PHYSICS

BOOKS - A2Z PHYSICS (HINGLISH)

NEWTONS LAWS OF MOTION

Basics Of Newton'S Laws Of Motion

1. Inertia is that property of a body by virtue of which the body is

A. unable to change by itself the state of rest.

B. unable to change by itself the state of uniform motion.

C. unable to change by itself the direction of motion.

D. unable to change by itself the state of rest or of uniform motion.

Answer: D

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2. A ball is travelling with uniform translatory motion. This means that .

A. it is at rest.

B. the path can be a straight line or circular and the ball travels with uniform speed.

C. all parts of the ball have the same velocity (magnitude and direction) and the velocity is constant.

D. the centre of the ball moves with constant velocity and the ball spine about its centre uniformly.

Answer: C

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3. when a body is stationary:

A. there is no force acting on it

B. the force acting on its are not in contact with it

C. the combination of force acting on it balance each other

D. the body is in vacuum

Answer: C

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4. The relation $\overrightarrow{F} = m\overrightarrow{a}$, cannot be deduced from Newton's second law, if

A. force depend on time

B. momentum depend on time

C. acceleration depend on time

D. mass depend on time

Answer: D

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5. An astronaut accidentally gets separated out his small spaceship accelerating in interstellar space at a constant rate of $100ms^{-2}$. What is the acceleration of the astronaut the instant after he is outside the spaceship? (Assume that there are no nearby stars to exert gravitational force on him)

A. zero

B. $10ms^{-2}$

C. $50ms^{-2}$

D. $100ms^{-2}$

Answer: A

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6. In which of the following cases the net force acting on the body is not zero?

A. A drop of rain falling down with a constant speed.

B. A cork of mass 10g floating on the surface of water.

C. A car moving with a contant speed of $20 km h^{-1}$ on a rough road.

D. A pebble of mass $0.05 kg$ is thrown vertically upwards.

Answer: D

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7. Which one of the following statement is not ture about Newton's second law of motion $\overrightarrow{F} = \overrightarrow{ma}$?

A. The second law of motion is consistent with the first law.

B. The second law of motion is a vector law.

C. The second law of motion is applicable to a single point particle.

D. The second law of motion is not a local law.

Answer: D

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8. A boy sitting on the topmost berth in the compartment of a train which is just going to stop on a railway station, drop an apple aiming at the open hand of his brother sitting vertically below his hands at a distnace of about 2 meter. The apple willl fall

A. Preciselt 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 of the direction of motion of the train

D. None of these

Answer: B

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9. A person sitting in an open car moving at constant velocity throws a ball vertically up into air. The ball falls

A. Outside the car

B. In the car ahead of the person

C. In the car to the side of the person

D. Exactly in the hand which threw it up

Answer: D

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10. On a stationary sail-boat, air is blown at the sails from a fan attached to the boat. The boat will

A. Remain stationary

B. spin around

C. Move in a direction opposite to that in which air is blown

D. Move in the direction in which the air is blown

Answer: A

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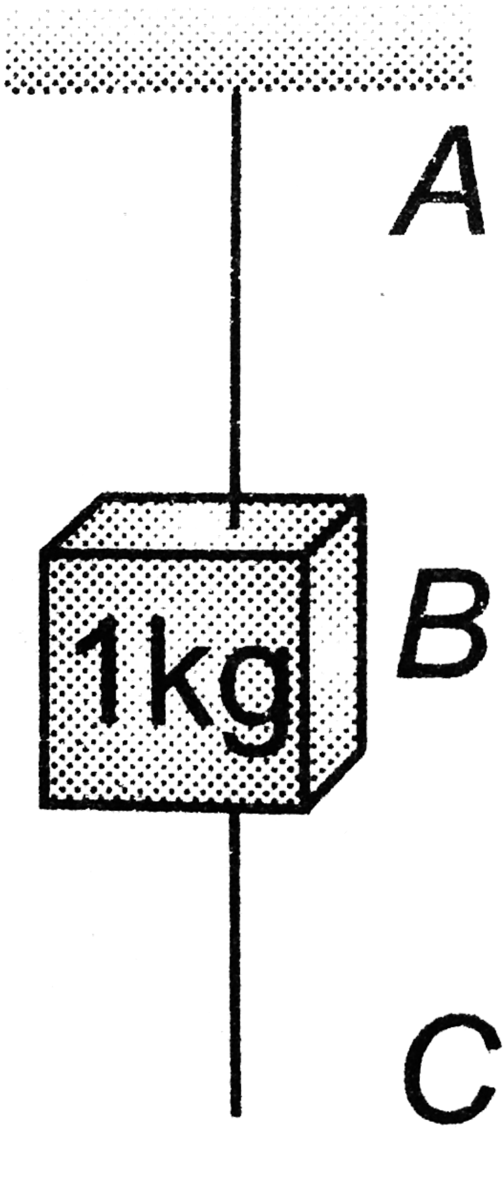
11. A mass of 1kg is suspended by a string A. Another string C is connected to its lower end (see figure). If a sudden jerk is given to C, then



A. The portion AB of the string will break

B. The portion BC of the string will break

C. None of the string will break

D. The mass will start rotating

Answer: B

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12. In the previous problem, If the string C is stretched slowly, then

A. The portion AB of the string will break

B. The portion BC of the string will break

C. None of the string will break

D. None of the above

Answer: A

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13. Which of the following conclusion is correct regarding a stationary body?

A. No force is acting on the body.

B. Vector sum of force acting on the body is zero.

C. The body is in vacuum.

D. The force acting on the body, do not constitute a couple.

Answer: B

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14. A locomotive (engine) pulls a series of wagons. Which is the correct analysis of the situation?

A. The train moves forward because the locative pulls foeward slightly harder on the wagons than the wagons pull backward on the locomotive.

B. Because action always equal reaction, the locomotive cannot pull the wagons. The wagons pull backward just as hard as the locomotive pulls forward, there is no motion.

C. The locomotive's force on the wagons is an strong as the force of the wagons on the locomotive, but the frictional force on the locomotive is forward and large while the backward frictional force on the wagons is small.

D. The locomotive can pull the wagons forward only if it weighs more than the wagons.

Answer: C

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15. When a speeding bus stop suddenly, passengers are thrown forward from their seats because

A. the back of seat suddenly puushes the passengers forward.

B. inertia of rest stops the bus and takes the body forward.

C. upper part of the body continues to be in the state of motion whereas the lower part of the body in contact with seat remains at crest.

D. upper part of the body come to resst whereas the lower part of the body in contact with seat begins to move.

Answer: C

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16. We can derive Newton's

A. second and third laws from the first law.

B. first and second laws from the first law.

C. third and first laws from the second law.

D. all the three laws are independent of each other.

Answer: C

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17. Which of the following statement is not true regarding the Newton's third law of motion?

A. To every action there is always an equal and opposite reaction.

B. Action and reaction act on the same body.

C. There is no cause-effect relation between action and reaction.

D. Action and reaction forces are simultaneous forces.

Answer: B

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18. A constant retarding force of 50N is allied to a body of mass 10kg moving initially with a speed of $10ms^{-1}$. The body comes to rest after

A. 2s

B. 4s

C. 6s

D. 8s

Answer: A

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19. A body A mass m_1 exerts a force on another body B of mass m_2 . If the acceleration of B be a_2 , then the acceleration (in magnitude) of A is

A. $\frac{m_2}{m_1}a_2$

B. $m_1m_2a_2$

C. $\frac{m_1}{m_2}a_2$

D. $(m_1 + m_2)a_2$

Answer: A

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20. When forces F_1 , F_2 , F_3 are acting on a particle of mass m such that F_2 and F_3 are mutually prependicular, then the particle remains stationary. If the force F_1 is now rejmoved then the acceleration of the particle is

A. F_1 / m

B. F_2F_3 / mF_1

C. $(F_2 - F_3) / m$

D. F_2 / m

Answer: A

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21. A body under the action of a force $\overrightarrow{F} = 6\hat{i} - 8\hat{j}N$ acquires an acceleration of $5ms^{-2}$. The mass of the body is

A. 2kg

B. 5kg

C. 4kg

D. 6kg

Answer: A

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22. A constant force acting on a body of mass 5kg change its speed from $5ms^{-1}$ in 10s without changing the direction of motion. The force acting on the body is

A. $1.5N$

B. 2N

C. $2.5N$

D. 5N

Answer: C

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23. A body of mass $0.4kg$ starting at origin at $t=0$ with a speed of $10ms^{-1}$ in the positive x-axis direction is subjected to a constant $F = 8$ N towards negative x-axis.

A. $-6000m$

B. $-8000m$

C. $+4000m$

D. $+7000m$

Answer: A

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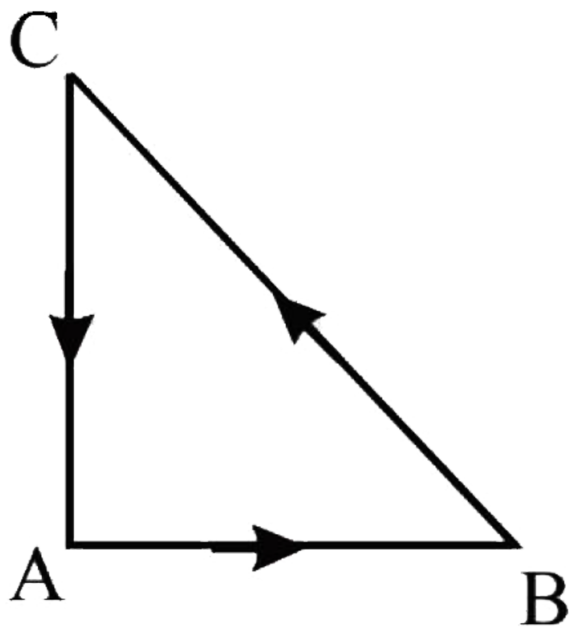
24. Three forces start acting simultaneously on a particle moving with velocity, $\bar{v}$. These forces are respresented in magnitude and direction by the three sides of a triangle ABC. The particle will now move with velocity



A. $\overrightarrow{v}$ remaining unchanged

B. less than $\overrightarrow{v}$

C. Greater than $\overrightarrow{v}$

D. $\overrightarrow{v}$ in the direction of the larges force BC

Answer: A

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25. Five forces $\overrightarrow{F}_1, \overrightarrow{F}_2, \overrightarrow{F}_3, \overrightarrow{F}_4$, and $\overrightarrow{F}_5$, are acting on a particle of mass $2.0kg$ so that is moving with $4m/s^2$ in east direction. If $\overrightarrow{F}_1$

force is removed, then the acceleration becomes $7m/s^2$ in north, then the acceleration of the block if only $\overrightarrow{F}_1$ is action will be:

A. $16m/s^2$

B. $\sqrt{65}ms^2$

C. $\sqrt{260}ms^2$

D. $\sqrt{233}ms^2$

Answer: B

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26. Ten one-rupee coins are put on top each other on a table. Each coin has a mass m. The rection of the 6^{th} coin (counted from the bottom) on the 7^{th} coin is

A. 4gm

B. 6gm

C. 7gm

D. 3gm

Answer: A

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27. A cork of mass 10g is floating on water. The net force acting on the cork is

A. 10N

B. $10^{-3}N$

C. $10^{-2}N$

D. zero

Answer: D

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28. A bullet of mass 40g moving with a speed of $90ms^{-1}$ enters a heavy wooden block and is stopped after a direction of 60cm. The average resistive force exerted by the block on the bullet is

A. 180N

B. 220N

C. 270N

D. 320N

Answer: C

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29. Five persons A, B, C, D, and E, are pulling a cart of mass 100kg on a smooth surface and cart is moving with acceleration $3m/s^2$ in east direction. When person A stops pulling, it moves with acceleration $24m/s^2$ in the north direction. The magnitude of acceleration of the cart when only A and B pull the cart keeping their direction, is:

A. $26m/s^2$

B. $3\sqrt{71}m/s^2$

C. $25m/s^2$

D. $30m/s^2$

Answer: C

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30. A machine gun is mounted on a 2000kg car on a horizontal frictionless surface. At some instant the gun fires bullets of mass 10gm with a velocity of $500m/\sec$ with respect to the car. The number of bullets fired per second is ten. The average thrust on the system is

A. 550N

B. 50N

C. 250N

D. 250N dyne

Answer: B

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31. A machine gun fires a bullet of mass 40 g with a velocity $1200 m s^{-1}$. The man holding it can exert a maximum force of 144 N on the gun. How many bullets can be fire per second at the most?

A. one

B. four

C. two

D. three

Answer: D

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32. If a bullet of mass 5gm moving with velocity $100m/\sec$, penertates the wooden block upto 6cm. Then the average force imposed by the bullet on the block is

A. 8300N

B. 417N

C. 830N

D. zero

Answer: B

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33. A 500kg rocket is set for verticle firing. The exhaust speed is $800ms(-2)$. To give an initial upward acceleration of $20ms(-2)$, the amount of gas ejected per second to supply the needed thrust will be $(g=10ms(-2)$

A. $127.5kgs^{-1}$

B. $187.5kgs^{-1}$

C. $185.5 kgs^{-1}$

D. $137.5 kgs^{-1}$

Answer: B

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34. A cricket ball of mass 250g collides with a bat with velocity $10 m/s$ and returns with the same velocity within 0.01 second. The force acted on bat is

A. 25N

B. 50N

C. 250N

D. 500N

Answer: D

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35. N bullet each of mass mkg are fired with a velocity $vms(-2)$ at the rate of n bullets per second upon a wall. The reaction offered by the wall to the bullets is given by

A. nmv

B. $\frac{Nmv}{n}$

C. $n\frac{Nm}{v}$

D. $n\frac{Nv}{m}$

Answer: A

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36. A ball of the mass 400gm is dropped from a height of 5m. A boy on the ground hits the ball vertically upwards with a bat with an average force of 100N so that it attains a vertical height of 20m. The time for which the ball remains in contect with the bat is [$g = 10m/s^{-2}$]

A. $0.12s$

B. $0.08s$

C. $0.04s$

D. $12s$

Answer: A

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37. A gardener waters the plants with a pipe of dimeter $1mm$. The water comes out at the rate of $10cm^3/\sec$. The reactionary force exerted on the hand of the gardener is

A. Zero

B. $1.27 \times 10^{-2} N$

C. $1.27 \times 10^{-4} N$

D. $0.127 N$

Answer: D

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38. A $100g$ iron ball having velocity $10m/s$ collides with a wall at an angle 30° and rebounds with the same angle. If the period of contact between the ball and wall and wall is

0.1 second, then the force experienced by the wall is

A. 10N

B. 100N

C. $1.0N$

D. $0.1N$

Answer: A

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39. At a certant of time the mass of a roket going up vertically is 100kg. If it is ejecting 5kg of gas per second at a speed of $400m/s$, the acceleration of the rocket would be $(\text{talking}$ g=10m//s^(2))`

A. $20m/s^2$

B. $10m/s^2$

C. $2m/s^2$

D. $1m/s^2$

Answer: B

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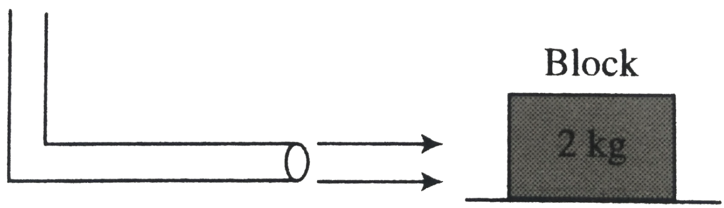
40. A block of metal weighing 2kg is resting on a frictionless plane. It is struck by a jet releasing water at a rate of $1kgs^{-1}$ and at a speed of $5ms^{-1}$. The initial acceleration of the block is



A. $2.5m/s^2$

B. $5m/s^2$

C. $10m/s^2$

D. $20m/s^2$

Answer: A

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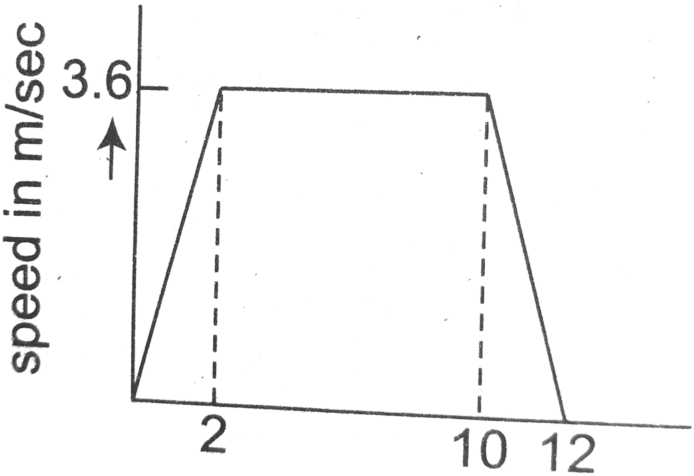
41. A lift is going up. The total mass of the lift and the passenger is 1500kg. The variation in the speed of the graph. The tension in the rope pulling the lift at $t = 11^{th}$ sec will be



A. 17400N

B. 14700N

C. 12000N

D. Zero

Answer: C

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42. A contant force starts acting on a body of mass m at rest. The velocity v acquired in treveling a specific distance depends on m as

A. $c\frac{1}{m}$

B. $v \propto \frac{1}{\sqrt{m}}$

C. $v \propto m$

D. $v \propto \sqrt{m}$

Answer: B

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Linear Momentum And Impulse

1. Which one of the following statement s in not ture?

A. The same force for the same time cause the same change in momentum for different bodies.

B. The rate of change of momentum of body is directly proportinal to the applied force and takes place in the direction in which the force acts.

C. A greater opposite force is needed to stop a heavy body than a light body in the same time, if they are moving with the same speed.

D. The greater the change in the momentum in a given time, the lesser is the force that needs to be applied.

Answer: D

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2. A body at rest breaks into two pieces of equal masses. The parts will move

A. move in the same direction with equal speeds

B. move in any direction with any speed

C. move in opposite direction with equal speeds

D. move in opposite direction with unequal speeds

Answer: C

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3. A nuclide at rest emits an alpha-particle. In this process:

A. alpha-particle moves with large velocity and the nuclesus remains at rest

B. both alpha-particle and nucleus move with equal speed in opposite direction

C. both move in opposite direction but nucleus with greater speed

D. both move in opposite direction but alpha-particle with greater speed.

Answer: D

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4. A vessel at rest explodes breaking it into three pieces. Two pieces having equal mass fly off perpendicular to one another with the same speed of $30 m/s$. The third pieces has three times the mass of each other piece. What is the direction (w.r.t. the piece having equal masses) and magnitude of its velocity immediately after the explosion?

A. $10\sqrt{2}, 135^{\circ}$

B. $10\sqrt{2}, 90^{\circ}$

C. $10\sqrt{2}, 60^{\circ}$

D. $10\sqrt{2}, 30^{\circ}$

Answer: A

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5. A radioactive nucleus initially at rest decays by emitting an electron and neutron at right angle to one another. The momentum of neutron is $3.2 \times 10^{-24} kgm / s$ and the momentum of neutron is

$6.4 \times 10^{-24} kgm / \sec$. The direction of the recoiling nucleus with that of the electron motion is:

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

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

C. $\tan^{-1}(0.5)$

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

Answer: A

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6. A shell is fired from a cannon with a velocity $v(m/\sec.)$ at an angle θ with the horizontal direction. At the highest point in its path it explodes into two pieces of equal mass. One of the pieces retraces its path to the cannon and the speed (in $m/\sec.$) of the other piece immediately after the explosion is

A. $3v\cos\theta$

B. $2v\cos\theta$

C. $\frac{3v}{2}\cos\theta$

D. $\frac{\sqrt{3v}\cos\theta}{2}$

Answer: A

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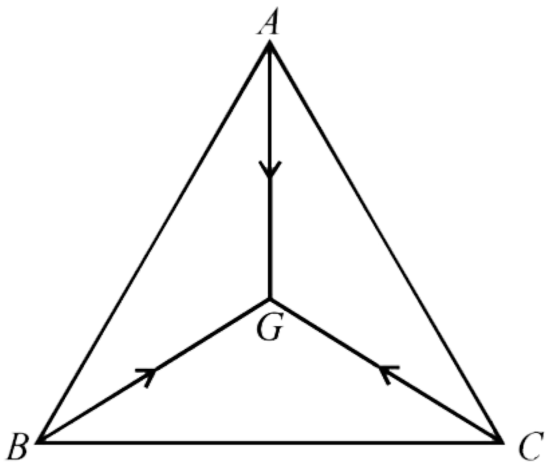
7. Three particles A, B and C of equal mass move with equal speed V along the medians of an equilateral triangle as shown in hgure. They collide at the centroid G of the triangle. After the collision, A comes to test, B retraces its path with the speed V. What is the velocity of

C ?



A. v, direction $\overline{OA}$

B. 2v, direction $\overline{OA}$

C. 2v, direction $\overline{OB}$

D. 2v, direction $\overline{BO}$

Answer: D

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8. A shell of mass 200g is fired by a gun of mass 100kg. If the muzzle speed of the shell is $80ms^{-1}$, then the recoil speed of the gun is

A. $16cms^{-1}$

B. $8cms^{-1}$

C. $8ms^{-1}$

D. $16ms^{-1}$

Answer: A

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9. a 100kg gun fires a ball of 1kg horizontally from a cliff of height 500m. If falls on the ground at a distance of 400m from the bottom of the cliff. The recoil velocity of the gun is (Take g: $10ms^{-2}$

A. $0.2ms^{-1}$

B. $0.4ms^{-1}$

C. $0.6ms^{-1}$

D. $0.8ms^{-1}$

Answer: B

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10. A body of mass M at rest explodes into three pieces, two of which of mass M//4 each are thrown off in prependicular directions eith velocities of $3/s$ and $4m/s$ respectively. The third piece willl be thrown off with a velocity of

A. $1.5m/s$

B. $2.0m/s$

C. $2.5m/s$

D. $3.0m/s$

Answer: C

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11. A bullet is fired from a gun. The force on the bullet is given by $F = 600 - 2 \times 10^5$ t, where F is in newtons and t in seconds. The force on the bullet becomes zero as soon as it leaves the barrel. What is the average impulse imparted to the bullet?

A. 9Ns

B. zero

C. $0.9Ns$

D. $1.8Ns$

Answer: C

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12. A particle moves in the xy-plane under the action of a force F such that the components of its linear momentum p at any time t are $p_x = 2\cos t, p_y = 2\sin t$. The angle between F and p at time t is

A. 90°

B. 0°

C. 180°

D. 30°

Answer: A

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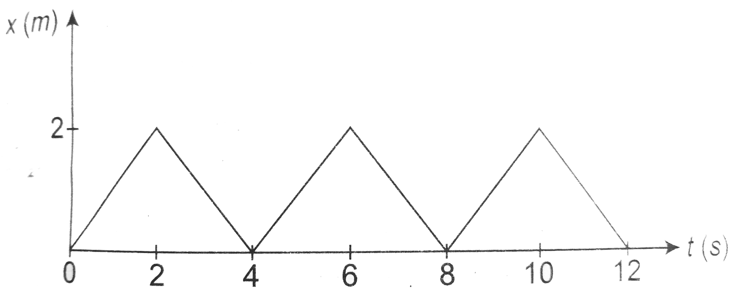
13. Figure shows the position-time (x-t) graph of one dimensional motion of a mass 500g. What is the time interval between two consecutive impulses received by the body?



A. 2s

B. 4s

C. 6s

D. 8s

Answer: A

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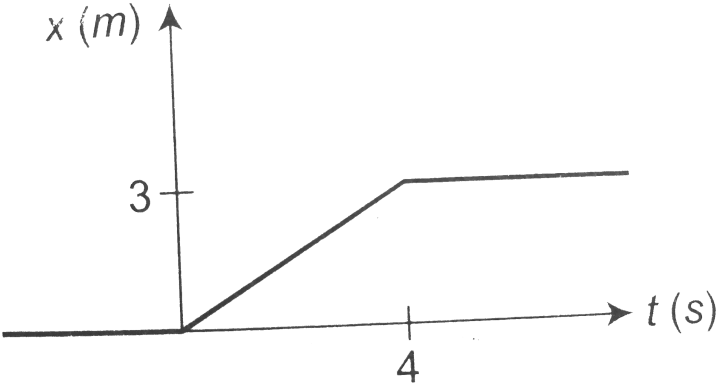
14. Figure shows the position-time graph of a particle of mass 4kg. Let the force on the particle for $t < 0$, $0 < t$lt,$4s$, $t > 4s$ be

F_1, F_2 and F_3 respectively. Then



A. $F_1 = F_2 = F_3 = 0$

B. $F_1 > F_2 = F_3$

C. $F_1 > F_2 > F_3$

D. $F_1 < F_2 < F_3$

Answer: A

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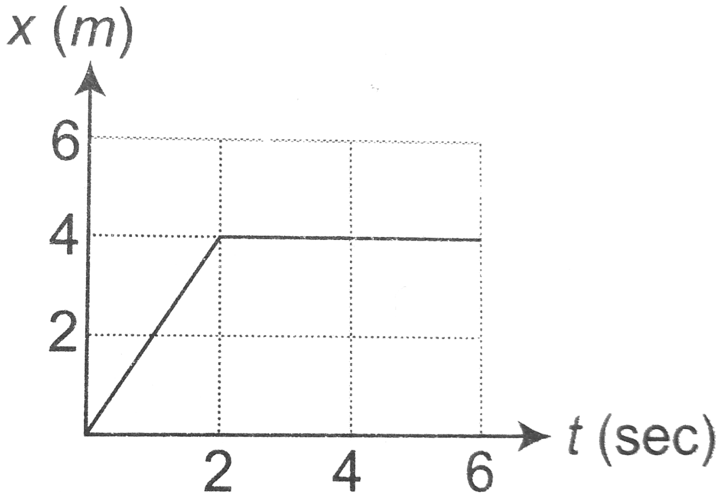
15. In the figure given below, the position-time graph of a particle of mass $0.1kg$ is shown. The impuslse at $t = 2$ sec is



A. $0.2kgm / \sec$

B. $-0.2kgm/\sec$

C. $-0.1kgm/\sec$

D. $-0.4kgm/\sec$

Answer: B

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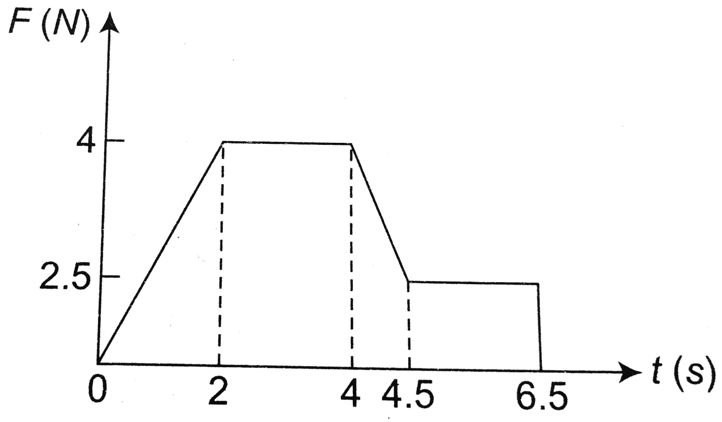
16. A body of 2kg has an initial speed $5ms^{-1}$. A force acts on it for some time in the direction of motion. The force time graph is shown in figure. The force time graph is shown in figure. The final speed of the body is



A. $9.25 ms^{-}(-1)$

B. $5 ms^{-}(-1)$

C. $14.25 ms^{-}(-1)$

D. $4.25 ms^{-}(-1)$

Answer: C

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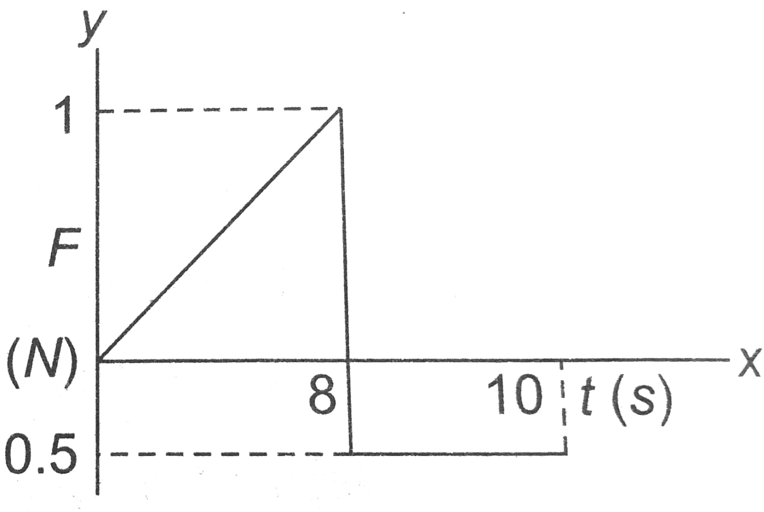
17. A force-time graph for the motion of a body is shown in the figure. The change in the momentum of the body between zero and 10sec is



A. $zero$

B. $4kgm / s$

C. $5kgm / s$

D. $3kgm / s$

Answer: D

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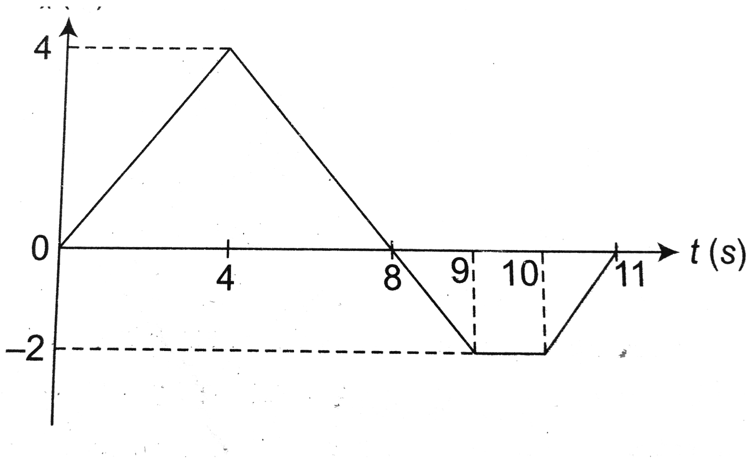
18. A 2kg toy car can move along an x axis. Graph shows force F_x , acting on the car which being at rest at time $t = 0$. The velocity of the particle at $t = 0s$ is:



A. $-im/s$

B. $-1.5im/s$

C. $6.5im/s$

D. $13im/s$

Answer: C

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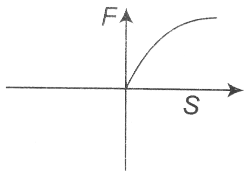
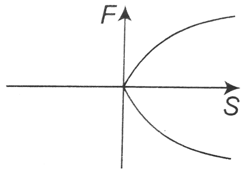
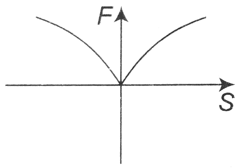
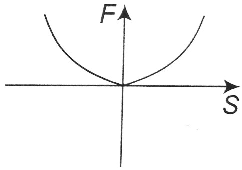
19. A particle of mass 'm' and initially at rest is acted by a force $F = a$ t. Newtons best representation of force-displacement graph is:

A. 

B. 

C. 

D. 

Answer: A

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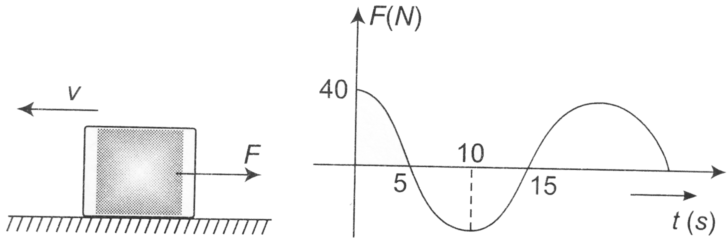
20. A 15kg block is initially moving along a smooth horizontal surface with a speed of $v = 4m/s$ to the left. It is acted by a force F, which varies in the manner shown. Determine the velocity of the block at $t = 15$ seconds.



A. $12.5m / s$

B. $8.5m / s$

C. $20m / s$

D. $9.5m / s$

Answer: A

Watch Video Solution

Equilibrium Of A Particle

1. A body subjected to three concurrent force is found to be in equilibrium. The resultant of any two force

A. is equal to third force.

B. is oposite to third force

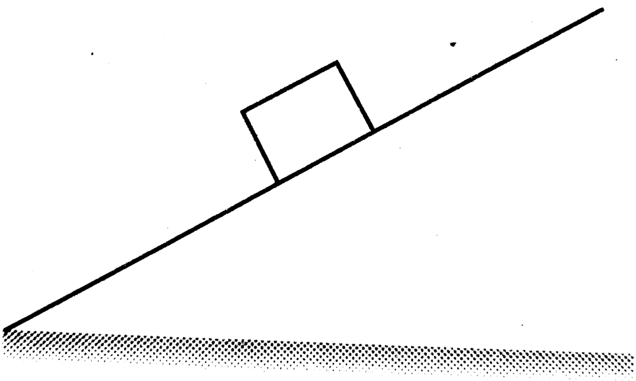
C. is collinear with the third force

D. all of these

Answer: D

Watch Video Solution

2. A block of mass 3kg is at rest on a rough inclined plane as shown in the figure. The magnitude of net force exerted by the surface on the block will be



A. 26N

B. 19.5N

C. 10N

D. 30N

Answer: D

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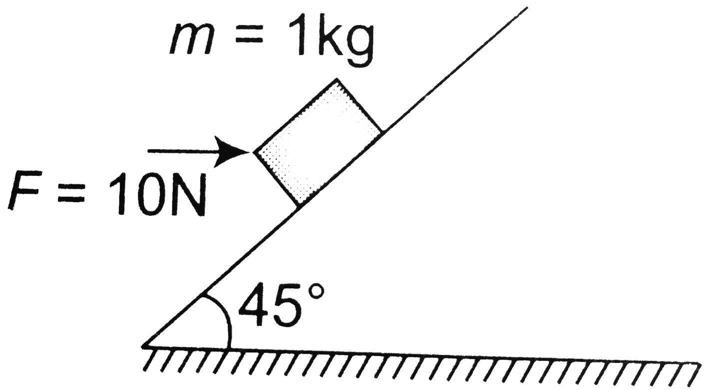
3. A body of mass 1kg lies on smooth inclined plane. The block of mass m is given force $F = 10 \quad N$ horizontally as shown. The magnitude of net normal reaction on the block is:



A. $10\sqrt{2}N$

B. $\frac{10}{\sqrt{2}}N$

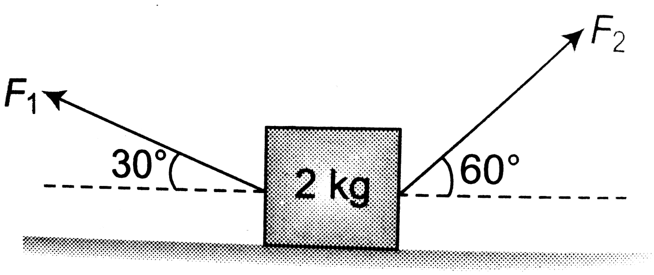
C. 10N

D. none of these

Answer: A

Watch Video Solution

4. A body of mass $2.0kg$ is placed on a smooth horizontal surface. Two force $F_1 = 20N$ and $F_2 = N$ are acting on the body in directions making angles of 30° and 60° to the surface. The reaction of the surface om the body will be



A. 20N

B. 25N

C. 5N

D. zero

Answer: D

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5. Three concurrent co-planer force $1N$, $2N$ and $3N$ acting along different directions on a body

A. can keep the body in equilibrium if 2 N and 3 N act at right angle.

B. can keep the body in equilibrium if 1 N and 2 N act

C. connot keep the body in equilibrium.

D. can keep the body in equilibrium if 1 N and 3 N act at an acute angle.

Answer: C

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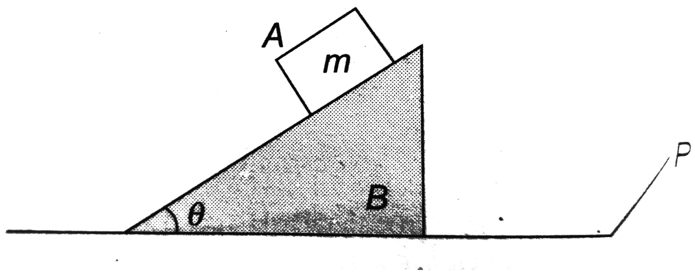
6. In the figure shown 'p' is a plate on which a wedge B is placed and on B a block A of mass m m is placed. The plate is suddenly removed and system of B and A is allowed to fall under gravity. Neglecting any force due to air on A and B , the normal force on A due to B is



A. $\frac{mg}{\cos\theta}$

B. $mg\cos\theta$

C. zero

D. $\dfrac{2mg}{\cos\theta}$

Answer: C

Watch Video Solution

7. Which of the following sets of concurrent force may be in equilibrium?

A. $F_1 = 3\,N, F_2 = 5\,N, F_3 = 9\,N$

B. $F_1 = 3\,N, F_2 = 5\,N, F_3 = 1\,N$

C. $F_1 = 3\,N, F_2 = 5\,N, F_3 = 19\,N$

D. $F_1 = 3\,N, F_2 = 5\,N, F_3 = 6\,N$

Answer: D

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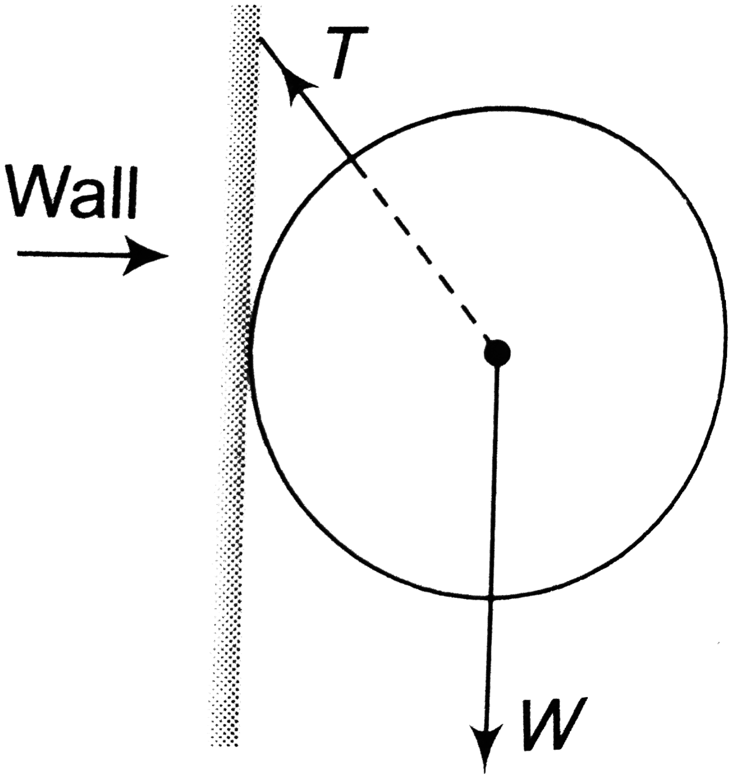
8. A uniform sphere of weight W and radius 3 m is being held by a frictionless wall as shown in the figure. The tension in the string will be:



A. $5W / 4$

B. $15W / 4$

C. $15W/16$

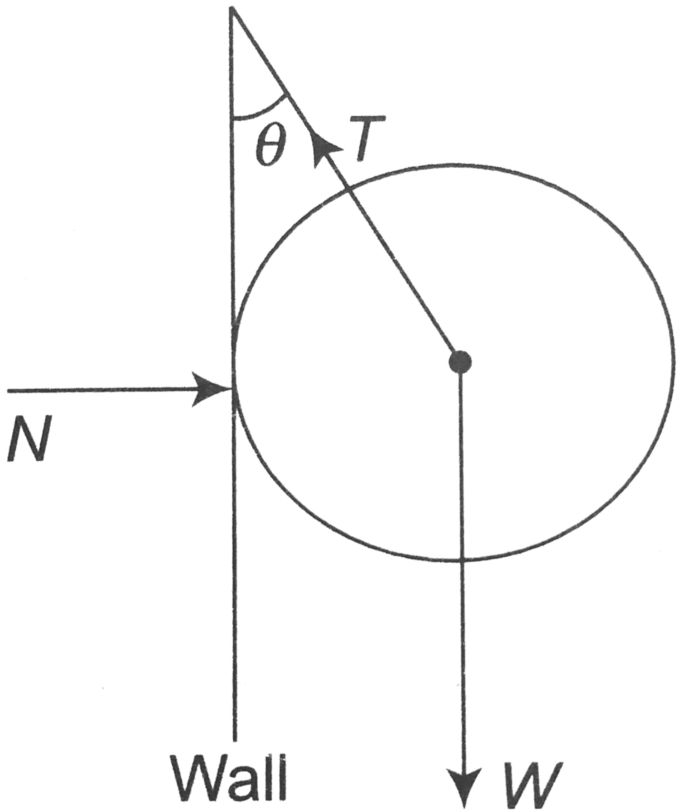
D. none of these

Answer: A

Watch Video Solution

9. A metal sphere is hung by a string fixed to a will. The force acting on the sphere are shown in figure. Which of the following statement is

NOT corrent?



A. $\overrightarrow{N} + \overrightarrow{T} + \overrightarrow{W} = 0$

B. $T^2 = T^2 + W^2$

C. $T = N + W$

D. N=Wtanθ

Answer: C

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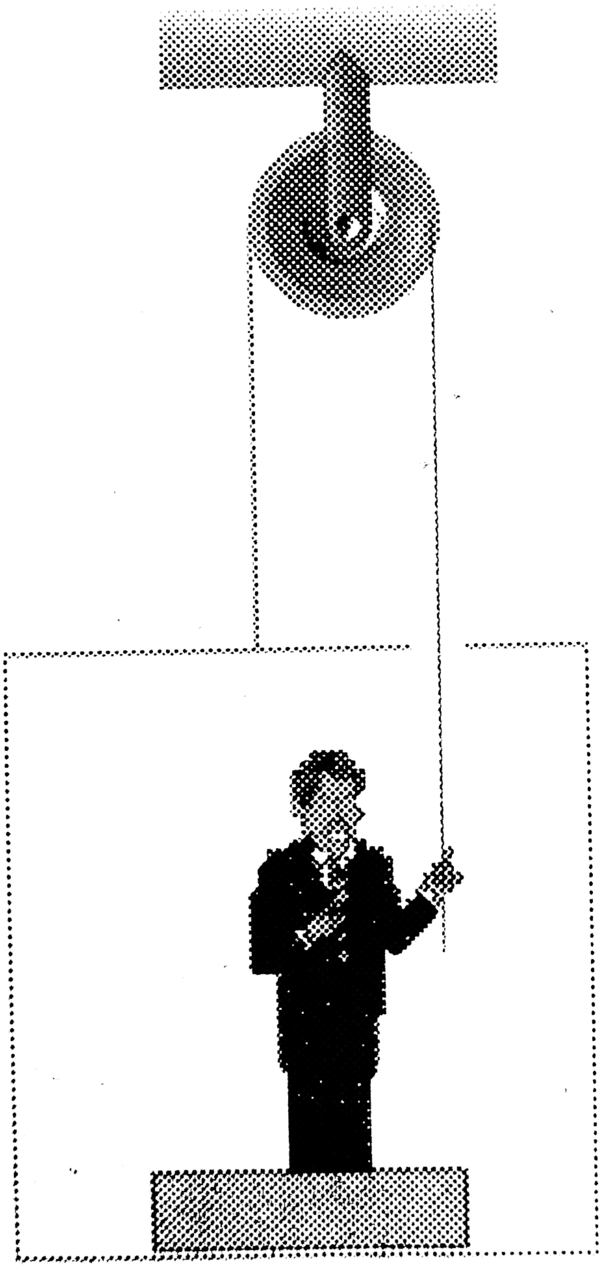
10. Figure shows a man of mass 50kg standing on a light weighing machine kept in a box of mass 30kg. The box is hanging from a pulley fixed to the ceiling through a light rope, the other end of which is held by the man himself.

If the man manages to keep the box at rest, the weight shown by the machine is.



A. 10N

B. 100N

C. 800N

D. 200N

Answer: B

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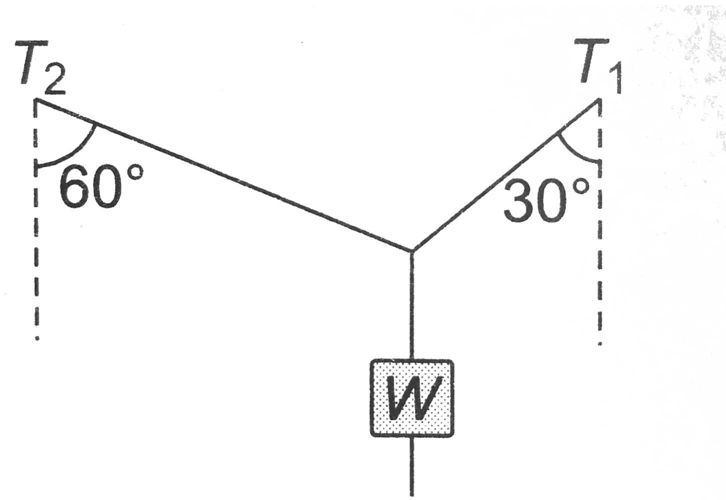
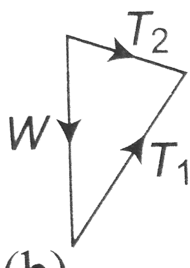
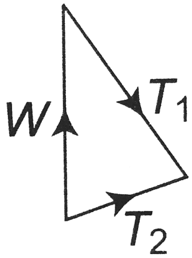
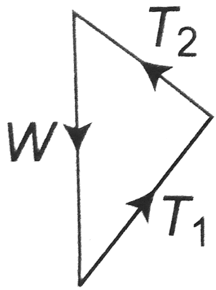
11. A weight w is supported by two strings inclined at 60° and 30° to the vertical. The tensions in the strings are T_1 and T_2 as shown. If these tensions are to be determined in terms of W using a triangle of force, which of these triangles should you draw? (block is in equilibrium)

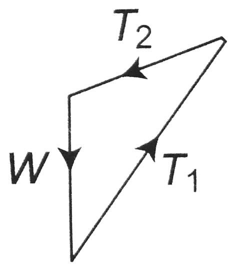


A. 

(b)

B. 

C. 

D. 

Answer: C

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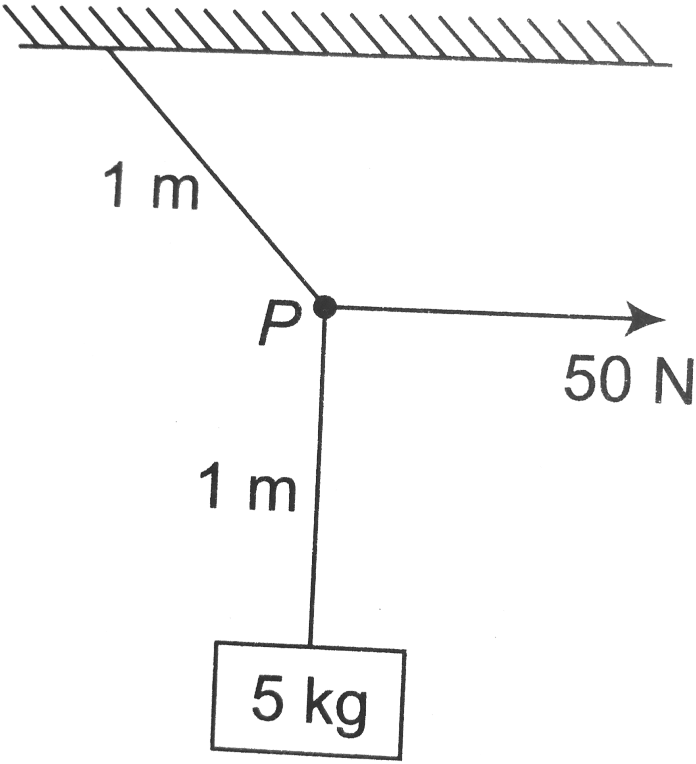
12. A block of mass 5kg is suspended by a massless rope of length 2 m from the ceiling. A force of 50 N is applied in the horizontal direction at the midpoint P of the rope, as shown in the figure. The angle made by the rope with the vertical in equilibrium is (Take

$g = 10ms^{-2}m$.



A. 30°

B. 40°

C. 60°

D. 45°

Answer: D

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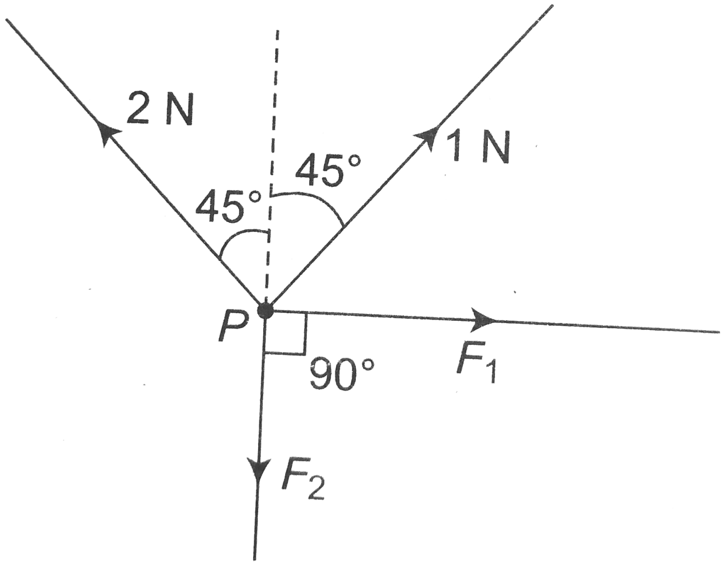
13. There are four force acting at a point p produced by strings as shown in figure, which is at rest. The force F_1 and F_2 are .



A. $\frac{1}{\sqrt{2}}N, \frac{3}{\sqrt{2}}N$

B. $\frac{3}{\sqrt{2}}N, \frac{1}{\sqrt{2}}N$

C. $\frac{1}{\sqrt{2}}N, \frac{1}{\sqrt{2}}N$

D. $\frac{3}{\sqrt{2}}N, \frac{3}{\sqrt{2}}N$

Answer: A

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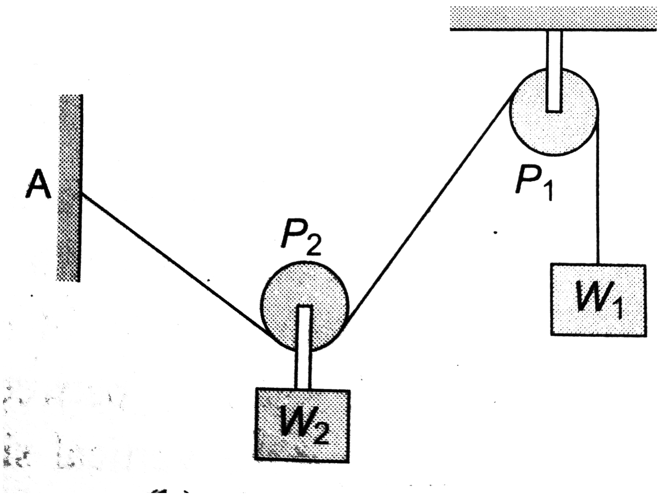
14. In the following figure the pulley P_1 is fixed and the pulley P_2 is movable. If $W_1 = W_2 = 100\ N$, what is the angle AP_2P_1

? The pulleys are frictionless.



A. 30°

B. 60°

C. 90°

D. 120°

Answer: D

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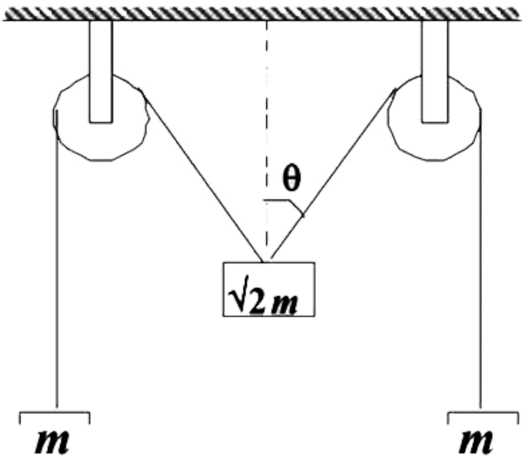
15. The pulleys and strings shown in the figure are smooth and of negligible mass. For the system to remain in equilibrium, the angle θ should be



A. 0°

B. 30°

C. 45°

D. 60°

Answer: C

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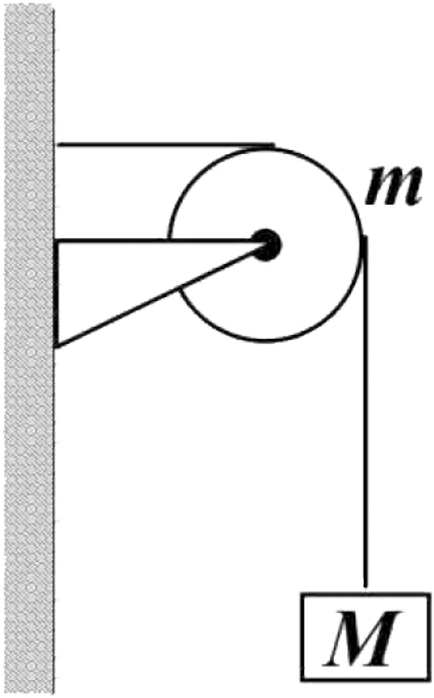
16. A string of negligible mass going over a clamped pulley of mass m supports a block of mass M as shown in the figure. The force on the pulley by the clamp is given by



A. $\sqrt{2}Mg$

B. $\sqrt{2}mg$

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

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

Answer: D

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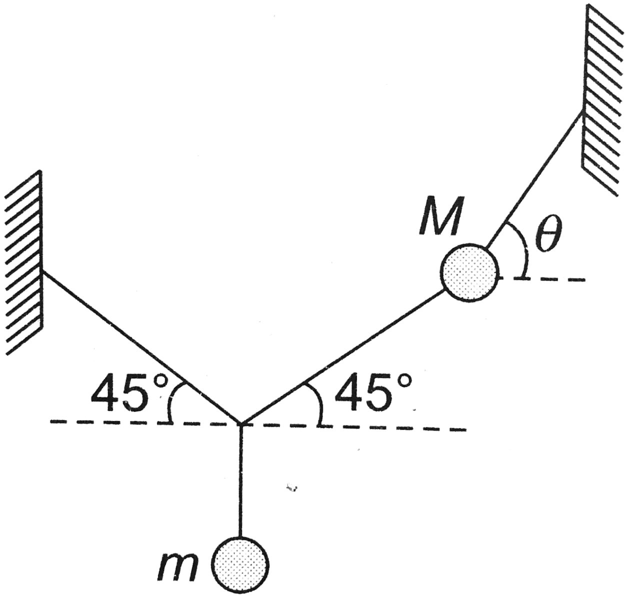
17. Two masses m and M are attached with strings as shown. For the system to be in equilibrium we have.



A. $\tan\theta = 1 + \frac{2M}{m}$

B. $\tan\theta = 1 + \frac{2m}{M}$

C. $\tan\theta = 1 + \frac{M}{2m}$

D. $\tan\theta = 1 + \frac{m}{2M}$

Answer: A

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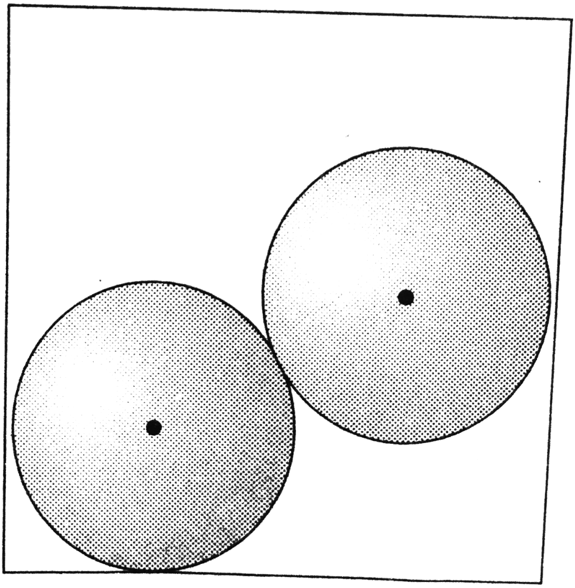
18. Two smooth sphere each of radius 5cm and weight W rest one on the other inside a fixed smooth cylinder of radius 8cm. The reaction between the sphere and the vertical side of the cylinder are:



A. $W/4$ and $3W/4$

B. $W/4$ and $W/4$

C. $3W/4$ and $3W/4$

D. W and W

Answer: C

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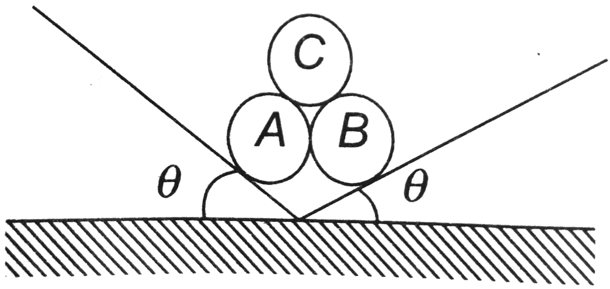
19. Three identical rigid circular cylinder A B and C are arranged on smooth inclined surfaces as shown in figure. The least value of theta that prevent the arrangement from collapse is.



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

B. $\tan^{-1}(1/2\sqrt{3})$

C. $\tan^{-1}(1/(3\sqrt{3})$

D. $\tan^{-1}(1/4\sqrt{3})$

Answer: C

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Applications Of Newton'S Laws Of Motion

1. Two persons are holding a rope of negligible weight tightly at its ends so that is horizontal. A 15kg weight is attached to the mid point which how no longer remains horizontal. The minimum tension required to completely straighten the rope is:

A. 15kg

B. $15 / 2kg$

C. 5kg

D. Infinitely large

Answer: D

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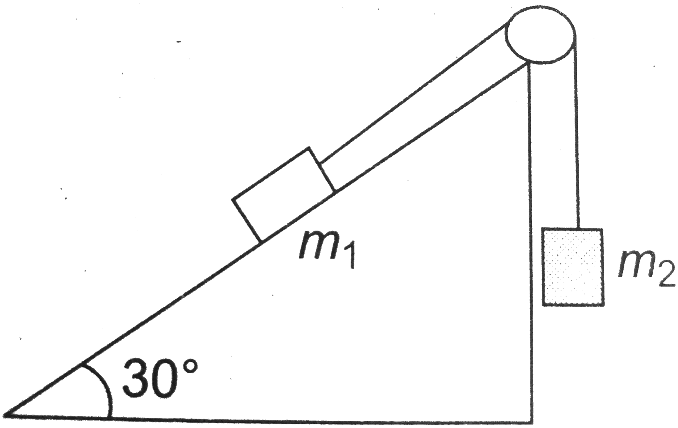
2. M is a fixed wedge. Masses m_1 and m_2 are connected by a light string. The wedge is smooth and the pulley is smooth and fixed $m_1 = 10kg$ and $m_1 = 7.5kg$. When m_2 is just released, the distance it will travel in 2 second is.



A. $2.8m$

B. $7.5m$

C. $4.0m$

D. $6.0m$

Answer: A

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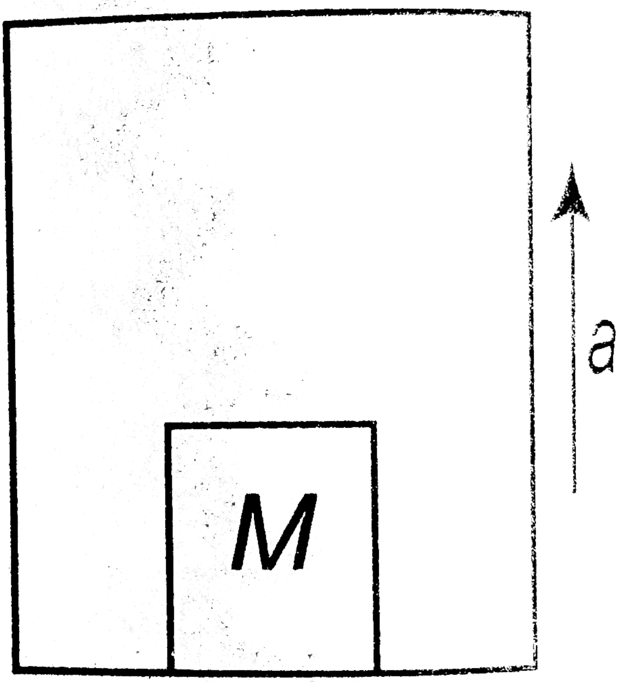
3. With what acceleration 'a' should the box of figure moving up so that the block of mass M

exerts a force $7Mg/4$ on the floor of the box?



A. $g/4$

B. $g/2$

C. $3g/4$

D. $4g$

Answer: C

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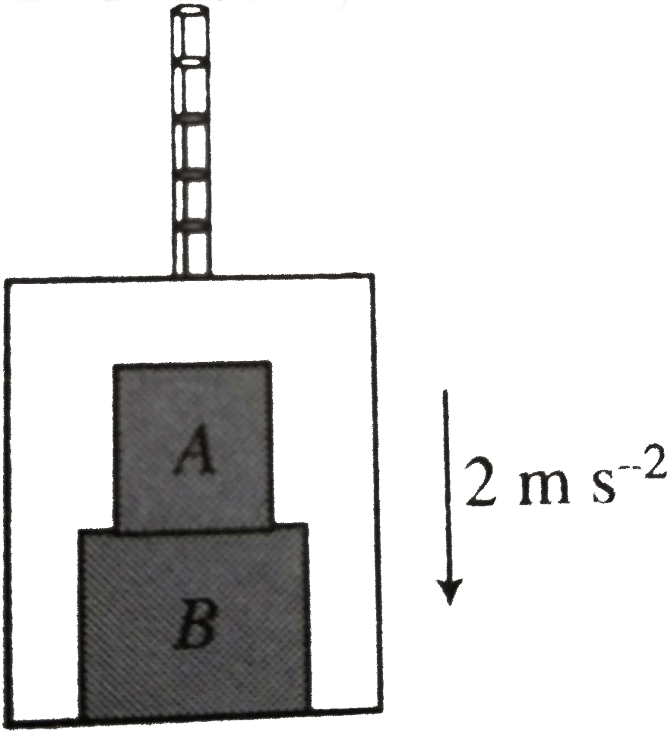
4. The elevator shown in fig. is descending with an acceleration of $2ms^{-2}$. The mass of the block $A = 0.5kg$. Find the force (in

Newton) exerted by block A on block B.



A. 2

B. 4

C. 6

D. 8

Answer: B

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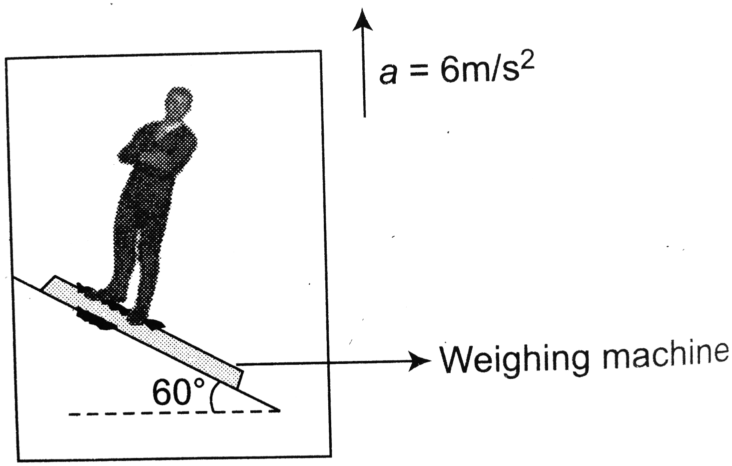
5. An elevator is accelerating upwards with an acceleration of $6m/s^2$. Inside it a person of mass 50kg is standing on a weighing machine which is kept on an inclined plane having angle of inclination 60° . The reading of the weighing machine is:



A. 40kg

B. 160kg

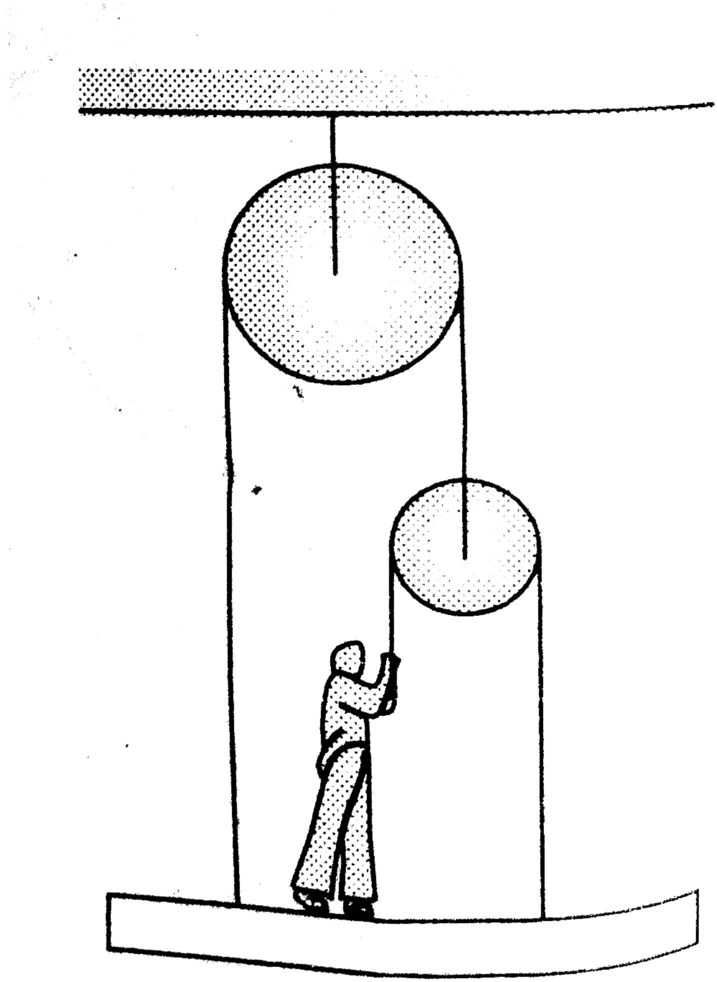
C. 80kg

D. 50kg

Answer: A

Watch Video Solution

6. In the given diagram, with what force must the man pull the rope to hold the plank in position? Mass of the man is 80kg. Neglect the weights of plank, rope and pulley. Take.



A. 200N

B. 300N

C. 600N

D. 150N

Answer: A

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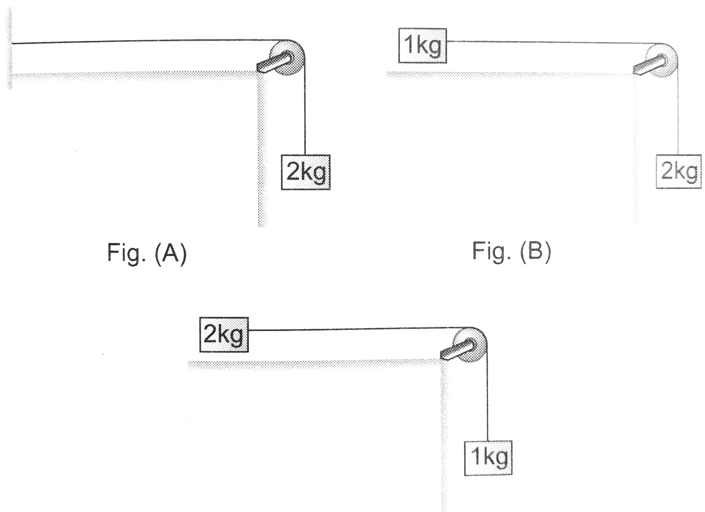
7. Consider the three cases given in figures shown. Assume the friction to be absent everywhere and the pulleys to be light, the string connecting the blocks to other block or fixed vertical wall to be light and inextensible.

Let T_A , T_B and T_C be the etnsion in the strings in figure A , figure B and figure C respectively. Then pick the correct comparison between the given tension (for the instant shown) from options below.



A. $T_A = T_B = T_C$

B. T_B=$T_C < T_A$

C. $T_A < T_B < T_c$

D. $T_B < T_C < T_A$

Answer: D

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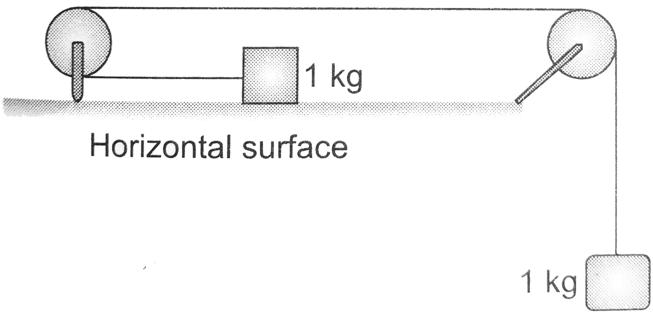
8. Consider the system as shown in the figure. The pulley and the string are light and all the surfaces are frictionless. The tension in the string is $\left(g = 10 m / s^{2}\right)$.



A. 0N

B. 1N

C. 2N

D. 5N

Answer: D

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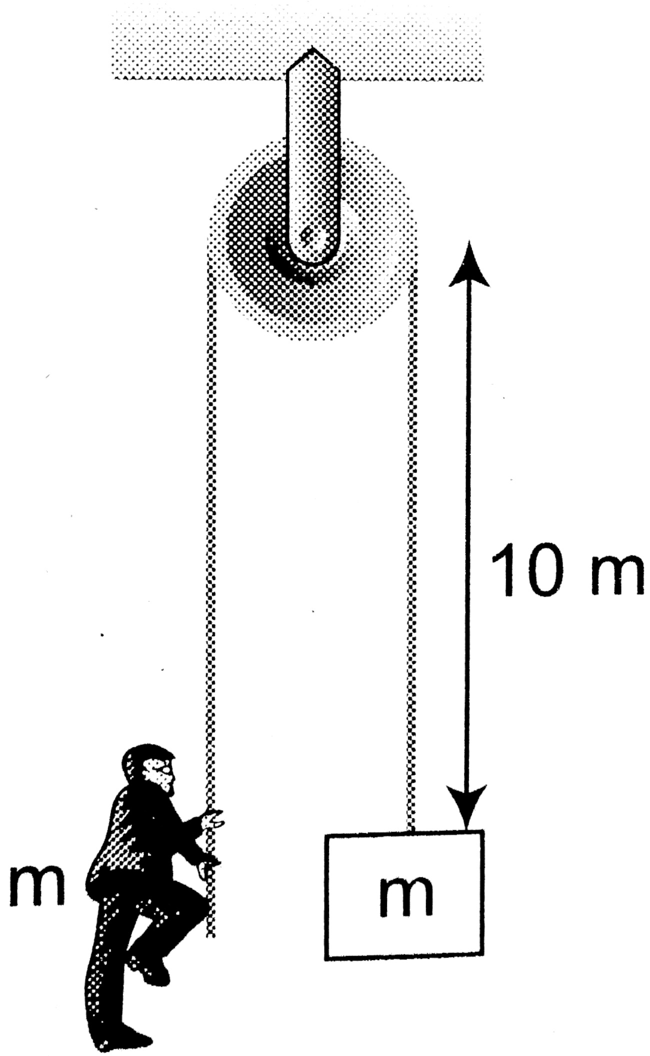
9. A boy and a block, both of same mass, are suspended at the same horizontal level, from each end of a light string that moves over a frictionless pulley as shown. The boy start moving upward with an acceleration $2.5m/s^2$ relative the rope. If the block is to travel a total distance 10m before reaching at the pulley, the time taken by the block in doing so is equal to:



A. $\sqrt{8}s$

B. 4s

C. $\frac{10}{\sqrt{8}}s$

D. 8s

Answer: B

Watch Video Solution

10. In order to raise a mass of 100kg a of mass 60kg fastens a rope to it and passes the rope over a smooth pulley. He climbs the rope with acceleration $5g/4$ relative to the rope. The tension in the rope is: Take $g = 10m/s^2$

A. 1432N

B. 928N

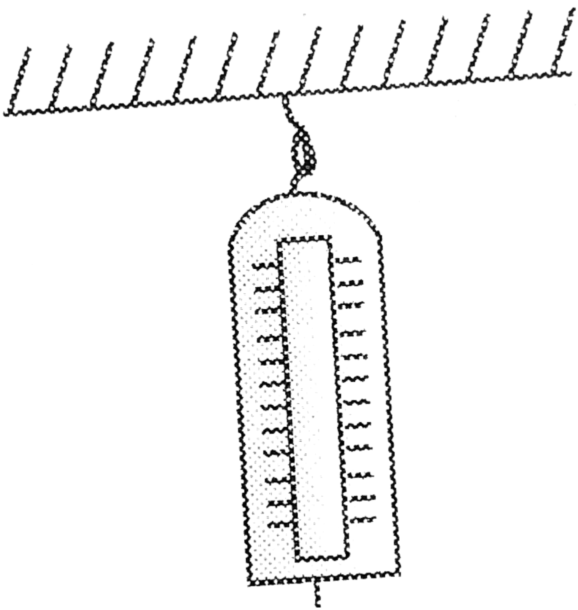
C. 1219N

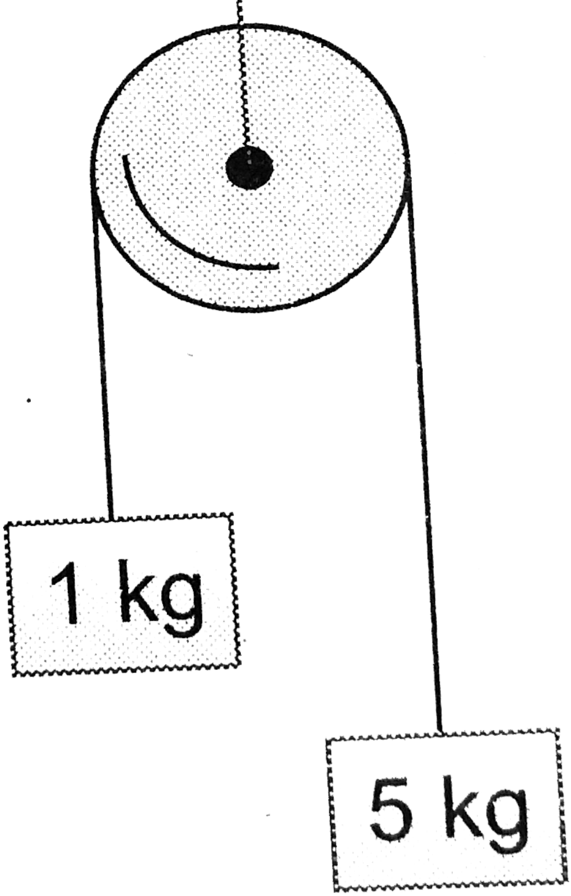
D. 642N

Answer: C

Watch Video Solution

11. Two masses of 1kg and 5kg are attached to the ends of a massless string passing over a pulley of negligible weight. The pulley itself is attached to a light spring balance as shown in figure. The masses start moving during this interval, the reading of spring balance will be:





A. more than 6kg

B. less than 6kg

C. equal 6kg

D. none of the above

Answer: B

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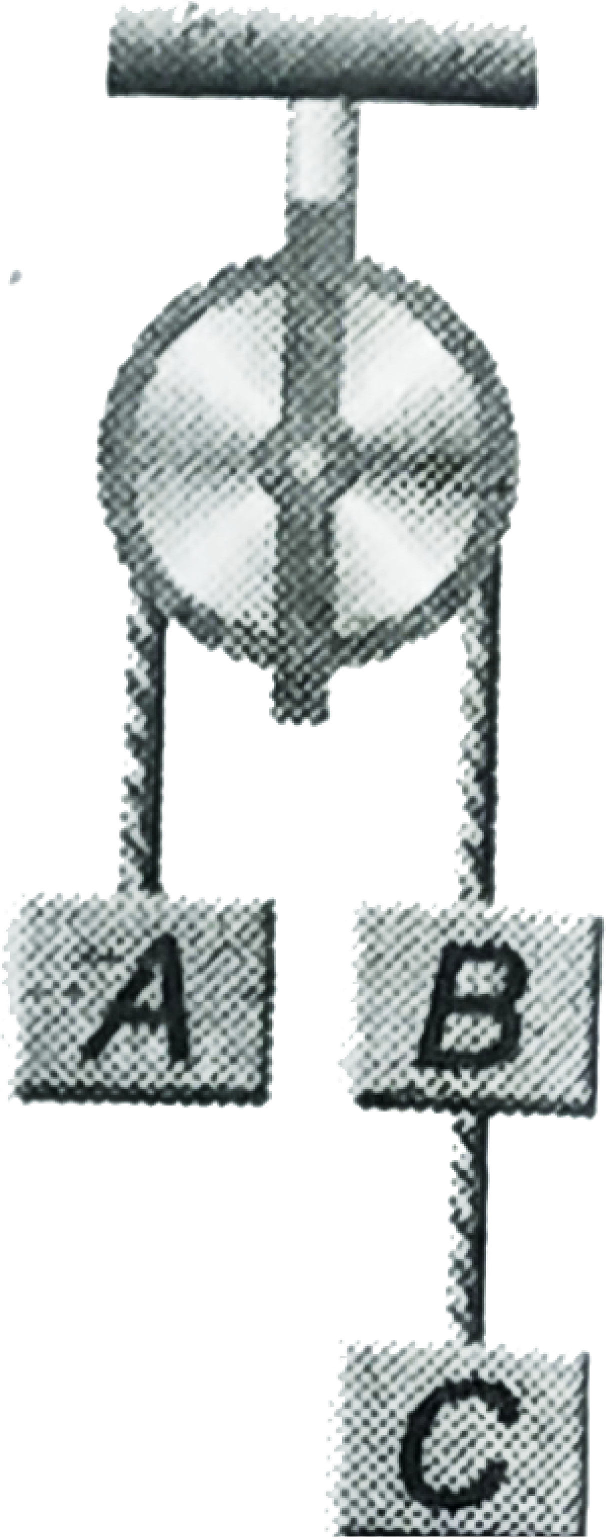
12. Three equal weight A, B and C of mass $2kg$ each are hanging on a string passing over a fixed frictionless pulley as shown in the figure. The tension in the string connecting weights B and C is approximately


A
B
C

A. zero

B. 13N

C. $3.3N$

D. $19.6N$

Answer: B

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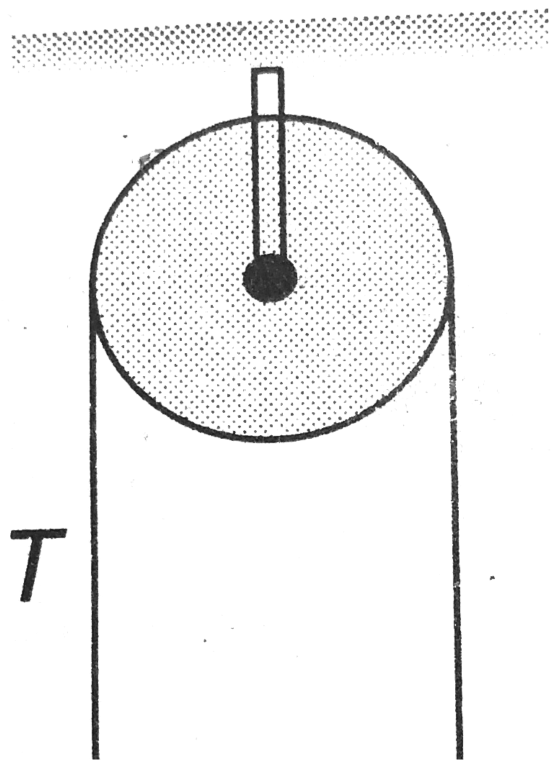
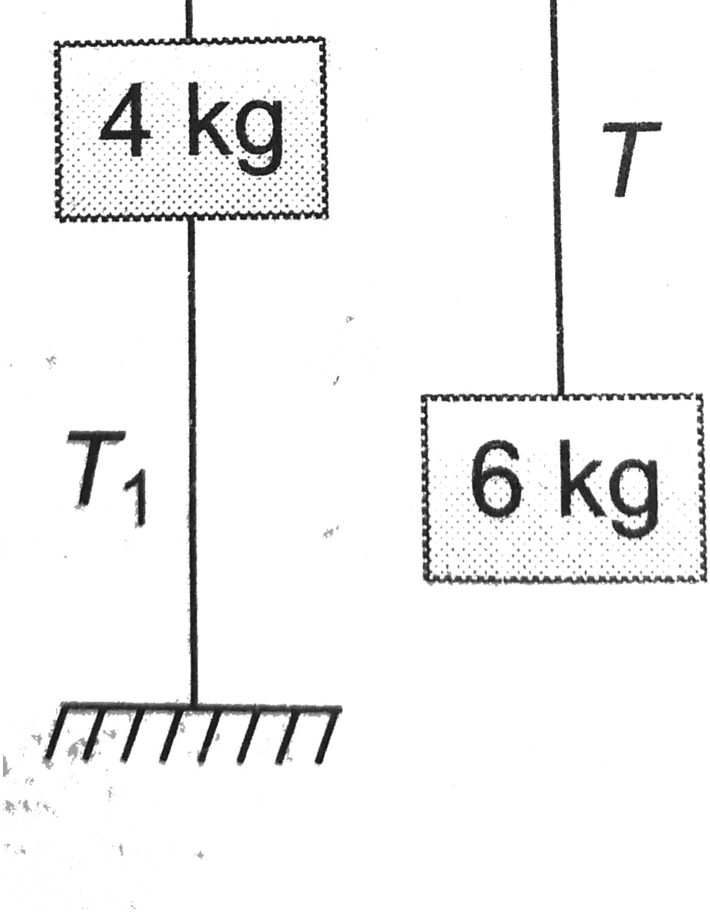
13. Two bodies of mass 4kg and 6kg are attached to the ends of a string passing over a pulley. The 4kg mass is attached to the table top by another string. The tension in this string T_1 is equal to: Take





A. 20N

B. 25N

C. $10.6N$

D. 10N

Answer: A

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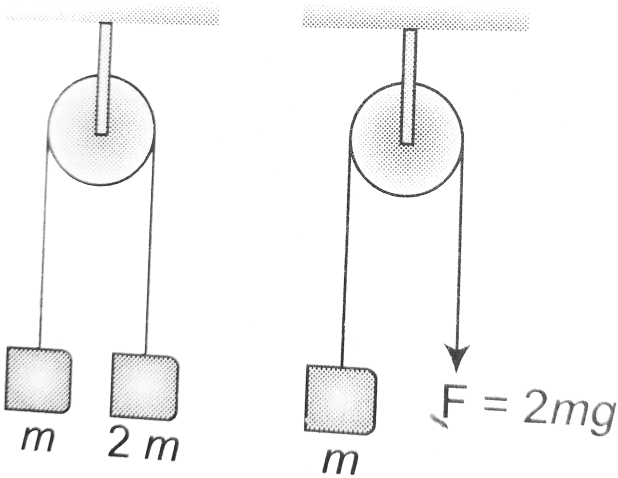
14. Figure shown two pulley arrangements for lifting a mass m . In case-1, the mass is lifting by attaching a mass 2m while in case-2 the mass is lifted by pulling the other end with a downward force $F = 2mg$. If a_a and a_b are the accelerations of the two masses then

(Assume string is massless and pulley is ideal).



A. $a_a = a_b$

B. $a_a = \frac{a_b}{2}$

C. $a_a = \frac{a_b}{3}$

D. $a_a = 2a_b$

Answer: C

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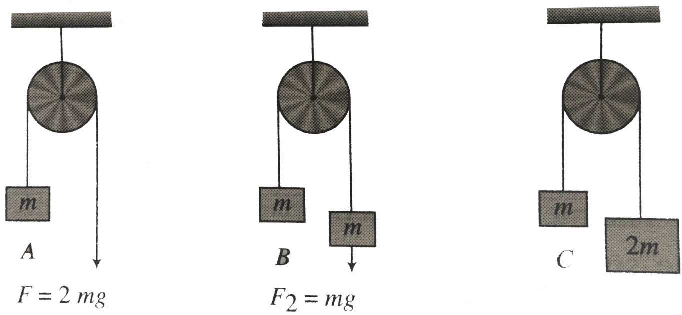
15. In fig the blocks A, B, and C of mass m each have acceleration $a_1, a_2,$ and a_3, respectively. F_1 and F_2 are external force of magnitude $2mg$ and mg, respectively. Then



A. $a_1 = a_2 = a_3$

B. $a_1 > a_2 > a_3$

C. $a_1 = a_2$, $a_2 > a_3$

D. $a_1 > a_2$, $a_2 = a_3$

Answer: B

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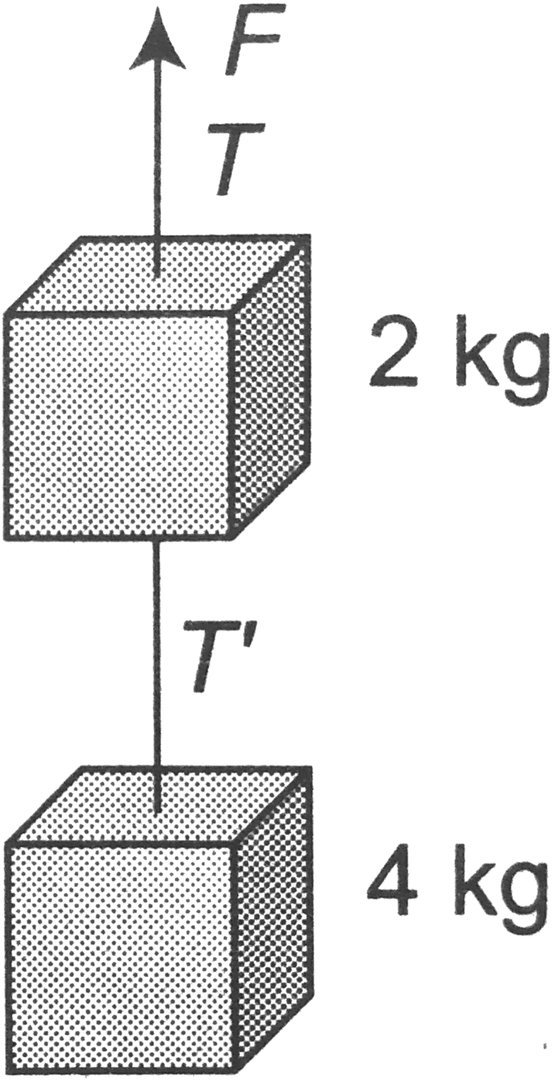
16. Two block are connected by a string as shown in the diagram. The upper block is hung by another string. A force F applied on the upper string produces an acceleration of $2m/s^2$ in the upward direction in both the blocks. If T and T^t be the tension in the two part of the string, then



A. $T = 70.8N$ and $T^t = 47.2N$

B. $T = 58.8N$ and $T^t = 47.2N$

C. $T = 70.8N$ and $T^t = 58.8N$

D. $T = 70.8N$ and `T^(t)=0

Answer: A

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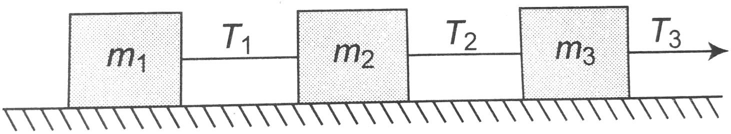
17. Three blocks are connected as shown in figure on a horizontal frictionless table. If $m_1 = 1kg$, $m_2 = 8kg$, $m_3 = 27kg$ and

$T_3 = 36N$, T_2 will be.



A. 18N

B. 9N

C. $3.375N$

D. $1.75N$

Answer: B

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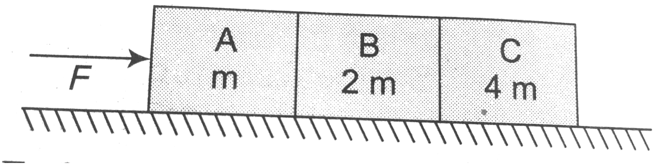
18. A force F is applied on block A as shown in the figure. The contact force between A and B and between the blocks B and C respectively are (Assume frictionless surface)



A. $\frac{F}{7}, \frac{2F}{7}$

B. $\frac{6F}{7}, \frac{4F}{7}$

C. $F, \frac{F}{7}$

D. $\frac{4F}{7}, \frac{6F}{7}$

Answer: B

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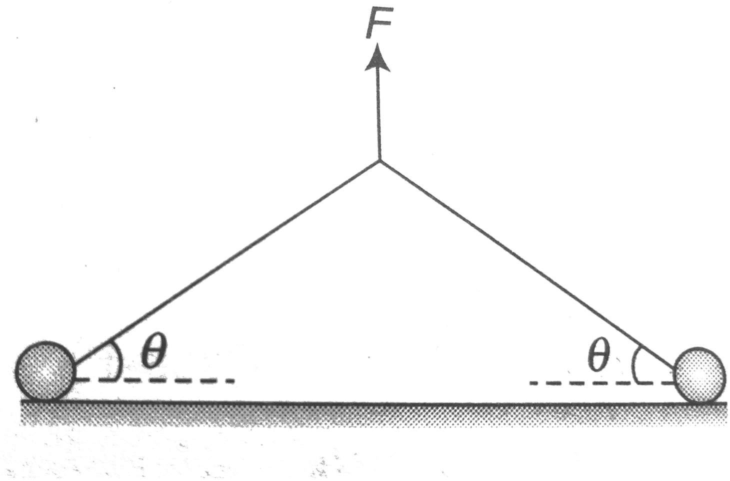
19. Two small sphere each of mass m connected by a string of length 2l are kept on a smooth horizontal surface. A vertical force F is applied at the middle of the string. What is maximum value of F for which the sphere do not lose contact with the surface?



A. 2mg

B. mg

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

D. 4mg

Answer: A

Watch Video Solution

20. A perfectly straight portion of a uniform rope has mass M and length L . At end A of the segment, the tension in the rope is T_A and at end B it is $T_B(T_B > T_A$. Neglect effect of gravity and no contact force acts on the rope in between points A and B . The tension in the rope at a distance $L/5$ from end A is.

A. $T_B - T_A$

B. $(T_A + T_B)/5$

C. $(4T_A + T_B)/5$

D. $(T_A - T_B)/5$

Answer: C

Watch Video Solution

21. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m . Force P is applied at one end of rope. The force which the rope exerts on the block is:

A. $\dfrac{P}{(M-m)}$

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

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

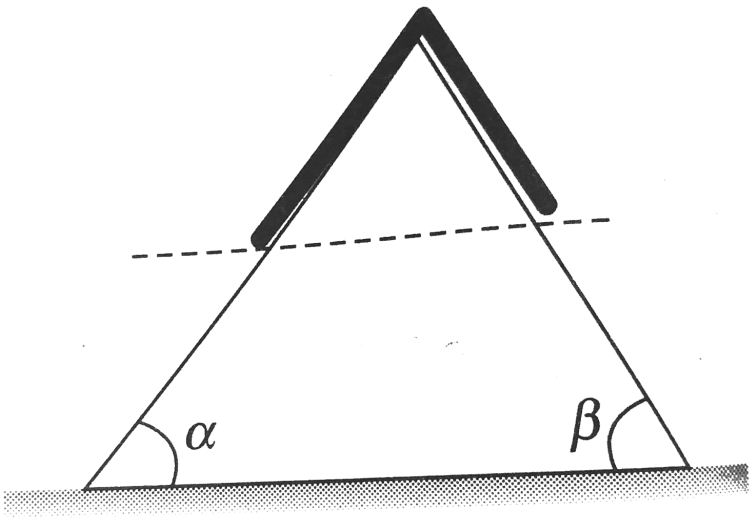
D. $\dfrac{PM}{(M-m)}$

Answer: C

Watch Video Solution

22. A uniform of rope length L and mass M is placed on a smooth fixed wedge as shown. Both ends of rope are at same horizontal level.

The rope is initially released from rest, then the magnitude of initial acceleration of rope is.



A. zero

B. $m(\cos\alpha - \cos\beta)g$

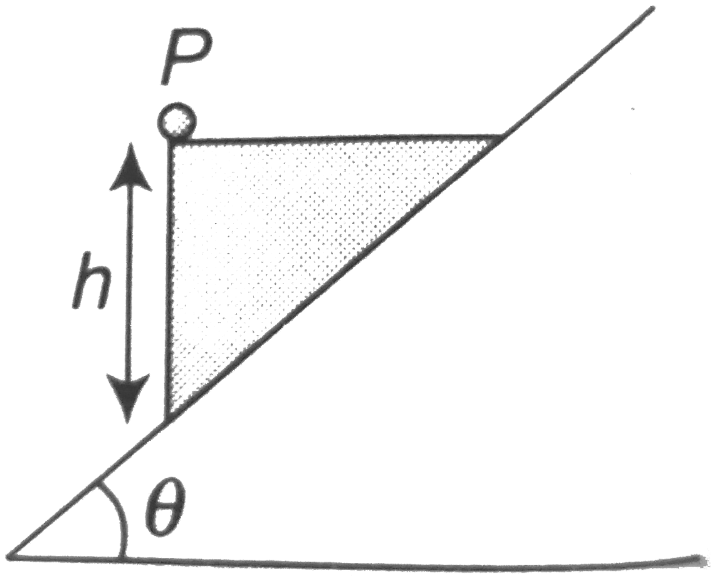
C. $m(\tan\alpha - \tan\beta)g$

D. none of these

Answer: A

Watch Video Solution

23. A wedge of height 'h' is released from rest with a light particle P placed on it as shown. The wedge slides down an incline which makes an angle theta with the horizontal. All the surface are smooth, P will reach the surface of the incline in time:



A. $\sqrt{\dfrac{2h}{g\sin^2\theta}}$

B. $\sqrt{\dfrac{2h}{g\sin\theta\cos\theta}}$

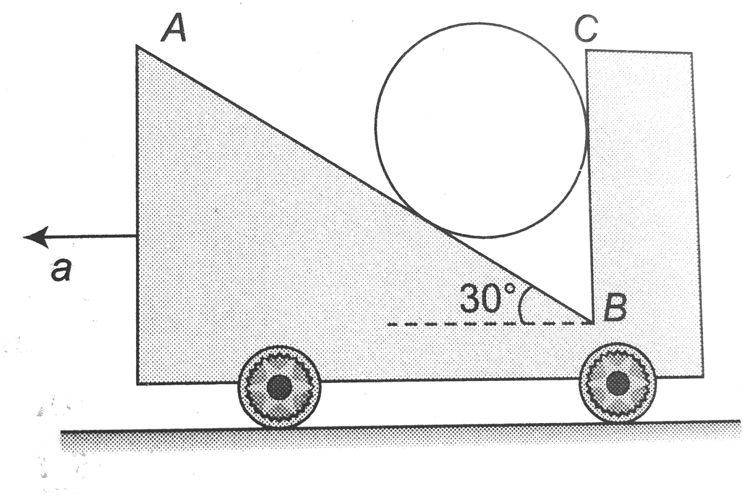
C. $\sqrt{\dfrac{2h}{g\tan\theta}}$

D. $\sqrt{\frac{2h}{g\cos^2\theta}}$

Answer: A

Watch Video Solution

24. A cylinder rests in a supporting carriage as shown. The side AB of carriage makes an angle 30° with the horizontal and side BC is vertical. The carriage lies on a fixed horizontal surface and is being puplled towards left with an horizontal acceleration a . The magnitude of normal reactions exerted by side AB and BC of carriage on the cylinder be N_{AB} and N_{BC} resectively. Neglect friction everywhere. Then as the madnnitude of acceleration a of the carriage is increased, pick up the correct statement:



A. N_{AB} increases and N_{BC} decreases.

B. Both N_{AB} and N_{BC} increases..

C. N_{AB} remains constant and N_{BC} increases.

D. N_{AB} increases and N_{BC} remains contant.

Answer: C

Watch Video Solution

25. A ball is suspended on a thread from the ceiling of a car. The brakes are applied and the speed of car changes from 5 m/sec to $5/3$ m/sec during the time interval of 3 seconds. Find the angle that the thread with the ball will deviate from vertical.

A. $\theta = \tan^{-1}\left(\frac{1}{9}\right)$

B. $\theta = \tan^{-1}\left(\frac{8}{9}\right)$

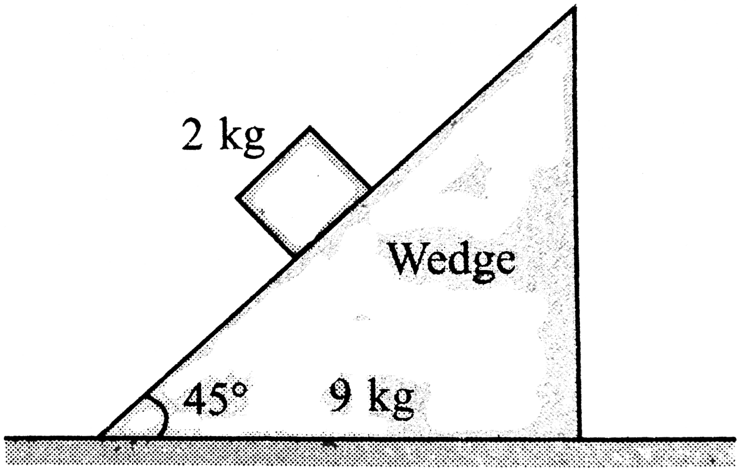
C. $\theta = \sin^{-1}\left(\frac{1}{9}\right)$

D. $\theta = \cos^{-1}\left(\frac{1}{9}\right)$

Answer: A

Watch Video Solution

26. A block of mass $2kg$ slides down the face of a smooth 45° wedge of mass $9kg$ as shown in the figure. The wedge is placed on a frictionless horizontal surface. Determine the acceleration of the wedge.



A. $2m/s^2$

B. $\frac{11}{\sqrt{2}}m/s^2$

C. $1m/s^2$

D. none of these

Answer: C

Watch Video Solution

27. A body of mass m is placed over a smooth inclined plane of inclination theta. Which iis placed over a lift which is moving up with an acceleration a_0 . Base length o f the inclined plane is L . Calculate the velocity of the block with respect to lift at the bottom, if it is allowed to slide down from the top o fthe plane from rest.

A. $\sqrt{2(a_0 + g)L \sin \theta}$

B. $\sqrt{2(a_0 + g)L\cos\theta}$

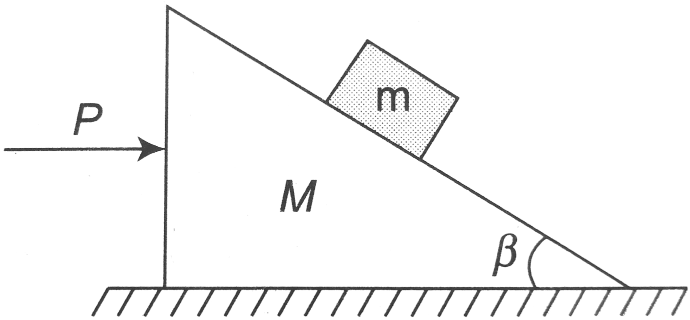
C. $\sqrt{2(a_0 + g)L\tan\theta}$

D. $\sqrt{2(a_0 + g)L\cot\theta}$

Answer: C

Watch Video Solution

28. Two wooden blocks are moving on a smooth horizontal surface such that the mass m remains stationary with respect too block of mass M as shown in the figure. The magnitude of force P is:



A. $(M+m)g\tan\beta$

B. $g\tan\beta$

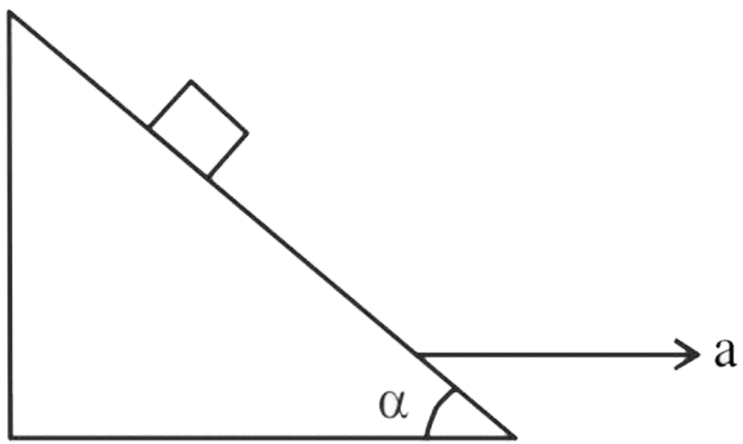
C. $mg\cos\beta$

D. $(M+m)g\cos es\beta$

Answer: A

Watch Video Solution

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



A. g

B. $g \tan \alpha$

C. $g / \tan \alpha$

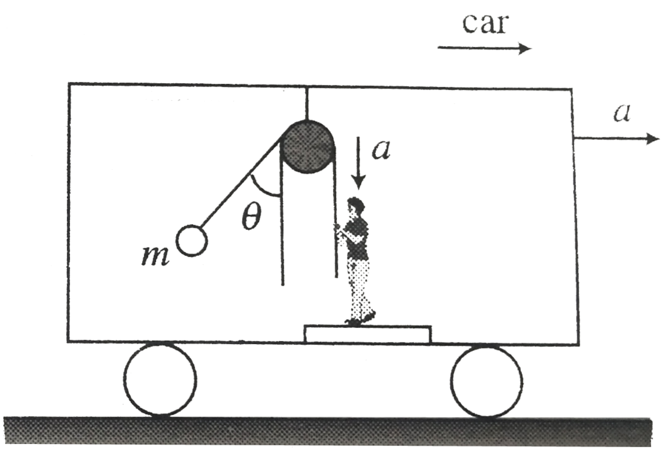
D. $\mathrm{g} \cos e c \alpha$

Answer: B

Watch Video Solution

30. A bob is hanging over a pulley inside a car through a string. The second end of the string is in the hands of a person standing in the car.

The car is moving with constant acceleration a directed horizontally as shown in fig. The other end of the string is pulled with constant acceleration a vertically. The tension in the string is equal to



A. $m\sqrt{g^2 + a^2}$

B. $m\sqrt{g^2 + a^2} - ma$

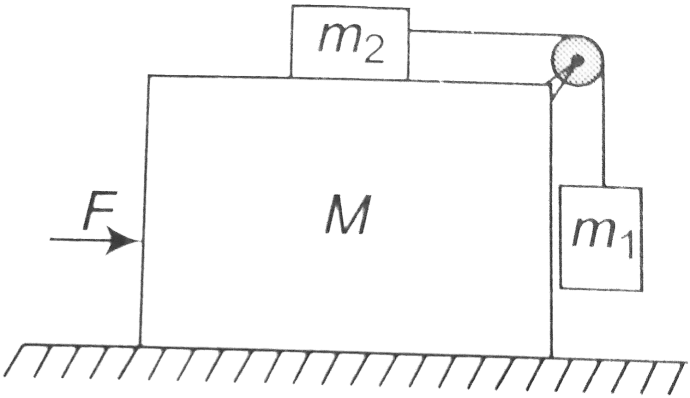
C. $m\sqrt{g^2 + a^2} + ma$

D. $m(g + a)$

Answer: C

Watch Video Solution

31. A large cubical shaped block of mass M rests on a fixed horizontal surface. Two blocks of mass m_1 and m_2 are connected by a light inextensible string passing over a light pulley as shown. Neglect friction everywhere. Then the constant horizontal force of magnitude F that should be applied to M so that m_1 and m_2 do not mov relative to$M$ is:



A. $F = \frac{m_2}{m_1}(m_1 + m_2 + M)g$

B. $F = \frac{m_1}{m_2}(m_1 + m_2 + M)g$

C. $F = \frac{m_1}{m_2}(m_1 + M)g$

D. $F = \frac{m_2}{m_1}(m_1 + M)g$

Answer: B

Watch Video Solution

32. A block of mass m is kept on a wedge of mass M . Initially the system is held. At certain time the system is released and the wedge is observed to move with acceleration A on inclined surface as shown. There is no friction anywhere. The acceleration of block (m) with respect to wedge (M) will be.

.

A. A rightward

B. $A \cos \theta$ rightward

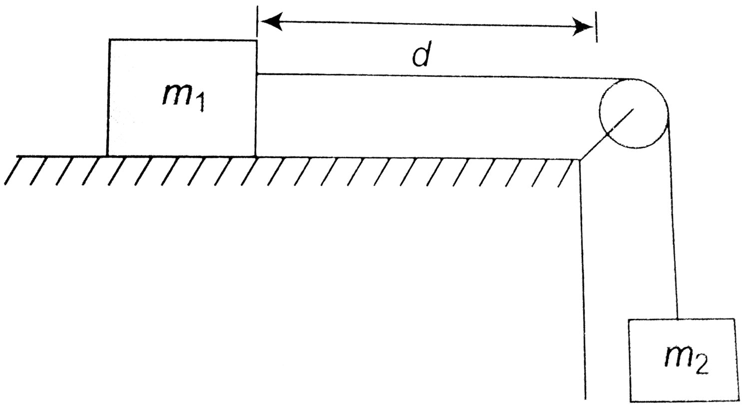
C. $A \cos \theta$ leftward

D. none of these

Answer: B

Watch Video Solution

33. A block of mass m_1 lies on a smooth horizontal table and is connected to another freely hanging block of mass m_2 by a light inextensible string passing over a smooth fixed pulley situated at the edge of the table. Initially the system is at rest with m_1 a distance d from the pulley. Then the time taken for m_1 to reach the pulley is.



A. $\dfrac{m_2 g}{m_1 + m_2}$

B. $\sqrt{\dfrac{2d(m_1 + m_2)}{m_2 g}}$

C. $\sqrt{\dfrac{2m_2d}{(m_1+m_2)g}}$

D. None of thess

Answer: B

Watch Video Solution

Basic Concept Of Static And Kinetic Frictions

1. A rectangular wooden block $5 \times cm10cm \times 10cm$ in size is kept on a horizontal surface with its face of largeest area on the surface. A minimum force of $1.5N$ applied parallel to the surface. Sets the block in sliding motion along the surface. If the block is now kept with its face of smaller area in contant with the surface, the minimum force applied parallel to the surface, to set the block in motion, is.

A. greater than $1.5N$

B. less than $1.5N$

C. equal $1.5N$

D. may be greater of less than $1.5N$

Answer: C

Watch Video Solution

2. A body of mass 2kg is at rest on a horizontal table. The coefficient of friction between the body and the table is 0.3 . A force of 5N is applied on the body. The acceleration of the body is.

A. $0ms^{-2}$

B. $2.5ms^{-2}$

C. $5ms^{-2}$

D. $7.5ms^{-2}$

Answer: A

Watch Video Solution

3. A body of mass 2 kg at rest on a horizontal table. The coefficient of friction between the body and the table is 0.3 . A force of 5N is applied on the body. The force of friction is

A. 5N

B. $5.88N$

C. 6N

D. 20N

Answer: A

Watch Video Solution

4. A block of mass 3kg is placed on a rough horizontal surface $(\mu_s = 0.4)$. A force of $8.7N$

is applied on the block. The force of friction between the block and floor is .

A. $8.7N$

B. 12N

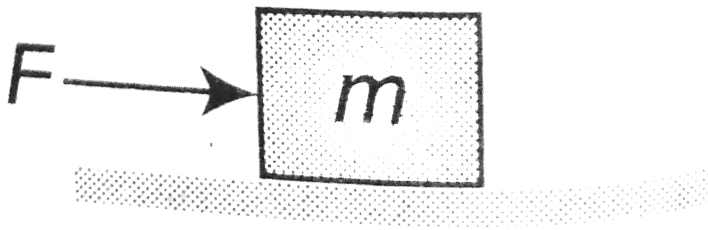
C. 10N

D. zero

Answer: A

Watch Video Solution

5. A horizontal force F acts on the block of mass m and the block remains stationary, thr value of friction force is.



A. μmg

B. $\mu mg - F$

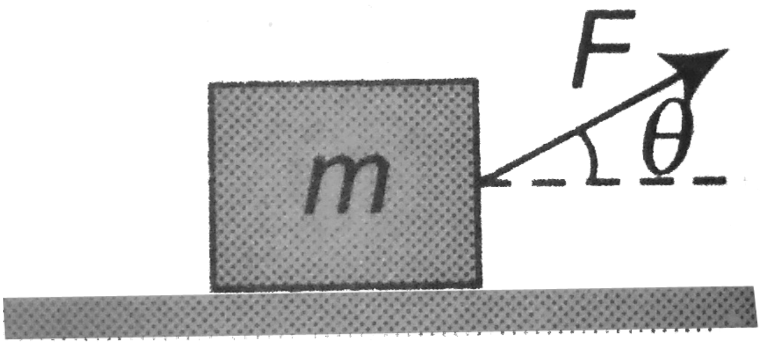
C. F

D. zero

Answer: C

Watch Video Solution

6. In previous question, if we pull the block by the force F making an angle theta and the block remains stationary, the value of friction force is.



A. μmg

B. $F\cos\theta$

C. $\dfrac{\mu mg}{\sin\theta+\mu\cos\theta}$

D. $\dfrac{\mu mg}{\sqrt{1+\mu^2}}$

Answer: B

Watch Video Solution

7. In Q . 120, the minimum force F required to pull it. $\left(\mu=\dfrac{1}{2}\right)$ is:

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

B. $\frac{mg}{2}\cos\theta$

C. $\frac{mg}{\sqrt{5}}$

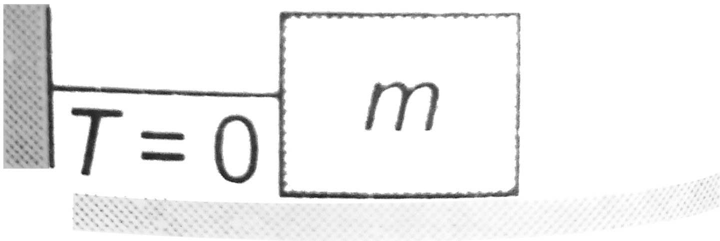
D. None of these

Answer: C

Watch Video Solution

8. A block of mass m is stationary on a horizontal surface. It is connected with a string which has no tension. The coefficient of friction between the block and surface is m .

Then , the frictional force between the block and surface is:



A. zero

B. $\mu m g$

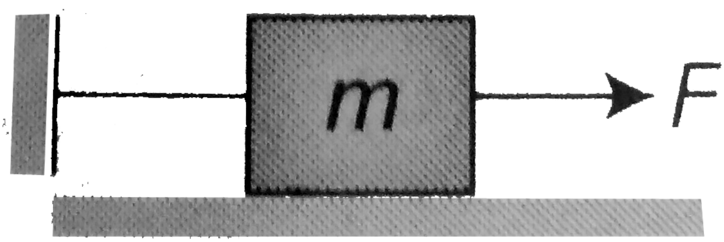
C. $\frac{\mu m g}{\mu}$

D. None of these

Answer: A

Watch Video Solution

9. In previous question, if a horizontal force $F = \mu mg/2$ act on the block and the block remains stationary, then tension in string is.



A. zero

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

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

D. none of thses

Answer: A

Watch Video Solution

10. A body of mass 2kg is placed on a horizontal surface having kinetic friction 0.4 and static friction 0.5 . If the force applied on the body is $2.5N$, then the frictional force acting on the body will be

A. 8N

B. 10N

C. 20N

D. $2.5N$

Answer: D

Watch Video Solution

11. In previous question, if the force applied on the body is $20N$, the acceleration of the body will be.

A. $10ms^{-2}$

B. $6ms^{-2}$

C. $5ms^{-2}$

D. $8.75ms^{-2}$

Answer: B

Watch Video Solution

12. A rectanglar body is held at rest by pressing it againts a vertical wall for which

$\mu < 1$. Which of the following is generally ture?

A. It will be easier to hold the body If the surface in contant are smooth.

B. Pressing force reuired is smaller than weight mg of the body

C. Pressing force reuired is geater than weight mg of the body

D. The required pressing force is independent of coefficienet of friction between surface in contact.

Answer: C

Watch Video Solution

13. A block of weight W is held against a vertical wall by applying a horizontal force of $75N$. The surface3 of the wall is rough. Now (conside $\mu < 1$)

A. $W < 75N$

B. $W = 75N$

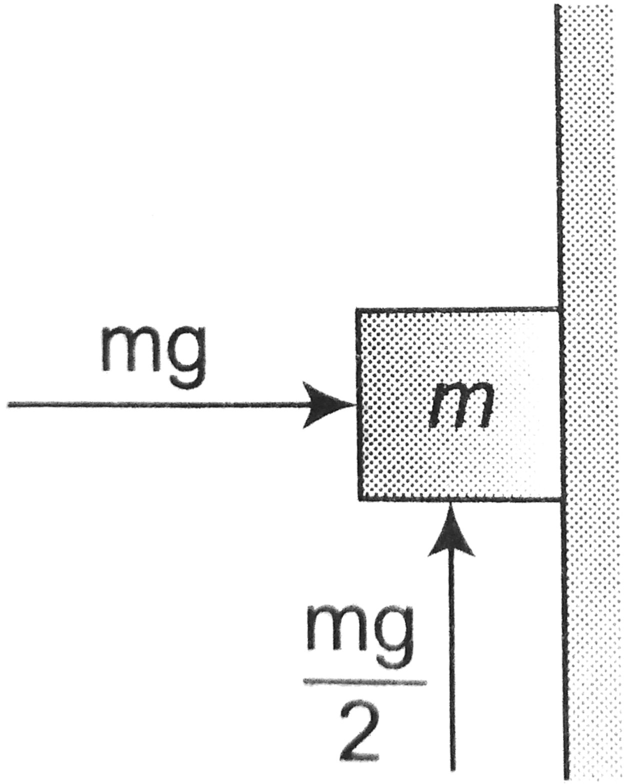
C. $W > 75N$

D. None of these

Answer: A

Watch Video Solution

14. A block pressed against the vertical wall is in equilibrium. The minimum coefficient of friction is:



A. 0.4

B. 0.2

C. 0.5

D. none of these

Answer: C

Watch Video Solution

15. In previous question, if $\mu = 0.3$ the acceleration of the block will be:

A. zero

B. $\frac{g}{10} \uparrow$

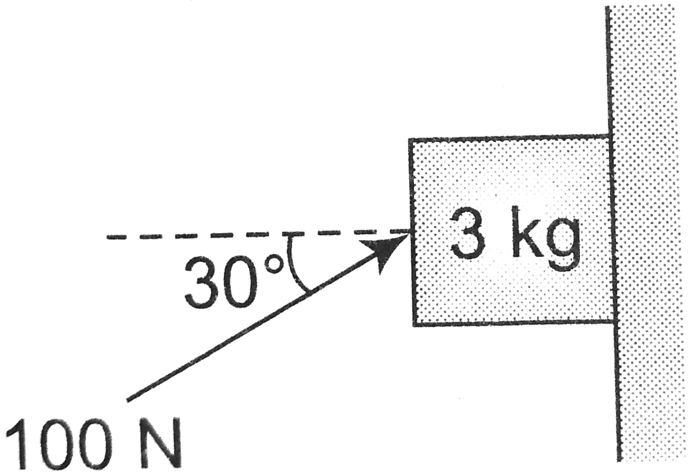
C. $\frac{g}{4} \downarrow$

D. $\frac{g}{5} \downarrow$

Answer: D

Watch Video Solution

16. A force of 100N is applied on a block of mass 3kg as shown in the figure. The coefficient of friction between the surface and the block is $\mu = \frac{1}{\sqrt{3}}$. The friction force acting on the bock is.



A. 15N downward

B. 25N upward

C. 20N downword

D. 30N upward

Answer: C

Watch Video Solution

17. In previous problem the acceleration o fbolck is.

A. zero

B. $10m/s^2$ upward

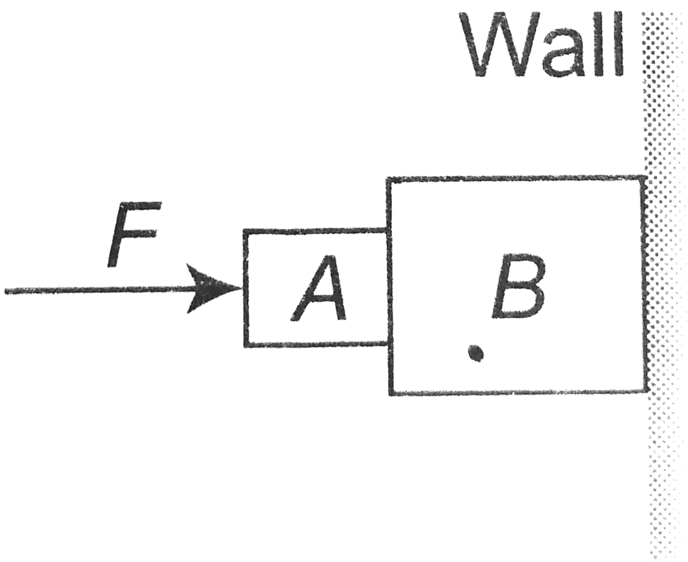
C. $10m/s^2$ downward

D. none of these

Answer: A

Watch Video Solution

18. Figure shows two block A and B pushed against the wall with the force F. The wall is smooth but the surfaces in contact of A and B are rough. Which of the following is true for the system of blocks to be at rest againts wall?



A. F should be equal to weight of A and B

B. F should be less than weight of A and B

C. F should be more than weight of A and B

D. System connot be in rquilibrium (at rest).

Answer: D

Watch Video Solution

19. A block of mass 1kg is at rest on a horizontal table. The coefficient of static friction between the block and the table is 0.5. The magnitude of the force acting upward at an angle of 60° from the horizontal that will just start the block moving is.

A. 5N

B. $\dfrac{20}{2+\sqrt{3}}N$

C. $\dfrac{20}{2-\sqrt{3}}N$

D. 10N

Answer: B

Watch Video Solution

20. A box mass m kg is placed on the rear side of an open truck acceleration at $4ms^{-2}$. The coefficient of friction between the box ant the surface below it is 0.4 . The net acceleration of the box with respect to the truck is zero. The value of m is.

A. 4kg

B. 8kg

C. $9.78kg$

D. It could be any value

Answer: D

Watch Video Solution

21. A body of mass 8kg lies on a rough horizontal table. It is observed that a certain horizontal force gives the body an acceleration of the body is $16ms^{-2}$. The coefficient of friction is.

A. 0.2

B. 0.3

C. 0.4

D. 0.8

Answer: D

Watch Video Solution

22. A body of mass 40kg resting on a rough horizontal surface is subjected to a force P which is just enough to start the motion of the body. If $\mu_s = 0.5\mu_k = 0.4, g = 10ms^{-2}$ an dthe force P is continuously applied on the body, then the accceleration of the body is.

A. zero

B. $1ms^{-2}$

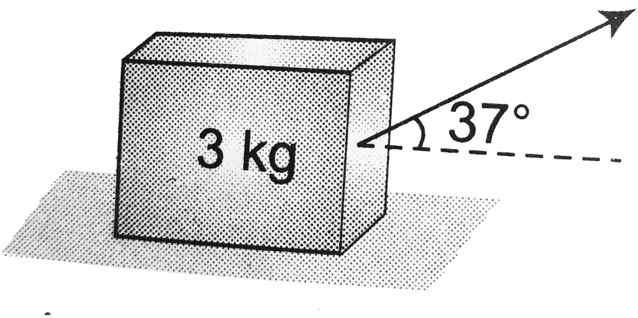
C. $2ms^{-2}$

D. $2.4ms^{-2}$

Answer: B

Watch Video Solution

23. A 3kg block is pulled by a force which is inclined at 37° to the horizontal table. The friction coefficient between the table and block is $1/3$. For what minimum value of this force, will the block start sliding?



A. 5N

B. 10N

C. 20N

D. 25N

Answer: B

Watch Video Solution

24. A block of mass m is placed in equilibrium on a moving plank. The maximum horizontal acceleration of the plank for $\mu = 0.2$ is:

A. $2m/s^2$

B. $3m/s^2$

C. dependent on the mass m

D. none of these

Answer: A

Watch Video Solution

25. A block of mass $m = 2kg$ is placed in equilibrium on a moving plank accelerating with $a = 4m/s^2$. If coefficient of friction between plank and block $\mu = 0.2$. The friction force acting on the block is:

A. 8N

B. 6N

C. zero

D. 4N

Answer: D

Watch Video Solution

26. A block of mass $m = 2kg$ is placed in equilibrium on a moving plank accelerating with $a = 1m/s^2$. If coefficient of friction between plank and block $\mu = 0.2$. The friction force acting on theblock is:

A. 2N

B. 4N

C. 3N

D. None of these

Answer: A

Watch Video Solution

27. A block of mass 70kg is kept on a rough horizontal surface $(\mu = 0.4)$. A person is trying to pull the block by applying a horizontal force, but the block is not moving. The net contact force exerted by the surface on the block is F , then:

A. $F = 700N$

B. $F = 280N$

C. $700N \leq F \leq 750N$

D. $F = 754N$

Answer: C

Watch Video Solution

28. 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. 10N

B. $7\sqrt{3}N$

C. $10 \times \sqrt{3}N$

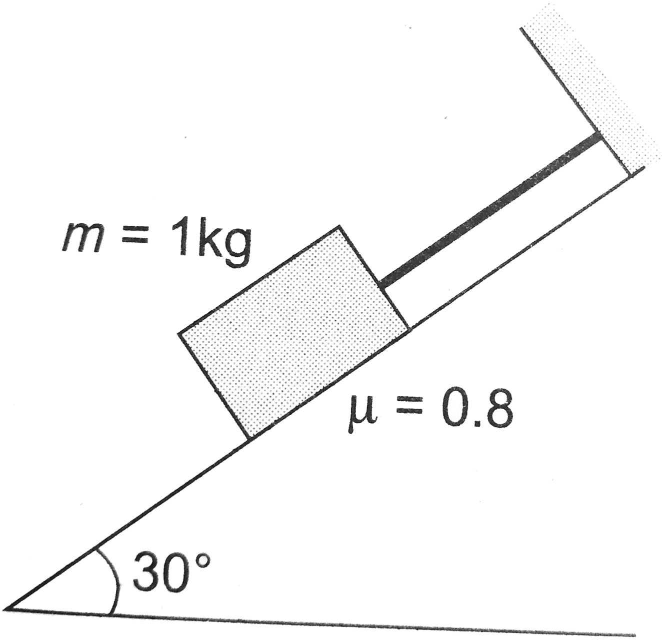
D. 7N

Answer: A

Watch Video Solution

29. For the arrangment shown in the fig. the tension in the string is [Given:

$\tan^{-1}(0.8) = 39°$].



A. 6N

B. $6.4N$

C. $0.4N$

D. zero

Answer: D

Watch Video Solution

30. A block of mass 4kg rests on an an inclined plane. The inclination of the plane is gradually increased. It is found that when the inclination is 3 in 5 $\left(\sin\theta = \frac{3}{5}\right)$ the block just begins to slide down the plane. The coefficient of friction between the block and the plane is.

A. 0.4

B. 0.6

C. 0.8

D. 0.75

Answer: D

Watch Video Solution

31. A block of mass m is placed on a rough inclined plane. When the inclination of the plane is θ , the block just beging to slide down the plane under its own weight. The minimum force applied parallel to the plane, to move the block up the plane, is.

A. $mg\sin\theta$

B. $2mg\sin\theta$

C. $mg\cos\theta$

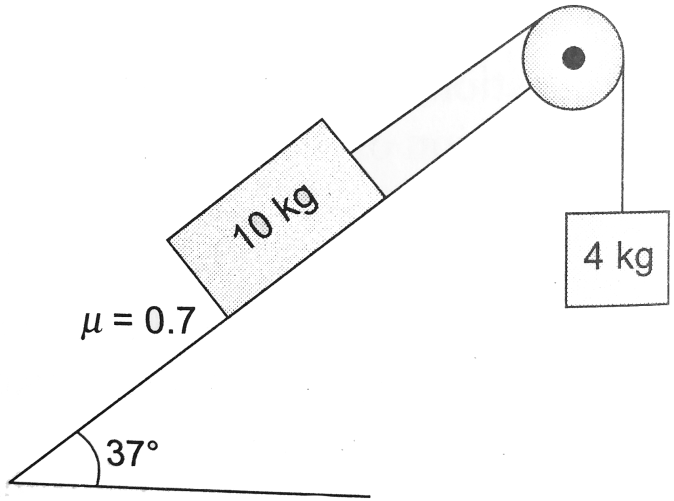
D. $mg\tan\theta$

Answer: B

Watch Video Solution

32. In the arrangement shown in the figure

$[\sin 37^\circ = 3/5]$.



A. direction of force of friction is up the

plane

B. the mangnitude of force of friction is zero

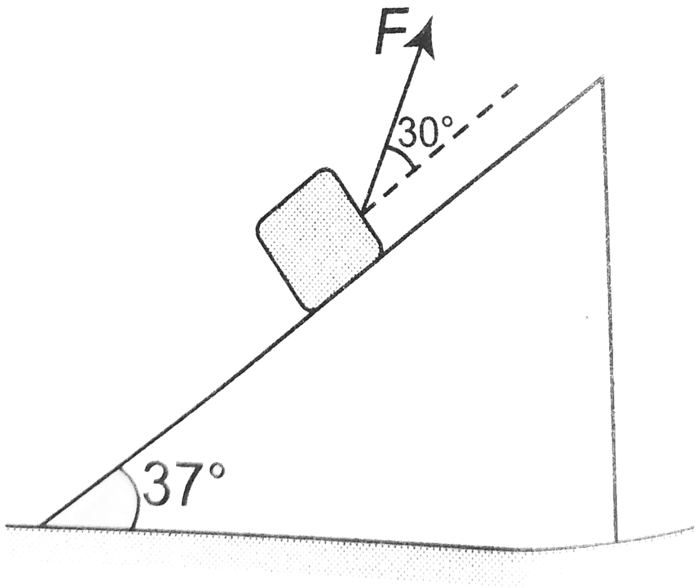
C. the tension in the string is $20N$

D. magnitude of force of friction is $56N$

Answer: A

Watch Video Solution

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



A. static in nature in the direction up the plane and have the value $30.2N$

B. static in nature in the direction down the plane and have the value $30.2N$

C. kinetic in nature in the direction up the plane and have the value $30.2N$

D. None of these

Answer: C

Watch Video Solution

34. A block of mass mm remains stationary on a fixed inclined plane of inclination θ . If μ= coefficient of static friction the reaction of ground on the block is:

A. $\mu g \cos \theta$

B. $mg \cos \theta$

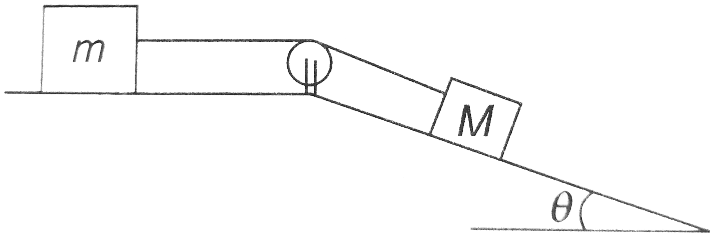
C. $mg \sin \theta$

D. $mg \downarrow$

Answer: D

Watch Video Solution

35. Find the maximum value of (m//m) in the situation shown in figure so that the system remains at rest. Friction coefficient of both the contacts is μ , string is massless an pulley is friction less.



A. $\dfrac{\cos\theta}{\sin\theta-\mu\cos\theta}$

B. $\dfrac{\sin\theta}{\sin\theta-\mu\cos\theta}$

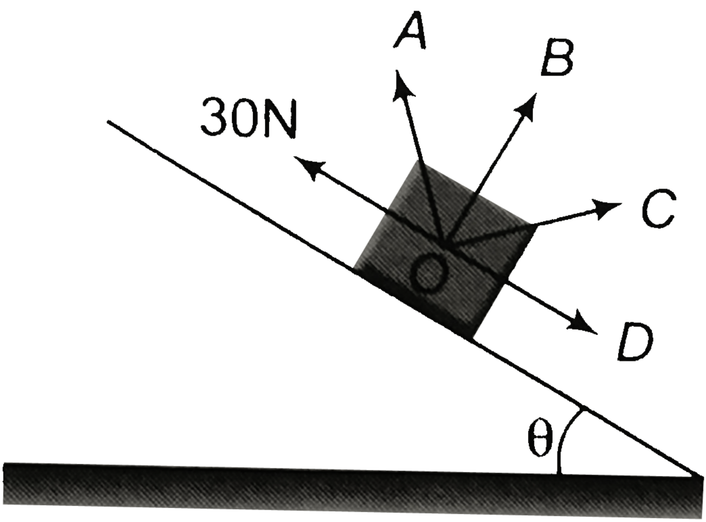
C. $\dfrac{\mu\cos\theta}{\sin\theta-\mu\cos\theta}$

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

Answer: D

Watch Video Solution

36. A body of mass $10kg$ lies on a rough inclined plane of inclination $\theta = \sin^{-1}\left(\frac{3}{5}\right)$ with the horizontal. When the force of $30N$ is applied on the block parallel to and upward the plane, the total force by the plane on the block is nearly along



A. OA

B. OB

C. OC

D. OD

Answer: A

Watch Video Solution

37. A small mass slide down an inclined plane of inclination theta with the horizontal. The coeffcient of friction is $\mu = \mu_0 \ x$ where x is the distance through which the mass slide down and μ_0, a contant. Then the speed is maxmum after the mass covers a distance of.

A. $\frac{\cos\theta}{\mu_0}$

B. $\frac{\sin\theta}{\mu_0}$

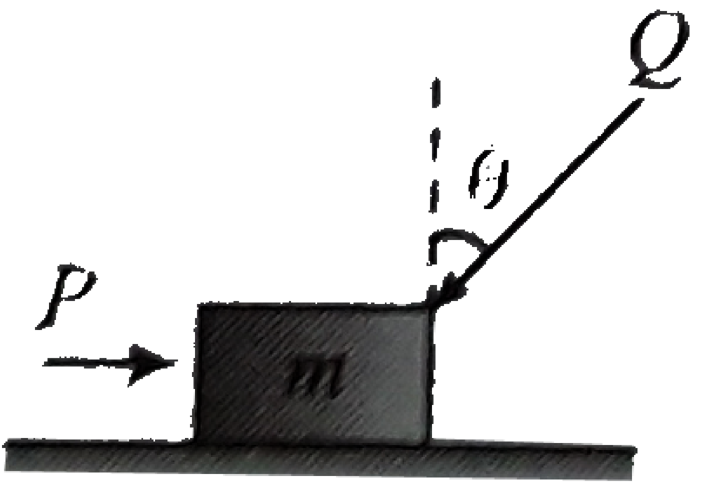
C. $\frac{\tan\theta}{\mu_0}$

D. $\frac{2\tan\theta}{\mu_0}$

Answer: C

Watch Video Solution

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

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

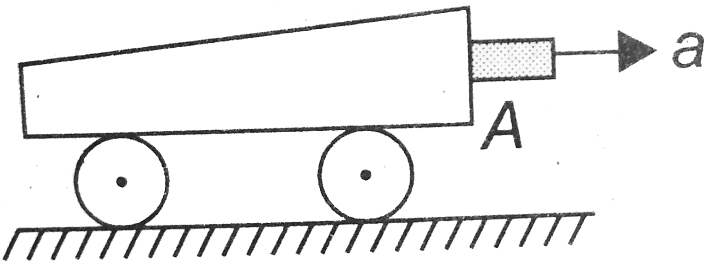
C. $(P + Q\cos\theta)/(mg + Q\sin\theta)$

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

Answer: A

Watch Video Solution

39. The minimum acceleration that must be impprted to the cart in the figure so that the block A will not fall (given μ is the coefficient if friction between the surface of block and cart) is given by:



A. μg

B. g/μ

C. $\dfrac{g}{\sqrt{\mu}}$

D. $\dfrac{\mu}{g}$

Answer: B

Watch Video Solution

40. A particle is projected along the line of greatest slope up a rough plane inclined at an angle of 45° with the horizontal. If the coefficient of friction is $1/2$. Their retardation is:

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

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

C. $\frac{g}{\sqrt{2}}\left(1-\frac{1}{2}\right)$

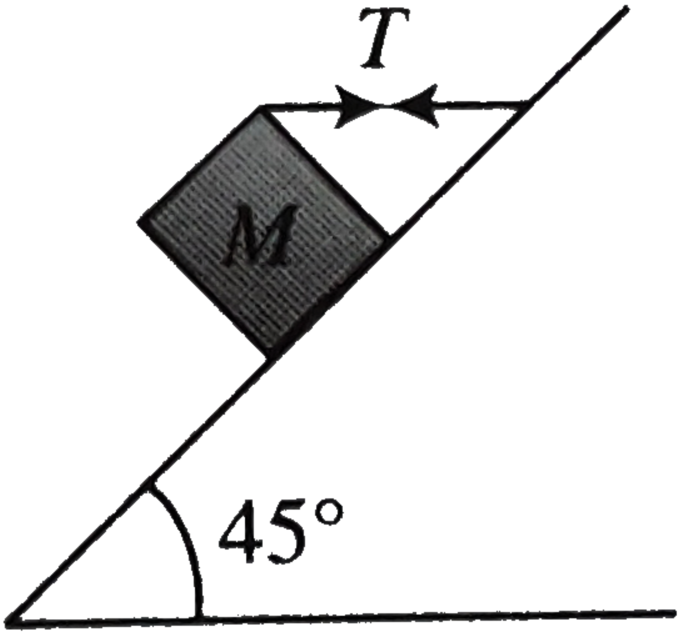
D. $\frac{g}{\sqrt{2}}\left(1+\frac{1}{2}\right)$

Answer: D

Watch Video Solution

41. 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 friction of contact is



A. $1/2$

B. $2/3$

C. $3/4$

D. $1/4$

Answer: A

Watch Video Solution

42. 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 $(g = 10ms^{-2})$

A. $1/4$

B. $1/2$

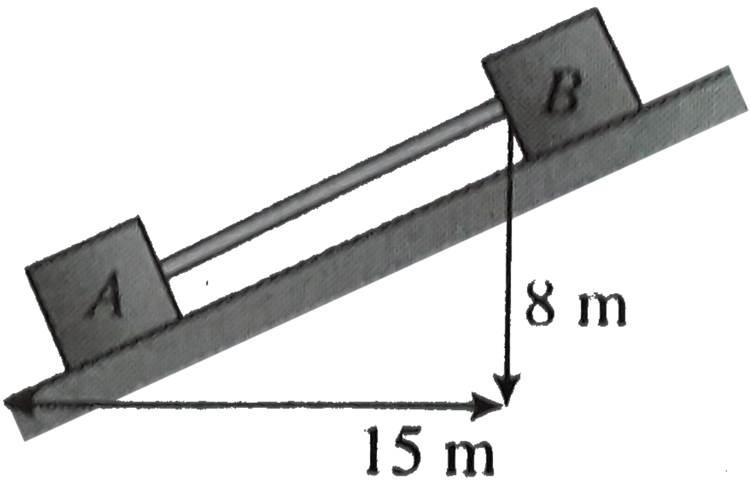
C. 2

D. 4

Answer: C

Watch Video Solution

43. 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 $\left(g = 10ms^{-2}\right)$



A. $150N$

B. $75N$

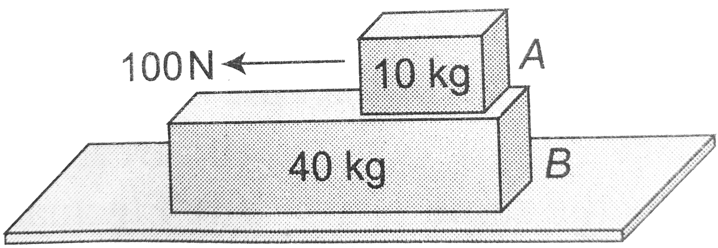
C. $200N$

D. $250N$

Answer: A

Watch Video Solution

44. A 40kg slab rests on a frictionless floor as shown in the figure. A 10kg block rests on the top of the slab. The static coefficient of friction between the block and slab is 0.60 while the kinetic friction is 0.04 . The 10kg block is acted upon by a horizontal force 100N. if $g = 9.8m/s^2$, the resulting acceleration of the slab will be.



A. $1m/s^2$

B. $1.5m/s^2$

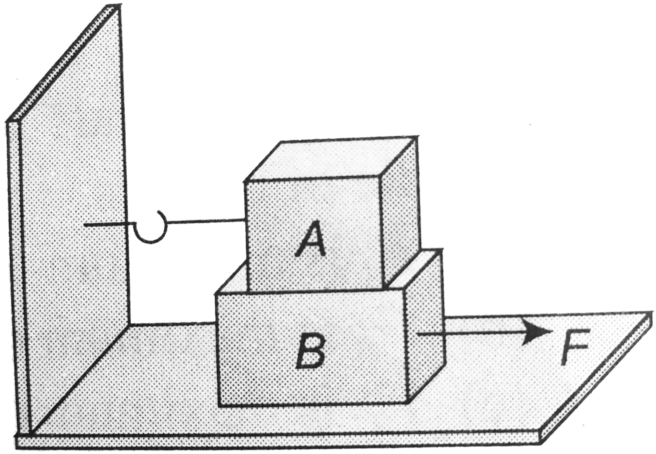
C. $2m/s^2$

D. $6m/s^2$

Answer: A

Watch Video Solution

45. A block A with mass 100kg is resting on another block B of mass 200kg. As shown in figure a horizontal rope tied to a wall hold it. The coefficient of friction between A and B is 0.2 while coefficient of friction between B and the ground is 0.3 . the minimum required force F to start moving B will be.



A. $900N$

B. $100N$

C. $1100N$

D. $1200N$

Answer: C

Watch Video Solution

Dynamics Of Circular Motion

1. An unbanked curve has a radius of 60m. The maximum speed at which a car can make a turn if the coefficient of static friction is 0.75 , is

A. $2.1m/s$

B. $14m/s$

C. $21m/s$

D. $7m/s$

Answer: C

Watch Video Solution

2. A person wants to drive on the vertical suirface of a large cylindrical wooden $well$ commonly known as $deathwell$ in a circus. The radius of the well 2 meter, and the coefficient of friction between the tyers of the motorcycle and the wall of the well is 0.2 the minimum speed the motorcyclist must have in order to prevent slipping should be

A. $10m/s$

B. $15m/s$

C. $20m/s$

D. $25m/s$

Answer: A

Watch Video Solution

3. Water in a bucket is whirled in a vertical circle with a string attached to it. The water does not fill down even when the bucket is inverted at the top of its path. We conclude that in this position

A. $mg = \frac{mv^2}{r}$

B. mg is greater than $= \frac{mv^2}{r}$

C. mg is not greater than $= \frac{mv^2}{r}$

D. none of these

Answer: C

Watch Video Solution

4. A stone of mass m tied to a string of length l is rotated in a circle with the other end of the string as the centre. The speed of the stone is v. If the string breaks, the stone will move

A. towards the centre

B. away from the centre

C. along a tangent

D. will stop

Answer: C

Watch Video Solution

5. A motorcycle is going on an overbridge of radius R. The driver maintains a constant speed. As the motorcycle is ascending on the overbridge, the normal force on it

A. Increases

B. Decreases

C. Remains the same

D. fluctuates

Answer: A

Watch Video Solution

6. Three identical cars A,B and C are moving at the same speed on three bridges. The car A goes on a plane bridge, B on a bridge convex upward and C goes on a bridge concave upward. Let F_A, F_B and F_C be the normal forces exerted by the cars on the bridges when they are at the middle of bridges

A. F_A is maximum of the three force.

B. F_B is maximum of the three force.

C. F_C is maximum of the three force.

D. $F_A = F_B = F_C$

Answer: C

Watch Video Solution

7. A train A runs from east to west and another train B of the same maas runs from west to east at the same speed along the equator. A presses the track with a force F_1 and B presses the track with a force F.

A. $F_1 > F_2$

B. $F_1 < F_2$

C. F_1=F_2

D. The information is insufficient to find the relation between F_1 and F_2

Answer: A

Watch Video Solution

8. A car turns a corner on a slippery road at a canstant speed of $12m/s$. If the co0efficient is 0.4 , the minimum radius of the arc in metres in which the car truns is.

A. 72

B. 36

C. 18

D. 9

Answer: B

Watch Video Solution

9. A small objective placed on a rotating horizontal trun table just slip when it is placed at a distance 4cm from the axis of rotation. If the angular velocity of the trun-table doubled, the objective slip when its distance from the axis of ratation is.

A. $1cm$

B. $2cm$

C. $4cm$

D. $8cm$

Answer: A

Watch Video Solution

10. An automobile of mass m is crossing over a convex upward over bridge with a speed v . If the radius of the bridge is r the thrusrt on the bridge at the highest point will be.

A. $mg+\frac{mv^2}{r}$

B. $mg-\frac{mv^2}{r}$

C. mg

D. $\frac{mv^2}{r}$

Answer: B

Watch Video Solution

11. A curved road of 50m in radius is banked to correct angle for a given speed. If the speed is to be double keeping the same banking angle, the radius of curvature of the road should be changed to.

A. $200m$

B. $100m$

C. $50m$

D. none of these

Answer: A

Watch Video Solution

12. A stone of mass m is tied to a strin and is moved in a vertical circle of radius r making n revolution per minute. The total tension in the string when the stone is its lowest point is.

A. mg

B. $m\left(g + \pi n r^2\right.$

C. $m(g + nr)$

D. $m\left(g + \frac{\pi^2 n^2 r}{900}\right)$

Answer: D

Watch Video Solution

13. A stone tied to a string is rotated with a uniform speed in a vertical plane. If mass of the stone is m, the length of the string is r and linear speed of the stone is v when the stone is at its lowest point, then the tension in the string will be

(g= acceleration due to gravity)

A. mg

B. mv^2 / r

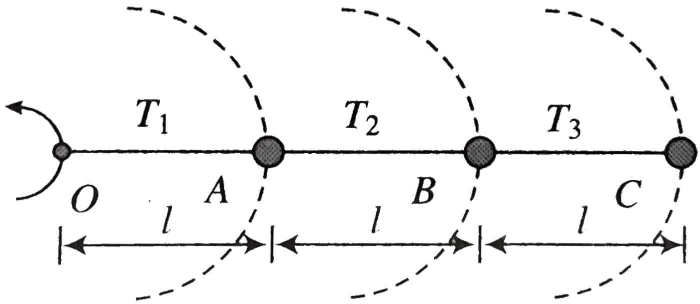
C. $\left(mv^2 / r\right) - mg$

D. $\left(mv^2 / r\right) + mg$

Answer: D

Watch Video Solution

14. 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. $3 : 5 : 7$

B. $3 : 4 : 5$

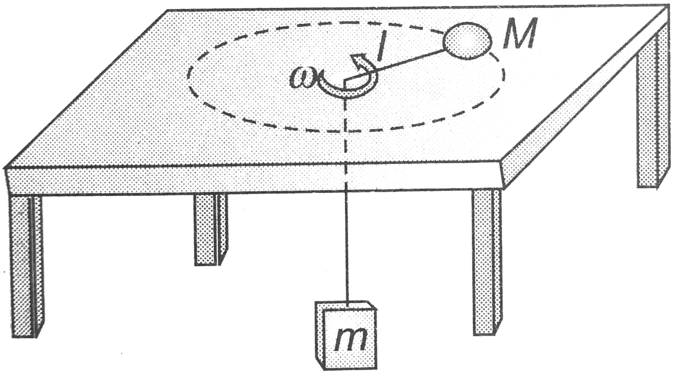
C. $7 : 11 : 6$

D. $3 : 5 : 6$

Answer: D

Watch Video Solution

15. A block of mass M is situation on a smooth horizontal frictionless table. A thread tied to the block passes through a hole in the table and carries a mass m at its other end if the length of the thread above the table is l, what should be the value of m so that it may remain suspended at a constant height and the block M moves in a circular p-ath with an angular velocity ω on the table?



A. $\dfrac{Ml\omega^2}{g}$

B. $\dfrac{Ml\omega^2}{3g}$

C. $\dfrac{Ml\omega^2}{5g}$

D. $\dfrac{2Ml\omega^2}{g}$

Answer: A

Watch Video Solution

16. A string of length $l = 1m$ is fixed at one end carries a mass of 100gm at other end. The string makes $\sqrt{5}/(\pi)$ revolutions per second about a verticle axis passing through its second end. What is the angle of inclination of the string with the vertical?

A. 30°

B. 45°

C. 60°

D. 75°

Answer: C

Watch Video Solution

17. A stone of mass 1kg tied to a light inextensible sstring of length $L = 10m$ is whirling in a circular path of radius L in vertical plane. If the ratio of the maximum tension in the string to the minimmum tension in the string is 4 and if g is taken to be

$10ms^{-2}$, the speed of the stone at the highest point of the circle is.

A. $10ms^{-1}$

B. $5\sqrt{2}ms^{-1}$

C. $10\sqrt{3}$

D. None of these

Answer: C

Watch Video Solution

18. A 8kg stone tied at the end of a string 1 metre long is whirled in a vertical circle. At the instant when the string makes an angle theta with the vertical, the speed of the stone is $4ms^{-1}$ and the tension in the thread is 104N. Then theta is.

A. 0°

B. 30°

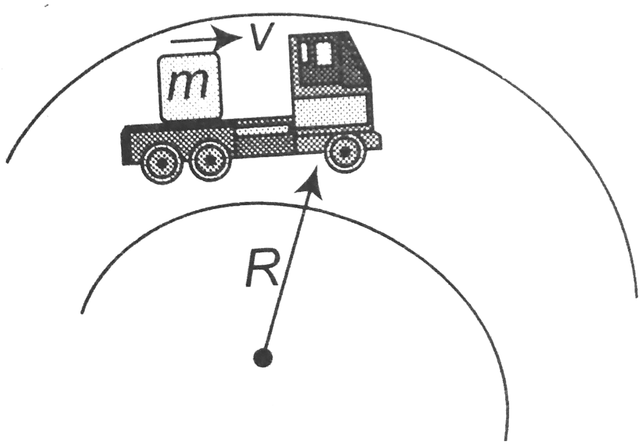
C. 60°

D. None of these

Answer: C

Watch Video Solution

19. a truck is carry a box of mass $m = 50kg$ on its flat horizontal rough surface with coefficient of friction $\mu = 0.3$. It is crossing a circular track of radius 27m. What is the maximum speed of the truck so thet the box does not slide from the truck while moving on the circular path?



A. $18 km / hr$

B. $36 km / hr$

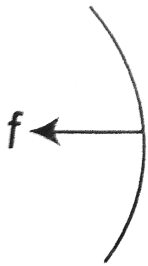
C. $32.4 km / hr$

D. None of these

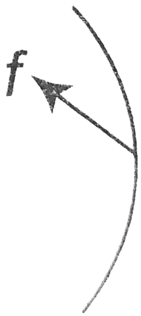
Answer: C

Watch Video Solution

20. Indicate the direction of frictional force on a car which is moving along the curved path with non zero tangential acceleration, in anti-clock direction:

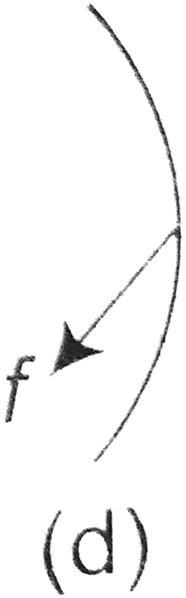
A. 

B.



(c)

C.



D.

Answer: C

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21. A partical of mass m is attached to a massless string of length l and is oscillating in a vrtical plane with the other end of the string fixed to a rigid support. The tension in the string at a certain instant is $T = kmg$.

A. k can never be geaater than 1

B. k can never be less than 1

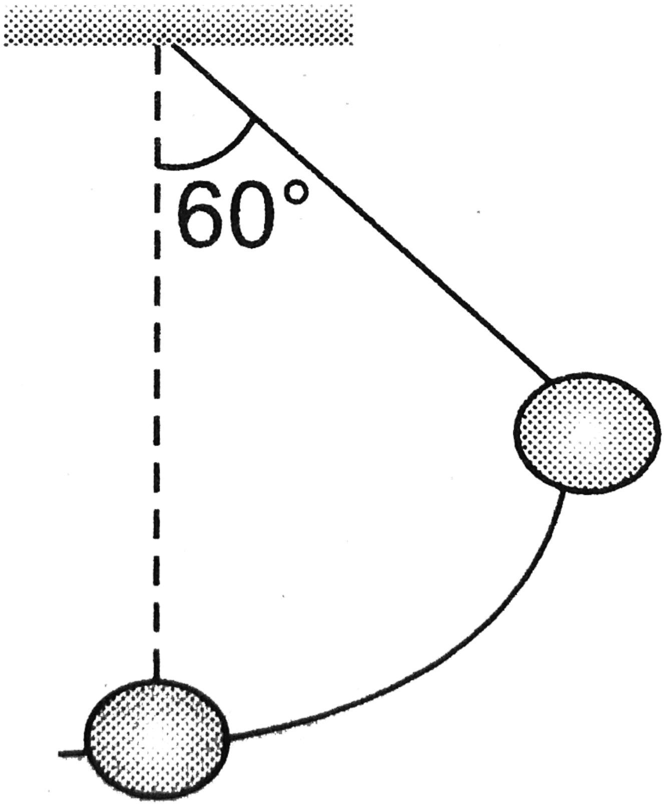
C. k can never be equal than 1

D. k can never be geaater than 3

Answer: D

Watch Video Solution

22. A pendulum of length $l = 1m$ is released from $\theta_0 = 60^\circ$. The rate of change of speed of the bob at $\theta = 30^\circ$ is.



A. $5\sqrt{3}m / s^2$

B. $5m / s^2$

C. $10m / s^2$

D. $2.5m / s^2$

Answer: B

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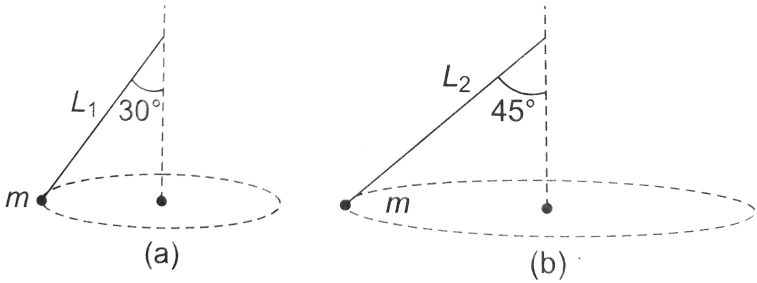
23. Two partical tied to different strings are whirled in a horizontal circle as shown in figure. The ratio of lengths of the string so that they complete their circular path with equal time priod is:



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

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

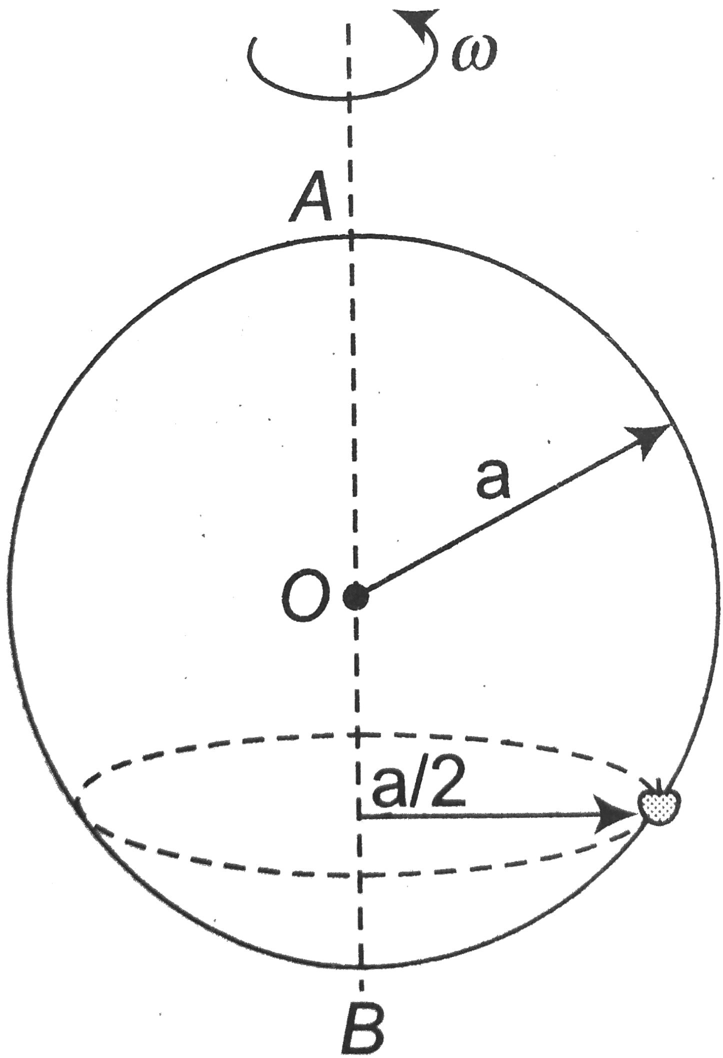
C. 1

D. None of these

Answer: B

Watch Video Solution

24. A smooth wire is bent into a vertical circle of radius a. A bead P can slide smoothly on the wire. The circle is rotated about vertical diameter AB as axis with a speed omega as shown in figure. The bead P is at rest w.r.t. the circular ring in the position shown. then ω^2 is equal to:



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

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

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

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

Answer: B

Watch Video Solution

25. A particle is attached to an end of a rigid rod. The other end of the rod is hunged and the rod rotates always remaining horizontal. Its angular speed is increasing at contant rate.

The mass of the particle is m . The force exerted by the rod on the particle is $\vec{F}$, then:

A. $F \geq mg$

B. F is constant

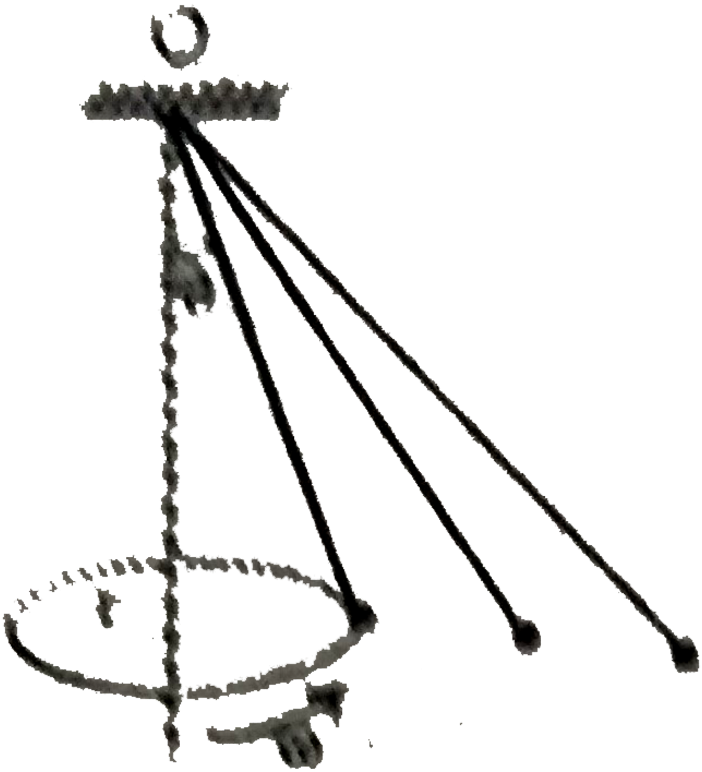
C. The angle between $\vec{F}$ and horizontal plane decreases.

D. The angle between $\vec{F}$ and the rod decreases.

Answer: C

Watch Video Solution

26. Three masses of small size are attached by light inextensible strings of various lengths to a point O on the ceiling. All of the masses swing round in horizontal circles of various radii with the same angular frequency ω (one such circle is drawn in the shown figure.) Then pick up the correct statement.



A. The vertical depth of each mass below point of suspension from ceilling is different.

B. The radius of horizontal circular path of each mass is same.

C. All masses revolve in the same horizontal plane.

D. All the particales must have same mass.

Answer: C

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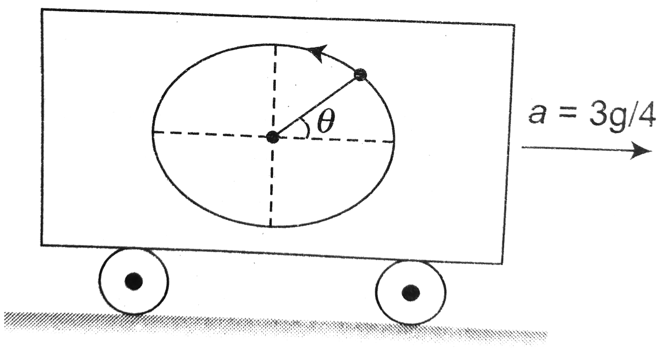
27. A bus is moving with a constant acceleration $a = 3g/4$ towards right. In the bus, a ball is tied with a rope and is rotated in vertical circle as shown. The tension in the rope will be minimum, when the rope makes an angle $\theta =$_ __ __



A. 53°

B. 37°

C. $180 - 53^{\circ}$

D. $180 + 37^{\circ}$

Answer: A

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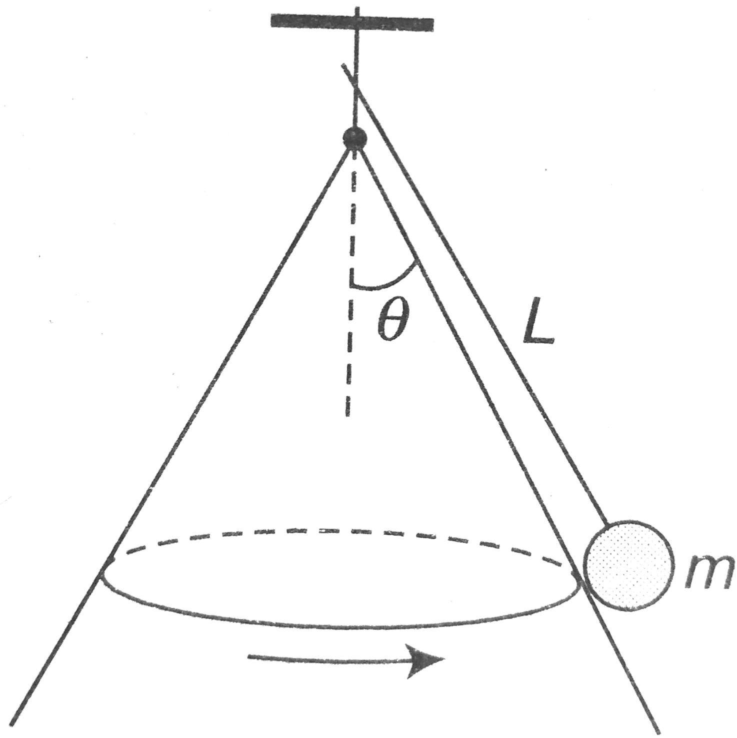
28. A small sized mass m is attached by a massless string (of length L) to the top of a fixed frictionless solid cone whose axis is vertical. The half angle at the vertex of cone is theta. If the mass m moves around in a horizontal circle at speed v , what is the maximum value of v for which mass stay in contact with the comes? (g is acceleration due to gravity.)



A. $\sqrt{gL\cos\theta}$

B. $\sqrt{gL\sin\theta}$

C. $\sqrt{gL\sin\theta\tan\theta}$

D. $\sqrt{gl\tan\theta}$

Answer: C

Watch Video Solution

29. A small sized mass m is attached by a massless string (of length L) to the top of a fixed frictionless solid cone whose axis is vertical. The half angle at the vertex of cone is theta. If the mass m moves around in a horizontal circle at speed v , what is the maximum value of v for which mass stay in contact with the comes? (g is acceleration due to gravity.)

A. the car cannot make a turn without skidding

B. if the car runs at a speed less than $40km / hr$, it will slip up the slope

C. If the car runs at the correct speed of $40km/hr$, the force by the road on car is equal to mv^2/r

D. if the car runs at the correct speed of $40km/hr$, the force by the road on the car is greater than mg as well as greater than mv^2/r

Answer: D

Watch Video Solution

30. A particle describes a horizontal circle in a conical funnel whose inner surface is smooth with speed of $0.5m / s$. What is the height of the plane of circle from vertex the funnel?

A. $0.25cm$

B. $2cm$

C. $4cm$

D. $2.5cm$

Answer: D

Watch Video Solution

31. 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 beight point of the circle directed vertical downward are

HereT_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. $mg - T_1$ and $mg + T_2$

B. $mg + T_1$ and $mg - T_2$

C. $mg + T_1 - \left(\frac{mv_1^2}{R}\right)$ and

$mg - T_2 + \left(\frac{mv_2^2}{R}\right)$

D. $mg - T_1 - \left(\frac{mv_1^2}{R}\right)$ and

$mg + T_2 + \left(\frac{mv_2^2}{R}\right)$

Answer: A

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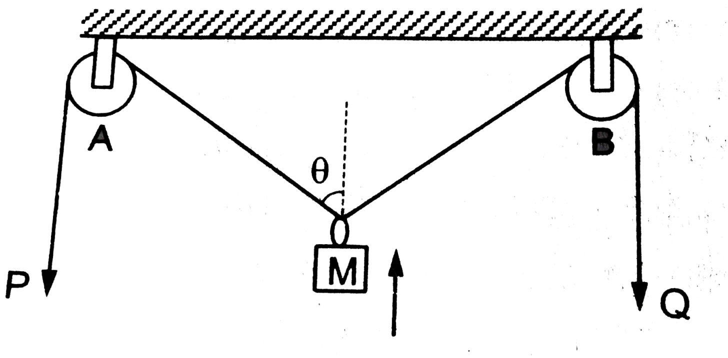
Problems Based On Mixed Concepts

1. In the arrangement shown in figure the ends P and Q of an inextensible string move downwards with uniform speed u. Pulleys A and B are fixed. The mass M moves upwards with a speed



A. $2U \cos \theta$

B. $U \cos \theta$

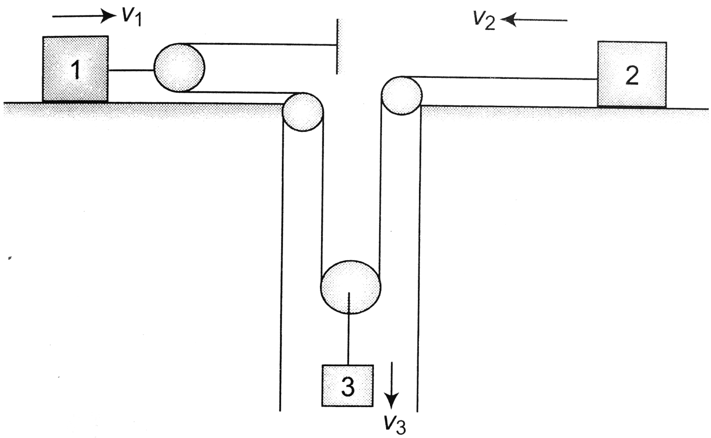
C. $\frac{2U}{\cos \theta}$

D. $\frac{U}{\cos \theta}$

Answer: D

Watch Video Solution

2. Three block 1, 2 and 3 are arranged as shown in the figure. The velocities of the blockes v_1 , v_2 and v_3 are shown in the figure. What is the relationship between v_1 , v_2 and v_3 ?



A. $2 v_1+v_2=v_3$

B. $v_1+v_2=v_3$

C. $2 v_1+2 v_2=v_3$

D. None of these

Answer: D

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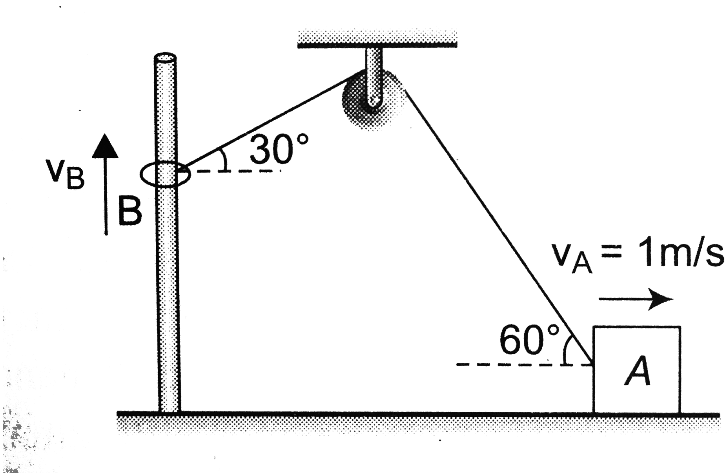
3. Find velocity of ring B (V_B) at the instant shown. The string is taut and inextensible:



A. $\frac{1}{2}m/s$

B. $\frac{\sqrt{3}}{4}m/s$

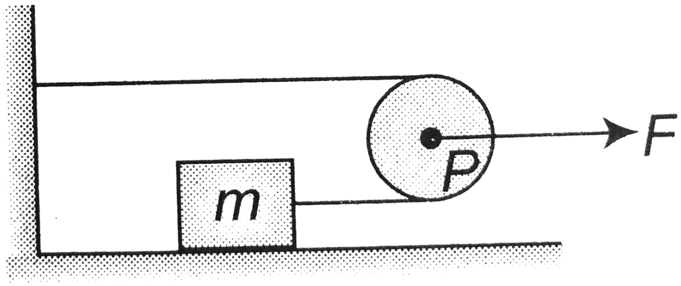
C. $\frac{\sqrt{1}}{4}m/s$

D. $1m/s$

Answer: D

Watch Video Solution

4. The ratio of acceleration of pulley to the acceleration of the block is (string is inextensible).



A. 0.5

B. 2

C. 1

D. None of these

Answer: A

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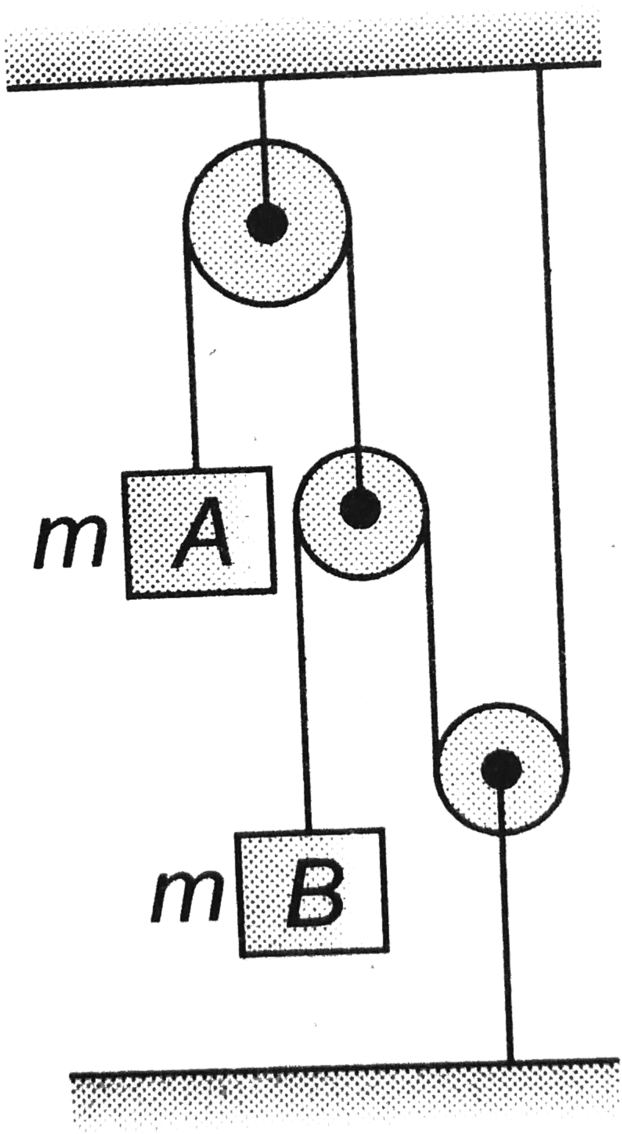
5. In the arrangement shown, the pulleys and the string are ideal. The acceleration of block

B is.



A. $g/5$

B. $g/2$

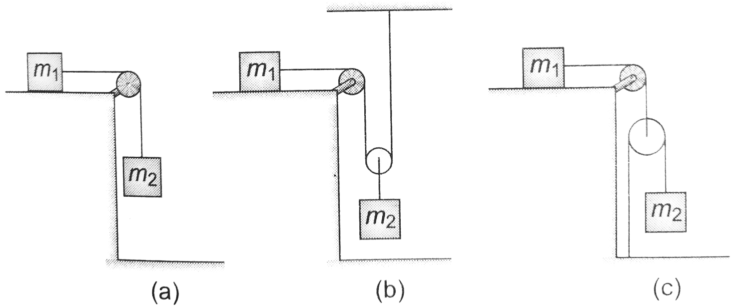
C. $2g/5$

D. $2g/3$

Answer: C

Watch Video Solution

6. In each of the three arrangements, the block of mass m_1 is being pulled left with constant velocity. There is no friction anywhere. The string are light and anextensible and pulleys are massless. The ratio of the speed of the block of mass m_2 in the three cases respectively is:



A. $2:1:4$

B. $2:4:1$

C. $4:2:1$

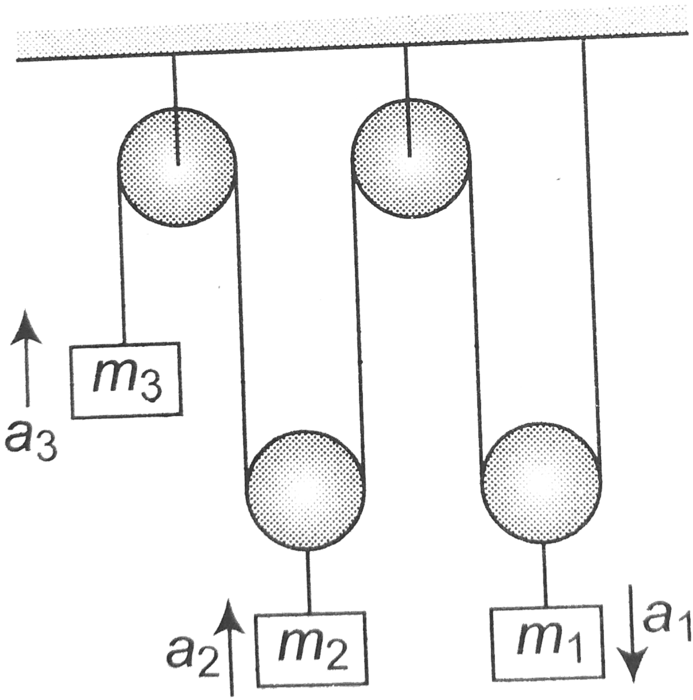
D. Connot be calculated

Answer: A

Watch Video Solution

7. If the blocks are moving as shown in the figure the relation between a_1 , a_2 and a_3 will

be.



A. $2a_1 + 2a_2 + a_3 = 0$

B. $2a_1 - 2a_2 + a_3 = 0$

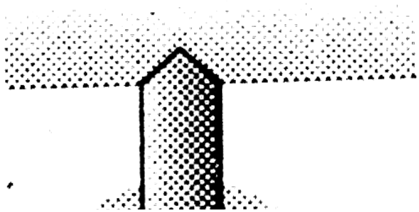
C. $2a_1 - 2a_2 + 2a_3 = 0$

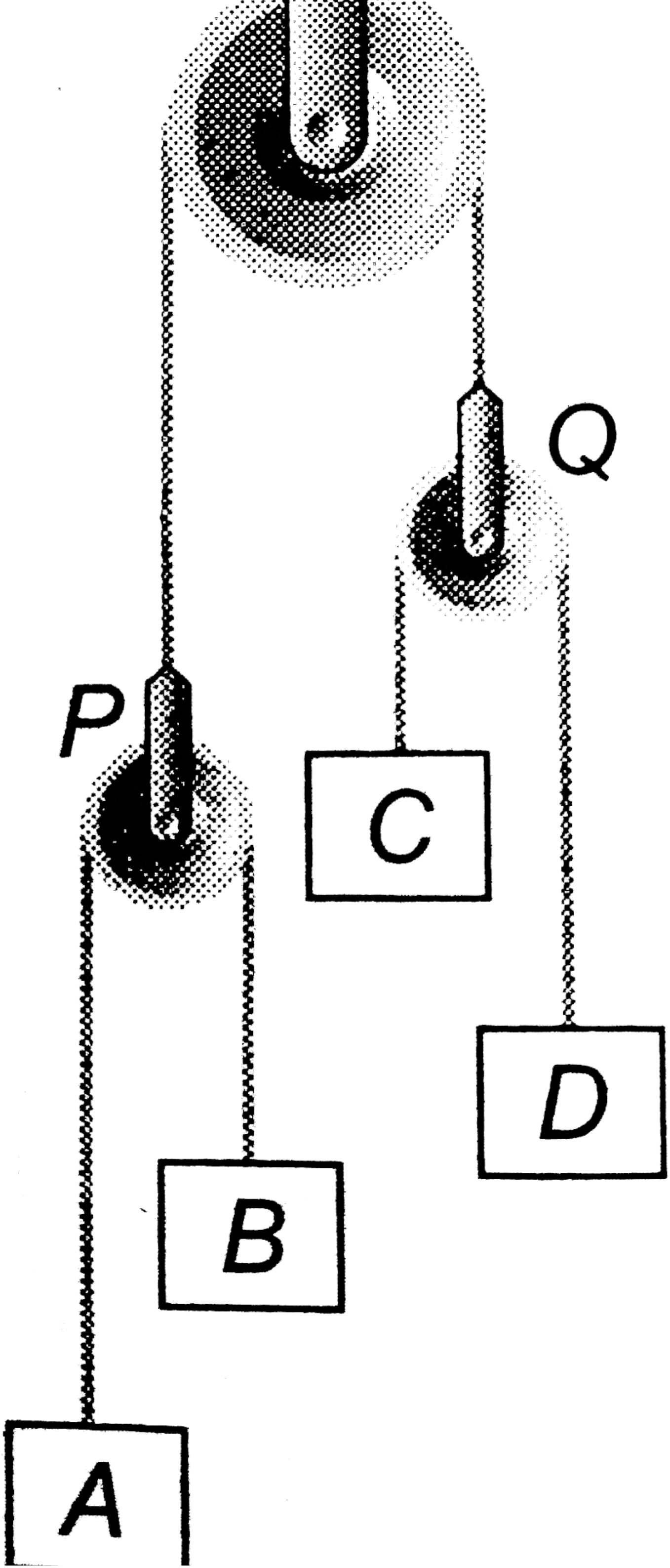
D. $2a_2 - 2a_1 + a_3 = 0$

Answer: D

Watch Video Solution

8. In the figure acceleration of A is $1m/s^2$ upward, acceleration of B is $7m/s^2$ upward acceleration of C is $2m/s^2$ upward. The acceleration of D will be.





Q
P
C
D
B
A

A. $7m/s^2$ downwards

B. $2m/s^2$ downwards

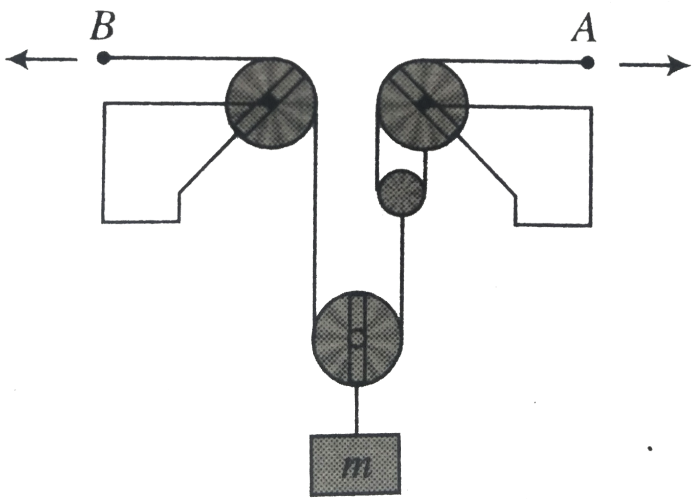
C. $10m/s^2$ downwards

D. $8m/s^2$ downwards

Answer: C

Watch Video Solution

9. For the pulley system shown in fig. each of the cables at A and B is given a velocity of $2ms^{-1}$ in the direction of the arrow. Determine the upward velocity v of the load m.



A. $1.5m/s$

B. $3m/s$

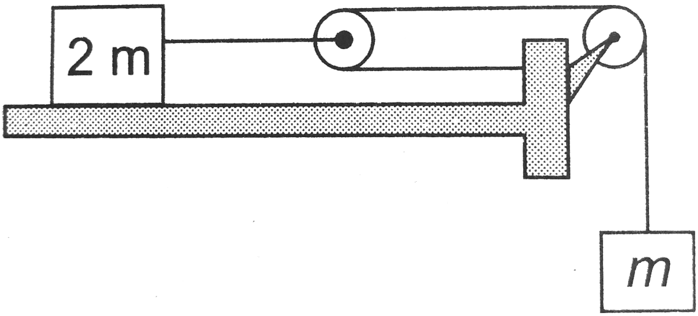
C. $6m/s$

D. None of these

Answer: A

Watch Video Solution

10. Consider the situation shown in figure. All the surface are smooth. The tension in the string connected to $2m$ is.



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

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

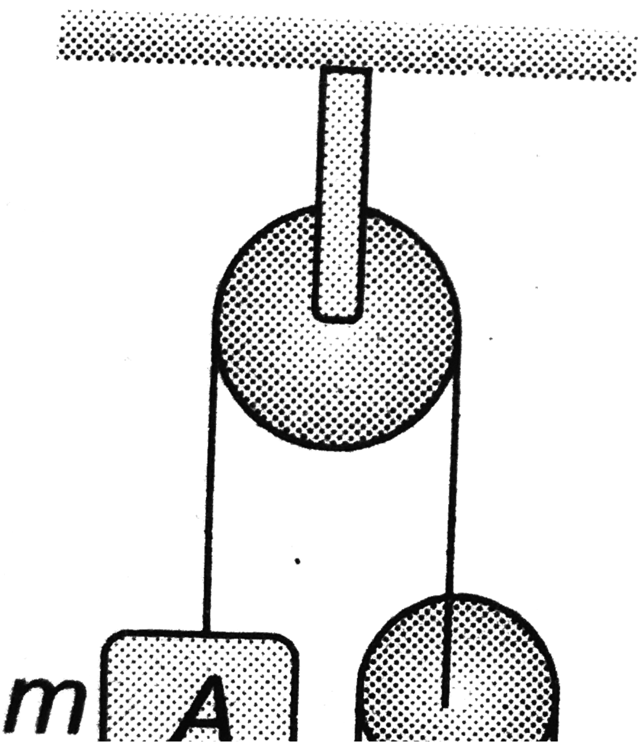
C. $\frac{2mg}{3}$

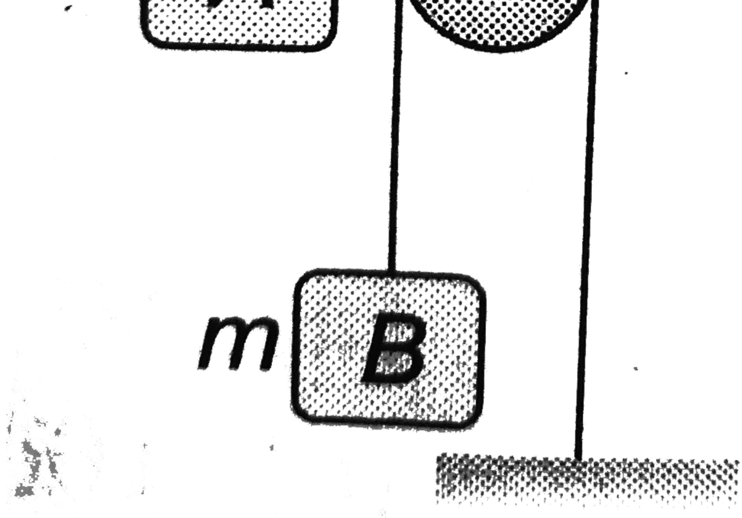
D. mg

Answer: C

Watch Video Solution

11. In the figure shown neglecting friction and mass of pulley, what is the acceleration of mass B ?





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

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

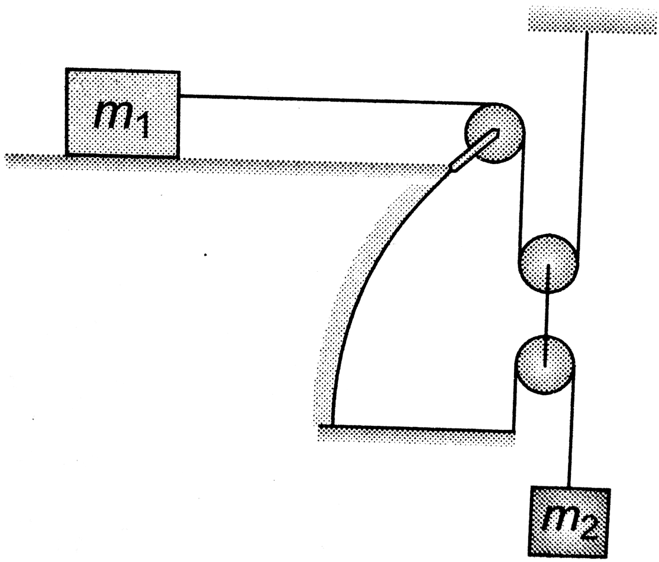
C. $\frac{2g}{2}$

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

Answer: D

Watch Video Solution

12. Two block of masses m_1 and m_2 are connected as shown in the figure. The acceleration of the block m_2 is:



A. $\dfrac{m_2 g}{m_1 + m_2}$

B. $\dfrac{m_1 g}{m_1 + m_2}$

C. $\dfrac{4m_2 g - m_1 g}{m_1 + m_2}$

D. $\dfrac{m_2 g}{m_1 + 4m_2}$

Answer: A

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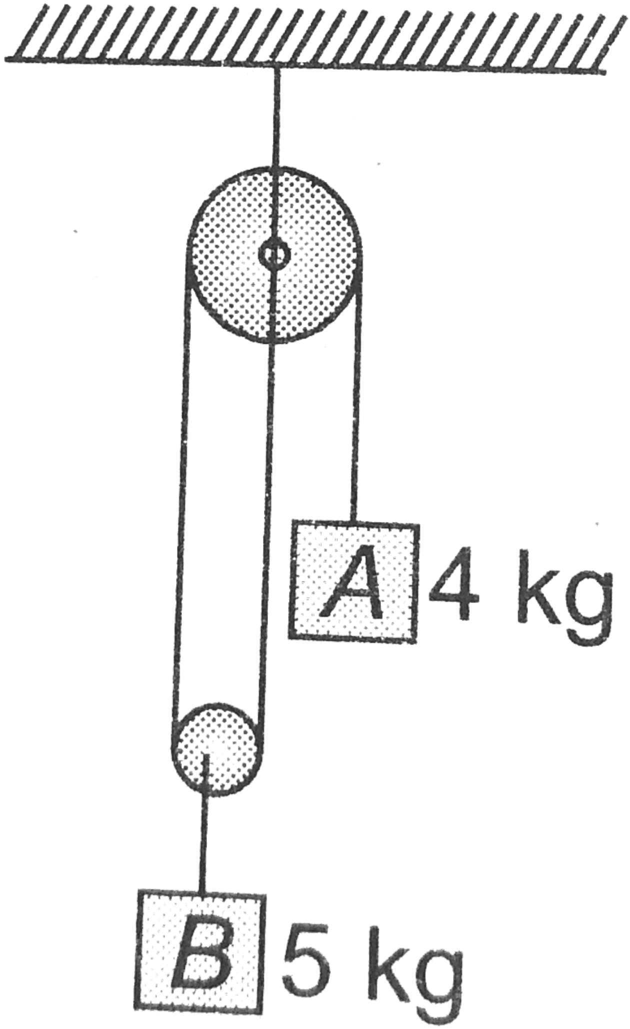
13. The acceleration of the block (A) and (B) respectively in situation shown in the figure is:

(pulleys and string are massless).



A. $\frac{2g}{7}$ downward, $\frac{g}{7}$ upward

B. $\frac{2g}{3}$ downward, $\frac{g}{3}$ upward

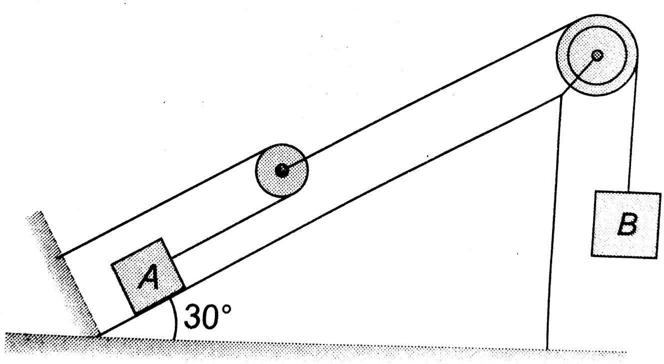
C. $\frac{10}{13}g$ downward, $\frac{5g}{13}$ upward

D. none of these

Answer: A

Watch Video Solution

14. In the system shown in figure $m_B = 4kg$, and $m_A = 2kg$. The pulleys are massless and friction is absent everywhere. The acceleration of block A is.



A. $10/3m/s^2$

B. $20/3m/s^2$

C. $2m/s^2$

D. $4m/s^2$

Answer: A

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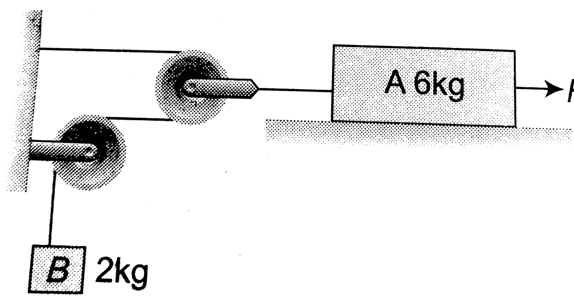
15. The system starts from rest and A attains a velocity of $5m/s$ after it has moved $5m$ toward right. Assuming the arrangement to be frictionless everywhere and pulley and string to be light, the value of the constant force F applied on A is:



A. $50N$

B. $75N$

C. $100N$

D. $96N$

Answer: B

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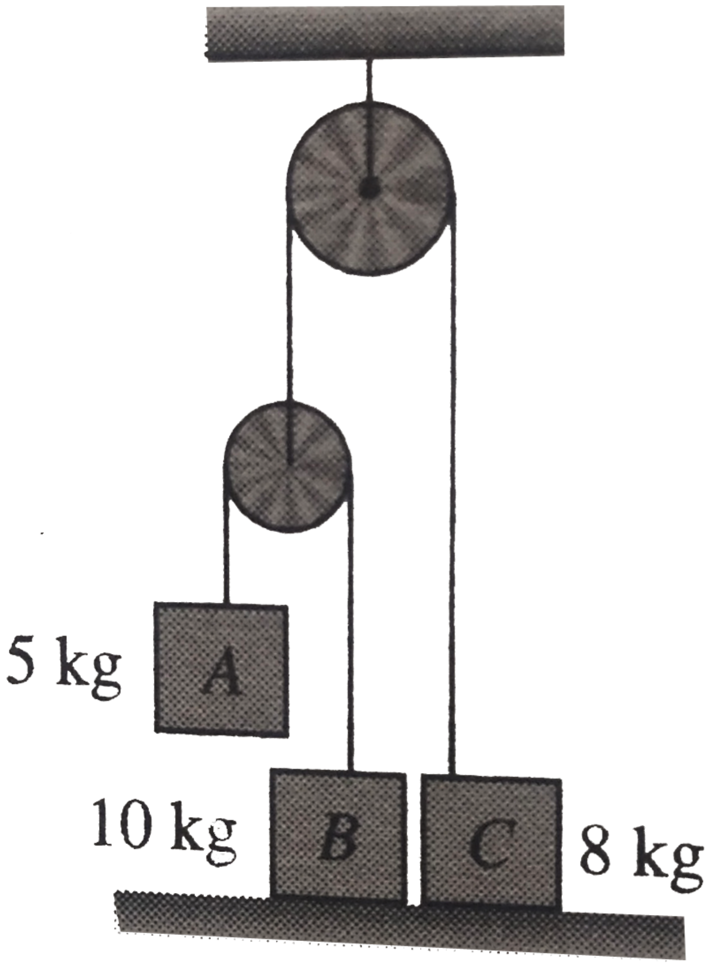
16. In the following arrangement, the system is initially at rest. The 5-kg block is now released. Assuming the pulley and string to be massless and smooth, the acceleration of block C will be



A. zero

B. $2.5m / s^2$

C. $\frac{10}{7} m / s^2$

D. $\frac{5}{7} m / s^2$

Answer: D

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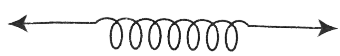
17. The tension in the spring is.



A. Zero

B. $2.5N$

C. $5N$

D. $10N$

Answer: C

Watch Video Solution

18. A spring balance and a physical balance are kept in a lift. In these balance equal masses are placed. If now the lift starts moving upward with constant acceleration, then.

A. The reading of spring balance will increases increses and the equilibrium position of the physical balance will disturb

B. The reading of spring balance will remain in unchanged and physical balance will remain in equilibrium

C. The reading of spring balance will decrease and physical balance will remain in equilibrium

D. The reading of spring balance will increases and the physical balance will ramain in equilibrium

Answer: D

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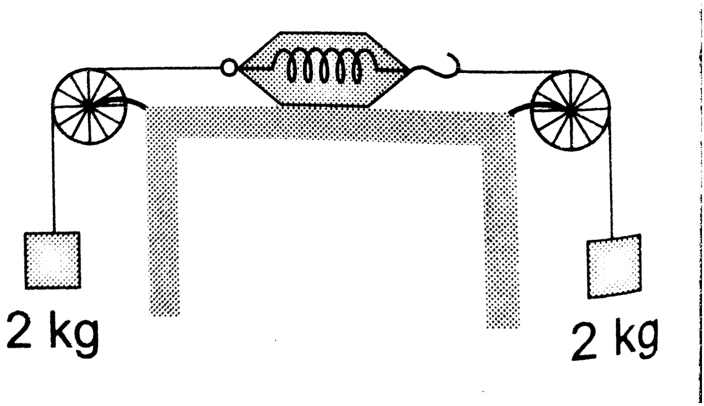
19. As shown in the figure, two equal masses each of $2kg$ are suspended from a spring balance. The reading of the spring balance will

be.



A. Zero

B. $2kg$

C. $4kg$

D. Between zero and $2kg$

Answer: B

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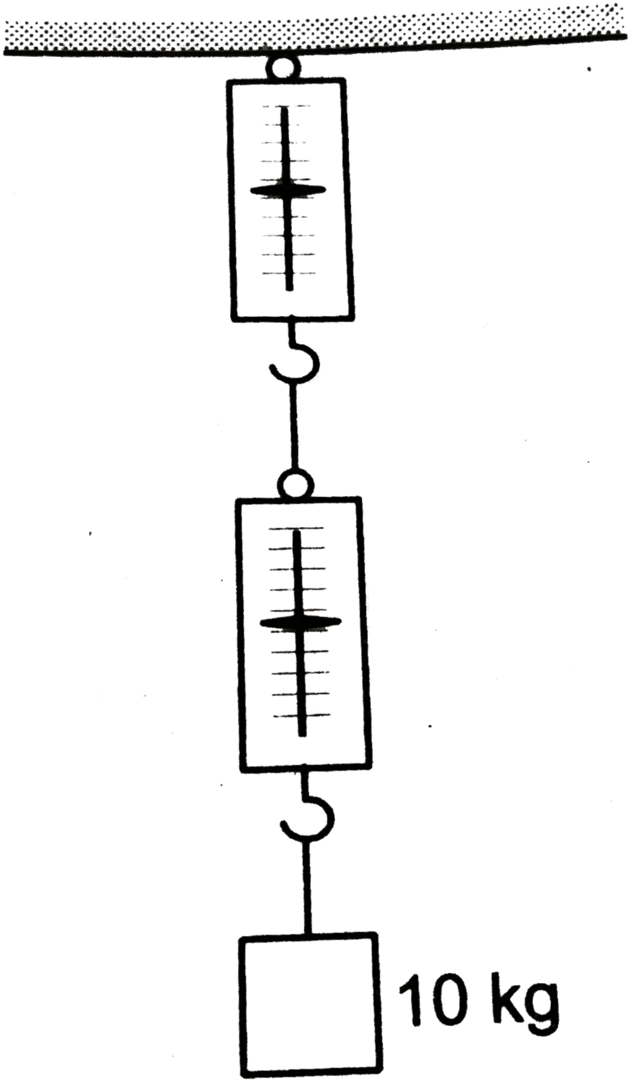
20. A block of mass 10 kg is suspended through two light spring balances as shown in figure



A. Both the scales will read $10kg$

B. Both the scales will read $5kg$

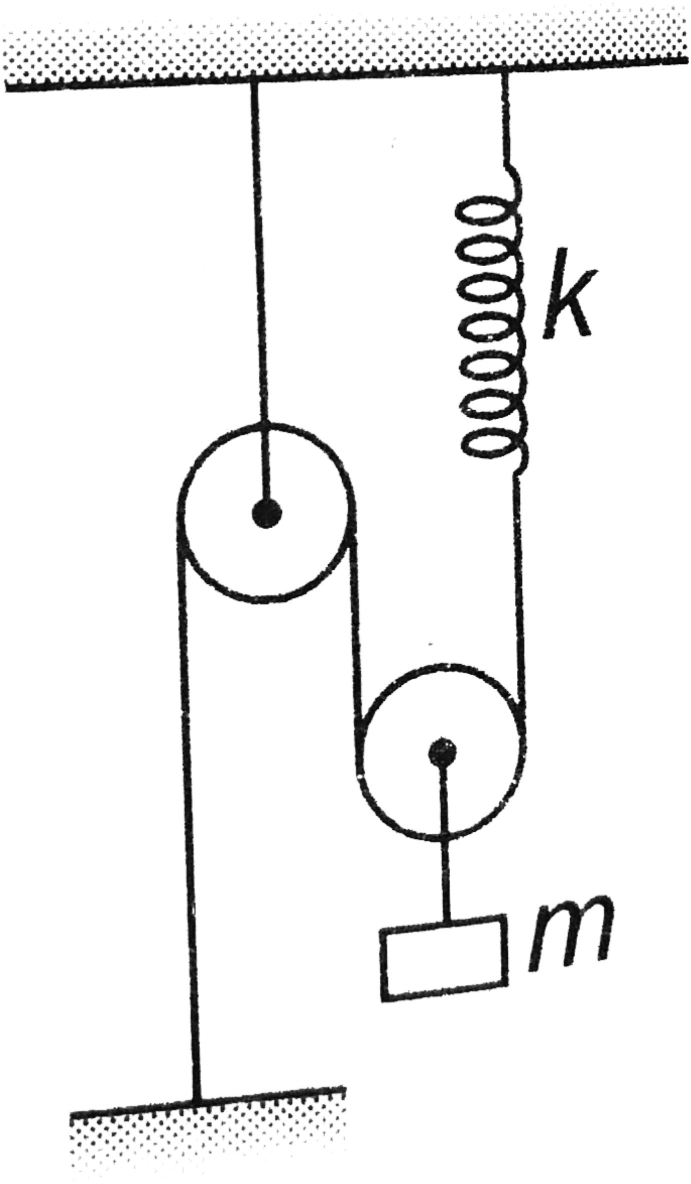
C. The upper scale will read $10kg$ and the lower zero

D. The reading may be anything but their sum will be $10kg$

Answer: A

Watch Video Solution

21. Mass m shown in the figure is in equilibrium. If it is displaced further by x and released find its accleleration just after it is released. Take pulleys to be light and smooth and string light.


k
m

A. $\frac{4kx}{5m}$

B. $\frac{2kx}{5m}$

C. $\frac{4kx}{m}$

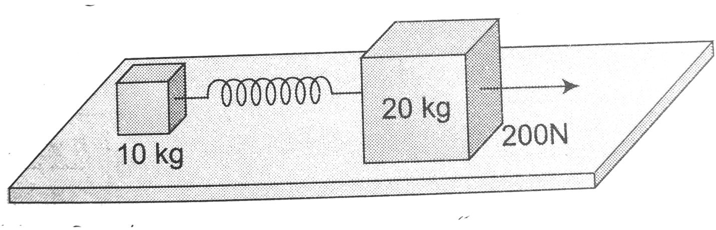
D. none of these

Answer: C

Watch Video Solution

22. The masses of $10kig$ and $20kg$ respectively are connected by a massless spring as shown in figure. A force of $200N$ acts on the $20kg$

mass. At the instant shown, the $10kg$ mass has acceleration $12m/\sec^2$. What is the acceleration of $20kg$ mass?



A. $12m/\sec^2$

B. $4m/\sec^2$

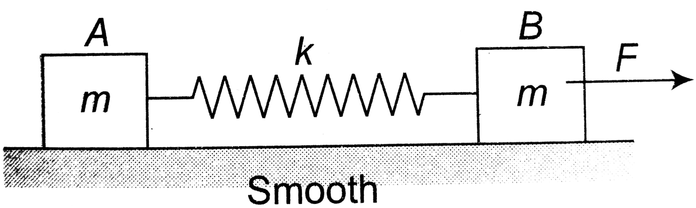
C. $10m/\sec^2$

D. Zero

Answer: B

Watch Video Solution

23. Initially the spring is un deformed. Now the force F is applied to B as shown in the figure. When the displacement of B w.r.t. A is x towards right in some time then relative acceleration of B w.r.t. A at that moment is:



A. $\frac{F}{2m}$

B. $\dfrac{F - kx}{m}$

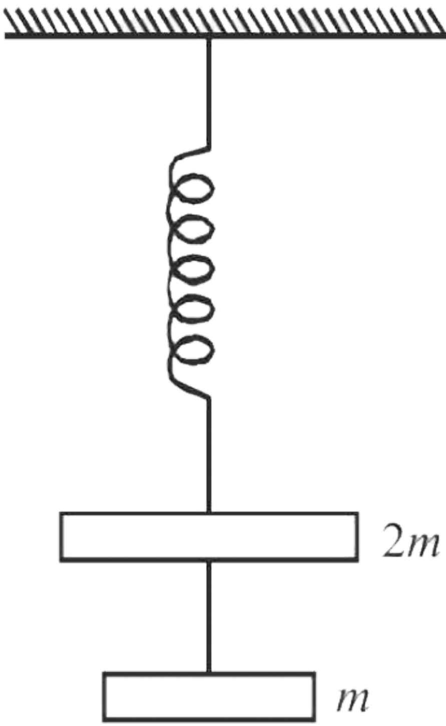
C. $\dfrac{F - 2kx}{m}$

D. none of these

Answer: C

Watch Video Solution

24. The string between blocks of mass m and 2m is massless and inextensible. The system is suspended by a massless spring as shown. If the string is cut find the magnitudes of accelerations of mass 2m and m (immediately after cutting)



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

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

C. g, g

D. $\frac{g}{2}, \frac{g}{2}$

Answer: B

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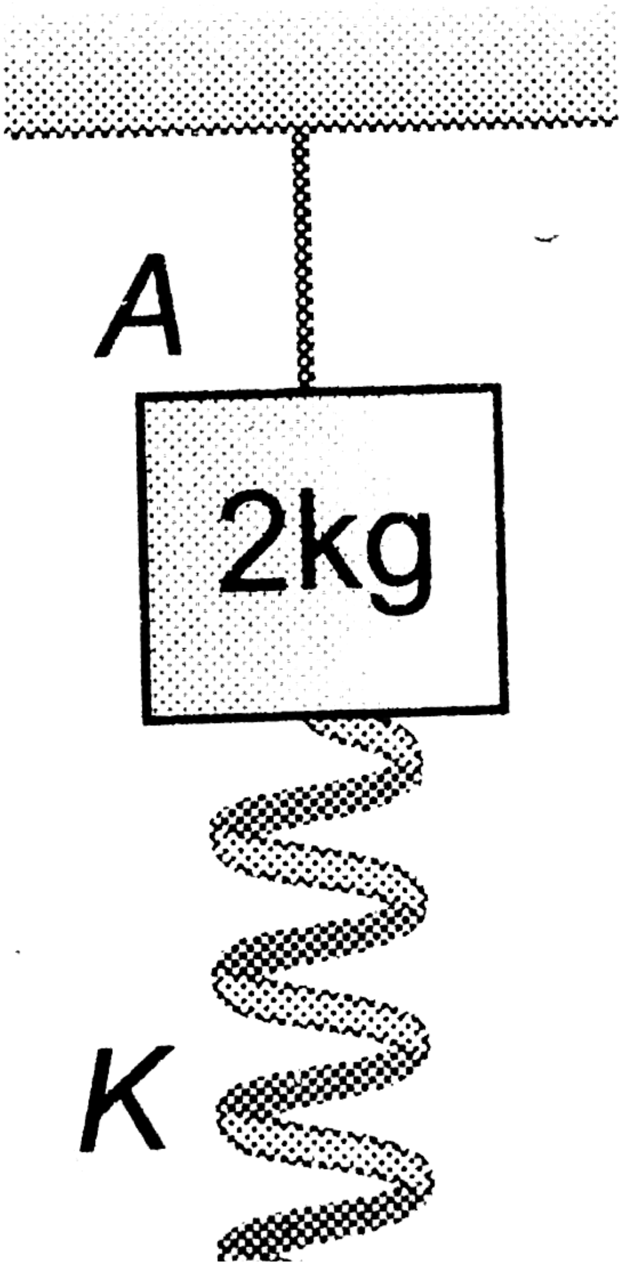
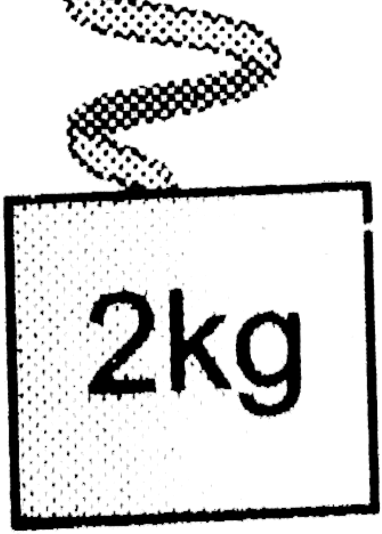
25. Two block of mass $2kg$ are connected by a massless ideal spring of spring constant $K = 10N/m$. The upper block is suspended from roof by a light string A . The system shown is in equilibrium. The string A is now cut, the acceleration of upper block just after the string A is cut will be $(g = 10m / s^2$.





A. $0 m / s^{2}$

B. $10 m / s^{2}$

C. $15 m / s^{2}$

D. $20 m / s^{2}$

Answer: D

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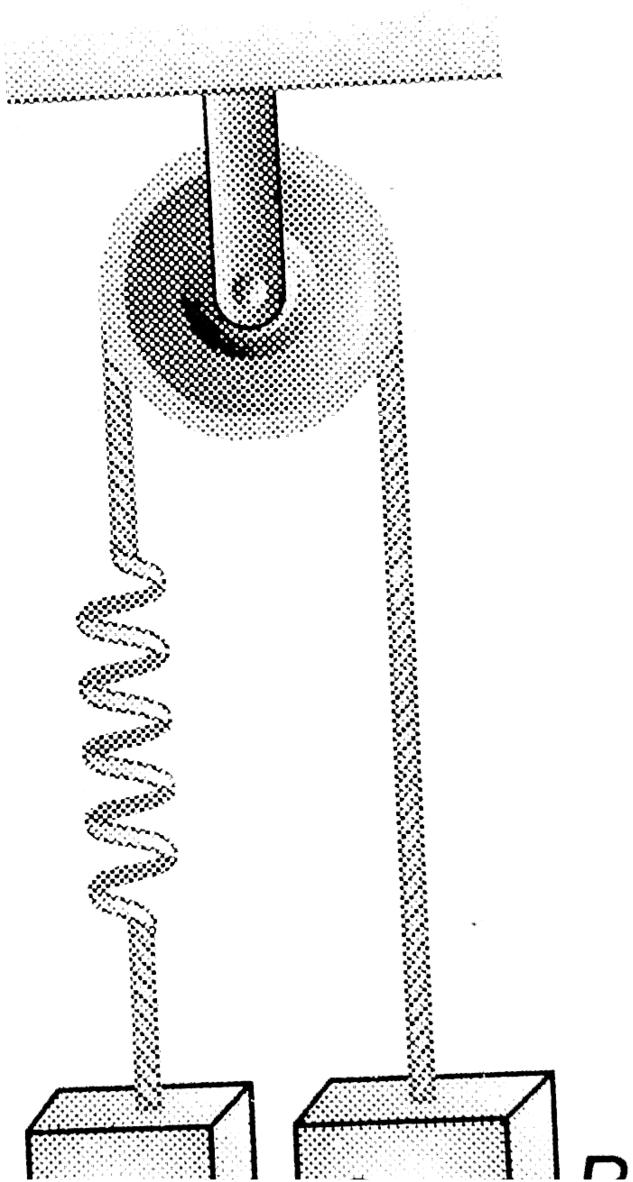
26. A block A of mass m is attached at one end of a light spring and the other end of the spring is connected to another block B of mass $2m$ through a light string as shown in the figure. A is held and B is in static equilibrium. Now A is released. The acceleration of A just after that instant is a. In the next case, B is held and A is in static equilibrium. Now when B is released, its acceleration immediately after the release is b.

The value of a/b is (pulley, string and the spring are massless).



A. 0

B. undefined

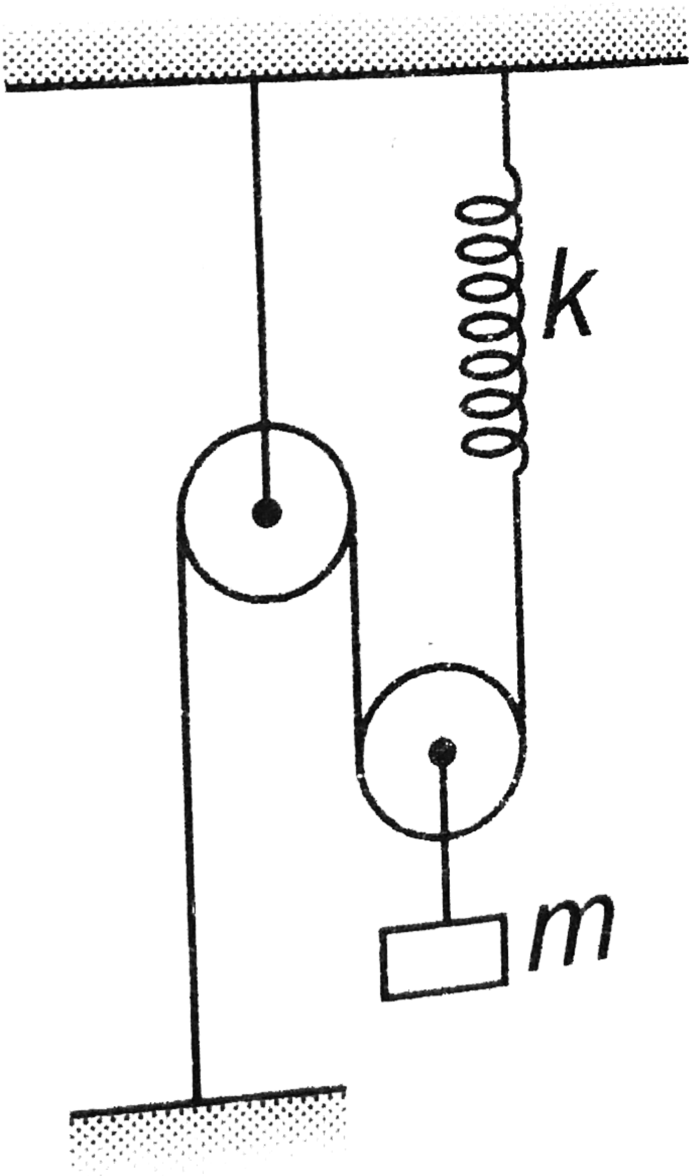
C. 2

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

Answer: C

Watch Video Solution

27. Mass m shown in the figure is in equilibrium. If it is displaced further by x and released find its accleleration just after it is released. Take pulleys to be light and smooth and string light.



k
m

A. $\frac{4kx}{5m}$

B. $\frac{2kx}{5m}$

C. $\frac{4kx}{m}$

D. none of these

Answer: C

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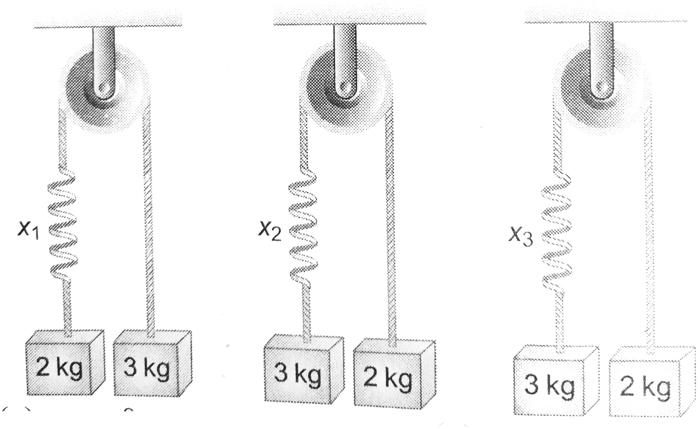
28. Same spring is attached with $2kg$, $3kg$ and $1kg$ blocks in three different cases as shown in figure. If x_1, x_2 and x_3 be the extensions in the spring in these cases then (Assume all the

block s to move with uniform acceleration).



A. $x_1 = 0$,$x_3 > x_2$

B. $x_2 > x_1 > x_3$

C. $x_3 > x_1 > x_2$

D. $x_1 > x_2 > x_3$

Answer: B

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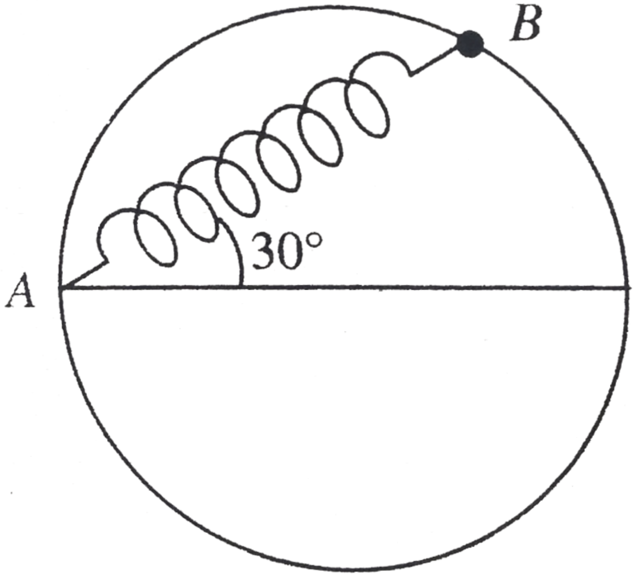
29. A bead of mass m is attached to one end of a spring of natural length R and spring constant $K = \frac{\left(\sqrt{3}+1\right)mg}{R}$. The other end of the spring is fixed at a point A on a smooth vertical ring of radius R as shown in fig. The normal reaction at B just after it is released to move is



A. $mg/2$

B. $\sqrt{3}mg$

C. $3\sqrt{3}mg$

D. $\dfrac{3\sqrt{3}mg}{2}$

Answer: D

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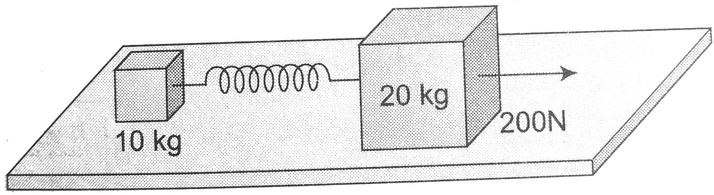
30. The masses of $10kig$ and $20kg$ respectively are connected by a massless spring as shown in figure. A force of $200N$ acts on the $20kg$ mass. At the instant shown, the $10kg$ mass has acceleration $12m/\sec^2$. What is the acceleration of $20kg$ mass?



A. 0

B. $10m / s^2$

C. $4m / s^2$

D. $12m / s^2$

Answer: C

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31. A horizontal force F of variable magnitude and constant direction acts on a body of mass m which is initially at rest at a point O on a smooth horizontal surface. The magnitude of F is given by $F=\beta+\alpha t$ where t is the time for which the force has been acting on the distance of the body from O at time t , then s is equal to.

A. $\frac{1}{2m}\left(\beta t+\alpha t^{2}\right)t$

B. $\frac{1}{2m}\left(\beta+\alpha t^{2}\right)$

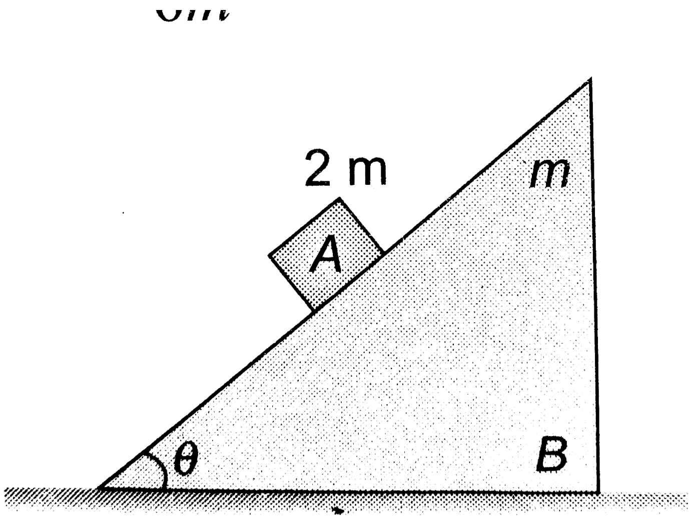
C. $\frac{(\beta+\alpha t)t^{2}}{2m}$

D. $\frac{t^2}{6m}(3\beta + \alpha t)$

Answer: D

Watch Video Solution

32. In the figure if block A and wedge b will move with same acceleration, then the magnitude of normal reaction between the block and the wedge will be (There is no friction between block and the wedge and the wedge moves on horizontal surface as shown.)



A. $2mg / \cosh t\eta$

B. $2mg \cosh t\eta$

C. $mg \cosh t\eta$

D. none of these

Answer: A

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33. A car is moving on a plane inclined at 30° to the horizontal with an acceleration of $10m/s^2$ parallel to the plane upward. A bob is suspended by a string from the roof. The angle in degrees which the string makes with the vertical is: (Assume that the bob does not move relative to car) $\left[g = 10m/s^2\right]$

A. 20°

B. 30°

C. 45°

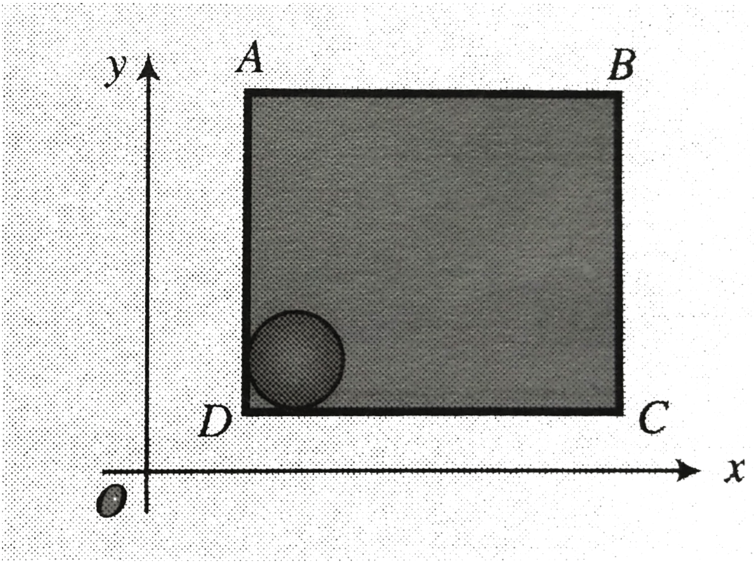
D. 60°

Answer: B

Watch Video Solution

34. A solid sphere of mass 2 kg is resting inside a cube as shown in fig. The cube is moving with a velocity

$\vec{v} = \left(5t\hat{i} + 2t\hat{j}\right)ms^{-1}$. Here t is time in seconds. All surface are smooth. The sphere is at rest with respect to the cube. What is the total force exerted by the sphere on the cube?



A. $\sqrt{29}N$

B. $29N$

C. $26N$

D. $\sqrt{89}N$

Answer: C

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35. A lift of total mass M is raised by cable from rest through a height h . The greatest tension which the cables car safely bear is n Mg. The maximum sped of lift during its journey if the ascent is to made in shortest time is

A. $\sqrt{2gh\left(\frac{n+1}{n}\right)}$

B. $\sqrt{2gh}$

C. $\sqrt{2gh\left(\frac{n}{n+1}\right)}$

D. $\sqrt{2gh\left(\frac{n-1}{n}\right)}$

Answer: D

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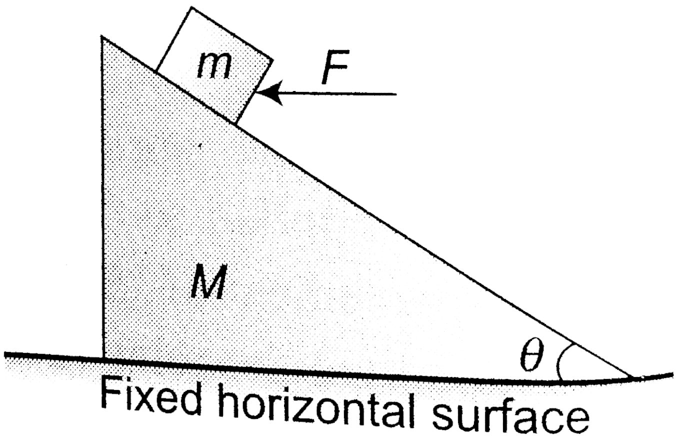
36. A block of mass m lies on wedge of mass M , which lies on fixed horizontal surface. The wedge is free to move on the horizontal surface. A horizontal force of magnitude F is applied on block as shown neglecting friction at all surface, the value of force F such that block has no relative motion w.r.t wedge will be: (Where g is acceleration due to gravity)



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

B. $(M+m)g\cot\theta$

C. $\frac{m}{M}(M+m)g\tan\theta$

D. $\frac{m}{M}(M+m)g\cos\theta$

Answer: C

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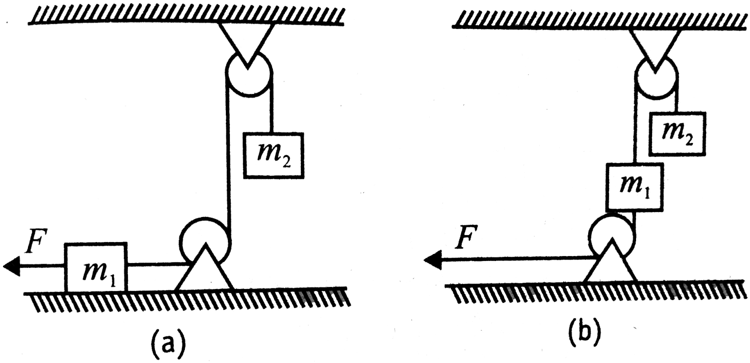
37. The ratio of tensions in the string connected to the block of mass m_2 in figure, respectively, is (friction is absent everywhere):

$[m_1 = 50kg, m_2 = 80kg$ and $F = 1000N]$



A. $7:2$

B. $2 : 7$

C. $3 : 4$

D. $4 : 3$

Answer: C

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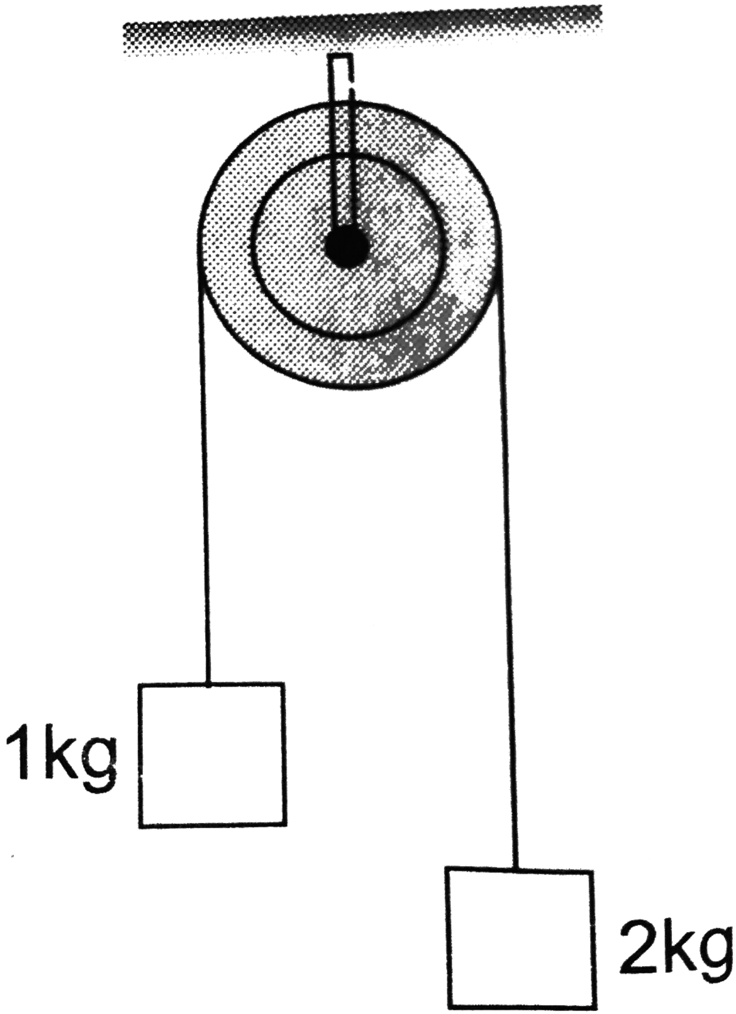
38. Two unequal masses are connected on two sides of a light and smooth pulley as shown in figure. The system is released from rest. The larger mass is stopped 1.0 second after the system is set into motion and then released immediately. The time elapsed before the string is tight again is: Take $g = 10m / s^2$


1kg
2kg

A. $1/4s$

B. $1/2s$

C. $2/3s$

D. $1/3s$

Answer: D

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39. A hockey player is moving northward and suddenly turns westward with the same speed to avoid an opponet. The force that acts on the player is.

A. Frictional force along westward.

B. muscle force along southward.

C. frictional force along south-west.

D. muscle force along souoth-west.

Answer: C

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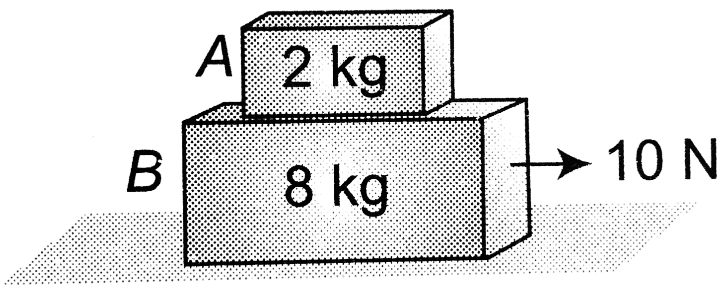
40. Block A of mass $2kg$ is placed over a block B of mass $8kg$. The combination is placed on a rough horizontal surface. If $g = 10ms^{-2}$, coefficient of friction between B and floor $= 0.5$, coefficient of friction between A and $B = 0.4$ and a horizontal force of $10N$ is applied on $8kg$ block, then the force of friction between A and B is.



A. $100N$

B. $50N$

C. $40N$

D. None of these

Answer: D

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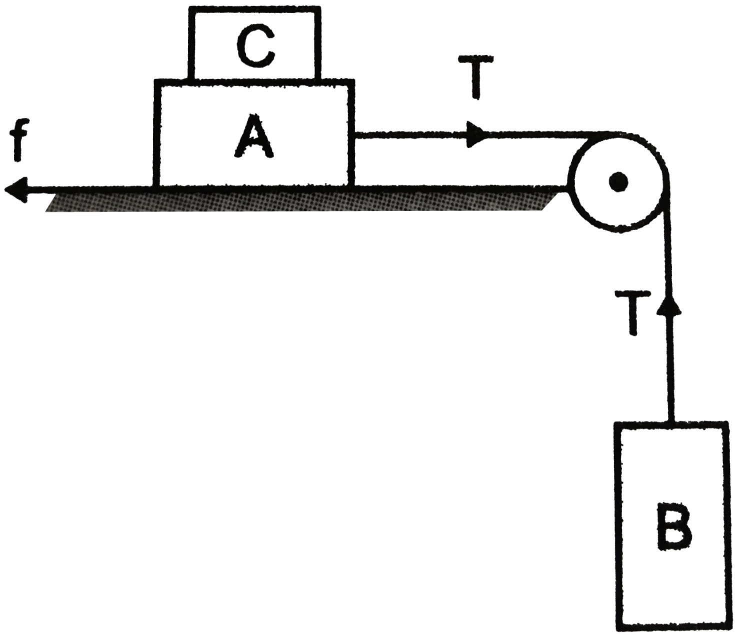
41. In the masses of A and B are 10 kg and 5 kg . Calculate the minimum mass of C which may stop A from slipping Coefficient of static friction between block A and table is 0.2



A. $15kg$

B. $5kg$

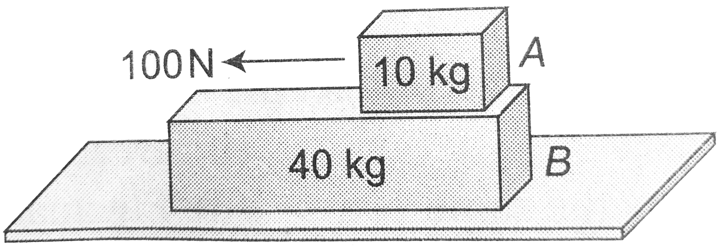
C. $10kg$

D. $0kg$

Answer: A

Watch Video Solution

42. A 40kg slab rests on a frictionless floor as shown in the figure. A 10kg block rests on the top of the slab. The static coefficient of friction between the block and slab is 0.60 while the kinetic friction is 0.40 . The 10kg block is acted upon by a horizontal force 100N. if $g = 9.8m/s^2$, the resulting acceleration of the slab will be.



A. $1.5m / s^{-2}$

B. $2.0m / s^{-2}$

C. $10m / s^{-2}$

D. $1.0m / s^{-2}$

Answer: D

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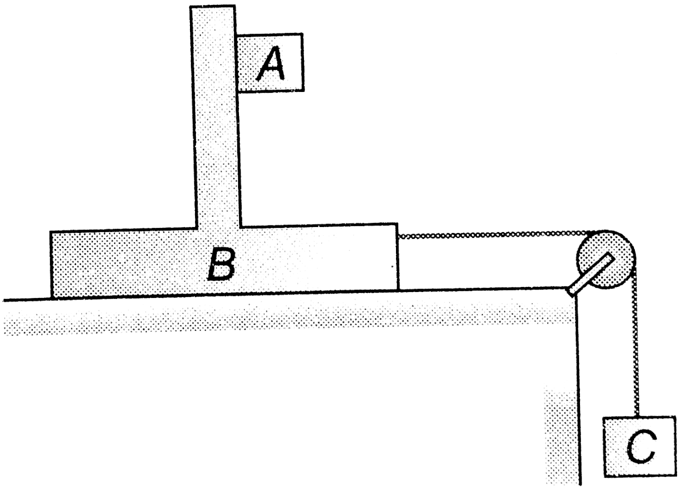
43. In the arrangement shown in the figure mass of the block B and A are $2m$, $8m$ respectively. Surface between B floor is smooth. The block B is connected to block C by means of a pulley. If the whole system is released then the minimum value of mass of the block C so that the block A remains stationary with respect to B is: (Coefficient of friction between A and B is μ and pulley is ideal).



A. $\dfrac{m}{\mu}$

B. $\dfrac{2m}{\mu + 1}$

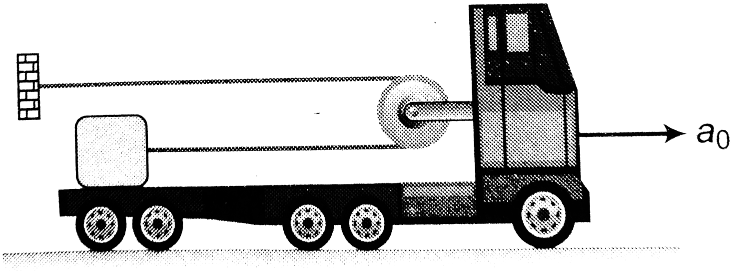
C. $\dfrac{10m}{1 - \mu}$

D. $\dfrac{10m}{\mu - 1}$

Answer: D

Watch Video Solution

44. A flat car is given an acceleration $a_0 = 2m/s^2$ starting from rest. A cable is connected to a crate of weight $50kg$ as shown whose other end is attached to a fixed support on ground. Neglect friction between the floor and the car wheels and also the mass of the pulley. Calcuollate corresponding tension in th cable if $\mu = 0.30$ between the crate and the floor or the car.



A. $350N$

B. $250N$

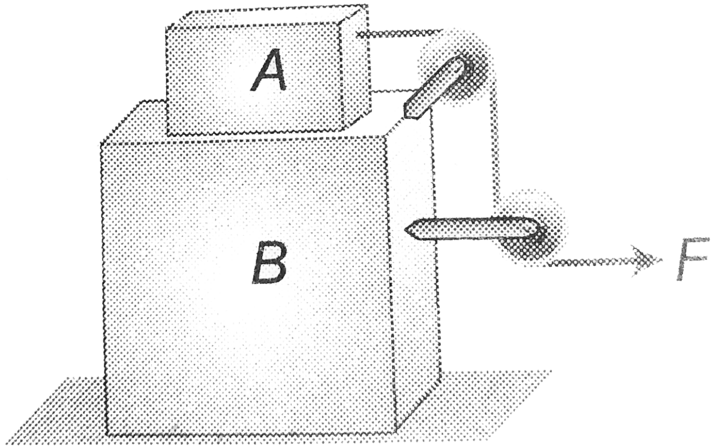
C. $300N$

D. none of these

Answer: A

Watch Video Solution

45. In the arrangement shown in figure, m_A = m_B = 2kg. String is massless and pulley is frictionless. Block B is resting on a smooth horizontal surface, while friction coefficient beteen block A and B is $\mu = 0.5$. the Maximum horizontal force F that can be applied so that block A does not slip over block B is.



A. $25N$

B. $40N$

C. $30N$

D. $20N$

Answer: D

Watch Video Solution

46. The coefficient of friction between the block and the horizontal surface is mu. The block moves toward right under action of horizontal force F (figure-a). Sometime later another force P is applied to the block making an angle theta $\left(such\widehat{t\tan\theta} = \mu\right)$ with vertical as shown in (figure-b). After application of force P , the acceleration of block shall.

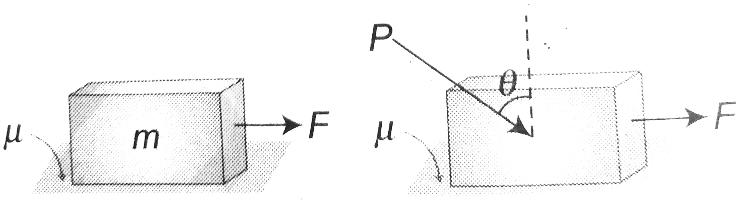


Figure-a Figure-b

A. Increases

B. Decrease

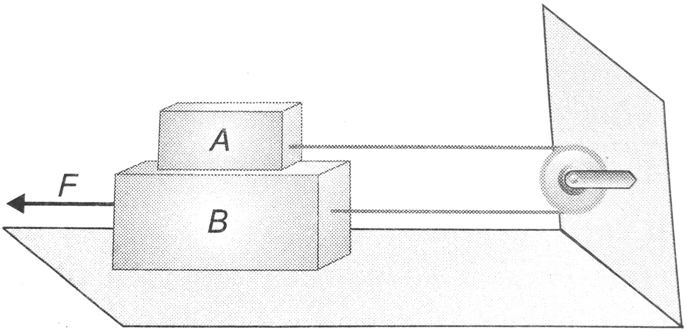
C. remains same

D. information insufficient for drawing inference.

Answer: C

Watch Video Solution

47. Two blocks A and B of masses $m = 10kg$ and $M = 20kg$ respectively are planed on each other and their combination rests on a fixed horizontal surface C . A light string passing over the smooth light pulley is used to contact A and B as shown. The coefficient of sliding friction between all surface in contact is $\mu = \frac{1}{4}$. if A is dragged with a force F then for both A and B to move with a uniform speed we have.



A. $175N$

B. $100N$

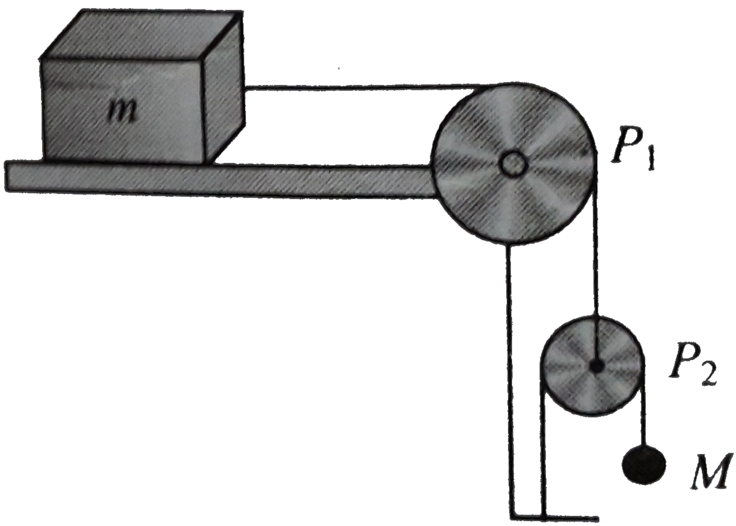
C. $125N$

D. None of these

Answer: A

Watch Video Solution

48. In the pulley arrangement shown in Fig the pulley p_2 is movable .Assuming the coefficient of friction between m and surface to be μu 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

49. A block placed on a horizontal surface is being pushed by a force F making an angle θ with the vertical. If the friction coefficient is μ.

How much force is needed to get the block just started.

A. $\dfrac{\mu m g}{(\sin\theta - \mu\cos\theta)}$

B. $\dfrac{(\sin\theta - \mu\cos\theta)}{\mu m g}$

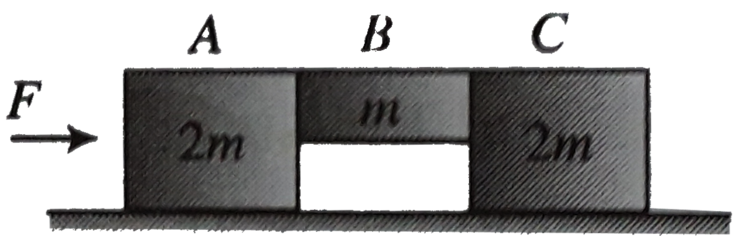
C. $\mu m g$

D. none of these

Answer: A

Watch Video Solution

50. 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 fo 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

51. Assertion: A rocket works on the principle of conservation of linear momentum.

Reason: Wheneven there is a change in momentum of one body, the same change occurs in the momentum of the second body of the same system but in the opposite directio.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

Watch Video Solution

Assertion Reasoning

1. Assertion: Pulling a lawn roller is easier than pushing it.

reason: Pulling increases the apparent weight and hence the force of friction.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

Watch Video Solution

2. Assertion: The familiar equation $mg = R$ for a body on a table is true only if the body is in equilibrium.

reason: The equality of mg and R has no connection with the third law.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of

assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: B

Watch Video Solution

3. Assertion:Mass is a measure of inertia of the body in linear motion.

Reason: Greater the mass, greater is the force required to change its state of rest or of uniform motion.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

Watch Video Solution

4. Assertion:On a merry-go-around, all parts of our body are subjected to an inward force.

Reason: We have a feeling of being pushed outward the direction of impending motion.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: B

Watch Video Solution

5. Assertion:A table cloth can be pulled from a table without dislodging the dishes.

Reason: To every action there is an equal and opposite reaction.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: B

Watch Video Solution

6. Assertion: If external force on a body is zero, its acceleration is zero.

Reason: This is the simple from of Newton's second law of motion.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: C

Watch Video Solution

7. Assertion: Newton's second law of motion given the measurement of force.

Reason: According to Newton's second law of motion, force is directly proportional to the rate of change of momentum.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

Watch Video Solution

8. Assertion: There is no cause-effect relation between action and raction.

Reason: Action and reaction are not simultaneous force.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: C

Watch Video Solution

9. Assertion: The terms action and reaction in the third law of motion stand for simultaneous mutual force between a pair of bodies.

Reason: In this conext action always precede or cause reaction.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: C

Watch Video Solution

10. Assertion: A player lowers his hands while catching a cricket ball and suffers less reaction force.

Reason: The time of catch increases when cricketer lowers hand while catching a ball.

A. If both assertion and reason are ture and reason is the correct explanation of

assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

Watch Video Solution

11. Assertion: If a body is momentarily at rest, it means that force or acceleration are necessarily zero at that instant.

Reason: Force on a body at a given time is determined by the direction of motin only.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of

assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: D

Watch Video Solution

12. Assertion: For applying the second law of motion, there is no conceptual distinction between inanimate and animate objects.

Reason: An animate object requires an external force to acceleration.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: B

Watch Video Solution

13. 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. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: B

Watch Video Solution

14. Assertion: There is no apprecible change in the position of the body during the action of the impulsive force.

Reason: In case of impulsive force the time of action of the force is very short.

A. If both assertion and reason are ture and reason is the correct explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

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NEET Questions

1. A $30gm$ bullet initially at $120m/s$ penetrates $12cm$ into a wooden block. The average block. The average resistance exerted by the wooden block is.

A. $2850N$

B. $2200N$

C. $2000N$

D. $1800N$

Answer: D

Watch Video Solution

2. A player caught a cricket ball of mass $150gm$ moving at a rate of $20m/s$. If the catching process be comleted in $0.1\ s$, then the force of the blow exerted by the ball on the hands of the player is.

A. $0.3N$

B. $30N$

C. $3000N$

D. $3000N$

Answer: B

Watch Video Solution

3. Two bodies of massless string passing over a frictionless pulley. The acceleration of the system is $\left(g = 9.8m / s^2\right)$

A. $4.9m / s^2$

B. $2.45m / s^2$

C. $1.4m / s^2$

D. $9.5m / s^2$

Answer: C

Watch Video Solution

4. A vehicle of mass m is moving on a rough horizontal road with momentum P . If the coefficient of friction between the tyres and the road br mu, then the stopping distance is:

A. $\frac{P}{2\mu mg}$

B. $\frac{P^2}{2\mu mg}$

C. $\frac{P}{2\mu m^2 g}$

D. $\frac{P^2}{2\mu m^2 g}$

Answer: D

Watch Video Solution

5. A man weighing $80kg$ is standing on a trolley weighting $320kg$. The trolley is resting on frictionless horizontal rails. If the man starts walking on the trolley along the rails at speed $1m/s$ (w.r.t. to trolley) then after $4s$ his displacement relative to the ground will be :

A. $5m$

B. $4.8m$

C. $3.2m$

D. $3.0m$

Answer: C

Watch Video Solution

6. A lift of mass $1000kg$ is moving with an acceleration of $1m/s^2$ in upward direction.

Tension developed in the string, which is connected to the lift, is.

A. $9, 800N$

B. $10, 000N$

C. $10, 800N$

D. $11, 000N$

Answer: C

Watch Video Solution

7. A man weighs $80kg$. He stands on a weighing scale in a lift which is moving upwords with a uniform acceleration of $5m/s^2$. What would be the reading on the scale?

A. $400N$

B. $800N$

C. $1200N$

D. Zero

Answer: C

Watch Video Solution

8. A monkey of mass $20kg$ is holding a vertical rope. The rope will not break when a mass of $25kg$ is suspended from it but will break it the mass exeeds $25kg$. What is the maximum acceleration with which the monkey can climb up along the rope? $\left(g = 10m / s^2\right)$.

A. $10m / s^2$

B. $25m / s^2$

C. $2.5m / s^2$

D. $5m/s^2$

Answer: C

Watch Video Solution

9. The coefficient of static friction between the block of 2 kg and the table shown in figure is $\mu_s = 0.2$. What should be the maximum value of m so that the blocks do not move? Take $g = 10\frac{m}{s^2}$. The string and the pulley are light and smooth.

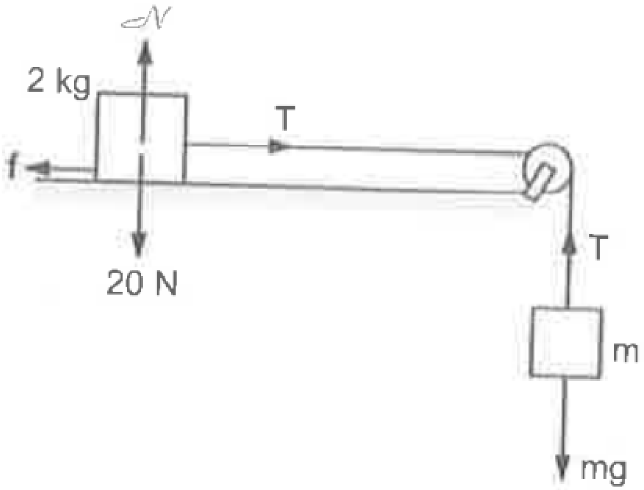


Figure 6-W3

A. $2.0kg$

B. $4.0kg$

C. $0.2kg$

D. $0.4kg$

Answer: D

Watch Video Solution

10. A tube of length L is filled completely with an incomeressible liquid of mass M and closed at both the ends. The tube is then rotated in a horizontal plane about one of its ends with a uniform angular velocity ω. The force exerted by the liquid at the other end is

A. $\frac{ML\omega^2}{2}$

B. $\frac{ML^2\omega}{2}$

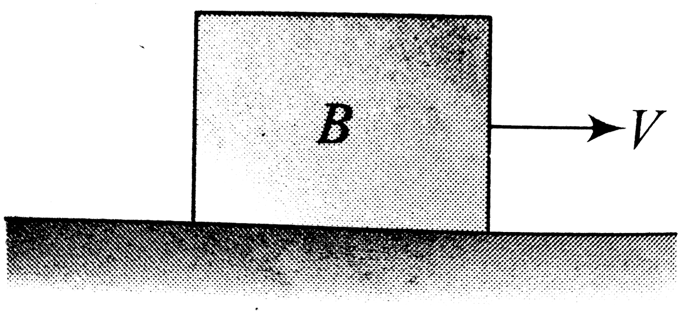
C. $(ML\omega^2)$

D. $\frac{(ML^2\omega)^2}{2}$

Answer: A

Watch Video Solution

11. A block B is pushed momentarily along a horizontal surface with an initial velocity v . If mu is the coefficient of sliding friction between B and the surface, block B will come to rest after a time:



A. $\frac{v}{g\mu}$

B. $\frac{g\mu}{v}$

C. $\frac{g}{v}$

D. $\frac{v}{g}$

Answer: A

Watch Video Solution

12. Sand is being dropped on a conveyor belt at the rate of $M kg / s$. The force necessary to kept the belt moving with a constant with a constant velocity of $v m / s$ will be.

A. Mv newton

B. 2 Mv newton

C. $\frac{Mv}{2}$ newton

D. zero

Answer: A

Watch Video Solution

13. A body, under the action of a force $\overrightarrow{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$, acquires an acceleration of $1ms^{-2}$. The mass of this body must be.

A. $2\sqrt{10}kg$

B. $10kg$

C. $20kg$

D. $10\sqrt{2}kg$

Answer: D

Watch Video Solution

14. The mass of a lift is $2000kg$. When the tension in the supporting cable is $28000N$, then its acceleration is.

A. $30ms^{-2}$ downwards

B. $4ms^{-2}$ upwards

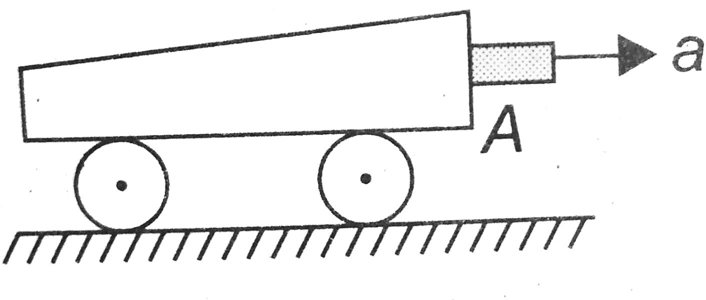
C. $4ms^{-2}$ downwards

D. $14ms^{-2}$ upwards

Answer: B

Watch Video Solution

15. The minimum acceleration that must be impprted to the cart in the figure so that the block A will not fall (given μ is the coefficient if friction between the surface of block and cart) is given by:



A. $a > \frac{mg}{\mu}$

B. $a > \frac{g}{\mu}$

C. $a \geq \frac{g}{\mu}$

D. $a < \frac{g}{\mu}$

Answer: C

Watch Video Solution

16. A gramphone record is revolving with an angular velocity omega. A coin is placed at a distance r from the centre of the record. The static coefficient of friction is mu. The coin will revolve with the record if.

A. $r = \mu g \omega^2$

B. $r < \frac{\omega^2}{\mu g}$

C. $r \leq \frac{\mu g}{\omega^2}$

D. $r \geq \frac{\mu g}{\omega^2}$

Answer: C

Watch Video Solution

17. A person of mass $60kg$ is inside a lift of mass $940kg$ and presses the button on control panel. The lift starts moving upword with an acceleration $1.0m/s^2$. If $g = 10m/s^2$, the tension in the supporting cable is.

A. $9680N$

B. $11000N$

C. $1200N$

D. $8600N$

Answer: C

Watch Video Solution

18. A body mass M hits normally a rigid wall with velocity v and bounces back with the same velocity. The impulse experienced by the body is:

A. $1.5Mv$

B. $2Mv$

C. zero

D. Mv

Answer: B

Watch Video Solution

19. A conveyor belt is moving at a constant speed of $2m/s$. A box is grenty dropped on it. Th ecoefficient of friction between them is $\mu = 0.5$. The distance that the box will move relative to belt before coming to rest on it taking $g = 10ms^{-2}$ is:

A. $1.2m$

B. $0.6m$

C. zero

D. $0.4m$

Answer: D

Watch Video Solution

20. A car of mass $1000kg$ negotiates a banked curve of radius $90m$ on a fictionless road. If the banking angle is 45° the speed of the car is:

A. $10ms^{-1}$

B. $20ms^{-1}$

C. $30ms^{-1}$

D. $5ms^{-1}$

Answer: C

Watch Video Solution

21. A stone is dropped from a height h. It hits the ground with a certain momentum P. If the same stone is dropped from a height

100% more thanthe preyiious height, the momentum when it hits the ground will change by

A. 68%

B. 41%

C. 200%

D. 100%

Answer: B

Watch Video Solution

22. A car of mass m is moving on a level circular track of radius R, if μ_s represents the static friction between the road and tyres of the car, the maximum speed of the car in circular motion is given by.

A. $\sqrt{\mu_s m R g}$

B. $\sqrt{Rg / \mu_s}$

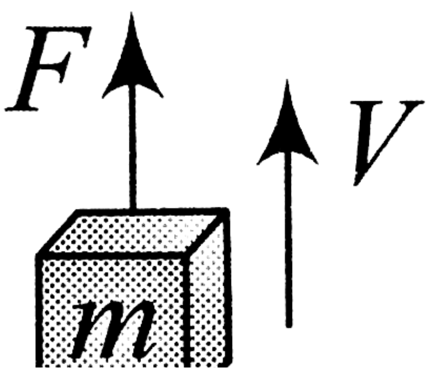
C. $\sqrt{mRg / \mu_s}$

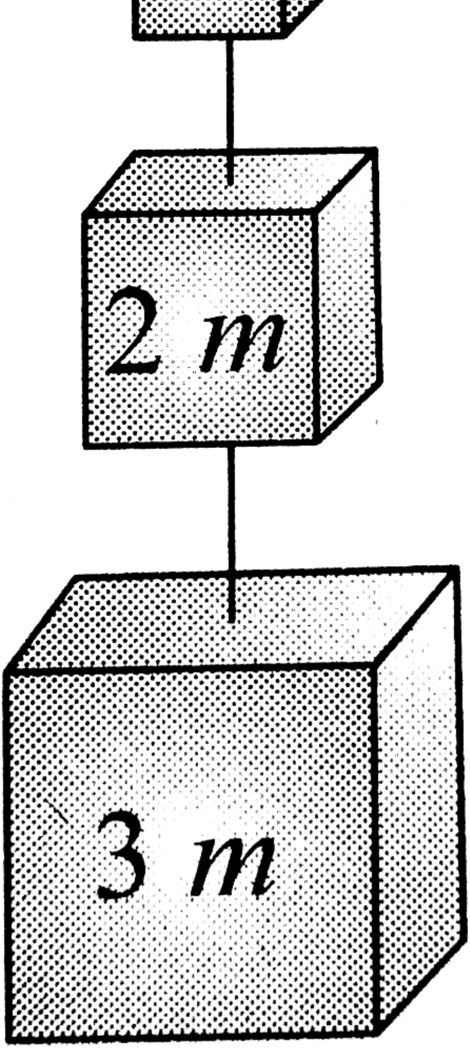
D. $\sqrt{\mu_s R g}$

Answer: D

Watch Video Solution

23. Three blocks with masses m , $2m$ and $3m$ are connected by strings, as shown in the figure. After an upward force F is applied on block m , the masses move upward at costant speed v . What is the net force on the block of mass $2m$? (g is the acceleration due to gravity). ltBrgt





A. Zero

B. $2mg$

C. $3mg$

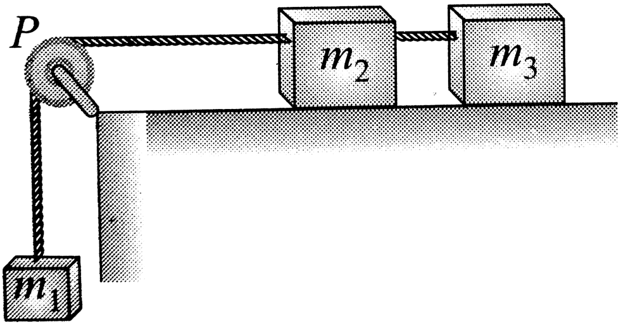
D. $6mg$

Answer: A

Watch Video Solution

24. A system consists of three masses m_1 , m_1 , 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 (Assume $m_1 = m_2 = m_3 = m$).



A. $\dfrac{g(1-2\mu)}{9}$

B. $\dfrac{2g\mu}{3}$

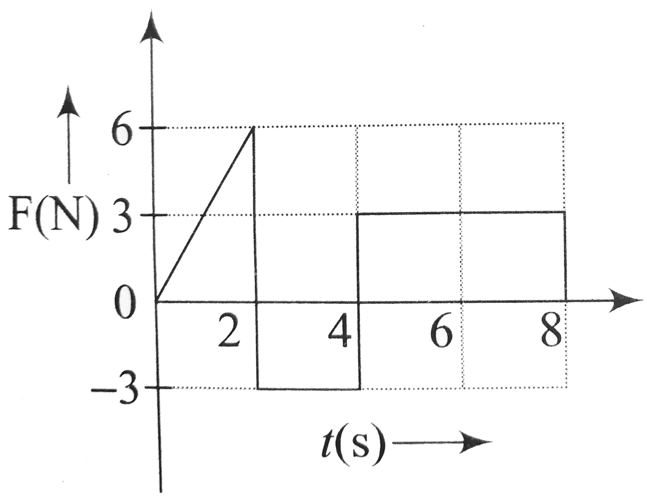
C. $\dfrac{g(1-2\mu)}{3}$

D. $\dfrac{g(1-2\mu)}{2}$

Answer: C

Watch Video Solution

25. The force F acting on a particle of mass m is indicated by the force-time graph shown below. The change in momentum of the particle over time interval from zero to 8 s is.



A. $24Ns$

B. $20Ns$

C. $12Ns$

D. $6Ns$

Answer: C

Watch Video Solution

26. A balloon with mass m is descending down with an acceleration a $(where a < g)$. How much mass should be removed from it so that it starts moving up with an acceleration a?

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

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

C. $\frac{ma}{g+a}$

D. $\frac{ma}{g-a}$

Answer: A

Watch Video Solution

27. A block A of mass m_1 rests on a horizontal table. A light string connected to it passes over a frictionless pulley at the edge of table and from its other end another block B of mass m_2 is suspended. The coefficient of knetic friction between the block and table is μ_k . When the block A is sliding on the table, the tension in the string is.

A. $\frac{(m_2+\mu_k m_1)g}{m_1+m_2}$

B. $\frac{(m_2-\mu_k m_1)g}{m_1+m_2}$

C. $m_1 m_2 \frac{(1+\mu_k)g}{(m_1+m_2)}$

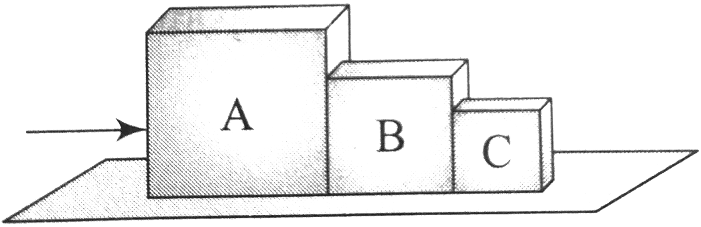
D. $m_1 m_2 \frac{(1-\mu_k)g}{(m_1+m_2)}$

Answer: C

Watch Video Solution

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

B` is.



A. $2N$

B. $6N$

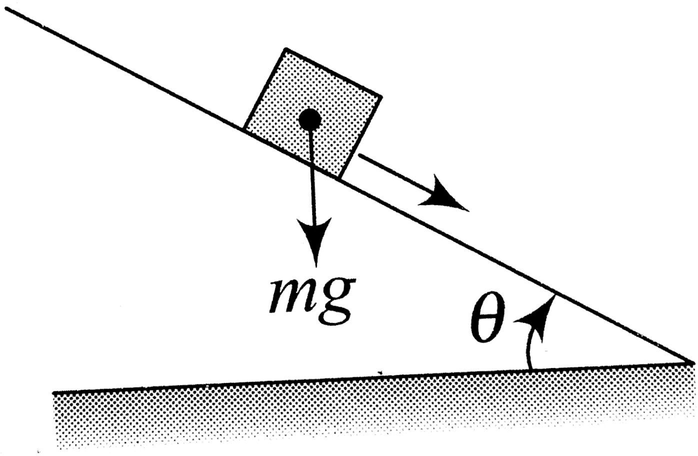
C. $8N$

D. $18N$

Answer: B

Watch Video Solution

29. A plank with a box on it at one end is gradually raised about the other end. As the angle of inclination with the horizontal reaches 30° , the box starts to slip and slide $4.0m$ down the plank in $4.0s$. The coefficients of static and kinetic friction between the box and the plank will be, respectively.



A. 0.4 and 0.3

B. 0.6 and 0.6

C. 0.6 and 0.5

D. 0.5 and 0.6

Answer: C

Watch Video Solution

30. Two stones of masses m and $2m$ are whirled in horizontal circles, the heavier one in a radius $\frac{r}{2}$ and the lighter one in radius r. The tangential speed of light stone is n times that of the value heavier stone when they experience same centripetal forces. The value of n is:

A. 1

B. 2

C. 3

D. 4

Answer: B

Watch Video Solution

31. A car is negotisting a curved road of radius R . The road is banked at an angle theta. The coefficient of friction between the tyres of the car and the road is μ_s . The maximum safe velocity on this road is:

A. $\sqrt{gR^2\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$

B. $\sqrt{gR\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$

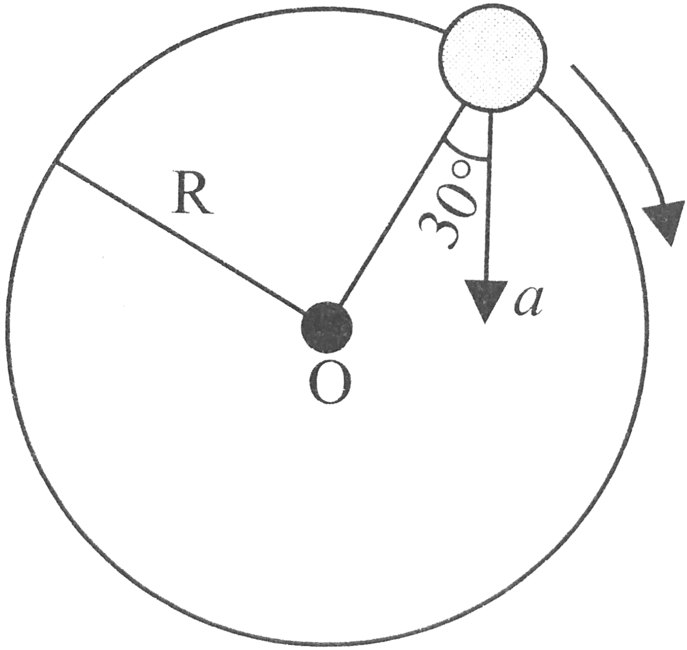
C. $\sqrt{\frac{g}{R}\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$

D. $\sqrt{\frac{g}{R^2}\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$

Answer: B

Watch Video Solution

32. In the given figure, $a = 15m/s^2$ represents the total acceleration of a particle moving in the clockwise direction in a circle of radius $R = 2.5m$ at a given instant of time. The speed of the particle is.



A. $5.7m / s$

B. $6.2m / s$

C. $4.5m/s$

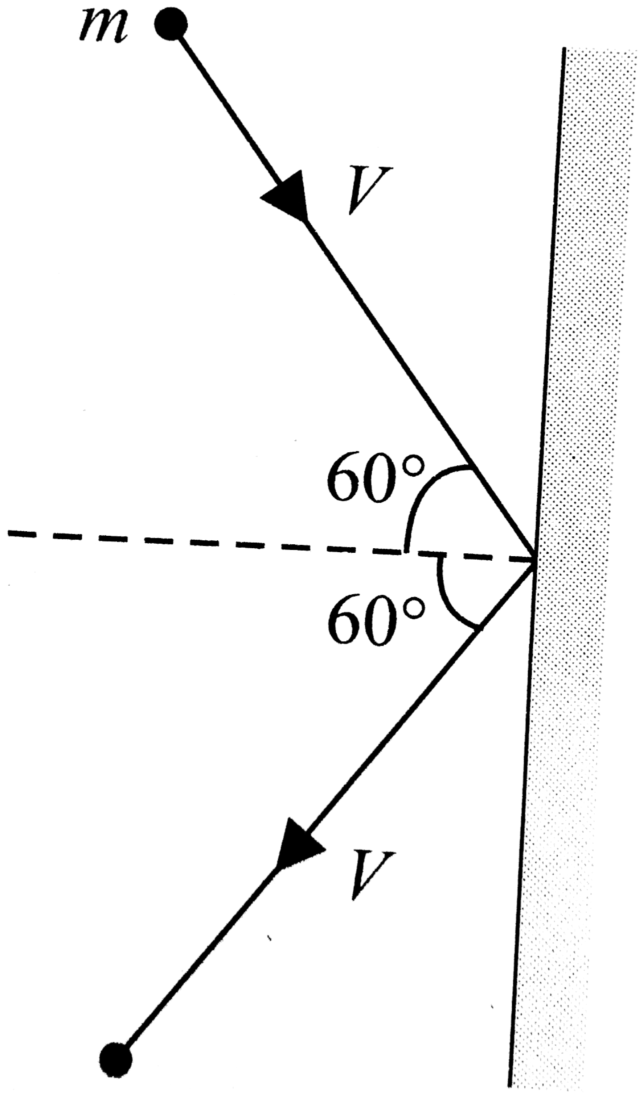
D. $5.0m/s$

Answer: A

Watch Video Solution

33. A riding ball of mass m strikes a rigid wall at 60° and gets reflected without loss of speed as shown in the figure below. The value of impulse imparted by the wall on the ball will

be.



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

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

C. mV

D. $2mV$

Answer: C

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34. A spring of force constant k is cut into lengths of ratio $1:2:3$. They are connected in series and the new force constant is k'. Then they are connected in parallel and force constant is k''. Then k' : k" is :

A. $1:9$

B. $1:11$

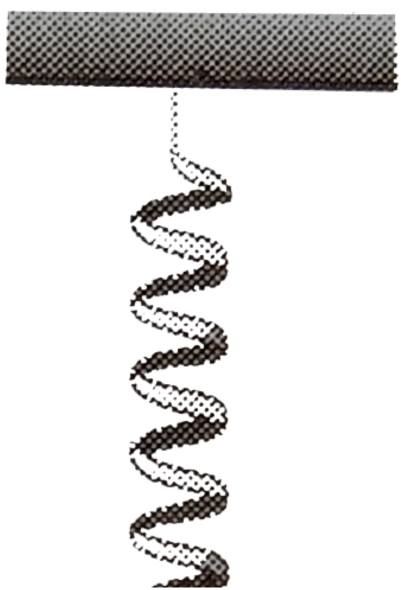
C. $1:14$

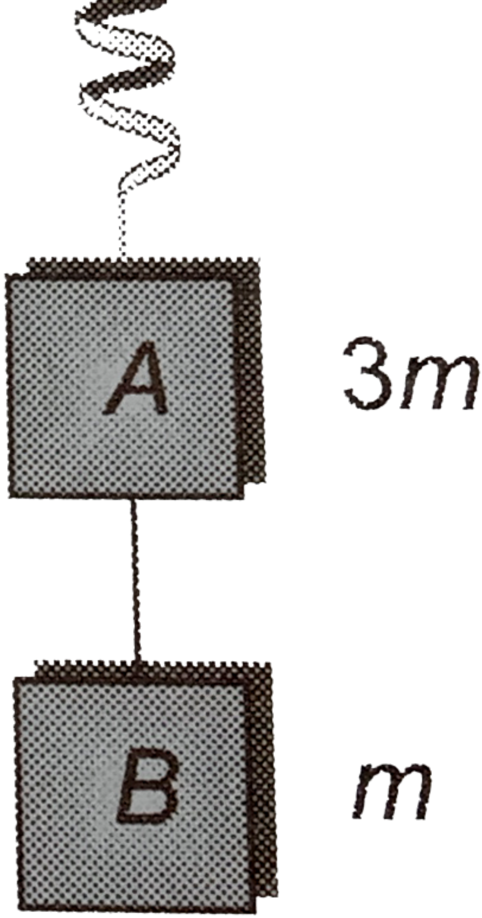
D. $1:16$

Answer: B

Watch Video Solution

35. Two block A and B of masses $3m$ and m respectively are connected by a massless and nextensible string. The whole system is suspended by a massless spring as shown in figure. The magnitudes of acceleration of A and B immediately after the string is cut, are resectively





A. $\frac{g}{3}, g$

B. g, g

C. $\frac{g}{3}, \frac{g}{3}$

D. $g, \frac{g}{3}$

Answer: A

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36. One end of string of length l is connected to a particle on mass m and the other end is connected to a small peg on a smooth horizontal table. If the particle moves in circle with speed v the net force on the particle (directed toward centre) will be (T reprents the tension in the string):

A. $T+\frac{mv^2}{1}$

B. $T-\frac{mv^2}{1}$

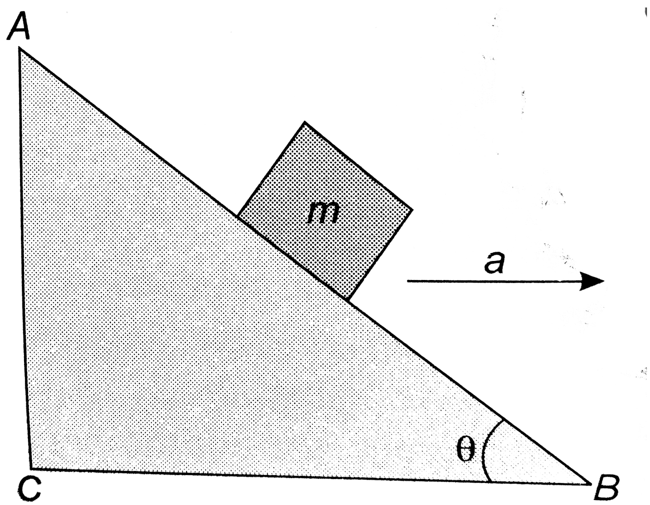
C. zero

D. T

Answer: D

Watch Video Solution

37. A block of mass m is placed on a smooth inclined wedge ABC of inclination theta as shown in the figure. The wedge is given an acceleration a towards the right. The relation between a and theta for the block to remain stationary on the wedge is.



A. $a = g \tan \theta$

B. $a = \dfrac{g}{\cos ec\theta}$

C. $a = \cos \theta$

D. $a = \dfrac{g}{\sin \theta}$

Answer: A

Watch Video Solution

38. Which one of the following statements is incorrect?

A. Coefficient of sliding friction has dimension of length.

B. Rolling friction is smaller than the sliding friction.

C. Friction force opposes the relative motion.

D. Limiting value of static friction is directly proportional to normal reaction.

Answer: A

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AIIMS Questions

1. When the two surface are coated with the lubricant, the they will

A. roll upon each other

B. stick to each other

C. slide upon each other

D. none of the above

Answer: C

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2. A stone tied to a string is rotated with a uniform speed in a vertical plane. If mass of the stone is m, the length of the string is r and linear speed of the stone is v when the stone is at its lowest point, then the tension in the string will be

(g= acceleration due to gravity)

A. mg

B. $\frac{mv^2}{r} - mg$

C. $\frac{mv}{r}$

D. $\frac{mv^2}{r} + mg$

Answer: D

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3. If a ladder weighting $250N$ is placed against a smooth vertical wall having coefficient of friction between it and floor 0.3, then what is the maximum force of friction available at the point of contact between the ladder and the floor?

A. $75N$

B. $50N$

C. $35N$

D. $25N$

Answer: A

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4. A block of mass $10kg$ is placed on a rough horizontal surface having coefficient of friction $\mu = 0.5$. If a horizontal force of $100N$ is acting on it, then acceleration of the will be.

A. $0.5m / s^2$

B. $5m / s^2$

C. $10m / s^2$

D. $15m / s^2$

Answer: B

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5. 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 upward with uniform velocity

C. When the elevator moves downward with constant acceleration

D. When the elevator moves downward with uniform velocity

Answer: C

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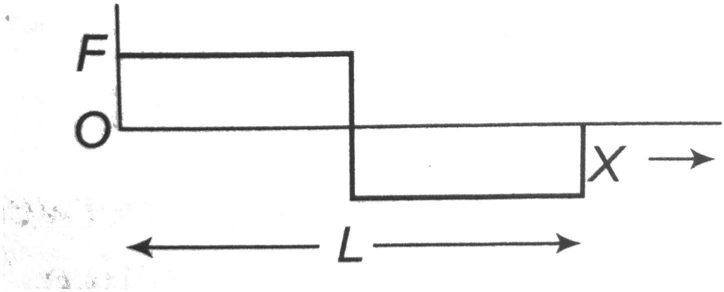
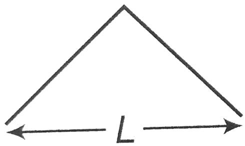
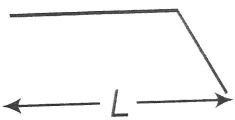
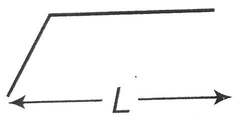
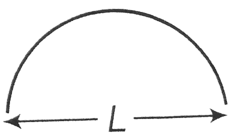
6. A person used force (F), shown in figure to move a load with constant velocity on given surface. Identify the correct surface profile:



A. 

B. 

C. 

D. 

Answer: A

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7. A smooth block is released at rest on a 45° incline and then slides a distance d. The time taken to slide is n times as much to slide on rough incline than on a smooth incline. The coefficient of friction is

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

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

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

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

Answer: C

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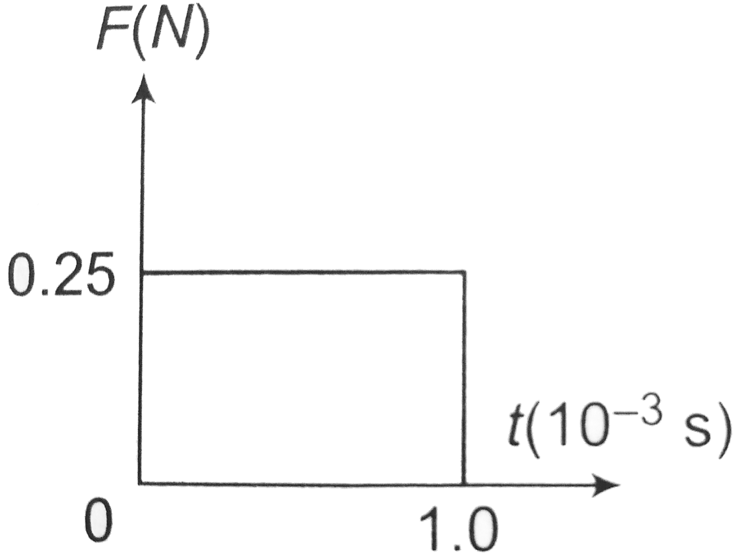
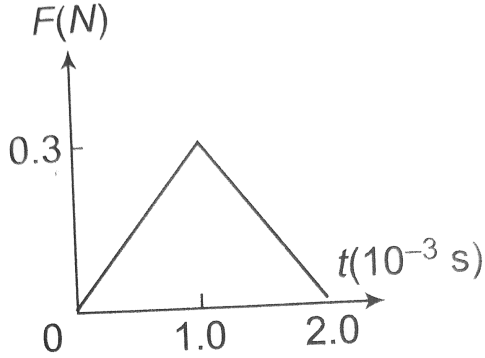
8. Figures I, II, III, and IV depict variation of force with time. The impulse is highest in the case of situations depicted. Figure(s).



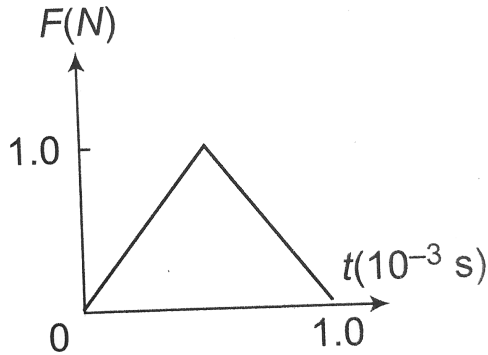
F(N)
0.25
t(10−3 s)
0
1.0

,

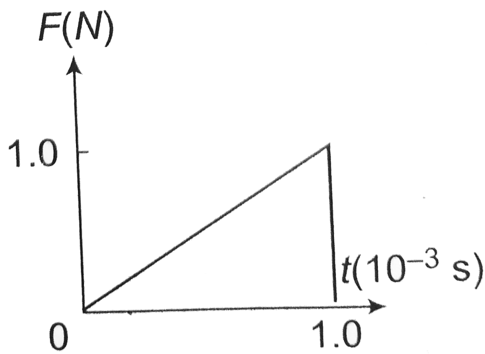
(II)



(III)



(IV)



A. I and II

B. III and I

C. III and IV

D. IV only

Answer: C

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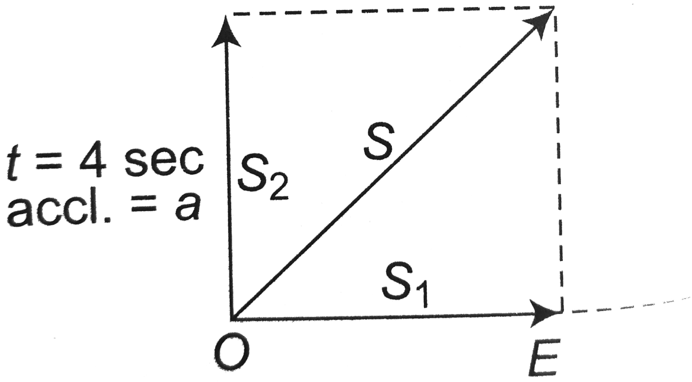
9. A body mass $2kg$ has an initial velocity of 3 metre//sec along OE and it is subject to a force of $4N$ in a direction perpendicular to OE. The distance of body from O after 4 sec will be:



A. $12m$

B. $20m$

C. $8m$

D. $48m$

Answer: B

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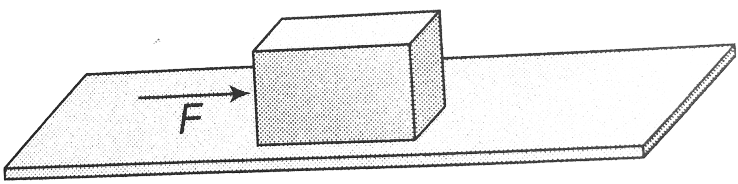
10. A block of mass $2kg$ is kept on the floor. The coefficient of static friction is 0.4 . If a force F of $2.5N$ is applied on the block as shown in the figure, the frictional force between the block and the floor will be.



A. $2.5N$

B. $5N$

C. $7.84N$

D. $10N$

Answer: A

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11. A car is moving along a straight horizontal road with a speed v_0 . If the coefficient of friction between the tyre and the road is μ, the shortest distance in which the car can be stopped is.

A. $\frac{v_0^2}{2\mu g}$

B. $\frac{v_0}{\mu g}$

C. $\left(\frac{v_0}{\mu g}\right)^2$

D. $\frac{v_0}{\mu}$

Answer: A

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12. A motorcycle is going on an overbridge of radius R. The driver maintains a constant speed. As the motorcycle is ascending on the overbridge, the normal force on it

A. Increases

B. Decreases

C. remain the same

D. fluctuates

Answer: A

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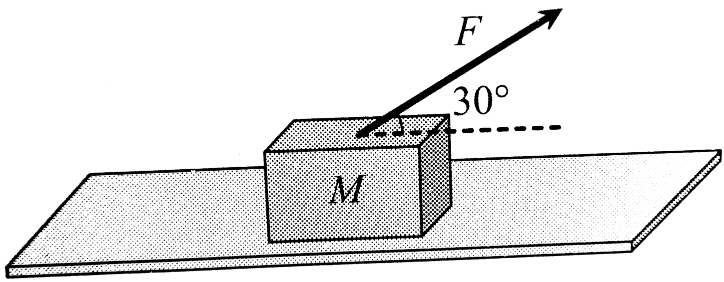
13. A block of mass $m = 5kg$ is resting on a rough horizontal surface for which the coefficient of friction is 0.2 . When a force $F = 40N$ is applied, the acceleration of the block will be $\left(g = 10m / s^2\right)$.



A. $5.73m / \sec^2$

B. $8.0m / \sec^2$

C. $3.17m / \sec^2$

D. $10.0m / \sec^2$

Answer: A

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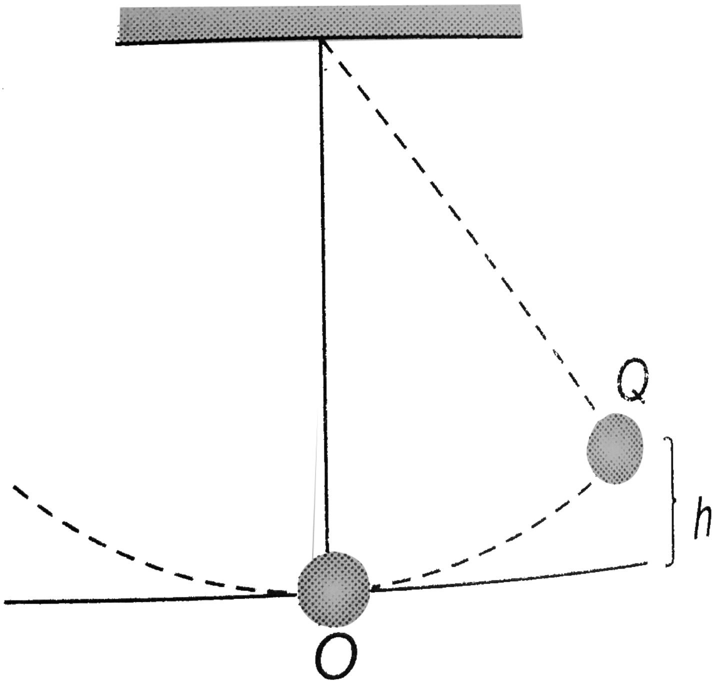
14. The bob of a simple pendulum it displaced position O to a equilibrium position Q which is at height h above O and the bob to then mass released Assuming the mass of the bob is m and time period 2.0 sec of oscillation to be string when the bob passes through O is



A. $m\left(g+\pi\sqrt{2gh}\right)$

B. $m\left(g+\sqrt{\pi^2 gh}\right)$

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

D. $m\left(g+\sqrt{\frac{\pi^2}{3}gh}\right)$

Answer: A

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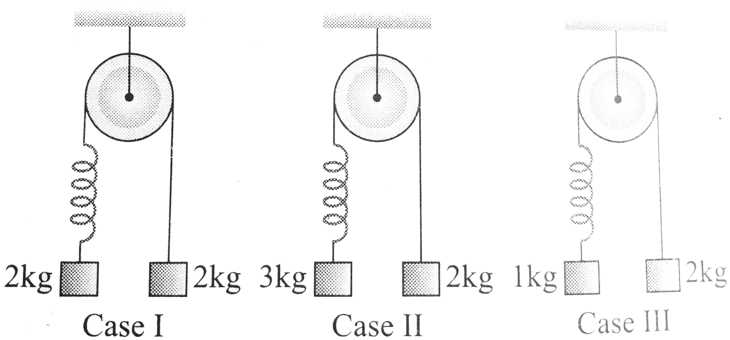
15. Consider three cases, same spring is attached with $2kg$, $3kg$ and $1kg$ blocks as shown in figure. If x_1 , x_2 , x_3 be the extensions in the spring in the three cases, then.



A. $x_2 > x_1 > x_3$

B. $x_1 > x_2 > x_3$

C. $x_1 = 0, x_3 > x_2$

D. $x_3 > x_2 > x_1$

Answer: A

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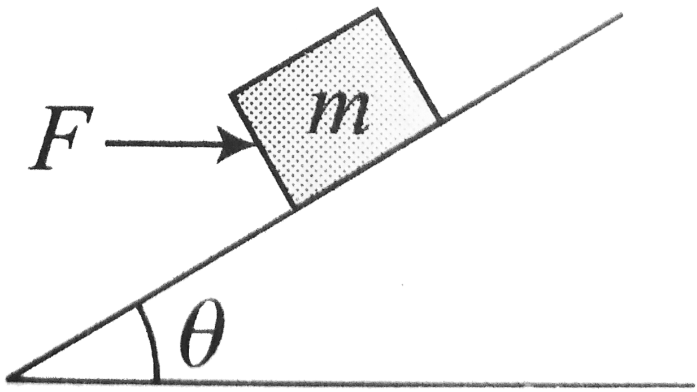
16. A horizontal force acting on a block of mass m which is placed on an inclined plane (as shown in the figure). What is the normal reaction N on the block?



A. $mg\sin\theta + F\cos\theta$

B. $mg\cos\theta - F\sin\theta$

C. $mg\cos\theta + F\sin\theta$

D. $mg\sin\theta - F\cos\theta$

Answer: C

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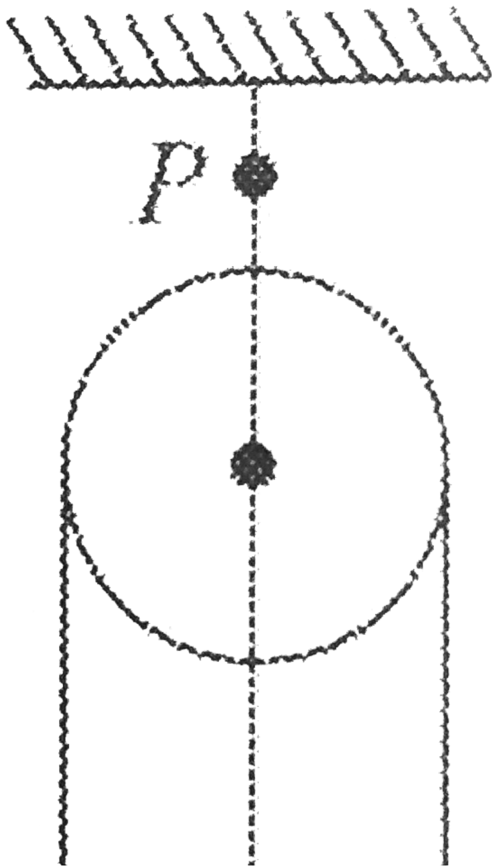
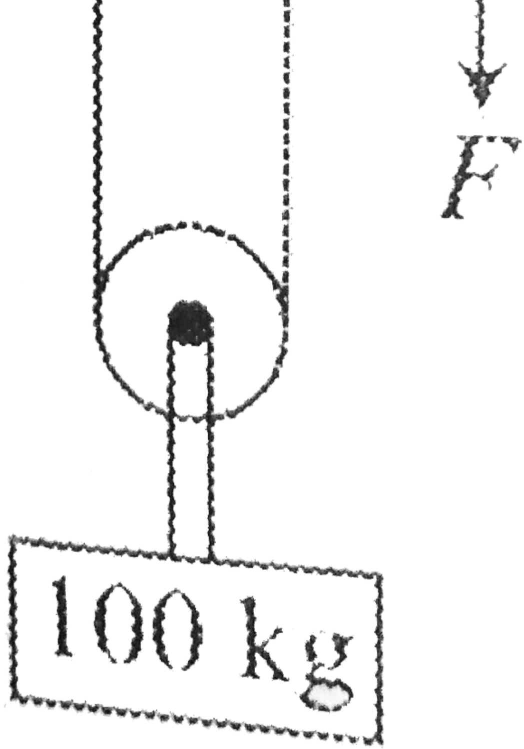
17. In the diagram $100 kg$ block is moving up with constant velocity, then find out the tension at point P :





A. $1330N$

B. $490N$

C. $1470N$

D. $980N$

Answer: C

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18. A Rocket having initial mass $5 \times 10^6 kg$, which include mass of fuel of mass $4 \times 10^6 kg$ is ejecting gas with velocity $4000m/s$ relative to Rocket when entire fuel finishes?

A. $6438m/s$

B. $4500m/s$

C. $3785m/s$

D. $4000m/s$

Answer: A

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19. Assertion: A rocket moves forward by pushing the surrounding air backwards.

Reason: It derives the necessary thrust to move forward according to Newton's third law of motion.

A. If both assertion and reason are ture and reason is a true explanation of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

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20. Assertion: The driver in a vechile moving with a constant speed on a straight road is in a non-inertial fram of reference.

Reason: A reference frame in which Newton's law of motion are applicable is non-inertial.

A. If both assertion and reason are ture and reason is a true explanation of assertion.

B.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: C

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21. Assertion: The driver in a vechile moving with a constant speed on a straight road is in a non-inertial frame of reference.

Reason: A reference frame in which Newton's law of motion are applicable is non-inertial.

A. If both assertion and reason are ture and reason is a true explanation of assertion.

B.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: C

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22. Assertion: A man in a dosed cabin falling freely does not experience gravity.

Reason: Inertial and gravitational mass have equivalence.

A. If both assertion and reason are ture and reason is a true explanation of assertion.

B.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

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23. Assertion: Two bodies of masses M and $m(M > m)$ are allowed to fall from the same height if the air resistance for each be the same then both the bodies will reach the earth simultaneously.

Reason: For same air resistance, acceleration of both the bodies will be same.

A. If both assertion and reason are true and reason is a true explanation of assertion.

B. if reason is true but assertion is false

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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24. Assertion: Friction is a self-adjusting force.

Reason: Friction does not depend upon mass of the body

A. If both assertion and reason are ture and reason is a true explanation of assertion.

B.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: D

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25. Assertion: There is no apprecible change in the position of the body during the action of the impulsive force.

Reason: In case of impulsive force the time of action of the force is very short.

A. If both assertion and reason are ture and reason is a true explanation of

assertion.

B.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

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26. Assertion: On a rainy day, it is difficult to drive a car or bus at high speed.

Reason: The value of coefficient of friction is lowered due to wetting of the surface.

A. If both assertion and reason are ture and reason is a true explanation of assertion.

B.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

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Chapter Test

1. A body of mass $2kg$ is moving towards east with a uniform speed of $2ms^{-1}$. A force of $3N$ is applied to it towards north. The magnitude of the displacement of the body $2s$ after the application of force is.

A. $4m$

B. $5m$

C. $6m$

D. $7m$

Answer: B

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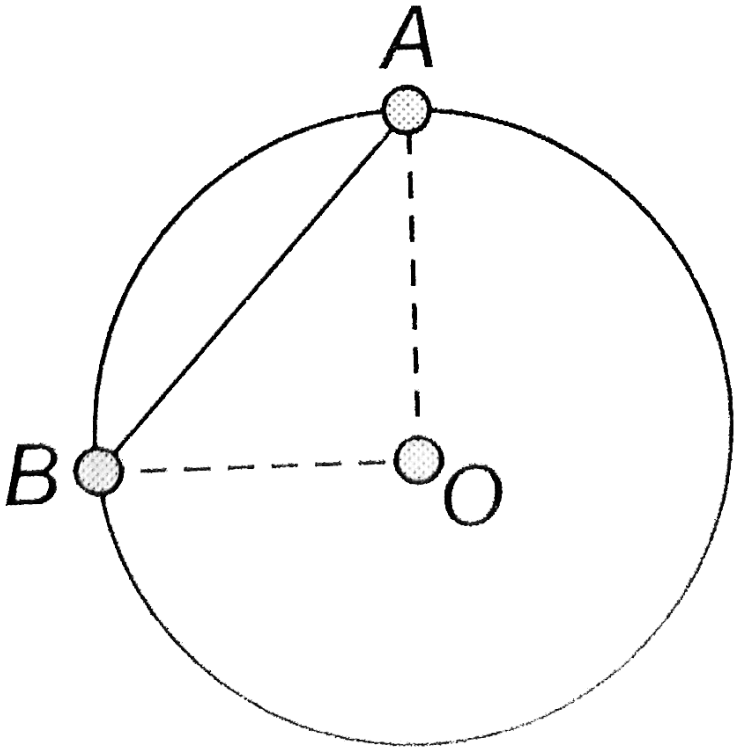
2. Beads A and B each of mass m , are connected by a light inextensible cord. They are constrained (restricted) to move on a frictionless ring in a vertical plane as shown. The beads are released from rest at the position shown. The tension in the cord just after the release is.



A. $\sqrt{2}mg$

B. mg

C. $\dfrac{mg}{\sqrt{2}}$

D. $2mg$

Answer: C

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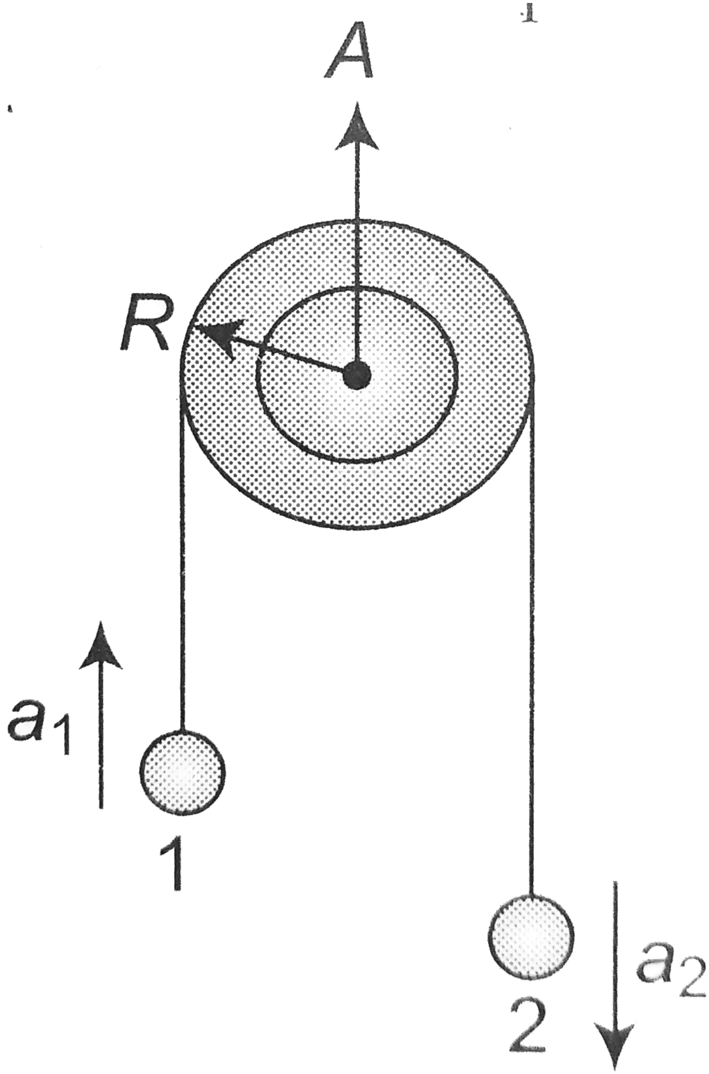
3. Two masses are connected by a string which passes over a pulley acceleration upward at a rate A shown. If a_1 and a_2 be the accelerations of bodies 1 and 2 respectively then,



A. $A = (a_1 + a_2)$

B. $A = (a_1 - a_2)$

C. $A = \frac{a_1 + a_2}{2}$

D. $A = \frac{a_1 - a_2}{2}$

Answer: D

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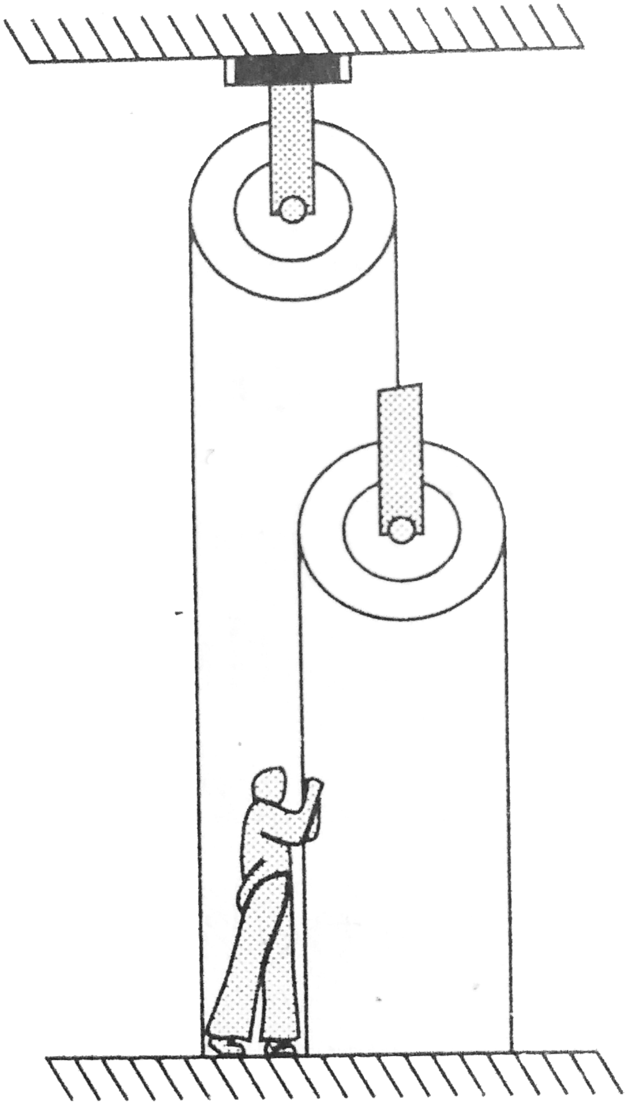
4. In the figure shown the force with which the man should pull the rope to hold the plank in position is F . If weight of the man is $60kgf$, the plank and pulleys have negligible masses, then.



A. $F = 150N$

B. $F = 300N$

C. $F = 600N$

D. $F = 1200N$

Answer: A

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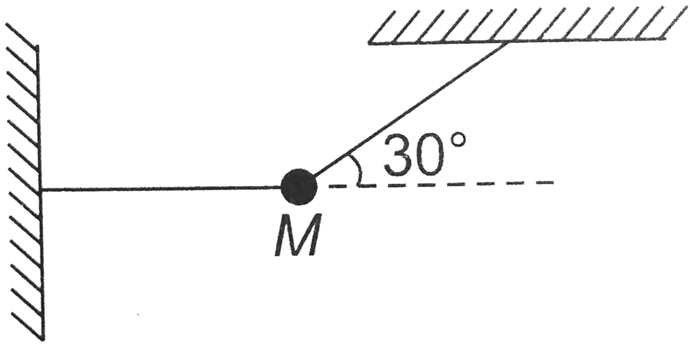
5. A mass M is hung with a light inextensible string. Tension in horizontal part of string is.



A. $\sqrt{3}Mg$

B. $\sqrt{2}Mg$

C. $\dfrac{mg}{\sqrt{3}}$

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

Answer: A

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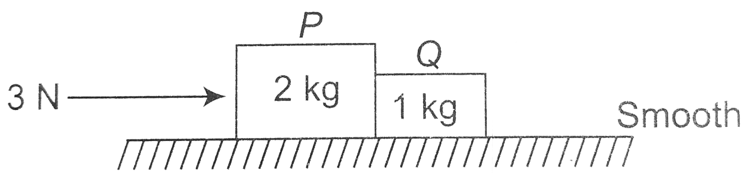
6. Two masses rest on smooth surface as shown in the figure. Force exerted by P on Q is.



A. $1.5N$

B. $1N$

C. $2N$

D. $3N$

Answer: B

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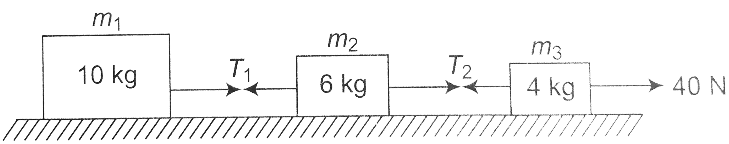
7. There blocks of masses m_1 , m_2 and m_3 are connected by may less unstretchable strings on a smooth surface. Tension T_2 is.



A. $2.3N$

B. $32N$

C. $23N$

D. $3.2N$

Answer: B

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8. A body, under the action of a force $\overrightarrow{F} = 6\hat{i} - 8\hat{j} + 10\hat{k}$, acquires an acceleration of $1ms^{-2}$. The mass of this body must be.

A. $10\sqrt{2}kg$

B. $2\sqrt{10}kg$

C. $10kg$

D. $30kg$

Answer: A

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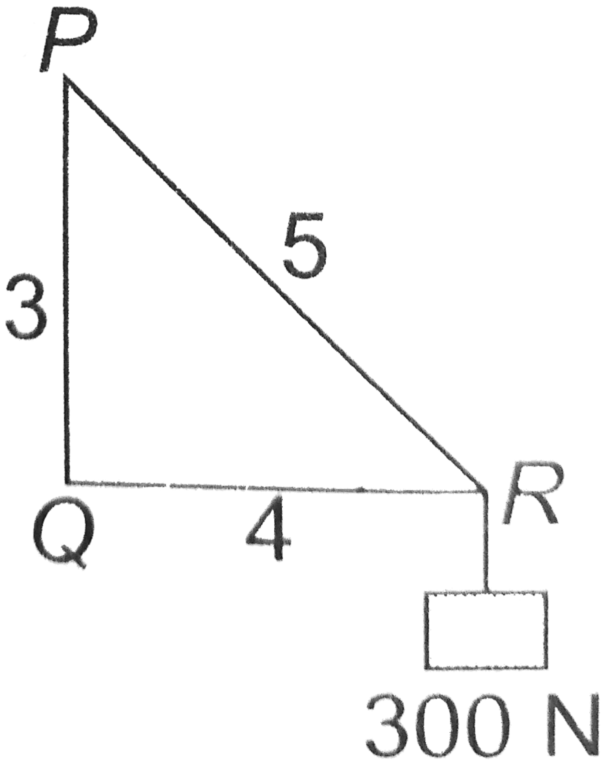
9. Three light rods from a right angled triangle. The tension in the rod PR, if a force of

$300 N$ is applied vertically downward at R is.



A. $400 N$

B. $200 N$

C. $300 N$

D. $500N$

Answer: D

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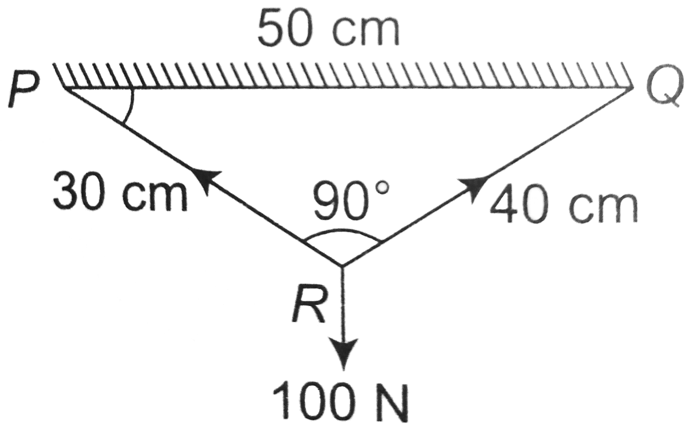
10. A light string of $70cm$ has its two ends tied at the same level $50cm$ apart. A force of $100N$ is applied at a distance of $30cm$ from P . The tension in part PR is.



A. $18N$

B. $8N$

C. $0N$

D. $80N$

Answer: D

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11. A person holds a spring balance with a mass m hanging from it goes up and up in a helicopter, then reading of weight of body as indicated by spring balance will.

A. be increasing

B. be decreasing

C. first increase and then decrease

D. remain the same.

Answer: D

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12. Two equal masses are kept on the pans of a simple balance in a lift acceleration upward. Then.

A. Pans will remain at the same level

B. Nothing can be said as data is incomplete

C. left side pan will lower down.

D. Right side pan will lower down.

Answer: A

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13. The force required to just move a body up an inclined plane is double the force the required prevent it from sliding down. If phi is angle of friction and theta is the angle which incline makes with the horizontal then,

A. $\tan\theta = \tan\phi$

B. $\tan\theta = 2\tan\phi$

C. $\tan\theta = 3\tan\phi$

D. $\tan\phi = 2\tan\theta$

Answer: C

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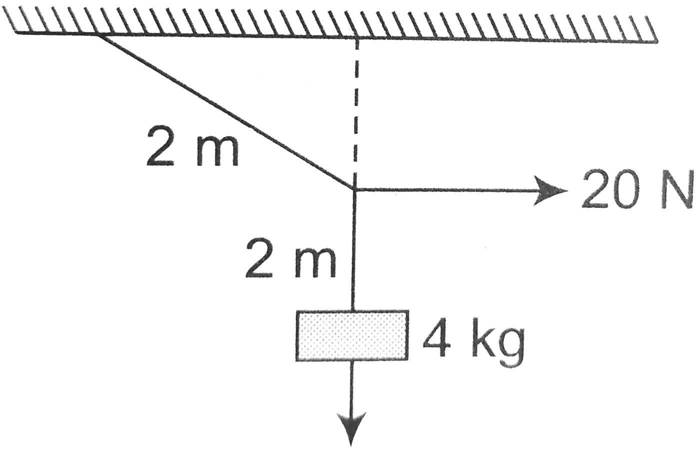
14. A mass of $4kg$ is suspended by a rope of length $4m$ from a ceiling. A force of $20N$ in the horizontal direction is applied at the mid-point of the rope as shown in figure. What is the angle which the rope makes with the vertical in equilibrium? Neglect the mass of the rope. Take $g = 10 m s^{-2}$.



A. $\tan^{-1} 2$

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

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

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

Answer: B

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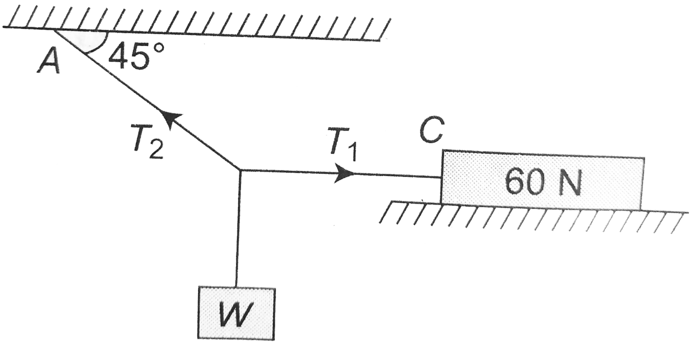
15. In the figure, a block of weight $60N$ is placed on a rough surface. The coefficient of friction between the block and the surface is 0.5 . What should be the weight W such that the block does not slip on the surface?



A. $60N$

B. $\frac{60}{\sqrt{2}N}$

C. $30N$

D. $\frac{30}{\sqrt{2}N}$

Answer: C

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16. A rocket is going upward with acceleration motion. A man sitting in it feels his weight increased 5 times his own weight. If the mass of the rocket including that of the man is $1.0 \times 10^4 kg$, how much force is being applied by rocket engine? (Take $g = 10ms^{-2}$).

A. $5 \times 10^4 N$

B. $5 \times 10^5 N$

C. $5 \times 10^8 N$

D. $2 \times 10^4 N$

Answer: B

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17. A body is moving under the action of two force $\overrightarrow{F_1} = 2\hat{i} - 5\hat{j}$, $\overrightarrow{F_2} = 3\hat{i} - 4\hat{j}$. It's velocity will become uniform under a third force $\overrightarrow{F_3}$ given by.

A. $5\hat{i} - \hat{j}$

B. $-5\hat{i}-\hat{j}$

C. $5\hat{i}+\hat{j}$

D. $-5\hat{i}+9\hat{j}$

Answer: D

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18. A body of mass $10kg$ is acted upon by two perpendicular force, $6N$. The resultant acceleration of the body is.

A. $1 m s^{-2}$ at an angle of $\tan^{-1}\left(\frac{3}{4}\right)$ w.r.t. $8N$ force

B. $0.2 m s^{-2}$ at an angle of $\tan^{-1}\left(\frac{3}{4}\right)$ w.r.t. $8N$ force

C. $1 m s^{-2}$ at an angle of $\tan^{-1}\left(\frac{4}{3}\right)$ w.r.t. $8N$ force

D. $0.2 m s^{-2}$ at an angle of $\tan^{-1}\left(\frac{4}{3}\right)$ w.r.t. $8N$ force

Answer: A

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

A. $2.5m / s^{2}$

B. $5m / s^{2}$

C. $7m / s^{2}$

D. $10m / s^2$

Answer: A

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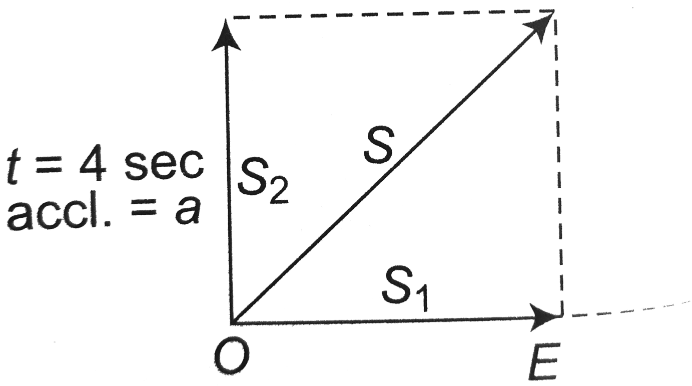
20. A body mass $2kg$ has an initial velocity of 3 metre//sec along OE and it is subject to a force of $4N$ in a direction perpendicular to OE. The distance of body from O after 4 sec will be:



A. 12 metres

B. 20 metres

C. 8 metres

D. 48 metres

Answer: B

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21. A force of $100N$ need to be applied parallel to a smooth inclined plane just to hold a body on it. The angle of inclination of the inclined plane is plane is 30° . How much horizontal force need to be applied to do the same?

A. $50N$

B. $87N$

C. $100N$

D. $115N$

Answer: D

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22. A plumb bob is hung from the ceiling of a train compartment. The train moves on an inclined track of inclination 30° with horizontal. Acceleration of train up the plane is $a = g/2$. The angle which the string supporting the bob makes with normal to the ceiling in equilibrium is.

A. 30°

B. $\tan^{-1}(2/(\sqrt{3})$

C. $\tan^{-1}(\sqrt{3}/2)$

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

Answer: B

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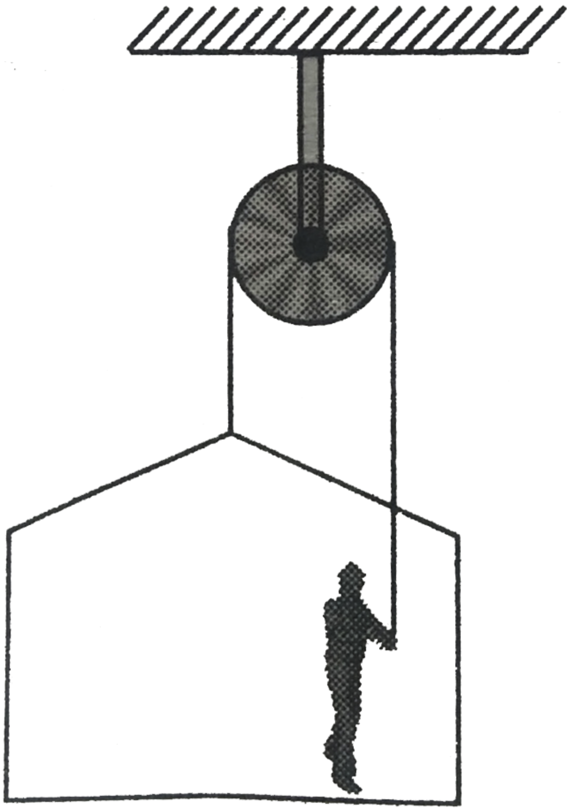
23. A man is raising himself and the crate on which he stands with an acceleration of $5ms^{-2}$ by a massless rope-and-pulley arrangement. Mass of the man is 100kg and that of the crate is 50 kg. If $g = 10ms^{-2}$, then the tension in the rope is



A. $2250N$

B. $1125N$

C. $750N$

D. $375N$

Answer: B

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24. A balloon of mass M is descending at a constant acceleration α. When a mass m is released from the balloon, it starts rising with the same acceleration α. Assuming that its volume does not change, what is the value of m?

A. $\dfrac{\alpha}{\alpha+g}M$

B. $\dfrac{2\alpha}{\alpha+g}M$

C. $\dfrac{\alpha+g}{\alpha}M$

D. $\dfrac{\alpha+g}{2\alpha}M$

Answer: B

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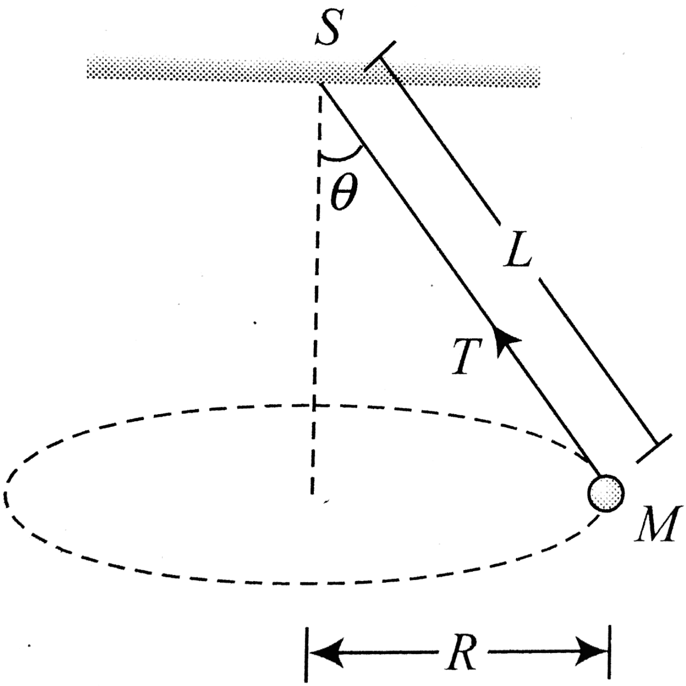
25. A string of length L is fixed at one end and carries a mass M at the other end. The string makes $2/\pi$ revolution per second around the vertical axis through the fixed end as shown in the figure, then tension in the string is.



A. ML

B. 2ML

C. 4ML

D. 16ML

Answer: D

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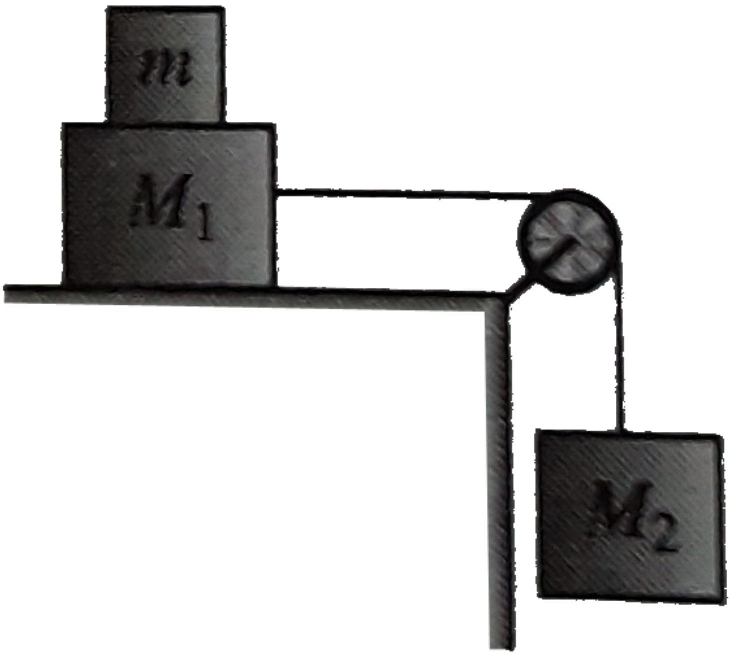
26. Two block of masses M_1 and M_2 are connected with a string passing over a pulley as shown in figure The block M_1 lies on a horizontal surface friction between the block M_1 and the horizontal surface is μ The system accelerates. What additional mass m should be placed on the block M_1 so that the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



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

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

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

D. $(M_2 - M_1)\mu$

Answer: B

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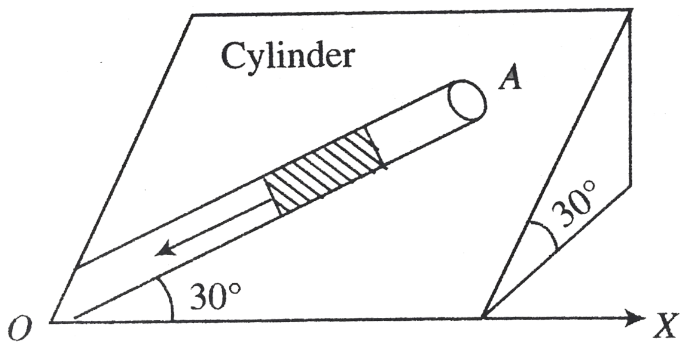
27. An inclined plane makes an angle 30° with the horizontal. A groove (OA) of length 5m cut in the plane makes an angle 30° with OX. A short smooth cylinder is free to slide down under the influence of gravity. The time taken by the cylinder to reach from A to O is

$\left(g = 10 m s^{-2}\right)$.



A. $4s$

B. $2s$

C. $3s$

D. $1s$

Answer: B

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28. Assertion: Force is always in the direction of motion.

Reason: In every case force is not parallel to acceleration.

A. If both assertion and reason are true and reason is not the correct explaination of assertion.

B. If both assertion and reason are ture but reason is not the correct explanation of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: D

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29. Assertion: Force on a body A by body B is equal and opposite to the force on the body B by A .

Reason: Force in nature always occur between pairs of bodies.

A. If both assertion and reason are true and reason is the correct explaination of assertion.

B. If both assertion and reason are true and reason is not the correct explaination of assertion.

C. If assertion is ture but reason is false.

D. If both assertion and reason are false.

Answer: A

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30. Assertion: Friction opposes relative motion and thereby dissipates power in the form of heat.

Reason: Friction is always an undesirable force.

A. If both assertion and reason are true and reason is not the correct explaination of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

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