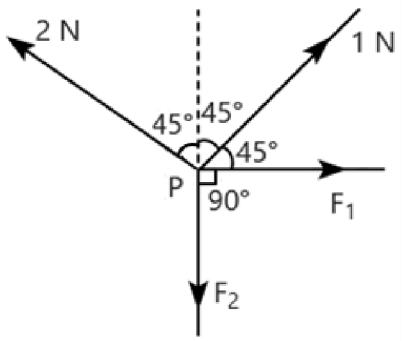
SECTION A

1 Four forces are acting at a point P in equilibrium as shown in the figure. If the ratio of force F_1 to F_2 is $1 : x$, then the value of x is:



1. 4
2. 3
3. 2
4. 1

2 A rocket with a lift-off mass of $20,000$ kg is blasted upwards with an initial acceleration of $5\ \text{ms}^{-2}$. Then initial thrust (force) of the blast is: (Take $g = 10\ \text{ms}^{-2}$)

1. 7×10^5 N
2. 0
3. 2×10^5 N
4. 3×10^5 N

3 A body of mass 10 kg is acted upon by two perpendicular forces, 6 N and 8 N. The resultant acceleration of the body is:

(a)	1 ms^{-2} at an angle of $tan^{-1}\left(\frac{4}{3}\right)$ w.r.t. 6 N force
(b)	0.2 ms^{-2} at an angle of $tan^{-1}\left(\frac{3}{4}\right)$ w.r.t. 8 N force
(c)	1 ms^{-2} at an angle of $tan^{-1}\left(\frac{3}{4}\right)$ w.r.t. 8 N force
(d)	0.2 ms^{-2} at an angle of $tan^{-1}\left(\frac{3}{4}\right)$ w.r.t. 6 N force

Choose the correct option:

1.	(a), (c)
2.	(b), (c)
3.	(c), (d)
4.	(a), (b), (c)

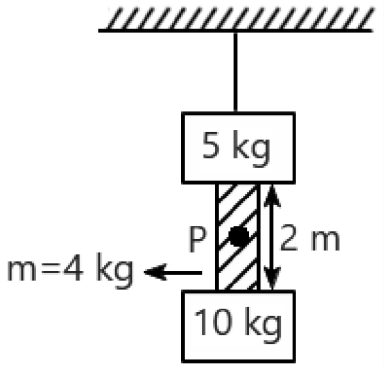
4 If the tension in the cable supporting an elevator is equal to the weight of the elevator, the elevator may be:

(a)	going up with increasing speed
(b)	going down with increasing speed
(c)	going up with uniform speed
(d)	going down with uniform speed

Choose the correct option:

1.	(a) and (b)
2.	(b) and (c)
3.	(c) and (d)
4.	all of these

5 The tension at the mid-point P of the rope is:
(Consider the system is in equilibrium condition, mass of rope$=$ 4 kg and $g = 10\ \text{m/s}^2$.)

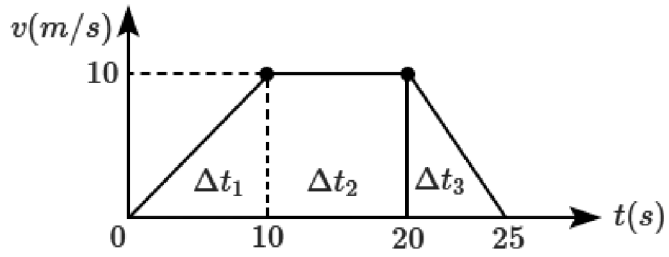


1. 100 N
2. 120 N
3. 140 N
4. 190 N

6 A block of mass m slides down a smooth plane inclined at an angle of 60° with the horizontal. The normal reaction of the incline acting on the block equals:

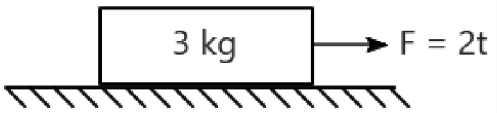
1. $mg\sin 60^\circ$
2. $mg\cos 60^\circ$
3. $mg\tan 60^\circ$
4. $mg\cot 60^\circ$

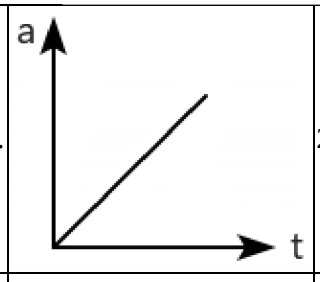
7 The velocity (v)-time (t) graph of a lift moving upwards has been shown below. Let T_1, T_2 and T_3 be the tensions in elevator cable during the time intervals Δt_1, Δt_2 and Δt_3. Then $T_1 : T_2 : T_3$ is:
(Take $g = 10$ m/s^2)

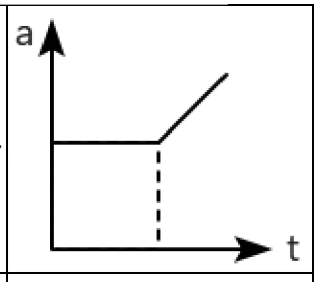


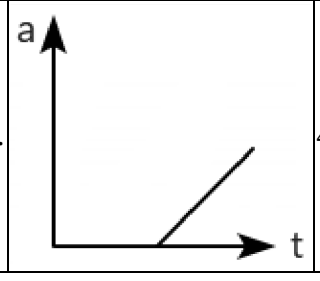
1. 12 : 10 : 11
2. 11 : 10 : 9
3. 11 : 10 : 8
4. 12 : 10 : 12

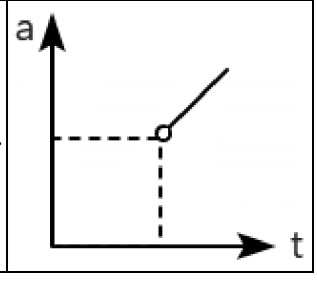
8 A block of mass 3 kg is placed on a rough surface $(\mu = 0.2)$ and a variable force acts on it. Variation of acceleration of block with time is correctly shown by the graph:



1. 

2. 

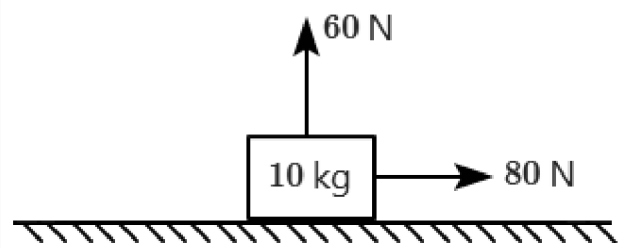
3. 

4. 

9 In order to stop a car in shortest distance on a horizontal road, one should

1.	apply the brakes very hard so that the wheels stop rotating.
2.	apply the brakes hard enough to just prevent slipping.
3.	pump the brakes (press and release).
4.	shut the engine off and not apply brakes.

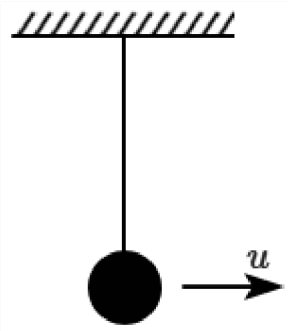
10 A block is placed on a smooth horizontal surface, and forces are applied to it as shown in the diagram. Take $g = 10$ m/s^2. The normal reaction acting on the block is:



1. 100 N
2. 60 N
3. 40 N
4. 20 N

11 A 60 kg man pushes a 40 kg man by a force of 60 N. The 40 kg man has pushed the other man with a force of:
1. 40 N
2. 0
3. 60 N
4. 20 N

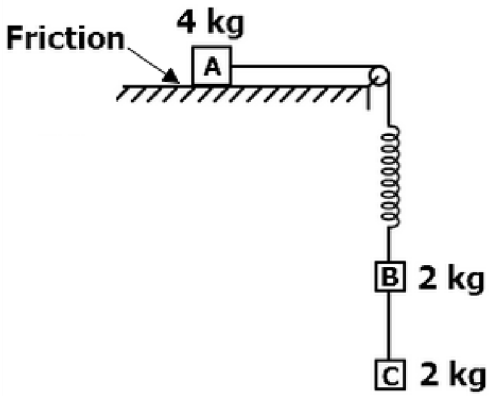
12 A ball of mass 1 kg is hanging from 1 m long inextensible string which can withstand a maximum tension of 400 N. The maximum speed u that should be given to the ball is: (Take $g = 10$ m/s^2)



1. $\sqrt{390}$ m/s
2. $\sqrt{410}$ m/s
3. 20 m/s
4. 22 m/s

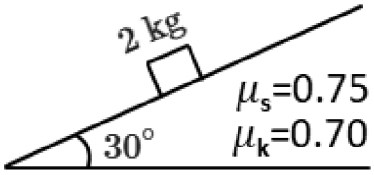
13 A batsman hits back a ball straight in the direction of the bowler without changing its initial speed of 12 m/s. If the mass of the ball is 0.15 kg, then impulse imparted to the ball is:
(Assume linear motion of the ball)
1. 0.15 Ns
2. 3.6 Ns
3. 36 Ns
4. 0.36 Ns

14 The system is at rest initially, due to the force of friction acting on A. If the string connecting the lower blocks is cut, the accelerations of the blocks A, B, C will be, respectively,



1.	$\frac{g}{3}$ to left, g upward, g downward.
2.	zero, zero, g downward.
3.	zero, g upward, g downward.
4.	g to right, zero, g downward.

15 The friction force on 2 kg the block is:



1. $\frac{15\sqrt{3}}{2}$ N
2. $7\sqrt{3}$ N
3. 10 N
4. none of these

16 Given below are two statements:

Assertion (A):	Improper banking of roads causes wear and tear of tyres.
Reason (R):	The necessary centripetal force in that event is provided by the force of friction between the tyres and the road.

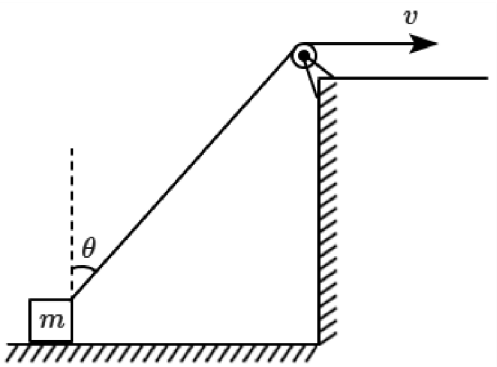
1. Both **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.
2. Both **(A)** and **(R)** are true but **(R)** is not the correct explanation of **(A)**.
3. **(A)** is true but **(R)** is false.
4. Both **(A)** and **(R)** are false.

17 A car is moving on a circular track of radius 50 cm with coefficient of friction being 0.34. On this horizontal track, the maximum safe speed for turning is equal to: (Take $g = 10$ m/s^2)

1. 1.03 m/s
2. 1.7 m/s
3. 1.3 m/s
4. 1.8 m/s

SECTION B

18 If the block is being pulled by the rope moving with speed v as shown, then the horizontal velocity of the block is:



1. v
2. $v cos\theta$
3. $\frac{v}{cos\theta}$
4. $\frac{v}{sin\theta}$

19 A mass is thrown vertically upward. The direction of net force acting on the mass during its upward and downward journey respectively will be:

1.	upward, upward
2.	upward, downward
3.	downward, upward
4.	downward, downward

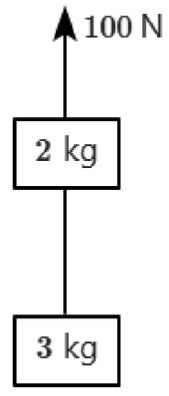
20 A boy pushes a box of mass 2 kg with a force $\vec{F} = \left(20\hat{i} + 10\hat{j}\right)$N on a frictionless surface. If the box was initially at rest, then displacement along the x-axis after 10 s is:

1. 250 m
2. 400 m
3. 500 m
4. 750 m

21 The motion of a particle of mass m is described by $y = ut + \frac{1}{2}gt^2$. The force acting on the particle is:

1. $3mg$
2. mg
3. $\frac{mg}{2}$
4. $2mg$

22 The system of blocks is pulled up by force as shown in the figure. The force exerted on the 3 kg block by the connecting string is:



1. 80 N
2. 60 N
3. 40 N
4. 100 N

23 A body moving horizontally has an initial speed of 20 m/s. Due to friction, the body stops after 5 s. If the mass of the body is 5 kg, the coefficient of friction is:
(Take $g = 10\ m/s^2$)
1. 0.1
2. 0.2
3. 0.3
4. 0.4

24 A disc revolves with a speed of 0.5 revolutions per second and has a radius of 15 cm. Two coins are placed at 3 cm and 12 cm away from the center. If the coefficient of friction between coins and the disc is 0.2, then:

1.	coin at 3 cm will slip.
2.	coin at 12 cm will slip.
3.	both coins will slip.
4.	no coin will slip.

25 Given below are two statements:

Statement I:	When a railway engine pulls a train and the system moves forward, the force exerted by the engine on the train is greater than that exerted by the train on the engine.
Statement II:	The normal force exerted by the ground on a man is the reaction force of the weight of the man.

1.	Statement I is incorrect and Statement II is correct.
2.	Both Statement I and Statement II are correct.
3.	Both Statement I and Statement II are incorrect.
4.	Statement I is correct and Statement II is incorrect.

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