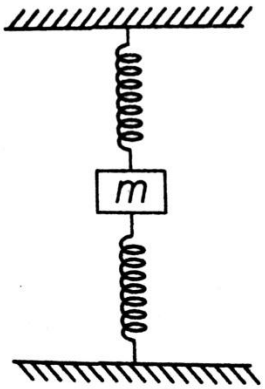
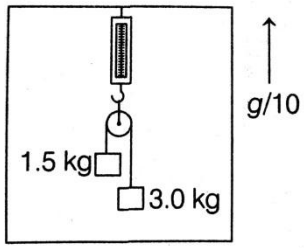
1. A light rope hangs over a smooth pulley. A monkey of mass 5 kg climbs down the portion of the rope on one side with acceleration of 1 m/s^2. Find with what acceleration another monkey of mass 4 kg will climb up the portion of the rope on the other side, so that the rope may remain at rest.
(a) 1.2 m/s^2 (b) 2.4 m/s^2 (c) 0.2m/s^2 (d)5.4m/s^2

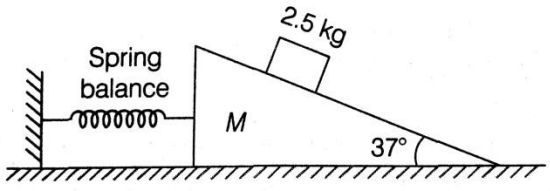
2. A block tied between two springs is in equilibrium. If upper spring is cut, then the acceleration of the block just after cut is 6 m/s^2 downwards. Now, if instead of upper spring, lower spring is cut, then the magnitude of acceleration of the block just after the cut will be (take, g = 10 m/s^2)
(a) 16 m/s^2 (b) 4 m/s^2
(c) Cannot be determined (d) None of these



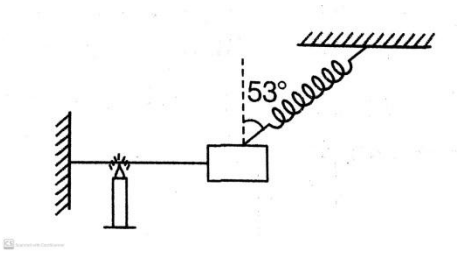
3. Find the reading of the spring balance as shown in figure. The elevator is going up with an acceleration of $\frac{g}{10}$, the pulley and the string are light and the pulley is smooth.
(a) 4 kg (b) 4.3 kg (c) 4.4 kg (d) 4.5 kg



4. Find the reading of spring balance as shown in figure. Assume that, mass M is in equilibrium
(a) 40 N (b) 15 N (c) 20 N (d) 12N



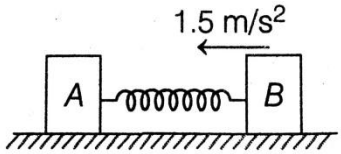
5. The block shown in the figure is equilibrium. Find acceleration of the block just after the string burns.
(a) $\frac{3g}{5}$ (b) $\frac{4g}{5}$ (c) $\frac{4g}{3}$ (d) None of these



6. Two blocks A and B with masses 4 kg and 6 kg respectively are connected by a stretched spring of negligible mass as in figure. When the two blocks are released simultaneously, the initial acceleration of B is 1.5 m/s² westward. The acceleration of A is

(a) 1 m/s², westward (b) 2.25 m/s², eastward

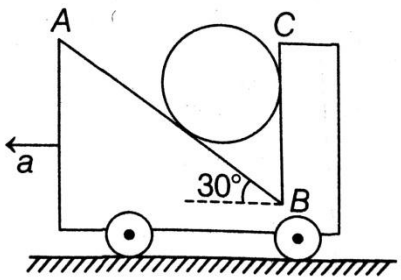
(c) 1 m/s², eastward (d) 2.75 m/s², westward



7. 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 pulled towards left with a horizontal acceleration a. The magnitude of normal reactions exerted by sides AB and BC of carriage on the cylinder be N_{AB} and N_{BC}, respectively. Neglect friction everywhere. Then, as the magnitude of acceleration a of the carriage is increased, pick up the correct statement.

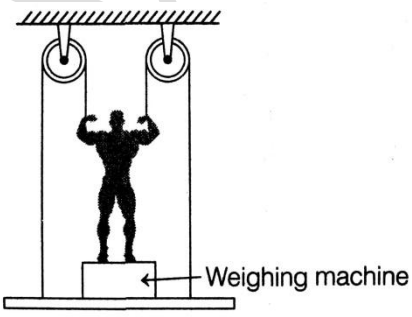
(a) N_{AB} increases and N_{BC} decreases. (b) Both N_{AB} and N_{BC} increase.

(c) N_{AB} remains constant and N_{BC} increases. (d) N_{AB} increases and N_{BC} remains constant.



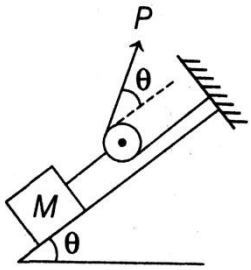
8. A man uses two pulleys to raise himself with an acceleration 2 m/s², as in figure. Man stands on a light weighing machine fitted in horizontal platform. Determine the reading of weighing machine.

(a) 15 kg (b) 30 kg (c) 60 kg (d) 90 kg



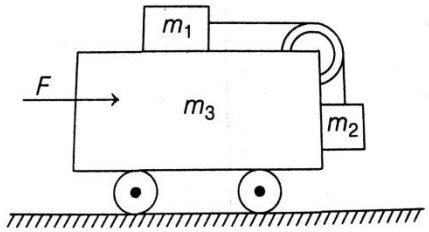
9. What should be the minimum force P to be applied to the string, so that block of mass m just begins to move up the frictionless plane?

(a) Mg $\tan\frac{\theta}{2}$ (b) Mg $\cot\frac{\theta}{2}$ (c) $\frac{Mg\cos\theta}{1+\sin\theta}$ (d) None of these



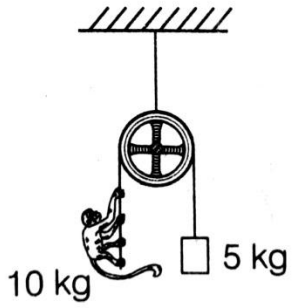
10. A mass m_1 , placed on top of a trolley of mass m_3, is connected to another mass m_2 by means of a string passing over a smooth pulley as shown in the figure. The friction between surfaces is negligible. For m_1 and m_2 not to move with respect to trolley, the horizontal force F to be applied on trolley is

(a) $F = m_3g$ (b) $F = (m_1+m_2)g$ (c) $F = (m_1+m_2+m_3)\frac{m_2g}{m_1}$ (d) $F = m_1g$



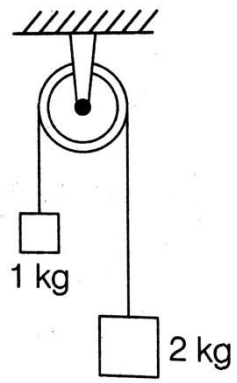
11. In the figure shown acceleration of monkey relative to the rope if it exerts a force of 80 N on string will be

(a) 2 ms^{-2} (b) 4 ms^{-2} (c) 6 ms^{-2} (d) 8 ms^{-2}



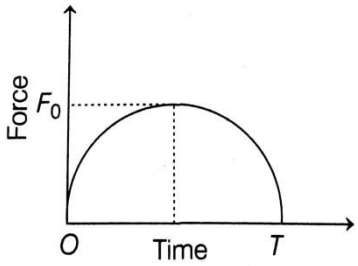
12. Two unequal masses are connected on two sides of a light string passing over a light and smooth pulley as shown in figure. The system is released from rest. The larger mass is stopped 1.0 s after the system is set into motion. The time elapsed before the string is tight again is ($g = 10\ m/s^2$)

(a) $\frac{1}{4}s$ (b) $\frac{1}{2}s$ (c) $\frac{2}{3}s$ (d) $\frac{1}{3}s$



13. A particle of mass m, initially at rest, is acted upon by a variable force F for a brief interval of time T. it begins to move with a velocity u after the force stops acting. F is shown in the graph as a function of time. The curve is a semicircle.

(a) $u = \frac{\pi F_0^2}{2m}$ (b) $u = \frac{\pi T^2}{8m}$ (c) $u = \frac{\pi F_0 T}{4m}$ (d) $u = \frac{F_0 T}{2m}$

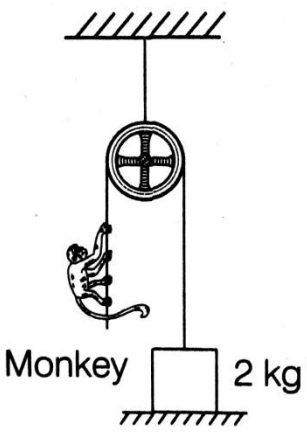


14. Two bodies of masses m_1 and m_2 are connected by a light string which passes over a frictionless, massless pulley. If the pulley is moving upward with uniform acceleration $\frac{g}{2}$, then tension in the string will be

(a) $\frac{3m_1m_2}{m_1+m_2}g$ (b) $\frac{m_1+m_2}{4m_1m_2}g$ (c) $\frac{2m_1m_2}{m_1+m_2}g$ (d) $\frac{m_1m_2}{m_1+m_2}g$

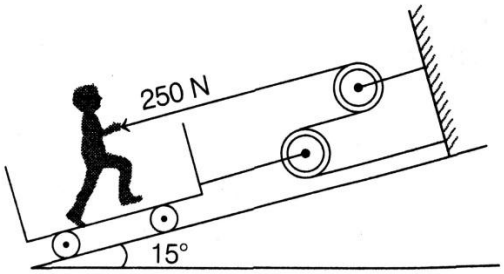
15. The pulley shown is frictionless. A monkey of mass 1 kg moves up on the massless string, so as to just lift a block of mass 2 kg. After sometime, the monkey stops moving with respect to string. The change in magnitude of monkey's acceleration is

(a) $\frac{g}{3}$ (b) $\frac{2g}{3}$ (c) g (d) 2g



16. A trolley is being pulled up an inclined plane by a man sitting on it (as shown in figure). He applies a force of 250 N. If the combined mass of the man and trolley is 100 kg, the acceleration of the trolley will be [Use, sin 15° = 0.26, g = 10 m/s^2]

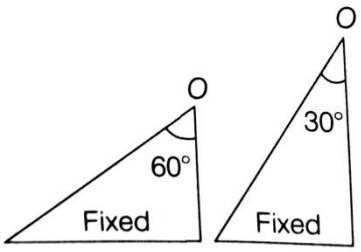
(a) 2.4 ms^{-2} (b) 4 ms^{-2} (c) 4.9 ms^{-2} (d) 0.1 ms^{-2}



17. Two particles start together from a point O and slide down along straight smooth inclined planes at 30° and 60° to the vertical and in the same vertical plane as in figure. The relative acceleration of second with respect to first will be (in magnitude and direction) as

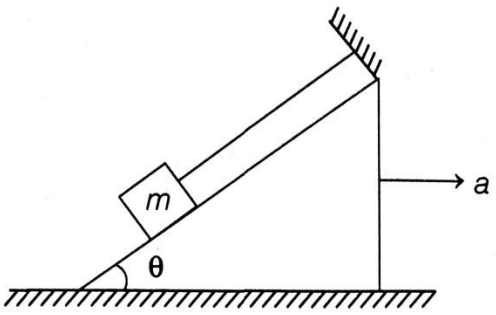
(a) $\frac{g}{2}$ in the vertical direction (b) $\frac{g\sqrt{3}}{2}$ at 45° with vertical

(c) $\frac{g}{\sqrt{3}}$ inclined at 60° to vertical (d) g in the vertical direction



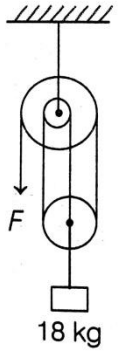
18. The wedge is moved towards right with acceleration a which is slowly increased from zero. Find tension in the string just when the small block breaks contact with the surface of the wedge. (Assume all surfaces are smooth and string is inextensible)

(a) 2mg sin θ (b) mg cosec θ (c) mg tan θ (d) mg cot θ



19. In the figure t the free end of the light string, a force F is applied to keep the suspended mass of 18 kg at rest. Assuming, pulley is light then the force exerted by the ceiling on the system is

(a) 200N (b) 120N (c) 180N (d) 240N



20. A man is standing in a lift which goes up and comes down with the same constant acceleration. If the ratio of the apparent weights in the two cases is 2 : 1, then the acceleration of the lift is

(a) 3.33 ms^{-2} (b) 2.50 ms^{-2} (c) 2.00 ms^{-2} (d) 1.67 ms^{-2}

21. Figure shows two pulley arrangements for lifting a mass m. In (a) the mass is lifted by attaching a mass 2m, while in (b) the mass is lifted by pulling the other end with a downward force F = 2mg. If f_a and f_b are the accelerations of the two masses, then

(a) $f_a = f_b$ (b) $f_a \frac{f_b}{2}$ (c) $f_a = \frac{f_b}{3}$ (d) $f_a = 2f_b$