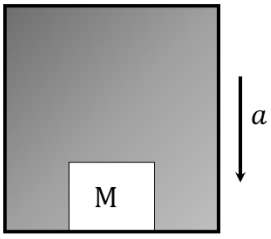
Chapter 6

Newton's Laws of Motion

Exercise

Pseudo Force

Q.1 With what acceleration a should the bigger box shown in the figure descend so that the block of mass M exerts a force $\frac{Mg}{4}$ on the floor of the box?
(Hint: - Use the concept of pseudo-force)



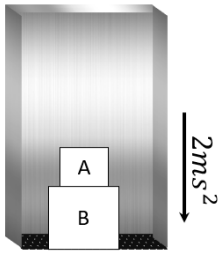
(**A**) $\frac{g}{4}$ (**B**) $\frac{g}{2}$ (**C**) $\frac{3g}{4}$ (**D**)4g

Q.2 With what minimum acceleration can a fireman slide down a rope whose breaking strength is $\frac{2}{3}$ of his weight?
(Hint: - Use the concept of pseudo-force)
(**A**) $\frac{2g}{3}$ (**B**)g (**C**) $\frac{g}{3}$ (**D**)Zero

Q.3 A pendulum hanging from the ceiling of a railway carriage make an angle of 30° with the vertical when it is accelerating. Find the acceleration of the carriage.
(**A**) $\frac{\sqrt{3}g}{2}$ (**B**) $\frac{2g}{\sqrt{3}}$ (**C**)$g\sqrt{3}$ (**D**) $\frac{g}{\sqrt{3}}$

Q.4 A man of mass m slides down along a rope which is connected to the ceiling of an elevator with deceleration a relative to the rope. If the elevator is going upward with an acceleration a relative to the ground, then tension in the rope is
(**A**)mg (**B**)m (g + 2a) (**C**)$m\,(g + a)$ (**D**)Zero

Q.5 The elevator shown in figure is descending with an acceleration of 2 ms^{-2}.The mass of the block A = 0.5 kg. The force exerted by the block A on the block B is (g = 10 ms^{-2})



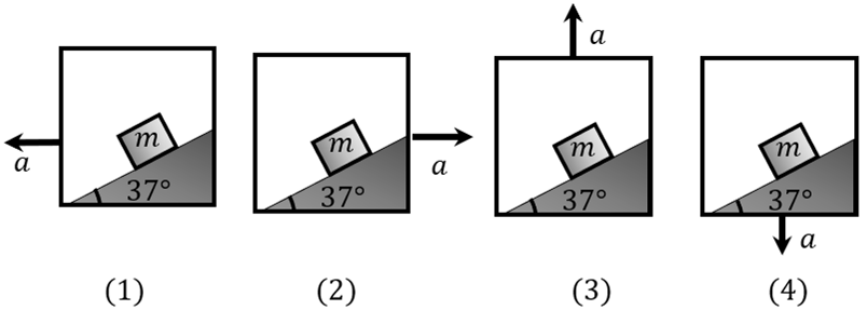
(**A**)2N (**B**) 4N (**C**)6 N (**D**)8 N

Q.6 A block of mass m is placed on a wedge. The wedge can be accelerated in four manners marked as (1), (2), (3) and (4) as shown in the figure. If the normal reactions in situation (1), (2), (3) and (4) are N_1, N_2, N_3 and N_4 respectively and acceleration with which the block slides on the wedge in situations are b_1, b_2, b_3 and b_4 respectively then

(**A**)$N_3 > N_1 > N_2 > N_4$ (**B**)$N_4 > N_3 > N_1 > N_2$

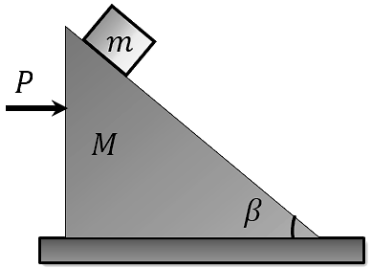
(**C**)$b_2 > b_3 > b_4 > b_1$ (**D**)$b_2 > b_3 > b_1 > b_4$

Which of the above statements are correct?



(**A**)A and B (**B**)B and D (**C**)C and D (**D**)A and C

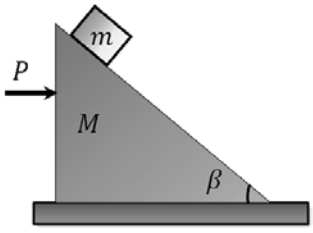
Q.7 Two wooden blocks are moving on smooth horizontal surface that the mass m remains stationary with respect to the block of mass M as shown. Find the magnitude of P



(**A**)(M + m)g tan β (**B**)Mg tan β

(**C**)mg sec β (**D**)(M + m)g sec β

Q.8 Two wooden blocks are moving on smooth horizontal surface that the mass m remains stationary with respect to the block of mass M as shown. Find the force exerted by the M on m.

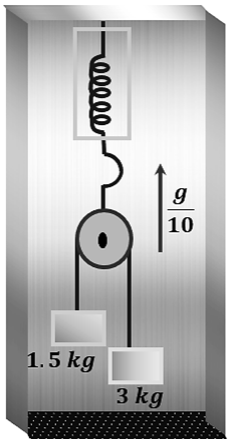


(**A**)(M + m)g tan β (**B**)Mg tan β

(**C**)mg sec β (**D**)(M + m)g sec β

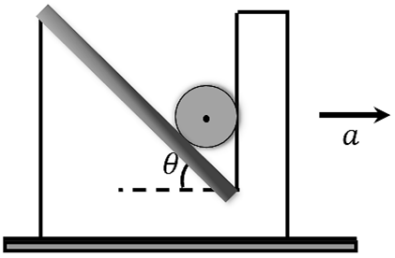
Q.9 The reading of the spring balance for the system shown in the figure is (in kg). The elevator is going up with an acceleration of $\frac{g}{10}$ m/s^2_____.

(Take $g = 10\ m/s^2$)



Q.10 In the figure shown, the minimum value of acceleration of wedge (a) at which the cylinder starts rising up the inclined surface is

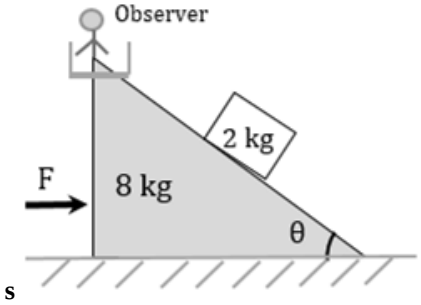
(**A**)g tan θ (**B**)g cot θ (**C**)g sin θ (**D**)g cos θ



WORKSHEET

Chapter-Pseudo Force

Q.1 The block of mass **2 kg** is in equilibrium w.r.t **8 kg** wedge. Wedge is pushed by a force of$\mathbf{F = 5\ N}$ In $+\mathbf{x}$ direction as shown. Find the pseudo force acting on block of mass$\mathbf{m = 2\ kg}$



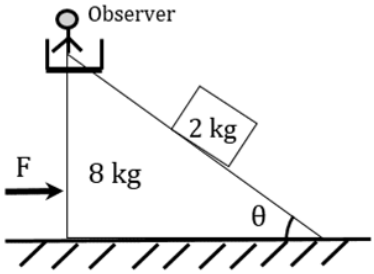
s

(**A**)1 N, $-$ x direction (**B**)2 N, $-$ x direction

(**C**)1 N, $+$ x direction (**D**)2 N, $+$ x direction

Pseudo Force

Q.2 The block of mass**2 kg** is in equilibrium w.r.t **8 kg** wedge. Wedge is pushed by a force of $\mathbf{F = 5\ N}$ in$+\mathbf{x}$ direction as shown. Find the pseudo force acting on the wedge is



(**A**)4 N, $+$ x direction (**B**)2 N, $+$x direction (**C**)4 N, $-$x direction(**D**)2 N, $-$ x direction

Pseudo Force

Q.3 A rail - road car is moving towards right with acceleration **a** and a dog of mass **m** is chasing a man (**A**) with an acceleration $\frac{\mathbf{a}}{\mathbf{3}}$relative to the car and the man (**A**) is accelerating towards left with an acceleration of magnitude$\frac{\mathbf{a}}{\mathbf{3}}$ with respect to car as shown in the figure. If an observer**B** on ground is observing both the dog and man (**A**), then the net force experienced by the dog as seen by observer**B** is

(**A**) $\frac{\mathrm{Ma}}{3}\hat{\mathrm{I}}$ (**B**) $-\frac{\mathrm{ma}}{3}\hat{\mathrm{I}}$ (**C**) $-\frac{2\mathrm{ma}}{3}\hat{\mathrm{I}}$ (**D**) $\frac{2\mathrm{ma}}{3}\hat{\mathrm{i}}$

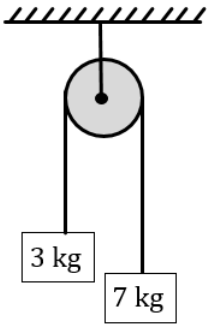
Pseudo Force

Q.4 A turn table is rotating about the fixed vertical axis. A particle of mass **m** is lying on a table at rest with respect to the table. An observer is standing over a block of mass **M** moving with an acceleration**a**. Find the magnitude of pseudo-force on a particle of mass**m**as observed by observer. (Given a body is subjected to an acceleration called centripetal acceleration directed towards the centre when it is rotating and is equal to$\mathbf{r\omega^2}$)

(**A**)$\mathrm{m}(\mathrm{a} - \mathrm{r}\omega^2)$ (**B**)Ma (**C**)$\mathrm{m}(\mathrm{a} + \mathrm{r}\omega^2)$ (**D**) ma

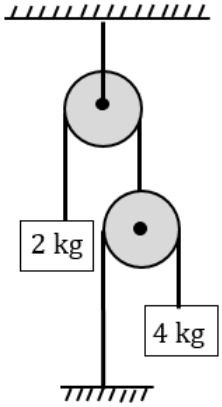
Pseudo Force

Q.5 The tension in the inextensible string using pseudo-force concept is (inN) (Take$\mathbf{g = 10\ m/s^2}$)



String Constraint

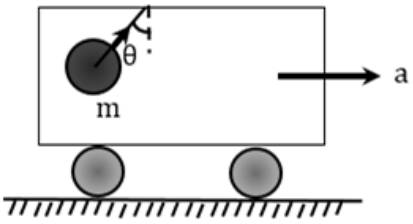
Q.6 Find the tension in the string connected to the block of mass**4 kg.** Assume the strings and pulleys to be ideal. (Take$\mathbf{g = 10\ m/s^2}$)



(A)$\frac{100}{9}$ **N** **(B)** $\frac{40}{3}$ N **(C)**$\frac{15}{2}$ N **(D)** $\frac{50}{3}$ N

Pseudo Force

Q.7 A small metallic sphere of mass **m**is suspended from the ceiling of a car accelerating on a horizontal road with constant acceleration**a** as shown in the figure. The tension in the string attached with metallic sphere is.

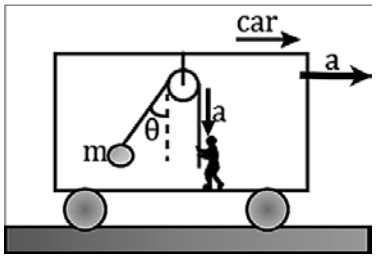


(A) Mg **(B)**$m(g + a)$ **(C)**$m(g - a)$ **(D)**$m\sqrt{g^2 + a^2}$

Pseudo Force

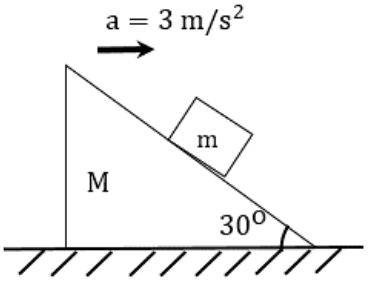
Q.8 A bob is hanging over a pulley inside a car through a string. The second end of the string is in the hands of a person standing in the car. The car is moving with constant acceleration**a** directed horizontally as shown. The other and of the string is pulled with constant acceleration **a**vertically down. Find the tension in the string.

(A)$m\sqrt{g^2 + a^2}$ **(B)**$m\sqrt{g^2 + a^2} - ma$ **(C)**$m\sqrt{g^2 + a^2} + ma$ **(D)**$m(g + a)$



Pseudo Force

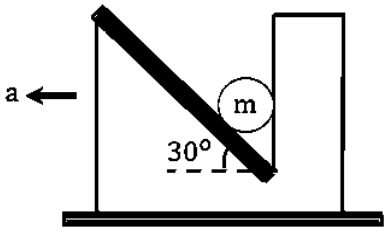
Q.9 What is the acceleration (in$\mathbf{m/s^2}$) of the block of mass m relative to the wedge of mass **M** for the figure shown? Assume all surfaces to be smooth. (Take$\mathbf{g = 10\ m/s^2}$)



(**A**) $\frac{2}{\sqrt{3}}$ (**B**) $\frac{10-3\sqrt{3}}{2}$ (**C**) $4\sqrt{3}$ (**D**) $\frac{10\sqrt{3}-3}{2}$

Pseudo Force

Q.10 In the figure shown, if a ball of mass**m** is at rest relative to the wedge moving to the left with an acceleration$\mathbf{a = g\sqrt{3}}$, find the force exerted by the vertical face of the wedge on mass**m.**



(**A**) $\frac{2mg}{\sqrt{3}}$ (**B**) $mg\sqrt{3}$ (**C**) $\frac{4mg}{\sqrt{3}}$ (**D**) $\frac{\sqrt{3}mg}{4}$

ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(C)	(C)	(D)	(B)	(B)	(D)	(A)	(C)		(A)
WORK SHEET										
Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(A)	(C)	(D)	(D)		(B)	(D)	(C)	(B)	(C)