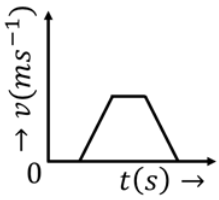
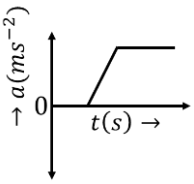
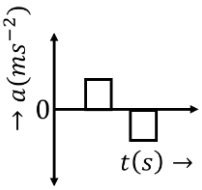
1. The velocity (v)-time (t) plot of the motion of a body is shown below.
The acceleration (a)- time (t) graph that best suits this motion is. **(2024)**



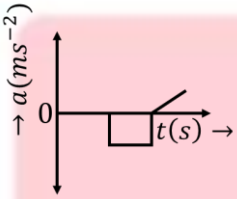
(a)



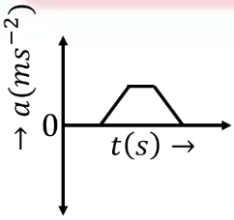
(b)



(c)



(d)



2. A vehicle travels half the distance with speed v and the remaining distance with speed 2v. Its average speed is: **(2023)**

(a) $\frac{3v}{4}$ (b) $\frac{v}{3}$

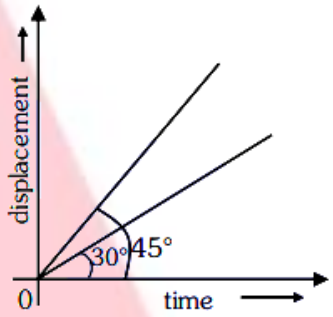
(c) $\frac{2v}{3}$ (d) $\frac{4v}{3}$

3. A horizontal bridge is built across a river. A student standing on the bridge throws a small ball vertically upwards with a velocity $4\,ms^{-1}$. The ball strikes the water surface after $4\,s$. The height of bridge above water surface is (Take $g = 10\,ms^{-2}$): **(2023)**

(a) 68 m (b) 56 m

(c) 60 m (d) 64 m

4. The displacement-time graphs of two moving particles make angles of 30° and 45° with the x-axis as shown in the figure. The ratio of their respective velocity is **(2022)**



(a) $\sqrt{3} : 1$ (b) $1 : 1$

(c) $1 : 2$ (d) $1 : \sqrt{3}$

5. The ratio of the distance travelled by a freely falling body in the 1st, 2nd, 3rd and 4th second **(2022)**

(a) 1 : 2 : 3 : 4 (b) 1 : 4 : 9 : 16

(c) 1 : 3 : 5 : 7 (d) 1 : 1 : 1 : 1

6. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field $\vec{E}$. Due to the force $q\vec{E}$, its velocity increases from 0 to 6 m/s in one second duration. At that instant, the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 second are respectively **(2018)**

(a) 1 m/s, 3.5 m/s

(b) 1 m/s, 3 m/s

(c) 2 m/s, 4 m/s

(d) 1·5 m/s, 3 m/s

7. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1. On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2 . The time taken by her to walk up on the moving escalator will be: **(2017-Delhi)**

(a) $\frac{t_1 t_2}{t_2 - t_1}$ (b) $\frac{t_1 t_2}{t_2 + t_1}$

(c) $t_2 - t_1$ (d) $\frac{t_1 + t_2}{2}$

8. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $X_P(t) = at + bt^2$ and $X_Q(t) = ft - t^2$. At what time do the cars have the same velocity? **(2016-II)**

(a) $\frac{a+f}{2(1+b)}$ (b) $\frac{f-a}{2(1+b)}$

(c) $\frac{a-f}{1+b}$ (d) $\frac{a+f}{2(b-1)}$

9. If the velocity of a particle is v = At + Bt^2 , where A and B are constants, then the distance travelled by it between 1 s and 2 s is: **(2016-I)**

(a) $\frac{3}{2}A + 4B$ (b) $3A + 7B$

(c) $\frac{3}{2}A + \frac{7}{3}B$ (d) $\frac{A}{2} + \frac{B}{3}$

10. A particle of unit mass undergoes one dimensional motion such that its velocity varies according to $v(x) = \beta x^{-2n}$ where β and n are constants and x is the position of the particle. The acceleration of the particle as a function of x, is given by: **(2015)**

(a) $-2n\beta^2 x^{-4n-1}$

(b) $-2\beta^2 x^{-2n+1}$

(c) $-2n\beta^2 e^{-4n+1}$

(d) $-2n\beta^2 x^{-2n-1}$

11. A Stone falls freely under gravity. It covers distances h_1, h_2 and h_3 in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between h_1, h_2 and h_3 is: **(2013)**

(a) $h_1 = h_2 = h_3$

(b) $h_1 = 2h_2 = 3h_3$

(c) $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$

(d) $h_2 = 3h_1$ and $h_3 = 3h_2$