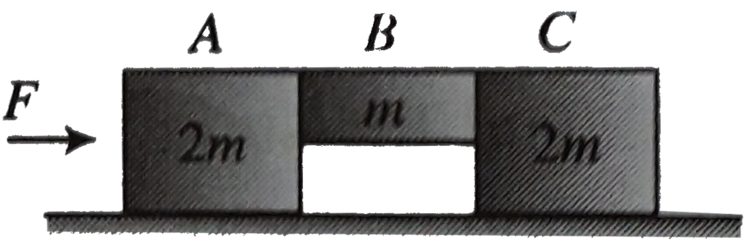
C. $M_2 - \frac{M_1}{\mu}$

D. $(M_2 - M_1)\mu$

Answer: b

Watch Video Solution

10. A system is pushed by a force F as shown in figure All surfaces are smooth except between B and C is μ. Minimum value of F to prevent block B from downward slipping is



A. $\left(\frac{3}{2\mu}\right)mg$

B. $\left(\frac{5}{3\mu}\right)mg$

C. $\left(\frac{5}{2}\right)\mu mg$

D. $\left(\frac{3}{2}\right)\mu mg$

Answer: B

Watch Video Solution

11. A body of mass M is resting on a rough horizontal plane surface the coefficient of friction being equal to μ At $t = 0$ a horizontal force $F = F_0 t$ starts acting on it , where F_0 is a constant find the time T at which the motion starts?

A. $\mu Mg / F_0$

B. $mg / \mu F_0$

C. $\mu F_0 Mg$

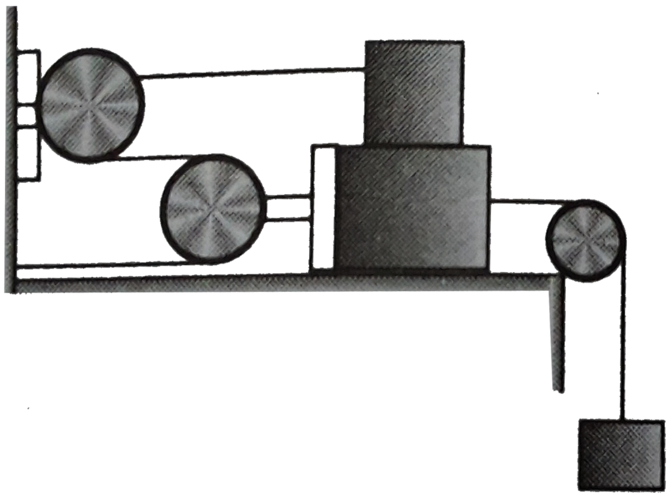
D. None of these

Answer: a

Watch Video Solution

12. The maximum value of mass of block C so that neither A nor B moves is (given that mass of A is $100kg$ and the of B $140kg$. Pulleys are smooth and friction coefficient between A and B and horizontal surface

$\mu = 0.3$)(Taking $g = 10 ms^{-2}$)



A. $210 kg$

B. $190 kg$

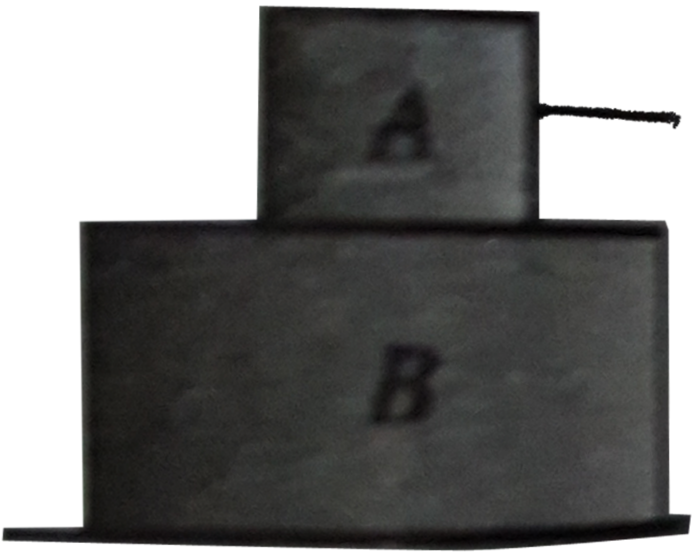
C. $185 kg$

D. $162 kg$

Answer: d

Watch Video Solution

13. A block A of mass $2kg$ is placed over smooth block B of mass $4kg$ which is placed over a smooth horizontal floor The coefficient of friction between A and B is 0.4 when a horizontal forces of magnitude $10N$ is applied on A the acceleration of block of A and B are



A. $1ms^{-2}$ and $2ms^{-2}$,respectively

B. $5ms^{-2}$ and $2.5ms^{-2}$,respectively

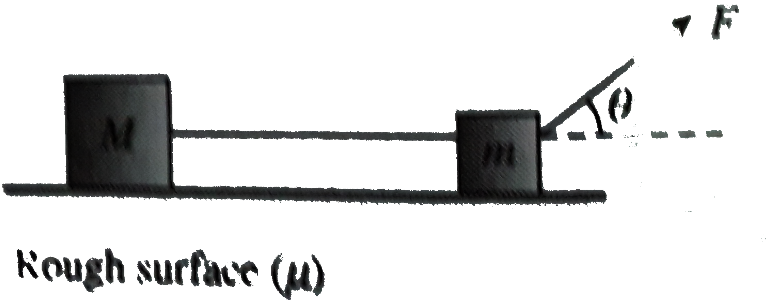
C. Both the block will moves together with acceleration $1/3ms^{-2}$

D. Both the block will moves together with acceleration $5/3ms^{-2}$

Answer: d

Watch Video Solution

14. Two block m and M tied together with an inextensible string are placed at rest on a rought horizontal surface with coefficient of friction μ The block m is pulled with a variable force F at a varying angle θ with the horizontal .The value of θ at which the least value of F is required to move the blocks given by



A. $\theta = \tan^{-1} \mu$

B. $\theta > \tan^{-1} \mu$

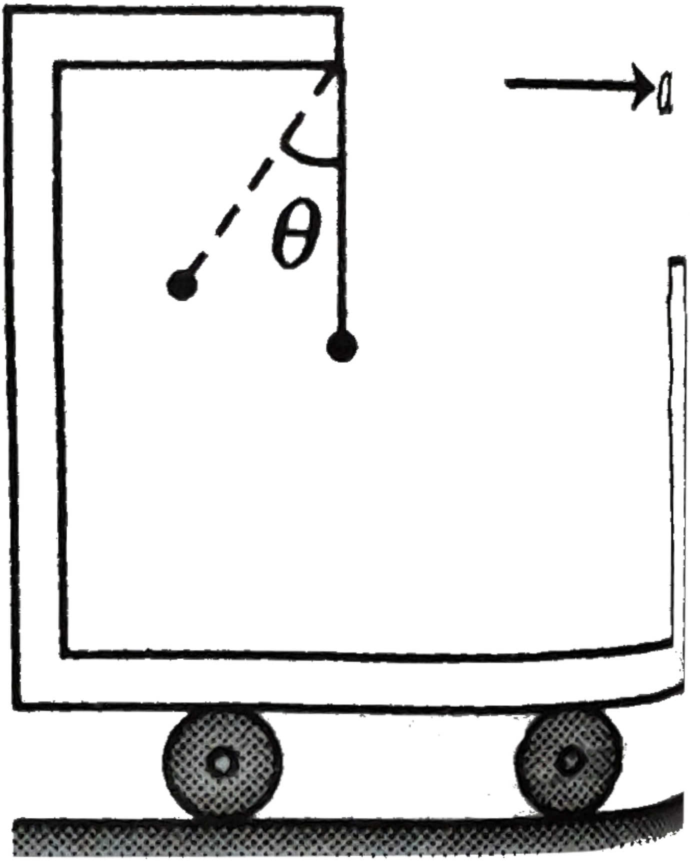
C. $\theta < \tan^{-1} \mu$

D. Insufficient data

Answer: a

Watch Video Solution

15. A trolley has a simple pendulum suspended from a frame fixed to itsa desk A block B is in contact on its vertical and The trolley is on horizontal rails and acceleration toward the right such that the block is just orevented from falling The value of coefficient of friction between A and B is 0.5 to the vertical is



A. $\tan^{-1}\left(\frac{1}{2}\right)$

B. $\tan^{-1}(3)$

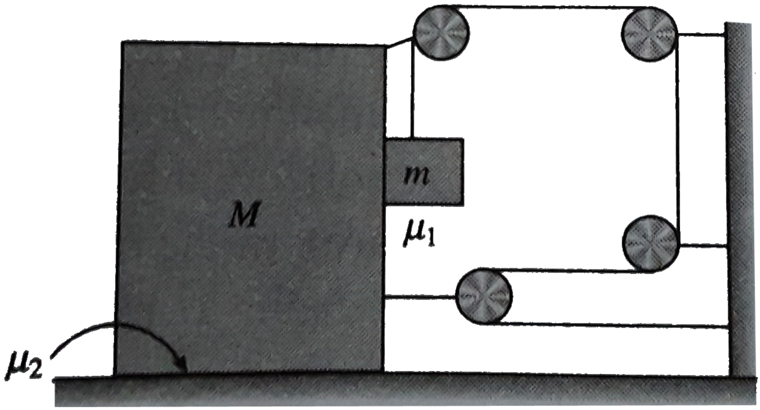
C. $\tan^{-1}(\sqrt{2})$

D. $\tan^{-1}(2)$

Answer: D

Watch Video Solution

16. Two blocks M and m are arranged as shown in the diagram The coefficient of friction between the block is $\mu_1 = 0.25$ and between the ground and M is $\mu_2 = \frac{1}{3}$ If $M = 8kg$ then find the value of m so that the system will remain at rest



A. $4/3kg$

B. $8/9kg$

C. $1kg$

D. $8/5kg$

Answer: c

Watch Video Solution

17. A body of mass m is launched up on a rough inclined plane making an angle 45° with horizontal If the time of descent between plane and body is

A. $\frac{2}{5}$

B. $\frac{3}{5}$

C. $\frac{3}{4}$

D. $\frac{4}{5}$

Answer: b

Watch Video Solution

18. A block of mass m is placed at rest on a horizontal rough surface with angle of friction ϕ. The block is pulled with a force F at an angle θ with the horizontal. The minimum value of F required to move the block is

A. $\frac{F}{M}(\cos\phi - \sin\phi) - \mu g$

B. $\frac{\mu F}{M}\cos\phi$

C. $\frac{F}{M}(\cos\phi + \sin\phi) - \mu g$

D. $\frac{F}{M}\sin\phi$

Answer: c

Watch Video Solution

19. The time taken by a body to slide down a rough 45° inclined plane is twice that required to slide down a smooth 45° inclined plane. The coefficient of kinetic friction between the object and rough plane is given by

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

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

C. $1-\frac{1}{n^2}$

D. $\frac{1}{2-n^2}$

Answer: c

Watch Video Solution

20. A passenger is traveling a train moving at $40ms^{-1}$ Hit suitcase is kept on the berth ,The drive of train applies breaks such that the speed of the train decreases at a constant rate to $20ms^{-1}$ in $5s$ What should be the minimum coefficient of friction between the suitcase and the berth if the suitcase is not to slide during and retardation of the train ?

A. 0.3

B. 0.5

C. 0.1

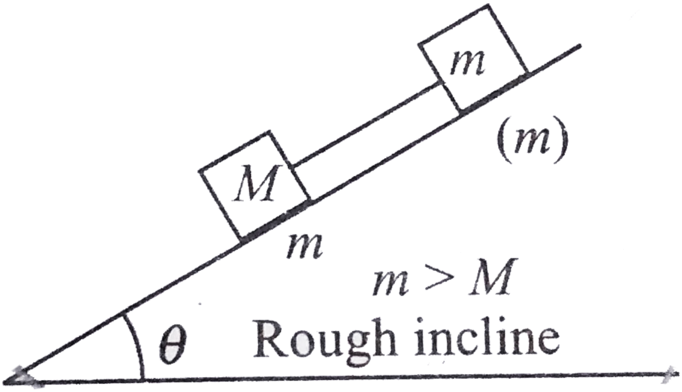
D. 0.2

Answer: b

Watch Video Solution

Watch Video Solution

21. In figure the tension in the rope (rope is light) is



A. $(M+m)g\sin\theta$

B. $(M+m)g\sin\theta-\mu mg\cos\theta$

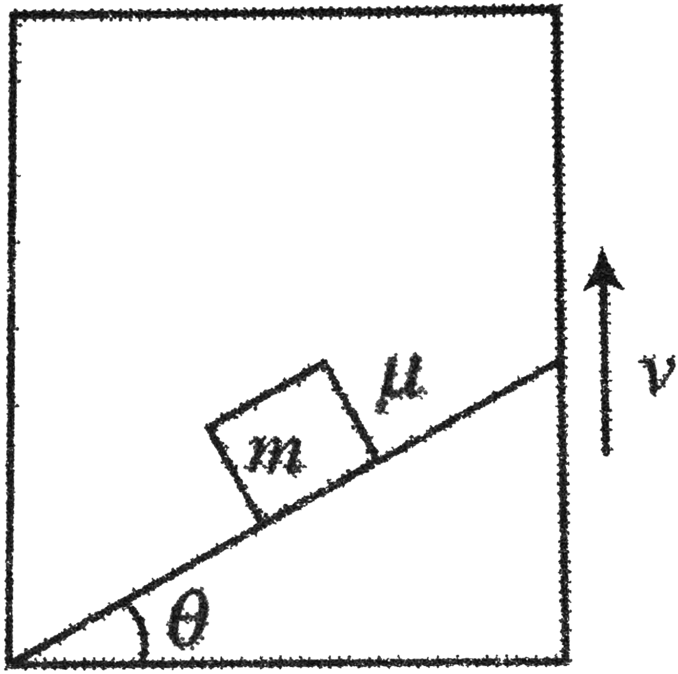
C. Zero

D. $(M+m)g\sin\theta$

Answer: c

Watch Video Solution

22. An inclined plane is moving up with constant velocity v. A block kept on incline is at rest. Calculate the work done by gravity, friction force, and normal reaciton on block in time interval of t.



A. The contact force between block and inclined is parallel to the incline

B. The contact force between block and inclined is of the magnitude $m(g+a)$

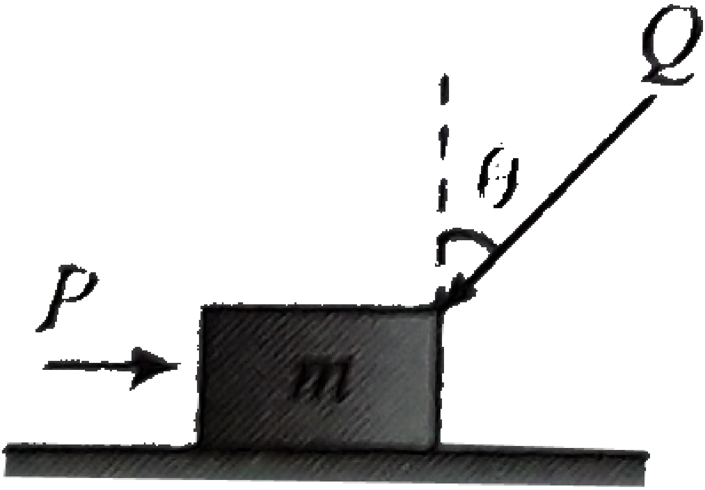
C. The contact force between block and inclined is perpendicular to the incline

D. The contact force is of the magnitude $mg\cos\theta$

Answer: b

Watch Video Solution

23. A block of mass m lying on a horizontal plane , is acted upon by a horizontal force p and another force Q inclined at an angle θ to the vertical .The block will remain in equilibrium if the coefficient of friction between it and the surface is (assume $p > Q$)



A. $(P \sin \theta - Q) / (mg - \cos \theta)$

B. $(P - Q \sin \theta) / (mg + \cos \theta)$

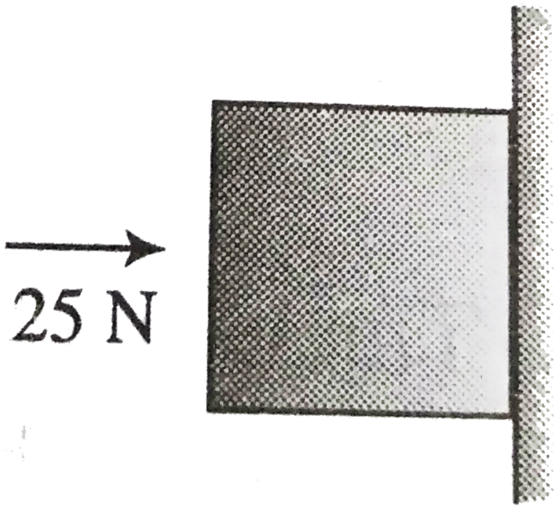
C. $(P \cos \theta + Q) / (mg - \cos \theta)$

D. $(P + Q \sin \theta) / (mg + Q \cos \theta)$

Answer: b

Watch Video Solution

24. A horizontal force of $25N$ is necessary to just bold a block stationary against between the block and the wall is 0.4 The weight of the block is



A. $2.5N$

B. $20N$

C. $10N$

D. $5N$

Answer: c

Watch Video Solution

25. A solid block of mass $2kg$ is resting inside a cube shown in figure The cube is moving with a velocity $\hat{v} = 5\hat{i} + 2\hat{j}ms^{-1}$ If the coefficient of friction between the surface of cube and block is 0.2 then the force of friction between the block and cube is

A. $10N$

B. $4N$

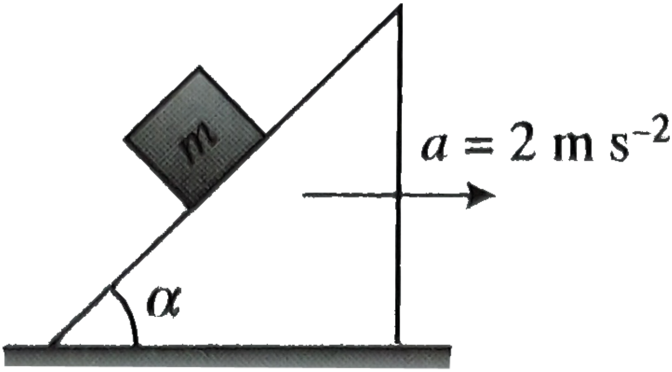
C. $14N$

D. Zero

Answer: d

Watch Video Solution

26. A block of mass m is lying on a wedge having inclination angle $\alpha = \tan^{-1}\left(\frac{1}{5}\right)$ wedge is moving with a constant acceleration $a = 2ms^{-2}$ The minimum value of coefficient of friction μ so that m remain stationary w.r.t. wedge is



A. $2/9$

B. $5/12$

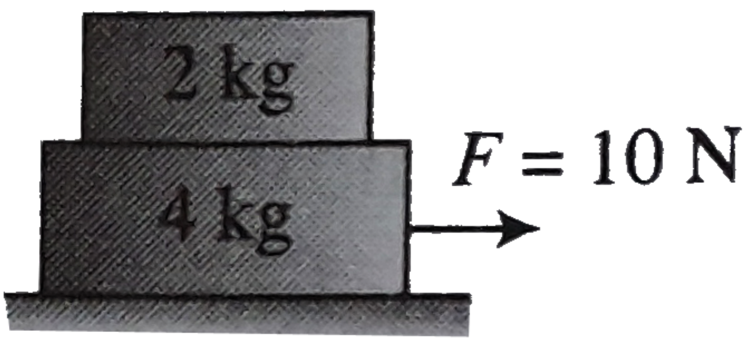
C. $1/5$

D. $2/5$

Answer: b

Watch Video Solution

27. In Fig the block are at rest a force of $10N$ act on the block of $4kg$ mass .The coefficient of staic friction and the coefficient of kinetic friction are $\mu_s = 0.2$ and $\mu_s = 0.15$ for both the surface in contact The magnitudeof frcition force acting between the surface of contact between the $2kg$ and $4kg$ block in this situation is



A. $3N$

B. $4N$

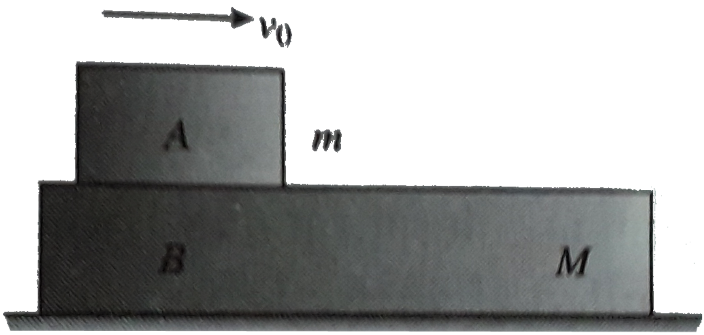
C. $3.33N$

D. Zero

Answer: d

Watch Video Solution

28. The masses of the block A and B are m and M Between A and B there is a constant force F but B can slide frictionlessly on the horizontal surface A is set in motion with velocity v_0 while B is at rest . What is the distance moved by A relative to B before they move with the same velocity



A. $\dfrac{mMv_0^2}{F(m-M)}$

B. $\dfrac{mMv_0^2}{2F(m-M)}$

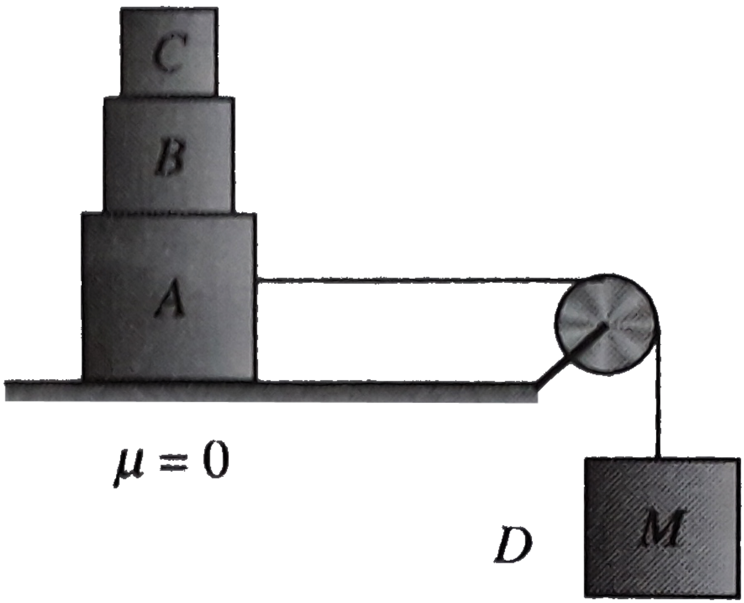
C. $\dfrac{mMv_0^2}{F(m+M)}$

D. $\dfrac{mMv_0^2}{2F(m+M)}$

Answer: D

Watch Video Solution

29. There block A B ,and C of equal mass m are placed one over the other on a frictionless surface (table) as shown in figure The coefficient of friction between any blocks A ,B and C is μ The maximum value of mass of block D so that the blocks A,B and C move without slipping over each other is



A. $\frac{3m\mu}{\mu+1}$

B. $\dfrac{3m(1-\mu)}{\mu}$

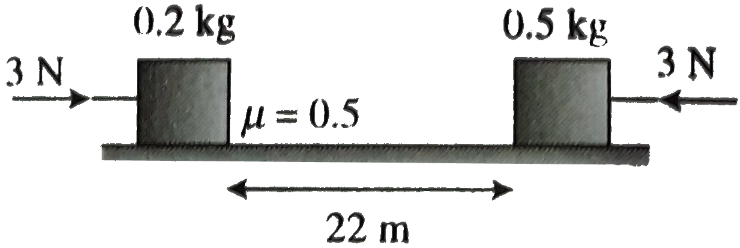
C. $\dfrac{3m(1+\mu)}{\mu}$

D. $\dfrac{3m\mu}{(1-\mu)}$

Answer: d

Watch Video Solution

30. Two blocks of masses of $0.2kg$ and $0.5kg$ which are placed $22m$ apart on a horizontal surface $(\mu = 0.5)$ are acted upon by two forces of magnitude $3N$ each as shown in figure in time $t = 0$ Then the time t at which they collide with each other is



A. $1s$

B. $\sqrt{2}s$

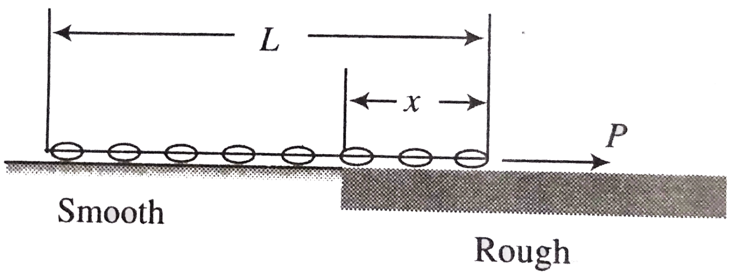
C. $2s$

D. None

Answer: C

Watch Video Solution

31. A chain of length L is placed on a horizontal surface as shown in figure. At any instant x is the length of chain on rough surface and the remaining portion lies on smooth surface. Initially $x = 0$. A horizontal force p is applied to the chain (as shown in figure) in the duration from $x = 0 \rightarrow x = L$. For chain to move with constant speed



A. The magnitude of P should increases with time

B. The magnitude of P should decreases with time

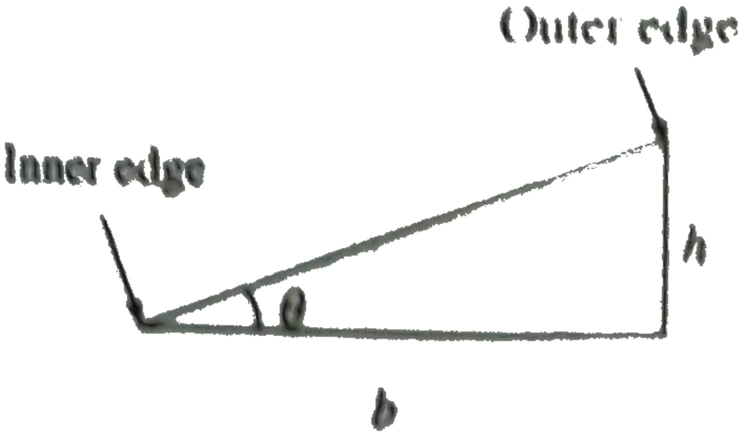
C. The magnitude of P should increases first and then decrease with time

D. The magnitude of P should decrease first and then increases with time

Answer: A

Watch Video Solution

32. A vehicle in moving with a velocity v on a carved total of width b and radius of curvature B For counteractiong the contritugal force on the vehicle , the difference in elevation required in between the outer and linner edges of the rod is



A. v^3b / Rg

B. vb / Rg

C. vb^2 / Rg

D. $vb / R'g$

Answer: a

Watch Video Solution

33. A circular road of radius $1000m$ has hanging angle 45° The maximum safe speed (in ms^{-1} of a car having a mass $2000kg$ will be (if the coefficient of friction between tying and road is 0.3)

A. 172

B. 124

C. 99

D. 86

Answer: A

Watch Video Solution

34. A circular table of radius $0.5m$ has a smooth diametrical groove. A half of mass $90g$ is is placed inside the groove along with a spring constant $10^2 Ncm^{-1}$ One end of the spring is tied to the table and the other end to the ball The ball is at a distance of $.0.1m$ from the center when the table is at rest On rotating the table with a constant angular frequency of $10^2 \frac{rad}{s^{-1}}$ the ball moves away from the center by a distance nearly equal to

A. $10^{-1}m$

B. $10^{-2}m$

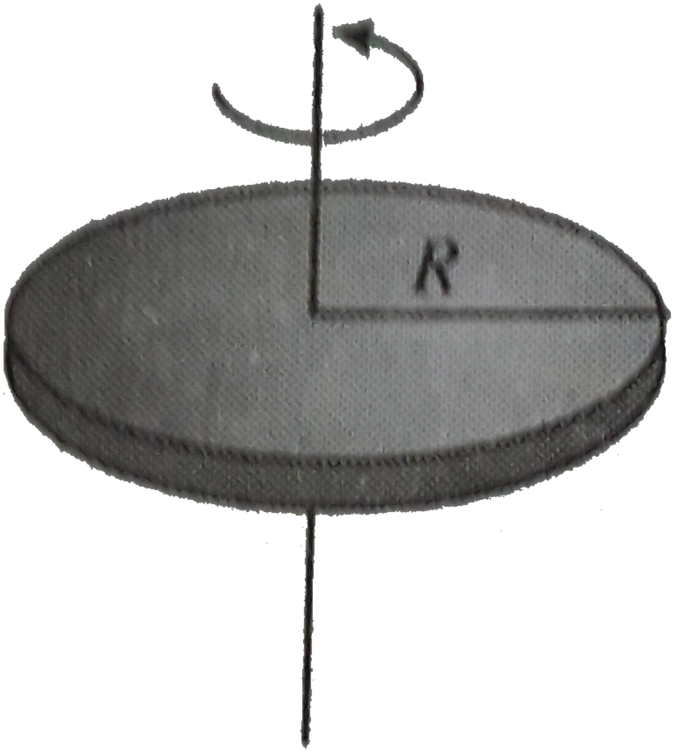
C. $10^{-3}m$

D. $2 \times 10^{-1}m$

Answer: b

Watch Video Solution

35. A disc of radius R rotates from rest about a vertical axis with a constant angular acceleration such that a coin placed with a tangenitial between a as shown in figure If the coefficient of static friction between the coin and disc is μ_s .Find the velocity of the before it start sliding relative as the disc



A. 0.1

B. 0.2

C. 0.3

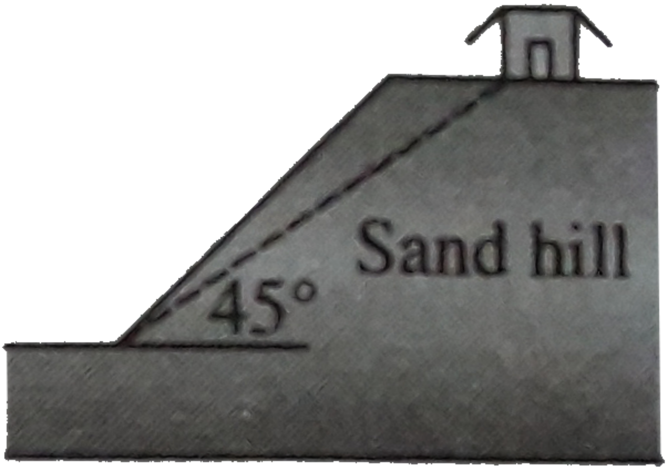
D. 0.4

Answer: b

Watch Video Solution

36. A house is built on the top of a hill with 45° slope Due to the sliding of meterial and sand top from top to the bottom of till , the slip angle has been redaced if the coefficient of static friction between sand particles is 0.75 what is the final angle attated by bill ?

$(\tan^{-1} 0.75 = 37^\circ)$



A. 8°

B. 45°

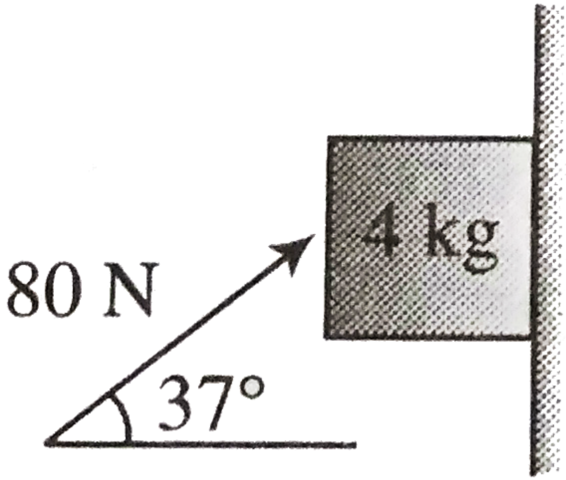
C. 37°

D. 30°

Answer: c

Watch Video Solution

37. A block of mass $4kg$ is pressed againest the wall by a force of $80N$ as shown in figure Determine the value of the friction force and block's acceleration (Take $\mu_s = 0.2, \mu_s = 0.15)$



A. $8N, 0ms^{-2}$

B. $32N, 6ms^{-2}$

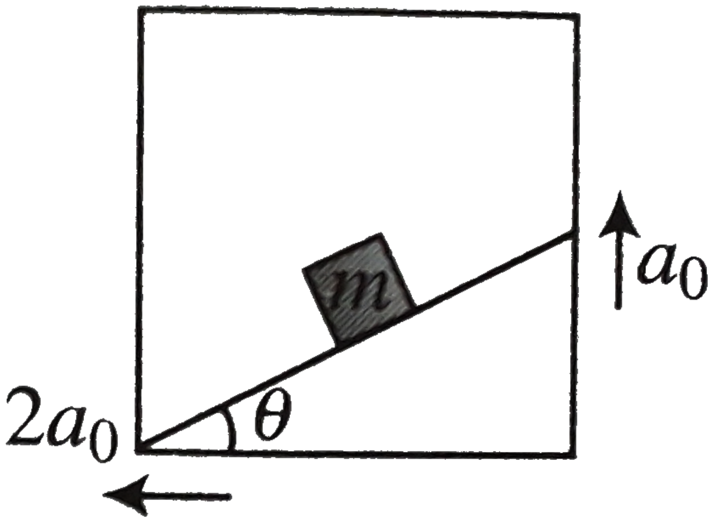
C. $8N, 6ms^{-2}$

D. $32N, 2ms^{-2}$

Answer: a

Watch Video Solution

38. For the situation shown in Fig the block is sationary w.r.t.inclined fixed in an elevator the alevator is having an acceleration of $\sqrt{5}a_0$ whose components are shown in the figure the surface is rought and coefficient of static friction between the inclined and block is μ Determine the magnitude of force excerted by inclined on the block (Take$a_0 = g/2$ and $\theta = 37^\circ$, $\mu_s = 0.2$)



A. $\dfrac{mg}{10}$

B. $\dfrac{9mg}{25}$

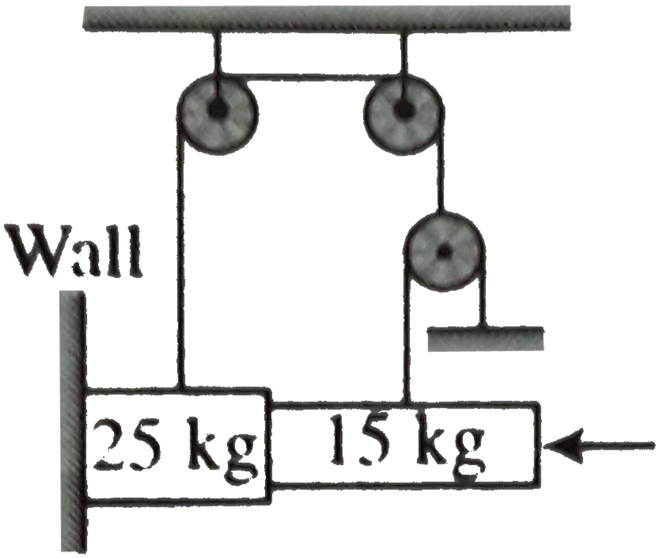
C. $\dfrac{3mg}{25} \times \sqrt{41}$

D. $\dfrac{\sqrt{13}mg}{2}$

Answer: d

Watch Video Solution

39. If the coefficient of friction between all surface figure is 0.4 then find the minimum force F to have equilibrium of the system.



A. $62.5N$

B. $150N$

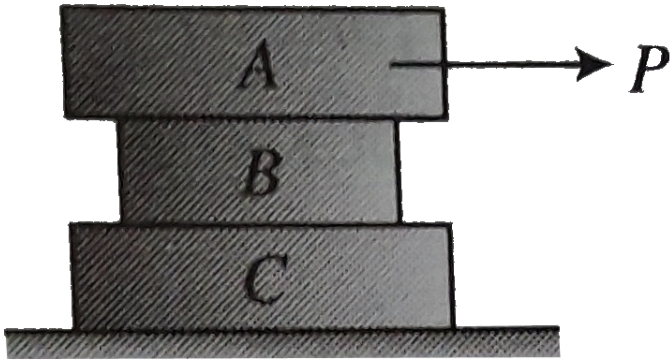
C. $31.25N$

D. $50N$

Answer: c

Watch Video Solution

40. Find the least horizontal force P to start motion of any part of the system of the three blocks resting upon one another as shown in figure The weights of blocks are $A = 300N, B = 100N$ and $C = 200N$ .Between A and B , the coefficient of friction is 0.3 between B and C is 0.2 and between C and the ground is 0.1



A. $60N$

B. $90N$

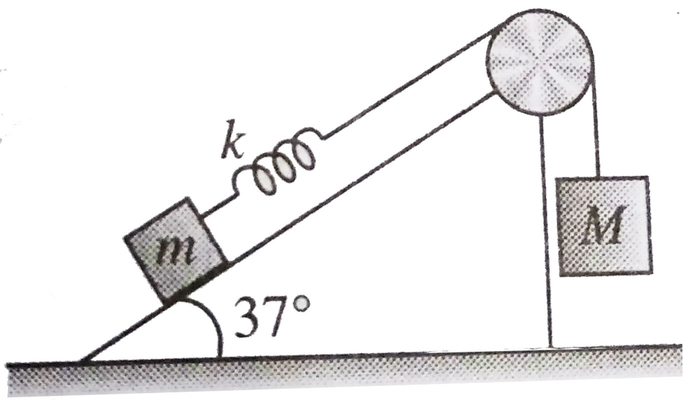
C. $80N$

D. $70N$

Answer: a

Watch Video Solution

41. A block of mass m attached with a massless spring of force constant k The block is placed over a rought inclined surface for which the coefficient of friction is $0.5M$ is released from rest when the spring was unstretched The minimum to move the value of M required to move the block m up the plane is (neglect mass of spring and pulley and friction in pulley)



A. $m/2$

B. $m/3$

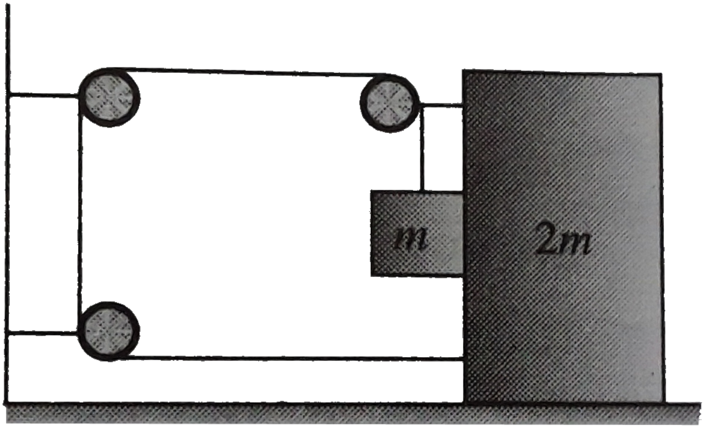
C. $m/4$

D. None of these

Answer: a

Watch Video Solution

42. In the system shown in Fig the friction coefficient between ground and bigger block is μ There is no friction between both the block .The string connecting both the block is light all three pulley are light and frictionless Then the minimum limiting value of μ so that the system remain in equilibrium , is



A. $\frac{1}{2}$

B. $\frac{1}{3}$

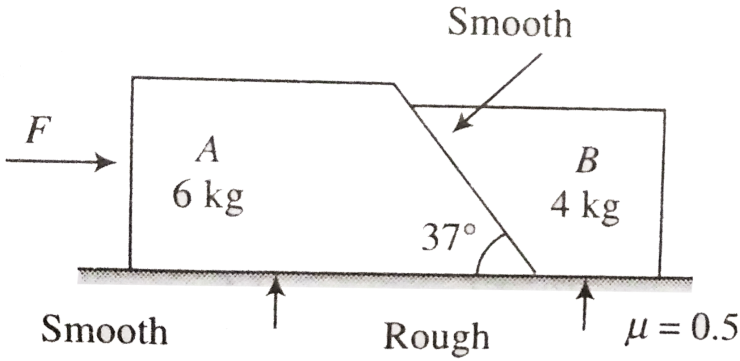
C. $\frac{2}{3}$

D. $\frac{3}{2}$

Answer: C

Watch Video Solution

43. Two block A of $6kg$ and B of $4kg$ are placed in contact with each other as shown in figure



There is no friction A and ground and between both the blocks .The coefficient of friction between B and ground is 0.5 A horizontal force F is applied on A find the minimum and maximum value of F which can be applied so that both blocks can move combinely without any relative between them.

A. $10N$, $50N$

B. $12N, 50N$

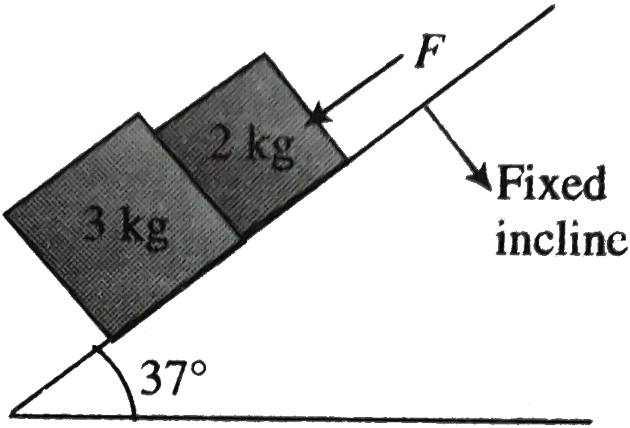
C. $12N, 75N$

D. None of these

Answer: c

Watch Video Solution

44. Two blocks of masses $3kg$ and $2kg$ are placed side by side on an inclined as shown in figuire A force $F = 292A$ force $F = 20N$ is active on $2kg$ block along the inclined .The coefficient of friction between the block and the inclined is same and equal to 0.1 .Find the normal force exerted by $2kg$ block on $3kg$block



A. $18N$

B. $30N$

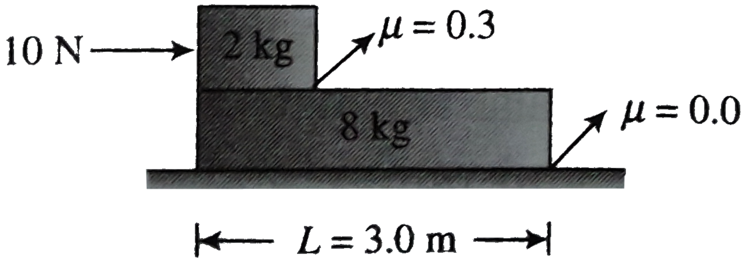
C. $12N$

D. $27.6N$

Answer: c

Watch Video Solution

45. Determine the time in which the smaller block reaches other end of bigger block in figure



A. $4s$

B. $8s$

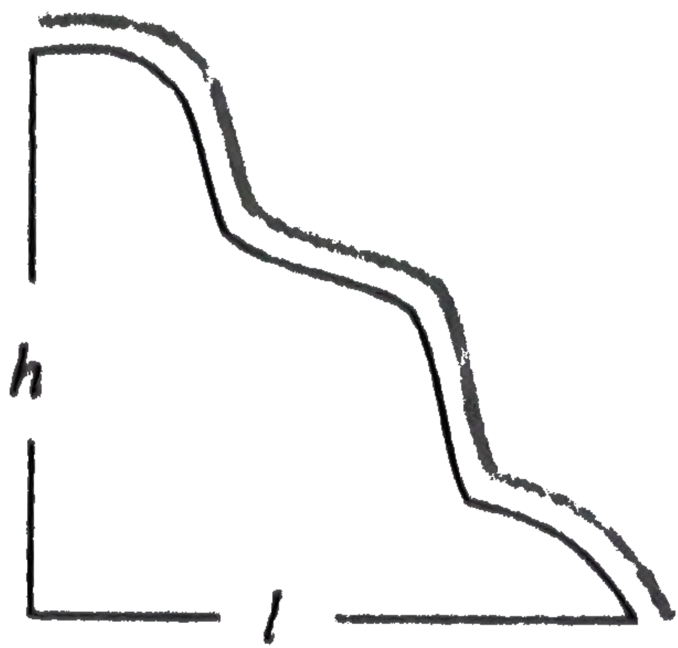
C. $2.19s$

D. $2.13s$

Answer: c

Watch Video Solution

46. A uniform chain is placed at rest on a rought surface of base length 1 and height h on an irregular suface as shown in figure Then the minimum coefficient of friction between the chain and the surface must be equal to



A. $\mu = \frac{h}{2l}$

B. $\mu = \frac{h}{t}$

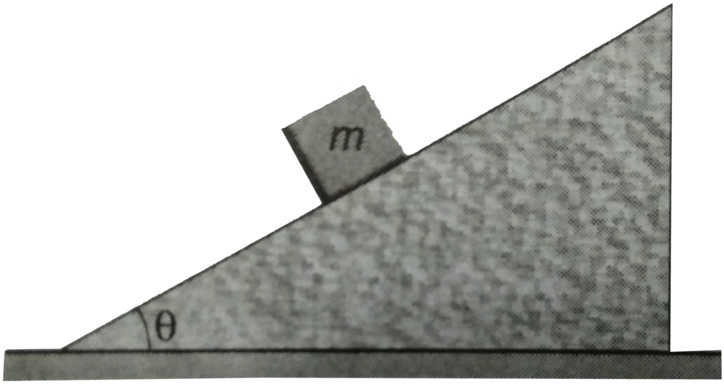
C. $\mu = \frac{3h}{2l}$

D. $\mu = \frac{2h}{3l}$

Answer: b

Watch Video Solution

47. A block of mass m is at rest on a rough wedge as shown in figure. What is the force exerted by the wedge on the block?



A. Net force applied by m on M is mg

B. Normal force applied by m on M is mg

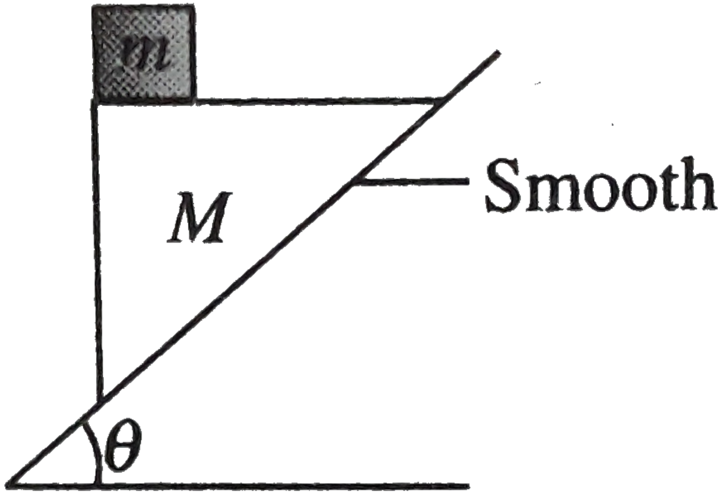
C. Force of friction applied by m on M is mg

D. None of the above

Answer: A

Watch Video Solution

48. A triangular prism of mass m placed on it is released from rest on a smooth inclined plane of inclination θ The block does not slip on the prism. Then



A. The accelaration of the prism is $g \cos \theta$

B. The accelaration of the prism is $g \tan \theta$

C. The minimum coefficient of friction between the block the block and the prism is $\mu_{\min} = \cot \theta$

D. The minimum coefficient of friction between the

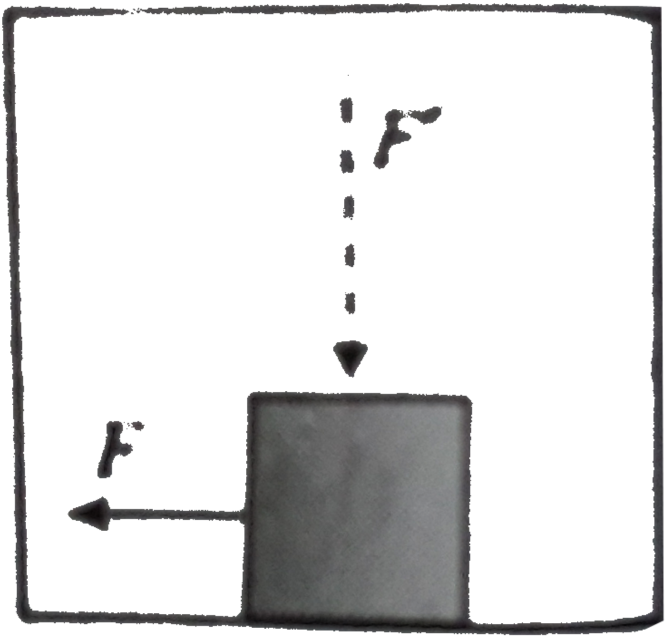
block the block and the prism is $\mu_{\min} = \tan\theta$

Answer: d

Watch Video Solution

49. A block of mass m is kept on the floor of a freely falling lift .During the free fall of the lift, the block is pulled horizontally with a force of $F = 5N, \mu_s = 0.1$

The friction force on the block will be



A. $5N$

B. $2N$

C. $2N$

D. $2N$

Answer: c

Watch Video Solution

50. If in pervious problem, an additional force $F' = 100N$ is applied in vertical direction as shown in figure The friction force acting on the block is

A. $zero$

B. $10N$

C. $20N$

D. $5N$

Answer: d

Watch Video Solution

51. A rectangular wooden box $10cm \times 20cm \times 40cm$ is size is kept on a horizontal surface with its of lergest are on the surface .A minimum force of $10N$ applied are on the surface sets the box in sliding motion along the surface If the surface, minimum force applied parallel to the surface , to set the box in motion , is

A. less than $10N$

B. May be greater or less than $10N$

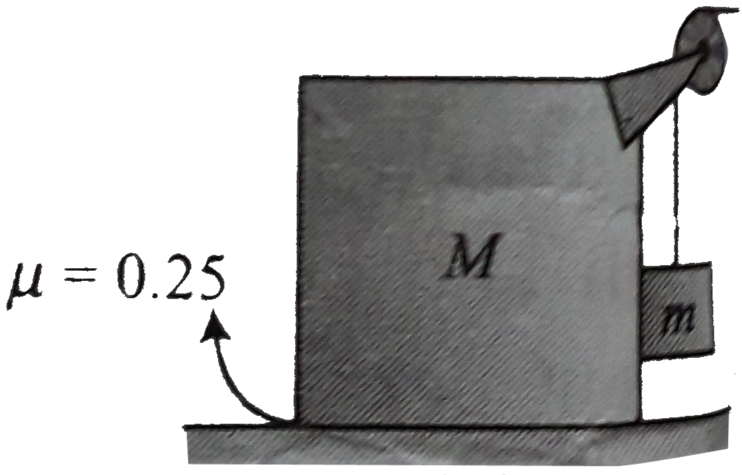
C. greater than $10N$

D. equal to $10N$

Answer: d

Watch Video Solution

52. Two blocks (m and M) are arranged as in figure Then is friction between ground and M only and other surface are frictionless between ground and $M is \mu = 0.25$ The maximum ratio of m and $M(m / M)$ so that the system remain is at rest



A. $\frac{1}{3}$

B. $\frac{1}{4}$

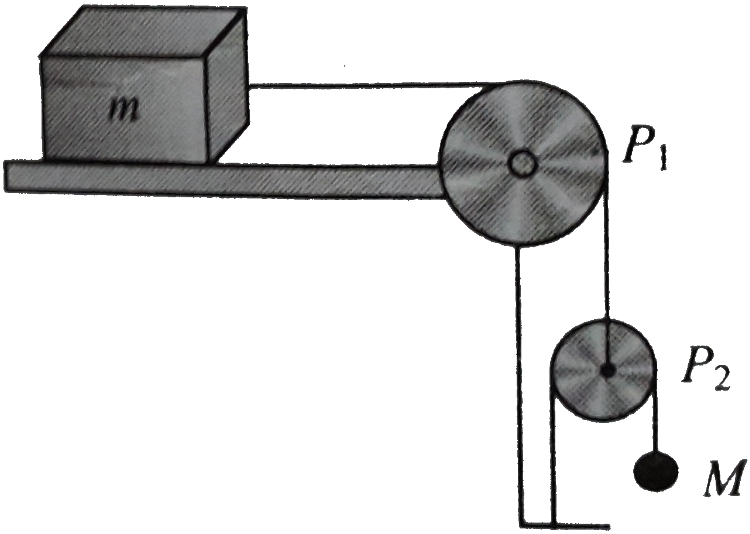
C. 3

D. none of these

Answer: a

Watch Video Solution

53. In the pulley arrangement shown in Fig the pulley p_2 is movable .Assuming the coefficient of friction between m and surface to be μ the minimum value of M for which m is at rest is



A. $M = \frac{\mu m}{2}$

B. $m = \frac{\mu M}{2}$

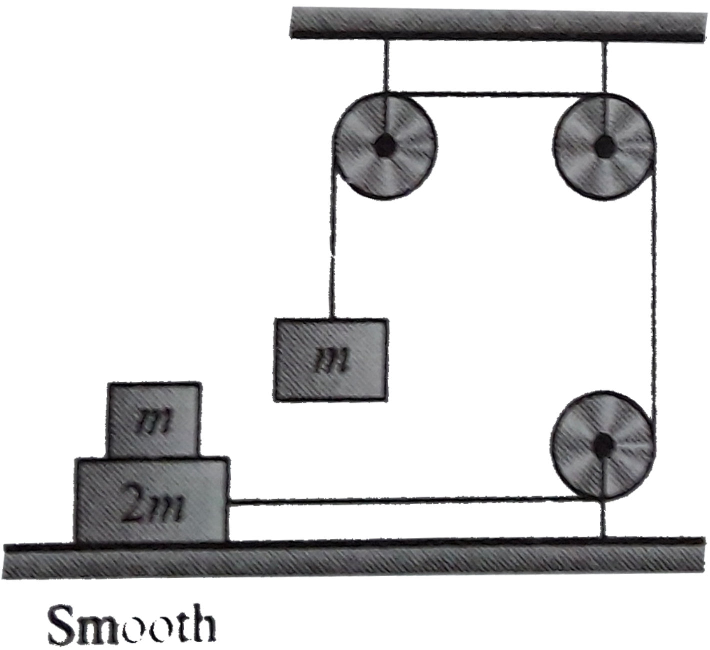
C. $M = \frac{m}{2\mu}$

D. $m = \frac{M}{2\mu}$

Answer: a

Watch Video Solution

54. In the arrangement shown in Fig there is no friction between of mass $2m$ and ground but there is friction between the block of masses m is stationary with respect to block of mass $2m$ The value of friction between m and $2m$is



A. $\frac{1}{2}$

B. $\frac{1}{\sqrt{2}}$

C. $\frac{1}{4}$

D. $\frac{1}{3}$

Answer: c

Watch Video Solution

55. A lift moving with a uniform velocity v in which a block of mass m is lying .The friction force offered by the when coefficient of friction is $\mu = 0.5$ will be

A. zero

B. $mg/2$

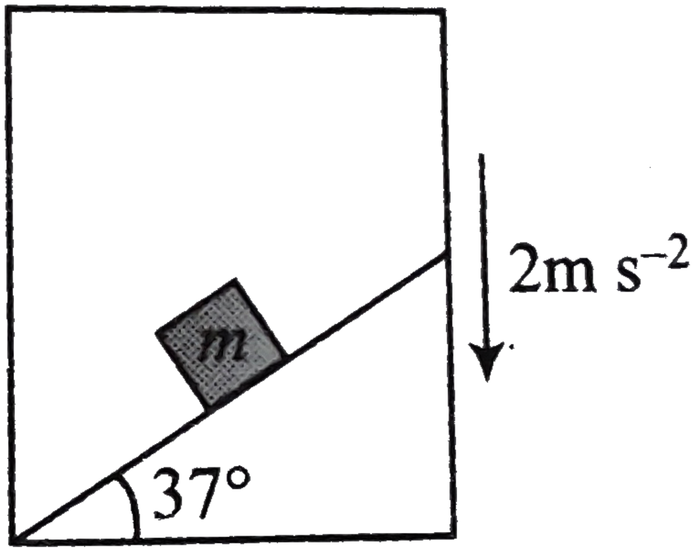
C. mg

D. $2mg$

Answer: A

Watch Video Solution

56. A block of mass is kept on an inclined plane of a lift moving down with acceleration of $2ms^{-2}$ What should be the minimum coefficient of friction to let the block move down with constant velocity?



A. $\mu = \dfrac{1}{\sqrt{3}}$

B. $\mu = 0.4$

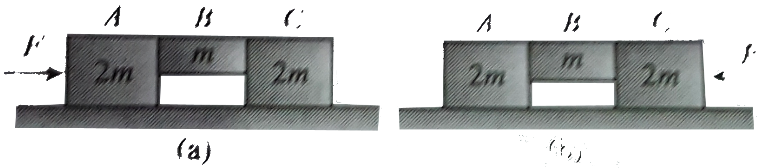
C. $\mu = 0.8$

D. $\mu =$ not defined

Answer: a

Watch Video Solution

57. The system is pushed by a force F as shown in figure All surface are smooth except between B and C friction coefficient between B and C is Minimum value of F to prevent block B from down ward slipping is



A. $\left(\frac{3}{2\mu}\right)mg$

B. $\left(\frac{5}{2\mu}\right)mg$

C. $\left(\frac{5}{2}\right)\mu mg$

D. $\left(\frac{3}{2}\right)\mu mg$

Answer: b

Watch Video Solution

58. If is problem - 57 all situation are same expect force is applied on block C as shown in figure in case (b) Minimum value of F to prevent block B from downward slipping is

A. $\left(\frac{5}{3\mu}\right)mg$

B. $\left(\frac{5}{2\mu}\right)mg$

C. $\left(\frac{5}{2}\right)\mu mg$

D. None of these

Answer: a

Watch Video Solution

59. A block of mass M is being pulley along horizontal surface .The coefficient of friction the block and the surface is μ If another block of mass $M/2$ is placed on the block and it is pulled is again pulled on the surface , the coefficient of friction the block and the surface will be

A. μ

B. $\frac{3\mu}{2}$

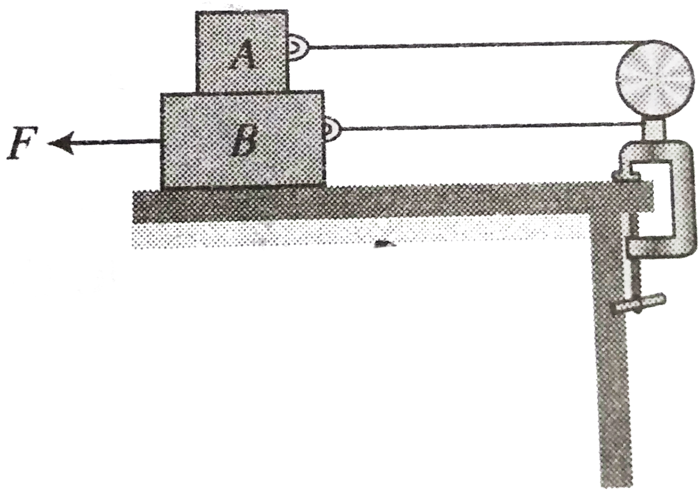
C. 2μ

D. $\frac{5\mu}{2}$

Answer: a

Watch Video Solution

60. Block A as shown in Fig weighs $2.0N$ and block B weighs $6.0N$ The coefficient of ikinetic friction between all surface is 0.25 Find the magnitude of the horizontal force necessary to drag block B to the left at constant speed if A and B are connected by a light , flxeible cord passing around a fixed, frictionless pulley



A. $2N$

B. $3N$

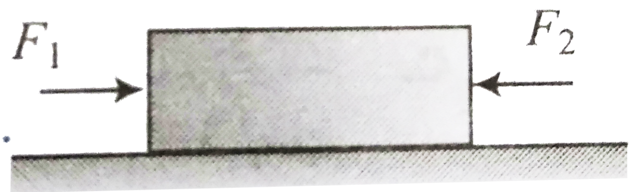
C. $5N$

D. $6N$

Answer: b

Watch Video Solution

61. Figure shown a wooden block at rest in equilibrium on a rought horizontal plane being acted upon by force $F_1 = 10N$, $F_2 = 2N$, as shown .IFF_1 is removed , the resulting force acting on the block will be



A. $2N$ toward left

B. $2N$ toward right

C. $0N$

D. cannot be determined

Answer: c

Watch Video Solution

62. A block of mass 2 kg is pushed against a rough vertical wall with a force os 40 N. Coefficient of static friction being 0.5. Another horizontal force is 15 N, is applied on the block in a direction paralle to the wall. Will the block move? If yes in which direction? If no, find the frictional force exerted by the wall on the block.

A. will move at angle 37° with vertical with acceleration $5/2ms^{-2}$ downward.

B. will move at angle 37° with vertical with acceleration $5/2ms^{-2}$ upward.

C. will move at angle 45° with vertical with acceleration $5/2ms^{-2}$ downward.

D. none of these

Answer: a

Watch Video Solution

63. A main revolves a stone of mass m tied to the end of a string in a circle of radius R The net force at the lowest and height point of the circle directed vertical downward are

Here T_1, T_2 and (v_1, v_2) denote the tension in the string (and the speed of the stone) at the lowest and highest points, respectively.

A. $\begin{matrix} \text{Lowest point} & \text{highest point} \\ mg - T_1 & mg + T_2 \end{matrix}$

B. $\begin{matrix} \text{Lowest point} & \text{highest point} \\ mg + T_1 & mg - T_2 \end{matrix}$

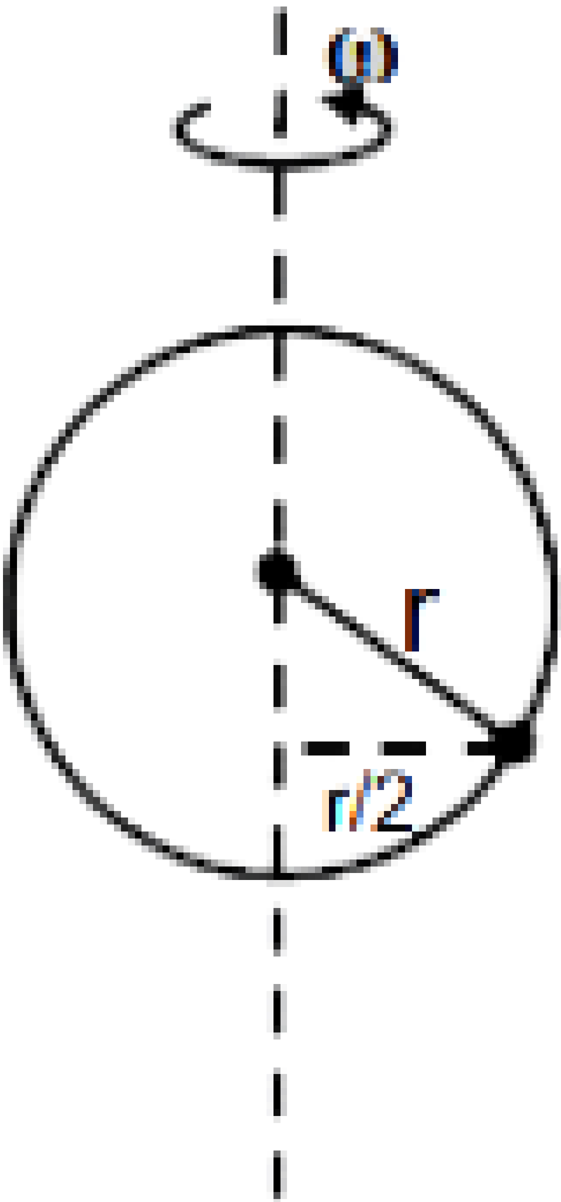
C. $\begin{matrix} \text{Lowest point} & \text{highest point} \\ mg + T_1 - \frac{mv^2}{r} & mg - T_2 + \frac{mv^2}{r} \end{matrix}$

D. $\begin{matrix} \text{Lowest point} & \text{highest point} \\ mg - T_1 - \frac{m_1 v_1^2}{R} & mg + T + \frac{m_1 v_1^2}{R} \end{matrix}$

Answer: A

Watch Video Solution

64. A ring of radius r is rotating about a vertical axis along its diameter with constant angular velocity ω. A read of mass m remains at rest $w.r.t.$ ring at the position shown in figure. Then w^2 is:



A. $\frac{2g}{a}$

B. $\frac{g}{2a}$

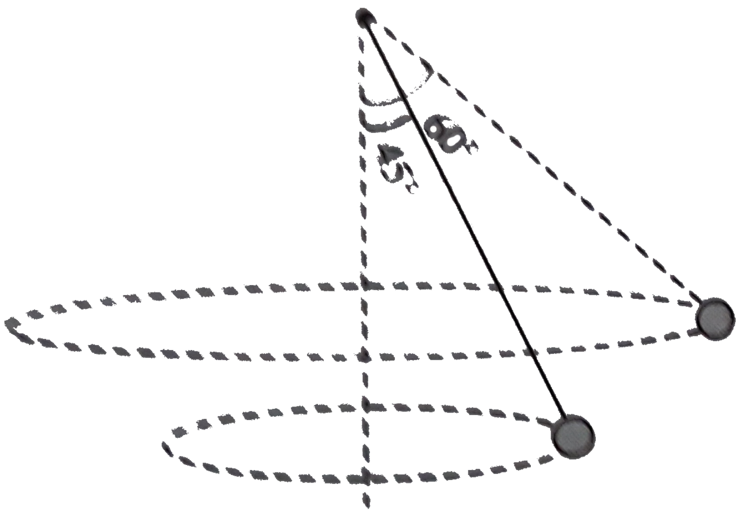
C. $\frac{2g}{a\sqrt{3}}$

D. $\frac{g\sqrt{3}}{2a}$

Answer: c

Watch Video Solution

65. When the string of a conical pendulum makes an angle of 45° with the vertical , its time is T_1 when the string makes an angle of 60° with the vertical , its time period is T_2 then T_1^2 / T_2^2 is



A. 2

B. $\sqrt{2}$

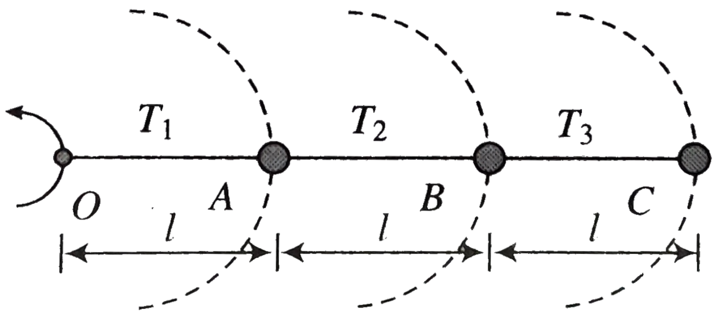
C. 0.5

D. none of these

Answer: b

Watch Video Solution

66. Three identical particles are joined together by a thread as shown in figure All the partical are moving in a horizontal plane If the vertical of the outermost particle is v_0 then the ratio of tension in the three sections of the string $(T_1 : T_2 : T_3 = ?)$ is



A. $6 : 5 : 3$

B. $3 : 5 : 6$

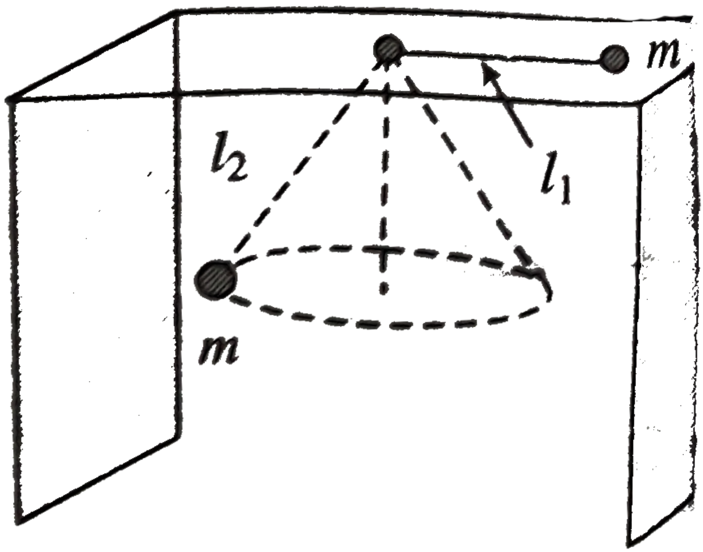
C. $3 : 4 : 5$

D. none of these

Answer: A

Watch Video Solution

67. Two identical particles are attached at the end of a light string which passes through a hole at the center of a table One of the partical is made to move in a circle on a table with angular velocity ω_1 and the ther is made a move is a horizontal ω_2 if $l_1$and l_2 are the length the table , than in order that particle under down the table neither moves down nor move up the ratio l_1 / l_2 is



A. $\frac{\omega_1}{\omega_2}$

B. $\frac{\omega_2}{\omega_1}$

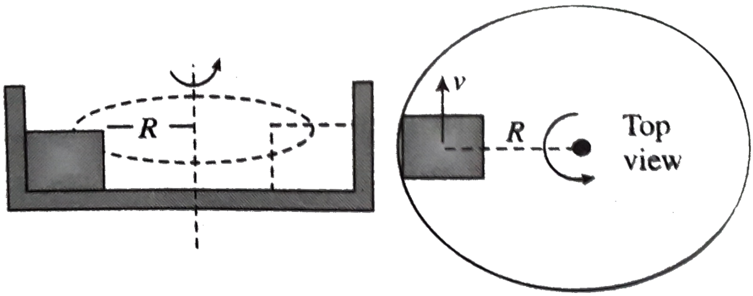
C. $\frac{\omega_1^2}{\omega_2^2}$

D. $\frac{\omega_2^2}{\omega_1^2}$

Answer: D

Watch Video Solution

68. A block of mass m is revolving in a smooth horizontal plane with a constant speed v.If the radius of the circle path is R find the total contact force received by the block



A. $\frac{mv^2}{R}$

B. mg

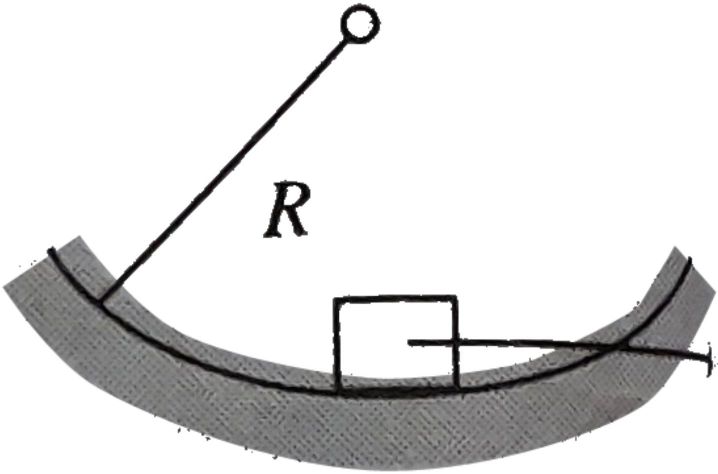
C. $m\sqrt{\frac{v^4}{R^2}+4g^2}$

D. $m\sqrt{\frac{v^4}{R^2}+g^2}$

Answer: D

Watch Video Solution

69. A particle is projected with a speed $v_0 = \sqrt{gR}$. The coefficient of friction the particle and the hemi-spherical plane is $\mu = 0.5$ Then , the acceleration of the partical is



A. g

B. $\frac{\sqrt{5}g}{2}$

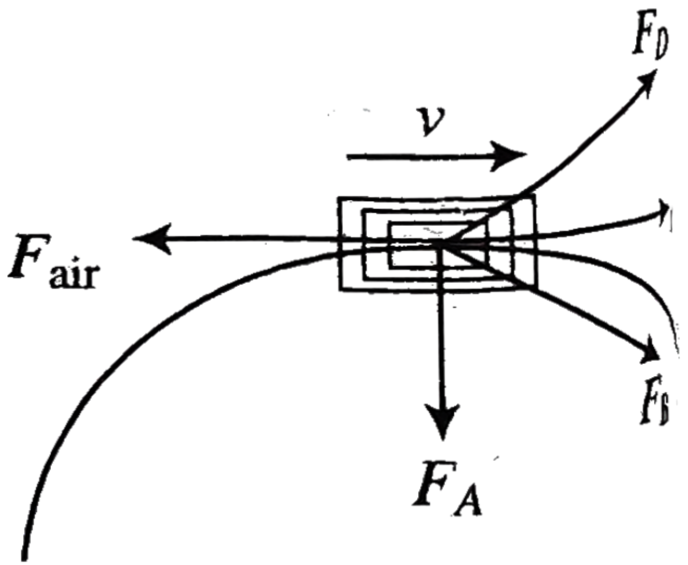
C. $\sqrt{2}g$

D. none of these

Answer: B

Watch Video Solution

70. A car travels with constant speed on a circular road level ground in figure F_{air} is the force of air resistence acts opposite to the motion of car which of the other forces shown best represents the horizontal force of the road on the car's tires?



A. F_C

B. F_D

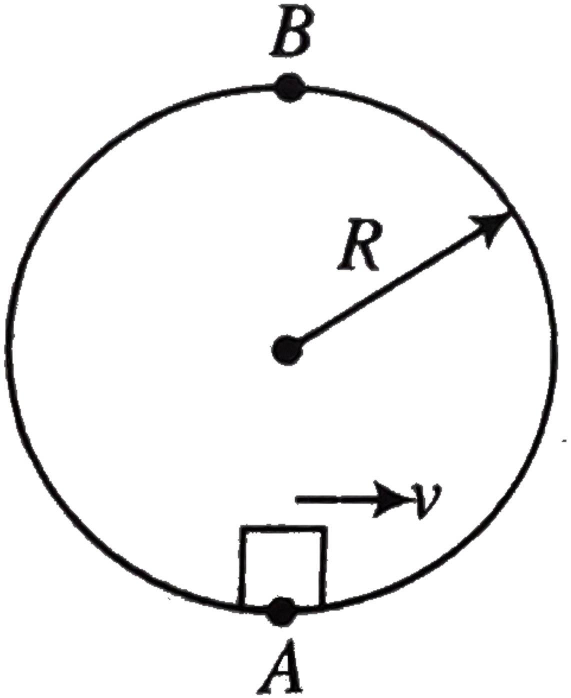
C. F_A

D. F_B

Answer: D

Watch Video Solution

71. A block of mass m is projected on a smooth horizontal circular track with velocity v what is the average normal force exered by the circular walls on the block during motion A to B?



A. $\frac{mv^2}{R}$

B. $\frac{mv^2}{\pi R}$

C. $\frac{2mv^2}{R}$

D. $\frac{2mv^2}{\pi R}$

Answer: d

Watch Video Solution

72. Two cars A and B start racing at the same on a flat race track which consists of two strainght sections each of length 100π and one circular section as shown in figure The rule of the race is that each car must travel at constant speed at all time without even skidding

A. Car A completes its journey before car B

B. Both cars complete their journey in same time

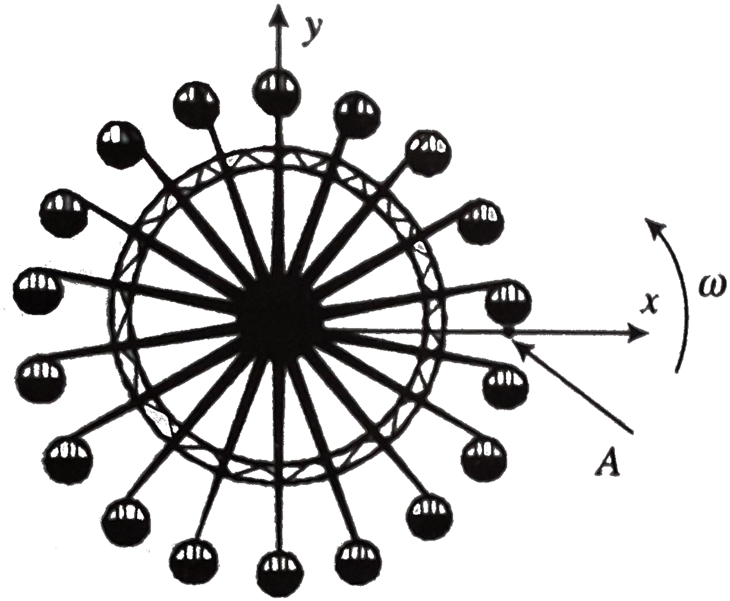
C. Velocity of car A is greater than that of car B

D. Car B of car A is journey before carA

Answer: d

View Text Solution

73. Consider the setup is of a Ferris wheel in an amusement part. The wheel is turning in acounterclockwise manner Contrary i.e. parralel to the x- axis Determine the orienation of the normal to seat as it passes point A



A. parallel to the x- axis

B. in the first/third quadrants

C. parallel to the y- axis

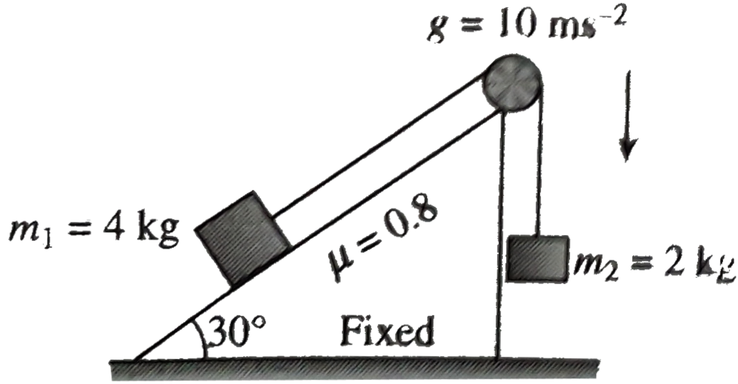
D. in the second/fourth quadrants

Answer: d

Watch Video Solution

74. Two blocks of masses m_1 and m_2 are connected through a massless inextensible string .A block of mass m_1 is placed at the fixed rigid inclined surface while the block of mass m_2 hanging at the other end of the string which is passing through a fixed massless frictionless pulley shown in figure The coefficient of static friction between the block and the inclined plane is 0.8 The system of masses m_1 and m_2 released from

rest



A. The tension in the string is $20N$ after releasing

the system

B. The contact force by the inclined surface on the

block in along normal to the inclined surface

C. The magnitude of contact force by the inclined

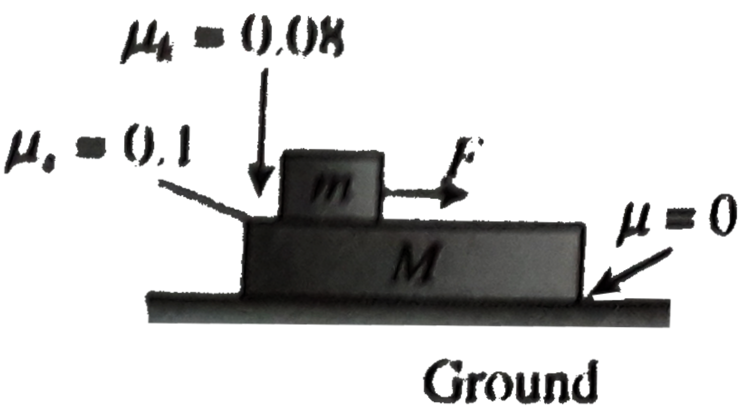
surface on the m_1 is $20\sqrt{3}N$

D. None of these

Answer: a,b,c

Watch Video Solution

75. In Fig if $F = 4N, m = 2kg M = 4kg$ then



A. The acceleration of m w.r.t. ground is $2/3ms^{-2}$

B. The acceleration of m w.r.t. ground is $1.2ms^{-2}$

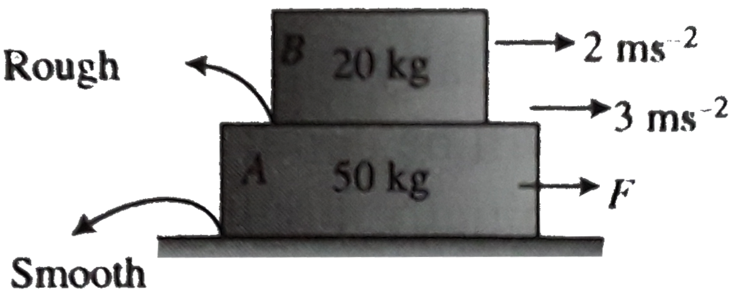
C. Acceleration of M is $0.4ms^{-2}$

D. Acceleration of M w.r.t.ground is $2/3ms^{-2}$

Answer: b,c

Watch Video Solution

76. A $20kg$ blocks is placed on of $50kg$block as shown in figure An horizontal force F acting on A causes an acceleration of $3ms^{-2}$ to A and $2ms^{-2}$ to B as shown in the figure for this situation mark out the corect statement(s)



A. The friction force between A and B is $40N$

B. The net force acting on A is $150N$

C. The value of F is $190N$

D. The value of F is $150N$

Answer: a,b,c

Watch Video Solution

77. Two blocks A and B of masses m_A and m_B have velocity v and $2v$ respectively at a given instant A horizontal force F acts on the block A There is no friction between ground and block B and coefficient of friction between A and B is μ The friction

A. on A supports its motion

B. on B opposes its motion relative to A

C. on B oppose its motion

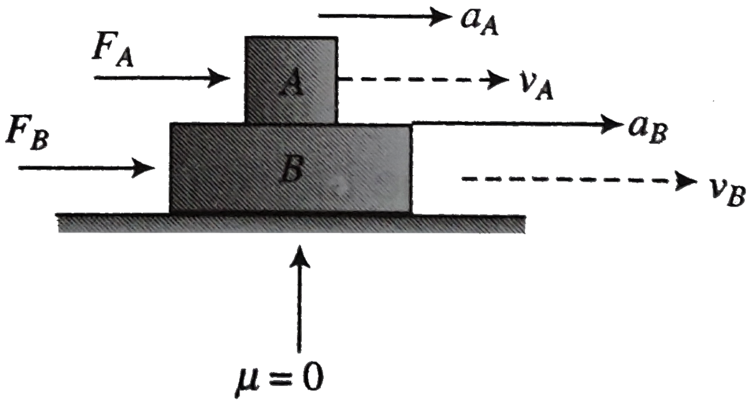
D. oppose the motion of both

Answer: a,b,c

Watch Video Solution

78. Two rough blocks A and B ,A placed over B move with acceleration $\vec{a}_A$ and $\vec{a}_B$ veclocities $\vec{v}(A)$ and

$\vec{v}_B$ by the action of horizontal forces $\overrightarrow{F_A}$ and $\overrightarrow{F_B}$, respectively. When no friction exsits between the blocks A and B,



A. $v_A = v_B$

B. $a_A = a_B$

C. Both (a) and (b)

D. None of the Above

Answer: C

Watch Video Solution

79. Mark the correct statement (s) regarding friction .

A. Friction force can be zero though the contact surface is rough

B. Even though there is no relative motion between surface friction force may exist between then

C. The expressions $f_L = \mu_s N$ or $f_k = \mu_s N$ are approximate expressions

D. The expression $f_L = \mu_s N$ rells that the direction of f_L and N are the same.

Answer: a,b,c

Watch Video Solution

80. A $3kg$ block of wood is on a level surface where $\mu_s = 0.25$ and $\mu_s = 0.2$A force of $7N$ is being applied horizontal to the block Mark the correct statement(s) regarding this situation.

A. If the block is initially at rest , it will remain at rest and friction force will be about ?$7N$

B. If the block is initially moving than it will continue its motion forever if the force applies is in the direction of the motion of the block

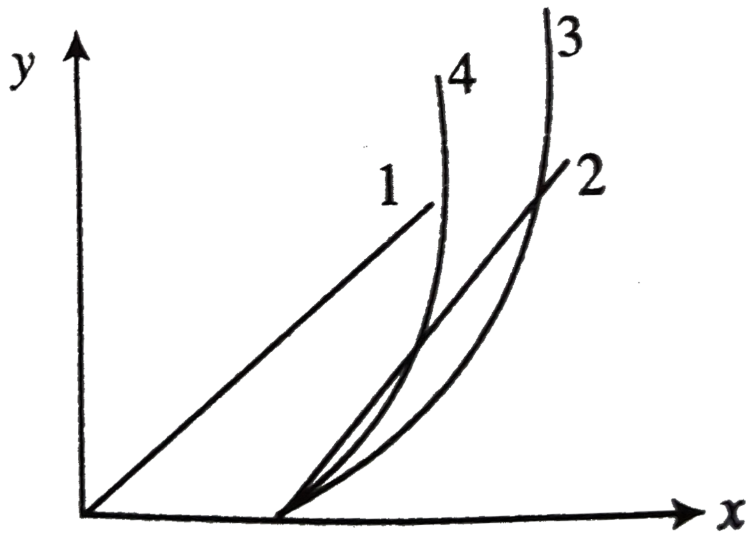
C. If the block is initially moving and the direction of applied force is mass as that of motion of block , than block moves with an acceleration of $1/3ms^{-2}$ along its initial direction of motion

D. If the block is initially moving and direction of applied force to that of initial motion of the blockthan the block decelerates comes to a stop and starts moving in the opposite direction.

Answer: a,b,c

Watch Video Solution

81. A block is resting over a rough horizontal floor. At $t=0$ a time -verying force starts acting on it , the force is described by equation $F=kt$ where k is constant and r is in seconds Marks the cerrect statement (s) for this situation .



A. Curve 1 showns acceleration - time graph

B. Curve 2 showns acceleration - time graph

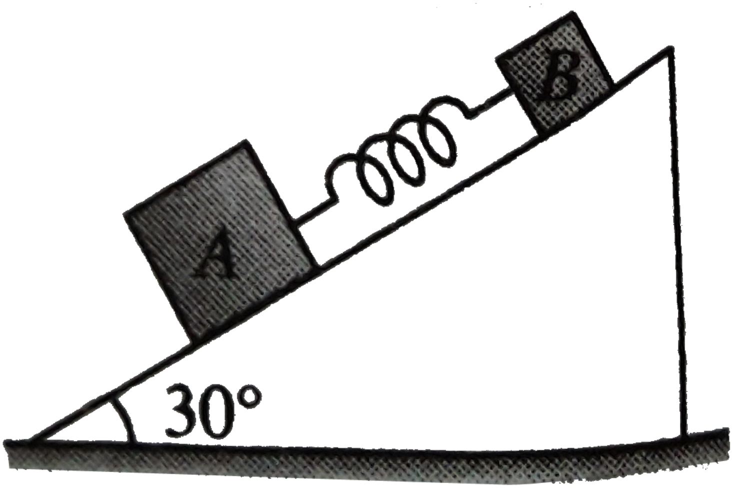
C. Curve 3 showns velocity - time graph

D. Curve 4 showns displacement - time graph

Answer: b

Watch Video Solution

82. Two blocks A and B of masses $5kg$ and $2kg$ respectively connected by a spring of force constant $= 100Nm^{-1}$ are placed on an inclined plane of inclined 30° as shown in figure If the system is released from rest



A. There will be no compression or elongation in the spring if all surface are smooth

B. There will be no compression or elongation in the spring if A is rough and B is smooth

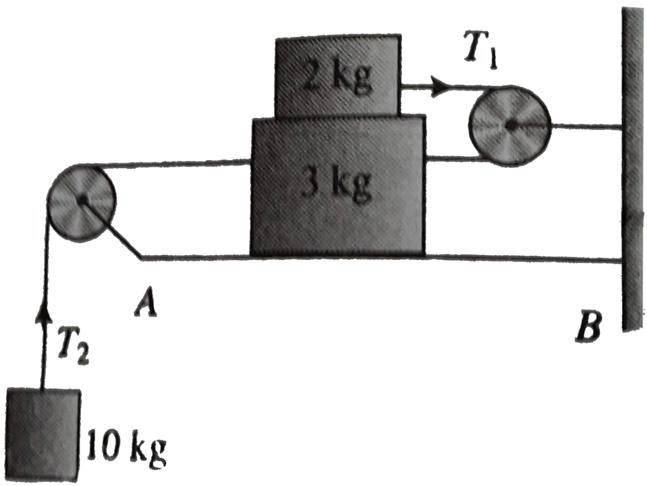
C. Maximum elongation in the spring $35cm$ If alll surface are smooth

D. There will be no compression or elongation in the spring if A is smooth and B is rough

Answer: a,d

Watch Video Solution

83. The coefficient of friction between the two two blocks is 0.3 where as the surface AB is smooth



A. Acceleration of the system masses is $88/15ms^{-2}$

B. Net force acting on $3kg$ mass is greater than that on $2kg$ mass

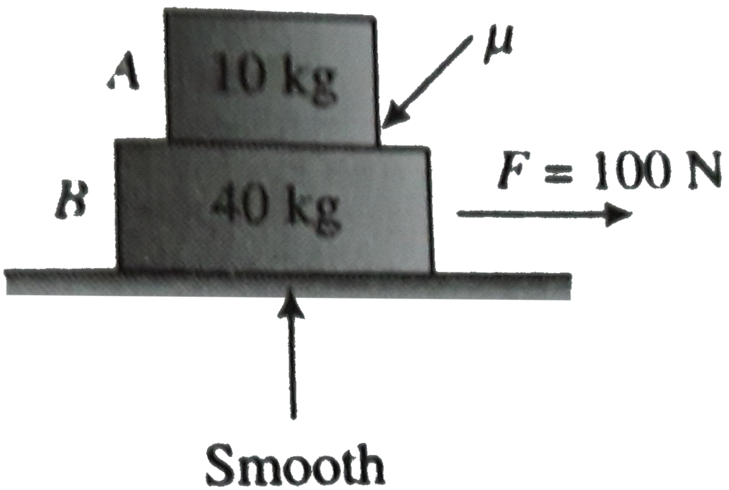
C. Tension $T_2 > T_1$

D. Since $10kg$ mass is acceleration downward , so the net force acting on if should be greater than any of the two block shown in figure

Answer: a,b,c

Watch Video Solution

84. A $10kg$ block is placed on top of a $40kg$ block as shown in figure .A horizontal force F acting on B cause an acceleration of $2ms^{-2}$ to B .For this situation marks our the correct statement(s)



A. The acceleration of A may be $2ms^{-2}$ or less than $2ms^{-2}$

B. The acceleration of A mass also be $2ms^{-2}$

C. The coefficient of friction between the blocks may be 0.2

D. The coefficient of friction between the blocks must be 0.2 only

Answer: b,c

Watch Video Solution

85. A car moving along a circular track of radius $50.0m$ acceleration from rest at $3.00ms^2$ Consider a situation when the car's centripetal acceleration equal its tangential acceleration

A. The angle around the track does the car travel is

1 red

B. The magnitude of the car's total acceleration at

that is $3\sqrt{2}ms^{-1}$

C. Time elapses before this situation is $\sqrt{\frac{50}{3}}s$

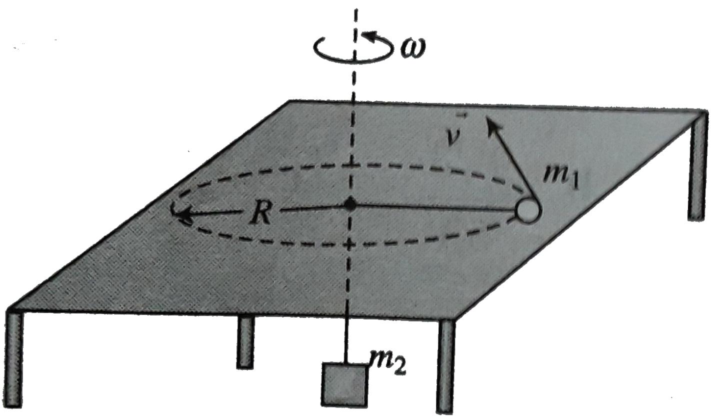
D. The distance travelled by the car during this time

$25m$

Answer: b,c,d

Watch Video Solution

86. A particle of m_1 moves in a circular path of radius R on a rotating .A string connecting the particles m_1 and m_2 passes over a smooth bole made on the table as shown in figure If mass m_1 does not slide relative to the rotating table , mark the correct option as applicable.



A. The friction force acting on the block $m_1 is \left(m_1\omega^2 R - m_2 g\right)$ along radial rotation towards center of rotation

B. The friction force acting on the block $m_1 is \left(m_1\omega^2 R - m_2 g\right)$ along tangle direction in the direction oppesite to $\overrightarrow{v}$

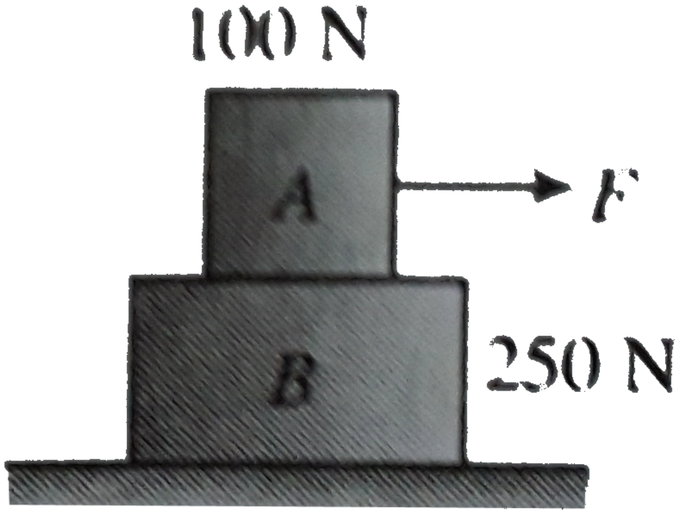
C. The maximum angular velocity of the particle is $\sqrt{\left(\frac{m_2 + \mu m_1}{m_1}\right)\frac{g}{R}}$

D. The minimum angular velocity of the particle is $\sqrt{\left(\frac{m_2 + \mu m_1}{m_1}\right)\frac{g}{R}}$

Answer: a,c,d

Watch Video Solution

87. Block B rests on a smooth surface .The coefficient of static friction between A and B is $\mu = 0.4$ where $F = 30N$ then



Acceleration of upper block is

A. $3/2ms^{-2}$

B. $6/7ms^{-2}$

C. $4/3ms^{-2}$

D. $3/7ms^{-2}$

Answer: B

Watch Video Solution

Multiple Correct

1. Block B rests on a smooth surface .The coefficient of static friction between A and B is $\mu = 0.4$ where $F = 30N$ then

Acceleration of lower block is

A. $3/7ms^{-2}$

B. $4/3ms^{-2}$

C. $6/7ms^{-2}$

D. $3/2ms^{-2}$

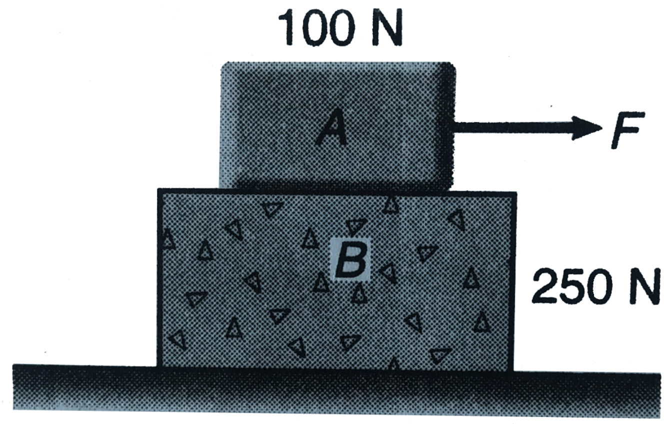
Answer: c

Watch Video Solution

2. Block B rests on a smooth surface . If the coefficient of static friction between A and B is $\mu = 0.4$. Determine the acceleration of each , if

(a) $F = 30N$ and

(b) $F = 250N(g = 10m/s^2)$



A. $4/5ms^{-2}$

B. $3/2ms^{-2}$

C. $3/5ms^{-2}$

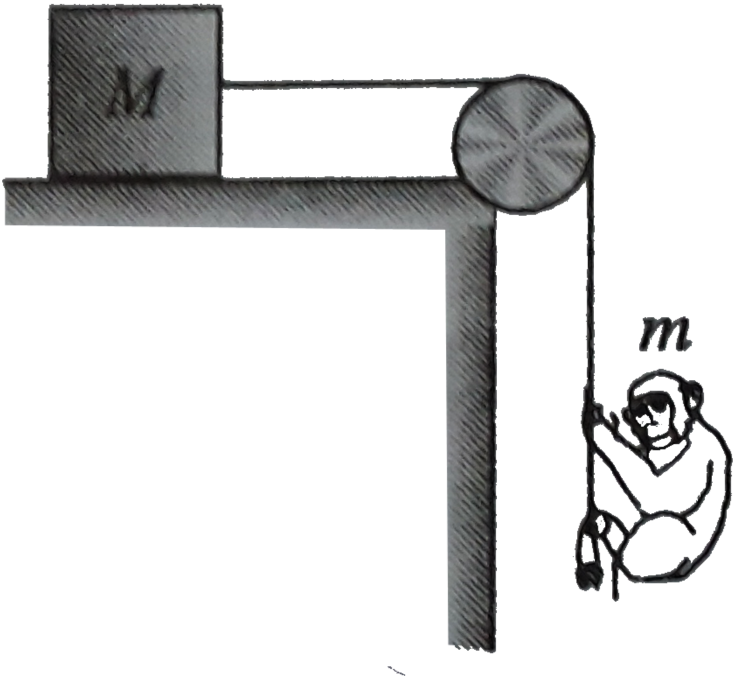
D. $8/5ms^{-2}$

Answer: d

Watch Video Solution

Linked Comprehension

1. A monkey of mass m clings a rope to a slung over a fixed pulley .The opposite end of the rope is tried to a weight of mass M tying on a horizontal table is μ Find the acceleration of weight and the tension of the rope for two cases .The monkey move downward with respect to the rope with an acceleration b.



The acceleration of weight is

A. $\dfrac{2m(g+b)-\mu Mg}{M+2m}$

B. $\dfrac{m(g+b)-\mu Mg}{2(M+m)}$

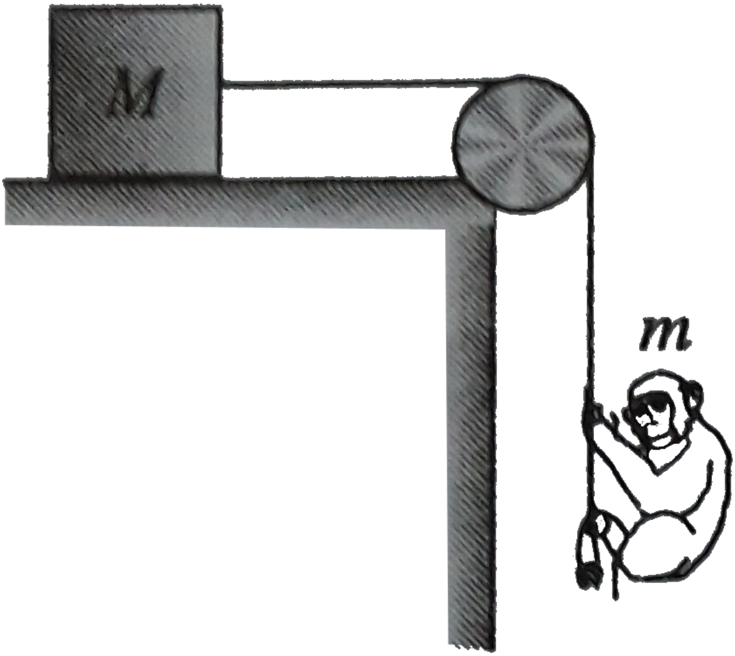
C. $\dfrac{m(g+b)-3\mu Mg}{M+3m}$

D. $\dfrac{m(g+b)-\mu Mg}{M+2m}$

Answer: d

Watch Video Solution

2. A monkey of mass m clings a rope to a slung over a fixed pulley .The opposite end of the rope is tried to a weight of mass M tying on a horizontal table is μ Find the acceleration of weight and the tension of the rope for two cases .The monkey move downward with respect to the rope with an acceleration b.



The tension of rope is

A. $\dfrac{Mm(\mu g + g + b)}{M + m}$

B. $\dfrac{Mm(\mu g - g + b)}{M + m}$

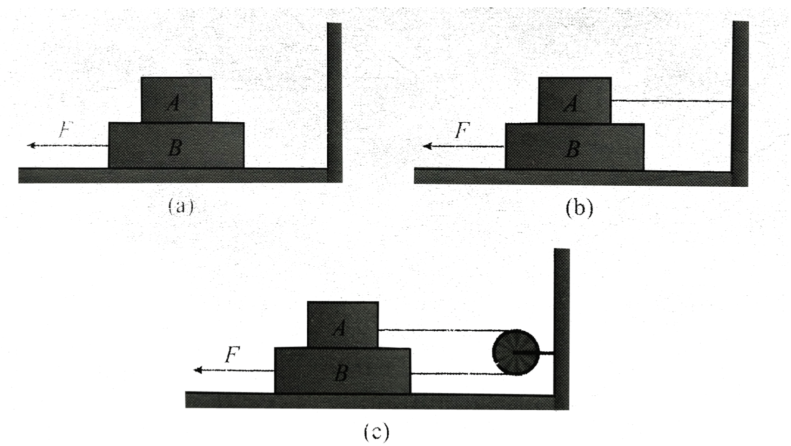
C. $\dfrac{Mm(\mu g + g - b)}{M + m}$

D. $\dfrac{Mm(\mu g - g - b)}{M + m}$

Answer: c

Watch Video Solution

3. Block A weighs $4N$ and block weigh $8N$ The coefficient of kinetic friction is 0.25 for all surface find the force F to slide B at a constant speed when (a)A rest on B and moves with it (b) A is held at rest and (c)A and B are connected by a light cord passing over a smooth putting as shown in fig 7.31 (a - c) restively.



A. $2N$

B. $3N$

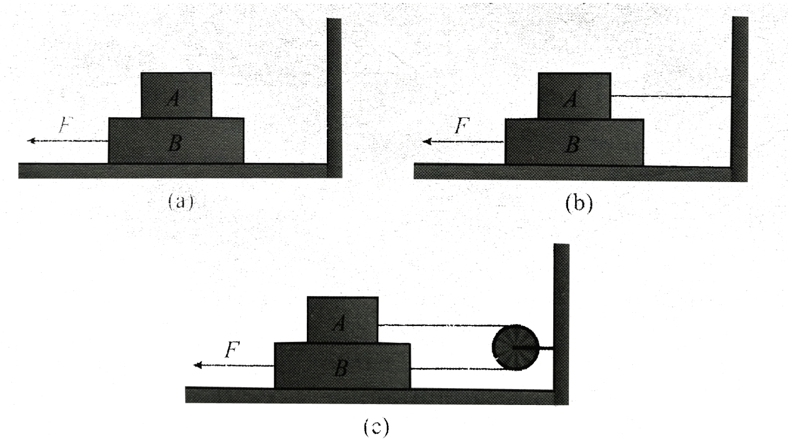
C. $4N$

D. $5N$

Answer: b

Watch Video Solution

4. Block A weighs $4N$ and block weigh $8N$ The coefficient of kinetic friction is 0.25 for all surface find the force F to slide B at a constant speed when (a)A rest on B and moves with it (b) A is held at rest and (c)A and B are connected by a light cord passing over a smooth putting as shown in fig 7.31 (a - c) restively.



A. $2N$

B. $3N$

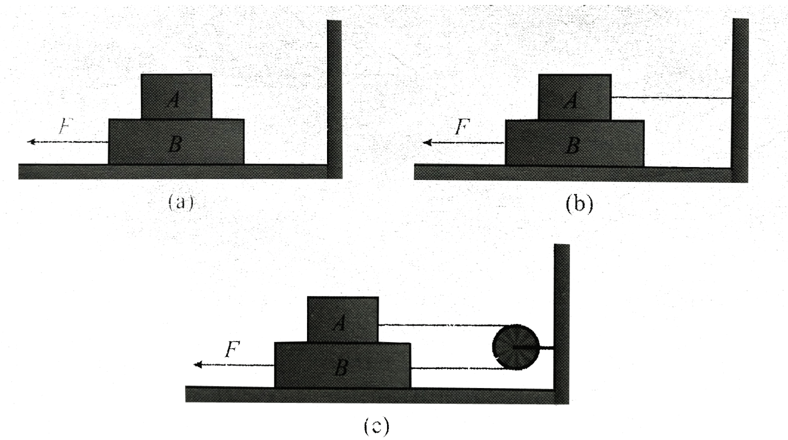
C. $4N$

D. $5N$

Answer: c

Watch Video Solution

5. Block A weighs $4N$ and block weigh $8N$ The coefficient of kinetic friction is 0.25 for all surface find the force F to slide B at a constant speed when (a)A rest on B and moves with it (b) A is held at rest and (c)A and B are connected by a light cord passing over a smooth putting as shown in fig 7.31 (a - c) restively.



A. $2N$

B. $3N$

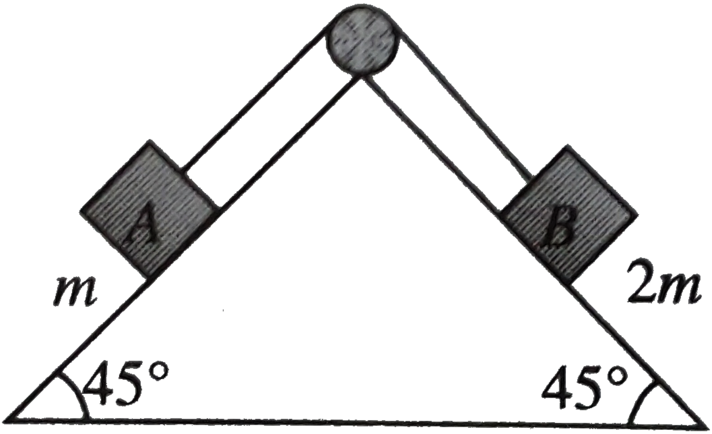
C. $4N$

D. $5N$

Answer: d

Watch Video Solution

6. Block A of mass m and block B of mass $2m$ are placed on a fixed traingular wedge by means of a massless inextensible string and a frictionless pulley as shown in figure The wedge is inclined at 45° to the horizontal on both sides .The coefficient of friction between blocks A and the wedge is $2/3$ and that between block B and is released from rest find the following



The acceleration of A is

A. $\frac{g}{3\sqrt{2}}$

B. Zero

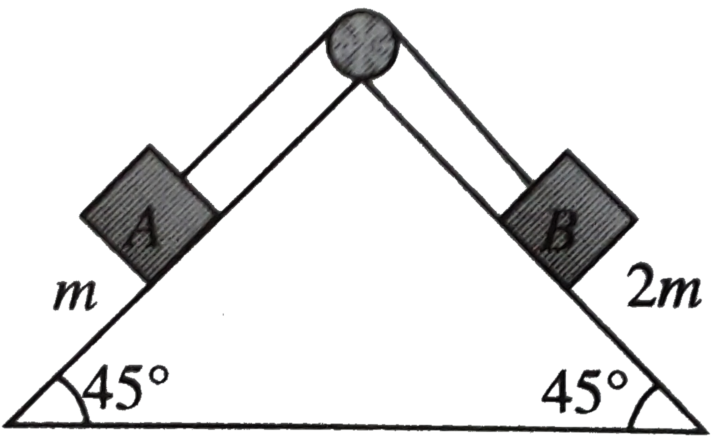
C. $(g)(\sqrt{7})$

D. $\frac{g}{2\sqrt{3}}$

Answer: b

Watch Video Solution

7. Block A of mass m and block B of mass $2m$ are placed on a fixed traingular wedge by means of a massless inextensible string and a frictionless pulley as shown in figure The wedge is inclined at 45° to the horizontal on both sides .The coefficient of friction between blocks A and the wedge is $2/3$ and that between block B and is released from rest find the following



The tension in the string is

A. $\frac{3}{\sqrt{5}}mg$

B. $\frac{5}{3\sqrt{2}}mg$

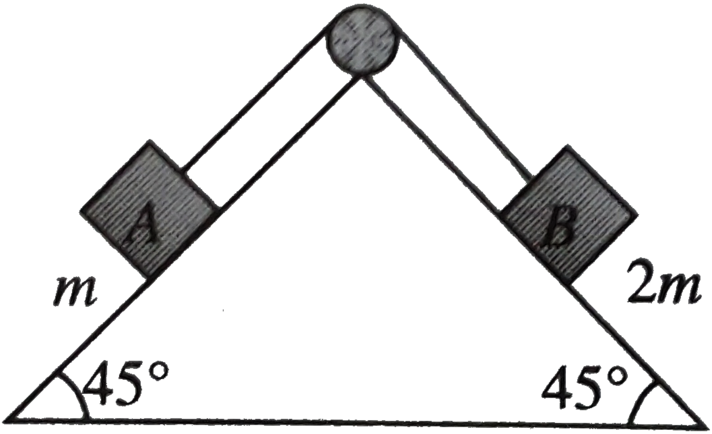
C. $\frac{2\sqrt{2}mg}{3}$

D. $\frac{mg}{5}$

Answer: c

Watch Video Solution

8. Block A of mass m and block B of mass $2m$ are placed on a fixed traingular wedge by means of a massless inextensible string and a frictionless pulley as shown in figure The wedge is inclined at 45° to the horizontal on both sides .The coefficient of friction between blocks A and the wedge is $2/3$ and that between block B and is released from rest find the following



The magnitude and direction of the force of friction acting on A are

A. mg down the plane

B. $\frac{mg}{2}$ up the plane

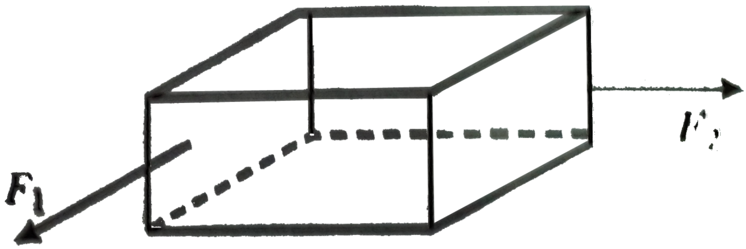
C. $\frac{mg}{\sqrt{2}}$,up the plane

D. $\frac{mg}{3\sqrt{2}}$ down the plane

Answer: D

Watch Video Solution

9. A block of mass $10kg$ is kept on a rought floor .The coefficient of friction between floor and block are $\mu_s = 0.4$ and $\mu_k = 0.3$ forces $F_1 = 5N$ and $F_2 = aN$ are applied on the block as shown in figure



If $F_1 = 5N$ and $F_2 = aN$ for what maximum value of a the motion of block impenride?

A. $\sqrt{31}N$

B. $\sqrt{26}N$

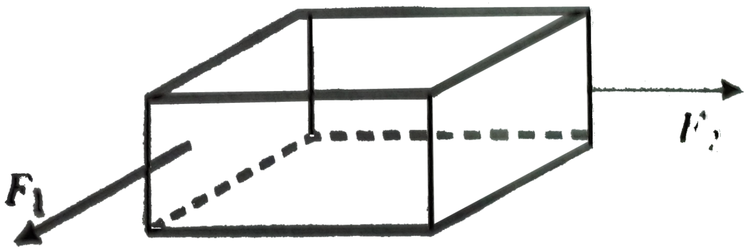
C. $\sqrt{41}N$

D. $\sqrt{36}N$

Answer: c

Watch Video Solution

10. A block of mass $10kg$ is kept on a rought floor .The coefficient of friction between floor and block are $\mu_s = 0.4$ and $\mu_k = 0.3$ forces $F_1 = 5N$ and $F_2 = 4N$ are applied on the block as shown in figure



If $F_1 = 5N$ and $F_2 = aN$ for what maximum value of a the motion of block impenride?

A. $\sqrt{1557}N$

B. $\sqrt{1225}N$

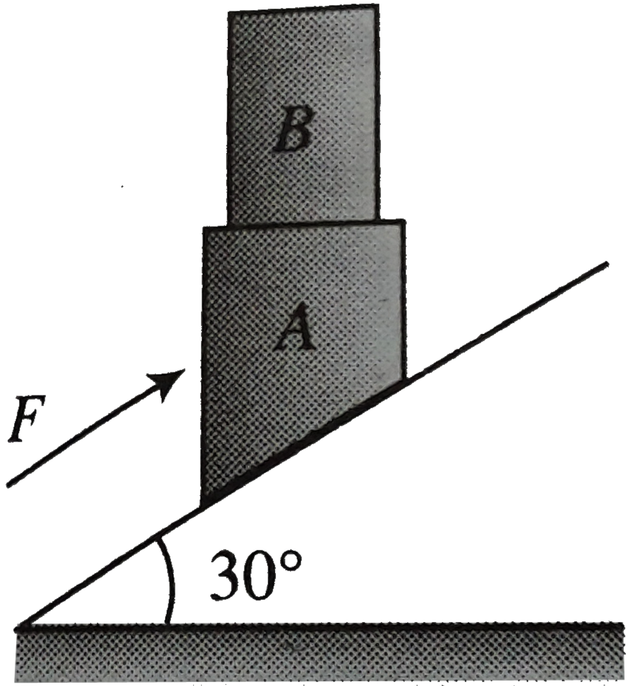
C. $\sqrt{1664}N$

D. $\sqrt{875}N$

Answer: a

Watch Video Solution

11. Block A has mass $40kg$ and B has $15kg$ and F is $500N$ parallel to smooth inclined plane.The system is moving together



The acceleration of the system is

A. $\frac{45}{11}ms^{-2}$

B. $\frac{23}{11}ms^{-2}$

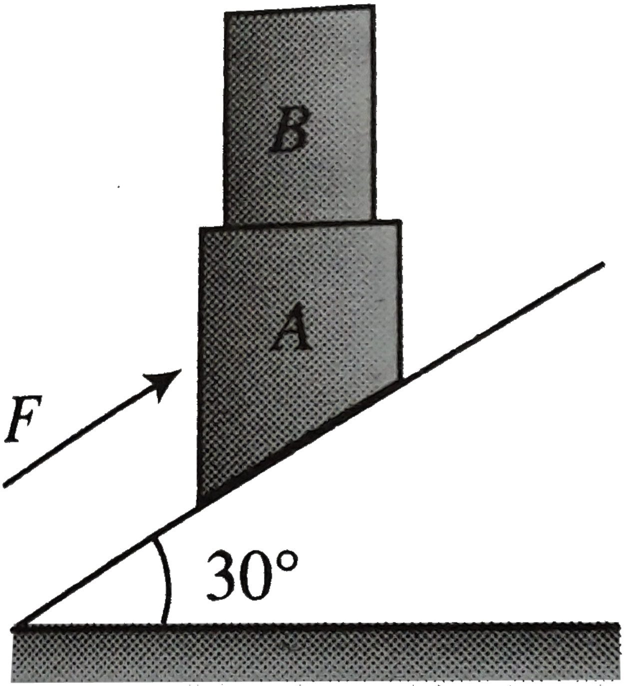
C. $\frac{13}{7}ms^{-2}$

D. $\frac{8}{3}ms^{-2}$

Answer: a

Watch Video Solution

12. Block A has mass $40kg$ and B has $15kg$ and F is $500N$ parallel to smooth inclined plane.The system is moving together



The least coefficient of friction between A and B is

A. $\frac{5\sqrt{2}}{12}$

B. $\frac{9\sqrt{3}}{53}$

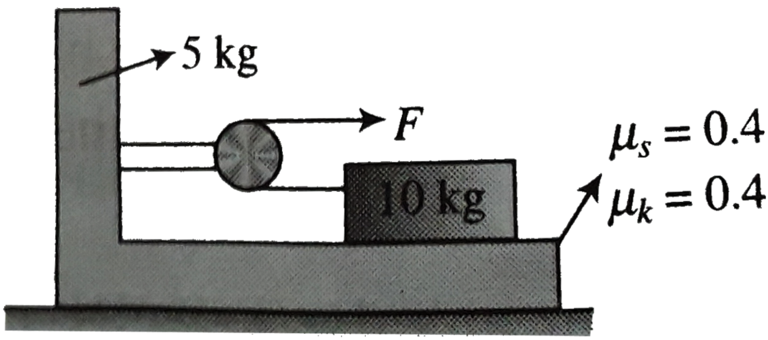
C. $\frac{9\sqrt{2}}{28}$

D. $\frac{5\sqrt{3}}{18}$

Answer: B

Watch Video Solution

13. A $10kg$ block rests on a $5kg$ bracket as shown in figureThe $5kg$ breaket rests on a horizontal surface The coefficient of frictionbetween the $10kg$ block and the braket on wich it rests are $\mu_s = 0.40$ and $\mu_k = 0.30$



The maximum force F that can be applied if the $10kg$ block is not to slide on the braket is

A. $32N$

B. $24N$

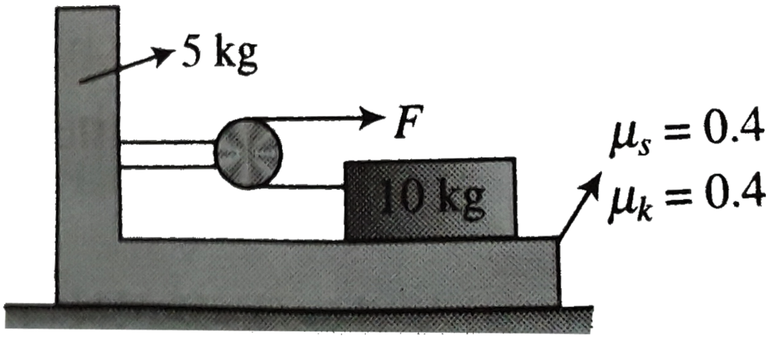
C. $18N$

D. $48N$

Answer: b

Watch Video Solution

14. A $10kg$ block rests on a $5kg$ bracket as shown in figureThe $5kg$ breaket rests on a horizontal surface The coefficient of frictionbetween the $10kg$ block and the braket on wich it rests are $\mu_s = 0.40 \text{ and } \mu_k = 0.30$



If the $10kg$ block is not to slide on the braket , the corresponding acceleration of the $5kg$ braacket is

A. $1.6ms^{-2}$

B. $0.8ms^{-2}$

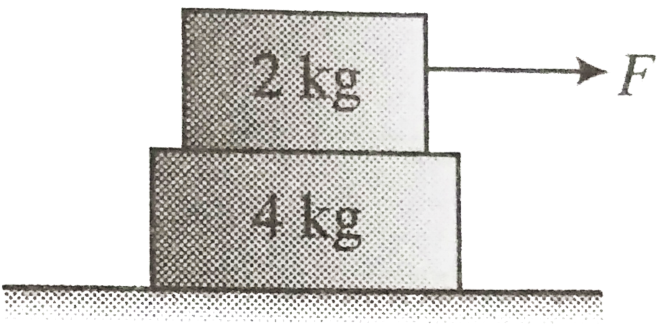
C. $1.2ms^{-2}$

D. $2.4ms^{-2}$

Answer: a

Watch Video Solution

15. A sufficiently long plane of mass $4kg$ is placed on a smooth horizontal surfaces A small block of mass $2kg$ is placed over the plank and is beging acted upon by a time verying horizontal force $F = (0.5t)$ where F is in newton and t is in second as shown in figure. The coefficient of friction slipping the plank and the block is given is $\mu_s = \mu_k = \mu$ time $t = 12s$ the relative slipping between the plank and the block is just likely to accor



The coefficient of friction μ is equal to

A. 0.10

B. 0.15

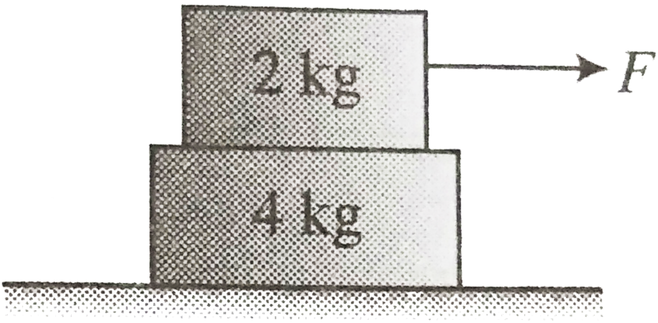
C. 0.20

D. 0.30

Answer: c

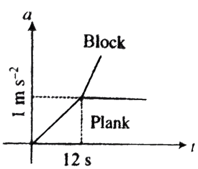
Watch Video Solution

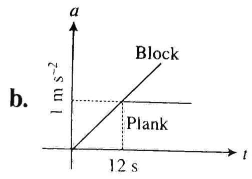
16. A sufficiently long plane of mass $4kg$ is placed on a smooth horizontal surfaces A small block of mass $2kg$ is placed over the plank and is beging acted upon by a time verying horizontal force $F = (0.5t)$ where f is in newton and t is in second as shown in figure .The coefficient of friction slipping the plank and the block is given is $\mu_s = \mu_k =$ mu time $t = 12s$ the relative slipping between the plank and the block is just likely to accor

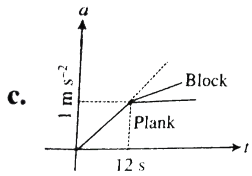


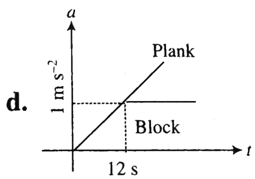
The acceleration a versus time l graph for the and the block shown in figure below is correctely represented in

A. a.



B. 

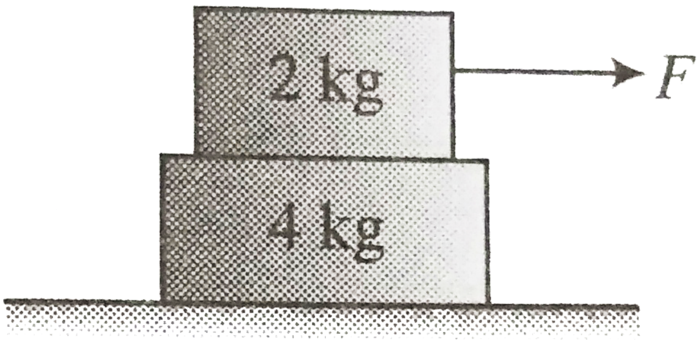
C. 

D. 

Answer: a

Watch Video Solution

17. A sufficiently long plane of mass $4kg$ is placed on a smooth horizontal surfaces A small block of mass $2kg$ is placed over the plank and is beging acted upon by a time verying horizontal force $F = (0.5t)$ where f is in newton and t is in second as shown in figure .The coefficient of friction slipping the plank and the block is given is $\mu_s = \mu_k = \mu$ time $t = 12s$ the relative slipping between the plank and the block is just likely to accor



The average acceleration of the plank in the time interval $0 \rightarrow 15s$ in the figure will be

A. $0.20ms^{-2}$

B. $0.30ms^{-2}$

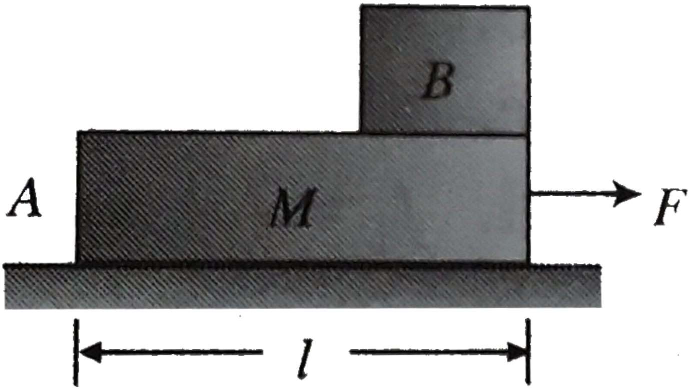
C. $0.40ms^{-2}$

D. $0.60ms^{-2}$

Answer: d

Watch Video Solution

18. A plank A of mass M rests on a smooth horizontal surface over which it can move without friction A cabe B of mass m lies on the plank at one edge .The coefficient of friction between the plank and the cube is μ The size of cube is very small in comparison to the plank.



At what force F applied to the plank in the horizontal direction will be cube begin to slide towards the other end of the plank?

A. $F > \mu(m + M)g$

B. $F > 0.5\mu(m + M)g$

C. $F = 0.5\mu(m + M)g$

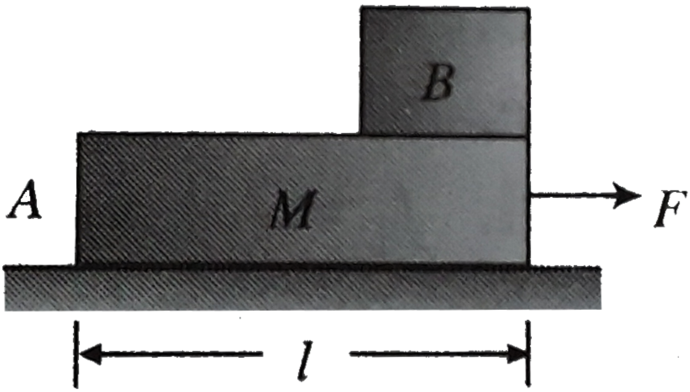
D. $F = \mu(m + M)g$

Answer: d

Watch Video Solution

19. A plank A of mass M rests on a smooth horizontal surface over which it can move without friction A cabe B of mass m lies on the plank at one edge .The coefficient of friction between the plank and the cube is μ The size of cube is very small in comparison to the plank.

In what time will the cube fall from the plank if the length of the latter is l?



A. $\sqrt{\dfrac{Ml}{F-\mu g(M+m)}}$

B. $\sqrt{\dfrac{2Ml}{F-\mu g(M+m)}}$

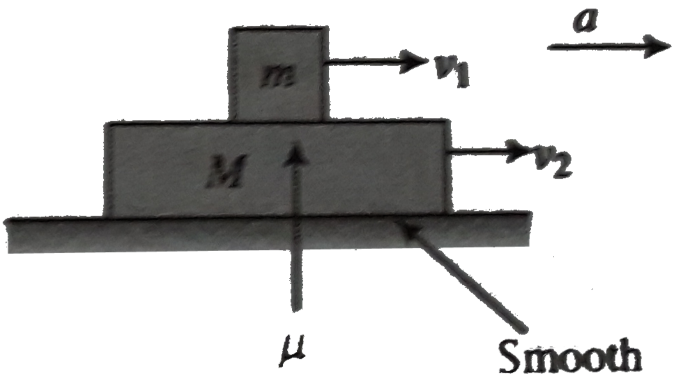
C. $\sqrt{\dfrac{Ml}{F+\mu g(M+m)}}$

D. $\sqrt{\dfrac{Ml}{F+\mu g(M+m)}}$

Answer: b

Watch Video Solution

20. A small block of mass m is plced over a long plank of mass M the coefficient of friction between then is μ .Ground is smooth At $t=0$ m is given a velocity v_1 and M a velocity $v_2(>v_1)$ as shown in Fig. After this M is maintained at constant celeration $a(<\mu g)$



Initially there will be some relative motion between the block and the plank ,but after some time relative motion will cease and velocities of both will become

Find the time t_0 when the velocities of both block and plank become same.

A. $\frac{v_2 - v_1}{\mu g + a}$

B. $\frac{v_2 + v_1}{\mu g - a}$

C. $\frac{v_2 - v_1}{\mu g - a}$

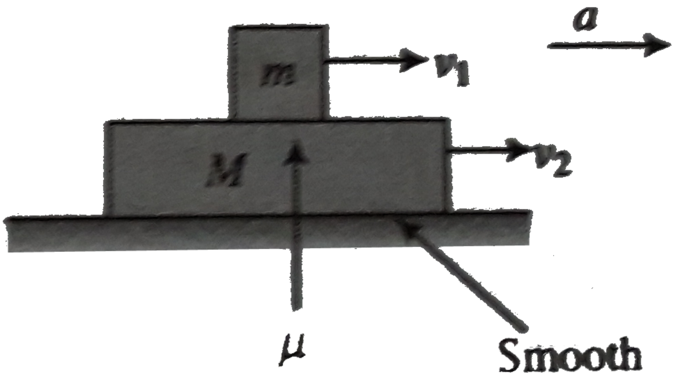
D. $\frac{v_2 + v_1}{\mu g + a}$

Answer: c

Watch Video Solution

21. A small block of mass m is plced over a long plank of mass M the coefficient of friction between then is μ

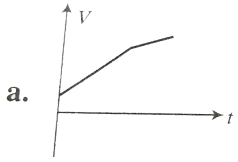
ground is smooth At $t = 0 m$ is given a velocity v_1 and M a velocity $v_2(> v_1)$ as shown in figure After this M is maintained at constant celeration $a(< \mu g)$

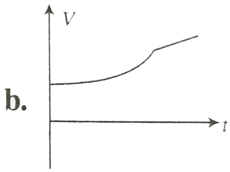


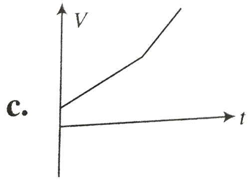
Initially there will be some relative motion between the block and the plank ,but after some time relative motion will cease and velocities of both will become

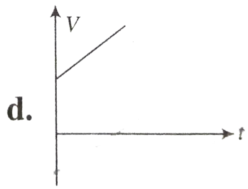
Draw the velocition of velocity of block as a function of time.

time.

A. 

B. 

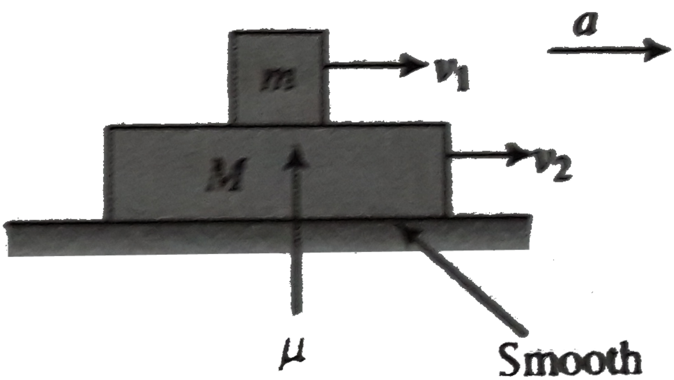
C. 

D. 

Answer: a

Watch Video Solution

22. A small block of mass m is plced over a long plank of mass M the coefficient of friction between then is μ ground is smooth At $t = 0$ m is given a velocity v_1 and M a velocity $v_2(> v_1)$ as shown in figure After this M is maintained at constant celeration $a(< \mu g)$



Initially there will be some relative motion between the block and the plank ,but after some time relative motion will cease and velocities of both will become

Find the forward force acting on the plank before after t_0 respectively.

A. $Ma, (M + m)a$

B. $\mu mg + Ma, (M + m)a$

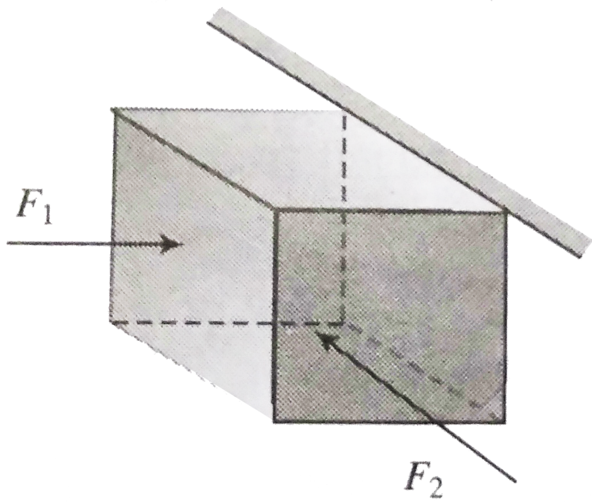
C. $\mu Mg + ma + Ma$

D. $(M + m)a, \mu mg + Ma$

Answer: b

Watch Video Solution

23. A block of mass $4kg$ pressed againest a rought wall by two perpendicular horizontal forces F_1 and F_2as shown in figure Coefficient of static friction between the block and wall is 0.6 and that of kinetic friction is 0.5



For $F_1 = 300N$ and $F_2 = 100N$ find the direction and magnitude of friction force acting on the block

A. $180N$ vertically upward

B. $40N$ vertically upward

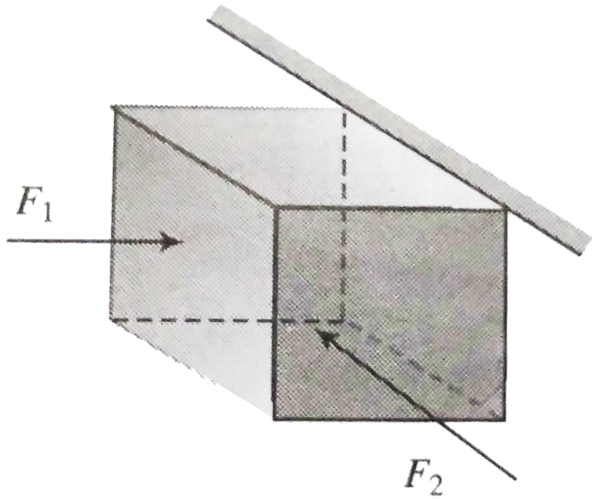
C. $107.7N$ making an angle of $\tan^{-1}\left(\frac{2}{5}\right)$ will the horizontal the upward direction

D. $91.6N$ making an angle of $\tan^{-1}\left(\frac{2}{5}\right)$ will the horizontal the upward direction

Answer: c

Watch Video Solution

24. A block of mass $4kg$ pressed againest a rought wall by two perpendicular horizontal forces F_1 and F_2as shown in figure Coefficient of static friction between the block and wall is 0.6 and that of kinetic friction is 0.5



For the above data, what is the acceleration of block?

A. Zero

B. $\frac{140}{4} ms^{-2}$,upward

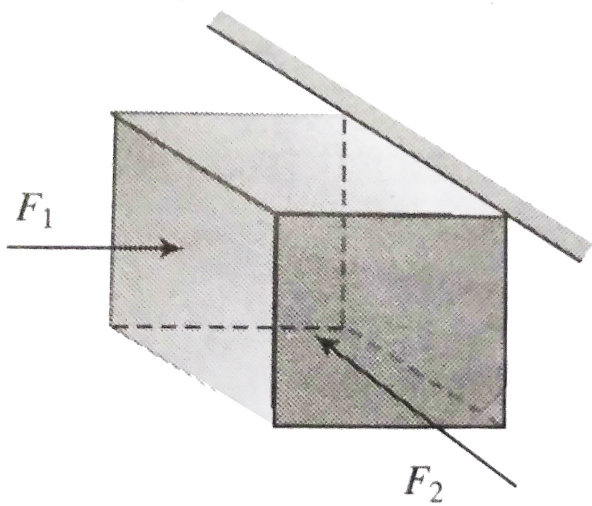
C. $\frac{180}{4} ms^{-2}$,upward

D. $\frac{107.7}{4} ms^{-2}$at an $\tan^{-1}\left(\frac{2}{5}\right)$ with the horizontal in the upward direction

Answer: a

Watch Video Solution

25. A block of mass $4kg$ pressed againest a rought wall by two perpendicular horizontal forces F_1 and F_2as shown in figure Coefficient of static friction between the block and wall is 0.6 and that of kinetic friction is 0.5



For $F_1 = 150N$ and $F_2 = 100N$ find the direction and magnitude of friction acting on the block

A. $90N$ making an angle of $\tan^{-1}\left(\frac{2}{5}\right)$ with the horizontal in the upward direction

B. $75N$ making an angle of $\tan^{-1}\left(\frac{2}{5}\right)$ with the horizontal in the upward direction

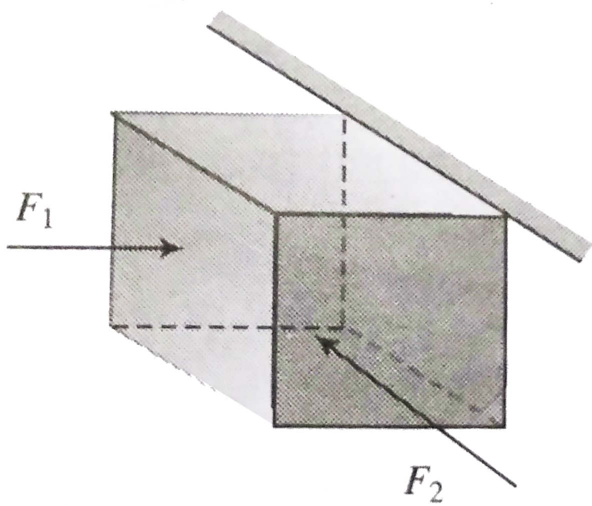
C. $107.7N$ making an angle of $\tan^{-1}\left(\frac{2}{5}\right)$ with the horizontal in the upward direction

D. Zero

Answer: b

Watch Video Solution

26. A block of mass $4kg$ pressed againest a rought wall by two perpendicular horizontal forces F_1 and F_2as shown in figure Coefficient of static friction between the block and wall is 0.6 and that of kinetic friction is 0.5



For the data of Q 28 ,Find the magnitude of acceleration of the block

A. Zero

B. $22.5ms^{-2}$

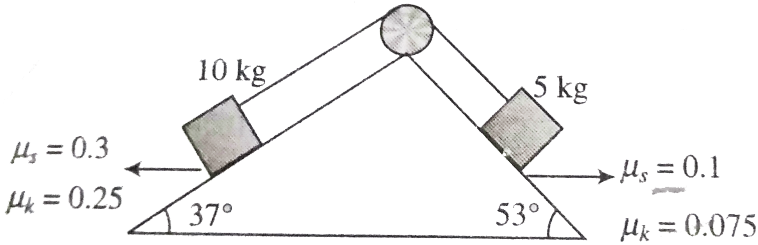
C. $26.925ms^{-2}$

D. $9.175ms^{-2}$

Answer: d

Watch Video Solution

27. A system of two blocks and a light string are kept on two inclined force (rought) as shown in figure All the are mentioned in the diagram pulley is light and frictionless $\left(Take g = 10ms^{-2}, \sin 37^{\circ} = 3/5\right)$



If the system force rest , then the acceleration of the system is

A. $\frac{7}{15} ms^{-2}$

B. Zero

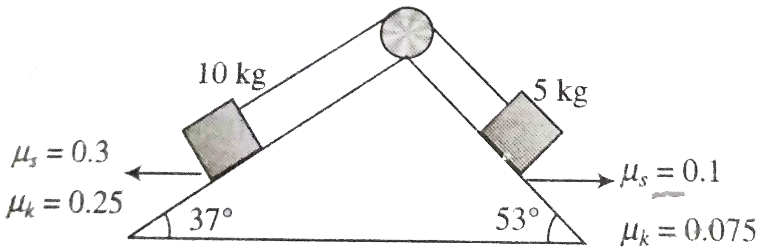
C. $\frac{47}{15} ms^{-2}$

D. $\frac{2.25}{15} ms^{-2}$

Answer: b

Watch Video Solution

28. A system of two blocks and a light string are kept on two inclined force (rought) as shown in figure All the are mentioned in the diagram pulley is light and frictionless $\left(Take g = 10ms^{-2}, \sin 37^{\circ} = 3/5\right)$



If a system moving in such away that a block of $10kg$ is comming down inclined with a speed of $2ms^{-2}$then how much time the system takes to come to a stop? [Assume the length of incline to be large enough]

A. $13.33s$

B. $80s$

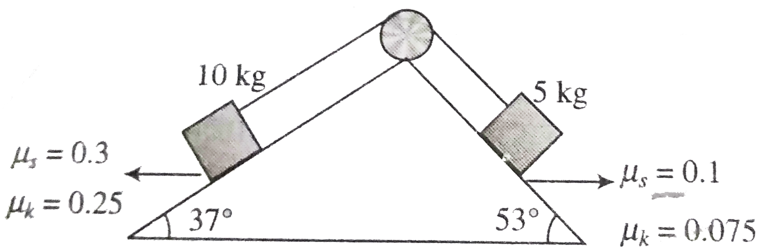
C. Infinite

D. Question is irrelevant

Answer: a

Watch Video Solution

29. A system of two blocks and a light string are kept on two inclined force (rough) as shown in figure All the are mentioned in the diagram pulley is light and frictionless $\left(Take g = 10ms^{-2}, \sin 37^{\circ} = 3/5\right)$



In the above question the motion of the system would be best described by

A. The system first decelerates, comes to a stop, and then continues s to move in the opposite direction

B. The system will continuously move with constant speed

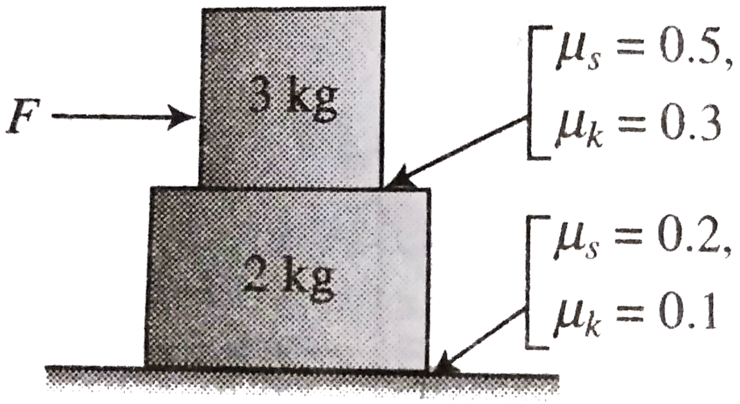
C. The system first decelerates and than come to a stop

D. The system acceleration and its speed increases with time

Answer: C

Watch Video Solution

30. A system of two blocks is placed on a rought horizontal surface as shown in figure below The coefficient of static and kinetic friction at two surfaces are shown A force F is horizontal applied on the upper block as shown . Let f_1, f_2 represent the frictional force between upper and lower surface of contact respectively and a_1, a_2 represent the acceleration of $3kg$ and $2kg$ block respectively



If F is gradually increasing forcethen which of the following statement (s) contact would be true?

A. For a particular value of $F(< F_0)$ there is no motion at any of the contact surface

B. The value of $F_0$is $10N$

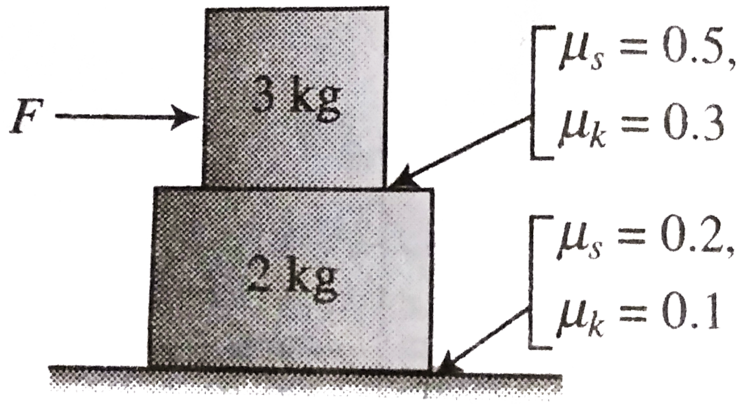
C. The F increases beyond F_0, f_1 increases and contitaes to increase unit it limiting value

D. All of the above

Answer: d

Watch Video Solution

31. A system of two blocks is placed on a rought horizontal surface as shown in figure below The coefficient of staic and kinetic friction at two surfaces are shown A force F is horizontal applied on the upper block as shown .Let f_1, f_2 represent the frictional force between upper and lower surface of contact respectively and a_1, a_2 represent the acceleration of $3kg$ and $2kg$ block respectively



For $F = 12N$ mark the correct option

A.

$$f_1 = 7.8N, f_2 = 7.8N, a_1 = 1.4ms^{-2}, a_2 = 0ms^{-2}$$

B. $f_1 = 7.8N, f_2 = 10N, a_1 = a_2 = 1.4ms^{-2}, a_2$

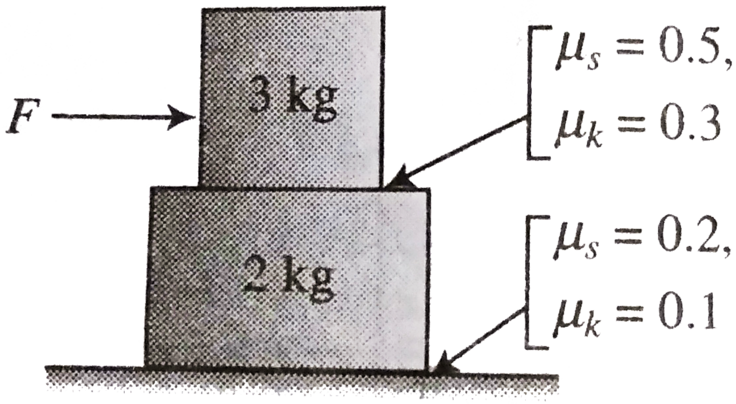
C. $f_1 = 7.8N, f_2 = 5N, a_1 = a_2 = 1.4ms^{-2}$

D. $f_1 = 7.4N, f_2 = 5N, a_1 = a_2 = 1.2ms^{-2}$

Answer: c

Watch Video Solution

32. A system of two blocks is placed on a rought horizontal surface as shown in figure below The coefficient of staic and kinetic friction at two surfaces are shown A force F is horizontal applied on the upper block as shown .Let f_1, f_2 represent the frictional force between upper and lower surface of contact respectively and a_1, a_2 represent the acceleration of $3kg$ and $2kg$ block respectively



For relative motion to be there between two blocks the minimum value of F should be

A. $15N$

B. $30N$

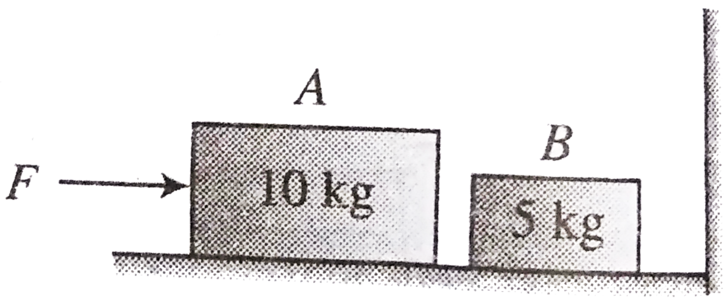
C. $25N$

D. $32N$

Answer: b

Watch Video Solution

33. Two bodies A and B of masses $10kg$ and $5kg$ placed very slightly seperated as shown in figure The coefficient of friction between the floor and the block are as $\mu_s = 0.4$ block A is pushed by an external force F The value of F can be changed when the weight between block A and ground breaks block A will start prssing block B will start pressing the vertical wall



If $F = 20N$,with how much force block A press block B?

A. $10N$

B. $20N$

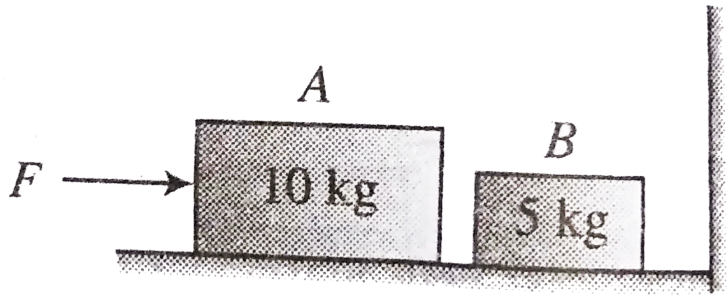
C. $30N$

D. Zero

Answer: d

Watch Video Solution

34. Two bodies A and B of masses $10kg$ and $5kg$ placed very slightly separated as shown in figure The coefficient of friction between the floor and the block are as $\mu_s = 0.4$ block A is pushed by an external force F The value of F can be changed when the weight between block A and ground breaks block A will start pressing block B will start pressing the vertical wall



If $F = 50N$, the friction force acting between block B and ground will be

A. $10N$

B. $20N$

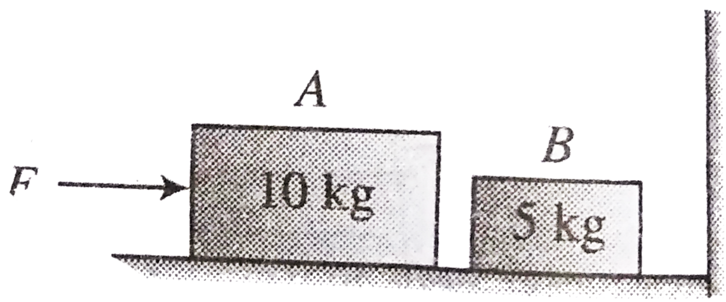
C. $30N$

D. None

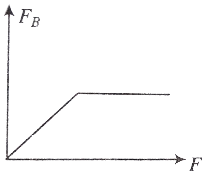
Answer: A

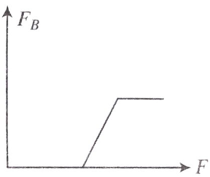
Watch Video Solution

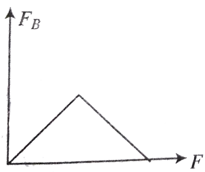
35. Two bodies A and B of masses $10kg$ and $5kg$ placed very slightly seperated as shown in figure The coefficient of friction between the floor and the block are as $\mu_s = 0.4$ block A is pushed by an external force F The value of F can be changed when the weight between block A and ground breaks block A will start prssing block B will start pressing the vertical wall



The force of friction acting on B verius with the applied force F acceleration to curve

A. a. 

B. b. 

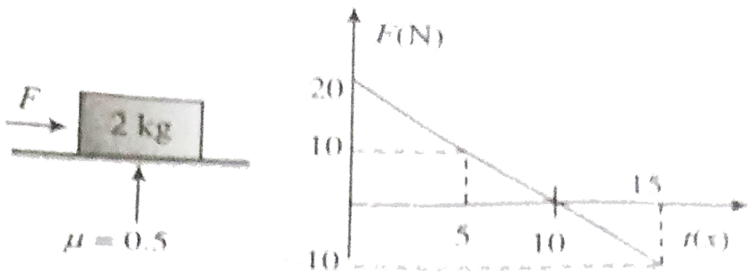
C. c. 

D. 

Answer: b

Watch Video Solution

36. On a stationary block of mass $2kg$ a horizontal forces F starts acting at $t = 0$ whose veriation with time is shown in figure .The coefficient of friction between the block and ground is 0.5 New answer the following question



Find the time when acceleration of the block is zero

A. At$5s$only

B. At$10s$only

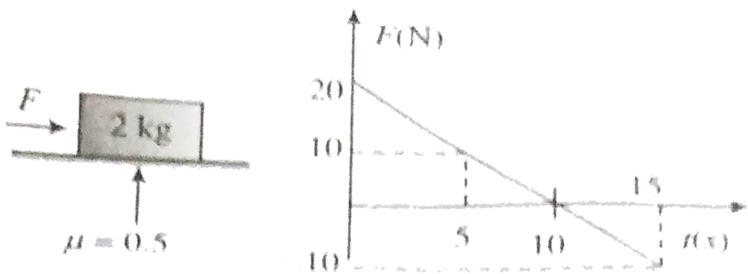
C. Both at$5s$ and $10s$

D. At a time after $t = 10s$only $5s$only

Answer: c

Watch Video Solution

37. On a stationary block of mass $2kg$ a horizontal forces F starts acting at $t = 0$ whose veriation with time is shown in figure .The coefficient of friction between the block and ground is 0.5 New answer the following question



Find the velocity of the block when for the firsst time its acceleration become zero

A. $12.5ms^{-1}$

B. $25ms^{-1}$

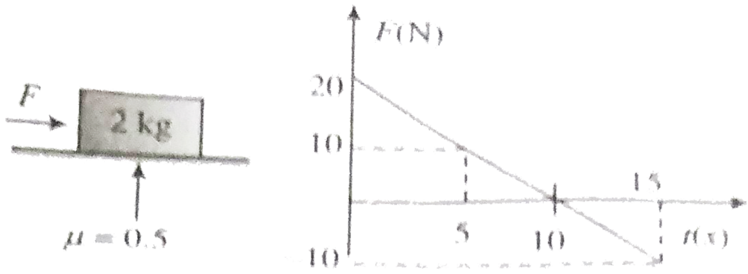
C. $10ms^{-1}$

D. None of these

Answer: a

Watch Video Solution

38. On a stationary block of mass $2kg$ a horizontal forces F starts acting at $t = 0$ whose veriation with time is shown in figure .The coefficient of friction between the block and ground is 0.5 New answer the following question



Find the velocity of the at $t = 12s$

A. $20ms^{-1}$

B. $-12ms^{-1}$

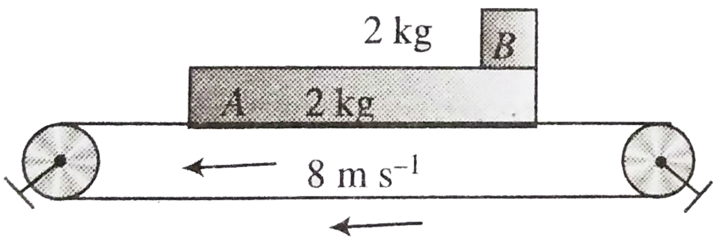
C. $+6ms^{-1}$

D. Zero

Answer: d

Watch Video Solution

39. A long conveyer belt moves with a constant velocity of $8ms^{-1}$.Two blockA and B each of mass $2kg$ are placed gently on the belt with B on A, initail velocity of block is zero Coefficient of friction between A and belt is 0.1 There is no friction between A and B length of A is $4m$



Find the time when A falls off A initially ,B is no the right and of A Ignore the dimensions of B

A. $1s$

B. $3s$

C. $2s$

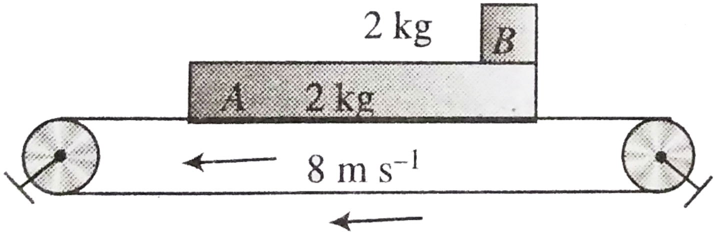
D. $4s$

Answer: c

Watch Video Solution

40. A long conveyer belt moves with a constant velocity of $8ms^{-1}$.Two blockA and B each of mass $2kg$ are placed gently on the belt with B on A, initail velocity of block is zero Coefficient of friction between A and belt is 0.1 There is no friction between A and B length of A is

$4m$



Find the velocity of A when B falls off A

A. $2ms^{-1}$

B. $4ms^{-1}$

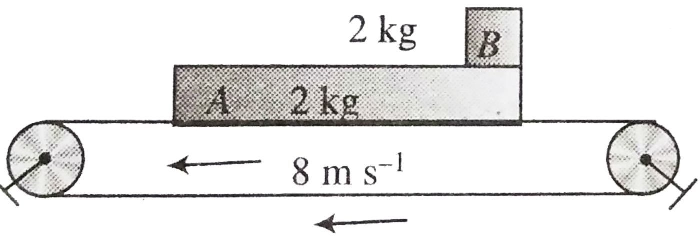
C. $6ms^{-1}$

D. $8ms^{-1}$

Answer: b

Watch Video Solution

41. A long conveyer belt moves with a constant velocity of $8ms^{-1}$.Two blockA and B each of mass $2kg$ are placed gently on the belt with B on A, initail velocity of block is zero Coefficient of friction between A and belt is 0.1 There is no friction between A and B length of A is $4m$



If the coefficient of friction between the block B and belt is 0.4 Find the separation between the two block when B come to rest w.r.t. belt

A. $8m$

B. $6m$

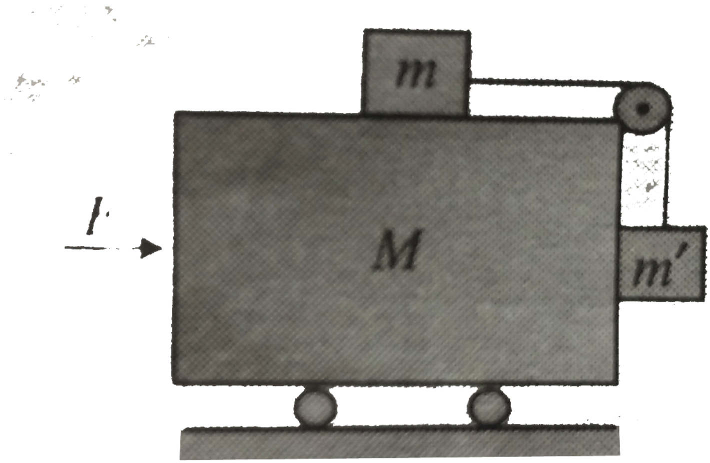
C. $2m$

D. None of these

Answer: c

Watch Video Solution

42. Two smooth blocks of masses m and m' connected by a light inextensible strings are moving on a smooth wedge of mass M. If a force F acts on the wedge the blocks do not slide relative to the wedge. Find the (a) acceleration of the wedge and (b) value of F.



A. $\frac{m'}{m+M}g$

B. $\frac{m'}{m}g$

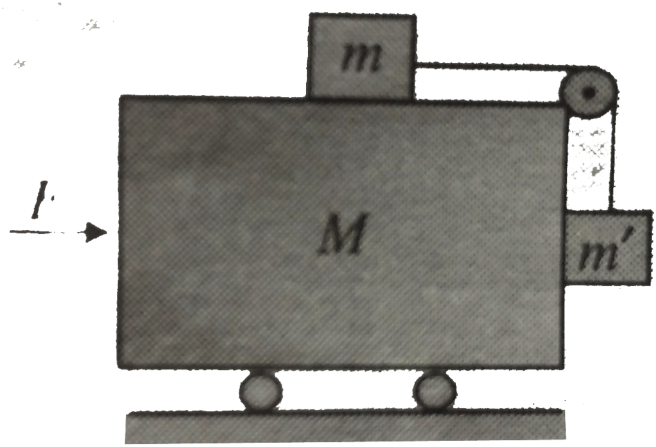
C. $\frac{m'}{M}g$

D. $\frac{m}{m'}g$

Answer: b

Watch Video Solution

43. Two smooth blocks of masses m and m' connected by a light inextensible strings are moving on a smooth wedge of mass M. If a force F acts on the wedge the blocks do not slide relative to the wedge. Find the (a) acceleration of the wedge and (b) value of F.



A. $(M + m + m')\dfrac{m'}{m}g$

B. $(M + m + m')\dfrac{m'}{m + M}g$

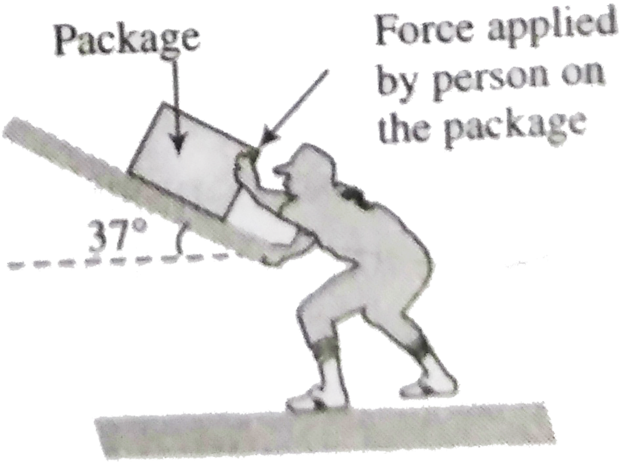
C. $(M + m + m')\dfrac{m'}{m' + M}g$

D. $(M+m+m')\dfrac{M}{m'+M}g$

Answer: a

Watch Video Solution

44. A person of mass $75kg$ works in a where his job is to arrange heavy articles in a stone - room As shown in figure he place a packing of mass $20kg$ on a ramp that is inclined to the horizontal at 37° and pushed it up the ramp with an acceleration $1.5ms^{-2}$ .This is the minimum acceleration for the packege to reach the top to the ramp.THe coefficient of static and friction between the shoes of the person and the ground is 0.8 and coefficient of kinetic friction for the motion of package on the is 0.5



Force applied by the person on the package is

A. $120N$

B. $250N$

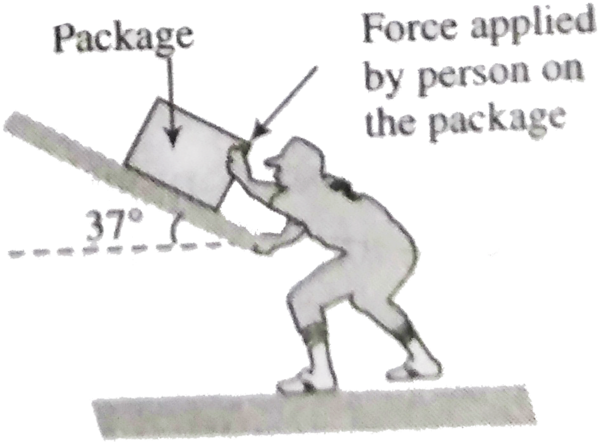
C. $210N$

D. None of these

Answer: d

Watch Video Solution

45. A person of mass $75kg$ works in a where his job is to arrange heavy articles in a stone - room As shown in figure he place a packing of mass $20kg$ on a ramp that is inclined to the horizontal at 37° and pushed it up the ramp with an acceleration $1.5ms^{-2}$ .This is the minimum acceleration for the packege to reach the top to the ramp.THe coefficient of static and friction between the shoes of the person and the ground is 0.8 and coefficient of kinetic friction for the motion of package on the is 0.5



Force of friction acting on the person is

Now suppose that the ground is wet which reduces the coefficient of static friction between the shoes of the person and the ground of 0.2 (other value remaining unchanged) Answer the following question:

A. $168N$

B. $200N$

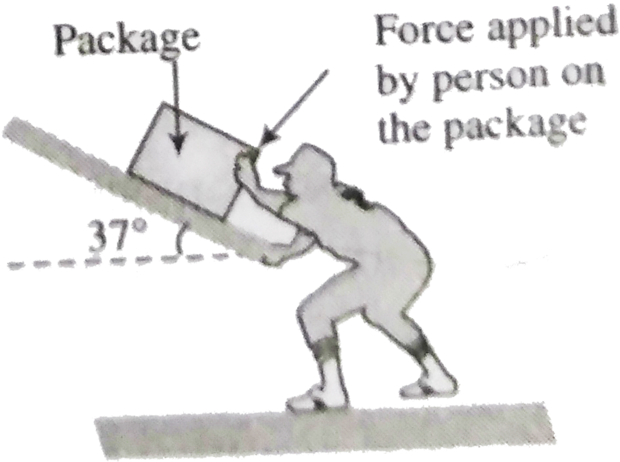
C. $480N$

D. None of these

Answer: d

Watch Video Solution

46. A person of mass $75kg$ works in a where his job is to arrange heavy articles in a stone - room As shown in figure he place a packing of mass $20kg$ on a ramp that is inclined to the horizontal at 37° and pushed it up the ramp with an acceleration $1.5ms^{-2}$ .This is the minimum acceleration for the packege to reach the top to the ramp.THe coefficient of static and friction between the shoes of the person and the ground is 0.8 and coefficient of kinetic friction for the motion of package on the is 0.5



Force applied by the person on the package is

A. $120N$

B. $250N$

C. $210N$

D. None of these

Answer: d

Watch Video Solution

47. A person of mass $75kg$ works in a where his job is to arrange heavy articles in a stone - room As shown in figure he place a packing of mass $20kg$on a ramp that is inclined to the horizontal at 37° and pushed it up the ramp with an acceleration $1.5ms^{-2}$ .This is the minimum acceleration for the packege to reach the top to the ramp.THe coefficient of static and friction between the shoes of the person and the ground is 0.8 and coefficient of kinetic friction for the motion of package on the is 0.5

Force of friction acting on the person will be

A. $160N$

B. $200N$

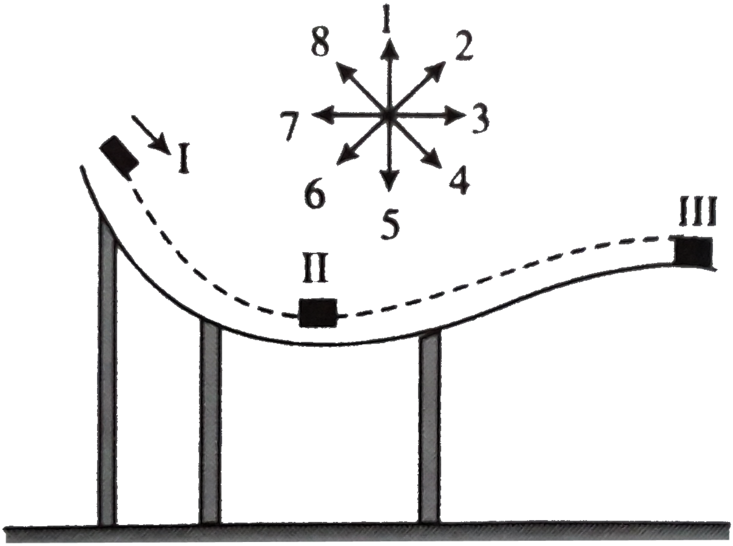
C. $180N$

D. None of these

Answer: d

Watch Video Solution

48. Figure depicts a block sliding along a frictionless ramp in vertical plane Eight numbered arrows in the diagram repreesent direction to be referred to when answering the questions



Position - i : Starts sliding on curve path

Position - ii : Lowest position of the curve path

Position - iii : Just outside of the curve path

The direction of the acceleration of the blocks when in position i is best represented by which of the arrows in the diagram

A. 4

B. 5

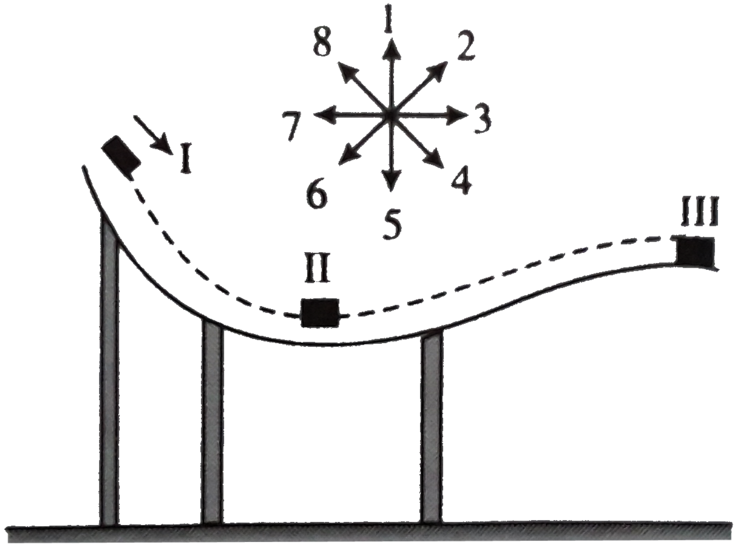
C. 2

D. None of the arrows, the accelerationis zero

Answer: a

Watch Video Solution

49. figure depicts a block sliding along a frictionless ramp in vertical plane Eight numbered arrows in the diagram repreesent direction to be referred to when answering the questions



Position - i : Starts sliding on curve path

Position - ii : Lowest position of the curve path

Position - iii : Just outside of the curve path

The direction of the acceleration of the blocks when in position ii is best represented by which of the arrows in the diagram?

A. 5

B. 8

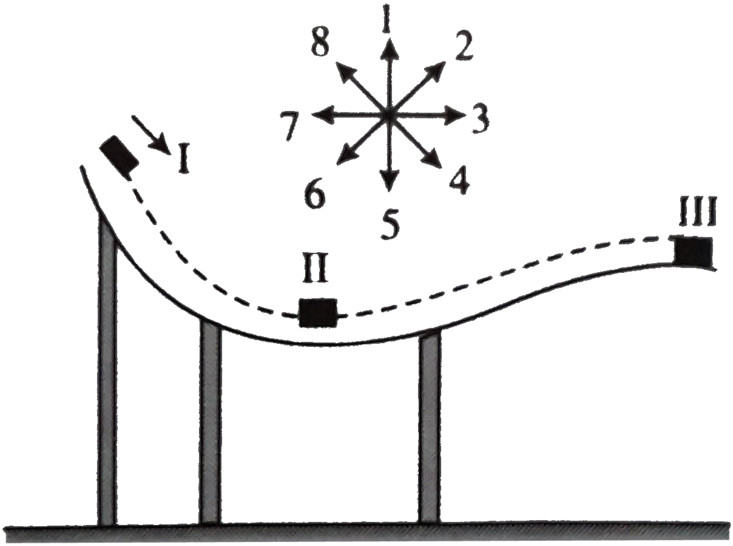
C. 1

D. 3

Answer: c

Watch Video Solution

50. figure depicts a block sliding along a frictionless ramp in vertical plane Eight numbered arrows in the diagram repreesent direction to be referred to when answering the questions



Position - i : Starts sliding on curve path

Position - ii : Lowest position of the curve path

Position - iii : Just outside of the curve path

The direction of the acceleration of the blocks (after leaving the ramp) at position i is best represented by which of the arrows in the diagram?

A. 5

B. 6

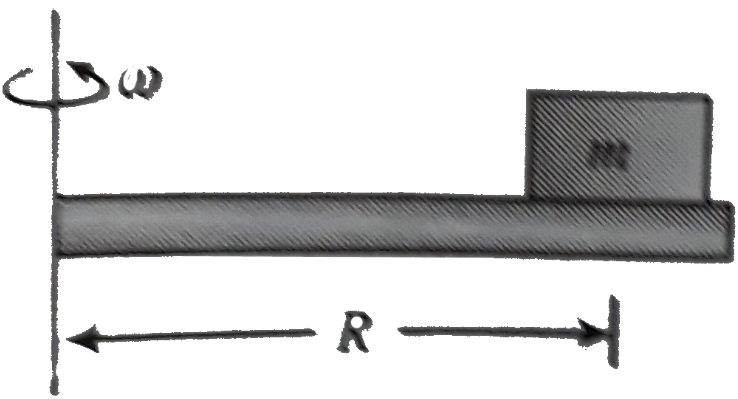
C. 2

D. None of the arrows, the accelerationis zero

Answer: a

Watch Video Solution

51. The coin is notating with a plate without sliding If the coefficient of friction between the coin and plane is $\mu = 0.75$ the friction between the coin and plate is



If the angular frequency of the rotation of the plate is

$\omega = \sqrt{\frac{g}{2R}}$ the friction force acting on coin is

A. $\frac{3}{4}mg \rightarrow$

B. $\frac{mg}{4} \leftarrow$

C. $\frac{3mg}{4} \leftarrow$

D. $\frac{mg}{2} \rightarrow$

Answer: C

Watch Video Solution

52. The coin is notating with a plate without sliding If the coefficient of friction between the coin and plane is

$\mu = 0.75$ the friction between the coin and plate is

If the plate is rotating along and the coin is gently placed on the rotating plate, the frictional force on the coin is

A. mg

B. $\frac{3}{2}mg$

C. $\frac{mg}{2}$

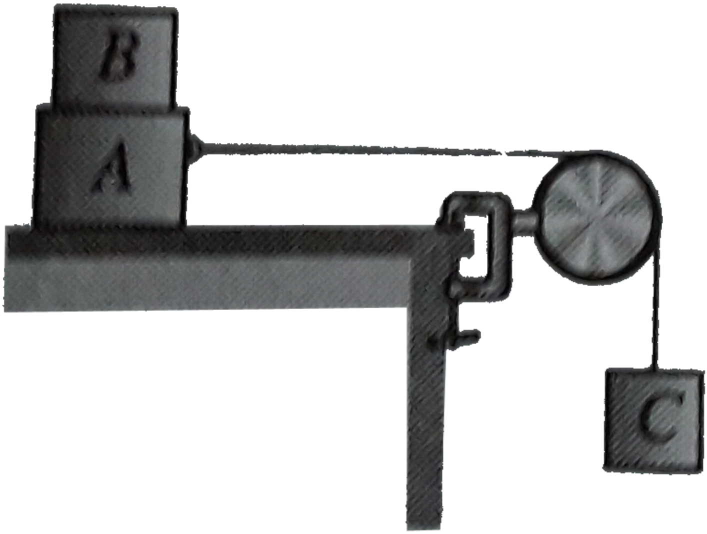
D. $\frac{3}{4}mg$

Answer: d

Watch Video Solution

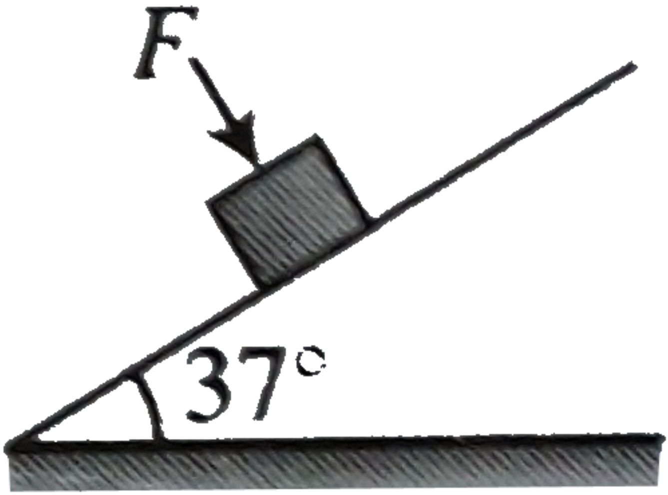
Integer

1. Block B of mass $m_B = 0.5kg$ rests on block A, with mass $m_A = 1.5kg$ which in turn is on a horizontal tabletop (as shown in figure) .The coefficient of kinetic friction between block A and the tabletop is $\mu_k = 0.4$ and the coefficient of static friction between block A and blockB is $\mu_s = 0.6$ A light string attached block A passes over a frictionless, massless pulley and block C is suspended from the other end of the string. What is the largest mass m_c (in kg) that block C can have so that block A and B still slide together when the system is replaced from rest?



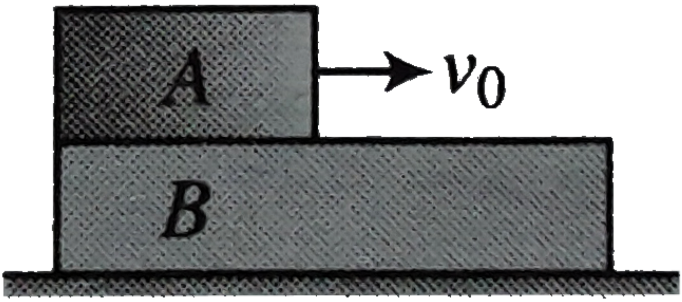
Watch Video Solution

2. A block of mass $m = 2kg$ is resting on a inclined plane of inclination 30° as shown in figure The coefficient of friction between the block and the plane is $\mu = 0.5$ what minimum force F (in newton) should be applied perpendicular to the plane on the block so that the does not slip on the plane?



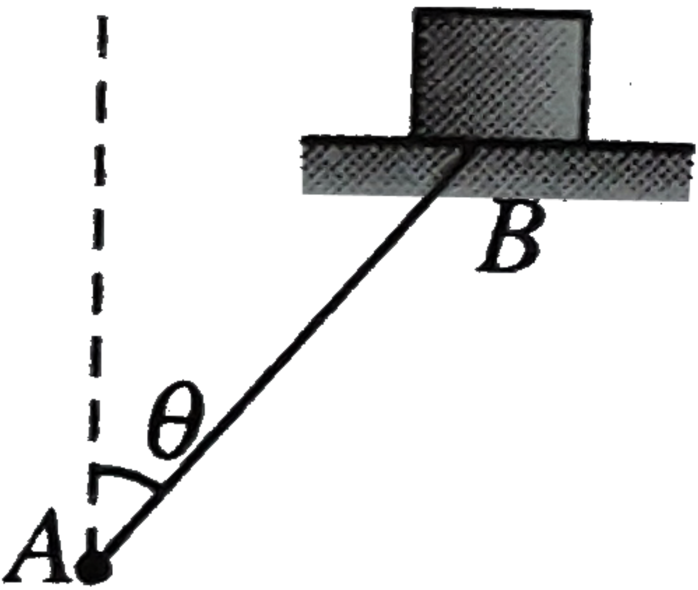
Watch Video Solution

3. A block A of mass m is placed over a plank$B$ of mass $2m$ plank B is placed over a smooth horizontal surface .The coefficient of friction between A and B is 0.4 Block A is given a velocity v_0 toward right Find acceleration (in ms^{-2} of B relative to A



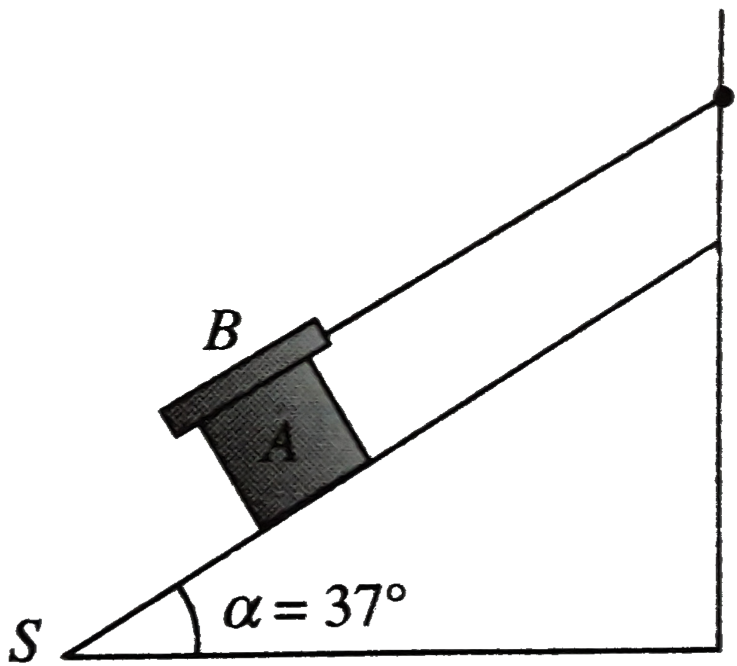
Watch Video Solution

4. A rod AB of length $2m$ is hinging at point A and its other end B is attached to a platform on which a point of mass m is kept. Rod rotates about point A maintain angle $\theta = 30^\circ$ with the vertical in such a way that platform remain horizontal and revolves on the horizontal circular path. If the coefficient of static friction between the block and platform is $\mu = 0.1$ then find the maximum angular velocity in rads^{-1} of rod so that the block does not slip on the platform $(g = 10ms^{-2})$



Watch Video Solution

5. A block A of weight W slide down an inclined plane S of slope 37° at a constant velocity, while the plank B also of weight W rests on top of A. The plank B is attached by a cord to the top of plane .The coefficient of kinetic friction μ is the same between the surface A and B and between S and A Determine the value of $1/\mu$



Watch Video Solution

6. A block of mass 1 kg lies on a horizontal surface in a truck. The coefficient of static friction between the block and the surface is 0.6. If the acceleration of the truck is $5m/s^2$, the frictional force acting on the block is............newtons.

Watch Video Solution

True And False

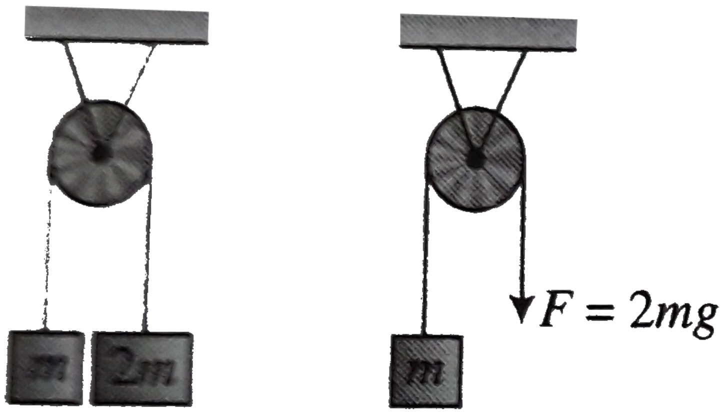
1. When a person walls on a rought surface, the frictional force exerted by the surface on the person is opposite to the direction of his motion.

Watch Video Solution

2. A simple pendulum with a bob of mass m swings with an angular amplitude of 40°. When its angular displacement is 20°, the tension in the string is greater than $mg\cos 20^\circ$

Watch Video Solution

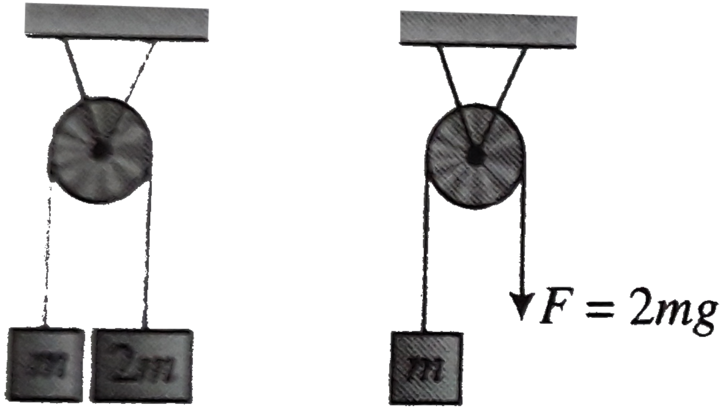
3. The pulley arrangement in Fig are identical .The mass of the rope is negligble in figure the mass m is lifted up by atteched a mass $2m$ to the other end of the rope . In (b), m is lifed up by pulley the other end of the rope with a constant in both cases



(a) (b)

Watch Video Solution

4. In the arrangement shown in Fig the ends P and $Q$of an unstrechable string move downwards with uniform speed U pulley A and B are fixed Mass M moves upward with a speed



(a) (b)

A. $2U \cos \theta$

B. $U / \cos \theta$

C. $2U / \cos \theta$

D. $U \cos \theta$

Answer: b

View Text Solution

Single correct answer type

1. A ship of mass $3 \times 10^7 kg$ initially at rest, is pulled by a force of $5 \times 10^5 N$ through a distance of $3m$. Assuming that the resistance due to water is negligible, the speed of the ship is

A. $1.5ms^{-1}$

B. $60ms^{-1}$

C. $0.1ms^{-1}$

D. $5ms^{-1}$

Answer: C

Watch Video Solution

2. A block of mass 2kg rests on a rough inclined plane making an angle of 30° with the horizontal. The coefficient of static friction between the block and the plane is 0.7. The frictional force on the block is

A. $9.8N$

B. $0.7 \times 9.8 \times (\sqrt{3})N$

C. $9.8 \times (\sqrt{3})N$

D. $0.7 \times 9.8N$

Answer: a

Watch Video Solution

3. When a bicycle is in motio, the force of friction exerted by the ground on the two wheels is such that it acts

A. In the backward on the front wheel and in the forward on the rear wheel

B. In the forward direction on the front wheel and in the backward on the rear wheel

C. In the backward direction on both and the rear wheel

D. In the forward direction on both the front and the rear wheel

Answer: a

Watch Video Solution

4. A car is moving in a circular horizonta track of radius 10m with a constant speed of 10 m/s. A pendulum bob is suspended from the roof of the cat by a light rigid rod of length 1.00m. The angle made by the rod with track is

A. Zero

B. 30°

C. 45°

D. 60°

Answer: c

Watch Video Solution

5. A block of mass 0.1 is held against a wall applying a horizontal force of 5N on block. If the coefficient of friction between the block and the wall is 0.5, the magnitude of the frictional force acting on the block is:

A. $2.5N$

B. $0.98N$

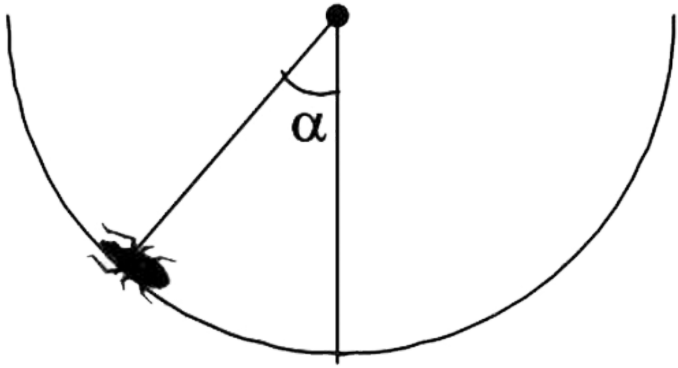
C. $4.9N$

D. $0.49N$

Answer: b

Watch Video Solution

6. An insect craws up a hemispherical surface very slowly (see fig.). The coefficient of friction between the insect and the surface is $1/3$. If the line joining the center of the hemispherical surface to the insect makes an angle α with the vertical, the maximum possible value of α is given by



A. $\cot\alpha = 3$

B. $\tan\alpha = 3$

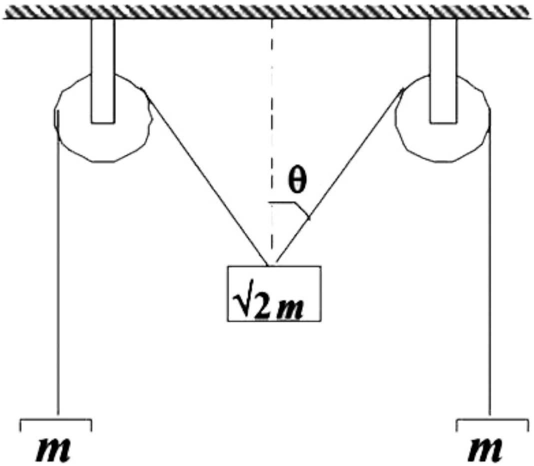
C. $\sec\alpha = 3$

D. $\cos ec\alpha = 3$

Answer: A

Watch Video Solution

7. The pulleys and strings shown in the figure are smooth and of negligible mass. For the system to remain in equilibrium, the angle θ should be



A. 0°

B. 30°

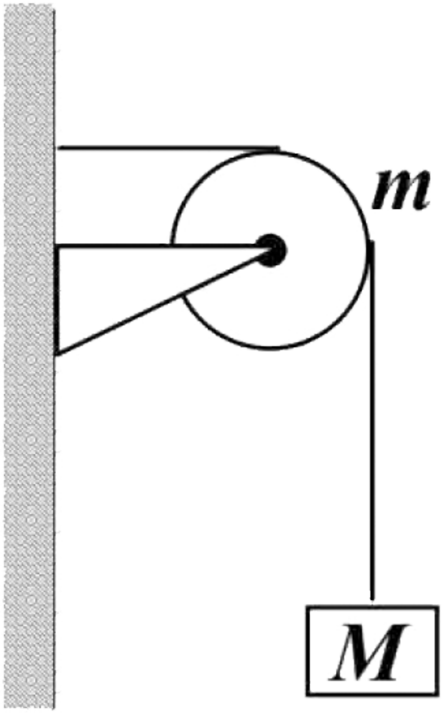
C. 45°

D. 60°

Answer: c

Watch Video Solution

8. A string of negligible mass going over a clamped pulley of mass m supports a block of mass M as shown in the figure. The force on the pulley by the clamp is given by



A. $\sqrt{2}Mg$

B. $\sqrt{2}mg$

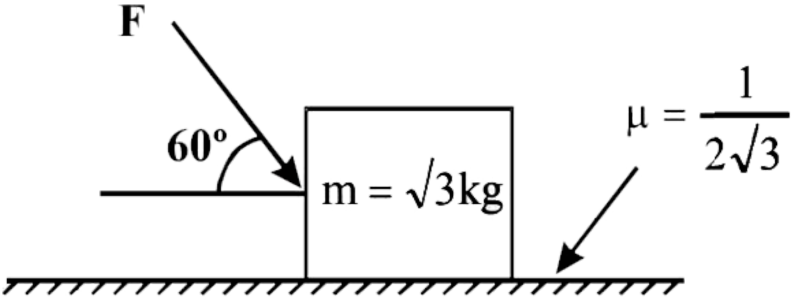
C. $\left(\sqrt{(M+m)^2+m^2}\right)g$

D. $\left(\sqrt{(M+m)^2+M^2}\right)g$

Answer: d

Watch Video Solution

9. What is the maximum value of the force F such that the block shown in the arrangement, does not move?



A. $20N$

B. $10N$

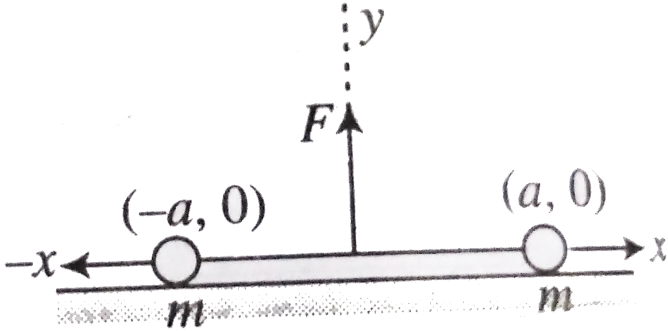
C. $12N$

D. $15N$

Answer: a

Watch Video Solution

10. Two masses each equal to m are lying on x-axis at $(-a, 0)(+a, 0)$ respectively as shown in figure They are connected by a light string A force F is applied at the origin along vertical direction As a result the masses move toward each other without loosing contact with ground What is the acceleration of each mass? Assume the instantaneous position of the masses as$(-x, 0)$ and $(x, 0)$



A. $\frac{2F}{m}\sqrt{\frac{a^2 - x^2}{x}}$

B. $\frac{2F}{m} \cdot \frac{x}{\sqrt{a^2 - x^2}}$

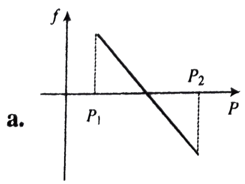
C. $\frac{F}{2m} \cdot \frac{x}{\sqrt{a^2 - x^2}}$

D. $\frac{F}{m}\frac{x}{\sqrt{a^2 - x^2}}$

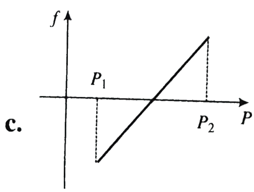
Answer: c

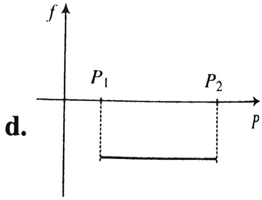
Watch Video Solution

11. A block of mass m is on an inclined plane of angle θ. The coefficient of friction between the block and the plane is μ and $\tan\theta > \mu$. The block is held stationary by applying a force P parallel to the plane. The direction of force pointing up the plane is taken to be positive. As P is varied from $P_1 = mg(\sin\theta - \mu\cos\theta)$ to $P_2 = mg(\sin\theta + \mu\cos\theta)$, the frictional force f versus P graph will look like

A. 

B.

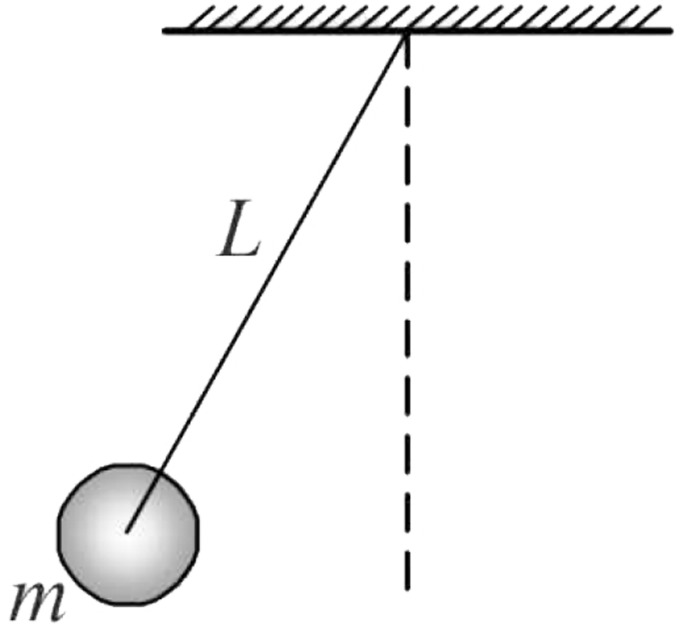
C. 

D. 

Answer: a

Watch Video Solution

12. A ball of mass (m) 0.5g is attached to the end of a string having length (L) 0.5m. The ball is rotated on a horizontal circular path about vertical axis. The maximum tension that the string can bear is 324N. The maximum possible value of anguar velocity of ball(in radian/s) is



A. 9

B. 18

C. 27

D. 36

Answer: d

Watch Video Solution

13. A block of mass $m_1 = 1kg$ and another mass $m_2 = 2kg$ are placed together(see figure) on an inclined plane with angle of inclination θ varius value of θ are given in list 1 The coefficient of friction between the block m_1 and the plank is always zero The coefficient of static and dynamic friction between the block m_2 and the plank are equal to $\mu = 0.3$ In List II expersssions for the friction the block m_2 are given Match the correct experssions of the frictionless in List II with the angle given in list 1 and choice the correct option The acceleration due too gravity detented by g

[Useful information

$\tan(5.5^\circ) = 0.1 \tan(11.5^\circ) = 0.2 \tan(16.5^\circ) = 0.3$]

List I P. $\theta = 5^\circ$ Q. $\theta = 10^\circ$

R. $\theta = 15^\circ$ S. $\theta = 20^\circ$

List 2

1.$m_2 g \sin\theta$ 2.$(m_1 + m_2) g \sin\theta$

3.$\mu m_2 g \cos\theta$ 4. $\mu(m_1 + m_2) g \cos\theta$

A. $P-1, Q-1, R-1, S-3$

B. $P-2, Q-2, R-2, S-3$

C. $P-2, Q-2, R-2, S-4$

D. $P-2, Q-2, R-3, S-3$

Answer: d

View Text Solution

Multiple correct answer type

1. A reference frame attached to the earth

A. is an inertial frame by definition

B. cannot be an inertial frame because the Earth is revolving round the sun

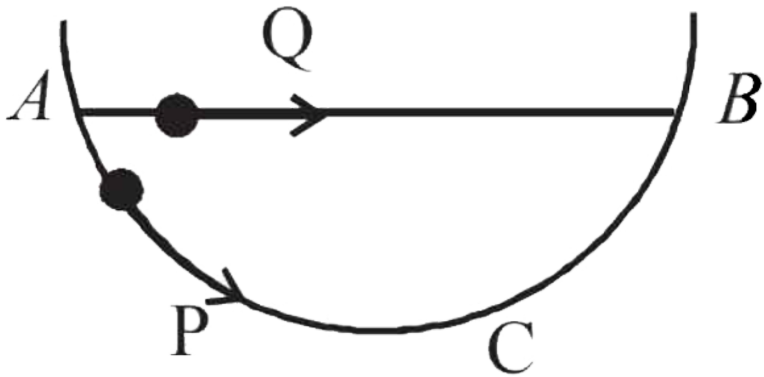
C. is an incrtial frame because Newton's laws are applicable in this frame

D. cannot be an incrtical frame because the Earth is rotating about its own axis

Answer: b,c

Watch Video Solution

2. A particle P is sliding down a frictionless hemispherical bowl. It passes the point A at $t = 0$. At this instant of time, the horizontal component of its velocity is v. A bead Q of the same mass as P is ejected from A at $t = 0$ along the horizontal string AB, with the speed v. Friction between the bead and the string may be neglected. Let t_P and t_Q be the respective times taken by P and Q to reach the point B. Then:



A. $t_p < t_Q$

B. $t_p = t_Q$

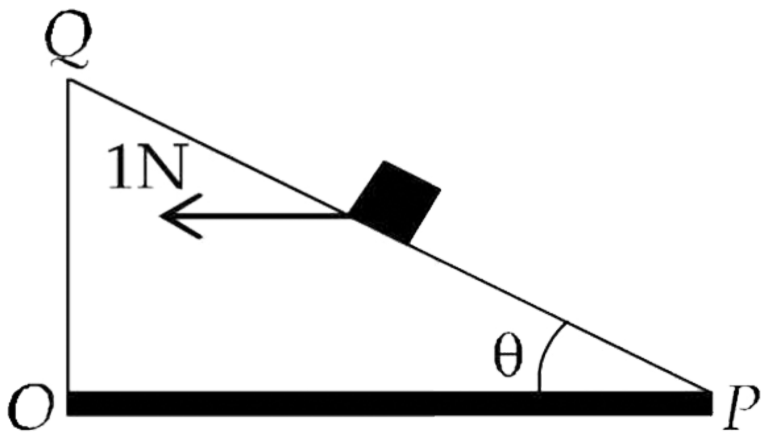
C. $t_p > t_Q$

D. $\frac{t_p}{t_Q} = \frac{\text{Length of are} ACB}{\text{Length of} AB}$

Answer: a

Watch Video Solution

3. A small block of mass of 0.1 kg lies on a fixed inclined plane PQ which makes an angle θ with the horizontal. A horizontal force of 1N acts on the block through its centre of mass as shown in figure.



The block remains stationary if (take $g = 10m/s^2$)

A. $\theta = 45^\circ$

B. $\theta > 45^\circ$ and a frictional force acts on the block toward P

C. $\theta > 45^\circ$ and a frictional force acts on the block toward Q

D. $\theta < 45^\circ$ and a frictional force acts on the block toward Q

Answer: a,c,

Watch Video Solution

Assertion -reasoning

1. STATEMENT-1: A cloth covers a table. Some dishes are kept on it. The cloth can be pulled out without dislodging the dishes from the table.

STATEMENT-2: For every action there is an equal and opposite reaction.

A. statement -I is true ,statement II is true ,Statement II is the correct explanation for statement -I

B. Statement -I is true ,Statement II is true statement II is not the correct explanation for statement -I

C. Statement -I is true ,Statement II is false

D. Statement -I is false ,Statement II is true

Answer: b

Watch Video Solution

2. STATEMENT-1: It is easier to pull a heavy object than to push it on a level ground and

STATEMENT-2: The magnitude fo frictional force depends on the nature of the two surfaces in contact.

A. statement -I is true ,statement II is true ,Statement II is the correct explanation for statement -I

B. Statement -I is true ,Statement II is true statement II is not the correct explanation for statement -I

C. Statement -I is true ,Statement II is false

D. Statement -I is false ,Statement II is true

Answer: b

Watch Video Solution

Integer type

1. A block is moving on an inclined plane making an angle 45° with the horizontal and the coefficient of friction is μ. The force required to just push it up the inclined plane is 3 times the force required to just prevent it from sliding down. If we define $N = 10\mu$, then N is

Watch Video Solution