# PHYSICS

# BOOKS - DC PANDEY ENGLISH

# KINEMATICS 1

## Scq Type

**1.** A particle has a velocity u towards east at $t = 0$. Its acceleration is towards west and is constant. Let $x_A$ and $x_B$ be the magnitude of displacements in the first 10 seconds and the next 10 seconds

A. $x_A < x_B$

B. $x_A = x_B$

C. $x_A > x_B$

D. the information is insufficient to decide the relation of $x_A$ with $x_B$

**Answer: D**

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**2.** A body starts from rest and is uniformly accelerated for $30$ s. The distance travelled in the first $10$ s is $x_1$,

next 10 s is $x_2$ and the last 10 s is $x_3$. Then $x_1 : x_2 : x_3$ is the same as :-

A. $1:2:4$

B. $1:2:5$

C. $1:3:5$

D. $1:3:9$

**Answer: C**

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**3.** A ball is dropped from the top of a building. The ball takes $0.5s$ to fall the $3m$ length of a window some

distance from the to of the building. If the speed of the ball at the top and at the bottom of the window are $v_T$ and $v_T$ respectively, then $\left(g = 9.8m/s^2\right)$

A. $v_T + v_B = 12ms^{-1}$

B. $v_T - v_B = 4.9ms^{-1}$

C. $v_B + v(T) = 1ms^{-1}$

D. $\frac{v_B}{v_T} = 2$

**Answer: A**

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**4.** A ball is dropped into a well in which the water level is at a depth $h$ below the top. If the speed of sound is $C$, then the time after which the splash is heard will be give by.

A. $T = \frac{2h}{v}$

B. $T = \sqrt{\frac{2h}{g}} + \frac{h}{v}$

C. $T = \sqrt{\frac{2h}{g}} + \frac{h}{2v}$

D. $T = \sqrt{\frac{h}{2g}} + \frac{2h}{v}$

**Answer: B**

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**5.** Two identical balls are shot upward one after another at an interval of 2s along the same vertical line with same initial velocity of $40ms^{-1}$. The height at which the balls collide is

A. $120m$

B. $75m$

C. $200m$

D. $45m$

**Answer: B**

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**6.** A stone thrown upwards with a speed u from the the top of the tower reaches the ground with a speed 3u. The height of the tower is

A. $3u^2/g$

B. $4u^2/g$

C. $6u^2/g$

D. $9u^2/g$

**Answer: B**

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**7.** A body iniitially at rest is moving with uniform acceleration a. Its velocity after n seconds is v. The displacement of the body in last 2 s is

A. $\frac{2v(n-1)}{n}$

B. $\frac{v(n-1)}{a}$

C. $\frac{v(n+1)}{n}$

D. $\frac{2v(2n+1)}{a}$

**Answer: A**

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**8.** A balloon is moving upwards with velocity $10m/s$. It releases a stone which comes down to the ground in $11s$. The height of the balloon from the ground at the moment when the stone was dropped is $(g = 10m/s^2)$

A. $495m$

B. $592m$

C. $362m$

D. $500m$

**Answer: A**

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**9.** A particle is thrown upwards from ground. It experiences a constant resistance force which can produce a retardation of $2ms^{-2}$. The ratio of time of ascent to time of descent 13 ($g = 10ms^{-2}$)

A. $1:1$

B. $\sqrt{\frac{2}{3}}$

C. $\frac{2}{3}$

D. $\sqrt{\frac{3}{2}}$

**Answer: B**

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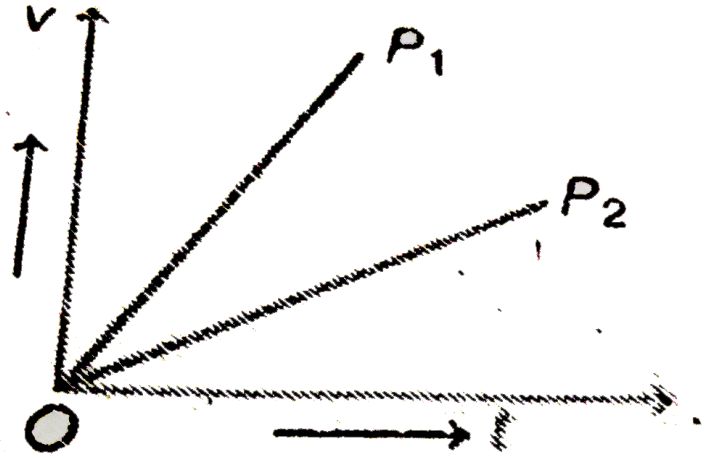
**10.** Shown in the figure are the velocity time graphs of the two particle $P_1$ and $P_2$ moving in same straight line in same direction. Which of the following statements about their relative motion is true?




Their relative velocity

A. is zero

B. is non-zero but constant

C. continuously decreases

D. continuously increases

**Answer: D**

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**11.** Two trains $A$ and $B$ , $100km$ apart are travelling towards each other on different tracks with same starting speed of $50km/h$. The train $A$ accelerates at $20km/h^2$ and the train $B$ retards at the rate $20km/h^2$. The distance covered by the train $A$ when they cross each other is

A. $70km$

B. $55km$

C. $65km$

D. $60km$

**Answer: D**

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**12.** To cross the river in shortest distance, a swimmer should swimming an angle $\theta$ with the upsteram. What is the ratio of the time taken to swim across in the shortest time to that in swimming across over shortest distance. [Asume that the speed of swimmer in still water is greater than the speed of river flow]

A. $\cos\theta$

B. $\sin\theta$

C. $\tan\theta$

D. $\cot\theta$

**Answer: B**

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**13.** Raindrops are falling vertically with a velocity $10m/s$. To a cyclist moving on a straight road the rain drops appear to be coming with a velocity of $20m/s$. The velocity of cyclist is :-

A. $10m/s$

B. $10\sqrt{3}m/s$

C. $20m/s$

D. $20\sqrt{3}m/s$

**Answer: B**

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**14.** At a metro station, a girl walks up a stationary escalator in time $t_1$. If she remains stationary on the escalator, then the escalator take her up in time $t_2$.

The time taken by her to walk up on the moving escalator will be

A. $\frac{t_1 + t_2}{2}$

B. $\sqrt{t_1 t_2}$

C. $\frac{t_1 t_2}{t_1 + t_2}$

D. $t_1 + t_2$

**Answer: C**

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**15.** Two cars are moving in the same direction with a speed of 30 km/h. They are separated from each

direction meets the two cars after an interval of 4 minutes, The speed of the third car is

A. $30kmh^{-1}$

B. $35kmh^{-1}$

C. $40kmh^{-1}$

D. $45kmh^{-1}$

**Answer: D**

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**16.** A bus is moving with a velocity $10ms^{-1}$ on a straight road. A scooterist wishes to overtake the bus

in $100s$. If the bus is at a distance of $1km$ from the scooterist, with what velocity should the scooterist chase the bus ?

A. $50ms^{-1}$

B. $40ms^{-1}$

C. $30ms^{-1}$

D. $20ms^{-1}$

**Answer: D**

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**17.** Two trains take $3s$ to pass another when going in the opposite directions but only $2.5s$ if the speed of one is increased by $50\%$. The time one would take to pass the other when going in the same direction at their original speed is

A. $10s$

B. $12s$

C. $15s$

D. $18s$

**Answer: C**

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**18.** For four particle A,B,C,D, the velocities of one with respect to other are given as $\vec{V}_{DC}$ is $20\frac{m}{s}$ towards north, $\vec{V}_{BC}$ is $20\frac{m}{s}$ towards east and $\vec{V}_{BA}$ is $20\frac{m}{s}$ towards south. Then $\vec{V}_{DA}$ is

A. $20m/s$ towards north

B. $20m/s$ towards south

C. $20m/s$ towards east

D. $20m/s$ towards west

**Answer: D**

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**19.** A ball is thrown vertically down with velocity of $5m/s$. With what velocity should another ball be thrown down after 2 seconds so that it can hit the $1^{st}$ ball in next 2 second.

A. $40m/s$

B. $10m/s$

C. $15m/s$

D. $20m/s$

**Answer: A**

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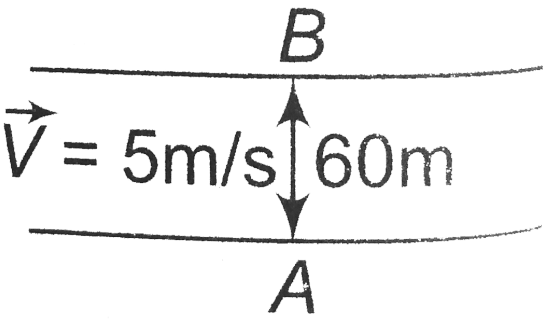
**20.** A man is crossing a river flowing with velocity of $5m/s$. He reaches a point directly across at a distance of 60m in 5 sec. His velocity in still water should be




A. $12m/s$

B. $13m/s$

C. $5m/s$

D. $10m/s$

**Answer: B**

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**21.** The velocity of an object moving rectilinearly is given as a function of time by $v = 4t - 3t^2$ where $v$ is in m/s and $t$ is in seconds. The average velocity if particle between $t = 0$ to $t = 2$ seconds is

A. 0

B. $-2m/s$

C. $-4m/s$

D. $+2m/s$

**Answer: A**

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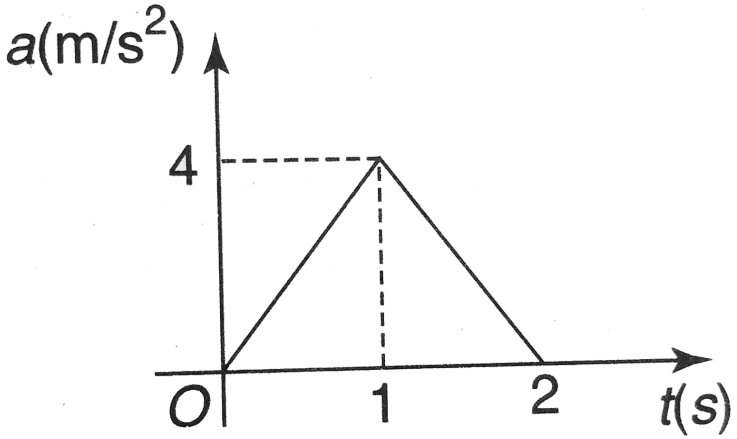
**22.** The acceleration-time graph of a particle moving in a straight line is as shown in figure. The velocity of the particle at time $t = 0$ is $2m/s$. The velocity after $2$ seconds will be



A. $6m/s$

B. $4m/s$

C. $2m/s$

D. $8m/s$

**Answer: A**

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**23.** Two cars $A$ and $B$ cross a point $P$ with velocities $10m/s$ and $15m/s$. After that they move with different uniform accelerations and the car $A$

overtakes $B$ with a speed of $25ms^{-1}$. What is velocity of $B$ at that instant?

A. (a)$20ms^{-1}$

B. (b)$25ms^{-1}$

C. (c)$30ms^{-1}$

D. (d)$40ms^{-1}$

**Answer: A**

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**24.** The last soldier of an $80m$ long marching troops runs from the end to its front, and then it runs back to

the end with the same speed. During this, the marching troop covers a distance of $150m$. The distance covered by the soldier is

A. $310m$

B. $250m$

C. $230m$

D. $160m$

**Answer: B**

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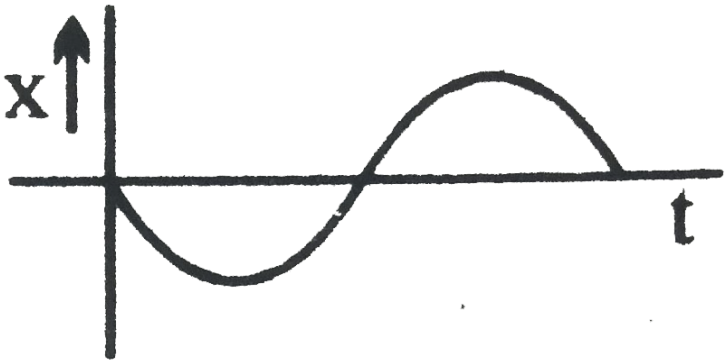
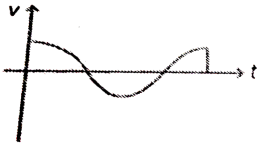
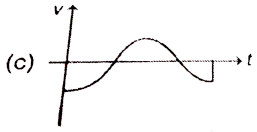
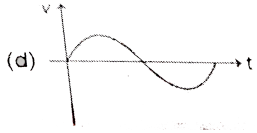
**25.** If position time graph of particle is sine curve as shown, what will be its velocity-time graph.




A. 


B. 


C. 


D. 

**Answer: C**

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**26.** The greatest acceleration or deceleration that a train may have is a. The minimum time in which the train may reach form one station to the other seprated by a distance d is-

A. $4\sqrt{\frac{d}{a}}$

B. $\sqrt{\frac{2d}{a}}$

C. $\frac{1}{2}\sqrt{\frac{d}{a}}$

D. $2\sqrt{\frac{d}{a}}$

**Answer: D**

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**27.** Average velocity of a particle moving in a straight line, with constant acceleration a and initial velocity $u$ in first $t$ seconds is.

A. $u + \frac{1}{2}at$

B. $u + at$

C. $\frac{u + at}{2}$

D. $\frac{u}{2}$

**Answer: A**

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**28.** During a accelerated motion of a particle

A. average velocity of the particle is always less than its final velocity

B. average velociyt of the particle is always greater than its final velocity

C. average velocity of the particle may be zero also

D. average velocity of the particle is half its final velocity

**Answer: C**

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**29.** Two particles are released from the same height at an interval of $1s$. How long aftger the first particle begins to fall will the two particles be $10m$ apart? ( $g = 10m/s^2$)

A. $1.5s$

B. $2s$

C. $1.25s$

D. $2.5s$

**Answer: A**

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**30.** A body travelling along a straight line , one thired of the total distance with a velocity $4ms^{-1}$. The remaining part of the distance was covered with a velocity $2ms^{-1}$ for half the time and with velocity $6ms^{-1}$ for the other half of time . What is the mean velocity averaged over te whle time of motin ?

A. $5m/s$

B. $4m/s$

C. $4.5m/s$

D. $3.5m/s$

**Answer: B**

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**31.** Two cars start off to race with velocities $4\frac{m}{s}$ and $2\frac{m}{s}$ and travel in straight line with uniform accelerations $1m\sec^{-2}$and 2 msec – 2` respectively. If they reach the final point at the same instant, then the length of the path is.

A. $30m$

B. $32m$

C. $20m$

D. $24m$

**Answer: D**

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**32.** A juggler maintains four balls in motion, making each to them to rise a height of $20m$ from his hand. What time interval should he maintain, for the alphaer distance between them.

A. $3s$

B. $\frac{3}{2}s$

C. $1s$

D. $2s$

**Answer: C**

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**33.** The displacement of a particle moving in a straight line is described by the relation $s = 6 + 12t - 2t^2$. Here $s$ is in metre and $t$ in second. The distance covered by the particle in first $5s$ is

A. $20m$

B. $32m$

C. $24m$

D. $26m$

**Answer: D**

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**34.** A ball projected upwards from the foot of a tower. The ball crosses the top of the tower twice after an interval of $6s$ and the ball reaches the ground after $12s$. The height of the tower is $\left(g = 10m/s^2\right)$ :

A. $120m$

B. $135m$

C. $175m$

D. $80m$

**Answer: B**

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**35.** A particle is projected vertically upwards from a point A on the ground. It takes time to reach a point B, but it still continues to move up. If it takes further time to reach the ground from point B. Then height of point B from the ground is :

A. $\frac{1}{2}g(t_1+t_2)^2$

B. $gt_1t_2$

C. $\frac{1}{8}g(t_1+t_2)^2$

D. $\frac{1}{2}gt_1t_2$

**Answer: D**

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**36.** A particle is released from rest from a tower of height 3h. The ratio of time intervals for fall of equal height h i.e. $t_1 : t_2 : t_3$ is :

A. $5:3:1$

B. $3:2:1$

C. $9:4:1$

D. $1:\left(\sqrt{2}-1\right):\left(\sqrt{3}:\sqrt{2}\right)$

**Answer: D**

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**37.** A ball is dropped from the roof of a tower height $h$. The total distance covered by it in the last second of its motion is equal to the distance covered by it in first three seconds. The value of $h$ in metre is $\left(g=10m/s^2\right)$

A. $125$

B. $200$

C. 100

D. 80

**Answer: A**

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**38.** Ball $A$ is dropped from the top of a building. At the same instant ball $B$ is thrown vertically upwards from the ground. When the balls collide, they are moving in opposite direction and the speed of $A$ is twice the speed of $B$. At what fraction of the height of the building did the collision occurs ?

A. $1/3$

B. $2/3$

C. $1/4$

D. $2/5$

**Answer: B**

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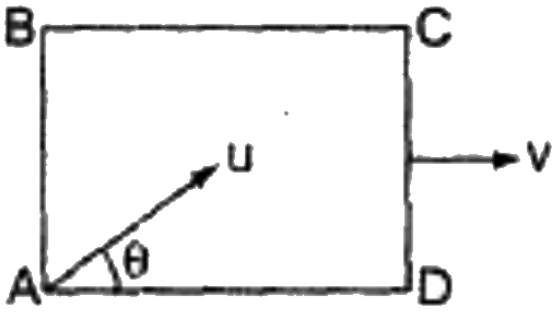
**39.** A horizontal smooth square platform ABCD is moving towards the right with a uniform speed v. At what angle $\theta$ must a particle slide from A, on the platform, with speed u so that it strikes the point B?

(Assume u to be uniform and $u > v$)




A. $\sin^{-1}\left(\frac{u}{v}\right)$

B. $\cos^{-1}\left(\frac{v}{u}\right)$

C. $\cos^{-1}\left(\frac{u}{v}\right)$

D. $\sin^{-1}\left(\frac{v}{u}\right)$

**Answer: B**

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**40.** Two stones are thrown up simultaneously from the edge of a cliff with initial speed $v$ and $2v$. The relative position of the second stone with respect to first varies with time till both the stones strike the ground as.

A. linearly

B. first linearly then parabolically

C. parabolically

D. first parabolically then linearly

**Answer: B**

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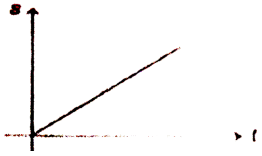
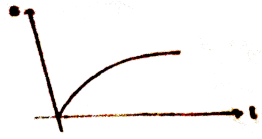
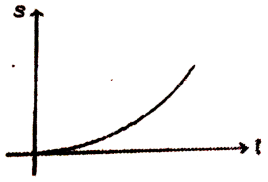
**41.** One stone is dropped from a tower from rest and simultaneously another stone is projected vertically upwards from the tower with some initial velocity. The graph of distance (s) between the two stones varies with time (t) as (before either stone hits the ground).

A. 


B. 


C. 


D. 

**Answer: A**

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**42.** A particle is dropped from point $A$ at a certain height from ground. It falls freely and passes through thre points $B, C$ and $D$ with $BC = CD$. The time taken by the particle to move from $B$ to $CD$ is $2s$ and from $C$ to $D$ is $1s$. The time taken to move from $A$ to $B$ is s

A. $0.5s$

B. $1.5s$

C. $0.75s$

D. $0.25s$

**Answer: A**

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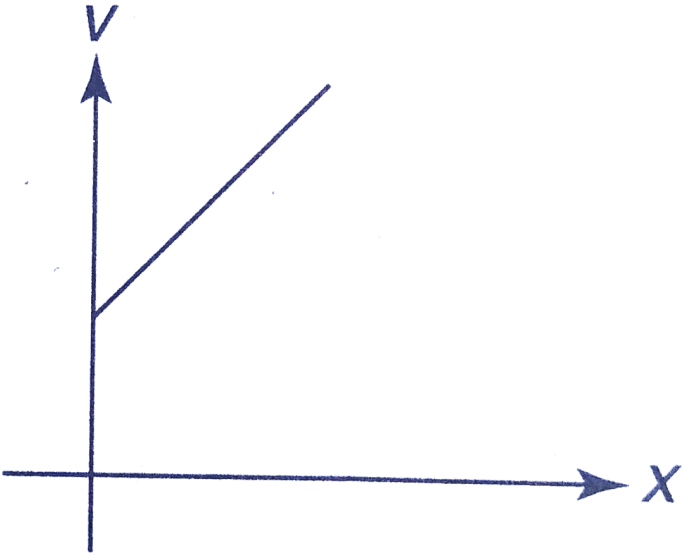
**43.** Graph of velocity versus displacement of a particle moving in a straight line is as shown in figure.

The acceleration of the particle is.




A. constant

B. increases linearly with $x$

C. increases parabolically with $x$

D. zero

**Answer: B**

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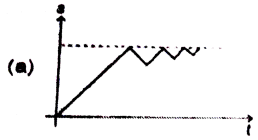
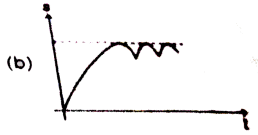
**44.** A ball is dropped from a certain height on a horizontal floor. The coefficient of restitution between the ball and the floor is $\frac{1}{2}$. The displacement time graph of the ball will be.

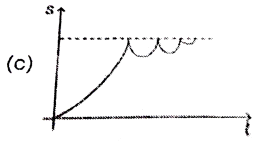
A.

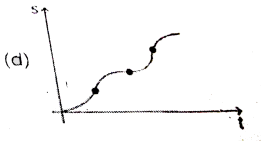



B.




C.



D. 


**Answer: C**

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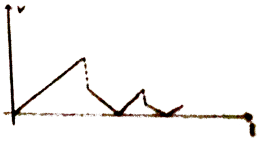
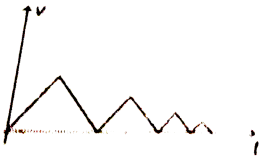
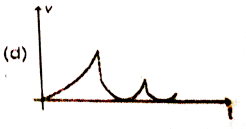
**45.** The speed -time graph of the ball in the above situation is.

A. 

B. 

C. 

D. 


**Answer: B**

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**46.** Velocity time equation of a particle moving in a straight line is $v = 2t - 4$ for $t \leq 2s$ and $v = 4 - 2t$ for $t > 2$.The distance travelled by the particle in the time interval from $t = 0$ to $t = 4s$ is (Here $t$ is in second and $v$ in m/s)

A. $12m$

B. $16m$

C. $4m$

D. $8m$

**Answer: B**

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**47.** A body starts from the origin and moves along the X-axis such that the velocity at any instant is given by $\left(4t^3 - 2t\right)$, where t is in sec and velocity in m/s. what

is the acceleration of the particle when it is 2 m from the origin?

A. $28m/s^2$

B. $22m/s^2$

C. $12m/s^2$

D. $10m/s^2$

**Answer: A**

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**48.** Two objects are moving along the same straight line. They cross a point A With an acceleration a, 2a

and velocity 2u, u at time $t = 0$. The distance moved by the object when one overtakes the

A. $\frac{6u^2}{a}$

B. $\frac{2u^2}{a}$

C. $\frac{4u^2}{a}$

D. $\frac{8u^2}{a}$

**Answer: D**

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**49.** Two balloons are moving in air with velocities $v_1 = \left\{2t\hat{i} + (t-2)\hat{j}\right)m/s$ and

$v_2 = \left\{(t-4)\hat{i} + t\hat{j}\right\} m/s$ then at what $t$ balloons are moving parallel to each other:

A. $5/4s$

B. $4/5s$

C. $10/3s$

D. $-3 + \sqrt{17}s$

**Answer: C**

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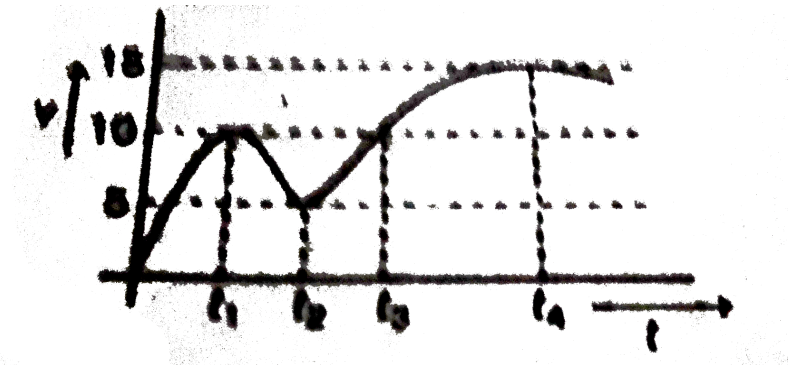
**50.** Veolocity-time graph of a particle undergoing rectilinear motioin is plotted upto $t = t_4$ as shown in

the figure. Average acceleration of the particle is zero in the time internal between




A. 0 and $t_1$

B. $t_1$ and $t_2$

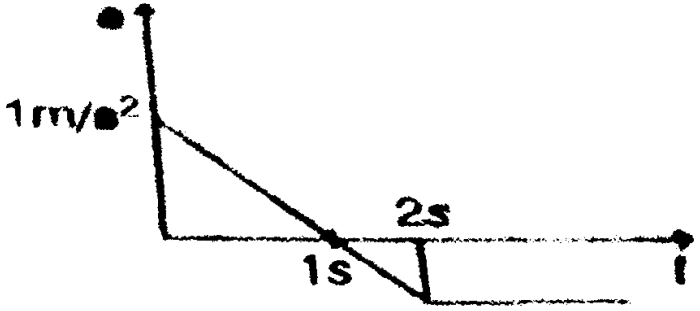
C. $t_1$ and $t_3$

D. $t_3$ and $t_4$

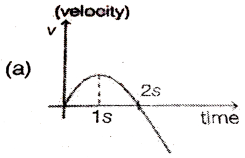
**Answer: A**

Watch Video Solution

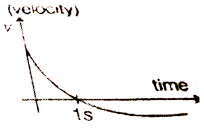
**51.** Acceleration versus time curve for a particle moving in a straight line is shown in the figure. If particle starts from rest at $t = 0$, then which of the following curve is correct for the same particle.



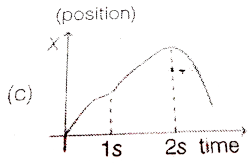

A.



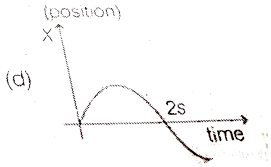

B.



C.




D.




**Answer: B**

Watch Video Solution

**52.** An airplane flies northward from town $A$ and $B$ and then back again. There is a steady wind blowing towards the north so that for the first state of the trip, the airplane is flying in the same direction as the wind and for the return trip of the journey, the

airplane is flying opposite of the wind. The total trip time $T_\omega$ as compared to the total trip time in the absence of any winds $T_0$ is:

A. $T_w = T_0$

B. $T_w > T_0$

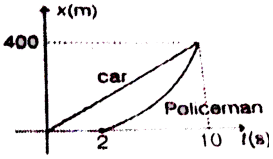
C. $T_w < T_0$

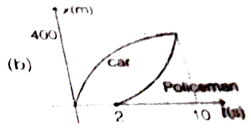
D. Data is insufficient

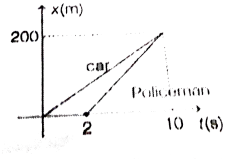
**Answer: A**

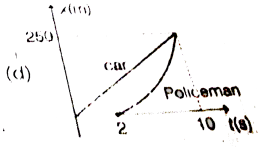
 Watch Video Solution

**53.** A car breaks a traffic signal with a speed of $40m/s$. After $2s$, a policeman starts following him with a constant acceleration of $12.5m/s^2$. Taking the position of signal to be origin, correct position time graph would be

A. 


B. 


C. 


D. 

**Answer: A**

Watch Video Solution

**54.** A plane is flying at a speed of $720 km h^{-1}$ with respect to air. The wind is blowing at a speed of $54 km h^{-1}$ from west to east. With respect to ground the plane is found to be movig northwards. In which direction is the plane heading?

A. North-West at angle $\sin^{-1}\left(\frac{3}{40}\right)$ to north

B. North-West at angle $\tan^{-1}\left(\frac{3}{40}\right)$ to west.

C. North-East at angle $\sin^{-1}\left(\frac{3}{40}\right)$ to north.

D. North -East at angle $\tan^{-1}\left(\frac{3}{40}\right)$ to east

**Answer: D**

Watch Video Solution

**55.** A particle is moving on a straight line. Its velocity at time $t$ is $(8-2t)m/s$. What is the total distance covered from $t=0$ to $t=6s$?

A. $12m$

B. $16m$

C. $18m$

D. $20m$

**Answer: A**

Watch Video Solution

**56.** A ball is dropped from a tower of height $h$ under gravity. If it takes $4s$ to reach the ground from height $\frac{h}{2}$, then time taken by it to reach from $h$ to $\frac{h}{2}$ is nearly:

A. $9.65s$

B. $6.35s$

C. $8.35s$

D. $5.65s$

**Answer: B**

Watch Video Solution

**57.** Velocity of a particle varies with time as $v = at\hat{i} + 2ht^2\hat{j}$. If the particle starts from point $(0, c)$, the trajectory of the particle is

A. $y = \frac{bx^{3/2}}{a} + c$

B. $y = \frac{4\sqrt{2}b}{3}\left(\frac{x}{a}\right)^{3/2} + c$

C. $y = \frac{4\sqrt{2}b}{3}\left(\frac{x}{a}\right)^{3/2} - c$

D. $y = \frac{bx^{3/2}}{a} - c$

**Answer: A**

Watch Video Solution

**58.** Two particles start moving from the same point along the same straight line. The first moves with constant velocity $v$ and the second with constant acceleration $a$. During the time that elapses before the sound catches the first, the greatest distance between the particle is.

A. $\frac{v^2}{a}$

B. $\frac{v^2}{2a}$

C. $\frac{2v^2}{a}$

D. $\frac{v^2}{4a}$

**Answer: B**

Watch Video Solution

**59.** A glass wind screen whose inclination with the vertical can be changed is mounted on a car. The moves horizontally with a speed of $2m/s$. At what angle $\alpha$ with the vertical should the wind screen placed so that the rain drops falling vertically downwards with velcoity $6m/s$ strike the wind screen perpendicularly?

A. $\tan^{-1}(1/3)$

B. $\tan^{-1}(3)$

C. $\cos^{-1}(3)$

D. $\sin^{-1}(1/3)$

**Answer: B**

Watch Video Solution

**60.** A swimmer crosses a flowing stream of width $\omega$ to and fro in time $t_1$. The time taken to cover the same distance up and down the stream is $t_2$. If $t_3$ is the time the swimmer would take to swim a distance $2\omega$ in still water, then

A. $t_1^2 = t_2 t_3$

B. $t_2^2 = t_1 t_3$

C. $t_3^2 = t_1 t_2$

D. $t_3 = t_1 + t_2$

**Answer: A**

Watch Video Solution

**61.** A point mass starts moving in straight line with constant acceleration $a$ from rest at $t = 0$. At time $t = 2s$, the acceleration changes the sign remaining the same in magnitude. The mass returns to the initial position at time $t = t_0$ after start of motion. Here $t_0$ is

A. $4s$

B. $\left(4+2\sqrt{2}\right)s$

C. $\left(2+2\sqrt{2}\right)s$

D. $\left(4+4\sqrt{2}\right)s$

**Answer: B**

Watch Video Solution

**62.** In a car race car $A$ takes $t_0$ time less to finish than car $B$ and pases the finishing point with a velocity $v_0$ more than car $B$. The cars start from rest and travel

with constant accelerations $a_1$ and $a_2$ . Then the ratio $\frac{v_0}{t_0}$ is equal to

A. $\frac{a_1^2}{a_2}$

B. $\frac{a_1 + a_2}{2}$

C. $\sqrt{a_1 a_2}$

D. $\frac{a_2^2}{a_1}$

**Answer: C**

Watch Video Solution

**63.** A particle moves in space along the path $z = ax^3 + by^2$ in such a way that $\frac{dx}{dt} = c = \frac{dy}{dt}$

where $a$, $b$ and $c$ are constants. The acceleration of the particle is

A. $\left(6ac^2x + 2bc^2\right)\hat{k}$

B. $\left(2ax^2 + 6by^2\right)\hat{k}$

C. $\left(4bc^2 + 3ac^2\right)\hat{k}$

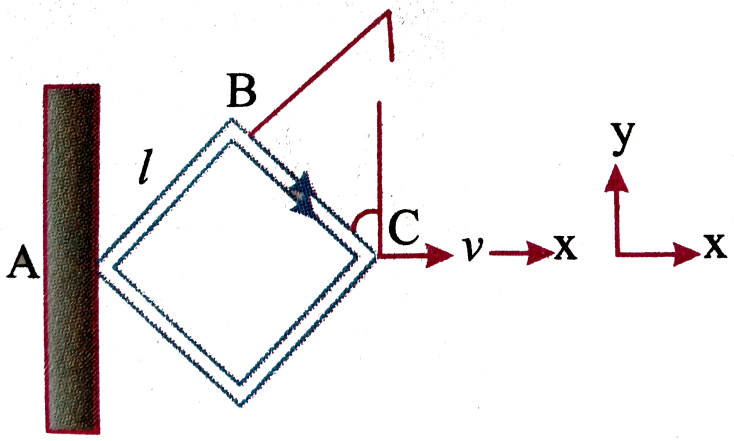
D. $\left(bc^2x + 2by\right)\hat{k}$

**Answer: A**

Watch Video Solution

**64.** Four rods of side length $l$ have been hinged to form a rhombus. Vertex $A$ is fixed to a rigid support,

vertex $C$ is being moved along the $x$-axis with constant velocity $V$ as shown in figure. The rate at which vertex $B$ is nearing the $x$-axis at the moment the rhombus is in the form of a squarem is




A. $\frac{v}{4}$

B. $\frac{v}{3}$

C. $\frac{v}{2}$

D. $\frac{v}{\sqrt{2}}$

**Answer: C**

Watch Video Solution

**65.** A car leaves station $X$ for station $Y$ every 10 min. The distance between $X$ and $Y$ is $60km$. The car travels at speed $60km/h$. A man drives a car from $Y$ towards $X$ at speed $60km/h$. If he starts at the moment when first car leaves station $X$, how many cars would he meet om route?

A. 20

B. 7

C. 10

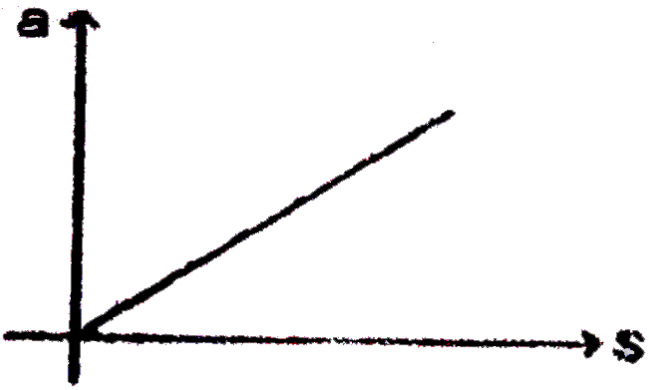
D. 5

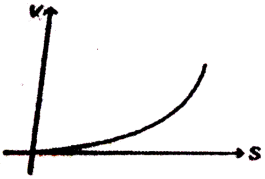
**Answer: B**

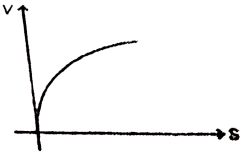
Watch Video Solution

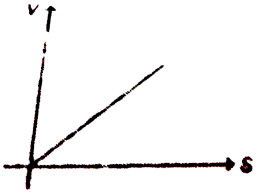
**66.** Acceleration $(a)$ -displacement $(s)$ graph of a particle moving in a straight line is as shown in the figure. The initial velocity of the particle is zero. The

$v - s$ graph of the particle would be




A. 


B. 


C. 


D.

**Answer: C**

Watch Video Solution

**67.** A horizontal wid is blowing with a velocity $v$ towards north-east. A man starts running towards north with acceleration $a$. The after which man will feel the wind blowing towards east is

A. $\frac{v}{a}$

B. $\frac{\sqrt{2}V}{a}$

C. $\frac{v}{\sqrt{2}a}$

D. $\frac{2v}{a}$

**Answer: C**

Watch Video Solution

**68.** The distance between two moving particles $P$ and $Q$ at any time is a.If $v_r$ be their relative velocity and if $u$ and $v$ be the components of $v_r$, along and perpendicular to $PQ$.The closest distance between $P$ and $Q$ and time that elapses before they arrive at their nearest distance is

A. $\frac{av_1}{v^2}$

B. $\frac{av_2}{v^2}$

C. $\frac{av}{v_1^2}$

D. $\frac{av}{v_2^2}$

**Answer: A**

 Watch Video Solution

**69.** Consider a collection of a large number of particles each with speed v. The direction of velocity is randomly distributed in the collection. Show that the magnitude of the relative velocity between a pair of particles averaged over all the pairs in the collection is greater than v.

A. zero

B. greater than $v$

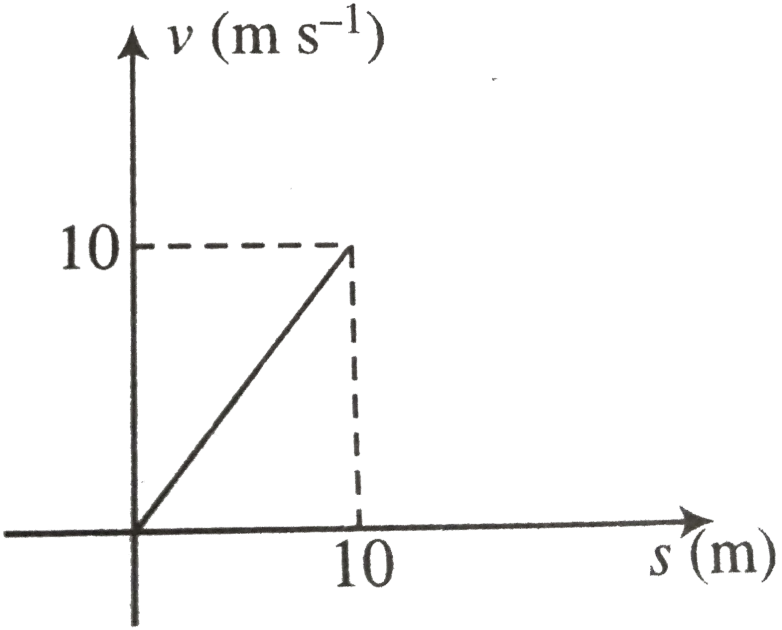
C. less than $v$

D. $v$

**Answer: B**

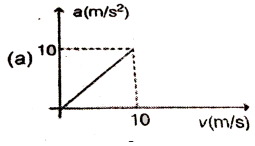
Watch Video Solution

**70.** Velocity versus displacement graph of a particle moving in a straight line as shown in figure.

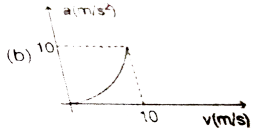


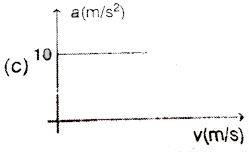

The corresponding acceleration versus velocity graph will be .

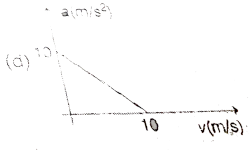
A.




B.



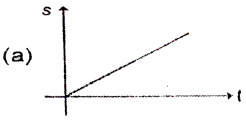
C. 


D. 

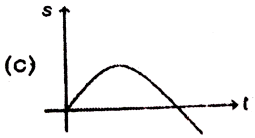

**Answer: A**

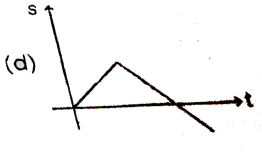
Watch Video Solution

**71.** A particle is moving in $x - y$ plane with $y = \frac{x}{2}$ and $V_x = 4 - 2t$. The displacement versus time graph of the particle would be

A. 

B. 


C. 


D. 


**Answer: C**

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**72.** A car 2m long and 3m wide is moving at $10m/s$ when a bullet hits it in a direction making an angle of $\tan^{-1}(3/4)$ with the car as seen from the ground. The bullet enters one edge of the car at the corner

and passes out at diagonally opposite corner. Neglecting gravity, the time for the bullet to cross the car is

A. $1.0s$

B. $0.4s$

C. $0.2s$

D. $0.6s$

**Answer: C**

Watch Video Solution

**73.** A particle starts from rest and moves with an acceleration of $a = \{2 + |t - 2|\} m / s^2$ The velocity of the particle at $t = 4$ sec is

A. $16 m / s$

B. $20 m / s$

C. $8 m / s$

D. $12 m / s$

**Answer: D**

Watch Video Solution

**74.** A $2-m$ wide truck is moving with a uniform speed $v_0 = 8ms^{-1}$ along a straight horizontal road. $A$ pedestrian starts to cross the road with a uniform speed $v$ when the truck is $4m$ away from him, The minimum value of $v$ so that he can cross the road safely is .

A. $2.62m/s$

B. $4.6m/s$

C. $3.57m/s$

D. $1.414m/s$

**Answer: C**

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**75.** In the one-dimensional motion of a particle, the relation between position $x$ and time $t$ is given by $x^2 + 2x = t$ (here $x > 0$). Choose the correct statement

A. the retardatioin of the particle is $\frac{1}{4(x+1)^3}$

B. the uniform velocity of the particle is $\frac{1}{(x+1)^3}$

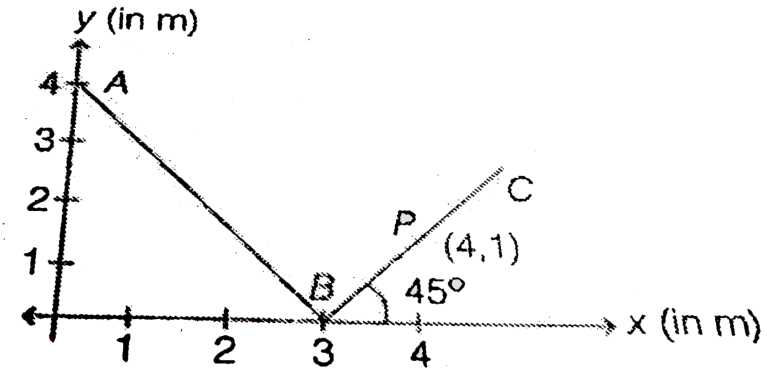
C. Both are correct

D. Both are wrong

**Answer: A**

Watch Video Solution

**76.** A particle moves in $x - y$ plane, starting from $A$ along straight line path $AB$ and $BC$ as shown in the graph. When it is at point $P$ angle between diections of its average velocity and instantaneous velocity is $[\tan 37^\circ = 3/4]$




A. $90^\circ$

B. $82^\circ$

C. $98^\circ$

D. $74^\circ$

**Answer: B**

Watch Video Solution

**77.** A particle is moving along $x$-axis with constant acceleration. At $t = 0$, the particle is at $x = 3m$ and $\frac{dx}{dt} = +4m/s$. The maximum value of $x$ co-ordiante of the particle is observed 2 seconds later. Starting from $t = 0$ sec, after what time, particle reaches its initial position again?

A. $4s$

B. $6s$

C. $8s$

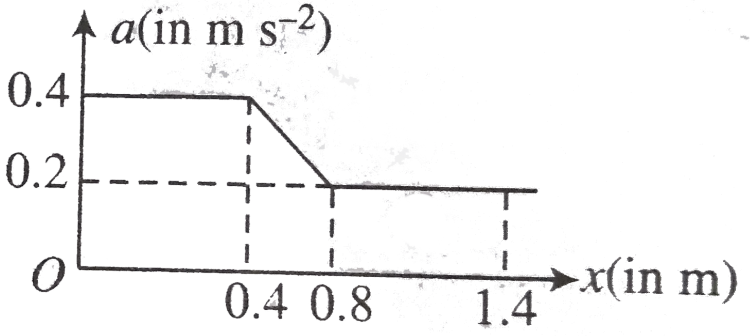
D. $12s$

**Answer: A**

Watch Video Solution

**78.** The acceleration of a particle which moves along the positive x-axis varies with its position as shown in figure. If the velocity of the particle is $0.8ms^{-1}$ at x = 0, then velocity of the particle at $x = 1.4m$ is

$(\in ms^{-1})$.




A. 1.6

B. 1.2

C. 1.4

D. None of these

**Answer: B**

Watch Video Solution

**79.** A stone is drpped from the top of a tall cliff and n seconds later another stone is thrown vertically downwards with a velocity u. Then the second stone overakes the first, below the top of the cliff at a distance given by

A. $\frac{g}{2}\left[\frac{n(gn/2-u)}{(gn-u)}\right]^2$

B. $\frac{g}{2}\left[\frac{n(gn-u/2)}{(gn-u)}\right]^2$

C. $\frac{g}{2}\left[\frac{n(gn-u/2)}{(gn-u/2)}\right]^2$

D. $\frac{g}{2}\left[\frac{gn-u}{gn-(u-2)}\right]^2$

**Answer: A**

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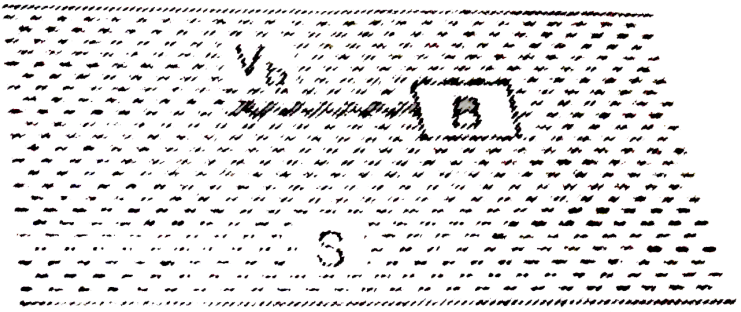
**80.** A boat $'B'$ is moving upstream with velocity $3m/s$ with respect to ground. An observer standing on the boat observes that a swimmer $'S'$ is crossing the river perpendicular to the direction of motion of the boat. If river flow velocity is $4m/s$ and swimmer crosses the river of width $100, m$ is $50s$. Then




A. velocity of swimmer w.r.t ground is $\sqrt{13}m/s$

B. drift of swimmer along river is zero

C. drift of swimmer along river will be $50m$

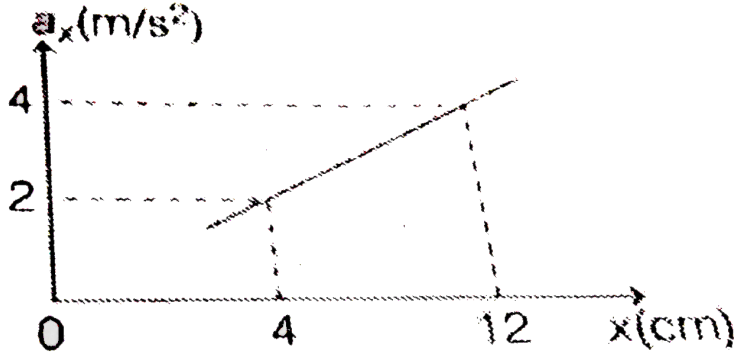
D. velocity of swimmer w.r.t grond is $2m/s$

**Answer: A**

Watch Video Solution

**81.** A particle moves along the positive $x$-axis with an acceleration$a_x$ which increases linearly with $x$, as shown in the graph. If the velocity of the particle at $x = 4cm$ is $0.40m/s$ determine the velocity at

$x = 12cm$




A. $0.2m/s$

B. $0.4m/s$

C. $0.8m/s$

D. $1.6m/s$

**Answer: C**

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**82.** In the figure shown a river of width $4m$ is flowing with speed of $5m/s$. A swimmer whose swimming speed relative to the water is $4\frac{m}{s}$, starts swimming from a point $A$ on a bank. On the other bank $B$ is a point which is directly opposite to $A$. What minimum distance (in m) the swimmer will have to walk on the other bank to reach the point $B$.

A. 2

B. 3

C. 4

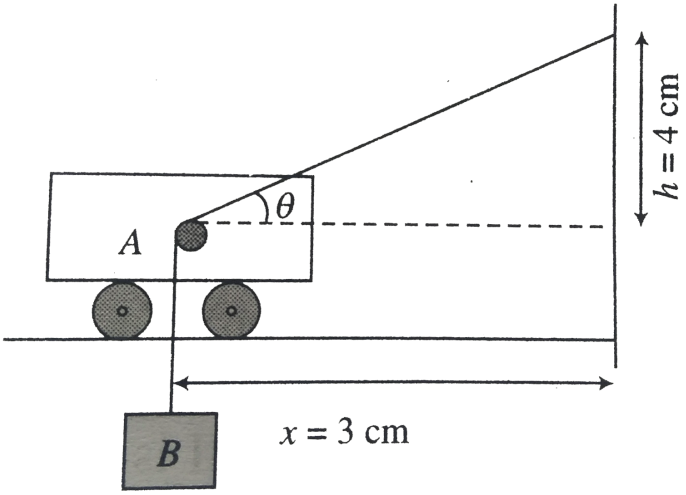
D. 5

**Answer: B**

Watch Video Solution

**83.** Choose the correct option:

The string in fig. is passing over small smooth pulley rigidly attached to trolley A. If the speed of trolley is constant and equal to $v_A$ towards right, speed of block B at the instant shown in figure are




A. (a) $v_A$

B. (b) $\frac{4}{5}v_A$

C. (c) $\frac{3}{4}v_A$

D. (d) $\frac{3}{5}v_A$

**Answer: D**

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**84.** A man who swims at a speed of $5km/h$ wants to cross a $500m$ wide stream flowing at $4km/h$ and reach the point which is directly opposite to his starting point. If he reaches a point somewhere else he has to walk back to desitination, his walking speed being $2km/h$. Find the minimum time in which he can

reah his destination.

A. 5 min

B. 10 min

C. 15 min

D. 20 min

**Answer: B**

Watch Video Solution

**85.** Two particles having position verctors $\vec{r}_1 = \left(3\hat{i} + 5\hat{j}\right)$ metres and $\vec{r}_2 = \left(-5\hat{i} - 3\hat{j}\right)$ metres are moving with velocities $\vec{v}_1 = \left(4\hat{i} + 3\hat{j}\right) m/s$ and $\vec{v}_2 = \left(\alpha\hat{i} + 7\hat{j}\right) m/s$. If they collide after 2 seconds, the value of $\alpha$ is

A. 2

B. 4

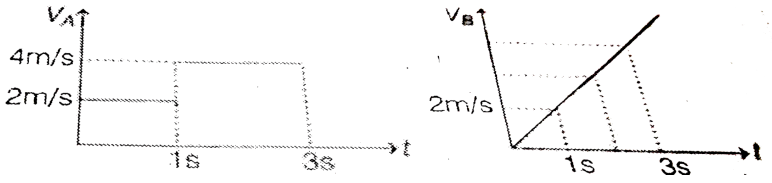
C. 6

D. 8

**Answer: D**

Watch Video Solution

**86.** Two particles $A$ and $B$ start from the origin along $x$-axis. Velocity time graph of both particles are shown in the figure. During the given time interval, the maximum separation between the particles is




A. $4m$

B. $1m$

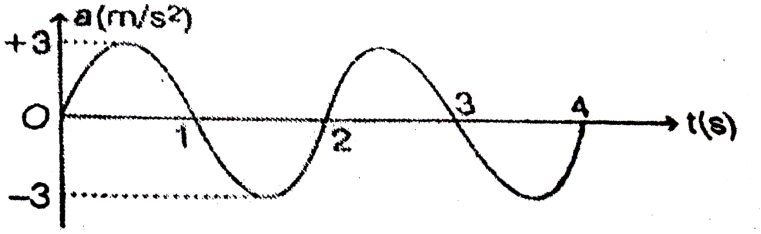
C. $2m$

D. $3m$

**Answer: C**

Watch Video Solution

**87.** A particle is moving in a straight line. Particle was initially at rest. Acceleration versus time graph is shown in figure. Acceleration of particle is given by $a = 3\sin \pi t$ in $m/s^2$. The time (in s) when the particle comes to rest is




A. $t = 0, 1, 2, 3, 4$

B. $t = 1, 3$

C. $t = 0, 2, 4$

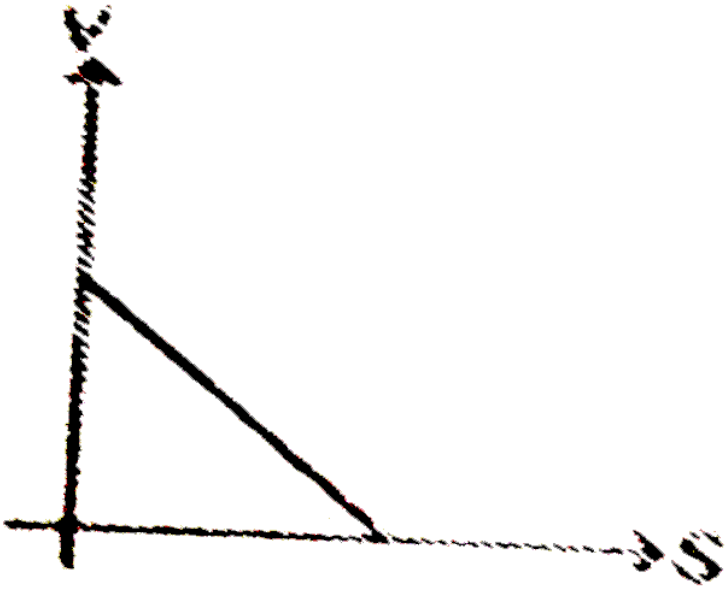
D. at $t = 0.5, 1.5, 2.5$

**Answer: C**

Watch Video Solution

**Mcq Type**

**1.** Velocity displacement graph of a particle moving in a straight line is as shown in figure.




A. magnitude of acceleration of particle is decreasing

B. magnitude of acceleration of particlre is increasing

C. acceleration versus displacement graph straight line

D. acceleration versus displacement graph is parabola

**Answer: A::C**

Watch Video Solution

**2.** Let $v$ and $a$ be the instantaneous velocity and acceleration of a particle moving in a plane. Then rate of change of speed $\frac{dv}{dt}$ of the particle is equal to

A. $|a|$

B. $\frac{v.\ a}{v}$

C. the component of $a$ parallel to $v$

D. the component of $a$ perpendicular to $v$

**Answer: B::C**


**3.** Starting from rest a particle is first accelerated for time $t_1$ with constant acceleration $a_1$ and then stops in time $t_2$ with constant retardation $a_2$. Let $v_1$ be the average velocity in this case and $s_1$ the total displacement. In the second case it is accelerating for the same time $t_1$ with constant acceleration $2a_1$ and come to rest with constant retardation $a_2$ in time $t_3$.

If $v_2$ is the average velocity in this case and $s_2$ the total displacement, then

A. (a) $v_2 = 2v_1$

B. (b) $2v_1 < v_2 < 4v_1$

C. (c) $s_2 = 2s_1$

D. (d) $2s_1 < s_2 < 4s_1$

**Answer: A::D**

Watch Video Solution

**4.** A particle leaves the origin with an initial velodty $v = \left(3.00\hat{i}\right) m/s$ and a constant acceleration

$a = \left( -1.00\hat{i} - 0.500\hat{j} \right) m/s^2$. When the particle reaches its maximum x coordinate, what are

(a) its velocity and (b) its position vector?

A. $v = -2\hat{i}$

B. $v = \left( -1.5\hat{j} \right) m/s$

C. $r = \left( 4.5\hat{i} - 2.25\hat{j} \right) m$

D. $r = \left( 3\hat{i} - 2\hat{j} \right) m$

**Answer: B::C**

Watch Video Solution

**5.** Acceleration of a particle which is at rest at $x = 0$ is $\overrightarrow{a} = (4 - 2x)\hat{i}$. Select the correct alternative (s).

A. Particle further comes to rest at $x = 4$

B. Particle oscillates about $x = 2$

C. Maximum speed of particle is 4 units

D. Maximum speed of particle is 2 units

**Answer: A,B**

Watch Video Solution

**6.** A car is moving rectilinearly on a horizontal path with acceleration $a_0$.A person sitting inside the car observes that an insect $S$ is crawling up the screen with an acceleration a.If $\theta$ is the inclination of the wind screen with the horizontal, then the acceleration of the insect.

A. parallel to screen is $a + a_0 \cos\theta$

B. along the horizontal is $a_0 - a\cos\theta$

C. perpendicular to screen is $a_0 \sin\theta$

D. perpendicular to screen is $a_0 \tan\theta$

**Answer: B::C**

Watch Video Solution

**7.** The coordinate of a particle moving in a plane are given by $x(t) = a\cos(pt)$ and $y(t) = b\sin(pt)$ where $a, b(< a)$ and $P$ are positive constants of appropriate dimensions . Then

A. the path of the particle is an ellipse

B. The velocity and acceleration of the particle are normal to each other at $t = \pi/2p$

C. the acceleration of the particle is always directed towards a fixed point

D. the distance travelled by the particle in time interval $t = 0$ to $t = \pi / 2p$ is a

**Answer: A::B::C**

Watch Video Solution

**8.** A particle moving along a straight line with uniform acceleration has velocities $7m / s$ at A and $17m / s$ at C. B is the mid point of AC. Then :-

A. The average velocity at $B$ is $10m / s$

B. The average velocity between $A$ and $B$ is $10m / s$

C. The ratio of time to go from $A$ to $B$ and that from B to C is $3:2$

D. The average velocity between $B$ and $C$ is $15m/s$

**Answer: A::B::D**

Watch Video Solution

**9.** Let $r$ be the radius vector of a particle in motion about some reference point and $r$ its modulus. Similarly, $v$ be the velocity vector and $v$ its modulus. Then

A. $v \neq \frac{dr}{dt}$

B. $v = \frac{dr}{dt}$

C. $v = \left|\frac{dr}{dt}\right|$

D. $|dr| \neq dr$

**Answer: A::C::D**

Watch Video Solution

**10.** Two particles $A$ and $B$ are located in $x - y$ plane at points $(0, 0)$ and $(0, 4m)$. They simultaneoulsy start moving with velocities $v_A = 2\hat{j}m/s$ and $v_B = 2\hat{i}m/s$. Select the correct alternative(s)

A. the distance between them is constant

B. The distance between them first decreases and then increases

C. the shortest distance between them is $2\sqrt{2}m$

D. Time after which they are at minimum distances is $1s$

**Answer: B::C::D**

Watch Video Solution

**11.** The co-ordinate of the particle in x-y plane are given as $x = 2 + 2t + 4t^2$ and $y = 4t + 8t^2$ :-

The motion of the particle is :-

A. along a straight line

B. uniformly accelerated

C. along a parabolic path

D. non-uniformly accelerated

**Answer: A::B**

Watch Video Solution

**12.** River is flowing with a velocity $v_{BR} = 4\hat{i}m/s$. A boat is moving with a velocity of $v_{BR} = \left(-2\hat{i} + 4\hat{j}\right)m/s$ relative to river. The width

of the river is $100m$ along $y$-direction. Choose the correct alternative(s)

A. The boatman will cross the river in $25s$

B. Absolute velocity of boatman is $2\sqrt{5}m/s$

C. Drift of the boatman along the river current is $50m$

D. The boatman can never cross the river

**Answer: A::B::C**

Watch Video Solution

**13.** A particle is moving along $x$-axis. Its velocity $v$ with $x$ co-ordinate is varying as $v = \sqrt{x}$. Then

A. initial velocity of particle is zero

B. motion is non-uniformly accelerated

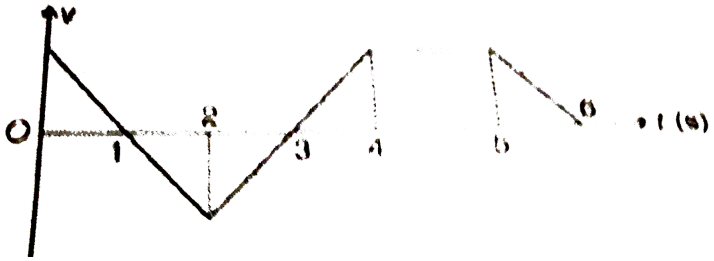
C. acceleration of particle at $x = 2m$ is $\frac{1}{2} m / s^2$

D. acceleration of particle at $x = 4m$ is $1 m / s^2$

**Answer: A::C**

Watch Video Solution

**14.** From $v - t$ graph shown in figure. We can draw the following conclusions




A. between $t = 1s$ to $t = 2s$ speed of particle is decreasing

B. between $t = 2s$ to $t = 3s$ speed of particle is increasing

C. between $t = 5s$ to $t = 6$ acceleration of particle is negative

D. between $t = 0$ to $t = 4s$ particle changes its directioin of motion twice

**Answer: C::D**

Watch Video Solution

**15.** A particle $P$ is projected upwards with $80m/s$. One second later another particle $Q$ is projected with initial velocity $70m/s$. Before either of the particle srikes the ground $(g = 10m/s^2)$

A. both particle are at rest with respect to each other

B. after $2s$ distance between the particles is $75m$

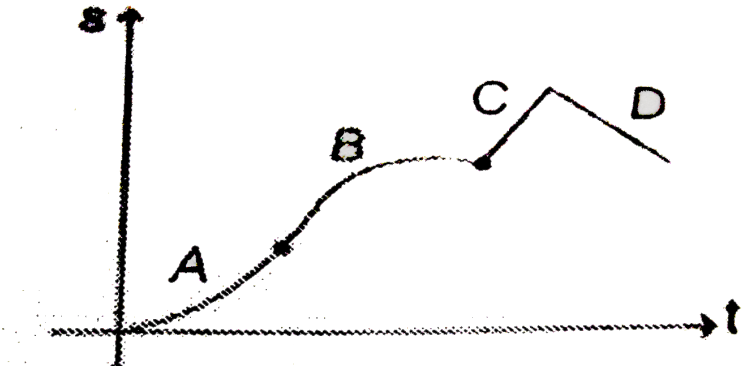
C. when particle $P$ is at highest point, particle $Q$ is moving downwards

D. when particle $P$ is at highest point, particle $Q$ is moving upwards

**Answer: A::B**

Watch Video Solution

**16.** Displacement time graph of a particle moving in a straight line is a shown in figure.




A. in region $A$ acceleration is positive

B. in region $B$ acceleration is negative

C. in region $C$ acceleration is positive

D. in region $D$ acceleration is negative

**Answer: A::B**

Watch Video Solution

**17.** At time $t = 0$, a particle is at $(-1m, 2m)$ and at $t = 2s$ it is at $(-4m, 6m)$. From this we can conclude that in the given time interval.

A. particle may be accelerate

B. particle may be accelerated

C. average speed of the particle is $2.5m/s$

D. average velocity of the particle is $2.5m/s$

**Answer: B::D**

Watch Video Solution

**18.** A particle $P$ lying on a smooth horizontal $x-y$ plane starts from $\left(3\hat{i}+4\hat{j}\right)m$ with velocity $\left(2\hat{i}\right)m/s$. Another particle $Q$ is projected (horizontally from origin with velocity $\left(x\hat{i}+y\hat{j}\right)$ so that is strikes $P$ after $2s$. Then

A. $x=2.0$

B. $x=3.5$

C. $y=2.0$

D. $y=3.5$

**Answer: B::C**

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**19.** Path of a particle moving in $x-y$ plane is $y=3x+4$. At some instant suppose $x$- component of velocity is $1m/s$ and it is increasing at a constant rate of $1m/s^2$. Then at this instant.

A. (a)speed of particle is $\sqrt{10}m/s$

B. (b)acceleration of particle is $\sqrt{10}m/s$

C. (c)velocity time graph is parabola

D. (d)acceleration time graph is parabola

**Answer: A::B**

Watch Video Solution

**20.** A particle moves along the X-axis as $x = u(t - 2s) = at(t - 2)^2$.

A. the initial velocity of the particle is $u$

B. the acceleration of the parabola is $u$

C. the acceleration of the particle is $2a$

D. at $t = 2s$ particle is at the origin

**Answer: C::D**

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**21.** A man standing on the edge of the terrace of a high rise building throws a stone, vertically up with at

speed of $20m/s$. Two seconds later, an identical stone is thrown vertically downwards with the same speed of $20m$,. Then

A. the relative velocity between the two stones remains constant till one hits the ground

B. both will have the ame kinetic energy when they hit the ground

C. the time interval between their hitting the ground is 2 seconds

D. if the collisions on the ground are perfectlyl elastic bothh will rise to the same height above the ground

**Answer: A::B::C::D**

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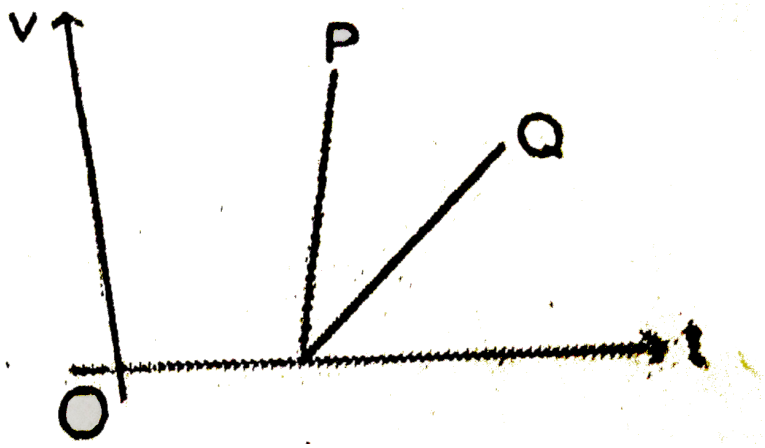
**22.** The $v - t$ graph for two particles $P$ and $Q$ are given in the figure. Consider the following statements(s). Then, which of the following statement(s) is/are True:




A. Their relative velocity is non-zero but constant

B. Their relative velocity is continuously increasing

C. Their relative acceleration is non-zero but constant

D. Their relative acceleration continuously increse

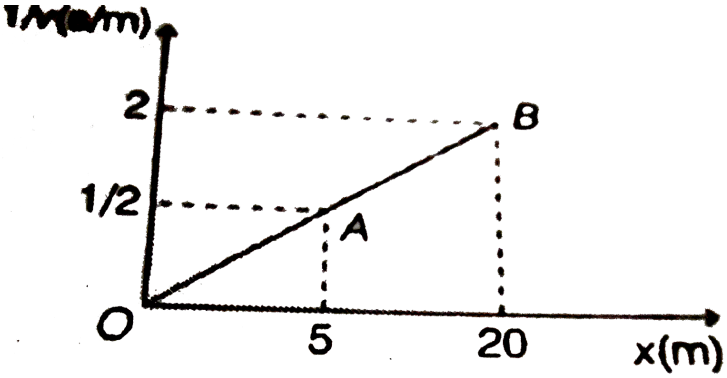
**Answer: B::C**

Watch Video Solution

**23.** A particle is moving in a straight line along the positive $x$-axis such that its speed is inversely proportional to the distance from origin $\left[v \propto \frac{1}{x} \Rightarrow v = \frac{k}{x}\right.$ where $k$ is the proportionally

constant].

The graph of motion of the particle for $1/v$ versus $x$ (distance from origin) is shown in the figure.




A. The time interval of motion from point $A$ to point $B$ is $12.50$

B. The time interval of motion from point $A$ to point $B$ is $18.75s$.

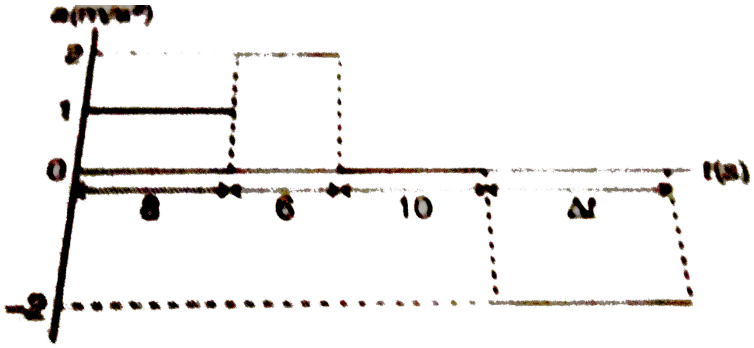
C. The proportionality constant $k$ is $10m^2/s$

D. The proportionality constant $k$ is $20m^2/s$

**Answer: B::C**

Watch Video Solution

**24.** A subway train travels between two of its stations at then stops with the acceleration shcedule shown in the acceleration versus time graph. Then




A. The time interval $\Delta$ is $8s$.

B. The distance between station is $350m$

C. The time interval $\Delta t$ is $10s$

D. The distance between stations is $416m$

**Answer: C::D**

Watch Video Solution

**25.** A particle starts moving with initial velocity $3m/s$ along $x$- axis from origin. Its acceleration is varying with $x$ co-ordinate in parobalic nature as shown in the figure. At $x = 1m$, tangent to the graph makes an

angle $45^\circ$ with positive $x$- aixs. Then at $x = 3m$,


A. velocity of the particle is $3\sqrt{2}m/s$

B. velocity of the particle is $3\sqrt{2}m/s$

C. acceleration of the particle is $4.5m/s^2$

D. acceleration of the particle is $9m/s^2$

**Answer: A::C**

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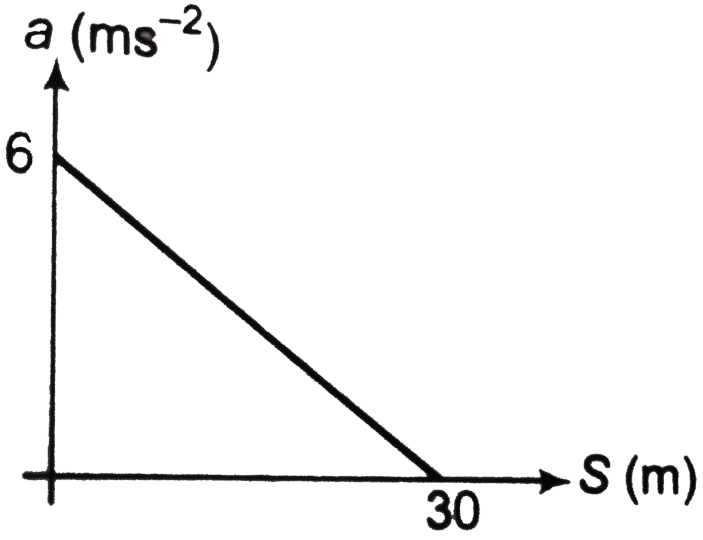
**26.** A train starts from rest at $S = 0$ and is subjected to an acceleration as shown in figure. Then,




A. Change in velocity at he end of $10m$ displacement is $50m/s$

B. Velocity of the train for $s = 10m$ is $10m/s$

C. The maximum velocity attained by train is equal to $6\sqrt{5}m/s$

D. The maximum velocity of the train ins $16m/s$

**Answer: B::C**

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**27.** Man A is sitting in a car moving with a speed of 54 $\frac{km}{hr}$ observes a man B in front of the car crossing perpendicularly a road of width 15 m in three seconds. Then the velocity of man B (in $\frac{m}{s}$) will be:

A. Speed of man $B$ is $5\sqrt{10}m/s$

B. Speed of man $B$ is $5ms^{-1}$

C. Actual direction of motion of $B$ is at an angle of $\tan^{-1}\left(\frac{1}{3}\right)$ with direction of motion of car

D. Actual direction of motion of $B$ is at an angle of $\tan^{-1}(3)$ with direction opposite to the direction of motion of car.

**Answer: A::C**

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## Comprehension Type

**1.** A particle starts from rest with a time varying acceleration $a = (2t - 4)$. Here $t$ is in second and $a$ in $m / s^2$

Particle comes to rest after a time $t =$ ..... second

A. 1

B. 4

C. 3

D. 2

**Answer: B**

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**2.** A particle starts from rest with a time varying acceleration $a = (2t - 4)$. Here $t$ is in second and $a$ in $m/s^2$

Maximum velocity of particle in negative direction is at $t =$ ..... second

A. 3

B. 4

C. 2

D. 1

**Answer: C**

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**3.** A particle starts from rest with a time varying acceleration $a = (2t - 4)$. Here $t$ is in second and $a$ in $m / s^2$

The velocity time graph of the particle is

A. parabola passing through origin

B. straight line not passing through origin

C. parabola not passing through origin

D. straight line passing through origin

**Answer: A**

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**4.** $x$ and $y$ co-ordinates of a particle moving in $x - y$ plane at some instant of time are $x = 2t$ and $y = 4t$ .Here $x$ and $y$ are in metre and $t$ in second. Then

The distance travelled by the particle in a time from $t = 0$ to $t = 2s$ is .....$m$

A. $2\sqrt{3}$

B. $4\sqrt{5}$

C. $\sqrt{2}$

D. $3\sqrt{40}$

**Answer: B**

Watch Video Solution

**5.** $x$ and $y$ co-ordinates of a particle moving in $x - y$ plane at some instant of time are $x = 2t$ and $y = 4t$ .Here $x$ and $y$ are in metre and $t$ in second. Then The path of the particle is a.....

A. straight line

B. parabola

C. circle

D. ellipse

**Answer: A**

Watch Video Solution

**6.** At time $t = 0$, particle $A$ is at $(1m, 2m)$ and $B$ is at $(5m, 5m)$. Velociyt of $B$ is $\left(2\hat{i} + 4\hat{j}\right) m/s$ Velocity of particle $A$ is $\sqrt{2}v)$ at $45^\circ$ with $x$-axis. A collides with $B$

.

Value of $v$ is .....m/s

A. 5

B. 15

C. 25

D. 10

**Answer: D**

Watch Video Solution

**7.** At time $t = 0$, particle $A$ is at $(1m, 2m)$ and $B$ is at $(5m, 5m)$. Velocity of $B$ is $\left(2\hat{i} + 4\hat{j}\right) m/s$ Velocity of particle $A$ is $\sqrt{2}v)$ at $45^\circ$ with $x$-axis. A collides with $B$

.

Time when $A$ will collide with $B$ is .....second.

A. $0.5s$

B. $1.5s$

C. $4s$

D. $3s$

**Answer: A**

Watch Video Solution

**8.** The position of a particle is given by

$x = 2(t - t^2)$

where $t$ is expressed in seconds and $x$ is in metre.

The acceleration of the particle is

A. 0

B. $4m / s^2$

C. $-4m / s^2$

D. None of these

**Answer: C**

Watch Video Solution

**9.** The position of a particle is given by

$x = 2(t - t^2)$

where $t$ is expressed in seconds and $x$ is in metre.

The maximum value of position co-ordinate of particle on positive $x$-axis is

A. $1m$

B. $2m$

C. $\frac{1}{2}m$

D. $4m$

**Answer: C**

Watch Video Solution

**10.** The position of a particle is given by

$x = 2(t - t^2)$

where $t$ is expressed in seconds and $x$ is in metre.

The particle

A. never does to negative $x$-axis

B. never goes to positive $x$-axis

C. starts from the origin goes up to $x = \frac{1}{2}m$ in the positive $x$ -axis and then moves in opposites direction

D. has zero initial velocity

**Answer: C**

Watch Video Solution

**11.** The position of a particle is given by

$x = 2(t - t^2)$

where $t$ is expressed in seconds and $x$ is in metre.

The total distance travelled by the paticle between $t = 0$ to $t = 1s$ is

A. $0m$

B. $1m$

C. $2m$

D. $\frac{1}{2}m$

**Answer: B**

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**12.** The position of a particle is given by

$x = 2(t - t^2)$

where $t$ is expressed in seconds and $x$ is in metre.

When does the object return to its initial velocity?

Watch Video Solution

**13.** The position of a particle is given by

$x = 2(t - t^2)$

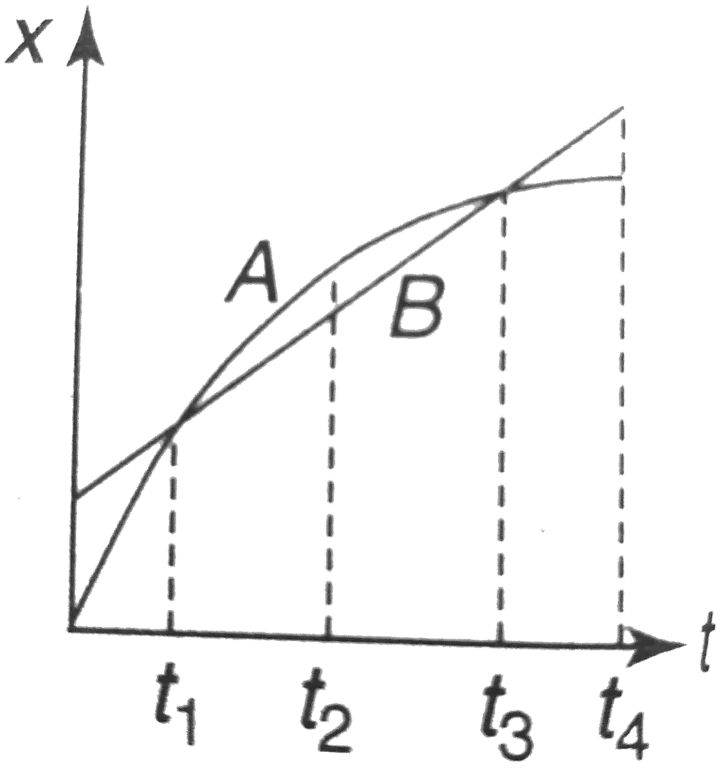
where $t$ is expressed in seconds and $x$ is in metre.

When is the object at rest?

Watch Video Solution

**14.** The graph given shows the positions of two cars, $A$ and $B$, as a function of time. The cars move along the x-axis on parallel but separate tracks, so that they can pass each other's position without colliding. At

which instant in time is car-A overtaking the car-B ?




A. $t_1$

B. $t_2$

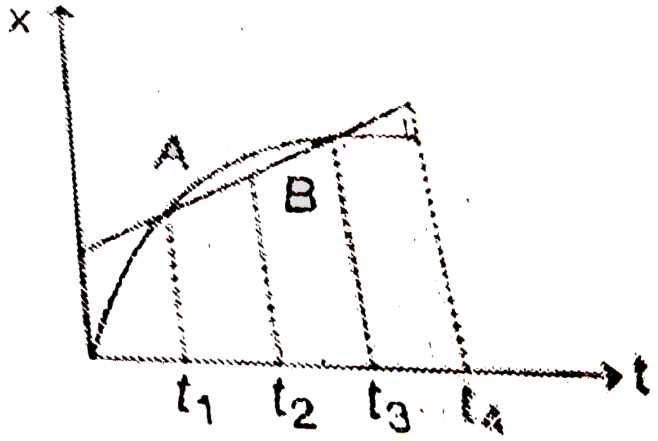
C. $t_3$

D. $t_4$

**Answer: A**

Watch Video Solution

**15.** The graph given show the position of two cars $A$ and $B$ as a function of time. The cars move along the $x$ axis on parallel but separate tracks, so that they can pass each other's position without colliding.




At time $t_3$ which car is moving faster?

A. car $A$

B. car $B$

C. same sped

D. None of these

**Answer: B**

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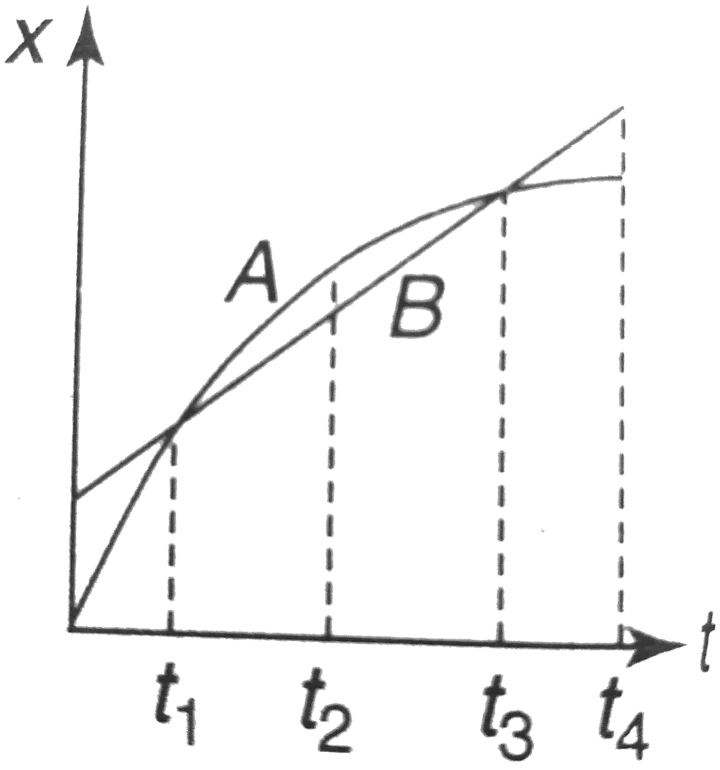
**16.** The graph given shows the positions of two cars, $A$ and $B$, as a function of time. The cars move along the x-axis on parallel but separate tracks, so that they can pass each other's position without colliding. At

which instant in time is car-A overtaking the car-B ?




A. $t_1$

B. $t_2$

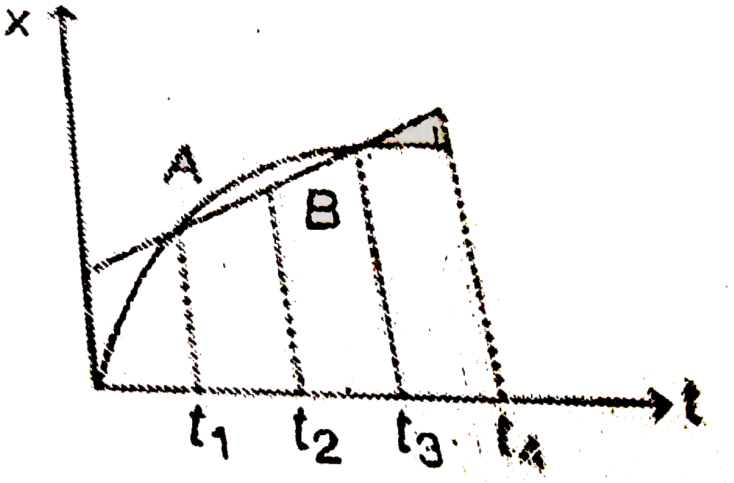
C. $t_3$

D. $t_4$

**Answer: B**

Watch Video Solution

**17.** The graph given show the position of two cars $A$ and $B$ as a function of time. The cars move along the $x$ axis on parallel but separate tracks, so that they can pass each other's position without colliding.



Which one of the following best describes the motion of car $A$ as shown on the graphs?

A. speeding up

B. constant velocity

C. slowing down

D. first speeding up, then slowing down

**Answer: C**

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**18.** Two trains $R$ and $S$ are approaching each other on a straight track, the former with a uniform velocity of

$25m/s$ and the latter with $15m/s$. When the are $225m$ apart brakes are siultaneously applied to both of them. The deceleration given by te brakes to the train $S$ increases linearly with time by $0.3m/s^2$ every second (i.e. $dv/dt = -0.3t$), while the train $R$ is given a uniform deceleration

What must be the minimum deceleration of train $R$ so that the trains do not collide?

A. $5s$

B. $25s$

C. $15s$

D. $10s$

**Answer: D**

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**19.** Two trains A and B are approaching each other on a straight track, the former with a uniform velocity of 25 m/s and other with 15m/s, when they are 225 m a part brakes are simultaneously applied to both of them. The deceleration given by the brakes to thetrain B increases linearly with time by $0.3m/s^2$ every second, while the train A is given a uniform deceleration, (a) What must be the minimum deceleration of the train A so that the trains do not

collide ? (b) What is the time taken by the trains to come to stop ?

A. $5m/s^2$

B. $2.5m/s^2$

C. $1.5m/s^2$

D. $7.5m/s^2$

**Answer: B**

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Match The Column

**1.** Match the following

| Table-1 | Table 2 |
| --- | --- |
| (A) $\frac{dv}{dt}$ | (P) Acceleration |
| (B) $\frac{d\lvert v\rvert}{dt}$ | (Q) Magnitude of acceleration |
| (C) $\frac{dr}{dt}$ | (R) Velocity |
| (D) $\frac{d\lvert r\rvert}{dt}$ | (S) Magnitude of velocity |
| | (T) None |

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**2.** Velocity of a particle is in negative direction with constant acceleration in positive direction. Then

match the following:

| Table-1 | Table-2 |
| --- | --- |
| (A) Velocity-time graph | (P) Slope → negative |
| (B) Acceleration-time graph | (Q) Slope → positive |
| (C) Displacement-time graph | (R) Slope → zero |
| | (S) \| Slope \| → increasing |
| | (T) \| Slope \| → decreasing |
| | (U) \| Slope \| → constant |

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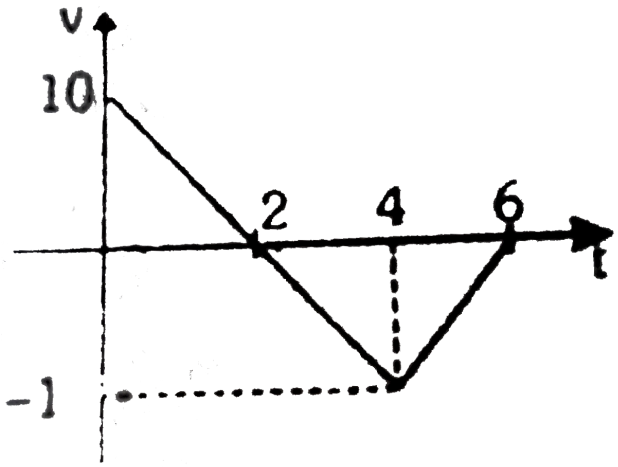
**3.** For the velocity -time graph shown in figure, in a time interval from $t = 0$ to $t = 6s$, match the following:




| | Column I | | Column II |
|---|---|---|---|
| $(A)$ | Change in velocity | $(p)$ | $-5/3SI$unit |
| $(B)$ | Average acceleration | $(q)$ | $-20SI$unit |
| $(C)$ | Total displacement | $(r)$ | $-10SI$unit |
| $(D)$ | Acceleration ay t=3s | $(s)$ | $-5SI$unit |

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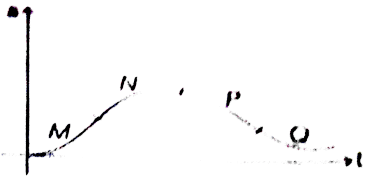
**4.** Let us call a motion, $A$ when velocity is positive and increasing $A^{-1}$ when velocity is negative and

increasing $R$ when velocity is positive and decreasing and $R^{-1}$ when velociyt is negative and decreasing. Now match the following two tales for the given $s-t$ graph




| Table-1 | | Table-2 | |
|---|---|---|---|
| (A) | M | (P) | $A^{-1}$ |
| (B) | N | (Q) | $R^{-1}$ |
| (C) | P | (R) | A |
| (D) | Q | (S) | R |

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**5.** In the $s-t$ equations $\left(s=10+20t-5t^2\right)$ match the following

| Table-1 | Table-2 |
|---|---|
| (A) Distance travelled in 3s | (P) – 20 unit |
| (B) Displacement in 1s | (Q) 15 unit |
| (C) Initial acceleration | (R) 25 unit |
| (D) Velocity at 4s | (S) –10 unit |

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**6.** Match the following

| Table-1 | Table-2 |
|---|---|
| (A) Constant positive acceleration | (P) Speed may increase |
| (B) Constant negative acceleration | (Q) Speed may decrease |
| (C) Constant displacement | (R) Speed is zero |
| (D) Constant slope of $a$-$t$ graph | (S) Speed must increa |
| | (T) Speed must decre |

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**7.** A balloon rises up with constant net acceleration of $10m/s^2$. After 2 s a particle drops from the balloon. After further 2 s match the following : $(\text{Take} g = 10m/s^2)$

| | Column I | | Column II |
|---|---|---|---|
| $(A)$ | Height of perticle from ground | $(p)$ | Zero |
| $(B)$ | Speed of particle | $(q)$ | $10SI$units |
| $(C)$ | Displacement of Particle | $(r)$ | $40SI$units |
| $(D)$ | Acceleration of particle | $(s)$ | $20SI$units |

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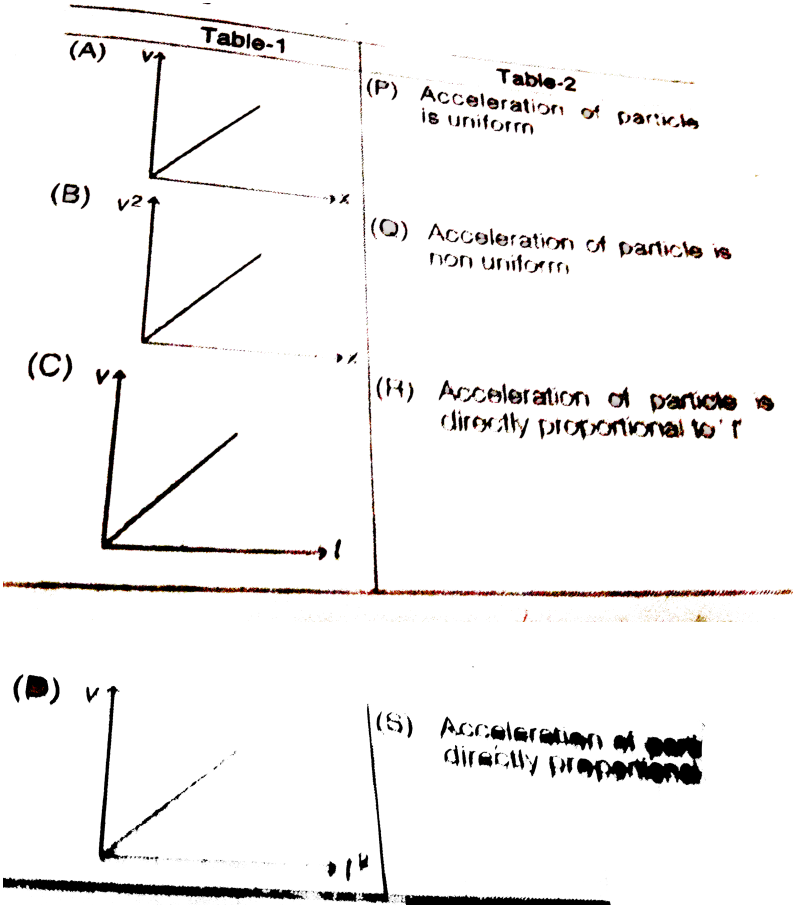
**8.** Table -1 gives some graph for a particle moves along $x$-axis in positive $x$-direction. The variables $v$, $x$ and $t$ represent speed of particle, $x$-coordinate of particle

and time respectively. Table -2 gives certain resulting interpretation. Match the graph in Table -1 with the statements in Table -2.

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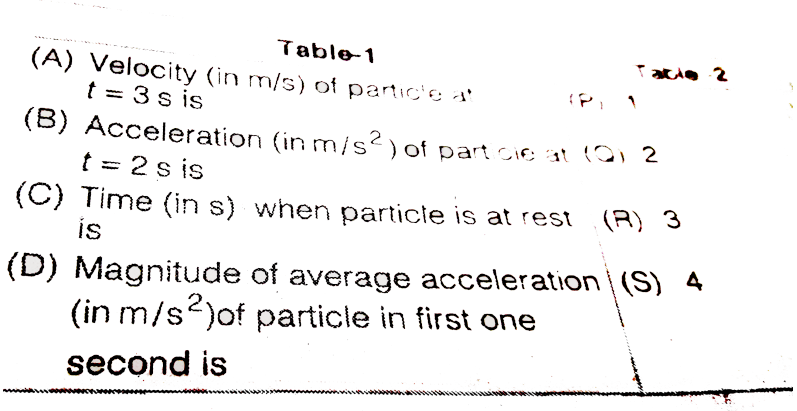
**9.** Velocity (in m/s) of a particle moving in a straight line given by $v = \left(t^2 - 2t_1\right)$. Match Table-1 with Table -2

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**10.** A ball of mas $2gm$ is thrown vertically upwards with a speed of $30m/s$ from a tower of height $35m$.

(Given $g = 10m/s^2$)

| Table-1 | Table-2 |
| --- | --- |
| (A) Displacement (in m) in first 2 s | (P) 10 |
| (B) Magnitude of average acceleration (in $m/s^2$) in first 6 s | (Q) 0 |
| (C) Distance travelled (in m) in 0-4 s | (R) 40 |
| (D) Speed (in m/s) at $t = 4$ s is | (S) None of these |

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## Integer Type

**1.** A stone is dropped from a certain height which can reach the ground in $5s$. It is stopped after $3s$ of its fall and then it is again released. The total time taken by the stone to reach the ground will be .

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**2.** A car starts moving along a line, first with acceleration $a = 5m/s^2$ starting from rest then uniformly and finally decelerating at the same rate till it comes to rest. The total time of motion is $25s$. The average speed during the time is $20m/s$. The particle moves uniformly for $(2.5x)$ second. Find the value of $x$

.

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**3.** Two particles P and Q simultaneously start moving from point A with velocities $15m/s$ and $20m/s$

respectively. The two particles move with acceleration equal in magnitude but opposite in direction. When P overtakes Q at point B then its velocity is $30m/s$, the velocity of Q at point B will be

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**4.** If a particle takes $t$ second less and acquire a velocity of $vms^{-1}$ more in falling through the same disance on two planets where the accelerations due to gravity are $2g$ and $8g$ respectively, then $v = x >$ . Find value of $x$

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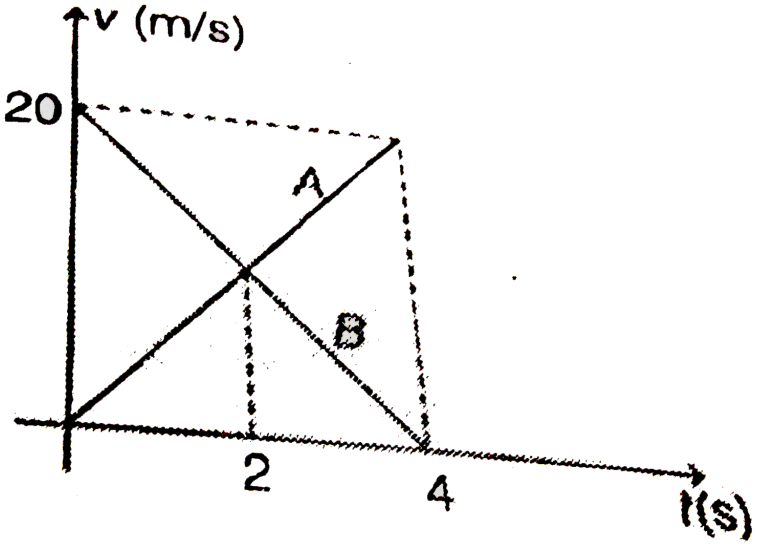
**5.** Speed time graph of two cars $A$ and $B$ approaching towards each other is shown in figure. Initial distance between them is $60m$. The two cars will cross each other after $t$ secons. Find value of it $t$.

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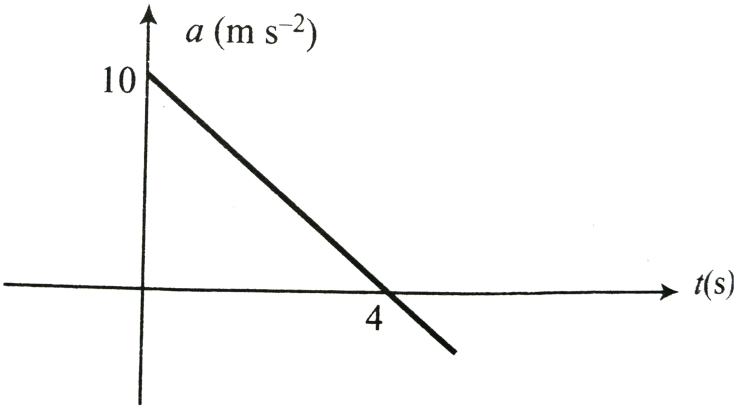
**6.** The acceleration-time graph of a particle moving along a straight line is as shown in. At what time the particle acquires its initial velocity?

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**7.** A lift performs the first part of its ascent with uniform acceleration a and the remaining with

uniform retardation $2a$. If t is the time of ascent, find the depth of the shaft.

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**8.** A small electric car has a maximum constant acceleration of $1m/s^2$, a maximum constant deceleration of $2m/s^2$ and a maximum speed of $20m/s$. The amount of minimum time it would take to drive this car $1km$ starting from rest is $(13n)$ second. Find value of $n$

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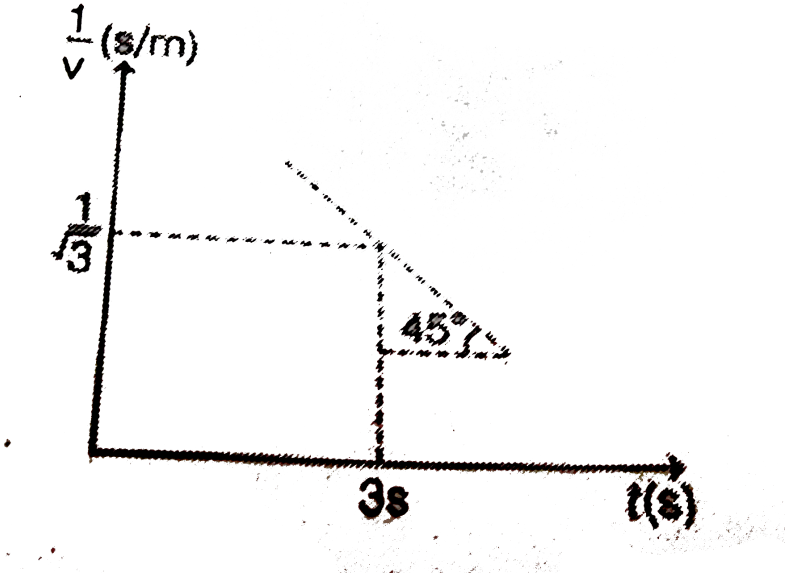
**9.** The diagram shows the variatioin of $1/v$ (where $v$ is velocity of the particle) with respect to time. At time $t = 3s$ using the details given in the graph, find the instantaneous acceleration (in $m/s^2$)

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**10.** Two particles are moving with velocities $v_1 = \hat{i} - t\hat{j} + \hat{k}$ and $v_2 = t\hat{i} + t\hat{j} + 2\hat{k} m/s$ respectively. Time at which they are moving perpendicular to each other is._____(second)

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**11.** A particle $A$ moves with velocity $\left(2\hat{i} - 3\hat{j}\right) m/s$ from a point $(4, 5m)m$. At the same instant a particle $B$, moving in the same plane with velocity $\left(4\hat{i} + \hat{j}\right) m/s$ passes through a point $C(0, -3)m$. Find the $x$-coordinate (in $m$) of the point where the particles collide.

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**12.** A ball is thrown upwards with a speed of $40m/s$. When the speed becomes half of the initial speed, gravity is switched off for next 2 second. After that gravity is again switched on but magnitude gravity is doubled. The total distance travelled by the ball from $t = 0$ to the time when the ball reaches the maximum heighth is $55\beta$. Find the value of $\beta$.

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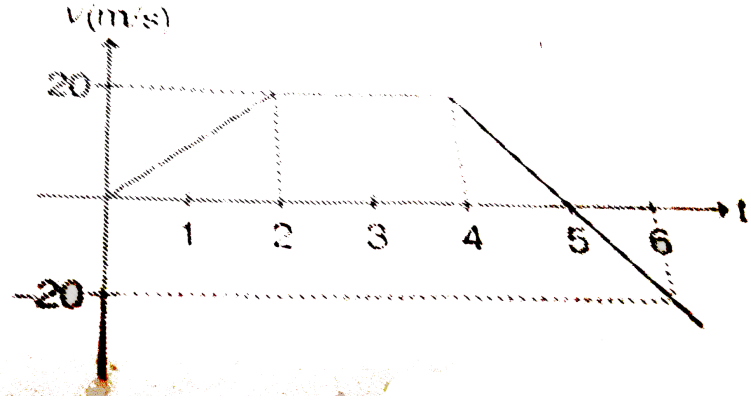
**13.** Figure shows the velocity time graph for a particle travelling along a straight line. The magnitude of

average velocity (in m/s) of particle during the time interval from $t = 0$ to $t = 6s$ is $10\alpha$. Find the value of $\alpha$.

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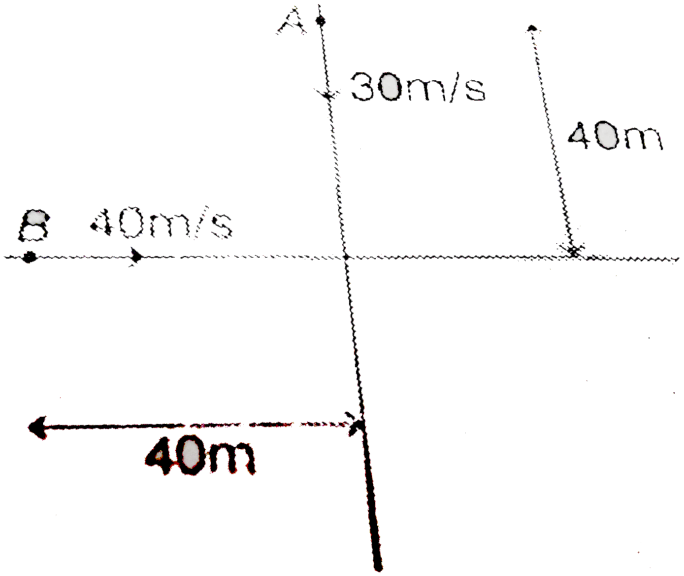
**14.** Two bodies $A$ and $B$ are moving along $y$-axis and $x$ -axis as shown. Find the minimum distance between $A$

and $B$ is subsequent motion (in $m$)

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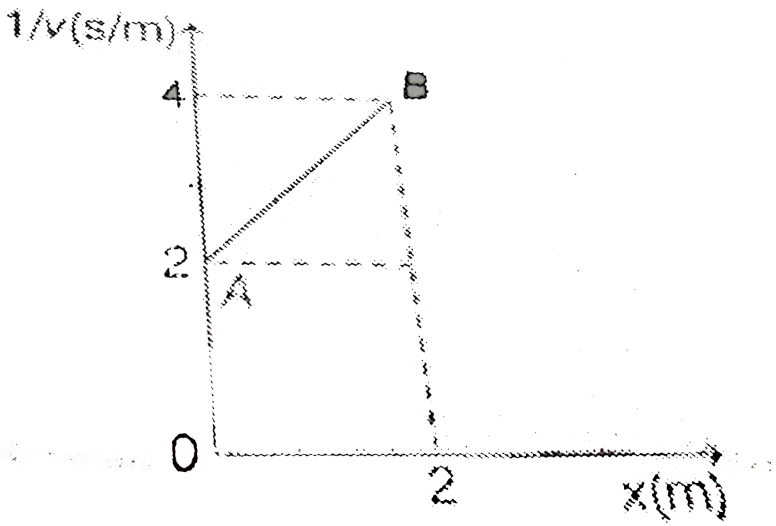
**15.** The $1/v$ versus positions graph of a particle is shown in the figure, where $v$ is the velocity of the particle. The particle is moving in a straight line aloing positive $x$- axis.Find the time taken by the particle to

reach from the point $A$ to $B$ in second.

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