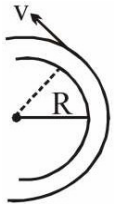
6 JEE MAINS PYQ [2021-2024]
Newton Law of Motion

1. A particle is moving with uniform speed along the circumference of a circle of radius R under the action of a central fictitious force F which is inversely proportional to R^3. Its time period of revolution will be given by: **[2021]**

(A) $T \propto R^2$ (B) $T \propto R^{\frac{3}{2}}$

(C) $T \propto R^{\frac{5}{2}}$ (D) $T \propto R^{\frac{4}{3}}$

2. A modern grand-prix racing car of mass m is travelling on a flat track in a circular arc of radius R with a speed v. If the coefficient of static friction between the tyres and the track is μ_s, then the magnitude of negative lift F_L acting downwards on the car is:
(Assume forces on the four tyres are identical and $g =$ acceleration due to gravity) **[2021]**



(A) $m\left(\frac{v^2}{\mu_s R}+g\right)$ (B) $m\left(\frac{v^2}{\mu_s R}-g\right)$

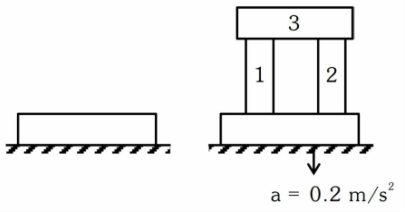
(C) $m\left(g-\frac{v^2}{\mu_s R}\right)$ (D) $-m\left(g+\frac{v^2}{\mu_s R}\right)$

3. A boy reaches the airport and finds that the escalator is not working. He walks up the stationary escalator in time t_1. If he remains stationary on a moving escalator then the escalator takes him up in time t_2. The time taken by him to walk up on the moving escalator will be: **[2021]**

(A) $\frac{t_1 t_2}{t_2 - t_1}$ (C) $\frac{t_1 + t_2}{2}$

(C) $\frac{t_1 t_2}{t_2 + t_1}$ (D) $t_2 - t_1$

4. A steel block of 10 kg rests on a horizontal floor as shown. When three iron cylinders are placed on it as shown, the block and cylinders go down with an acceleration 0.2 m/s^2. The normal reaction R' by the floor if mass of the iron cylinders are equal and of 20 kg each, is _____ N. [Take $g = 10\ m/s^2$ and $\mu_s = 0.2$] **[2021]**



(A) 716 (B) 686

(C) 714 (D) 684

5. A particle of mass m is suspended from a ceiling through a string of length L. The particle moves in a horizontal circle of radius r such that $r = \frac{L}{\sqrt{2}}$ .The speed of particle will be: **[2021]**

(A) $\sqrt{rg}$ (B) $\sqrt{2rg}$

(C) $2\sqrt{rg}$ (D) $\sqrt{\frac{rg}{2}}$

6. A force $\vec{F} = (40\hat{i} + 10\hat{j})N$ acts on a body of mass 5 kg. If the body at time t = 10s, will be: **[2021]**

(A) $(100\hat{i} + 400\hat{j})m$

(B) $(100\hat{i} + 100\hat{j})m$

(C) $(400\hat{i} + 100\hat{j})m$

(D) $(400\hat{i} + 400\hat{j})m$

7. The initial mass of a rocket is 1000kg. Calculate at what rate the fuel should be burnt so that the rocket is given an acceleration of 20 ms^{-2}. The gases come out at a relative speed of 500 ms^{-1} with respect to the rocket: [Use $g = 10\ m/s^2$] **[2021]**

(A) $6.0 \times 10^2\ kg\ s^{-1}$ (B) $500\ kg\ s^{-1}$

(C) $10\ kg\ s^{-1}$ (D) $60\ kg\ s^{-1}$

Answer Key

1.	**(A)**	**18.**	**(B)**	**35.**	**(12)**	**52.**	**(B)**
2.	**(B)**	**19.**	**(C)**	**36.**	**(36)**	**53.**	**(D)**
3.	**(C)**	**20.**	**(C)**	**37.**	**(3)**	**54.**	**(B)**
4.	**(B)**	**21.**	**(D)**	**38.**	**(6)**	**55.**	**(A)**
5.	**(A)**	**22.**	**(C)**	**39.**	**(12)**	**56.**	**(D)**
6.	**(3)**	**23.**	**(C)**	**40.**	**(C)**	**57.**	**(A)**
7.	**(D)**	**24.**	**(B)**	**41.**	**(C)**	**58.**	**(B)**
8.	**(D)**	**25.**	**(A)**	**42.**	**(A)**	**59.**	**(A)**
9.	**(B)**	**26.**	**(C)**	**43.**	**(C)**	**60.**	**(B)**
10.	**(D)**	**27.**	**(A)**	**44.**	**(D)**	**61.**	**(C)**
11.	**(10)**	**28.**	**(C)**	**45.**	**(B)**	**62.**	**(B)**
12.	**(5)**	**29.**	**(B)**	**46.**	**(C)**	**63.**	**(C)**
13.	**(30)**	**30.**	**(D)**	**47.**	**(B)**	**64.**	**(D)**
14.	**(492)**	**31.**	**(B)**	**48.**	**(D)**	**65.**	**(D)**
15.	**(82)**	**32.**	**(B)**	**49.**	**(2)**		
16.	**(30)**	**33.**	**(B)**	**50.**	**(3)**		
17.	**(A)**	**34.**	**(C)**	**51.**	**(A)**		