* 31. A body of mass $m$ is hauled from the earth's surface by applying a force

$$F = 2(ah - 1)\, m\vec{g}$$

where $a$ is positive constant and $h$ is height from the earth's surface.

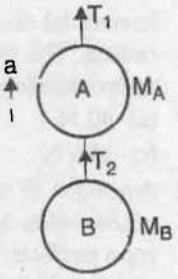
(a) at height $h = \frac{1}{2a}$, the velocity of the body is maximum

(b) at height $h = \frac{1}{a}$, the velocity of particle is zero

(c) the motion of particle is oscillatory

(d) all the above are correct

* 32. Which of the following expressions correctly represents $T_1$ and $T_2$ if the system is given an upward acceleration by a pulling up mass $A$?



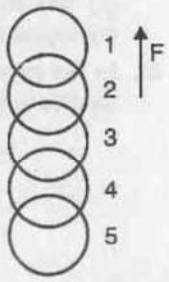

(a) $T_1 = M_A(a - g) + M_B(a - g)$, $T_2 = M_B(a - g)$

(b) $T_1 = M_A(g - a) + M_B(g - a)$, $T_2 = M_B(g - a)$

(c) $T_1 = M_A(g + a) + M_B(g + a)$, $T_2 = M_B(g + a)$

(d) $T_1 = M_A(g + a)$, $T_2 = M_B(g + a)$

* 33. A chain consisting of 5 links each of mass 0.1 kg is lifted vertically with a constant acceleration of 2.5 m/s$^2$ as shown in the figure. The force of interaction between the top link and the link immediately below it, will be:



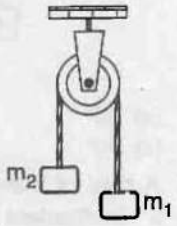

(a) 6.15 N

(b) 4.92 N

(c) 3.69 N

(d) 2046 N

34. In the given figure:



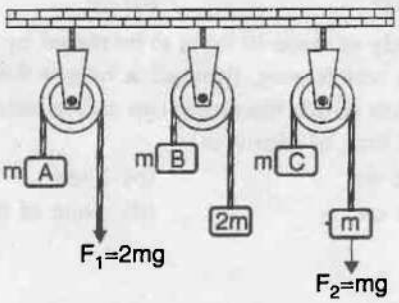

(a) acceleration of $m_1$ and $m_2$ are same

(b) the magnitude of relative acceleration of $m_1$ with respect to $m_2$ is twice the magnitude of acceleration of $m_1$

(c) the velocity of $m_1$ and $m_2$ are same

(d) the speed of $m_1$ and $m_2$ are not same

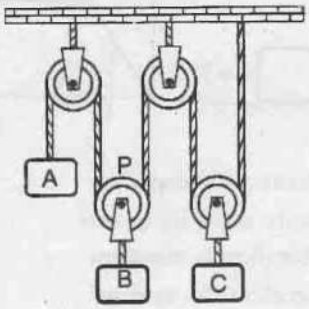
* 35. In the figure, the blocks $A$, $B$ and $C$ each of mass $m$ have accelerations $a_1$, $a_2$ and $a_3$ respectively. $F_1$ and $F_2$ are external forces of magnitude $2mg$ and $mg$ respectively. Then:




(a) $a_1 = a_2 = a_3$ (b) $a_1 > a_3 > a_2$

(c) $a_1 = a_2$, $a_2 > a_3$ (d) $a_1 > a_2$, $a_2 = a_3$

* 36. In the ideal case:



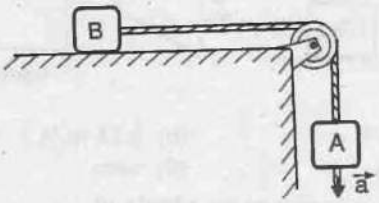

(a) magnitude of acceleration of $A$ is sum of magnitude of acceleration of $B$ and $C$

(b) magnitude of acceleration of $A$ is arithmetic mean of magnitude of acceleration of $B$ and $C$

(c) acceleration of pulley $P$ is same as that of mass $B$

(d) if $P$ is massless, net force on pulley is non-zero

37. The actual acceleration of body $A$ is $\vec{a}$. Then:



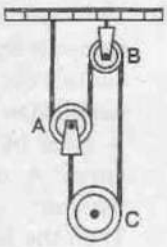

(a) the acceleration of $B$ is $\vec{a}$

(b) the acceleration of $B$ is $2\vec{a}$

(c) the magnitude of relative acceleration of $B$ with respect to $A$ is $\sqrt{2}\,\vec{a}$

(d) the momentum of $A$ may be equal to that of $B$

* 38. In the arrangement shown in figure, pulleys $A$ and $B$ are massless and the thread is inextensible.
Mass of pulley $C$ is equal to $m$. If friction in all the pulleys is negligible, then



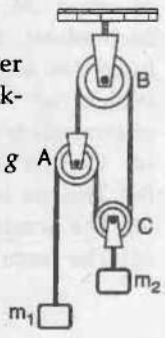

(a) tension in thread is equal to $\frac{1}{2}mg$

(b) acceleration of pulley $C$ is equal to $g/2$ (downward)

(c) acceleration of pulley $A$ is equal to $g$ (upward)

(d) acceleration of pulley $A$ is equal to $2g$ (upward)

39. In the given ideal pulley system:



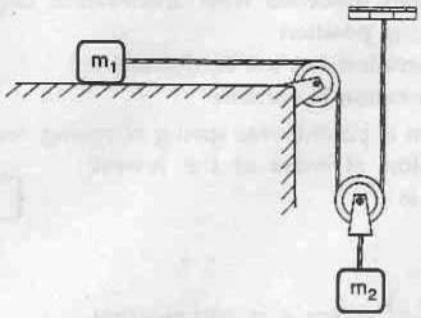

(a) tension in string is zero

(b) pulleys $B$ and $C$ rotate counter clockwise and the pulley $A$ clockwise

(c) $A$ and $B$ are same and is equal to $g$

(d) all the above

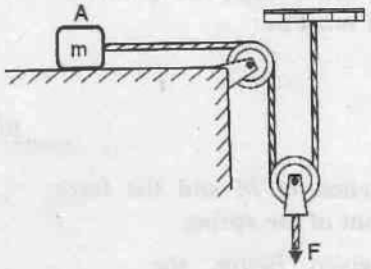
**40.** If the surface is smooth, the acceleration of the block $m_2$ will be :




(a) $\frac{m_2 g}{4m_1 + m_2}$ (b) $\frac{2m_2 g}{4m_1 + m_2}$

(c) $\frac{2m_1 g}{m_1 + 4m_2}$ (d) $\frac{2m_1 g}{m_1 + m_2}$

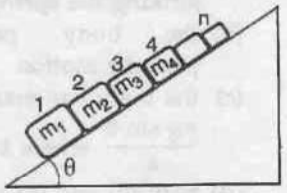
**41.** Pulleys and string are massless. The horizontal surface is smooth. The acceleration of the block $A$ is :




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

(c) $\frac{F}{4m}$ (d) 0

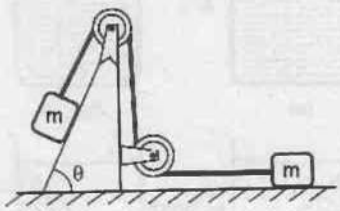
**42.** $n$-blocks of different masses are placed on the frictionless inclined plane in contact. They are released at the same time. The force of interaction between $(n-1)^{th}$ and $n^{th}$ blocks is :




(a) $(m_{n-1} - m_n) g \sin\theta$ (b) zero

(c) $mng \cos\theta$ (d) none of these

**43.** For the system shown in the figure, the pulleys are light and frictionless. The tension in the string will be :




(a) $\frac{2}{3} mg \sin\theta$ (b) $\frac{3}{2} mg \sin\theta$

(c) $\frac{1}{2} mg \sin\theta$ (d) $2mg \sin\theta$

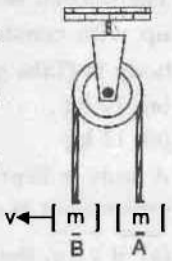
**44.** In the given figure :

(a) both masses always remain in same level

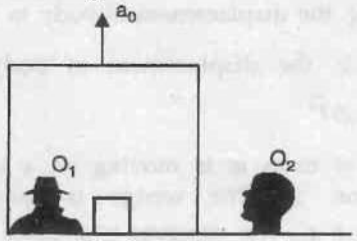
(b) after some time, $A$ is lower than $B$

(c) after some time, $B$ is lower than $A$

(d) no sufficient information




**45.** Observer $O_1$ is in a lift going upwards and $O_2$ is on the ground. Both apply Newton's law, and measure normal reaction on the body :




(a) the both measure the same value

(b) the both measure zero

(c) the both measure different value

(d) no sufficient data

**46.** A particle is found to be at rest when seen from frame $S_1$ and moving with a constant velocity when seen from another frame $S_2$. Mark the possible points from the following :

(a) both the frames are inertial

(b) both the frames are non-inertial

(c) $S_1$ is non-inertial and $S_2$ is inertial

(d) both (a) and (b) are correct

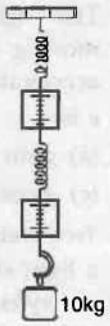
**47.** A block of mass 10 kg is suspended through two light springs which are balanced as shown in the figure. Then :

(a) both the scales will read 10 kg

(b) both the scales will read 5 kg

(c) the upper scale will read 10 kg and the lower zero

(d) the readings may be of any value but their sum will be 10 kg




**48.** A block of mass $m$ is suspended through three light springs balanced as shown in the figure :

(a) the reading of $A$ is greater than $B$

(b) the reading of $B$ is greater than $C$

(c) the readings of $A$, $B$ and $C$ are the same

(d) the readings of $A$ and $C$ are not the same