YAKEEN NEET 2.0

2026

Laws of Motion

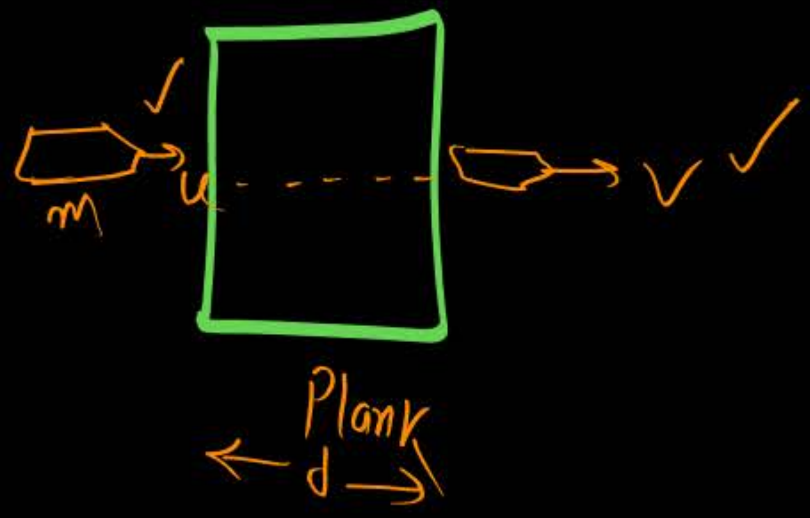
Physics	Lecture - 12

By- Manish Raj (MR Sir)

Todays Goal

{friction}

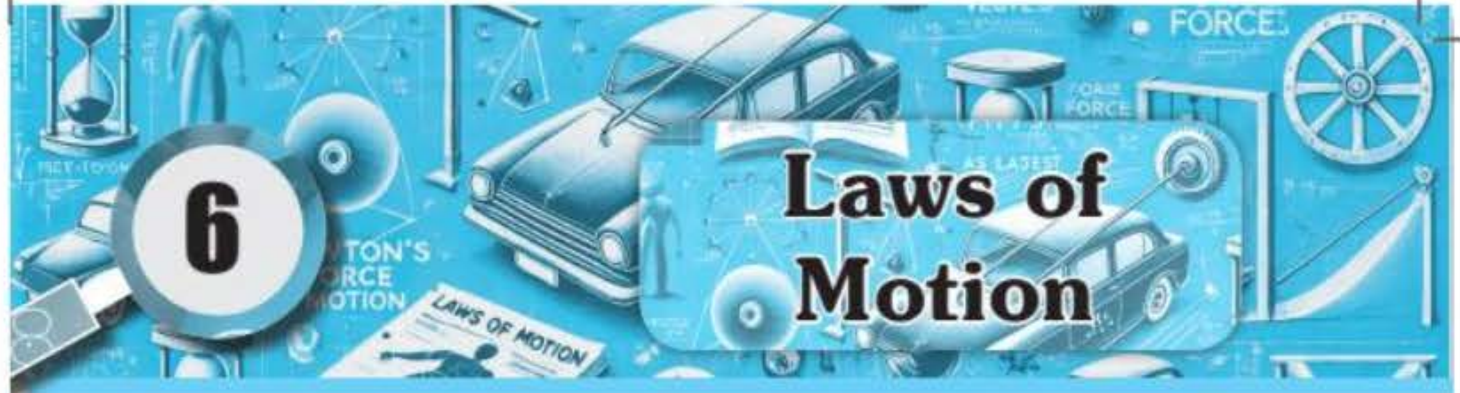
$$\Delta P = F \cdot \Delta t \quad \text{— (1)}$$



$$v^2 - u^2 = 2ad$$

$$a = \frac{v^2 - u^2}{2d}$$

$$\boxed{F = ma}$$



State of Body : Inertia

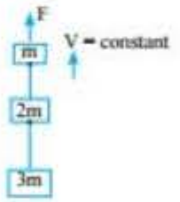
1. A boy sitting on the topmost berth in the compartment of a train which is just point to stop on a railway station, drops an apple aiming at the open hand of his brother sitting vertically below his hands at a distance of about 2 meter The apple will fall:
   (*a*) Precisely on the hand of his brother.
   (*b*) Slightly away from the hand of his brother in the direction of motion of the train.
   (*c*) Slightly away from the hand of his brother in the direction opposite to the direction of motion of the train.
   (*d*) None of the above
2. When an object is in equilibrium state then
   (*a*) It must be at rest
   (*b*) No force is acting on it
   (*c*) Its net acceleration must be zero
   (*d*) All of these
3. When an object is at rest
   (*a*) Force is required to keep it in rest state
   (*b*) No force is acting on it
   (*c*) A large number of forces may be acting on it which balance each other
   (*d*) It is in vacuum
4. A body released from a balloon rising up continues to move up along with the balloon due to inertial of motion.
   (*a*) True (*b*) False
   (*c*) Partially true (*d*) None of the above
5. Unit of inertia is same as unit of :-
   (*a*) Mass (*b*) Force
   (*c*) Di-electric constant (*d*) Angle

Newton's First Law of Motion or Law of Inertia

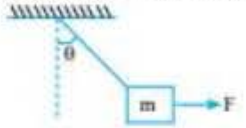
6. An athlete does not come to rest immediately after crossing the winning line due to the
   (*a*) Inertia of rest (*b*) Inertia of motion
   (*c*) Inertia of direction (*d*) None of these
7. Why does the horse rider falls forward when a horse at full gallop stops suddenly?
8. **Assertion (A):** If a body is moving with some fixed velocity, then there must be presence of Net force acting on Body.
   Reason (R): It is only the Net force which can change state of body from rest to motion
   (*a*) If both Assertion (A) and Reason (R) are correct and Reason (R) is a correct explanation of the Assertion (A)
   (*b*) If both Assertion (A) and Reason (R) are correct but Reason (R) is not the correct explanation of Assertion (A)
   (*c*) If Assertion (A) is incorrect but Reason (R) is correct
   (*d*) If both Assertion (A) and Reason (R) are incorrect
9. **Assertion (A):** Inertia is proportional to mass of object [higher the mass, higher will be it's inertia]
   Reason (R): Inertia is physical quantity that doesn't have any unit
   (*a*) If both Assertion (A) and Reason (R) are correct and Reason (R) is a correct explanation of the Assertion (A)
   (*b*) If both Assertion (A) and Reason (R) are correct but Reason (R) is not the correct explanation of Assertion (A)
   (*c*) If Assertion (A) is correct but Reason (R) is incorrect
   (*d*) If both Assertion (A) and Reason (R) are incorrect
10. Newton's first law is a special case of second law.
   (*a*) True (*b*) False
   (*c*) Partially true (*d*) None of the above

Tension in Equilibrium

11. Three blocks with masses m, $2m$, and $3m$ are connected as shown in the diagram. A force F is applied upward on the block with mass m, and the system moves with constant velocity V. Find the net force acting on the middle block of mass $2m$.



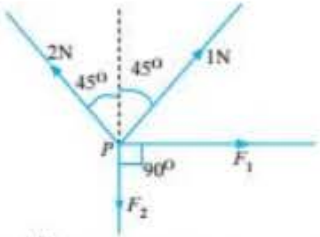
12. Find 'θ' angle by string from vertical and tension T in string where object of mans m is in equilibrium state.



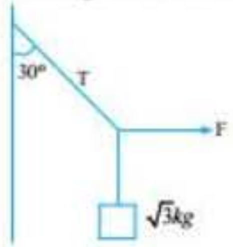
13. A mass of 10 kg is suspended vertically by a rope from the roof. When a horizontal force is applied on the mass, the rope deviated at an angle of 45° at the roof point. If the suspended mass is at equilibrium, the magnitude of the force applied is (Take, g = 10 ms^{-2})

(a) 70 N (b) 200 N
(c) 100 N (d) 140 N

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

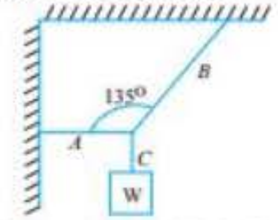


15. A block of $\sqrt{3}$ kg is attached to string whose other end is attached to the wall. An unknown force F is applied so that the string makes an angle of 30° with wall. The tension T is



(a) 15 N (b) 10 N
(c) 25 N (d) 20 N

16. A block of weight W is supported by three strings as shown in figure. Which of the following relations is true for tension in the strings? (Here T_1, T_2 and T_3 are the tension in the strings A, B and C respectively)



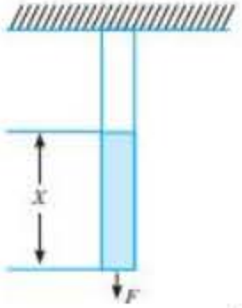
(a) $T_1 = T_2$ (b) $T_1 = T_3$
(c) $T_2 = T_3$ (d) $T_1 = T_2 = T_3$

17. A weight Mg is suspended from the middle of a rope whose ends are at the same level. The rope is no longer horizontal. The minimum tension required to completely straighten the rope is

(a) Mg/2 (b) Mg cos 8
(c) 2 mg cos 8 (d) Infinitely large

Tension in a Heavy Rope

18. A vertical force F is applied at one end of a uniform rope of mass M and length L. Find out tension in the rope as a function of x

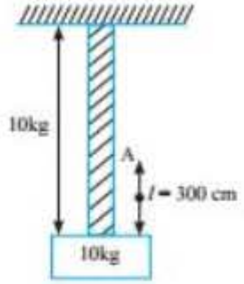


(a) $F + Mg$ (b) $F + \frac{MgL}{x}$
(c) $\frac{FL + Mgx}{L}$ (d) $\frac{Fx + MgL}{L}$

19. A uniform rope of mass M and length L is fixed at its upper end vertically from a rigid support. Then the tension in the rope at the distance l from the rigid support is

(a) $Mg\frac{L}{L+l}$ (b) $\frac{Mg}{L}(L-l)$
(c) Mg (d) $\frac{l}{L}Mg$

20. The adjoining figure shows a block of mass 10 kg connected to free end of a rope of mass 10 kg and length 10 m. The tension of the rope at point A is (g = 10m /s^2)

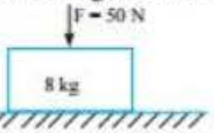


(a) 170 N (b) 30 N
(c) 130 N (d) 70 N

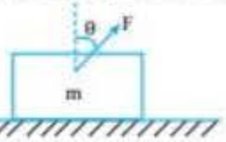
MR Physics

Contact Force

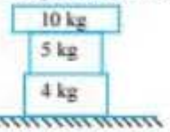
21. An 8 kg block is placed on the ground, and a vertical downward force of 50 N is applied to the block. Find the contact force (normal force) between the 8 kg block and the ground.



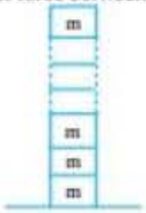
22. A block of mass m is placed on the ground. A force F is applied at an angle θ to the horizontal. Find the contact force (normal force) exerted by the block on the ground.



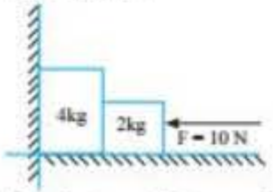
23. Three blocks of masses 4 kg, 5 kg, and 10 kg are stacked on top of each other, with the 4 kg block at the bottom, the 5 kg block in the middle, and the 10 kg block on top. Find the force applied by the 5 kg block on the 10 kg block.



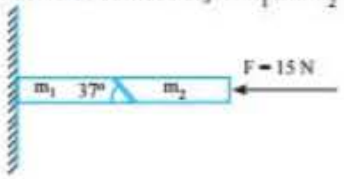
24. There are 50-identical block placed on over other shown in figure. Find contact force between 2[nd] and 3[rd] block.



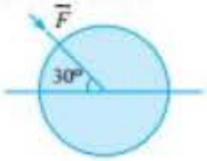
25. A 4 kg block is placed next to a 2 kg block, with a horizontal force of 10 N applied to the 2 kg block. The blocks are in contact with each other and are pushed against a wall as shown in the diagrame. Find the contact force between the 4 kg block and the 2 kg block..



26. Find contact force between object m_1 and m_2



27. As shown in figure, a 70 kg garden roller is pushed with force of $\vec{F} = 200$ N at an angle of 30° with horizontal. The normal reaction on the roller is



(a) 800 N (b) 600 N (c) $200\sqrt{3}N$ (d) $800\sqrt{2}N$

28. Ten one-rupee coins are put on top of each other on a table. Each coin has mass m.

Find the magnitude (is mgN) and direction of

(i) The force on the 7[th] coin (counted from the bottom due to all the coins on its top).

(ii) The force on the 7[th] coin by the eighth coin,

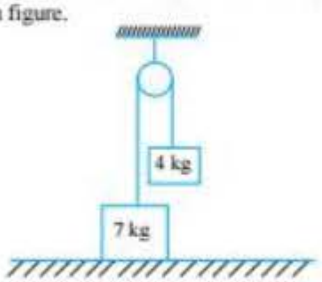
(iii) The reaction of the 6[th] coin on the 7[th] coin.

(a) 3, 3, –4 (b) –4, 3, 3

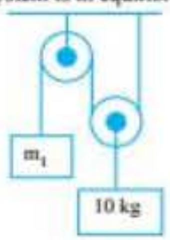
(c) 3, –4, 3 (d) None of these

Static Pulley Block System

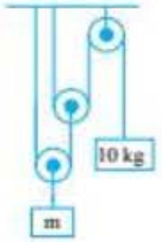
29. Find contact force between ground and 7 kg block as shown in figure.



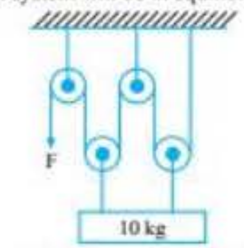
30. Find m_1 so that system is in equilibrium.



31. Find m = ?? if system is at rest?



32. F = ? So that system will be in equilibrium



(*a*) 10 N (*b*) 25 N (*c*) 100 N (*d*) 400 N

33. Mechanical Advantage in above is

(*a*) 4 (*b*) 10 (*c*) $\frac{1}{4}$ (*d*) 1

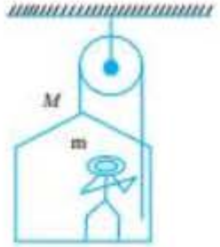
34. The pulleys and strings shown in the figure are smooth and of negligible mass. For the system to remain in equilibrium, the angle θ should be

(*a*) 0° (*b*) 30° (*c*) 45° (*d*) 60°

35. In the arrangement as Shown, tension T_2 is ($g = 10$ m/s^2)

(*a*) 50 N (*b*) 100 N (*c*) $50\sqrt{3}N$ (*d*) $100\sqrt{3}$ N

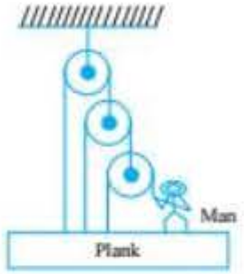
36. A man of mass *m* stands on a frame of mass *M*. He pulls a light rope, which passes over a pulley. The other end of the rope is attached to the frame. For the system to be in uniform motion, what force must the man exert on the rope ?



(*a*) $\frac{(M+m)g}{2}$ (*b*) (M + m)g

(*c*) (M - m)g (*d*) (M + 2m)g

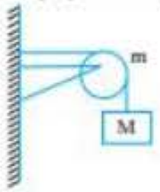
37. A man (mass *m*) hold himself and plank (mass *M*) in equilibrium with the help of 3 pulley + string system. The force exerted by man upon rope is



(*a*) $\frac{(M+m)g}{2}$ (*b*) $\frac{(M+m)g}{8}$

(*c*) $\frac{(M+m)g}{6}$ (*d*) $\frac{(M+m)g}{5}$

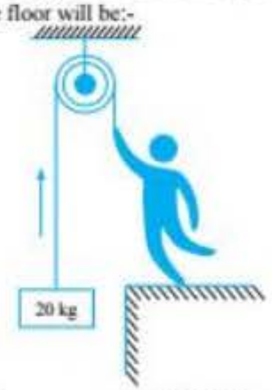
38. A string of negligible mass going over a clamped pulley of mass (m)supports a block of mass M as shown in the figure. The force on the pulley by the clamp is given by



(*a*) $\sqrt{2}$Mg (*b*) $\sqrt{2}$mg

(*c*) $g\sqrt{(M+m)^2+m^2}$ (*d*) $g\sqrt{(M+m)^2+M^2}$

39. Mass of a block is 20 kg. A man of mass 60 kg raises it with constant velocity as shown in the figure force exerted by man on the floor will be:-

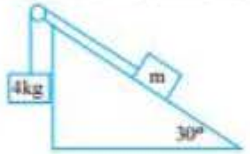


(*a*) 400 N (*b*) 600 N

(*c*) 200 N (*d*) None of the above

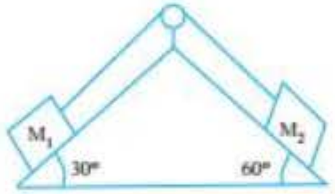
Smooth Inclined Plane

40. If system is in equilibrium then find value of m??

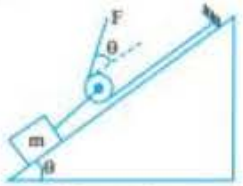


MR Physics

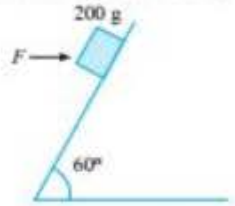
41. Find relation between m_1 and m_2 so that system is in equilibrium.



42. Find F so that object of mass m will be at rest on smooth inclined plane



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



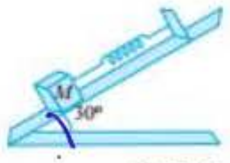
44. If a body is placed on a rough inclined plane, the nature of forces acting on the body is (are)

(*i*) Gravitational force (*ii*) Electromagnetic force
(*iii*) Nuclear force (*iv*) Weak nuclear force

(*a*) Only *i* (*b*) *i* and *iv*
(*c*) All (*d*) *i* and *ii*

Spring Mass System

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

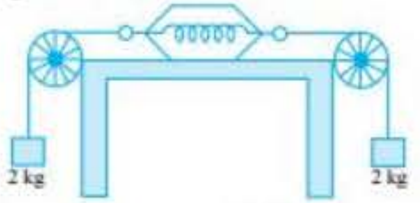


(*a*) 50 N (*b*) 25 N
(*c*) 500 N (*d*) 10 N

46. A block of mass 4 kg is suspended through two light spring balances A and B. Then A and B will read respectively:

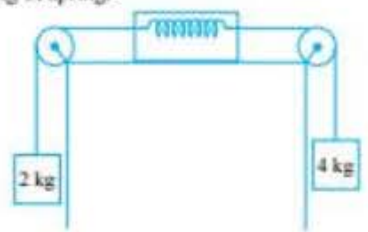
(*a*) 4 kg and zero kg (*b*) zero kg and 4 kg
(*c*) 4 kg and 4 kg (*d*) 2 kg and 2 kg

47. As shown in figure, two equal masses each of 2 kg are suspended from a spring balance. The reading of the spring balance will be



(*a*) Zero (*b*) 2 kg
(*c*) 4 kg (*d*) Between zero and 2 kg

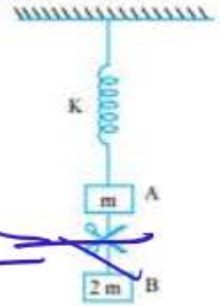
48. Reading of spring.



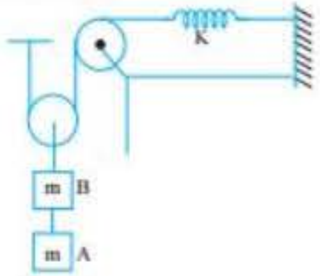
49. A spring whose unstretched length is l has a force constant k. The spring is cut into two pieces of unstretched lengths l_1 and l_2 where, $l_1 = nl_2$ and n is an integer. The ratio k_1/k_2 of the corresponding force constants, k_1 and k_2 will be:

(*a*) $1/n^2$ (*b*) n^2 (*c*) $1/n$ (*d*) n

50. System as shown in figure is in equilibrium. If string is cut then find acceleration of A and B.



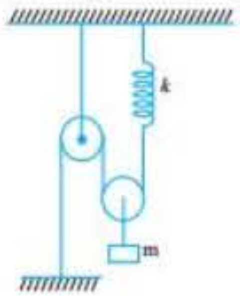
51. Initially both blocks A and B stay at equilibrium If string between A and B is cut, then acceleration of block A and B just after cut will be:



(a) g downward, g upward (b) g/2 downward, zero

(c) g downward, g downward (d) g/2 downward, g upward

52. A block of mass m shown in figure is in equilibrium. If it is displaced further by x and released. Find it acceleration just after it is released. Take pulleys to be light and smooth and strings light.



(a) $\frac{4kx}{5m}$ (b) $\frac{2kx}{5m}$

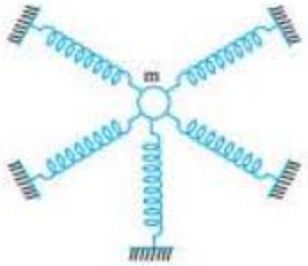
(c) $\frac{4kc}{m}$ (d) None of these

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

(a) 4.8 m/s² (b) 7 m/s²

(c) 2 m/s² (d) 0.5 m/s²

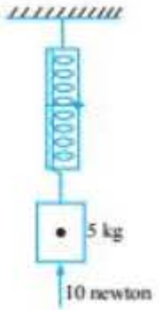
54. A sphere of mass m is kept in equilibrium with the help of several springs as shown in the figure. Measurement shows that one of the springs applies a Force $\overline{F}$ on the sphere. With what acceleration the sphere will move immediately after this particular spring is cut?



(a) Zero (b) $\overline{F}/m$

(c) $-\overline{F}/m$ (d) Insufficient information

55. Reading of spring balance is ($g = 10$ m/s²) if object of mass 5 kg is in equilibrium,

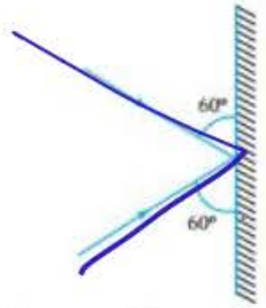


(a) 10 N (b) 20 N

(c) 30 N (d) 40 N

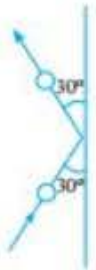
Newton's Second Law of Motion

56. A body of mass 3 kg moving with velocity 10 m/s hits a wall at an angle of 60° and returns at the same angle. The impact time was 0.2 s. Calculate the force exerted on the wall



(a) $150\sqrt{3}$N (b) $50\sqrt{3}$N (c) 100 N (d) 75 N

57. A 0.5 kg ball moving with a speed of 12 m/s strikes a hard wall at an angle of 30° with the wall. It is reflected with the same speed and at the same angle. If the ball is in contact with the wall for 0.25 s, the average force acting on the wall is:



(a) 48 N (b) 24 N (c) 12 N (d) 96 N

58. A cricketer catches a ball of mass 150 g in 0.1 s moving with speed 20 m/s, then the experiences force of

(a) 300 N (b) 30 N (c) 3 N (d) 0.3 N

59. A ball of mass 50 g is dropped from a height of 20 m. A boy on the ground hits the ball vertically upwards with a bat with an average force of 200 N, so that it attains a vertical height of 45 m. The time for which the ball remains in contact with the bat is [Take $g = 10\ m/s^2$]

(a) 1/20th of a second (b) 1/40th of a second
(c) 1/80th of a second (d) 1/20th of a second

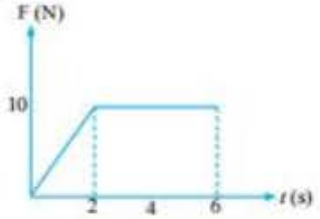
60. A force of 6 N acts on a body at rest and of mass 1 kg. During this time, the body attains a velocity of 30 m/s. The time for which the force acts on the body is

(a) 7 second (b) 5 second
(c) 10 second (d) 8 second

61. In two different experiments, an object of mass 5 kg moving with a speed of 25 ms^{-1} hits two different walls and comes to rest within (i) 3 second, (ii) 5 seconds, respectively. Choose the correct option out of the following:

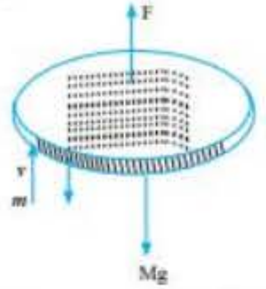
(a) Impulse and average force acting on the object will be same for both the cases.
(b) Impulse will be same for both the cases but the average force will be different.
(c) Average force will be same both the cases but the impulse will different.
(d) Average force and impulse will be different for both the cases.

62. A body of mass 3 kg is acted on by a force which varies as shown in the graph below. The momentum acquired is given by:



(a) Zero (b) 5 N-S
(c) 30 N-S (d) 50 N-S

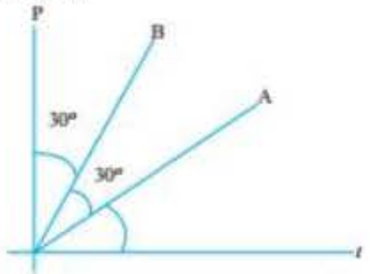
63. A disc of mass 1.0 kg kept floating horizontally in air by firing bullets of mass 0.05 kg each vertically at it, at the rate of 10 per second. If the bullets rebound with the same speed, the speed with which these are fired will be-



(a) 0.098 m/s (b) 0.98 m/s
(c) 9.8 m/s (d) 98.0 m/s

64. A stone of mass 1 kg is thrown with a velocity of 20 m/s across the frozen surface of a lake and it comes to rest after travelling a distance of 50 m. What is the magnitude of the force opposing the motion of the stone?

65. For two object P-t graph is given then find ratio of force acting on them.



66. Figures (a), (b), (c) and (d) show variation of force with time.

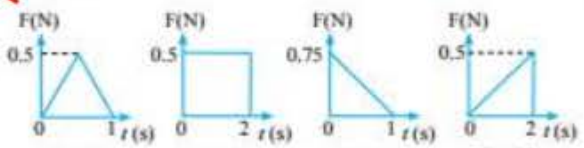


Fig. (a) Fig. (b) Fig. (c) Fig. (d)

The impulse is highest in figure

(a) Figure (c) (b) Figure (d)
(c) Figure (a) (d) Figure (b)

67. The momentum p (in kg/m) of a particle is varying with time t (in s) as $p = 2 + 3t^2$ The force acting on the particle at $t = 3$ s will be

(a) 18 N (b) 54 N (c) 9 N (d) 15 N

68. A force $\vec{F} = (2t\hat{i} + 3t^2\hat{j})$ N acts on an object moving in D plane. Find magnitude of change in momentum of the object in time interval t = 0 to t = 2s

69. At any instant the velocity of particle of mass 500 g is $(2t\hat{i}+3t^2\hat{j})$ m/s. If the force acting on the particle at t = 1s is $(\hat{i}+x\hat{j})$ N. Then the value of x will be
(*a*) 2 (*b*) 4 (*c*) 6 (*d*) 3

70. If impulse varies with time *t* as (kg ms^{-1}) = 20t^2 - 40t The change in momentum is minimum at
(*a*) t = 2s (*b*) t = 1s
(*c*) t = 1/2 s (*d*) t = 3 / 2s

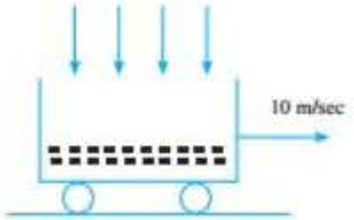
Variable Mass System

71. Gravel is dropped onto a conveyer belt at a rate of 0.5 kg/s. The extra force required in newton to keep the belt moving at 2 m/s is:
(*a*) 1 N (*b*) 2 N
(*c*) 4 N (*d*) 0.5 N

72. A balloon of mass 2 gram has a small hole pierced into it. The air comes out with a velocity of 4 m/s. If the balloon shrinks completely in 2.5 s. The average force acting on the balloon is
(*a*) 0.008 N (*b*) 0.0032 N
(*c*) 8 N (*d*) 3.2 N

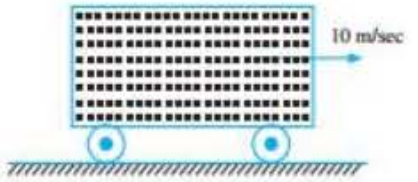
73. A balloon has mass of 10 g in air. The air escapes from the balloon at a uniform rate with velocity 4.5 cm/s. If the balloon shrinks in 5 s completely. Then, the average force acting on the balloon will be (in dyne).
(*a*) 3 (*b*) 9
(*c*) 12 (*d*) 18

74. A cart of mass 1200 kg is moving with constant speed 10 m/sec. Due to heavy rain, water is entering in cart with rate 10 kg/sec, as shown in diagram then velocity of cart after 2 minute will be:



(*a*) 5 m/sec (*b*) 10 m/sec
(*c*) 7.5 m/sec (*d*) 2.5 m/sec

75. A cart having total mass 3000 kg is moving with constant speed 10 m/sec now sand is leaking from hole with rate 10 kg/sec, then speed of cart after 2 minute will be :



(*a*) 10 m/sec (*b*) 16.67 m/sec
(*c*) 15 m/sec (*d*) None

76. Water jet is coming out of a hose pipe of diameter 20 cm with speed 20 cm/sec. It strikes a man inelastically. Find the force exerted by water jet on the person.
(*a*) 5.04 N (*b*) 1.26 N
(*c*) 2.52 N (*d*) 9.4 N

77. A satellite in force free space sweeps stationary interplanetary dust at a rate $(dM/dt) = \alpha v$ Here *v* is the velocity. The acceleration of satellite of mass Mis M is
(*a*) $-2\alpha v^2/M$ (*b*) $-3\alpha v^2/M$
(*c*) $-\alpha v^2/M$ (*d*) $-\alpha v^2$

78. A cart is moving with a velocity 20 m/s. Sand is being dropped into the cart at the rate of 50 kg/min. The force required to move the card with constant velocity will be
(*a*) 50 N (*b*) 30.33 N
(*c*) 26.45 N (*d*) 16.66 N

79. A stream of water flowing horizontally with a speed of 15 ms^{-1} gushes out of a tube of cross-sectional area 10^{-2} m^2 and hits a vertical wall nearby. What is the force exerted on the wall by the impact of water, assuming it does not rebound?
(*a*) 2250 N (*b*) 2408 N
(*c*) 2048 N (*d*) None of these

Rocket Propulsion

80. A 800 kg rocket is fired from earth so that exhaust speed is 1200 m/s. Then calculate mass of fuel burning per second, to provide initial thrust to overcome its weight. (g = 10m/(s^2)

81. A cracker rocket is ejecting gases at a rate of 0.05 kg/s with a velocity 400 m/s. The accelerating force on the rocket is:
(*a*) 20 dyns (*b*) 20 N
(*c*) 200 N (*d*) zero

82. If the force on a rocket, that releases the exhaust gases with a velocity of 300 m/s is 210 N, then the rate of combustion of the fuel is
(*a*) 0.07 kg/s (*b*) 1.4 kg/s
(*c*) 0.7 kg/s (*d*) 10.7 kg/s

83. A rocket of mass 5700 kg ejected mass at a constant rate of 15 kg/s with constant speed of 12 km/s. The acceleration of the rocket 1 minute after the blast is (g = 10m/(s^2)
(*a*) 34.9 m/s^2 (*b*) 27.5 m/s^2
(*c*) 3.50 m/s^2 (*d*) 13.5 m/s^2

84. Suppose a rocket with an initial mass M_0, eject a mass Δm in the form of gases in time Δt, then the mass of the rocket after time t is:-

(a) $M_0 - \frac{\Delta m}{\Delta t} t$ (b) $M_0 - \frac{\Delta m}{\Delta t}$ (c) $M_0 + \frac{\Delta m}{\Delta t}$ (d) M_0

Momentum & Conservation of Momentum

85. **Assertion (A):** Some force applied for some time causes the same change in momentum for different bodies
Reason (R): The total momentum of an isolated system of interacting bodies remains conserved
(a) If both Assertion (A) and Reason (R) are correct and Reason (R) is a correct explanation of the Assertion (A)
(b) If both Assertion (A) and Reason (R) are correct but Reason (R) is not the correct explanation of Assertion (A)
(c) If Assertion (A) is correct but Reason (R) is incorrect
(d) If both Assertion (A) and Reason (R) are incorrect

86. A body of mass m is projected with initial speed u at an angle θ with the horizontal. The change in momentum of body after time t is:
(a) $m u \sin\theta$ (b) $2 m u \sin\theta$
(c) $m g t$ (d) Zero

87. A particle is acted upon by a force given by $F = (12t + 3t^2)N$ where t is in seconds. Find the change in momentum of that particle from $t = 1$ to $t = 3$ sec.

Gun-Bullet System

88. A bullet of mass 50 g is fired from a gun with initial velocity of 32 m/s. If mass of the gun is 4 kg, then calculate the recoil velocity of the gun.

89. A machine gun fires a bullet of mass 65 g with a velocity of 1300 m/s. The man holding it can exert a maximum force of 169 N on the gun. The number of bullets he can fire per second will be:

90. A bullet of mass 40 g is fired from a gun of mass 10 kg. If velocity of bullet is 400 m/s, the recoil velocity of the gun will be:
(a) 1.6 m/s in the direction of bullet
(b) 1.6 m/s opposite to the direction of bullet
(c) 1.8 m/s in the direction of bullet
(d) 1.8 m/s opposite to the direction of bullet

91. **Assertion (A):** A bullet is fired from a rifle. If the rifle recoils freely, the kinetic energy of rifle is more than that of bullet
Reason (R): Kinetic energy depends on mass directly by formula $k.e = \frac{1}{2} mv^2$
(a) If both Assertion (A) and Reason (R) are correct and Reason (R) is a correct explanation of the Assertion (A)
(b) If both Assertion (A) and Reason (R) are correct but Reason (R) is not the correct explanation of Assertion (A)
(c) If Assertion (A) is incorrect but Reason (R) is correct
(d) If both Assertion (A) and Reason (R) are incorrect

92. A machine gun fire bullets of mass 40 gm each with the velocity of 100 m/sec. If average force is exerted on the gun F is 400 N, then find the no. of bullets fired per minutes.

Newton's third Law of Motion

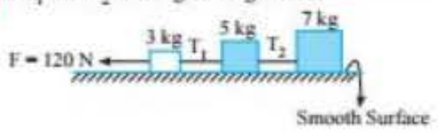
93. **Assertion (A):** A block of Table is at rest because gravitational force and normal Rx are action Rx^n pair and cancel out each other
Reason (R): Newton 3rd law states that every action has equal and opposite reaction in opposite direction
(a) If both Assertion (A) and Reason (R) are correct and Reason (R) is a correct explanation of the Assertion (A)
(b) If both Assertion (A) and Reason (R) are correct but Reason (R) is not the correct explanation of Assertion (A)
(c) If Assertion (A) is incorrect but Reason (R) is correct
(d) If both Assertion (A) and Reason (R) are incorrect

94. Swimming is possible on account of
(a) First law of motion
(b) Second law of motion
(c) Third law of motion
(d) Newton's law of gravitation

95. You are on a frictionless horizontal plane. How can you get off if no horizontal force is exerted by pushing against the surface
(a) By jumping
(b) By spitting or sneezing
(c) By rolling your body on the surface
(d) By running on the plane

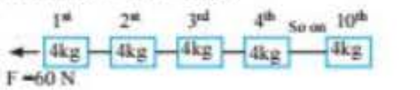
Connected Body Motion

96. Find T_1 and T_2 in the given figure are



(a) 28 N, 48 N (b) 48 N, 28 N
(c) 96 N, 56 N (d) 56 N, 96 N

97. Find tension b/w 7^{th} & 8^{th} block

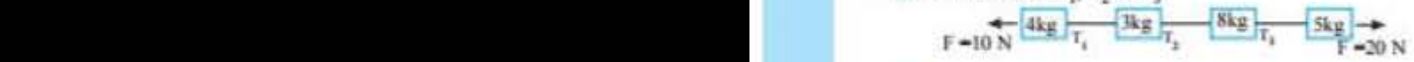


98. A block of mass M is pulled along a horizontal frictionless surface by rope of mass m. If a force P is applied at the free end of the rope, the force exerted by the rope on block is

(a) $\frac{Pm}{M+m}$ (b) $\frac{Pm}{M-m}$

(c) P (d) $\frac{PM}{M+m}$

99. Find tension T_1, T_2 & T_3

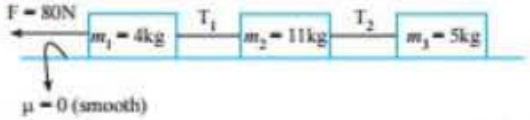


100. A train has 10 wagons each of mass 1000 kg attached to it. They are being pulled by force 10^4 N. Find out force exerted on last four wagons.

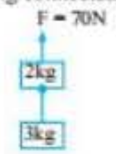
(a) 4×10^3 N (b) 4×10^4 N

(c) 5×10^4 N (d) 5×10^3 N

101. Find tension (T_1 & T_2) and acceleration of the system



102. Find tension in string connected between 2 kg and 3 kg.



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

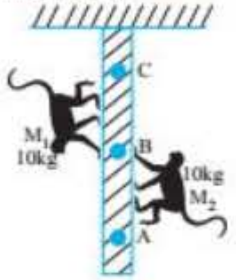
(a) T = 700 N while climbing upward

(b) T = 350 while going downward

(c) Rope will break while climbing upward

(d) Rope will break while going downward

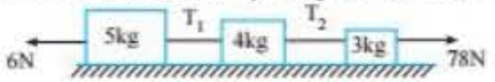
104. If monkey M_1 is at rest and breaking strength of string is 260 N, then a max of M_2 with which it can accelerate, so that string will not break is:



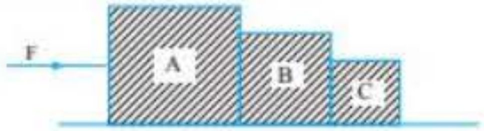
(a) 8 m/sec^2↑ (b) 6 m/sec^2↑

(c) 4 m/sec^2↑ (d) None

105. What will be the tension T_1 and T_2 in the given figure?



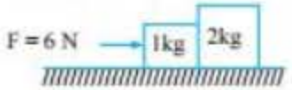
106. Three blocks A, B and C of masses 4 kg, 2 kg and 1 kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block, then the contact force between A and B is



(a) 18 N (b) 2 N

(c) 6 N (d) 8 N

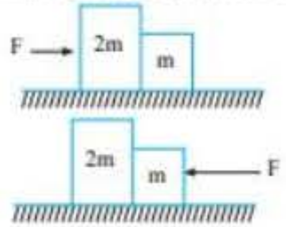
107. Arrangement of two block system is as shown. The net force acting on1 kg and 2 kg blocks are (assuming the surface to the frictionless) respectively



(a) 4 N, 8N (b) 1 N, 2N

(c) 2 N, 4 n (d) 3 N, 6 N

108. Two blocks are in contact on a frictionless table. One has mass m and the other 2m. A force F is applied on 2m as shown in the figure. Now the same force F is applied from the right on m. In the two cases respectively, the ratio of force of contact between the two blocks will be



(a) Same (b) 1 : 2

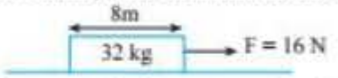
(c) 2 : 1 (d) 1 : 3

109. Figure shows a uniform rod of length 30 cm having a mass 3.0 kg. The rod is pulled by constant forces of 20 N and 32 N as shown. Find the force exerted by 20 cm part of the rod on the 10 cm part (all surfaces are smooth) is:

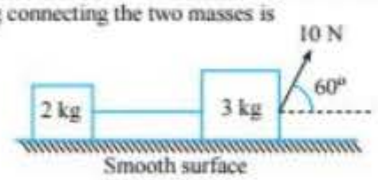
(a) 36 N (b) 12N

(c) 64 N (d) 24 N

110. A massive string of length 8 m and mass 32 kg, then find tension of a point 3 m away from on end where force is applied.

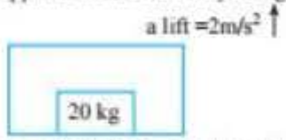


111. Figure shows two blocks connected by a light inextensible string as shown in figure. A force of 10 N is applied on the bigger block at 60° with horizontal, then the tension in the string connecting the two masses is



(*a*) 5 N (*b*) 2 N (*c*) 1 N (*d*) 3 N

112. Find force applied on base of lift by 20 kg block.



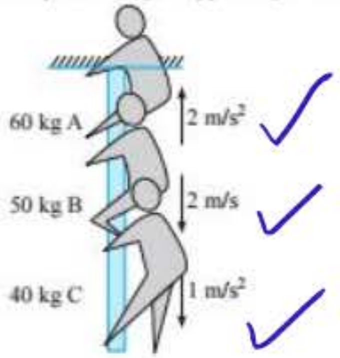
113. A lift of mass 1000 kg is moving with acceleration of 1 m/s² in upward direction, then the tension developed in string which is connected to lift is

(*a*) 9800 N (*b*) 10,800 N
(*c*) 11,000 N (*d*) 10, 000 N

114. A mass of 1 kg is suspended by a thread. It is (*i*) lifted up with an acceleration 4.9 m/s², (*ii*) lowered with an acceleration 4.9 m/s². The ratio of the tensions is

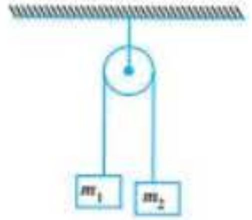
(*a*) 1 : 3 (*b*) 1 : 2 (*c*) 3 : 1 (*d*) 2 : 1

115. Tension in the rope at the rigid support is $g = 10\text{m}/s^2$

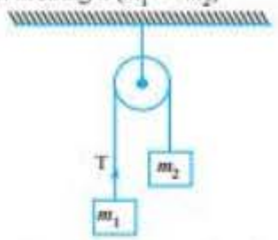


(*a*) 760 N (*b*) 1360 N (*c*) 1580 N (*d*) 1620 N

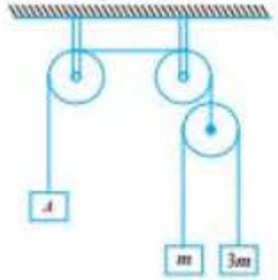
116. If $(m_2 > m_1)$ then find acceleration of m_1 and m_2 and Tension in string.



117. Find tension in string if $(m_1 >> m_2)$

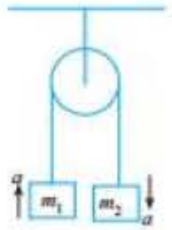


118. In the given figure, find mass of the block A if it remains at rest, when the system is released form rest. Pulleys and strings are massless. [g = 10 m/s²]

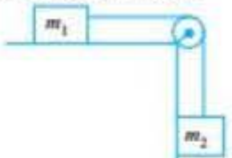


(*a*) m (*b*) 2 m (*c*) 2.5 m (*d*) 3 m

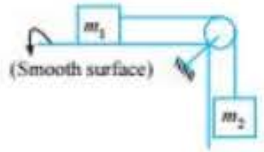
119. Find acceleration of m_1 and m_2 in given pulley block syst $(m_2 > m_1)$



120. Find acceleration of Block m_1 and m_2 and tension in string where horizontal surface is smooth.

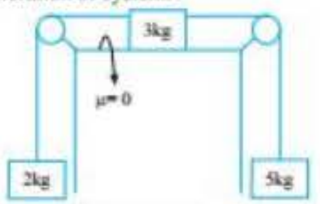


121. If $m_1 = m_2 = 1$ kg then find distance travelled by m_1 in first $\frac{1}{2}$ sec.

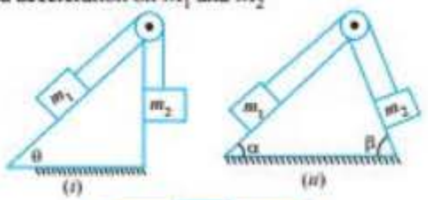


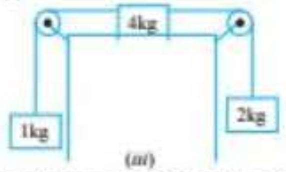
(*a*) 0.625 m (*b*) 0.425 m
(*c*) 0.725 m (*d*) 0.525 m

122. Find acceleration of system.

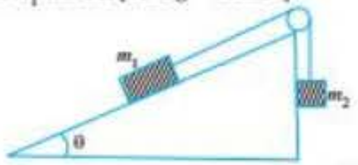


123. Find acceleration on M_1 and M_2





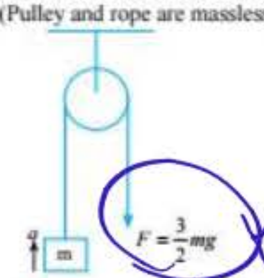
124. Two bodies of masses $m_1 = 5$ kg and $m_2 = 3$ kg are connected by a light string going over a smooth light pulley on a smooth inclined plane as shown in the figure. The system is at rest. The force exerted by the inclined plane on the body of mass m_1 will be: [Take $g = 10$ ms^{-2}]



(a) 30 N (b) 40 N (c) 50 N (d) 60 N

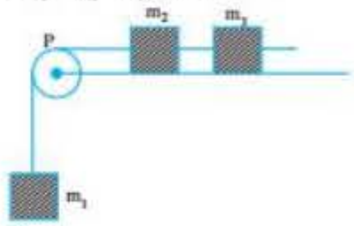
125. A hanging mass M is connected to a four times bigger mass by using a string pulley arrangement, as shown in the figure. The bigger mass is placed on a horizontal ice-slab and being pulled by 2 Mg force. In this situation, tension in the string is $x/5$ Mg for x = ______ Neglect mass of the string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

126. In the arrangement shown, the mass m will ascend with an acceleration (Pulley and rope are massless)



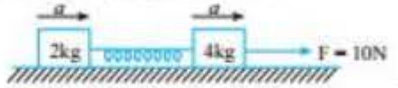
(a) Zero (b) g/2 (c) g (d) 2g

127. A system consists of three masses m_1, m_2 and m_3 connected by a string passing over a pulley P. The mass m_1 hangs freely and m_2 and m_3 are on a rough horizontal table (The coefficient of friction = μ). The pulley is frictionless and of negligible mass. The downward acceleration of mass m_1 is: (Assume $m_1 = m_2 = m_3 = m$)



(a) $\frac{g(1-g\mu)}{9}$ (b) $\frac{2g\mu}{3}$ (c) $\frac{g(1-2\mu)}{3}$ (d) $\frac{g(1-2\mu)}{2}$

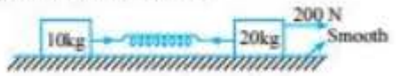
128. Two blocks of mass 2 kg and 4 kg are accelerated with same acceleration by a force 10 N as shown in figure on a smooth horizontal surface. Then the spring force between the two blocks will be (spring is massless)



(a) 5 N (b) 10 N (c) $\frac{10}{3}N$ (d) $\frac{5}{3}N$

129. Find acceleration of 2 kg. where acceleration of 4kg is 3m/s^2 in forward direction.

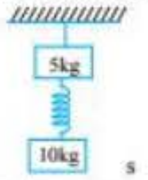
130. Two masses of 10 kg and 20 kg respectively are connected by a massless spring as shown in figure. A force of 200 N acts on the 20 kg mass. At the instant shown the 10 kg mass has acceleration 12 m/s^2 towards right. The acceleration of 20 kg mass at this instant is:



(a) 12 m/s^2 (b) 4 m/s^2
(c) 10 m/s^2 (d) zero

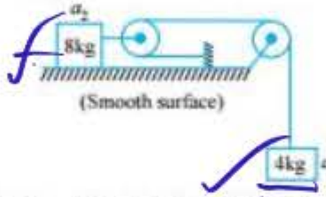
131. Find acceleration of B block if acceleration of a block is a_0 towards left.

132. System in figure is in equilibrium. Now string is cut. Acceleration of both block will be:



(a) g↓,0 (b) 3g↓,0 (c) 2g↓, g↓ (d) 3g↓, g↓

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



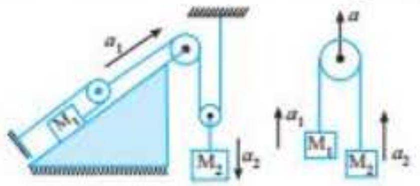
(a) $a_1 = a_2$ (b) $a_1 = 2a_2$ (c) $2a_1 = a_2$ (d) $a_1 = 4a_2$

134. A block is dragged on smooth plane with the help of a rope which moves with velocity v. The horizontal velocity of the block is:

(a) v (b) $\frac{v}{\sin\theta}$

(c) $v\sin\theta$ (d) $\frac{v}{\cos\theta}$

135. Constrain Motion: Find relation between a_1 and a_2



(i) (ii)

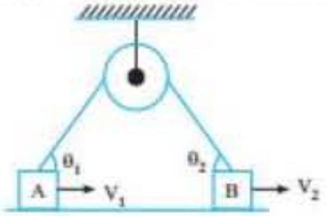
136. Constrain Motion: Find relation between V and V_p

137. In the figure shown, the pulley is moving with velocity u. The velocity of the block attached with string :

(a) 4 u (b) 3 u

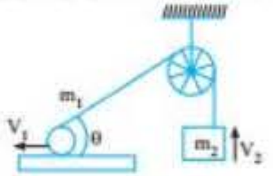
(c) 2 u (d) u

138. In the figure shown, blocks A and B move with velocities V_1 and V_2 along horizontal direction. The ratio of $\frac{v_1}{v_2}$:



(a) $\frac{\sin\theta_2}{\sin\theta_1}$ (b) $\frac{\sin\theta_1}{\sin\theta_2}$ (c) $\frac{\cos\theta_2}{\cos\theta_1}$ (d) $\frac{\cos\theta_1}{\cos\theta_2}$

139. In figure, a ball of mass m_1 and a block of mass m_2 are joined together with an inextensible string. The ball can slide on a smooth horizontal surface. If v_1 and v_2 are the respective speeds of the ball and the block, Find $\frac{v_1}{v_2}$



(a) cos θ (b) sec θ

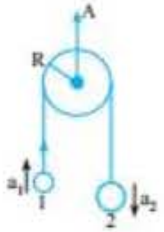
(c) tan θ (d) sin θ

140. Constrain Motion : Find relation between a_1 and a_2

(a) $a_1 = a_2$ (b) $a_1 = 3a_2$

(c) $a_1 = 2a_2$ (d) $2a_1 = 3a_2$

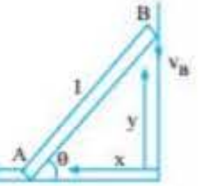
141. Two masses are connected by a string which passes over a pulley accelerating upward at a rate A as shown. If a_1 and a_2 be the acceleration of bodies 1 and 2 respectively then :



(a) $A = a_1 - a_2$ (b) $A = a_1 + a_2$

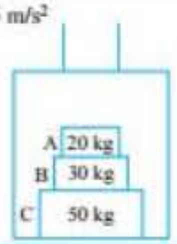
(c) $A = \frac{a_1 - a_2}{2}$ (d) $A = \frac{a_1 + a_2}{2}$

142. Figure shows a rod of length l resting on a wall and the floor. Its lower end A is pulled towards left with a constant velocity u. As a result of this, end B starts moving down along the wall. Find the velocity of the other end B downward when rod makes an angle θ with the horizontal.



(a) $2u \sin\theta$ (b) $u \sin\theta$ (c) $u \cot\theta$ (d) $2u \sin\theta$

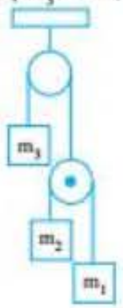
143. In shown situation elevator is moving upward with acceleration of 5 m/s²



	Column-I		Column-II
1	Net force acting on B	P	150 N
2	Normal reaction between A and B	Q	300 N
3	Normal reaction between B and C	R	450 N
4	Normal reaction between C and elevator	S	750 N
5		T	1500 N

(a) (1) – P, (2) – Q, (3) – S, (4) – T
(b) (1) – Q, (2) – Q, (3) – R, (4) – T
(c) (1) – P, (2) – R, (3) – S, (4) – S
(d) (1) – Q, (2) – R, (3) – R, (4) – T

144. Three masses m_1, m_2 and m_3 are attached to a string-pulley system as shown. All the three masses are held at rest and then released. To keep m_3 at rest, the condition is

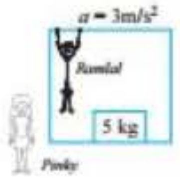


(a) $m_3 = m_1 + m_2$ (b) $m_3 = \frac{2m_1m_2}{m_1 + m_2}$
(c) $m_3 = \sqrt{m_1m_2}$ (d) $m_3 = \frac{4m_1m_2}{m_1 + m_2}$

145. With what minimum acceleration can a fire man slide down a rope whose breaking strength is 3/4th of his weight.
(a) g/4 m/s² (b) g m/s
(c) 3/4m/s² (d) Zero

Pseudo Force

146. Find contact force between block and surface of lift. w.r.t Ramal & Pinky



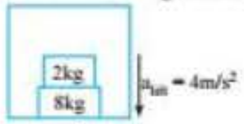
147. Normal on block with respect to pinky & Ramlal will be
(a) Same (b) Different
(c) Don't know

148. **Statement I:** An elevator can go up on down with uniform speed when its weight is balanced with the tension of its cable.

Statement II: Force exerted by floor of an elevator on foot of person standing on it is more than his/her weight when elevator goes down with increasing speed

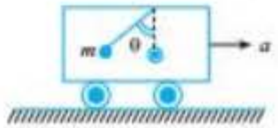
(a) Statement I and Statement II is false
(b) Statement I and Statement II is true
(c) Statement I is false but statement II is true
(d) Statement I is true but statement II is false

149. Find contact force between 2 kg and 8 kg



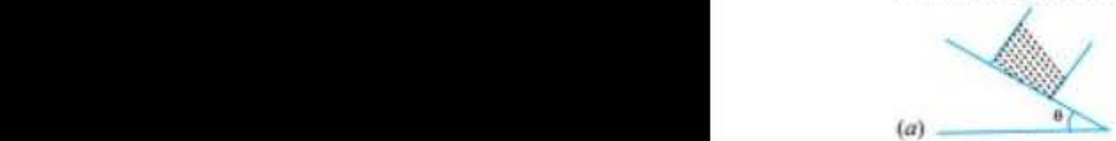
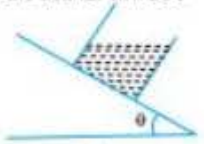
150. A small metallic sphere of mass m is suspended from the ceiling of a car accelerating on a horizontal road with constant acceleration a. The tension in the string attached with metallic sphere is
(a) Mg (b) $m(g + a)$
(c) $m(g - a)$ (d) $m\sqrt{g^2 + a^2}$

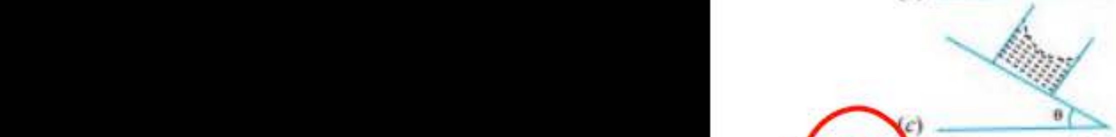
151. If trolley accelerates horizontally with acceleration a then bob is displaced backward from its initial vertical position. The angular deflection of the bob in equilibrium is



(a) $\theta = \cos^{-1}\left(\frac{a}{g}\right)$ (b) $\theta = \sin^{-1}\left(\frac{a}{g}\right)$
(c) $\theta = \cot^{-1}\left(\frac{a}{g}\right)$ (d) $\theta = \tan^{-1}\left(\frac{a}{g}\right)$

152. A beaker is half filled with water. It is allowed to slip down on smooth inclined plane with angle of inclination θ to the horizontal. The level of water in the beaker will be :-

(a)  (b) 

(c)  (d) 

153. A block of mass m kg is kept on a weighing machine in an elevator. If the elevator is retarding upward by a ms^{-2}, the reading of weighing machine is (in kg)

(a) mg (b) $m(g-a)$

(c) $m\left(1-\frac{a}{g}\right)$ (d) $m(g+a)$

154. A block of mass m, is kept on a wedge of mass M, as shown in figure such that mass m remains stationary w.r.t. wedge. The magnitude of force P is

(a) g tan β (b) mg tan β

(c) (m + M)g tan β (d) mg cot β

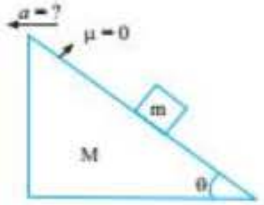
155. A block of mass m is placed on a smooth wedge of inclination θ. The whole system is accelerated horizontally so that the block does not slip on the wedge. The force exerted by the wedge on the block (g is acceleration due to gravity) will be

(a) $mg\cos\theta$ (b) $mg\sin\theta$ (c) mg (d) $mg/\cos\theta$

156. Select the correct statement regarding pseudo force

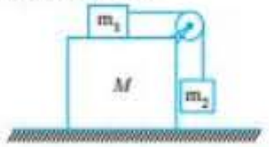
(a) It is electromagnetic in origin
(b) Newton's 3rd law is applicable for it
(c) It is a fundamental force
(d) It is used to make Newton's law applicable in non-inertial frame

157. Find acceleration of inclined plane so that block will fall freely.



(a) g tan θ (b) g cot θ (c) g (d) g sin θ

158. In the given arrangement all surfaces are smooth. What acceleration should be given to the system, for which the block m_2 doesn't slide down?



(a) $\frac{m_2 g}{m_1}$ (b) $\frac{m_1 g}{m_2}$ (c) g (d) $\frac{m_2 g}{m_1+m_2}$

159. A monkey of mass 20 kg is holding a vertical rope. The rope will not break when a mass of 25 kg is suspended from it but will break if the mass exceeds 25 kg. What is the maximum acceleration with which the monkey can climb up along the rope ? (g = 10m / (s²))

(a) 5 m/s² (b) 10 m/s² (c) 25 m/s² (d) 2.5 m/s²

160. A man of mass m is standing in an elevator moving downward with an acceleration. $\frac{g}{4}$ The force exerted by the bottom surface of the elevator on the 4 man will be

(a) $\frac{3mg}{4}$ (b) $\frac{mg}{4}$ (c) $\frac{5mg}{4}$ (d) $\frac{7mg}{4}$

161. Two blocks of masses 2 kg and 4 kg are hanging with the help of massless string passing over an ideal pulley inside an elevator. The elevator is moving upward with an acceleration. $\frac{g}{2}$ The tension in the string connected between the blocks 2 will be (Take g = 10m / (s²))

(a) 40 N (b) 60 N (c) 80 N (d) 20 N

162. 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 inertial frame because Newton's laws are applicable in this frame
(D) Cannot be an inertial frame because the earth is rotating about its axis

(a) (A, B) (b) (B, C) (c) (A, C) (d) (B, D)

Apparent Weight

163. A man weighs 80 kg. He stands on a weighing scale in a lift which is moving upwards with a uniform acceleration of 5 m/s². What would be the reading on the scale? (g = 10m /s²)

(a) Zero (b) 400 N (c) 800 N (d) 1200 N

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

(a) g/4 (b) g/2 (c) 3g/4 (d) g

165. A man of mass 90 kg is standing in an elevator whose cable broke suddenly. If the elevator falls, apparent weight of the man is:
(a) 90 N (b) 90 g N
(c) Zero (d) any negative value

166. A person is standing in an elevator. In which situation he finds his weight less
(a) When the elevator moves upward with constant acceleration
(b) When the elevator moves downward with constant acceleration
(c) When the elevator moves upward with uniform velocity
(d) When the elevator moves downward with uniform velocity

167. A bird is sitting in a large closed cage which is placed on a spring balance. It records a weight of 25 N. The bird (mass $m = 0.5$kg) flies upward in the cage with an acceleration of $2 m/s^2$) The spring balance will now record a weight of
(a) 24 N (b) 25 N (c) 26 N (d) 27 N

Friction on Horizontal & Vertical Surface

168. The limiting friction between two bodies in contact is independent of
(a) Nature of the surface in contact
(b) The area of surfaces in contact
(c) Normal reaction between the surfaces
(d) The materials of the bodies

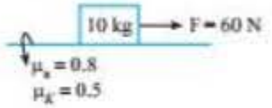
169. Which of the following is self-adjusting force?
(a) Static friction (b) Limiting friction
(c) Kinetic friction (d) Rolling friction

170. Maximum force of friction is called
(a) Limiting friction (d) Static friction
(c) Sliding friction (d) Rolling friction

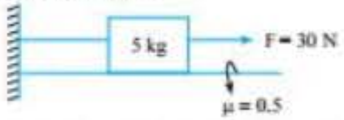
171. Which is a suitable method to decrease friction?
(a) Polishing (b) Lubrication
(c) Ball bearing (d) All of these

172. Given below are two statements:
Statement I: The limiting force of static friction depends on area of contact and independent of materials independent
Statement II: The limiting force of kinetic friction is independent of area of contact and depends on materials
(a) Statement I is incorrect but statement II is correct
(b) Statement I and Statement II is correct
(c) Statement I and Statement II is incorrect
(d) Statement I is correct but statement II is incorrect

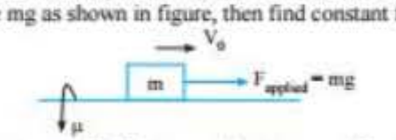
173. Find acceleration and friction between block and ground.



174. Find tension in string .....

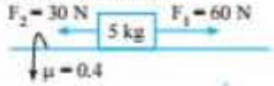


175. Object is moving with constant velocity under the applied force mg as shown in figure, then find constant force.

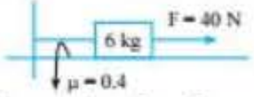


(a) mg (b) 2 mg (c) μmg (d) $\sqrt{2}mg$

176. Find acceleration and friction.



177. Find Tension in string.....

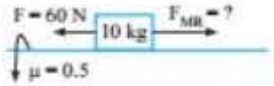


178. Object is thrown with velocity V_0 on rough surface of coefficient of friction μ, then stopping distance and time,

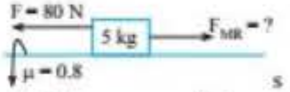
179. A body of mass 10 kg is moving with an initial speed of 20 m/s. The body stops after 5s due to friction between body and the floor. The value of the coefficient of friction is: (Take acceleration due to gravity $g = 10ms^{-2}$)
(a) 0.2 (b) 0.3 (c) 0.5 (d) 0.4

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

181. Find the applied force F_{MR} to keep the object at rest.



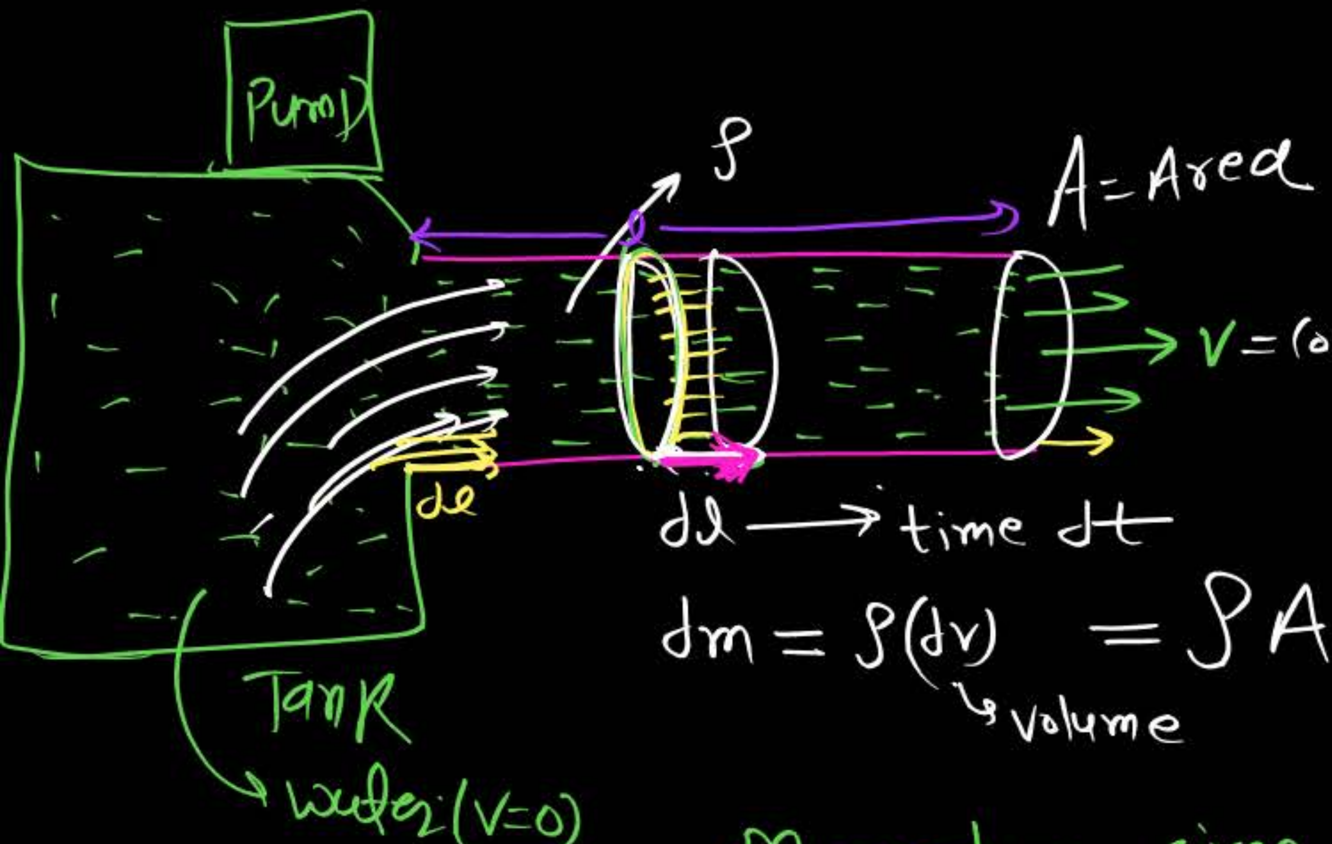
182. Find value of F_{MR} to keep the object at rest.



183. A heavy box is slid across a rough floor with an initial speed of 4 m/s It stoops moving after 8 seconds. If the average resisting force of friction is 10 N, the mass of the box (in kg) is:
(a) 40 (b) 20 (c) 5 (d) 2.5

184. A child weighing 25 kg slides down a rope hanging from a branch of a tall tree. If the force of friction acting against him is 200 N, the acceleration of child is ($g = 10m/s^2$)
(a) $22.5 m/s^2$ (b) $8 m/s^2$
(c) $5 m/s^2$ (d) $2 m/s^2$

1. A liquid of density ρ is flowing through a pipe of $\boxed{\text{Area} = A}$ with velocity v, then force applied by pump on liquid is



$dl \longrightarrow$ time dt

$dm = \rho(dv) = \rho A dl \quad \text{—(1)}$

$dv \to$ volume

Momentum given to liquid by Pump in dt time $= dm\,v$

$dP = dm\,v$

$$\text{Force} = \frac{dP}{dt} = \frac{dm}{dt} v = \rho A \frac{dl}{dt} v$$

$$= \rho A v \times v = \rho A v^2$$

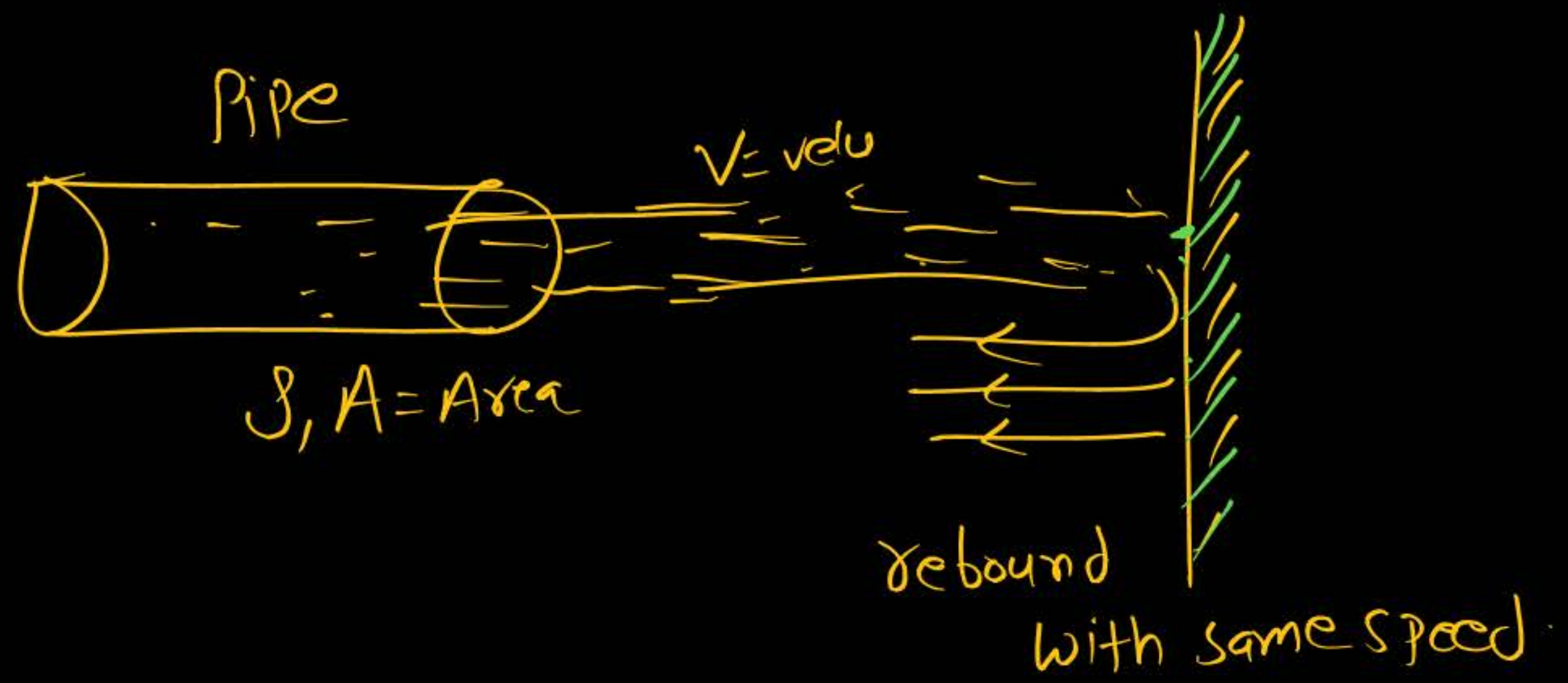
$$F = v\frac{dm}{dt}$$

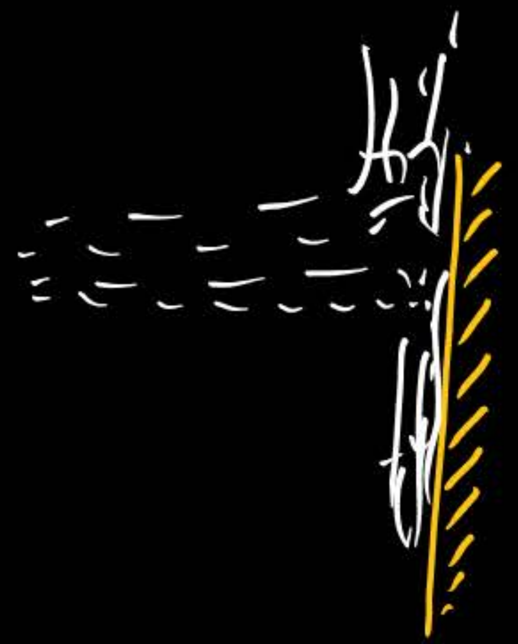
$$= v\frac{d(\rho A l)}{dt} = v\rho A \frac{dl}{dt}$$

$$= v\rho A v$$

$$= \rho A v^2$$

(2)

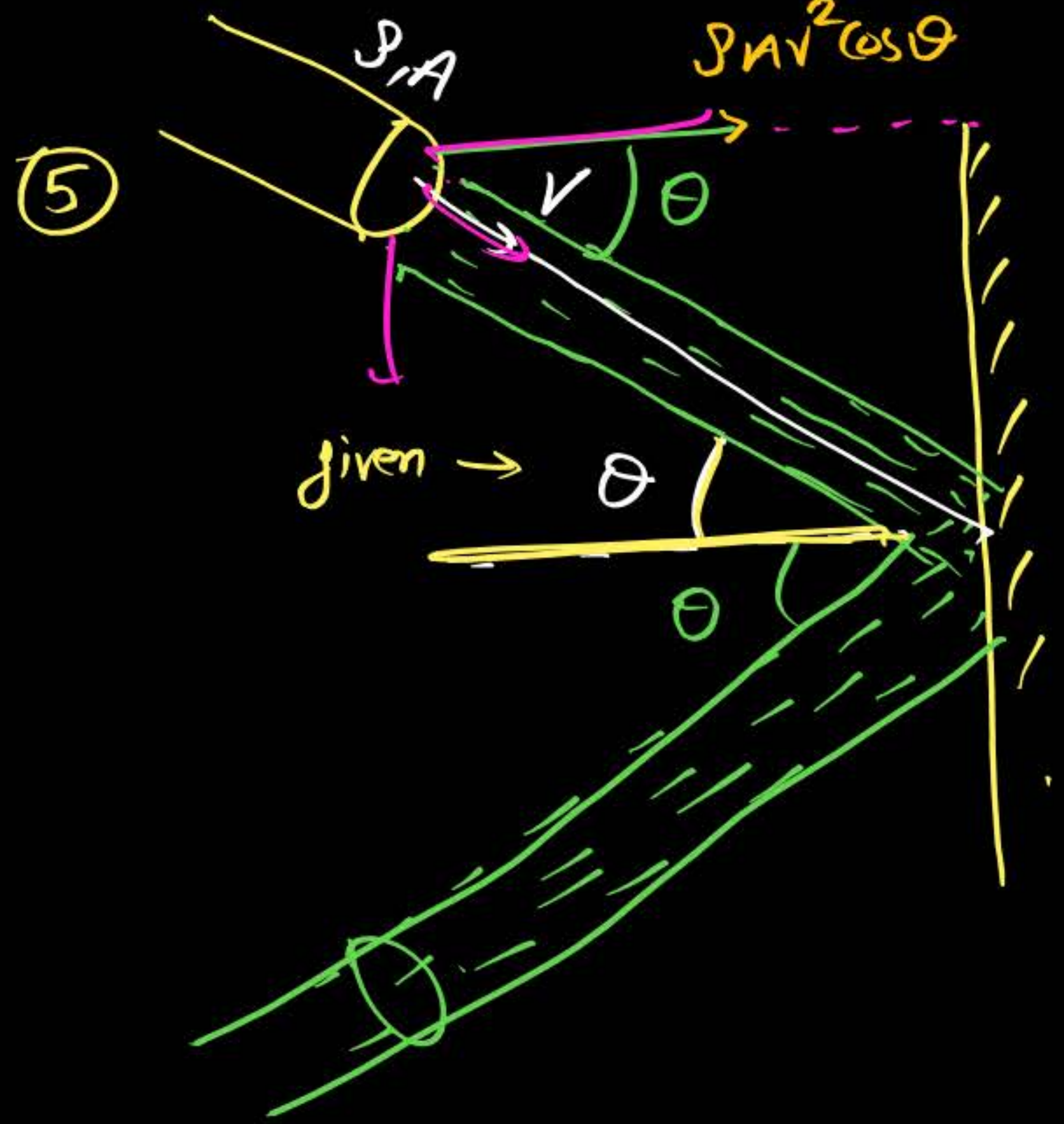




Force by liquid stream on wall $= 2(\rho A v^2)$

(3) If liquid stops after striking wall $= \rho A v^2$

(4) If liquid moves parallel to the wall after striking then force on wall $= \rho A v^2$

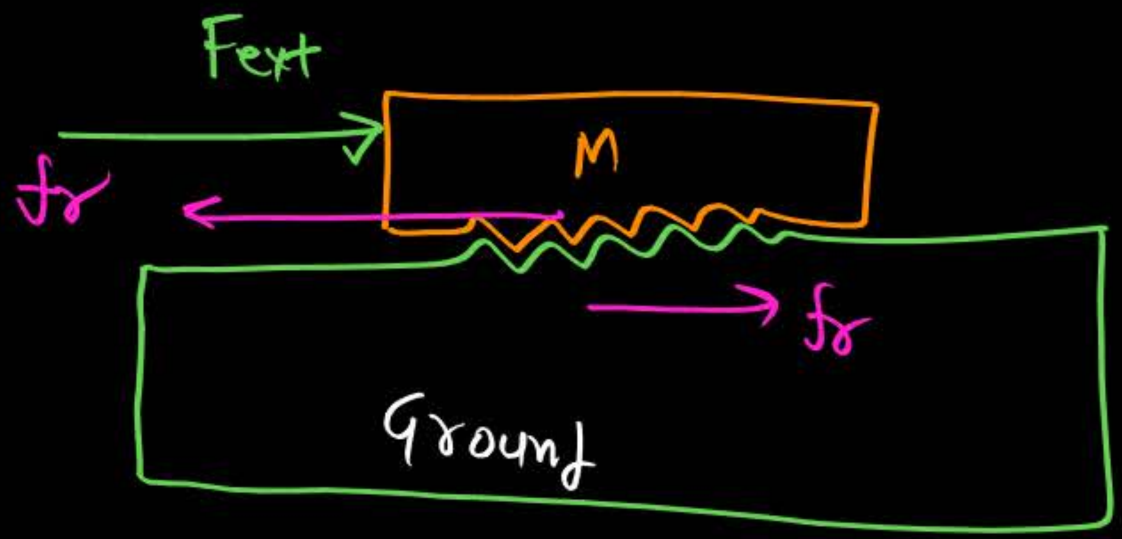


$$\boxed{|\text{Force on wall}| = 2\rho A V^2 \cos\theta}$$

A_2

FRICTION

Reason of friction is Interlocking (roughness)



friction oppose motion. → false

(sometime friction support or cause of motion)

friction oppose realtive motion

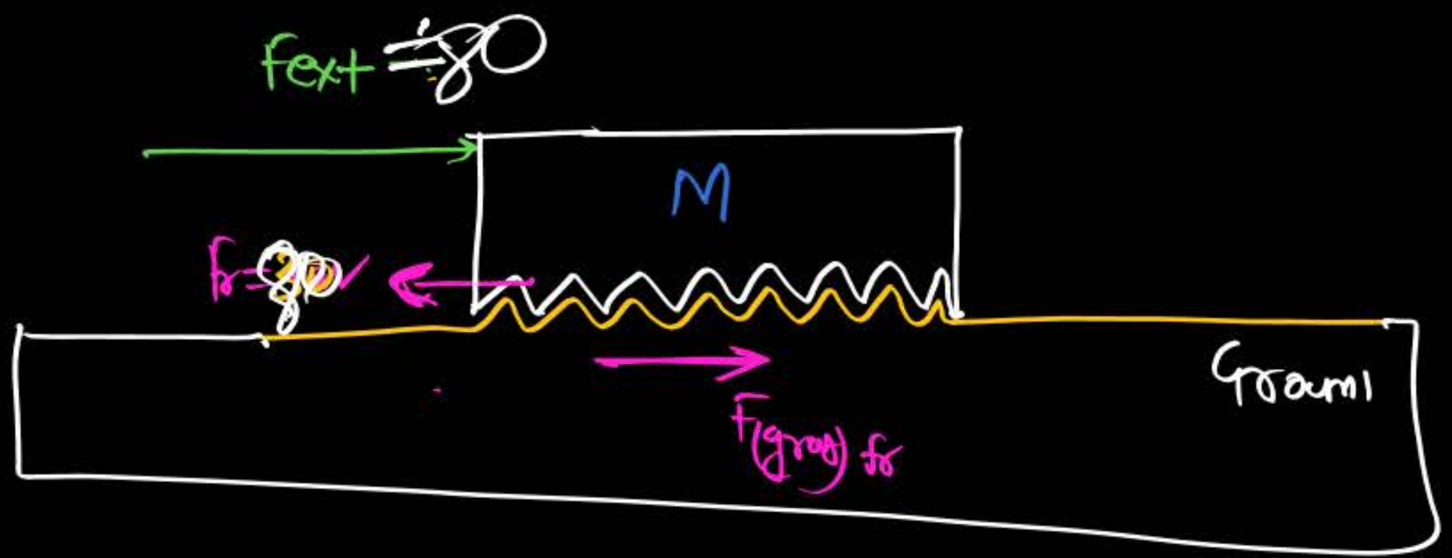
wrong

~~MR scam~~

→ (a) True

(b) false

friction opposte relative motion with respect to contact surface or tendency of relative motion force required to move this object is slightly greater than 100N.



$acc^n = 0$

Object is at rest

$f_{static\ friction}$ = Applied force

about to move

Interlocking about to on

$(f_{static})_{maxm} = f_{limiting}$

Move kar gya

$f_{kinetic} / f_{sliding}$

Object is moving (sliding)

$F_{applied}$	friction
ON	ON
10N	10N
20N	20N
30N	30N.
70N	70N
90N	90N
98N	98N
99N	99N
99.8N	99.8N
100N	100N
100.0001N	98N
110N	98N
220N	98N
400N	98N
500N	98N

(I) Static friction

$$\boxed{0 \le f_{static} \le \mu_l N}$$

- it oppose tendency of motion w.r.t contact surface.
- apply when object is at rest
- $\boxed{\text{self adjustable friction.}}$
- $\vec{F}_{static\ friction} = - \vec{F}_{applied\ force}$ (who create tendecny of motion)
  - (diretion)

$$\boxed{f_{static\ max} = \mu_s N \text{ or } \mu_l N}$$

(II) limiting friction force

f_l = Maximum static friction

$f_{max\ value\ of\ static\ friction} = \boxed{(f_{limiting}) = \mu_l N}$ ← friction ki aukad

μ_s = coefficient of static friction

(μ_l) = coefficient of limiting friction

(III) Kinetic friction [dynamic friction] / sliding friction.

[when object is in motion]

$$\boxed{f_{kinetic} = \mu_K N}$$

μ_K - Coefficient of kinetic friction

N = Normal.

* $$\boxed{\mu_s > \mu_K}$$

✓ Kinetic friction does not depends on speed of object

If Normal b/w two object is zero then friction must zero

True

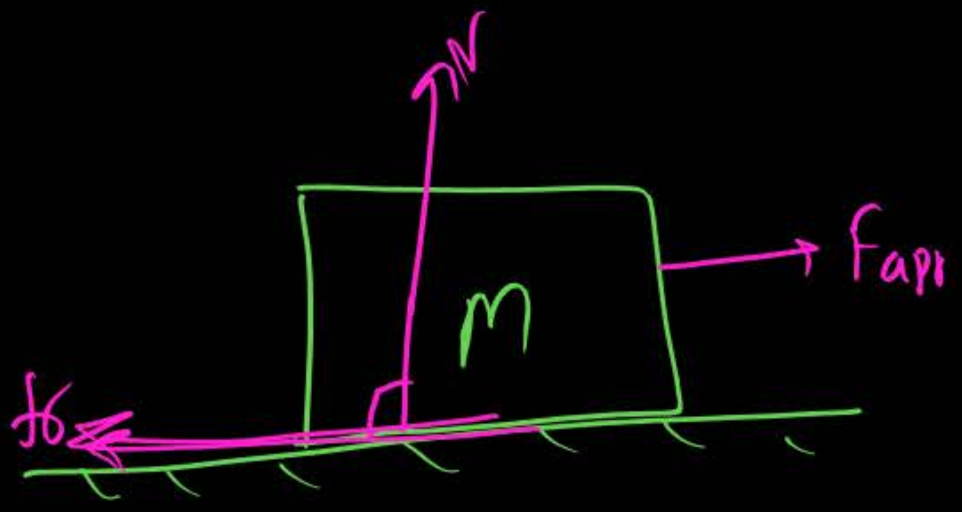
MR* BOX:-

1. friction contact force hai Jo contact surface ke Parallel lagta hai. ✓
2. It oppose tendency of relative motion or relative motion w.r.t. contact surface.
3. Har contact ka ek limit hota hai, Jispe uska Interlocking Break ho Jayga Jisko limiting (औकात) friction Kahte hai

$$\boxed{f_{limit} = \mu_s N}$$ ✓

Contact force

- Normal — $\perp r$ to surface
- friction — $\parallel r$ to surface



MR* BOX :—

friction lagne ke liye condition

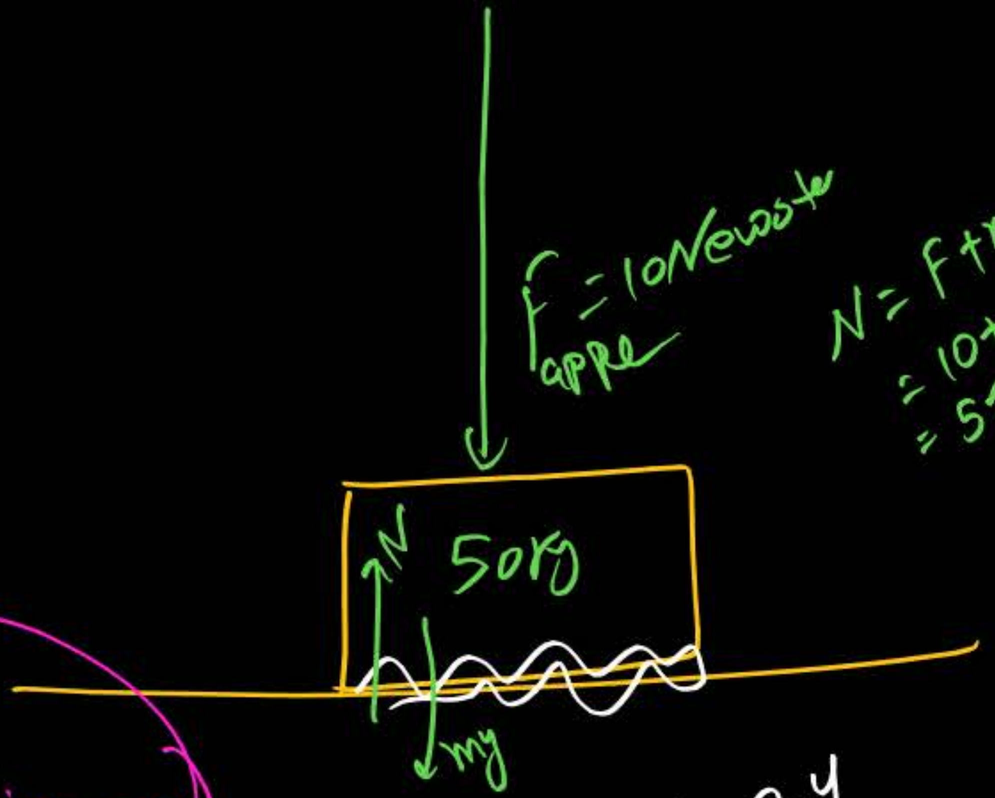
(1) There must be contact

(2) There must be roughness (Interlocking)

(3) There must be tendency of relative motion or relative motion w.r.t. surface.

(4) friction does not depends on speed, Area of contact.

(5) Question me ek hi μ given hai to $\mu_k = \mu_s = \mu$ lenge.



$N = F + mg$
$= 10 + 500$
$= 510N$

friction = 0
Ans

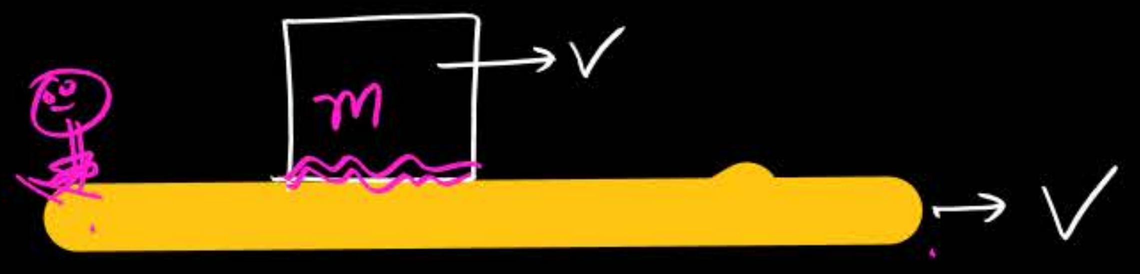
$\mu = 0.4$

MR scam

$\text{friction} = \mu N$
$= \frac{4}{10} \times 510$
$= 204$ newton

Draw Diretion of friction on Block

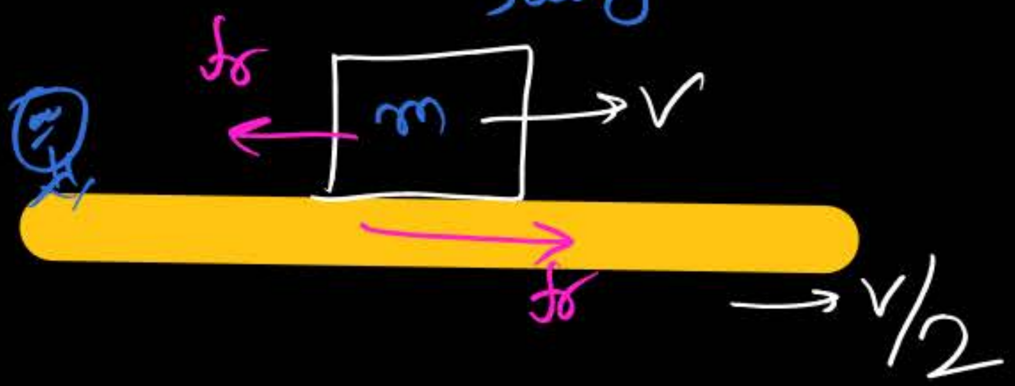
Case-1



$\boxed{f_r = 0}$

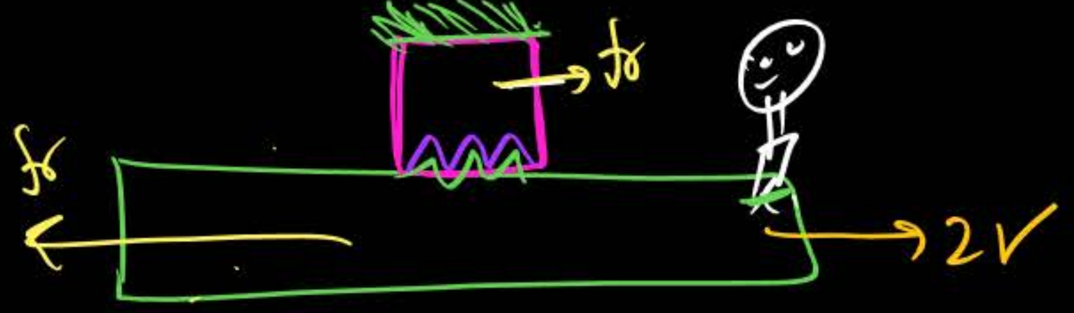
Case-2

sliding forward

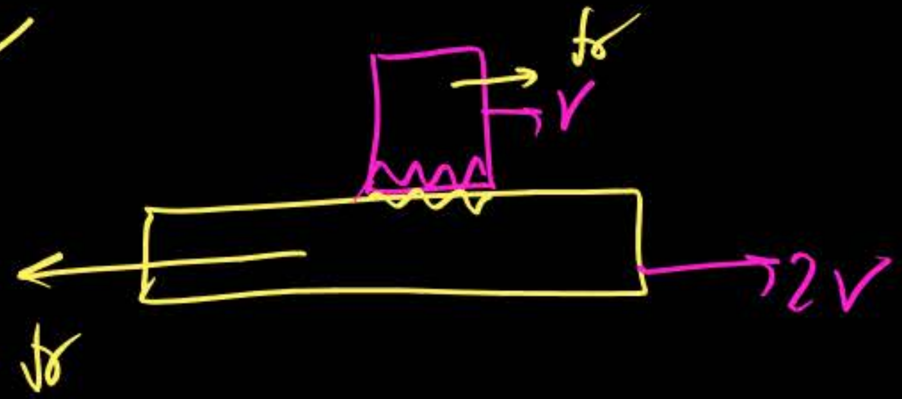


Case-3

rest



Case-4



Relative motion contact surface ke respect me dekhenge

✓ **Friction is a Necessity:**

Without friction

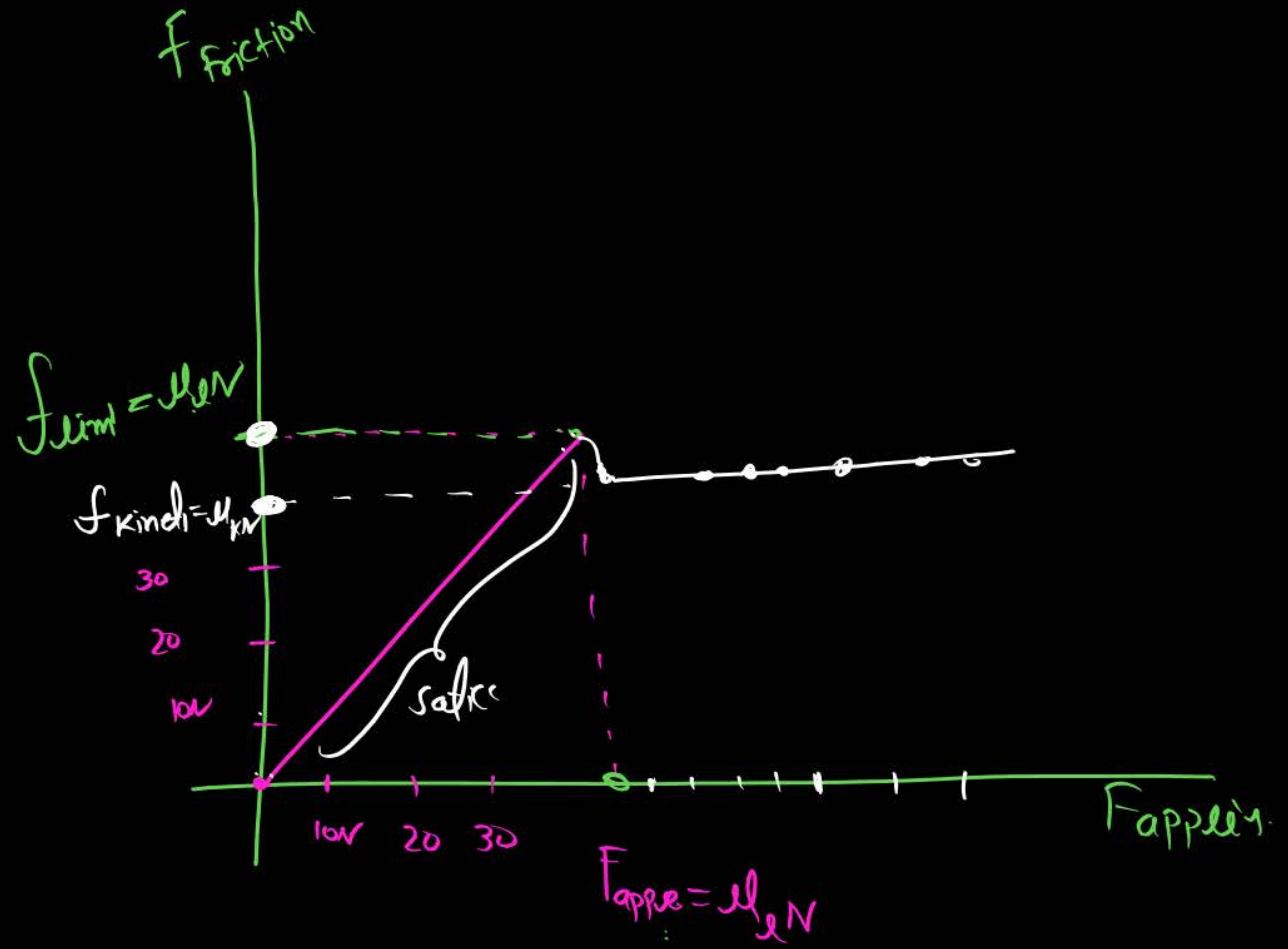
- We cannot walk.
- A bicycle, a vehicle, a train etc. cannot be started or stopped.
- It would be impossible to climb a tree or pole, to fix a nail, to write with a pen, etc.

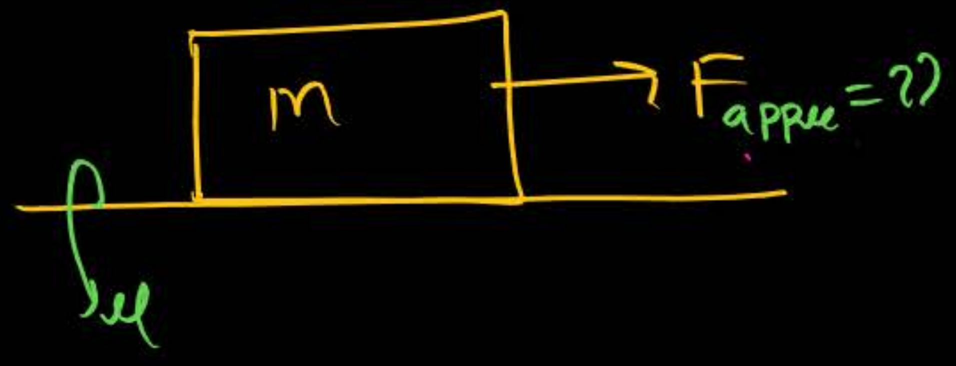
✓ **Friction is an Evil:**

- Wear and tear of tyres on the road is due to friction.
- Wear and tear of the machinery parts is due to friction.
- Heat produced by friction causes damage to the machines.
- Extra power is needed to overcome friction.

घर पर लिखना है

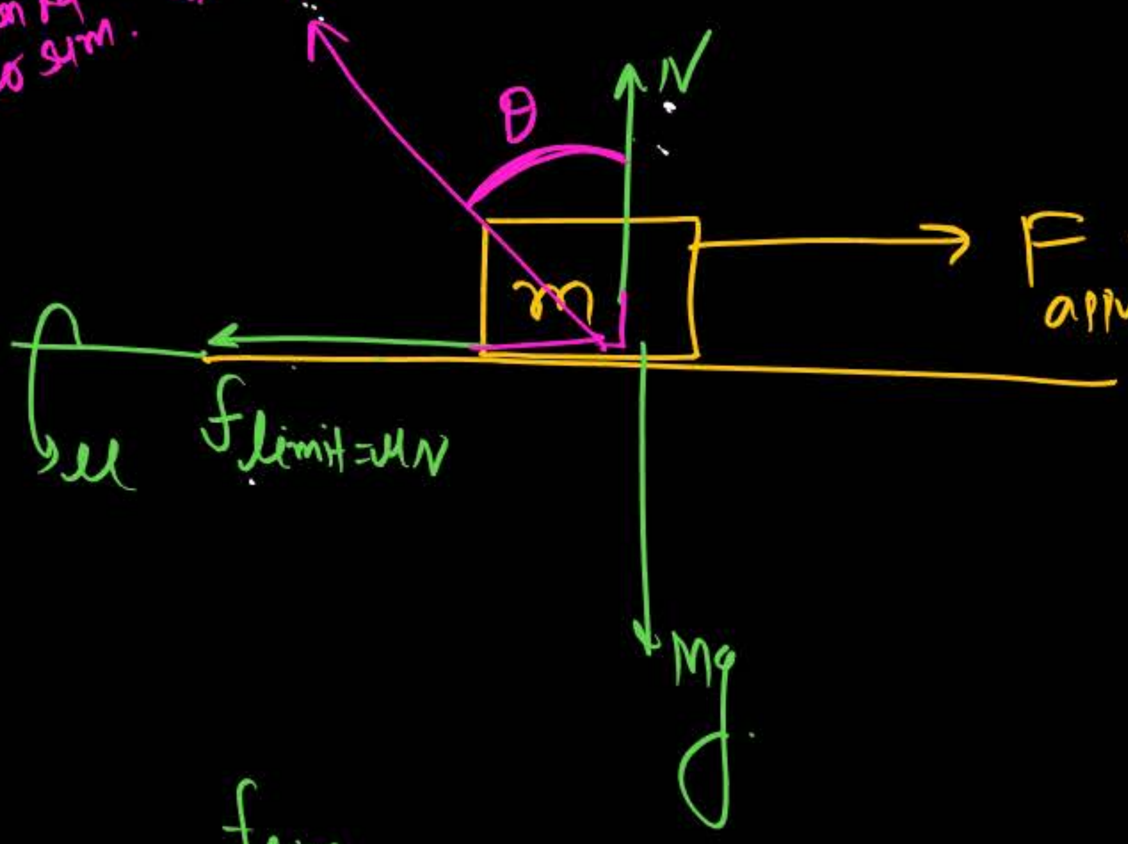
Graph B/W friction force and applied force :-



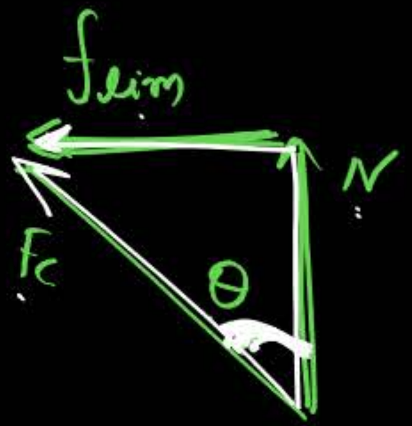


Angle of friction $\rightarrow$ Angle b/w Normal reaction & contact force when object is Just about to slide is c/d Angle of friction

Sol^n Normal & friction ka vector sum. $\Rightarrow F_c$



$F_{appl} = f_{limit} = \mu N$



$$\tan\theta = \frac{f_{lim}}{N} = \frac{\mu \cancel{N}}{\cancel{N}}$$

$$\tan\theta = \mu$$

$$\boxed{\theta = \tan^{-1}(\mu)}$$

Q If Angle of friction is 30° then find Coefficient of friction ??

Sol^n

$$\tan\theta = \mu$$

$$\tan 30^\circ = \mu$$

$$\mu = \frac{1}{\sqrt{3}} \text{ Ans}$$

MR* BOX for Questions on friction

\# ① find Normal rex^n

\# ② Find $f_{limiting} = \mu_s N$

friction ki aukad.

\# ③ Compaire b/w $f_{limiting}$ & $F_{applied}$

\# ④ $f_{limiting} > F_{applied}$

• (rest) $\boxed{a c c^n = 0}$

$F_{(friction)\,static} = F_{applied}$

\# ⑤ $f_{limiting} < F_{applied}$

(motion) $f_{kind} = \mu_k N$

$a = \frac{(F_{net})}{m}$

⑥ $f_{limiting} = F_{applied}$

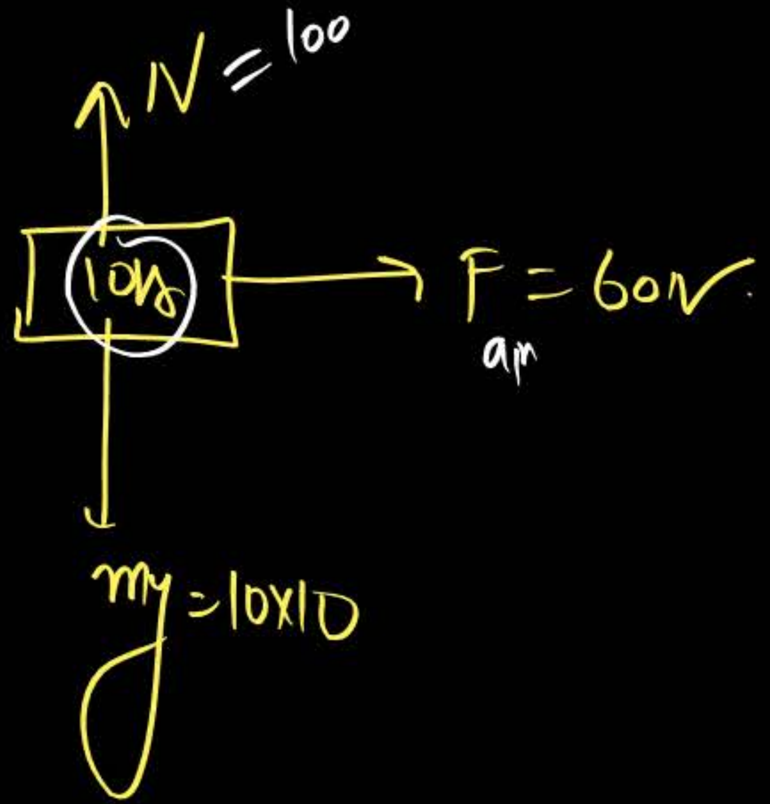
* about to motion

Critical case wale question.

(Q) find acceleration and friction force on block ??

$\mu_e(\mu_s) = 0.8$

$\mu_K = 0.5$



step-(1) find Normal

$f_{ls} = \mu N$

$= 0.8 \times 100$

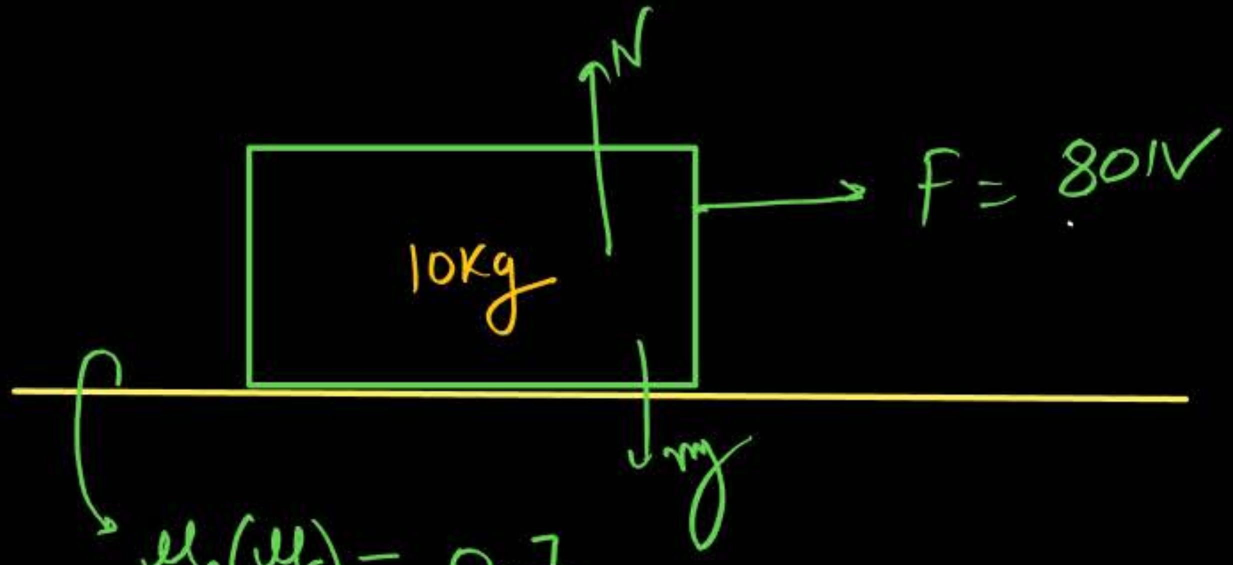
$\boxed{f_{ul} = 80N}$

$f_{lim} > f_{appl}$

$\boxed{a = 0}$

$\boxed{\left(\text{friction}\right) = 60N}$
static

(Q) find acceleration and friction force on block ??



$\mu_e(\mu_s) = 0.7$

$\mu_K = 0.4$

$\underline{\underline{Sol^n}}$

औकात

$$\boxed{\begin{aligned} f_{limit} &= \mu_e N \\ &= 0.7 \times 100 \\ &= \underline{70 New}\ * \end{aligned}}$$

$F_{applied} = 80 > f_{lim}$

$f_b = 70$ ✗

MR scam

$\cancel{a = \frac{80-70}{10} = \frac{1\cancel{0}}{1\cancel{0}}}$

$\cancel{1m/s^2}$

$f_{Kinetic} = \mu_K N$

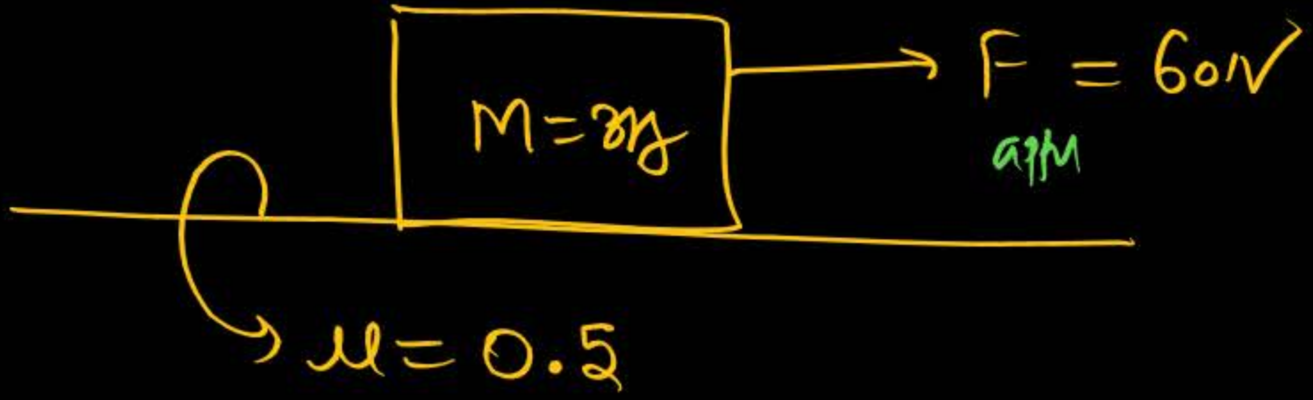
$= \frac{4}{1\cancel{0}} \times 10\cancel{0}$

$= \underline{40N}$ ✓

$a = \frac{80-40}{10} = \frac{4\cancel{0}}{1\cancel{0}}$

$\boxed{a = 4m/s^2}$

Q. find accn & friction.



Soln

$$f_{\text{औकात}} = \mu N$$

$$= 0.5 \times mg$$

$$= \frac{5}{1\cancel{0}} \times 3\cancel{0}$$

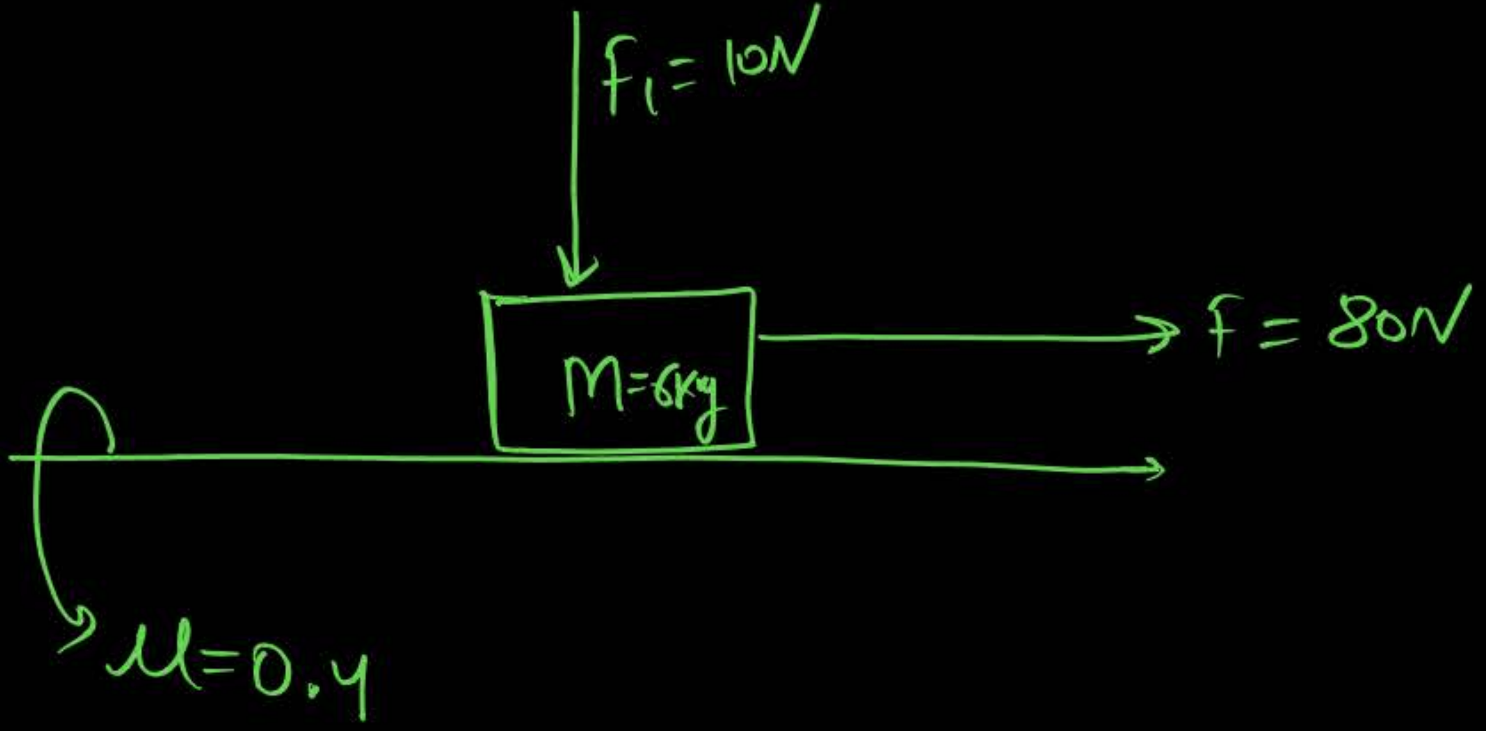
$$= 15N$$

$a = \frac{F_{net}}{mass}$

$$a = \frac{60-15}{3}$$

$$= \frac{\cancel{45}}{\cancel{3}} = 15 m/s^2$$

Q

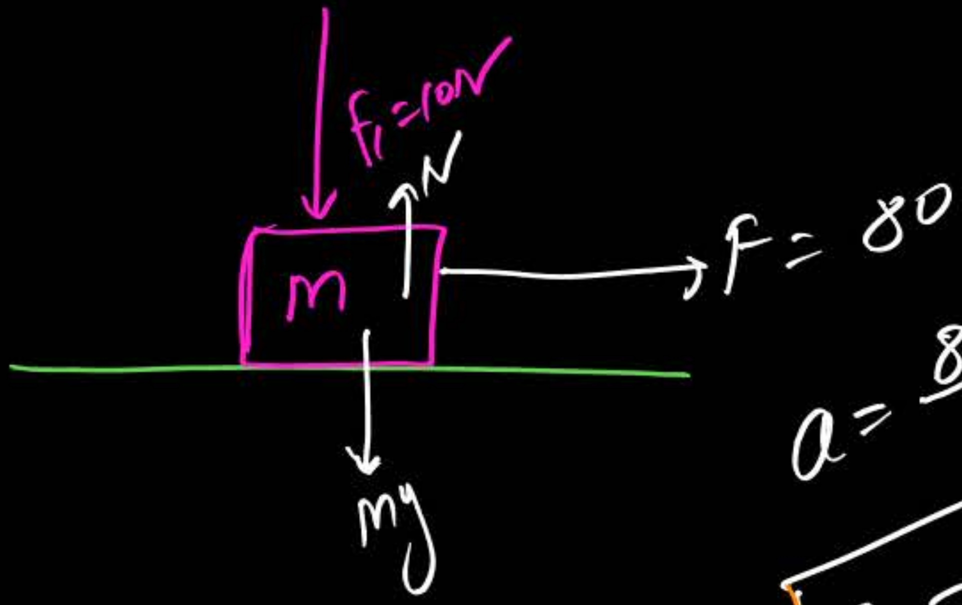


$$f_{lim} = \mu N$$
$$= \mu mg$$

MR scam

Q find friction force & acc^n of object.

Sol^n



$$a = \frac{80-28}{6}$$

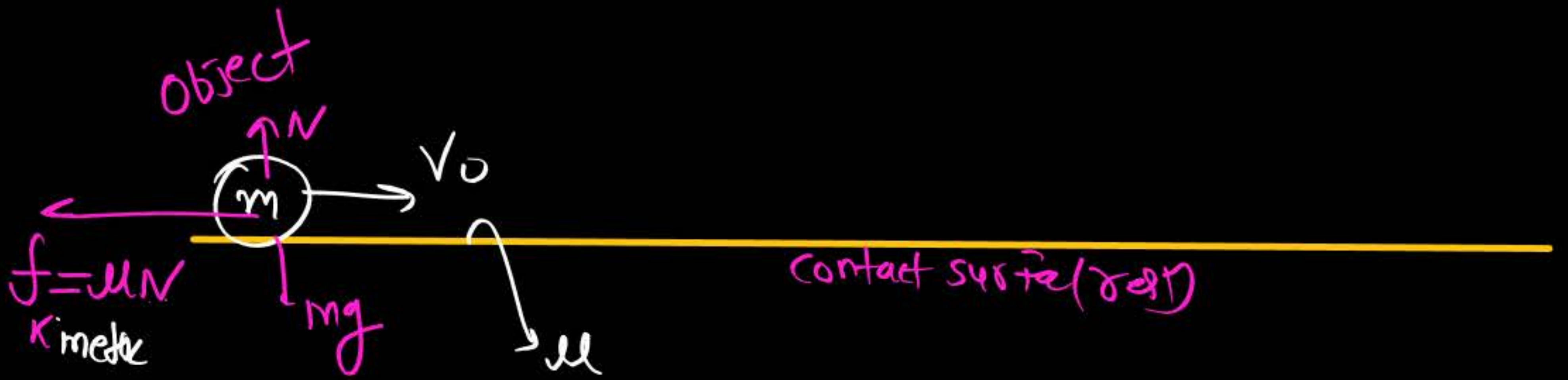
$$\boxed{a = \frac{52}{6}\ m/s^2}$$

$$N = mg + F_1$$
$$= 60 + 10$$
$$N = 70N$$

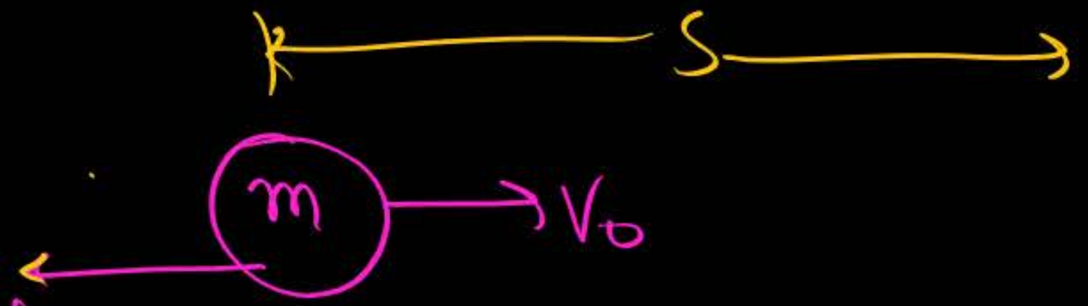
$$f_{lim} = \mu N$$
$$= \frac{4}{10} \times 70$$
$$= 28N$$

(Q) Object is thrown with velocity V_0 on rough surface then find time and distance after which object will comes to at rest.

NEET



$$\boxed{f_k = \mu mg}$$



$f_k = \mu \cancel{m} g = \cancel{m} a$

$\boxed{a = \mu g \text{ (Backward) ret}^n}$

$$\boxed{S = \frac{V_0^2}{2(\mu g)}}$$

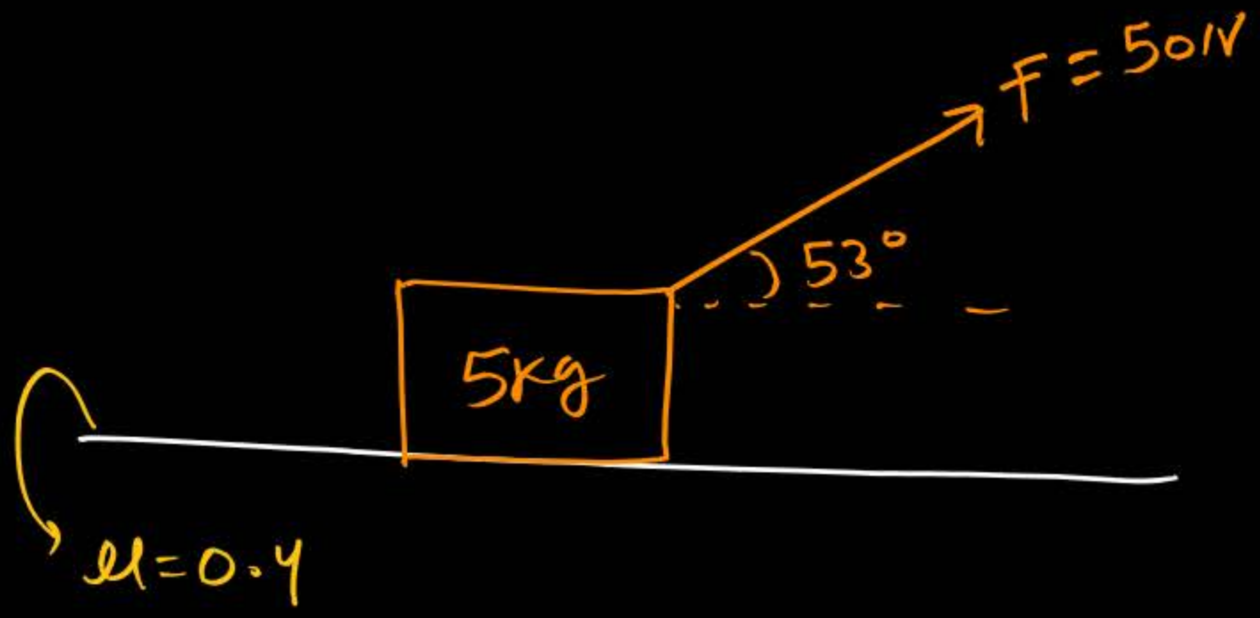
$\overset{0}{v} = u + at$

$V_0 = \mu g t$

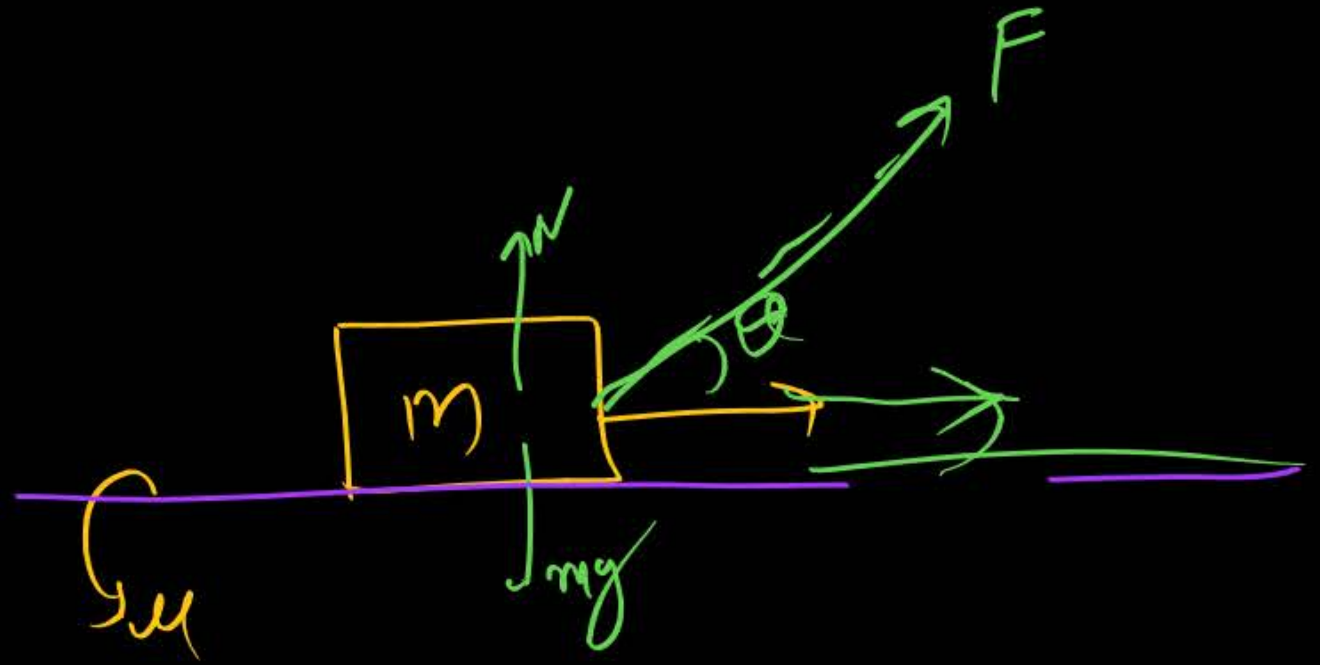
$$\boxed{t = \frac{V_0}{\mu g}}$$

H/W

1 find accn & friction



Q



find minimum force so that object will move on Horizontal Surface

MR scam

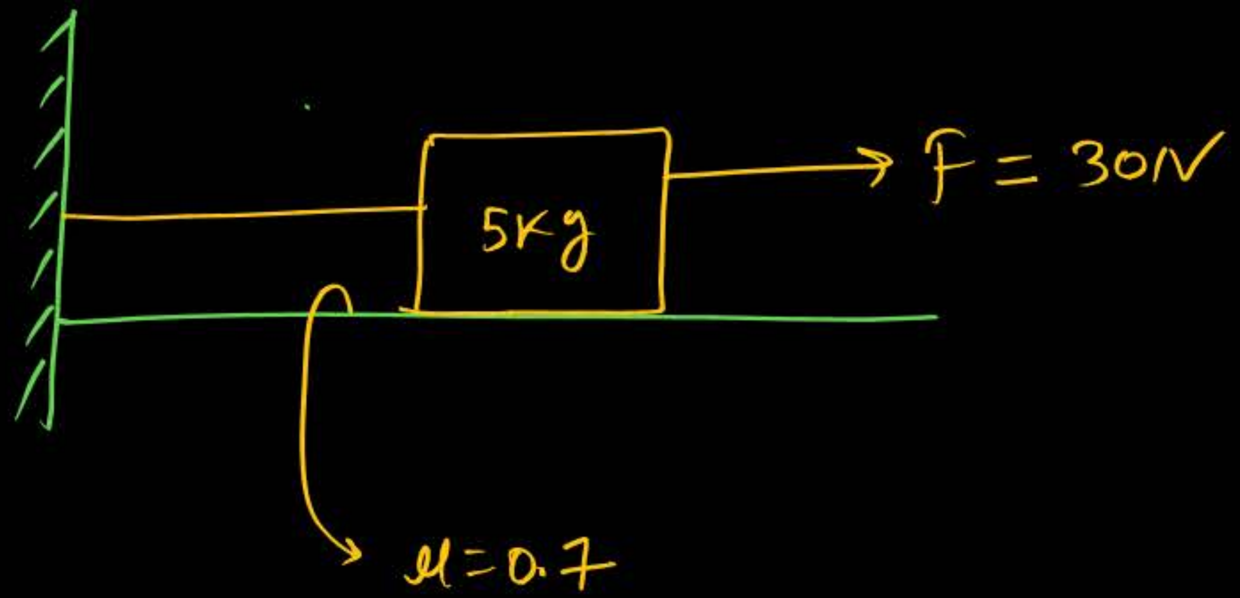
$\cancel{(F_{min}) = f_{lim} = \mu mg}$

$F_{min} = \dfrac{\mu mg}{\sqrt{1+\mu^2}}$ ✓

find minimum Horizontal force so that object will move on Horizontal Surface $F_{min} = \mu mg$

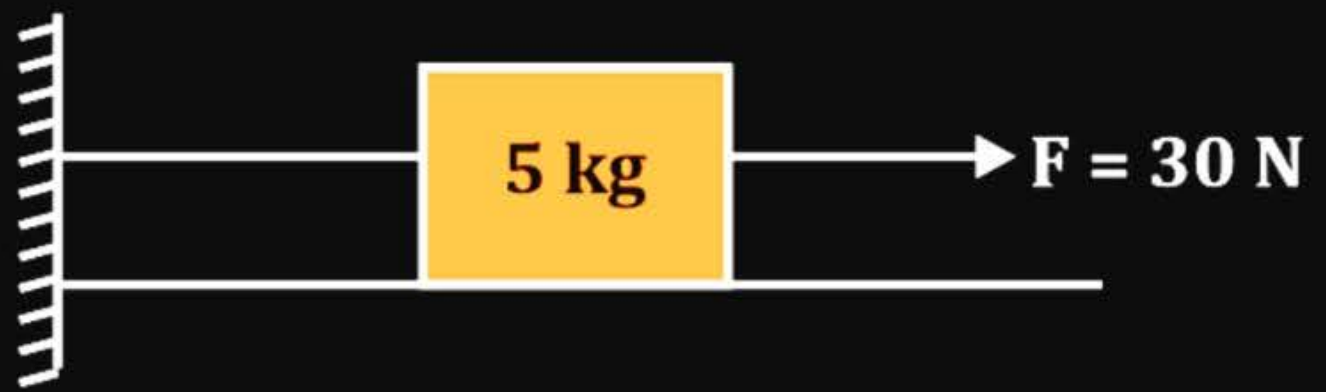
Ans

(2)



Question (3)

Find Tension in string .....



Question (4)

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

(1) 0.4 N

(2) 0.8 N

(3) 1.2 N

(4) Zero

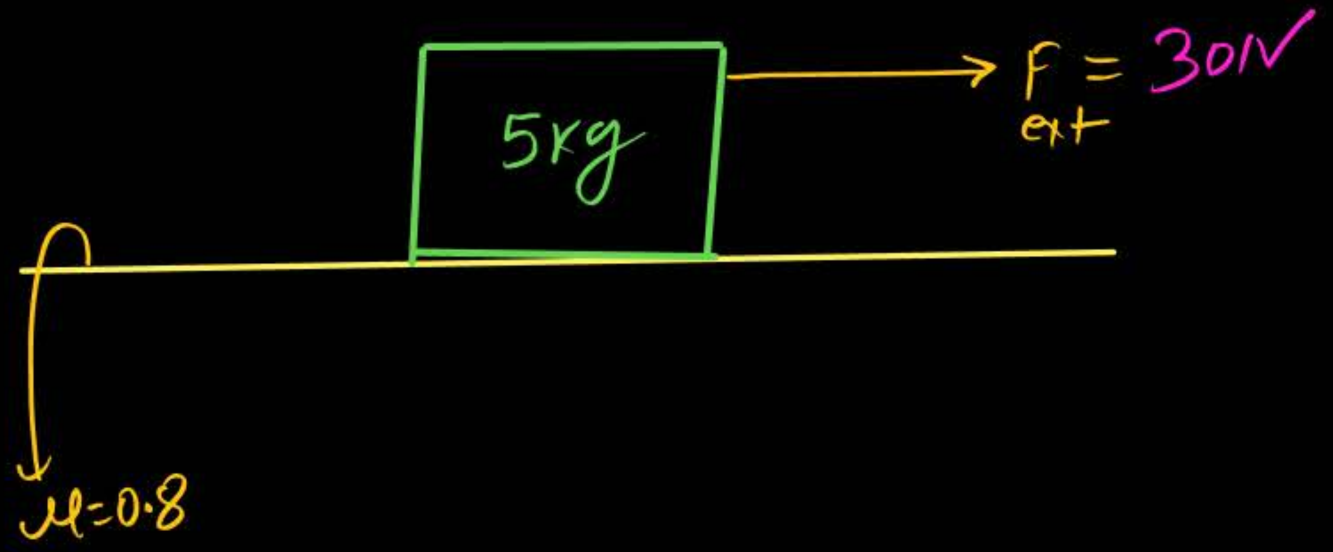
Question (5)

A heavy box is slid across a rough floor with an initial speed of 4 m/s. It stoops moving after 8 seconds. If the average resisting force of friction is 10 N, the mass of the box (in kg) is:

1. 40
2. 20
3. 5
4. 2.5

6

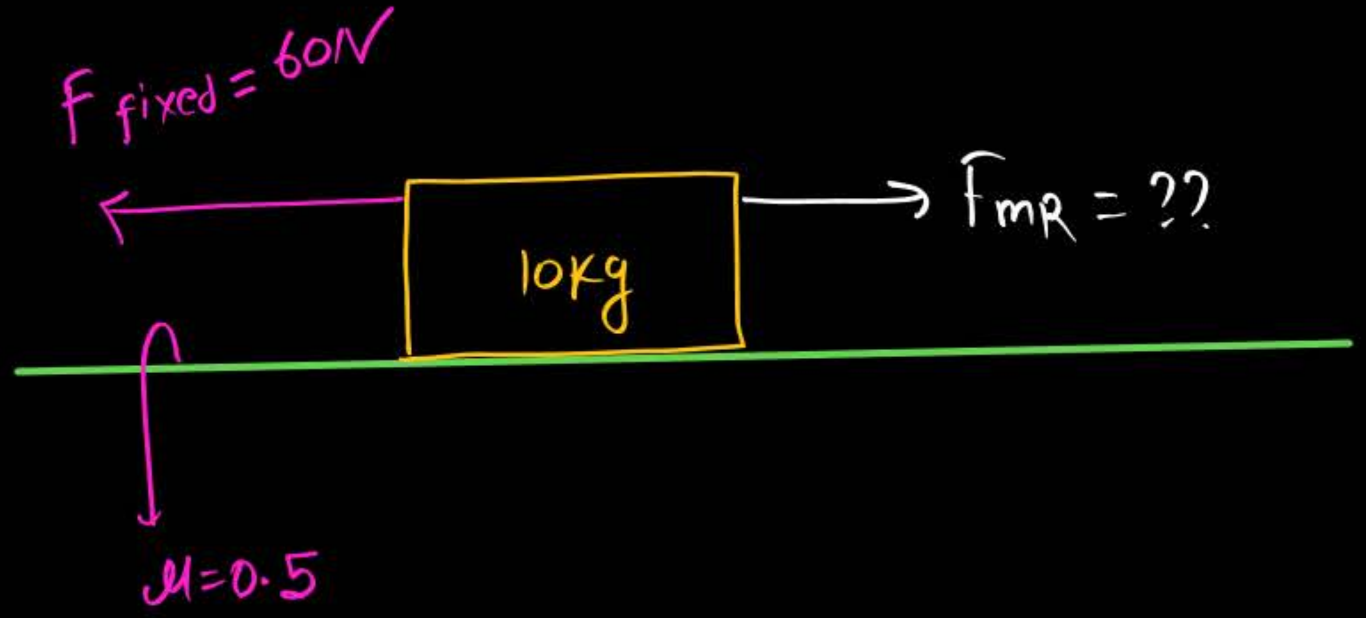
Find contact force b/w ground & Block :—



Question (7)

Find acceleration and friction.

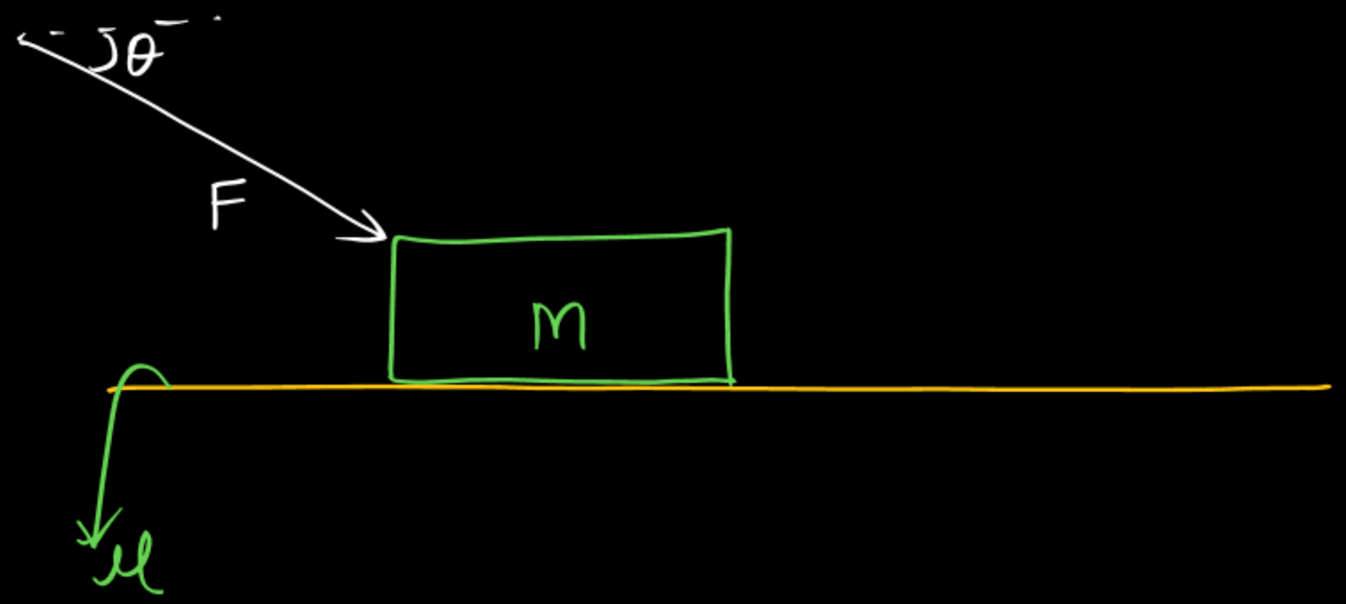
(8) Find range of applied force by (M.R) to keep the object at rest:-



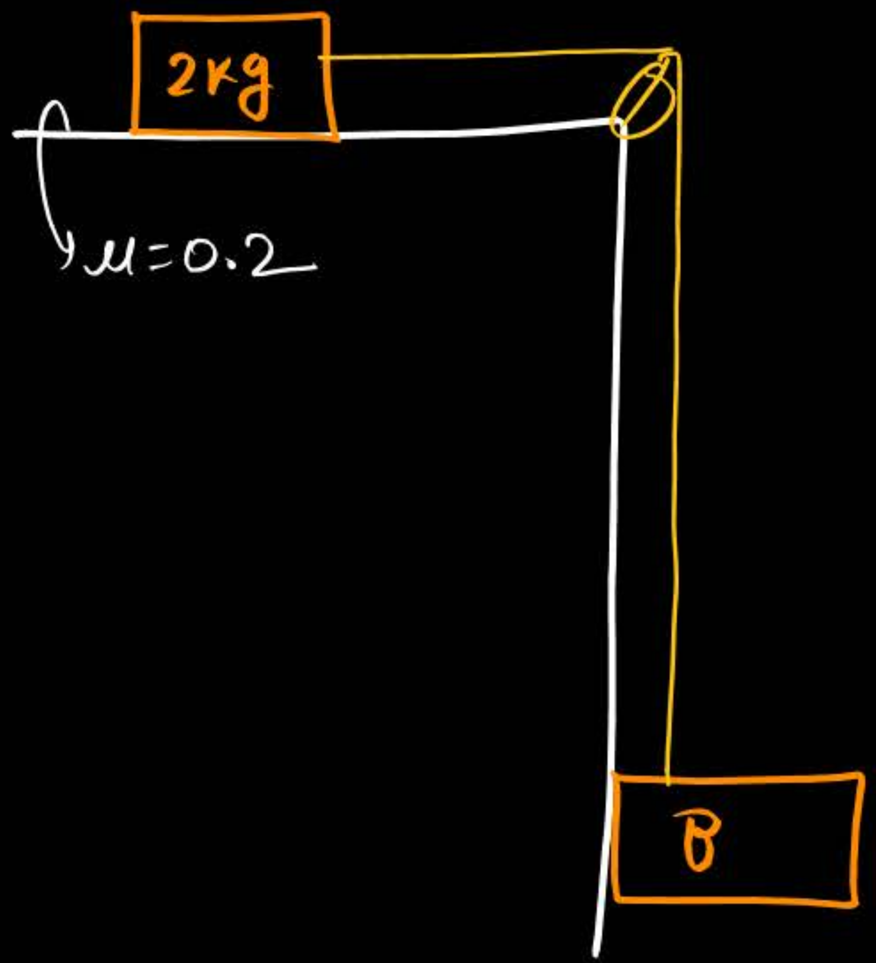
Question (9)

Find value of F_{MR} to keep the object at rest.

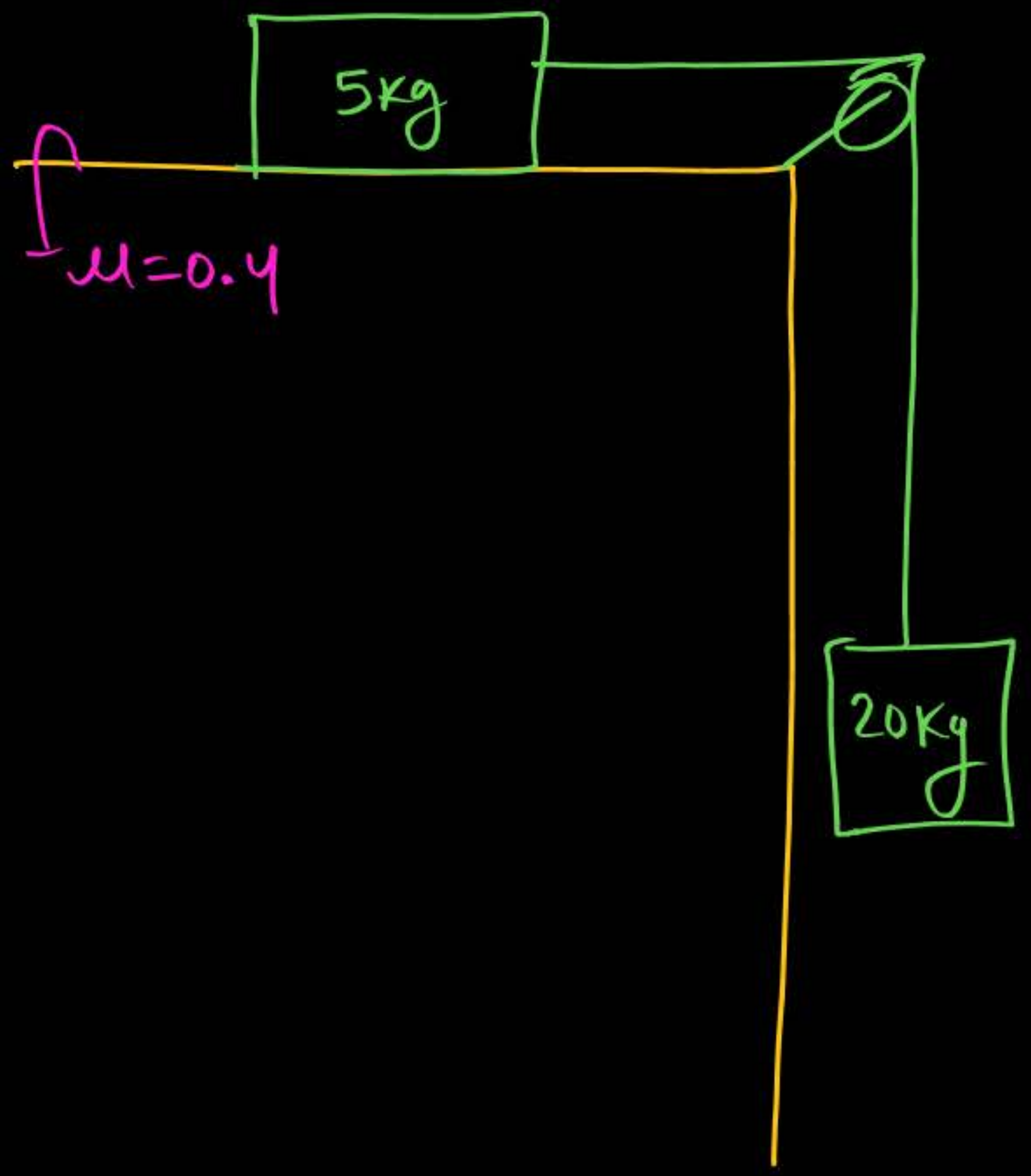
10



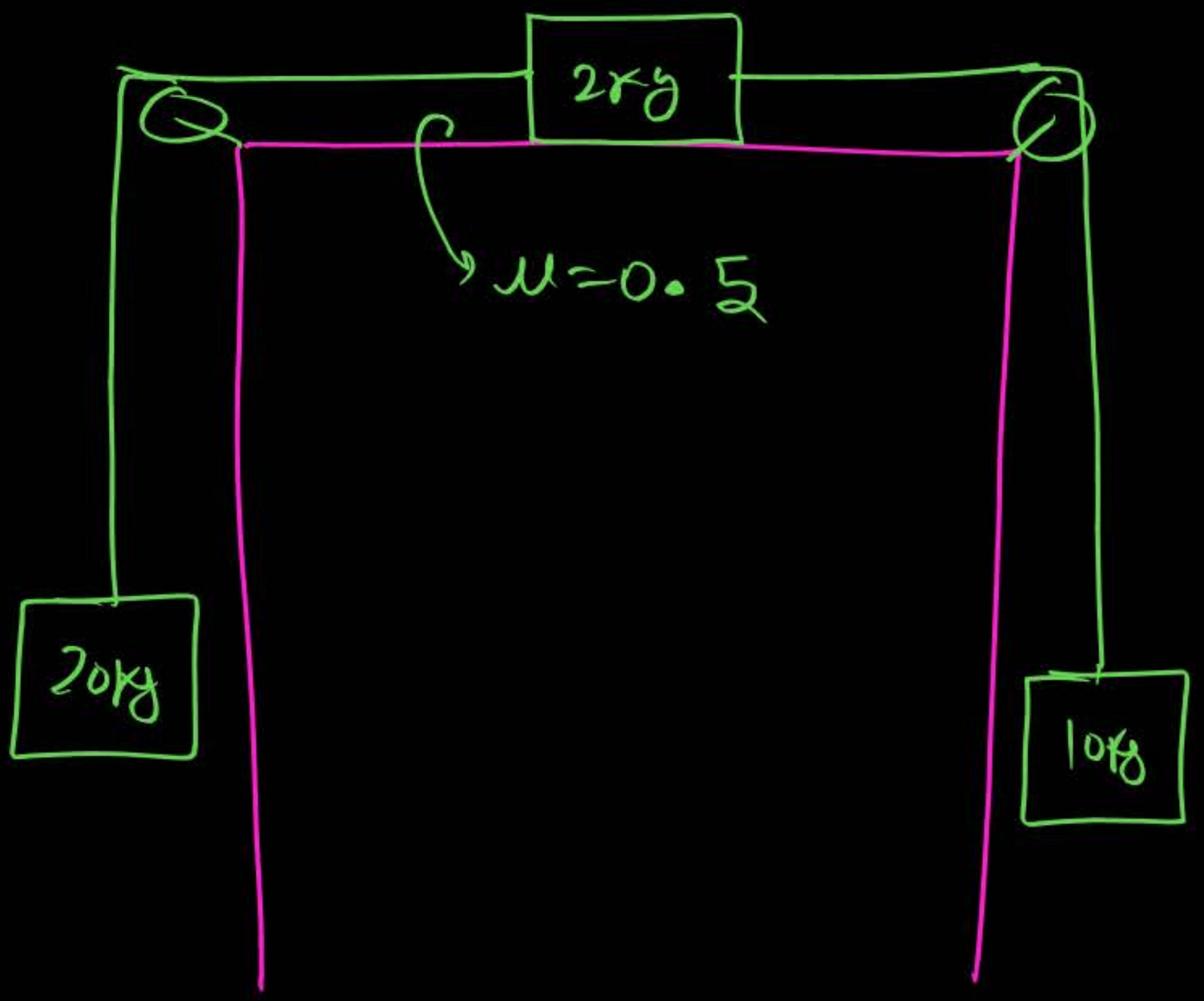
(11) find maximum value of θ so that block does not slide :—



(12) find Tension and accn.



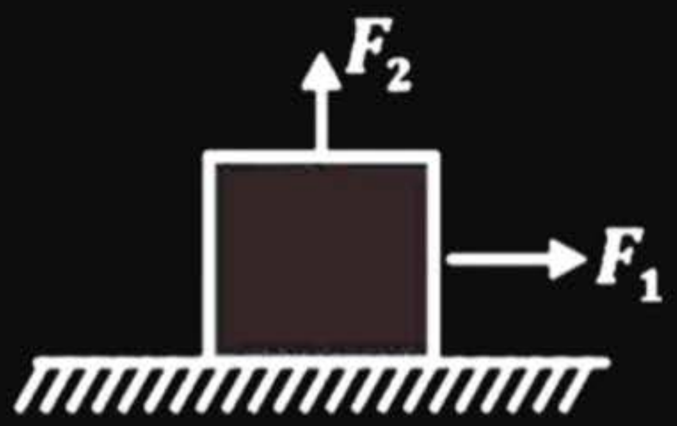
(13) find Tension & accn ??



Question (14)

In the figure shown, horizontal force F_1 is applied on a block but the block does not slide. Then as the magnitude of vertical force F_2 is increased from zero the block begins to slide; the correct statement is

1. The magnitude of normal reaction on block increases
2. Static frictional force acting on the block increases
3. Maximum value of static frictional force decreases
4. All of these



Question

15

The limiting friction between two bodies in contact is independent of

1. Nature of the surface in contact
2. The area of surfaces in contact
3. Normal reaction between the surfaces
4. The materials of the bodies

Question (16)

Which of the following is self-adjusting force?

1. Static friction
2. Limiting friction
3. Kinetic friction
4. Rolling friction

Question (17)

Maximum force of friction is called

1. Limiting friction
2. Static friction
3. Sliding friction
4. Rolling friction

Question (18)

Which is a suitable method to decrease friction?

1. Polishing
2. Lubrication
3. Ball bearing
4. All of these

THANK

YOU