PHYSICS

BOOKS - CP SINGH PHYSICS (HINGLISH)

MOTION IN A STRAIGHT LINE

Example

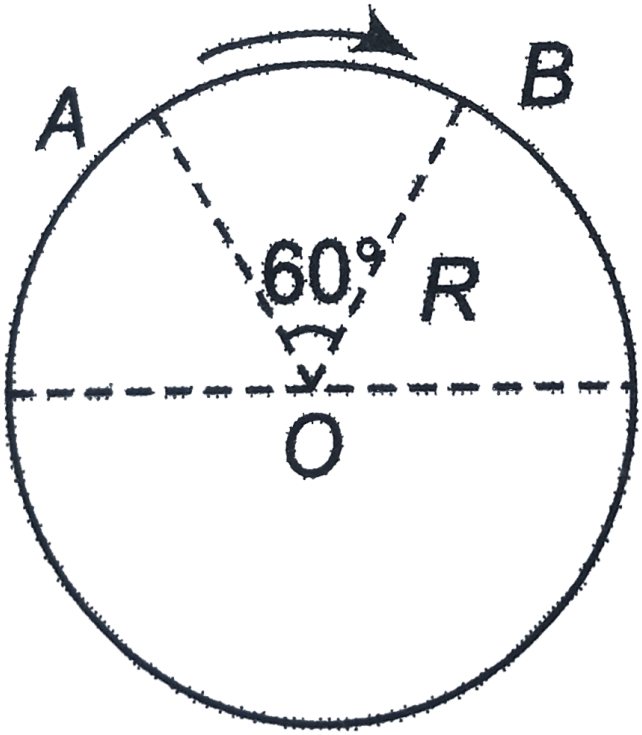
1. A partical moves $5M$ towards east and then $12m$ towards north. Find the displacement and distance covered.

Watch Video Solution

2. A particle moves in a circle of radius R. In half the period of revolution its displacement is ..... and distance covered is ..... .

Watch Video Solution

3. A particle moves in a of radius R from A to B, as shown in the figure. Find the distance and displacement covered.



Watch Video Solution

4. A partical moves in a straifgt line from A to B for the first $30km$ with speed $10km/h$ and the next $60km$ with speed $20km/h$. Find the

average speed and average velocity.

Watch Video Solution

5. A particle moves in a straight line from A to B

(a) for the first half of distance with speed v_1 and the next half of distance with speed v_2.

(b) for the first one-third distance with speed v_1 and the next two-third distance with speed v_2.

(c) for the first one-fourth distance with speed v_0, the next half of distance with speed $2v_0$ and the last one-fourth distance with speed $3v_0$. Find the average speed in each case.

Watch Video Solution

6. A particle moves in a straight line from A to B with speed v_1 and then from B to A with speed v_2. Find the average velocity and average speed.

Watch Video Solution

7. A partical moves from A to B for the first one-third with speed v_1 and the next two-third time with speed v_2. Find the average speed.

Watch Video Solution

8. A point traversed half the distance with a velocity v_0. The remaining part of the distance was covered with velocity v_1 for half the time, and with velocity v_2 for the other half of the time. Find the mean velocity of the point averaged over the whole time of motion.

Watch Video Solution

9. A partical is moving in a straight line under constant acceletation. If the motion starts from rest, Find the ratio of displacement in n second to that in the n^{th} second.

Watch Video Solution

10. A particle is moving in a straight line under constant acceleration. It travels $15m$ in the 3^{rd} second and $31m$ in the 7^{th} second. Find the initial velocity and constant acceleration.

Watch Video Solution

11. In the pervious problem, find the displacement in $10s$ and 10^{th} second.

Watch Video Solution

12. A particle starts from rest and moves under constant acceleration in a straight line. Find the ratio of displacement (a) in successive second and (b) in successive time interval t_0.

Watch Video Solution

13. A particle starts from rest and moves under constant acceleration in a straight line. Find the ratio of time in successive displacement d.

Watch Video Solution

14. two particles A and B are at separation of $100m$. They move towards each other with uniform speed, A with $5m/s$ and B with $15m/s$. When and where the two particle meet?

Watch Video Solution

15. If in the previous problem, particle A moves with constant acceleration $4m/s^2$ with initial speed $5m/s$ and B moves with uniform speed $12m/s$, when and where the particle meet?

Watch Video Solution

16. A bus starts from rest and moves with constant acceleration $8m/s^2$. At the same time, a car traveling with a constant velocity $16m/s$ overtakes and passes the bus. After how much time and at what distance the bus overtakes the car?

Watch Video Solution

17. A boy is moving with constant velocity $12m/s$. When he is $32m$ behind a cyclist, the cyclist starts from rest and moves under constant acceleration $2m/s^2$. After how much time the boy meets the cyclist? Explain reason for two answers.

Watch Video Solution

18. A boy is moving with constant velocity $v_0$on a straight road. When he is at a distance d behind the bus, the bus starts from rest and moves with a constant acceleration α. Find the minimum value of v_0 so that the boy catches the bus.

Watch Video Solution

19. Car A starts from a point O and moves with constant velocity $9m/s$. After $2s$, another car B begins its journey from O and follows car A. If car B starts from rest and moves under constant acceleration $4m/s^2$, after how much time and at what distance from O the cars meet?

Watch Video Solution

20. (a) If a train traveling at $72km/h$ is to be brought to rest in a distance of $200m$, find the deceleration.

(b) The velocity of a bullet is reduced from $200m/s$ to $100m/s$ while traveling through a wooden block of thickness $10cm$. Find the retardation (assuming it ti be uniform).

Watch Video Solution

21. A car is moving with constant speed $15m/s$. Suddenly the driver sees an obstruction on the road and takes $0.40s$ to apply the brake, the brake causes a deceleration of $5m/s^2$. Find the distance traveled by the car before it stops.

Watch Video Solution

22. A car is moving with speed $20m/s$. Suddenly the driver sees the sign of danger at a distance of $50m$, after a certain reaction time t_0, he applies breaks to cause deceleration $5m/s^2$. What is the maximum allowable reaction time t_0 to avoid accident and distance traveled by the car during reaction time?

Watch Video Solution

23. (a) A particle moving with constant acceleration from A to B in a straight line AB has velocities u and v at A and B respectively. Find the velocity of the particle at the midpoint of AB.

(b) If the time taken by the particle to go from A to the midpoint of AB is two times that from the midpoint of AB to B then find the value of v/u.

Watch Video Solution

24. A car accelerates from rest at a constant rate α for some time after which it decelerates at a constant rate β to come to rest. If the total time lapse is t seconds , evauate.

(i) maximum velocity reached , and

(ii) the total distance travelled .

Watch Video Solution

25. A particle starts from rest and moves with a constant acceleration of $4m/s^2$ for $10s$, then it moves under constant seceleration and stops in $20s$. Find (a) the maximum velocity attained by the particle (b) the total

distance traveled and (c) the distance/distances from the origin, when the particle is moving at half the maximum velocity.

Watch Video Solution

26. A train starts from station A with uniform acceleration a_1. For some distance and then goes with uniform retardation a_2 for some more distance to come to rest at station B. The distance between stations A and B is $4km$ and the train takes $1/5h$ to compete this journey. If accelerations are in km per minute unit, then show that $\frac{1}{a_1}+\frac{1}{a_2}=x$. Find the value of x.

Watch Video Solution

27. Between two points, a car accelerates uniformly at first, then moves with constant speed and finally retards uniformly to rest. If the ratio of time takes is $1:4:2$ and the maximum speed is $70km/h$, find the average speed over the whole journey.

Watch Video Solution

28. A partical starts from rest and moves in a straight line. It travels a distance L with uniform acceleration and then moves with constant velocity a further distance $2L$. Finally, it comes to rest after moving a further distance 4L under uniform retardation. Find the ratio of average speed to the maximum speed.

Watch Video Solution

29. A car starts moving rectilinearly first with acceleration $\alpha = 5ms^{-2}$ (the initial velocity is equal to zero), then uniformly, and finally, deceleration at the same rate α comes to a stop. The time of motion equals $t = 25s$. The average velocity during this time is equal to $72kmh^{-1}$ How long does the car move uniformly?

Watch Video Solution

30. The speed of a train increases at a constant rate α from zero to v and then remains constant for an interval and finally decreases to zero at a constant rate β. The total distance travelled by the train is l. The time taken to complete the journey is t. Then,

Watch Video Solution

31. Two trains, each having a speed of $30km/h$, are headed towards each other

Watch Video Solution

32. In a car race, car A takes a time t less than car B at the finish and passes the finishing point with speed v more than that of the car B. Assuming that both the cars start from rest and travel with constant acceleration a_1 and a_2 respectively. Show that $v = \sqrt{a_1 a_2}t$.

Watch Video Solution

33. A particle is dropped from the top of a tower of height $80m$. Find the time of jurney and the speed with which it strikes the ground.

Watch Video Solution

34. A particle is dropped the top of a tower. Its displacement in the first three seconds and in the last second is the same. Find the height of the tower.

Watch Video Solution

35. A particle is dropped from the top of a tower. If it falls half of the height of the tower in its last second of journey, find the time of journey.

Watch Video Solution

36. If in the previous problem, the particle travels $9/25$ of the distance in its last second, find the time of fall and the height of the tower.

Watch Video Solution

37. A particle is dropped from the top of a tower.

(a) Find the ratio of displacement in successive time interval t_0.

(b) Find the ratio of time in falling successive distances h.

Watch Video Solution

38. Drops of water fall at regular intervals from the roof of a building of height $h = 16m$. The first drop striking the ground at the same moment as the fifth drop is ready to leave from the roof. Find the distance between the successive drops.

Watch Video Solution

39. A ball is dropped from a height. If it takes $1s$ to cross the last $55m$ before hitting the ground, find the height from which it was dropped.

Watch Video Solution

40. A particle is dropped from some height. After falling through height h, the velocity of the particle becomes v_0. If it further falls through a distance $y(y << h)$, find the approximate increase in velocity in terms of v_0, y and h.

Watch Video Solution

41. A body is dropped from a large height h in time t_0 second. Find the time taken to cover the last meter of fall in terms of t_0

Watch Video Solution

42. Two particles begin to fall freely from the same height but the second falls t_0 second after the first. Find the time (after the dropping of first) when separation between the particles is h_0.

Watch Video Solution

43. A ball is dropped from the top of a tower. After $2s$ another ball is thrown vertically downwards with a speed of $40m/s$. After how much time and at what distance below the top of tower the balls meet?

Watch Video Solution

44. A ball is dropped from the top of an 80 m high tower After 2 s another ball is thrown downwards from the tower. Both the balls reach the ground simultaneously. The initial speed of the second ball is

Watch Video Solution

45. A particle is thrown vertically upward with speed $40m/s$.

(a) After how much time attains maximum height?

(b) Find (i) the maximum height attained by the particle.

(ii) the velocity at half of the maximum height.

(c) Find (i) the ratio of distances in the first half and the next half of time.

the ratio of the time in the first half and the second half of the distance (consider only upward journey)

Watch Video Solution

46. A ball is thrown vertically up with a velocity u. It passes three points A, B and C in its upward journey with velocities $\frac{u}{s}, \frac{u}{3}$ and $\frac{u}{4}$, respectively. Find $\frac{AB}{BC}$.

Watch Video Solution

47. If a ball is thrown vertically upwards with speed u, the distance covered during the last t second of its ascent is

Watch Video Solution

48. A ball is thrown vertically upward with speed $40m/s$. Simultaneously, another ball is dropped from a height $200m$ in the same verticle line. When and where the balls meet?

Watch Video Solution

49. A ball is thrown vartically upward with speed $70m/s$. After 1 s, another ball is dropped from a height $185m$ in the same vertical line. When and where the balls collide?

Watch Video Solution

50. From the foot of a tower $80m$ high, a stone is thrown up so as to reach the top of a tower. After $2s$, another stone is dropped from the top of the tower. When and where the two stones meet?

Watch Video Solution

51. A ball is thrown vertically upward with velocity $20m/s$ from a tower of height 60 m. After how much time and with what velocity will it strike the ground?

Watch Video Solution

52. In the previous problem, find the magnitude and direction of velocity after $1s$, $3s$ and $5s$. Also find the distance of the ball from the ground at these instances.

Watch Video Solution

53. A balloon carring a stone is moving vartically upward with velocity $12m/s$. When the balloon is at height $64m$, the stone is dropped. After how much time and with what velocity will it strike the ground?

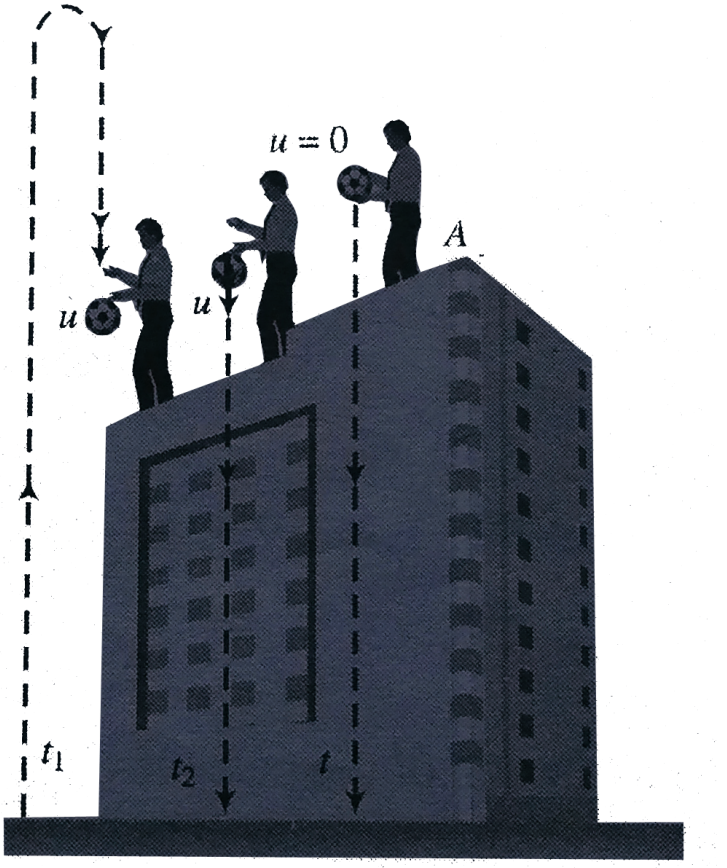
Watch Video Solution

54. Two balls are projected simultaneously with the same speed from the top of a tower, one vertically upwards and the other vertically downwards. They reach the ground in 9 s and 4 s, respectively. The height of the tower is $(g = 10m/s^2)$

Watch Video Solution

55. A body is thrown vertically upwards from A. The top of a tower . It reaches the ground in time t_1. It it is thrown vertically downwards from A with the same speed it reaches the ground in time t_2, If it is allowed to

fall freely from A. then the time it takes to reach the ground.



Watch Video Solution

56. A body is vertically upwards. If t_1 and t_2 are the times at which it is height h above the point of projection while ascending and descending, respectively, find (a) the velocity of projection and height h, (b) the

maximum height reached by the body and (c) the velocity of the body at height $h/2$.

Watch Video Solution

57. A particle is projected vertically upwards from a point O on the ground. It takes time t_1 to reach a point A at a height h above the ground, it continues to move and takes a time t_2 to reach the ground. Find (a) h, (b) the maximum height reached and (c) the velocity of the partical at the half of maximum height.

Watch Video Solution

58. two particals are thrown vertically upward with the same initial velocity of $50m/s$ but $2s$ apart. How long after the first one thrown, will they meet?

Watch Video Solution

59. A particle is thrown vertically upward with speed $45m/s$. Find the distance covered by the particle in the 5^{th} second of its journey.

Watch Video Solution

60. A parachutist after bailing out falls $80m$ without friction. When the parachute opens, he decelerates downward with $5m/s^2$ and reaches the ground with a speed of $10m/s$. (a) How long is the parachutist in air? (b) At what height did bail out?

Watch Video Solution

61. A rocket is fired vertically upward from the ground with a resultant vertical acceration of $5m/s^2$. The fuel is finished in $100s$ and it continues to move up. After how much time from then will the maximum height be reached and what is the maximum height?

Watch Video Solution

62. A balloon rises from rest on the ground with constant acceleration g //8. A stone is dropped from the balloon when the balloon has risen to a height of (H). Find the time taken by the stone to reach the ground.

Watch Video Solution

63. A roket fired vertically ascends with a constant acceleration $g/3$ for $1\ \min$. Its fuel is then all used and it continues to rise as a free body. What is the maximum height reached? What is the total time elapsed from the take off until the rocket strikes the earth?

Watch Video Solution

64. A partical is moving in a straight line such that its displacement at any time t is given by $s = 4t^3 + 3t^2$. Find the velocity and acceleration in terms of t.

Watch Video Solution

65. A partical moves along a straight line such that its displacement $s = \alpha t^3 + \beta t^2 + \gamma$, where t is time and α, β and γ are constant. Find the initial velocity and the velocity at $t = 2$.

Watch Video Solution

66. A partical is moving in a straight line such that ita velocity is given by $v = t^4 + 3t^2 + 8m/s$. Find acceleration at time $t = 1s$.

Watch Video Solution

67. The displacement of a partical as a function of time t is given by $s = \alpha + \beta t + \gamma t^2 + \delta t^4$, where α,β,γ and δ are constants. Find the ratio of the initial velocity to the initial acceleration.

Watch Video Solution

68. A partical is moving in a straight line such that $s = t^3 - 3t^2 + 2$, where s is the displacement in meters and t is in seconds. Find the

(a) velocity at $t = 2s$, (b) acceleration at $t = 3s$,

(c) velocity when acceleration is zero and

(d) acceleration when velocity is zero.

Watch Video Solution

69. The displacement of a particla moving in straight line is given by $s = t^4 + 2t^3 + 3t^2 + 4$, where s is in meters and t is in seconds. Find the

(a) velocity at $t = 1s$, (b) acceleration at $t = 2s$,

(c) average velocity during time interval $t = 0$ to $t = 2s$ and

(d) average acceleration during time interval $t = 0$ to $t = 1s$.

Watch Video Solution

70. The displacement x of a particle moving in one dimension under the action of a constant force is related to time t by the equation

$t = \sqrt{x} + 3$, where x is in meter and t is in second. Find the displacement of the particle when its velocity is zero.

Watch Video Solution

71. A particle is moving such that the velocity is given by $v = \sqrt{2\gamma s}$, where γ is constant and s is diplacement. Find the acceleration.

Watch Video Solution

72. A particle moves in a straight line as $s = \alpha(t-4) + \beta(t-4)^2$. Find the initial velocity and acceleration.

Watch Video Solution

73. The displacement of a particle varies as $s = \frac{k}{\alpha}\left(1 - e^{-\alpha t}\right)$, where k and α are constants. Find the velocity and acceleration in terms of t and their initial values.

Watch Video Solution

74. A partical moves in a straight line as $s = \alpha(t-2)^3 + \beta(2t-3)^4$, where α and β are constants. Find velocity and acceleration as a function of time.

Watch Video Solution

75. If the time and displacement of the particle along the positive x-axis are related as $t = \left(x^2 - 1\right)^{1/2}$, find the acceleration in terms of x.

Watch Video Solution

76. The relation between time t and displacement x is $t = \alpha x^2 + \beta x$, where $\alpha \text{ and } \beta$ are constants. The retardation is

Watch Video Solution

77. The position of particle moving along the x-axis veries with time t as $x = 6t - t^2 + 4$. Find the time-interval during which the particle is moving along the positive x-direction.

Watch Video Solution

78. A particle is moving such that $s = t^3 - 6t^2 + 18t + 9$, where s is in meters and t is in meters and t is in seconds. Find the minimum velocity attained by the particle.

Watch Video Solution

79. A particle is moving with velocity $v = t^3 - 6t^2 + 4$, where v is in m/s and t is in seconds. At what time will the velocity be maximum//minimum and what is it equal to?

Watch Video Solution

80. A particle is moving along the x-axis such that $s = 6t - t^2$, where s in meters and t is in second. Find the displacement and distance traveled by the particle during time interval $t = 0$ to $t = 5s$.

Watch Video Solution

81. A particle moves along the x-axis according to $s = t^3 - \frac{15}{2}t^2 + 12t + 5$, where the symbols have their usual meaning.

(a) Determine the time when speed is increasing//decreasing.

(b) At what time, the velocity changes its direction?

(c) Find the distance traveled in the first six seconds.

Watch Video Solution

82. Refer to Example 30, if the time of journey is minimum, find the value of v in terms of given quantities and also the minimum time.

Watch Video Solution

83. A particle is moving under constant acceleration $a = kt$. The motion starts from rest. The velocity and displacement as a function of time t is

Watch Video Solution

84. if $a = 3t^2 + 2t$, initial velocity is $5m/s$. Find the velocity at t=4s. The motion is in straight line, a is acceleration in m/s^2 and t is time in seconds.

Watch Video Solution

85. A particle in moving in a straight line such that its velocity is given by $v = 12t - 3t^2$, where v is in m//s and t is in seconds. If at =0, the particle is at the origin, find the velocity at $t = 3s$.

Watch Video Solution

86. A particle is moving under constant acceleration $a = \alpha t + \beta t^2$, where alpha beta constants. If the position and velocity of the partical at start, i.e. $t = 0$ are x_0 and v_0, find the displacement and velocity as a function of time t.

Watch Video Solution

87. The deceleration exerienced by a moving motor blat, after its engine is cut-off is given by $dv/dt = -kv^3$, where k is constant. If v_0 is the magnitude of the velocity at cut-off, the magnitude of the velocity at a time t after the cut-off is.

Watch Video Solution

88. A particle moves with an initial velocity v_0 and retardation alphav, where alpha is a constant and v is the velocity at any time t. If the particle is at the origin at $t = 0$, find

(a) (i) velocity as a function of time t.

(ii) After how much time the particle stops?

(iii) After how much time velocity decreases by $50\ \%$?

(b) (i) Velocity as a function of displacement s.

(ii) The maximum distance covered by the particle.

(c) Displacement as a function of time t.

Watch Video Solution

89. The motion of a body is given by the equation $dv/dt = 6 - 3v$, where v is in m//s. If the body was at rest at $t = 0$

(i) the terminal speed is $2m/s$

(ii) the magnitude of the initial acceleration is $6m/s^2$

(iii) The speed varies with time as $v = 2\left(1 - e^{-3t}\right)m/s$

(iv) The speed is $1m/s$, when the acceleration is half initial value

Watch Video Solution

90. A particle is moving in sand under acceleration $a = g - \lambda y^2$, where lambda is a positive constant and y is the distance traveled on the y-axis. If the initial velocity is v_0 and after traveling a distance y_m, the particle stops, find λ (the motion is along the y-axis).

Watch Video Solution

91. The velocity of a particle moving in the x direction varies as $V = \alpha\sqrt{x}$ where α is a constant. Assuming that at the moment $t = 0$ the particle was located at the point $x = 0$. Find the acceleration.

Watch Video Solution

92. A point moves linearly with deceleration which is given by $dv/dt = -\alpha\sqrt{v}$, where alpha is a positive constant. At the start $v = v_0$. The distance traveled by particle before it stops will be

Watch Video Solution

93. The velocity of a particle moving along the xaxis is given by $v = v_0 + \lambda x$, where v_0 and lambda are constant. Find the velocity in terms of t.

Watch Video Solution

94. (a) At the moment $t = 0$, a particle leaves the origin and moves in the positive direction of the x-axis. Its velocity is given by $v = 10 - 2t$. Find the displacement and distance in the first $8s$.

(b) If $v = t - t^2$, find the displacement and distamce in first 2s.

Watch Video Solution

95. A particle is moving in a straight line such that its velocity varies as $v = v_0 e^{-\lambda t}$, where λ is a constant. Find average velocity during the time interval in which the velocity decreases from v_0 to $\frac{v_0}{2}$.

Watch Video Solution

96. The velocity of a particle is given by $v = v_0 \sin \omega t$, where v_0 is constant and $\omega = 2\pi / T$. Find the average velocity in time interval $t = 0$ to $t = T / 2$.

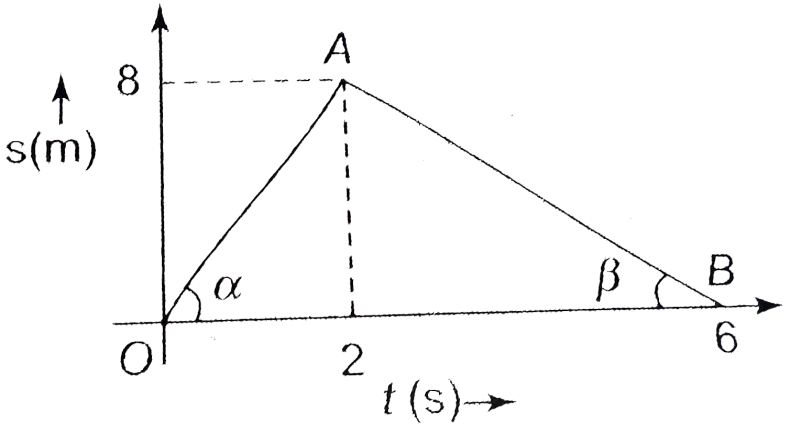
Watch Video Solution

97. The displacement-time graph for two particles is as shown. Find the ratio of their velocities.

Watch Video Solution

98. For a particle moving in a straight line, the position-time graph is as shown in the figure. Find the velocity of the particle at time $t = 1s$ and

$t = 4s$. Also sketch the v-t graph.

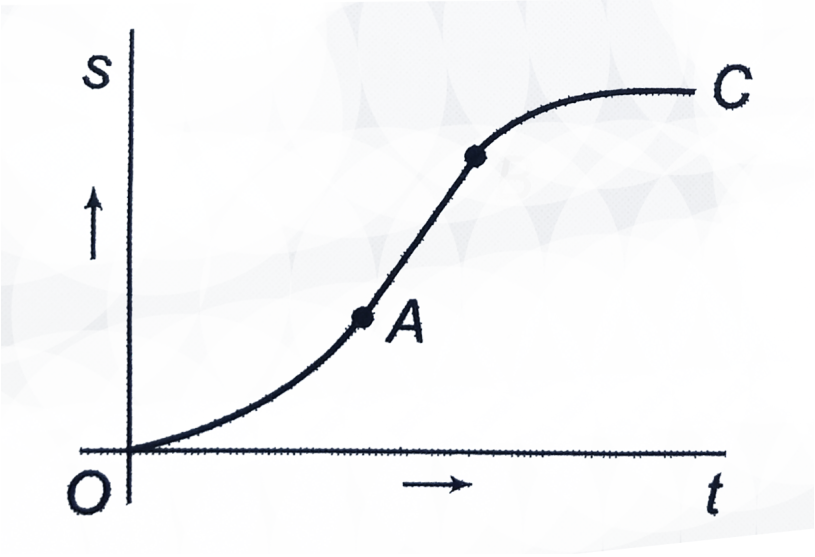


Watch Video Solution

99. The displacement-time graph for a particle moving in a straight line is as shown in the figure. Determine the velocity of the particle at $t = 1s$, $3s$ and $6s$. Sketch the velocity-time graph.

Watch Video Solution

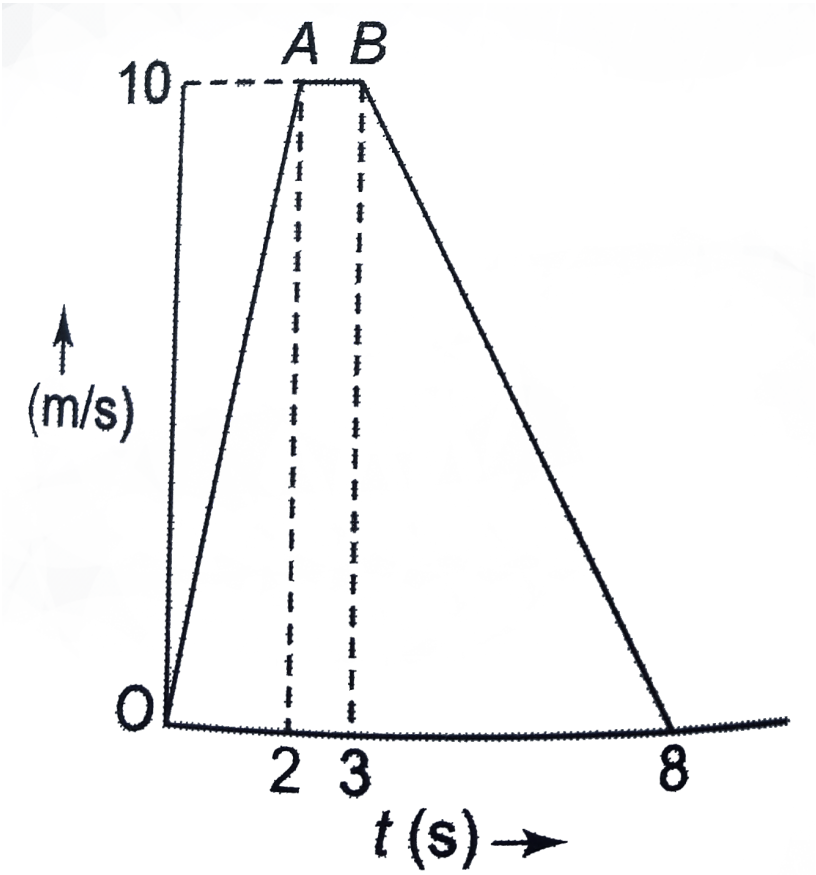
100. Consider the following st graph. What conclutions can be drawn regarding the velocity of the particle.



Watch Video Solution

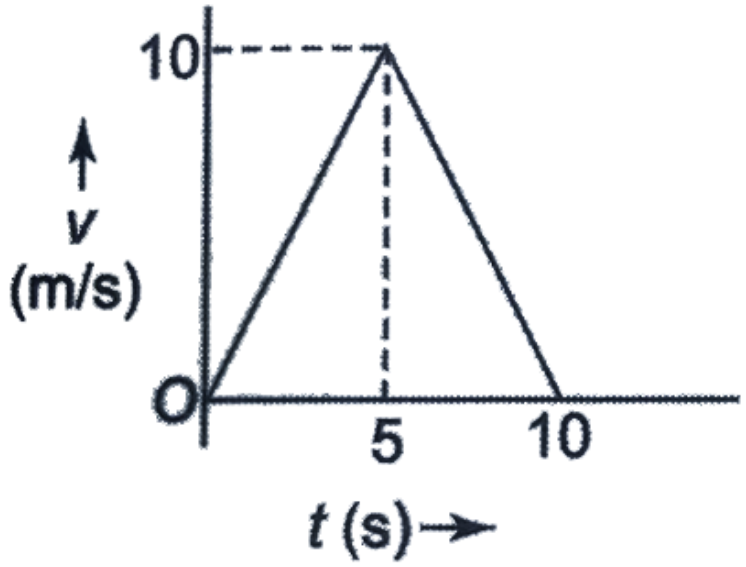
101. For a particle moving in a straight line, the velocity-time graph is as shown in the figure. Find the acceleration at time $t = 1s 2.5s$ and $5s$.

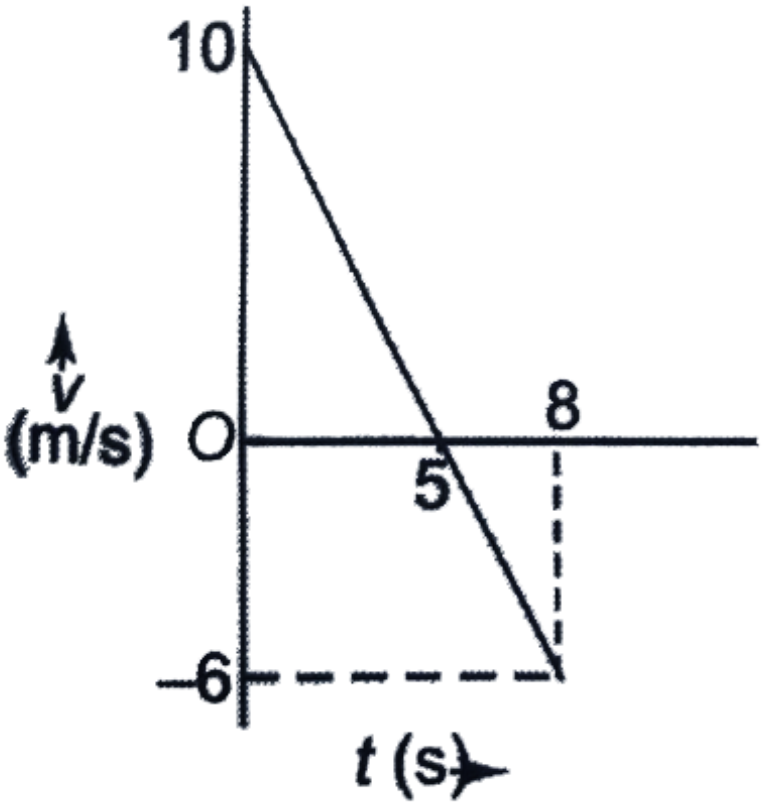
Sketch the acceleration time graph.

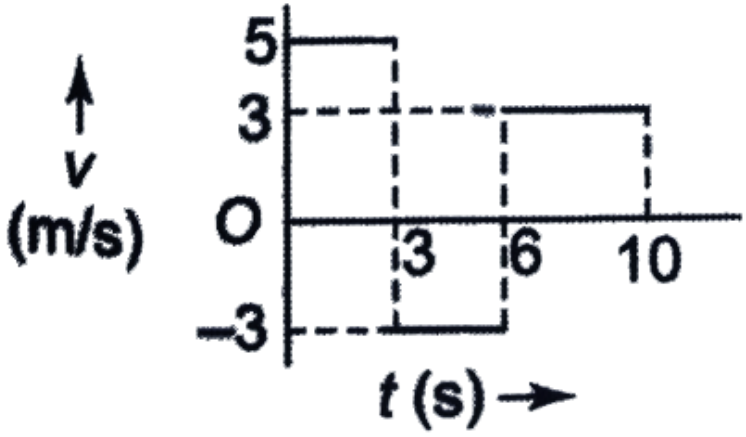


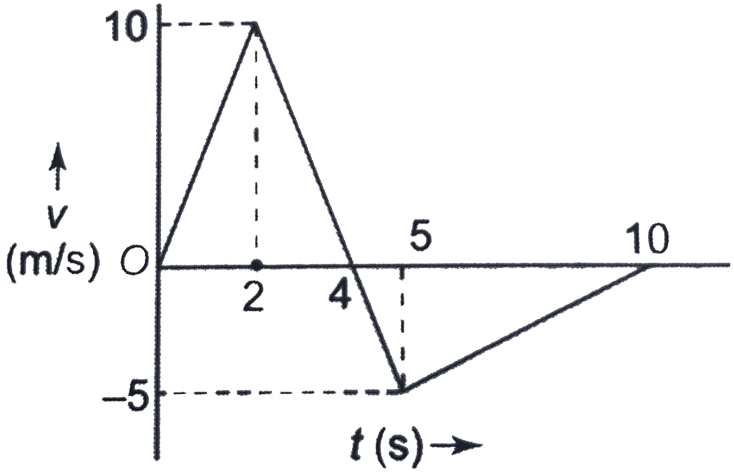
Watch Video Solution

102. A particle is moving in a straight line. Its v-t graph in different cases are as shown below. Find the diplacement and distance in time interval t=0 to t=10 s for the following cases:


10
v
(m/s)
O
5
10
t (s)

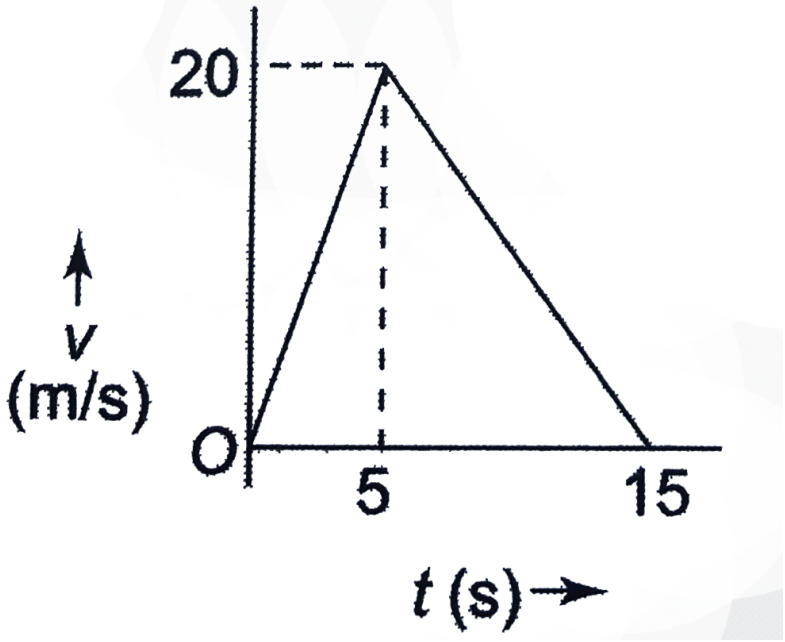

10
v
(m/s)
O
8
5
6
t (s)





Watch Video Solution

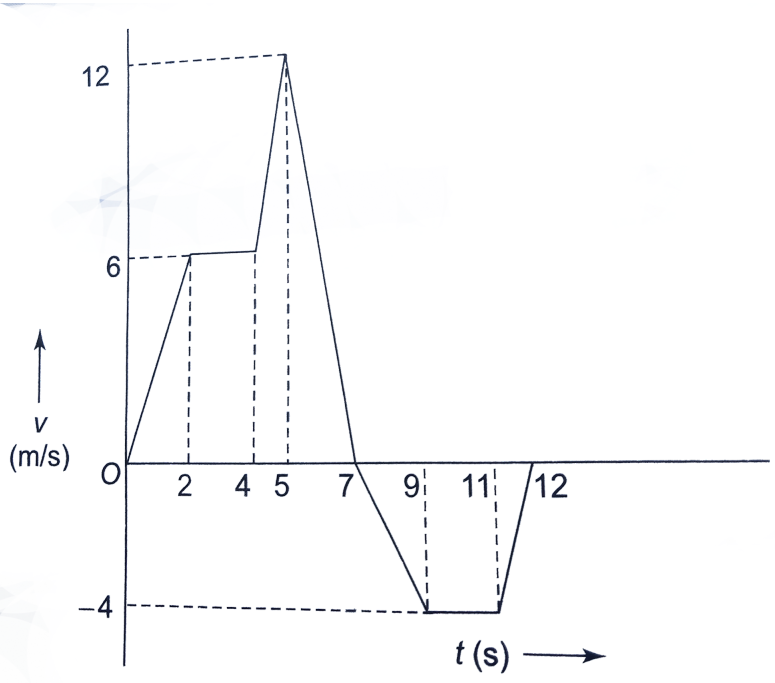
103. From the following v-t graph, find the displacement for time interval $t = 3$ to $t = 12s$.



Watch Video Solution

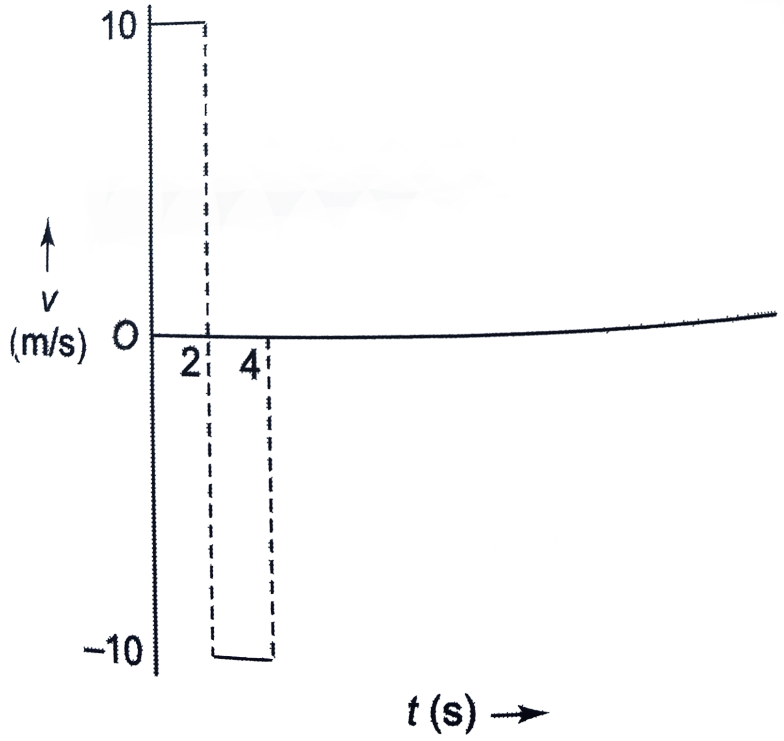
104. Study the following velocity-time graph. Determine the displacement and distance in the time interval $t = 0$ to $t = 12s$. Sketch the

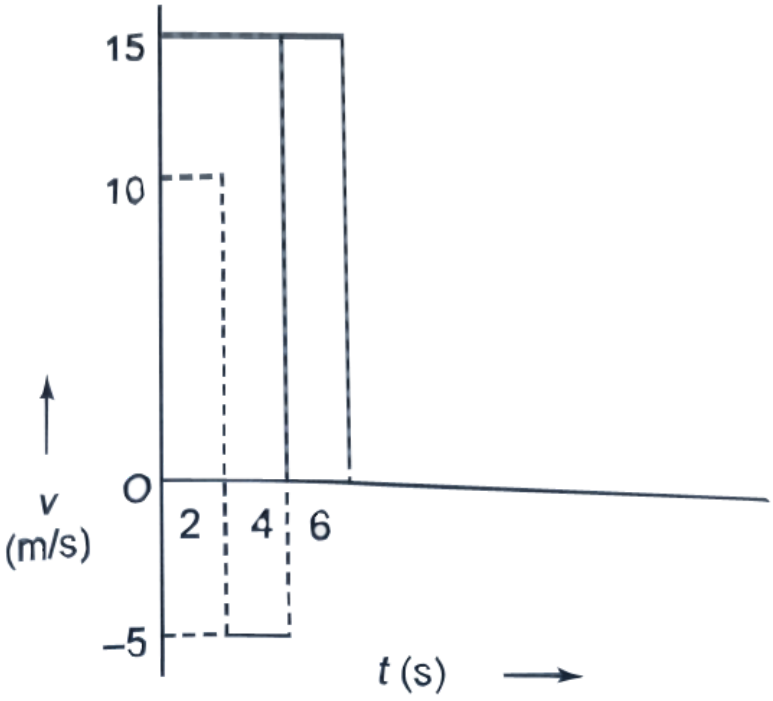
acceleration-time graph.

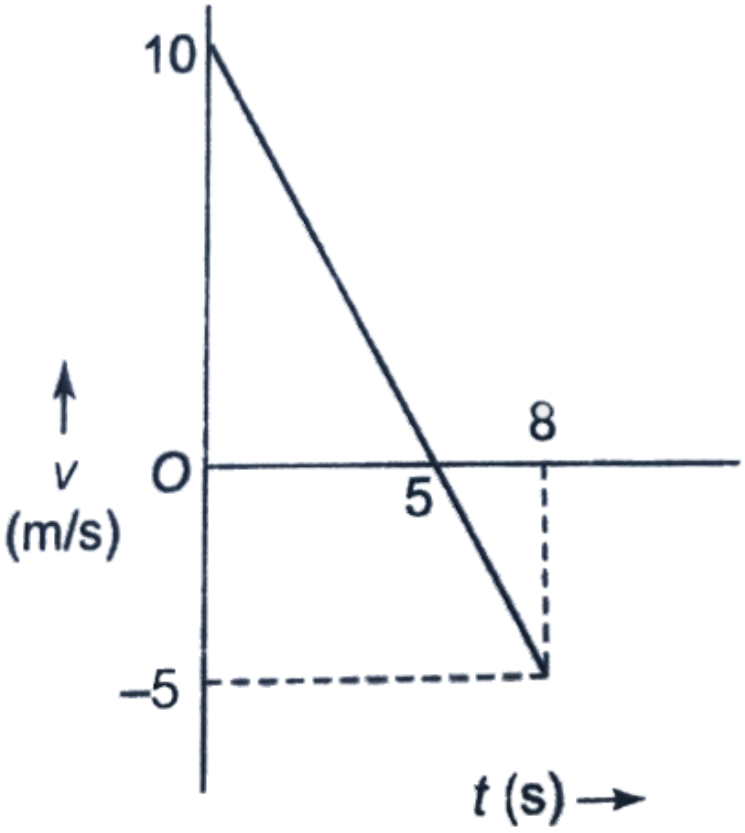


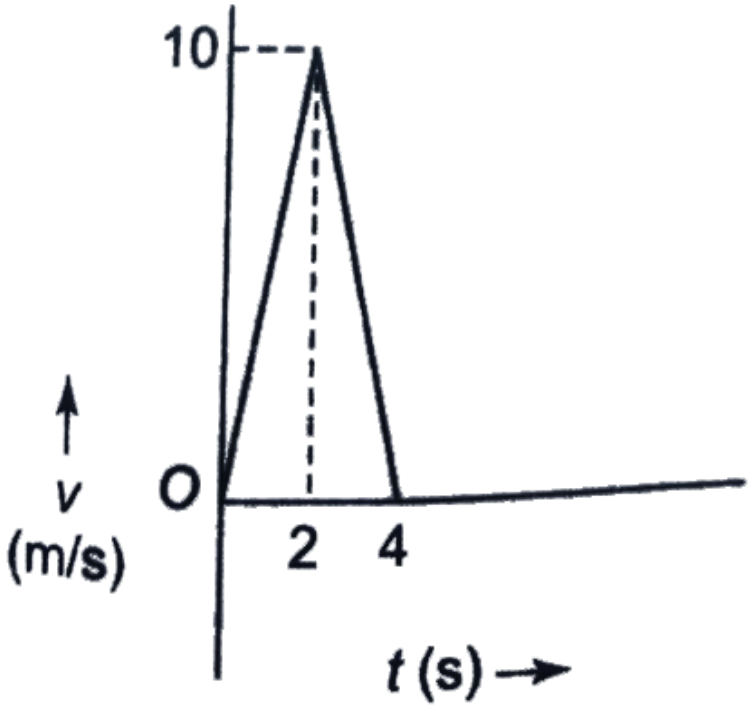
Watch Video Solution

105. A partical is moving along the x-axis and its velocity-time graph is shown in following diagrams. Sketch displacement-time graph.


10
v
(m/s)
O
2
4
–10
t (s)

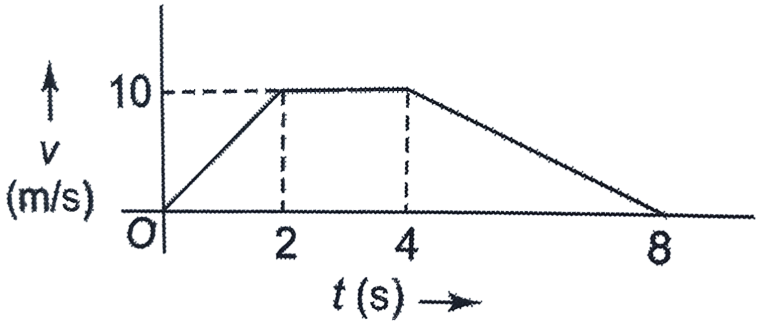

15
10
v
(m/s)
O
2
4
6
–5
t (s)

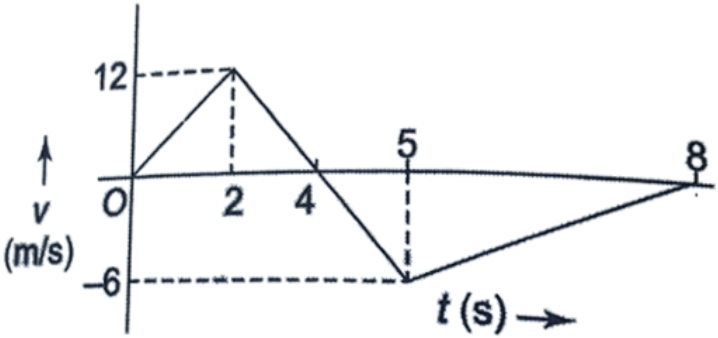

10
v
(m/s)
O
8
5
–5
t (s)

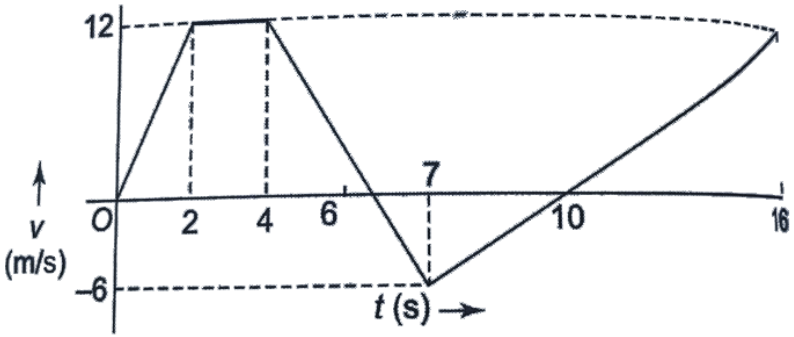


Watch Video Solution

106. A particle is moving along the x-axis and its velocity-time graph ia as shown in the following diagrems. Sketch the displacement-time graph.



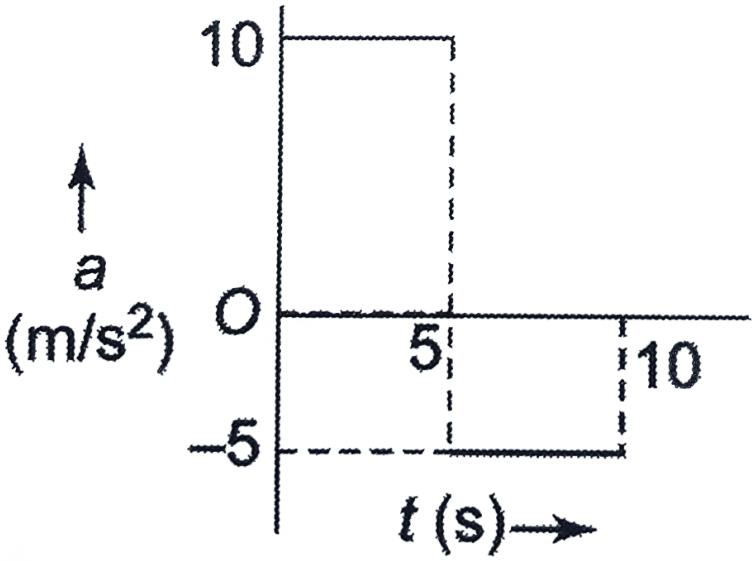




Watch Video Solution

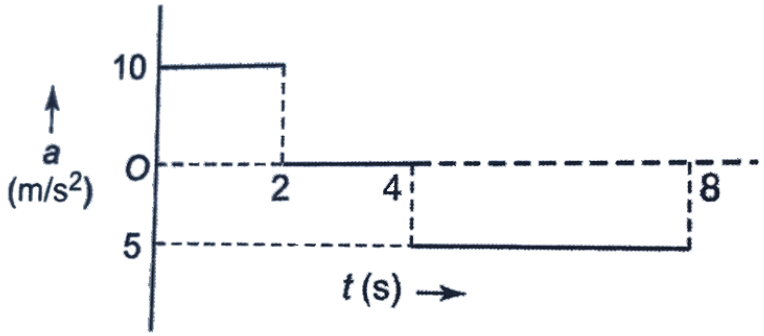
107. The acceleration-time graph of a patticle moving in a straight line is as shown below. Sketch the v-t graph. The initial velocity of the particle is

zero.



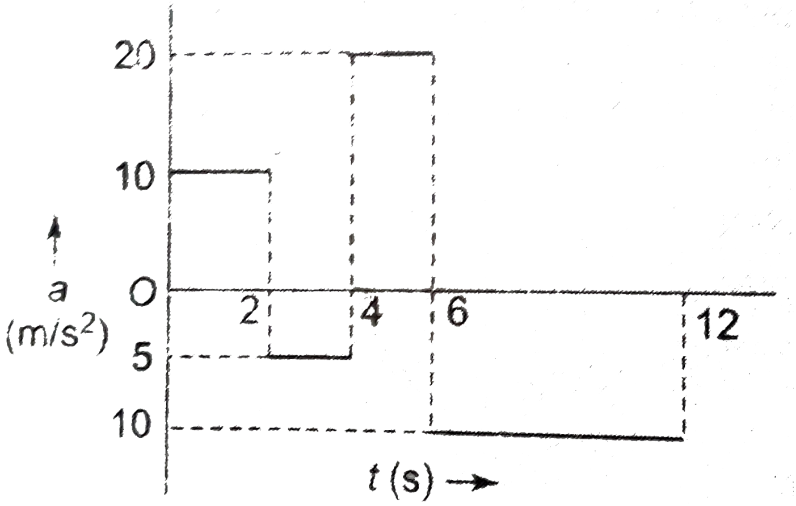
Watch Video Solution

108. Consider the following a-t graph for a particle moving along the x-axis. If the initial velocity is zero, sketch the v-t graph.



Watch Video Solution

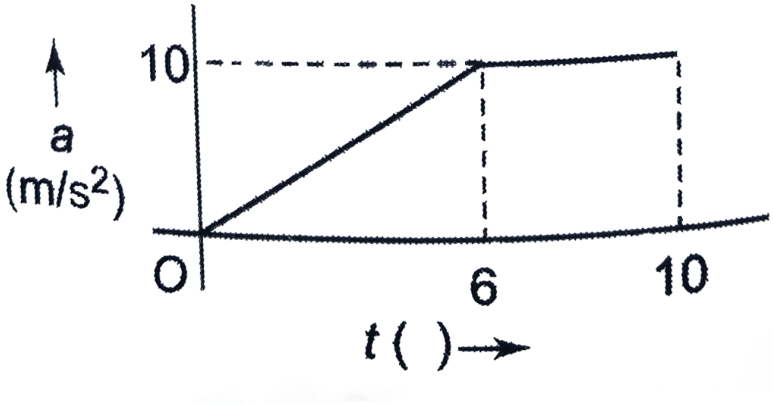
109. A particle is moving along the x-axis. Consider it's a-t graph. If initial velocity is 10 m//s, sketch the v-t graph and calculate the displacement in the time interval t=0 to 12 s.



Watch Video Solution

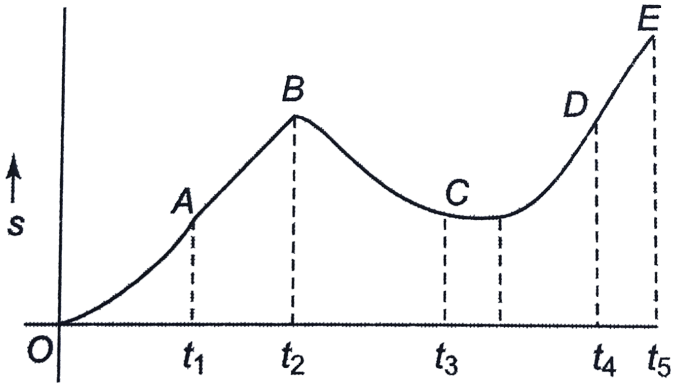
110. A particle is moving in a straight line and its acceleration-time graph is shown below. At $t = 0$, the particle is at rest. Find the velocity of the

particle at $t = 3s, 6s$ and $8s$. Also sketch the v-s graph.



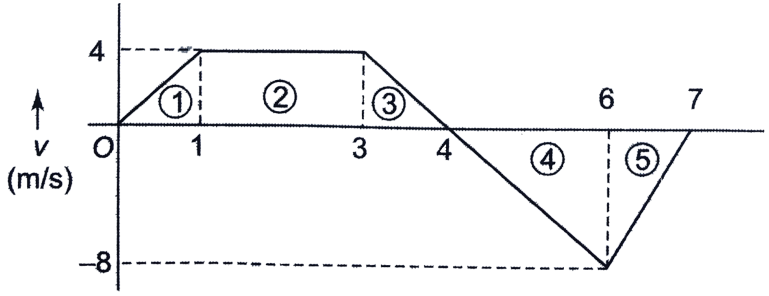
Watch Video Solution

111. A particle is moving along the x-axis and its position-time graph is shown. Determine the sign of acceleration.



Watch Video Solution

112. A particle is moving in a straight line along the xaxis. Its velocity-time graph is as shown. Sketch the displacement-time and distance-time grapgs.



Watch Video Solution

113. A partical is moving in a straight line under constant acceleration $4m/s^2$. The motion starts from rest. Sketch v-t and s-t graph for the duration $t = 0$ to $t = 5s$.

Watch Video Solution

114. A particle is moving in a straight line under constant acceleration alpha. If the intial velocity is v_0, sketch the v-t and s-t graphs. $(v_0 > 0)$.

Watch Video Solution

115. A particle is dropped from the top of a tower of height 80 m. Assuming the dropping point as the origin and the downward direction position, sketch v-t, s-t and a-t graph. $\left(g = 10m/s^2\right)$

Watch Video Solution

116. A particle is projected upwards with velocity $40m/s$. Taking the value of $g = 10m/s^2$ and upward direction as positive, plot a-t,v-t and s-t graphs of the particle from the starting point till it further strikes the ground.

Watch Video Solution

117. From the top of a toward of height $60m$, a ball is thrown vertically upward with speed $20m/s$. After some time, the ball strikes the ground. Sketch the v-t and s-t graph.

Watch Video Solution

118. In the previous problem, assuming the foot of the tower as the origin, sketch the s-t graph.

View Text Solution

119. a particle is moving in a straight line such that its velocity varies is given by $v = 10 - 2t$, where v isin the first 8 second.

View Text Solution

120. A car accelerates from rest at a constant rate α for some time after which it decelerates at a constant rate β to come to rest. If the total time

lapse is t seconds , evauate.

(i) maximum velocity reached , and

(ii) the total distance travelled .

Watch Video Solution

121. A car starts moving rectilinearly first with acceleration $\alpha = 5ms^{-2}$ (the initial velocity is equal to zero), then uniformly, and finally, deceleration at the same rate α comes to a stop. The time of motion equals $t = 25s$. The average velocity during this time is equal to $72kmh^{-1}$ How long does the car move uniformly?

Watch Video Solution

122. A balloon carrying a stone rises from rest on the ground with a constant acceleration $10m/s^2$. After 5 s, the stone is released and ultimately it strikes the ground. Sketch a v-t graph for the stone and the maximum height attained by it.

View Text Solution

123. A rocket is launched from the suface of the earth vertically upward from rest. It moves under acceleration $8m/s^2$. After 15 s the fuel is finished, the rocket moves under gravity and ultimately strickes the ground. Assuming upward direction position and launching point as the origin, sketch the v-t, s-t and a-t graph.

View Text Solution

124. A boy is moving with constant velocity $10m/s$. A car starts from rest as the boy passes and accelerates at $5m/s^2$. After how much time and at what distance the car meets the boy? Sketch v-t and s-t graphs for the boy and car.

View Text Solution

125. Two balls are thrown up simultaneously from the top of a $400m$ high tower with speed $10m/s$ and $55m/s$. Sketch a graph showing the separation between the balls versus time.

View Text Solution

126. A ball is dropped vertically from a height d above the ground . It hits the ground and bounces up vertically to a height $(d)/(2). Neg \leq ct \in g \subset sequentmotion$ and $airresis\tan ce, itsvelocity$ v$varieswiththeheight$h` above the ground as

Watch Video Solution

127. A ball is dropped from a height of $320m$ above the ground. After every collision, the speed of ball decreases by 50%. Taking dropping point as origin, downward direction positive and collision time negligible, sketch the v-t, s-t and a-t graphs. Also calculate the total distance traveled by the ball and the total time of journey.

Watch Video Solution

128. A particle is moving in a straight line under acceleration $a = 54 - 18t$. The particle starts from the origin.

(a) Sketch the a-t, v-t and s-t graph.

(b) Find the distance traveled in the first 9 s. (Acceleration is in m/s^2, time is in second)

Watch Video Solution

129. A particle is moving in a straight line such that $dv/dt = -\lambda v$, where v is the velocity and λ is a constant. At $t = 0$, the particle is at the origin and moves with velocity v_0. Sketch the following graphs:

$(a)v - t(b)s - t(c)v - s(d)\log_e vv/st$

Watch Video Solution

Exercises

1. The ratio of the numerical values of the average velocity and average speed of a body is always.

A. Unity

B. Unity or lass

C. unity or more

D. Less than unity

Answer: B

Watch Video Solution

2. Which of the following is a one-dimensional motion ?

A. Landing of an aircraft

B. Earth revolving around the sun

C. Motion of wheels of moving train

D. Train running on a straight track

Answer: D

Watch Video Solution

3. A point traversed half a circle of radius r during a time interval t_0, its mean speed and magnitude of mean velocity are

A. $\frac{\pi r}{t_0}, \frac{r}{t_0}$

B. $\frac{2\pi r}{t_0}, \frac{2r}{t_0}$

C. $\frac{\pi r}{t_0}, \frac{2r}{t_0}$

D. $\frac{2\pi r}{t_0}, \frac{r}{t_0}$

Answer: C

Watch Video Solution

4. A particle moves $3m$ north, then $4m$ east, and then $12m$ vertically upwards, its displacement is

A. $12m$

B. $13m$

C. $19m$

D. $15m$

Answer: B

Watch Video Solution

5. A person travelling on a straight line moves with a uniform velocity v_1 for some time and with uniform velocity v_2 for the next equal time. The average velocity v is given by

A. $\frac{v_1 + v_2}{2}$

B. $\sqrt{v_1 v_2}$

C. $\frac{v_1 v_2}{v_1 + v_2}$

D. $\frac{2v_1 v_2}{v_1 + v_2}$

Answer: A

Watch Video Solution

6. A car moves from X to Y with a uniform speed v_u and returns to Y with a uniform speed v_d. The average speed for this round trip is :

A. $\frac{v_1 + v_2}{2}$

B. $\sqrt{v_1 v_2}$

C. $\frac{v_1 v_2}{v_1 + v_2}$

D. $\frac{2v_1 v_2}{v_1 + v_2}$

Answer: D

Watch Video Solution

7. A particle moves in a straight line from A to B

(a) for the first half of distance with speed v_1 and the next half of distance with speed v_2.

(b) for the first one-third distance with speed v_1 and the next two-third distance with speed v_2.

(c) for the first one-fourth distance with speed v_0, the next half of distance with speed $2v_0$ and the last one-fourth distance with speed $3v_0$.

Find the average speed in each case.

A. $\frac{v_1 + v_2}{2}$

B. $\sqrt{v_1 v_2}$

C. $\frac{v_1 v_2}{v_1 + v_2}$

D. $\frac{2v_1 v_2}{v_1 + v_2}$

Answer: D

Watch Video Solution

8. If a car covers $\frac{2}{(5)^{th}}$ of the total distance with v_1 speed and $\frac{3}{(5)^{th}}$ distance with v_2. Then average speed is

A. $\frac{1}{2}\sqrt{v_1 v_2}$

B. $\frac{v_1 + v_2}{2}$

C. $\frac{2v_1 v_2}{v_1 + v_2}$

D. $\frac{5v_1 v_2}{3v_1 + 2v_2}$

Answer: D

Watch Video Solution

9. A car travels half the distance with a constant velocity of $40m/s$ and the remaining half with a constant velocity of $60m/s$. The average velocity of the car in m/s is

A. 42

B. 50

C. 48

D. 45

Answer: C

Watch Video Solution

10. One car moving on a staright road covers one-third of the distance with 20 $\frac{km}{hr}$ and the rest with 60 $\frac{km}{hr}$. The average speed is

A. $40km/h$

B. $80km/h$

C. $\frac{462}{3}km/h$

D. $39km/h$

Answer: D

Watch Video Solution

11. A particle moving in a straight line covers half the distance with speed v_0. The other half of the distance is covered in two equal time intervals with speed v_1 and v_2, respectively. The average speed of the particle during this motion is

A. $\frac{v_0(v_1+v_2)}{v_0+v_1+v_2}$

B. $\frac{2v_0(v_1+v_2)}{v_0+v_1+v_2}$

C. $\frac{2v_0(v_1+v_2)}{2v_0+v_1+v_2}$

D. $\frac{v_0(v_1+v_2)}{2v_0+v_1+v_2}$

Answer: C

Watch Video Solution

12. A body starts from rest. What is the retio of the distance traveled by the body during the 4^{th} and 3^{rd} seconds

A. $\frac{7}{5}$

B. $\frac{5}{7}$

C. $\frac{7}{3}$

D. $\frac{3}{7}$

Answer: A

Watch Video Solution

13. A partical is moving in a straight line under constant acceletation. If the motion starts from rest, Find the ratio of displacement in n second to that in the n^{th} second.

A. $\frac{2n-1}{n^2}$

B. $\frac{1}{n}$

C. $\frac{n^2}{n-1}$

D. $\frac{n^2}{2n-1}$

Answer: D

Watch Video Solution

14. A particle is moving in a straight line under constant acceleration of $4m/s^2$. If its velocity at t=0 is 10 m//s, the displacement of particle in the 5^{th} second of its motion is

A. $28m$

B. $100m$

C. $34m$

D. $50m$

Answer: A

Watch Video Solution

15. A body is moving with a uniform acceleration coverss $40m$ in the first 4 s and $120m$ in next 4s. Its initial velocity and acceleration are

A. $0, 5m/s^2$

B. $4m/s, 5m/s^2$

C. $4m/s, 0$

D. $4m/s, 5m/s^2$

Answer: A

Watch Video Solution

16. A particle starts its motion from rest under the action of a constant force. If the distance covered in first $10s$ is s_1 and the covered in the first $20s$ is s_2, then.

A. $y = 2x$

B. $y = 3x$

C. $y = 4x$

D. $y = x$

Answer: C

Watch Video Solution

17. A body travels for $15s$ starting from rest with a constant acceleration. If it travels distances x, y and z in the first $5s$, second 5 s and the next 5 s, repectively, the ralation between x, y and z is

A. $x = y = z$

B. $5x = 3y = z$

C. $x = \frac{y}{3} = \frac{z}{5}$

D. $x = \frac{y}{5} = \frac{z}{3}$

Answer: C

Watch Video Solution

18. A body moving with a uniform acceleration crosses a distance of 15 m in the 3^{rd} second and $23m$ in the 5^{th} second. The displacement in $10s$ will be

A. $150m$

B. $200m$

C. $250m$

D. $300m$

Answer: C

Watch Video Solution

19. A $150m$ long train is moving with a uniform velocity of $45km/h$. The time taken by the train to cross a bridge of length 850 metres is.

A. $56s$

B. $68s$

C. $80s$

D. $92s$

Answer: C

Watch Video Solution

20. Speeds of two identical cars are u and 4u at at specific instant. The ratio of the respective distances in which the two cars are stopped from that instant is

A. $1:1$

B. $1:4$

C. $1:8$

D. $1:16$

Answer: D

Watch Video Solution

21. A car moving with a speed of $40km/h$ can be stopped by applying the brakes after at least 2 m. If the same car is moving with a speed of $80km/h$, what is the minimum stopping distance?

A. $8m$

B. $2m$

C. $4m$

D. $6m$

Answer: A

Watch Video Solution

22. A bullet fired into a fixed target loses half of its velocity after penetrating $1cm$. How much further it will penetrate before coming to rest, assuming that it faces constant resistance to motion

A. $1.5cm$

B. $1.0cm$

C. $3.0cm$

D. $2.0cm$

Answer: C

Watch Video Solution

23. A particle moves in a straight line with a constant acceleration. It changes its velocity from $10ms^{-1}$ to $20ms^{-1}$ while passing through a distance $135m$ in t seconds. The value of t is.

A. 12

B. 9

C. 10

D. 1.8

Answer: B

Watch Video Solution

24. Two cars A and B are at rest at the origin O. If A starts with a uniform velocity of $20m/s$ and B starts in the same direction with a constant acceleration of $2m/s^2$, then the cars will meet after time

A. $10s$

B. $20s$

C. $30s$

D. $40s$

Answer: B

Watch Video Solution

25. Two trains travelling on the same track are approaching each other with equal speed of $40m/s$. The drivers of the trains beging to decelerate simultaneously when just ` 2.0 km apart. Assuming deceleration to be uniform and equal the value to the deceleration to barely avoid collision should be .

A. $0.2m/s^2$

B. $0.6m/s^2$

C. $0.4m/s^2$

D. $0.8m/s^2$

Answer: D

Watch Video Solution

26. A cyclist starts from rest and moves with a constant acceleration of 1 m/s^2. A boy who is 48 m behind the cyclist starts moving with a

constant velocity of $10m/s$. After how much time the boy meets the cyclist?

A. $8s$

B. $12s$

C. $10s$

D. both 1 and (2)

Answer: D

Watch Video Solution

27. A man is d distance behind the bus when the bus starts accelerating from rest with an acceleration a_0. With what minimum constant velocity should the man start running to catch the bus

A. $\sqrt{4a_0d}$

B. $\sqrt{3a_0d}$

C. $\sqrt{2a_0d}$

D. $\sqrt{a_0d}$

Answer: C

Watch Video Solution

28. A body A starts from rest with an acceleration a_1. After 2 seconds, another body B starts from rest with an acceleration a_2. If they travel equal distances in the 5^{th} second, after the start of A, then the ratio $a_1 : a_2$ is equal to :

A. $5:9$

B. $5:7$

C. $9:5$

D. $9:7$

Answer: A

Watch Video Solution

29. (a) A particle moving with constant acceleration from A to B in a straight line AB has velocities u and v at A and B respectively. Find the velocity of the particle at the midpoint of AB.

(b) If the time taken by the particle to go from A to the midpoint of AB is two times that from the midpoint of AB to B then find the value of v/u.

A. $\left(\frac{u^2+v^2}{2}\right)^2$

B. $\frac{u^2+v^2}{2}$

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

D. $\sqrt{\frac{u^2+v^2}{2}}$

Answer: D

Watch Video Solution

30. A car accelerates from rest at a constant rate α for some time, after which it decelerates at a constant rate β, to come to rest. If the total time elapsed is t seconds. Then evalute (a) the maximum velocity reached and (b) the total distance travelled.

A. $\frac{\alpha\beta t}{(\alpha+\beta)}$

B. $\frac{\alpha\beta t}{2(\alpha+\beta)}$

C. $\frac{2\alpha\beta t}{(\alpha+\beta)}$

D. $\frac{4\alpha\beta t}{(\alpha+\beta)}$

Answer: A

Watch Video Solution

31. In the previous question, the total distance traveled is

A. $\frac{\alpha\beta t^2}{4(\alpha+\beta)}$

B. $\frac{\alpha\beta t^2}{2(\alpha+\beta)}$

C. $\frac{2\alpha\beta t^2}{(\alpha+\beta)}$

D. $\frac{4\alpha\beta t^2}{(\alpha+\beta)}$

Answer: B

Watch Video Solution

32. The engine of a motoecycle can produce a maximum acceleration of $5m/s^2$. Its brakes can produce a maximum retardation of $10m/s^2$. What is the minimum time in which the motorcycle can cover a distance of $1.5km$?

A. (1)$30s$

B. (2)$15s$

C. (3)$10s$

D. (4)$5s$

Answer: A

Watch Video Solution

33. A train starting from rest accelerates uniformly for 100 s, then comes to a stop with a uniform retardation in the next 200 s. During the motion, it covers a distance of 3 km. Choose the wrong option

A. Its acceleration is $0.2m/s^2$

B. Its retardation is $0.1m/s^2$

C. The maximum velocity is $20m/s$

D. The maximum velocity is $10m/s$

Answer: D

Watch Video Solution

34. A particle starts from rest accelerates at $2m/s^2$ for $10s$ and then goes for constant speed for $30s$ and then decelerates at $4m/s^2$ till it stops. What is the distance travelled by it.

A. $750m$

B. $800m$

C. $700m$

D. $850m$

Answer: A

Watch Video Solution

35. A car , starting from rest, accelerates at the rate f through a distance S then continues at constant speed for time t and then decelerates at the rate $\frac{f}{2}$ to come to rest . If the total distance traversed is $15S$, then

A. $d = \frac{1}{2}\alpha t^2$

B. $d = \frac{1}{4}\alpha t^2$

C. $d = \frac{1}{72}\alpha t^2$

D. $d = \frac{1}{6}\alpha t^2$

Answer: C

Watch Video Solution

36. A ball of mass m_1 and another ball of mass m_2 are dropped from equal height. If the time taken by the balls are t_1 and t_2, respectively, then

A. $t_1 = t_2$

B. $t_1 = 2t_2$

C. $\frac{t_1}{t_2} = \frac{m_1}{m_2}$

D. $\frac{t_1}{t_2} = \frac{m_2}{m_1}$

Answer: A

Watch Video Solution

37. The ratio of the distance through which a ball falls in the 2^{nd}, 3^{rd} and 4^{th} second is (the initial velocity of the ball is zero)

A. $3:5:7$

B. $4:5:6$

C. $4:9:16$

D. $5:7:9$

Answer: A

Watch Video Solution

38. A ball is released from the top of a tower of height $hmeters$. It takes T seconds to reach the ground . What is the position of the ball at $\frac{T}{3}\sec ond$

A. $h/9$ meters from the ground

B. $7h/9$ meters from the ground

C. $8h/9$ meters from the ground

D. $17h/18$ meters from the ground

Answer: C

Watch Video Solution

39. A body freely falling from the rest has velocity v after it falls through a height h the distance it has to fall down for its velocity to become double is

A. $2h$

B. $4h$

C. $6h$

D. $8h$

Answer: B

Watch Video Solution

40. From the top of a tower, a particle is thrown vertically downwards with a velocity of $10m/s$. The ratio of the distances, covered by it in the $3rd$ and $2nd$ seconds of the motion is $\left(\text{Take} g = 10m/s^2\right)$.

A. $5:7$

B. $7:5$

C. $3:6$

D. $6:3$

Answer: B

Watch Video Solution

41. A stone from the top of a tower, travels 35 m in the last second of its journey. The height of the tower is

A. $20m$

B. $40m$

C. $60m$

D. $80m$

Answer: D

Watch Video Solution

42. A stone falls freely from rest from aheight h and it travels a distance $h/2$ in the last second. The time of journey is

A. $\sqrt{2}s$

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

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

D. $2s$

Answer: C

Watch Video Solution

43. A stone falls freely rest. The distance covered by it in the last second is equal to the distance covered by it in the first 2 s. The time taken by the stone to reach the ground is

A. $2.5s$

B. $3.5s$

C. $4s$

D. $5s$

Answer: A

Watch Video Solution

44. A stone falls freely from rest from aheight h and it travels a distance $9h/25$ in the last second. The value of h is

A. 145 m

B. 100 m

C. 125 m

D. 200 m

Answer: C

Watch Video Solution

45. A body falls from a large height. The ratio of distance traveled in each time interval t_0 during $t = 0$ to $t = 3t_0$ of the journey is

A. $1:4:9$

B. $1:2:4$

C. $1:3:5$

D. $1:2:3$

Answer: C

Watch Video Solution

46. A particle is dropped from rest from a large height Assume g to be constant throughout the motion. The time taken by it to fall through successive distance of $1m$ each will be :

A. All equal, being to $\sqrt{2/g}$ second

B. In the ratio of the square roots of the integers 1,2,3,...

C. In the ratio of the difference in the square roots of the integers,

i.e., $\sqrt{1}, (\sqrt{2}-\sqrt{1})(\sqrt{3}-\sqrt{2}), (\sqrt{4}-\sqrt{3})$...

D. In the retio of the reciprocal of the square roots of the integers,

i.e., $\frac{1}{\sqrt{1}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{4}}$

Answer: C

Watch Video Solution

47. A body, thrown upward with some velocity reaches the maximum height of $50m$. Another body with double the mass thrown up with double the initial velocity will reach a maximum height of

A. 100 m

B. 200 m

C. 300 m

D. 400 m

Answer: B

Watch Video Solution

48. When a ball is thrown up vertically with velocity u, it attains a maximum height H. What should be the velocity so that maximum height becomes $2H$?

A. $\sqrt{2}u$

B. $2u$

C. $3u$

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

Answer: A

Watch Video Solution

49. A particle is thrown vertically upwards. If its velocity is half of the maximum height is $20m/s$, then maximum height attained by it is

A. 25 m

B. 30 m

C. 35 m

D. 40 m

Answer: D

Watch Video Solution

50. Two balla A and B are thrown vertically upwards with their initial velocity in the ratio 3:4.

(i) The ratio of the maximum height attained by them is $9:16$

(ii) The ratio of the maximum height attained by them is $3:4$

(iii) The ratio of their time taken by them to raturn back to the ground is $3:4$

(iv) The ratio of their time taken by them to raturn back to the ground is $9:16$

A. (i), (ii)

B. (i),(iii)

C. (ii),(iii)

D. (ii),(iv)

Answer: B

Watch Video Solution

51. A particle is thrown vertically upward from the ground with some velocity and it strikes the ground again in time 2 s. The maximum height achieved by the particle is : $\left(g = 10m/s^2\right)$

A. 2.50 m

B. 1.25 m

C. 6.25 m

D. 5 m

Answer: D

Watch Video Solution

52. A ball is dropped on the floor a height of $80m$ rebounds to a height of $20m$. If the ball is in contact with floor for 0.1 s, the average acceleration during contact is

A. $400m/s^2$

B. $500m/s^2$

C. $600m/s^2$

D. $800m/s^2$

Answer: C

Watch Video Solution

53. The acceleration due to gravity on the planet A is 9 times the acceleration due to gravity on planet B. A man jumps to a height of $2m$ on the surface of A. What is the height of jump by the same person on the planet B ?

A. 18 m

B. 6 m

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

D. $\frac{2}{9}m$

Answer: A

Watch Video Solution

54. If a ball is thrown vertically upwards with speed u, the distance covered during the last t second of its ascent is

A. $\frac{1}{2}gt^2$

B. $ut - \frac{1}{2}gt^2$

C. $(u - gt)t$

D. ut

Answer: A

Watch Video Solution

55. A body thrown vertically upwards with an initial valocity u reaches maximum height in 6 s. The ratio of the distances traveled by the body in

the first second the seventh second is

A. $1:1$

B. $11:1$

C. $1:2$

D. $1:11$

Answer: B

Watch Video Solution

56. A body is thrown vertically upward with velocity u. The distance traveled by it in the fifth and the sixth second are equal. The velocity u is given by

A. $25m/s$

B. $50m/s$

C. $75m/s$

D. $100m/s$

Answer: B

Watch Video Solution

57. With what velocity a ball be projected vertically so that the distance covered by it in 5^{th} second is twice the distance it covers in its 6^{th} second $(g = 10m/s^2)$

A. $58.8m/s$

B. $49m/s$

C. $65m/s$

D. $19.6m/s$

Answer: C

Watch Video Solution

58. In the previous problem, distance covered in the 7^{th} second is

A. 1.25 m

B. 2.5 m

C. 3.75 m

D. 5.0 m

Answer: B

Watch Video Solution

59. A stone is dropped from the top of a $400m$ high tower. At the same time another stone is projected vertically upwards from the ground with a speed of $50m/s$. The two stones will cross each other after a time

A. 2 s

B. 4 s

C. 6 s

D. 8 s

Answer: D

Watch Video Solution

60. In the previous problem, the height at which the two stones will cross each other is

A. 20 m

B. 40 m

C. 60 m

D. 80 m

Answer: D

Watch Video Solution

61. A ball is dropped from the top of an 80 m high tower After 2 s another ball is thrown downwards from the tower. Both the balls reach the ground simultaneously. The initial speed of the second ball is

A. $10m/s$

B. $20m/s$

C. $30m/s$

D. $40m/s$

Answer: C

Watch Video Solution

62. A ball falls from height h. After 1 s, another ball falls freely from a point $25m$ below the point from where the first ball falls. Both of them reach the ground at the same time. The value of h is

A. 30 m

B. 45 m

C. 60 m

D. 75 m

Answer: B

Watch Video Solution

63. A healthy youngman standing at a distance of 7 m from 11.8 m high building sees a kid slipping from the top floor. With what speed (assumed uniform) should he run to catch the kid at the arms hieght (1.8m)?

A. $2.5m/s$

B. $5m/s$

C. $7.5m/s$

D. $10m/s$

Answer: B

Watch Video Solution

64. Water drops fall at regular intervals from a tap 5 m above the ground. The third drop is leaving the tap, the instant the first drop touches the ground. How far above the ground is the second drop at that instant. $\left(g = 10ms^{-2}\right)$

A. 2.50 m

B. 3.75 m

C. 4.00 m

D. 1.25 m

Answer: B

Watch Video Solution

65. A man throws ball with the same speed vertically upwards one after the other at an interval of 2 seconds. What should be the speed of the throw so that more than two ball are in the sky at any time (Given $g = 10\frac{m}{2^2}$)

A. At least $0.8m/s$

B. Any speed less than $19.6m/s$

C. Only with speed $19.6m/s$

D. More than $19.6m/s$

Answer: D

Watch Video Solution

66. Two balls A and B of same masses are thrown from the top of the building A. Thrown upward with velocity V and B, thrown downward with velocity V, then

A. Velocity of A is more than B at the ground

B. Velocity of B is more than A at the ground

C. Both A and B strike the ground with same velocity

D. None if these

Answer: C

Watch Video Solution

67. A balloon is going vertically upwards with a velocity of $10m/s$. When it is $75m$ above the ground, a stone is gently relesed from it. The time taken by the stone to reach the ground is $(g = 10m/s^2)$

A. 3 s

B. 4 s

C. 5 s

D. 6 s

Answer: C

Watch Video Solution

68. A ball is thrown vertically upwards from the top of a tower of height 60 m with a speed of 20 m//s.

(i) The ball strikes the ground after 6 s

(ii) The ball strikes the ground with speed $40m/s$

(iii) The distance of ball above the ground after $5s$ is $35m$

The maximum height attained by ball above the ground is 80 m

A. (i), (ii)

B. (i),(ii),(iii)

C. (ii),(iv)

D. All option are correct

Answer: D

Watch Video Solution

69. A body is dropped from a balloon moving up with a velocity of $4m/s$, when the balloon is at a height of 120 m from the ground. The height of the body after 5 s from the ground is:

A. 5 m

B. 10 m

C. 15 m

D. 20 m

Answer: C

Watch Video Solution

70. A balloon carrying a stone is moving with uniform speed $5m/s$ vertically upward. At some instant, stone is dropped from the balloon and it strikes the ground after 10 s of its release. The height from which stone was dropped is

A. 250 m

B. 350 m

C. 450 m

D. None

Answer: C

Watch Video Solution

71. Two balls are projected simultaneously with the same speed from the top of a tower, one vertically upwards and the other vertically downwards. They reach the ground in 9 s and 4 s, respectively. The height of the tower is $\left(g = 10m/s^2\right)$

A. 90 m

B. 180 m

C. 270 m

D. 360 m

Answer: B

Watch Video Solution

72. A stone dropped from a building of height h and it reaches after t second on the earth. From the same building if two stones are thrown (one upwards and other downwards) with the same speed and they reach the earth surface after t_1 and t_2 seconds, respectively, then

A. $t = t_1 - t_2$

B. $t = \dfrac{t_1 + t_2}{2}$

C. $t = \sqrt{t_1 t_2}$

D. $t = t_1^2 t_2^2$

Answer: C

Watch Video Solution

73. A body is projected verticallt upwards. If t_1 and t_2 be the times at which it is at a height h above the point of projection while ascending and descending respectively, then:

A. $.^{1/2} gt_1t_2$

B. gt_1t_2

C. $2gt_1t_2$

D. $4gt_1t_2$

Answer: A

Watch Video Solution

74. In the previous problem, the velocity of projection is

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

B. $g(t_1 + t_2)$

C. $2g(t_1 + t_2)$

D. $4g(t_1 + t_2)$

Answer: A

Watch Video Solution

75. A ball is dropped from a height of $5m$ onto a sandy floor and penetrates the sand up to 1 m before coming to rest. The retardation of the ball in sand (assuming it to be uniform) will be

A. $25m / s^2$

B. $50m / s^2$

C. $75m / s^2$

D. $100m / s^2$

Answer: B

Watch Video Solution

76. A parachutist after bailing out falls $80m$ without friction. When the parachute opens, it decelerates at $2m/s^2$. He reaches the ground with a speed of $20m/s$. At what height, did he bail out?

A. 180 m

B. 280 m

C. 380 m

D. 480 m

Answer: C

Watch Video Solution

77. A man in a balloon, rising vertically with an acceleration of $5m/s^2$, releases a ball 10 s after the balloon is let go from the ground. The greatest height above the ground reached by the ball is

A. 125 m

B. 250 m

C. 375 m

D. 500 m

Answer: C

Watch Video Solution

78. A rocket is fired upward from the earth's surface such that it creates an acceleration of $20m/s^2$. If after 5 s its engine is switched off, the maximum height of the rochet from the earth's surface would be

A. 250 m

B. 500 m

C. 750 m

D. 1000 m

Answer: C

Watch Video Solution

79. The displacement of a particle is given by $y = a + bt + ct^2 - dt^4$. The initial velocity and acceleration are respectively.

A. $\beta, 4s$

B. $-\beta, 2\gamma$

C. $\beta, 2\gamma$

D. $2r, \ -4\delta$

Answer: C

Watch Video Solution

80. The position x of a particle varies with time t as $x = at^2 - bt^3$. The acceleration at time t of the particle will be equal to zero, where (t) is equal to .`

A. $\frac{\alpha}{\beta}$

B. $\frac{2\alpha}{3\beta}$

C. $\frac{\alpha}{3\beta}$

D. zero

Answer: C

Watch Video Solution

81. A particle moves along a straight line such that its displacement s at any time t is given by $s = t^3 - 6t^2 + 3t + 4m$, t being is seconds. Find the velocity of the particle when the acceleration is zero.

A. $3m/s$

B. $-12m/s$

C. $42m/s$

D. $-9m/s$

Answer: D

Watch Video Solution

82. The motion of a particle along a straight line is described by the equation: $x = 8 + 12t - t^3$, where x is inmeter and t in second.

(i) the initial velocity of particle is 12 m//s

(ii) the retardation of particle when velocity is zero is $12m/s^2$

(iii) when acceleration is zero, displacement is 8 m

the maximum velocity of particle is $12m/s$

A. (i), (ii)

B. (ii), (iii)

C. (i), (ii), (iii)

D. All option are correct

Answer: D

Watch Video Solution

83. The position x of a particle with respect to time t along the x-axis is given by $x = 9t^2 - t^3$ where x is in meter and t in second. What will be the position of this particle when it achieves maximum speed along the positive x direction

A. 32 m

B. 54 m

C. 81 m

D. 24 m

Answer: B

Watch Video Solution

84. The position of a particle moving on the x-axis is given by $x = t^3 + 4t^2 - 2t + 5$ where x is in meter and t is in seconds

(i) the velocity of the particle at $t = 4s$ is $78m/s$

(ii) the acceleration of the particle at $t = 4s$ is $32m/s^2$

(iii) the average velocity during the interval $t = 0$ to $t = 4s$is $30m/s$

(iv) the average acceleration during the interval $t = 0$ to $t = 4s$ is $20m/s^2$

A. (i), (ii)

B. (ii), (iii)

C. (i), (ii), (iii)

D. All

Answer: D

Watch Video Solution

85. The displacement of a body along the x-axis depends on time as $\sqrt{x} = t + 2$, then the velocity of body

A. increases with time

B. decreases with time

C. independent of time

D. None of these

Answer: A

Watch Video Solution

86. The relation $3t = \sqrt{3x} + 6$ describe the displacement of a particle in one direction where x is in metres and t in sec.

The displacement, when velocity is zero is

A. 24 m

B. 12 m

C. 5 m

D. zero

Answer: D

Watch Video Solution

87. The distance covered by a particle varies with as $x = \frac{k}{b}\left(1 - e^{-bt}\right)$.

The speed of particle at time t is

A. ke^{-bt}

B. kbe^{-bt}

C. $\left(\frac{k}{b^2}\right)e^{-bt}$

D. $\left(\frac{k}{b}\right)e^{-bt}$

Answer: A

Watch Video Solution

88. The displacement x of a particle varies with time t as $x = ae^{-\alpha t} + be^{\beta t}$. Where a, b, α and β positive constant.

The velocity of the particle will.

A. go on decreasing with time

B. be independent of α and β

C. drop to zero when $\alpha = \beta$

D. go on increasing with time

Answer: D

Watch Video Solution

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

A. (i), (ii)

B. (i), (iii)

C. (iii),(iv)

D. (i), (iii), (iv)

Answer: C

Watch Video Solution

90. If the velocity of a particle is given by $v = (180 - 16x)^{\frac{1}{2}} \frac{m}{s}$, then its acceleration will be

A. Zero

B. $8m/s^2$

C. $-8m/s^2$

D. $4m/s^2$

Answer: C

Watch Video Solution

91. A particle move a distance x in time t according to equation $x = (t+5)^{-1}$. The acceleration of particle is alphaortional to.

A. $(velocity)^{2/3}$

B. $(velocity)^{3/2}$

C. $(dis\tan ce)^2$

D. $(dis\tan ce)^{-2}$

Answer: B

Watch Video Solution

92. The relation between time t and displacement x is $t = \alpha x^2 + \beta x$, where α and β are constants. The retardation is

A. $2\alpha v^3$

B. $2\beta v$

C. $2\alpha\beta v^3$

D. $2\beta^2 v^3$

Answer: A

Watch Video Solution

93. The velocity of a particle is $v = v_0 + gt + ft^2$. If its position is $x = 0$ at $t = 0$, then its displacement after unit time $(t = 1)$ is.

A. $v_0 + 2g + 3f$

B. $v_0 + \frac{g}{2} + \frac{f}{3}$

C. $v_0 + g + f$

D. $v_0 + \frac{g}{2} + f$

Answer: B

Watch Video Solution

94. A particle is moving with velocity $v = 4t^3 + 3t^2 - 1m/s$.

The displacement of particle in time $t = 1s$ to $t = 2s$ will be

A. 21 m

B. 17 m

C. 13 m

D. 9 m

Answer: A

Watch Video Solution

95. The acceleration a in ms^{-2} of a particle is given by $a = 3t^2 + 2t + 2$, where t is the time. If the particle starts out with a velocity $v = 2ms^{-1}$ at $t = 0$, then find the velocity at the end of $2s$.

A. $12m/s$

B. $18m/s$

C. $27m/s$

D. $36m/s$

Answer: B

Watch Video Solution

96. A particle, initially at rest, starts moving in a straight line with an acceleration $a = 6t + 4m/s^2$. The distance covered by it in 3 s is

A. 15 m

B. 30 m

C. 45 m

D. 60 m

Answer: C

Watch Video Solution

97. The acceleration of particle is increasing linearly with time t as bt. The particle starts from the origin with an initial velocity v_0. The distance travelled by the particle in time t will be.

A. $v_0 + \frac{1}{3}bt^2$

B. $v_0 + \frac{1}{3}bt^3$

C. $v_0 + \frac{1}{6}bt^2$

D. $v_0 + \frac{1}{2}bt^2$

Answer: C

Watch Video Solution

98. A particle is moving under constant acceleration $a = kt$. The motion starts from rest. The velocity and displacement as a function of time t is

A. kt^2, kt^3

B. $\frac{kt^2}{2}, \frac{kt^3}{3}$

C. $\frac{kt^3}{2}, \frac{kt^2}{3}$

D. $\frac{kt^2}{2}, \frac{kt^3}{6}$

Answer: D

Watch Video Solution

99. In the previous problem, if initial velocity is v_0, then velocity and displacement will be

A. $v_0 t + kt^2, v_0 + \frac{kt^3}{6}$

B. $v_0 + \frac{kt^2}{2}, v_0 t + \frac{kt^3}{6}$

C. $v_0 + kt^2, v_0 t + \frac{kt^3}{6}$

D. $v_0 + \frac{kt^2}{2}, v_0 t + \frac{kt^3}{6}$

Answer: B

Watch Video Solution

100. The deceleration exerienced by a moving motor blat, after its engine is cut-off is given by $dv/dt = -kv^3$, where k is constant. If v_0 is the magnitude of the velocity at cut-off, the magnitude of the velocity at a time t after the cut-off is.

A. $\frac{v_0}{\sqrt{1 + 2ktv_0^2}}$

B. $\frac{v_0}{2k}$

C. $\frac{v_0}{\sqrt{1+2kt}}$

D. $\frac{v_0}{\sqrt{2kt}}$

Answer: A

Watch Video Solution

101. An object , moving with a speed of $6.25m/s$, is decelerated at a rate given by :

$\frac{dv}{dt} = -2.5\sqrt{v}$ where v is the instantaneous speed . The time taken by the object , to come to rest , would be :

A. 1 s

B. 2 s

C. 4 s

D. 8 s

Answer: B

Watch Video Solution

102. The velocity of a particle moving in the positive direction of x-axis varies as $v = \alpha\sqrt{x}$ where α is positive constant. Assuming that at the moment $t = 0$, the particle was located at $x = 0$, find (i) the time dependance of the velocity and the acceleration of the particle and (ii) the mean velocity of the particle averaged over the time that the particle takes to cover first s meters of the path.

A. $\frac{\alpha^2 t}{2}, \alpha^2$

B. $\alpha^2 t, \frac{\alpha^2 t}{2}$

C. $\frac{\alpha^2 t}{2}, \frac{\alpha^2}{2}$

D. $\alpha^2 t, \alpha^2$

Answer: C

Watch Video Solution

103. A particle located at $x = 0$ at time $t = 0$, starts moving along with the positive $x - direction$ with a velocity 'v' that varies as $v = a\sqrt{x}$. The displacement of the particle varies with time as

A. t

B. $t^{1/2}$

C. t^3

D. t^2

Answer: D

Watch Video Solution

104. A point moves linearly with deceleration which is given by $dv/dt = -\alpha\sqrt{v}$, where alpha is a positive constant. At the start $v = v_0$. The distance traveled by particle before it stops will be

A. $\frac{v_0^{3/2}}{3\alpha}$

B. $\frac{4v_0^{3/2}}{\alpha}$

C. $\frac{4v_0^{3/2}}{3\alpha}$

D. $\frac{2v_0^{3/2}}{3\alpha}$

Answer: D

Watch Video Solution

105. At the moment t=0 particle leaves the origin and moves in the positive direction of the x-axis. Its velocity varies with time as $v = 10(1 - t/5)$. The dislpacement and distance in 8 second will be

A. 16 m, 34 m

B. 16 m, 25 m

C. 16 m, 16 m

D. 16 m, 9m

Answer: A

Watch Video Solution

106. A particle moves with an initial v_0 and retardation alphav, where v is its velocity at any time t.

(i) The particle will cover a total distance $\frac{v_0}{\alpha}$.

(ii) The particle will come to rest after time $\frac{1}{\alpha}$.

(iii) The particle will continue to move for a very long time.

(iv) The velocity of the particle will become $\frac{v_0}{2}$ after time $\frac{1n2}{\alpha}$

A. (i), (ii)

B. (ii), (iii)

C. (i), (ii), (iv)

D. All

Answer: C

Watch Video Solution

107. The motion of a body is given by the equation $dv/dt = 6 - 3v$, where v is in m//s. If the body was at rest at $t = 0$

(i) the terminal speed is $2m/s$

(ii) the magnitude of the initial acceleration is $6m/s^2$

(iii) The speed varies with time as $v = 2\left(1 - e^{-3t}\right)m/s$

(iv) The speed is $1m/s$, when the acceleration is half initial value

A. (i), (ii)

B. (ii), (iii),(iv)

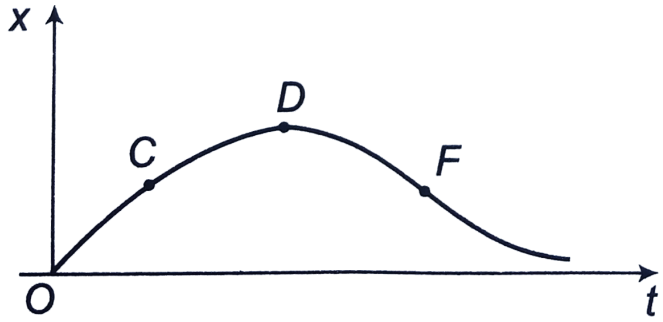
C. (i), (ii), (iii)

D. All

Answer: D

Watch Video Solution

108. The position-time graph of an object moving in a straight line is shown below. The object has zero velocity at



A. O

B. C

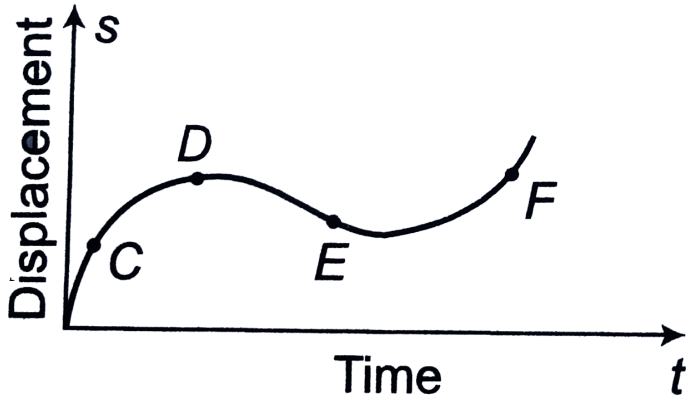
C. D

D. F

Answer: C

Watch Video Solution

109. The displacement-time graph of moving particle is shown below



The instantaneous velocity of the particle in negative at the point

A. D

B. F

C. C

D. E

Answer: D

Watch Video Solution

110. The displacement-time graph for two particle A and B are straight lines inclined at angles of 45° and 60° with the time axis. The ratio of velocities of v_A and v_B is

A. $1:2$

B. $1:\sqrt{3}$

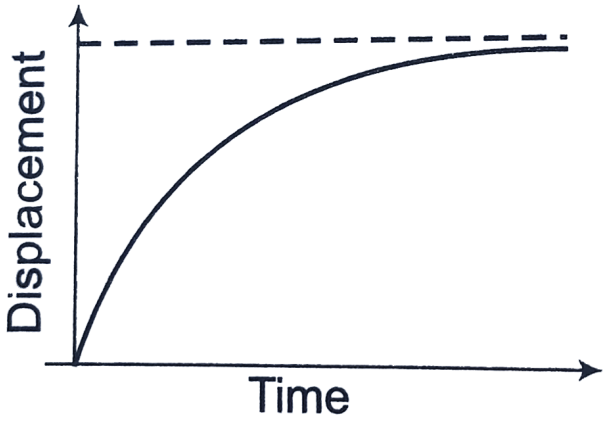
C. $\sqrt{3}:1$

D. $2:1$

Answer: B

Watch Video Solution

111. The displacement-time graph of a particle is as shown below. It indicates that



A. the particle starts with a certain velocity but the motion is retarded and finally the particle stops

B. the velocity of the particle is constant throufgout

C. the acceleration of the particle is constant throughout

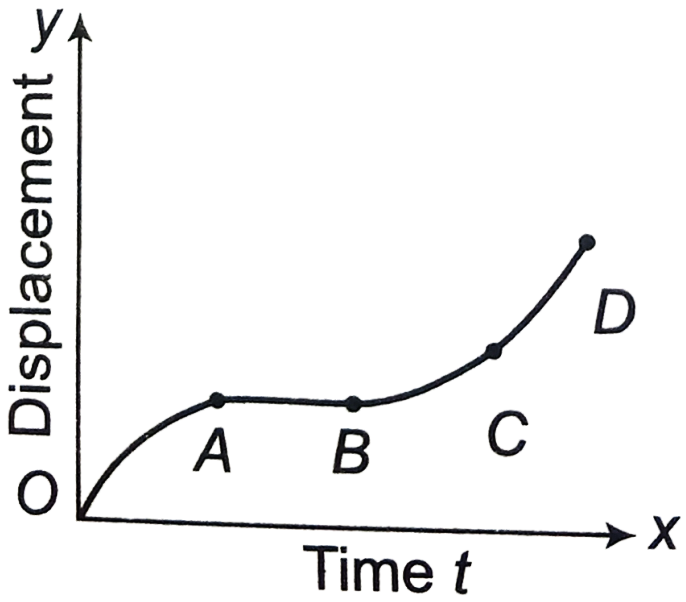
D. the particle starts with a velocity, the motion is accelerated and finally the particle moves with a constant velocity

Answer: A

Watch Video Solution

112. The graph between the displacement x and time t for a particle moving in a straight line is shown in the figure. During the interval OA, AB, BC and CD the acceleration of the particle is

OA, AB, BC, CD



A. $+, 0, +, +$

B. $-, 0, +, 0$

C. $+, 0, -, +$

D. $-, 0, -, 0$

Answer: B

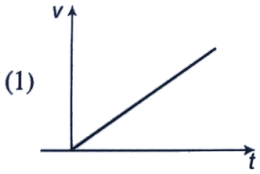
Watch Video Solution

113. The position-time relation of a particle moving along the x-axis is given by

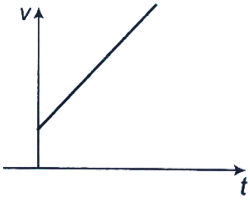
$x = a - bt + ct^2$

where a, b and c are positive numbers. The velocity-time graph of the particle is

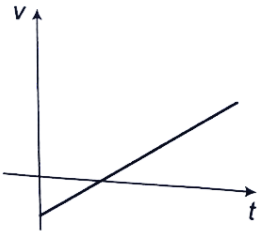
A.



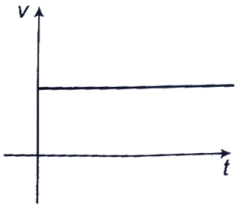
B.



C.



D.



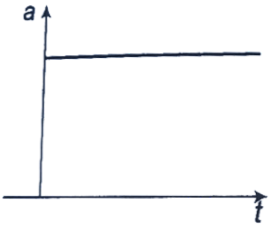
Answer: C

Watch Video Solution

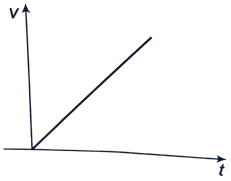
114. The velocity-time graph of a body moving in a straight line is shown below:

Which one of the following represents its acceleration time graph?

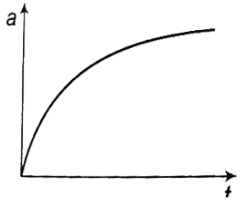
A.



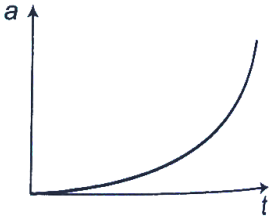
B.



C.



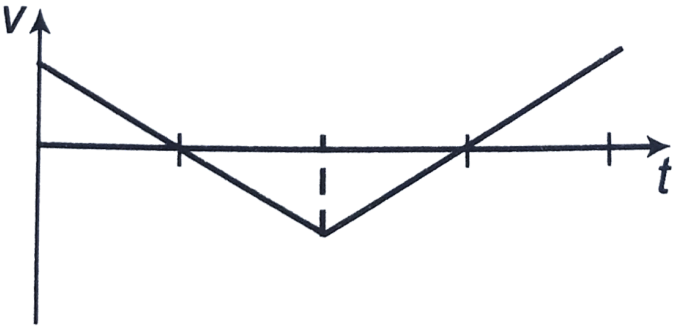
D.



Answer: A

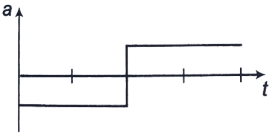
Watch Video Solution

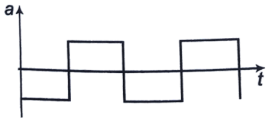
115. The graph below shws the velocity versus time graph for a body



Which of the following graph represents the corresponding acceleration v//s time graph?

A.


B.


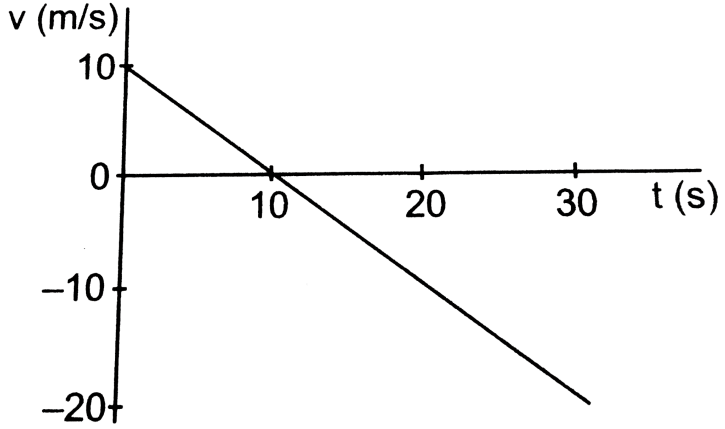
C.


D.


Answer: A

Watch Video Solution

116. The velocity time plot for a particle moving on straight line is shown in the figure.



A. The particle has a constant acceleration

B. The particle has never turned around

C. The particle has a zero displacement

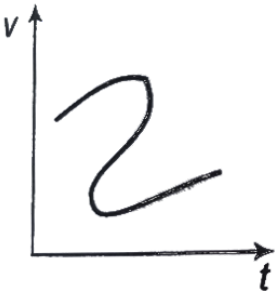
D. The average speed in the interval 0 to 10 s is the same as the average speed in the interval 10 s to 30 s

Answer: A

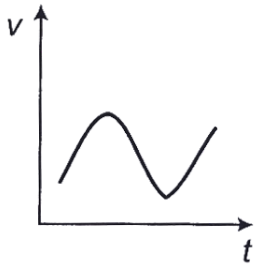
Watch Video Solution

117. Which of the following velocity-time graphs shows a realistic situation for a body in motion ?

A.

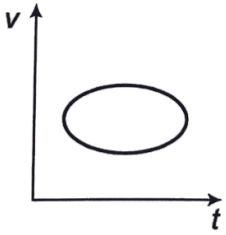


B.



C.

D.

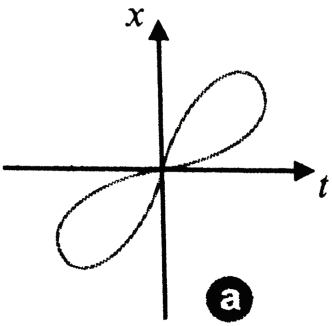


Answer: B

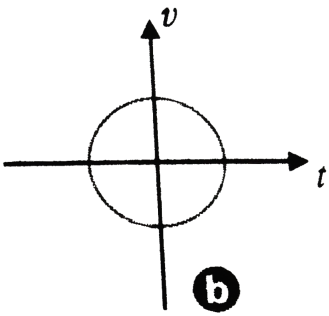
Watch Video Solution

118. Look at the graphs Fig. 2 (NCT) .5.(a) to (d) carefully and state, with reasons, with of these connot possibly represent one dimensional

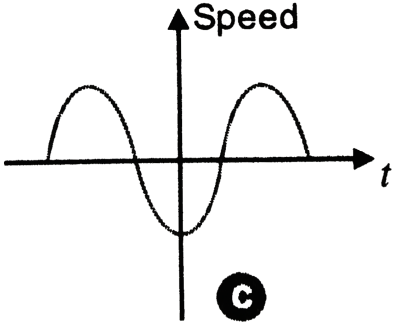
motion of a particle.



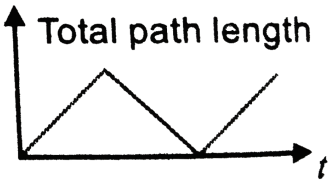
a



b

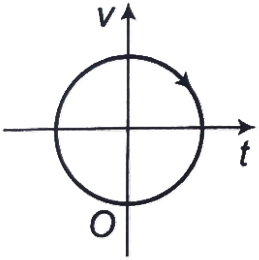


c

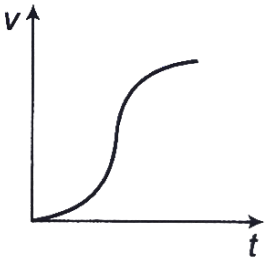


d

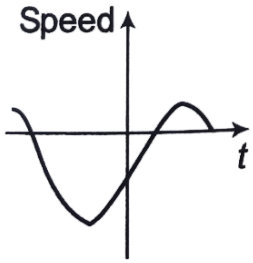
A.



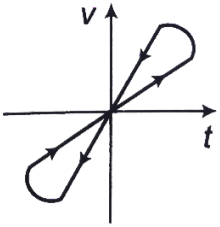
B.



C.



D.

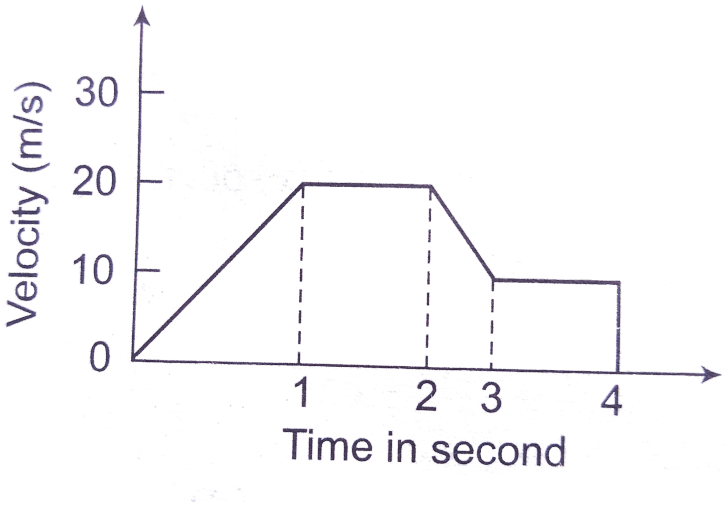


Answer: B

Watch Video Solution

119. The variation of velocity of a particle with time moving along a straight line is illustrated in the following figure. The distance travelled

by the particle in four seconds is.



A. 60 m

B. 55 m

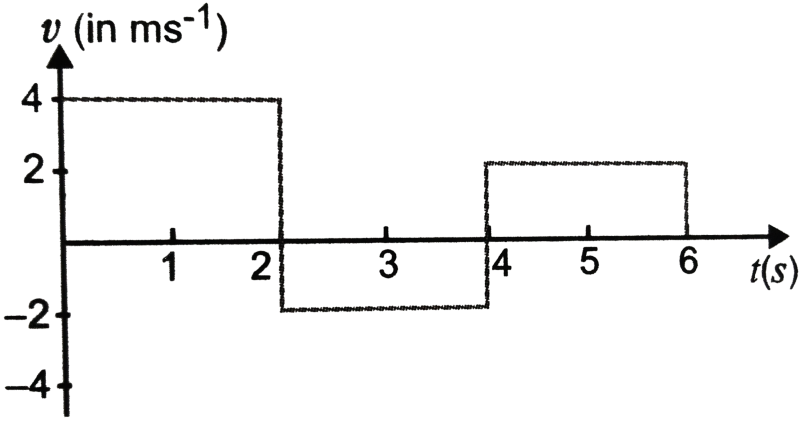
C. 25 m

D. 30 m

Answer: B

Watch Video Solution

120. The velocit-time graph of a body moving in a straight line is shown in Fig. 2 (d) . 32. Find the displacement and the distance travelled by the body in $6\,\text{sec}\,onds$.



A. 8 m, 16 m

B. 16 m, 8m

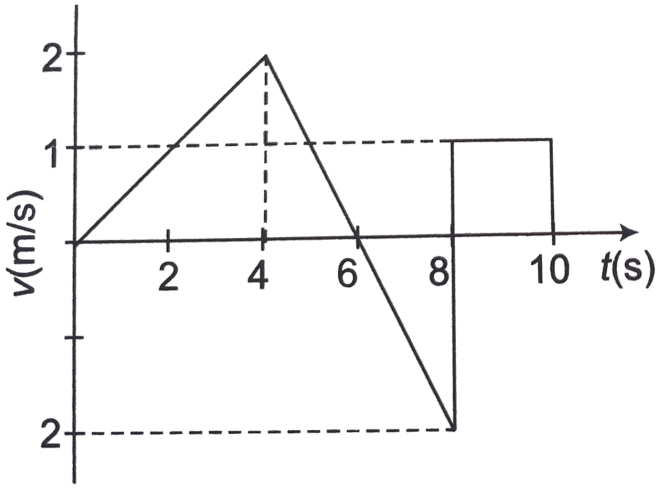
C. 16 m, 16 m

D. 8 m, 8 m

Answer: A

Watch Video Solution

121. The velocity-time graph of a body moving in a straight line is given below. The displacement of the body in 10 s is



A. 4 m

B. 6 m

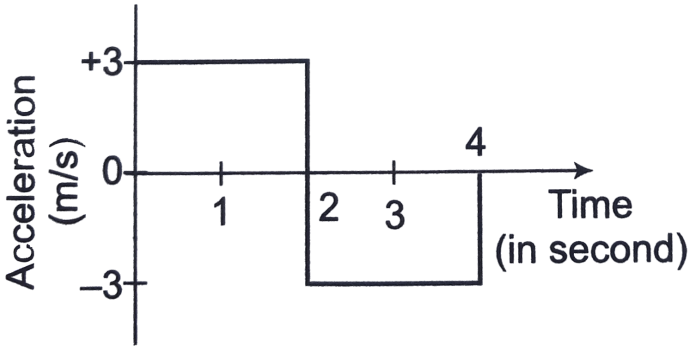
C. 8 m

D. 10 m

Answer: B

Watch Video Solution

122. A particle starts from rest at t=0 and moves in a straight line with an acceleration as shown below. The velocity of the particle at t=3 s is



A. $2m/s$

B. $3m/s$

C. $4m/s$

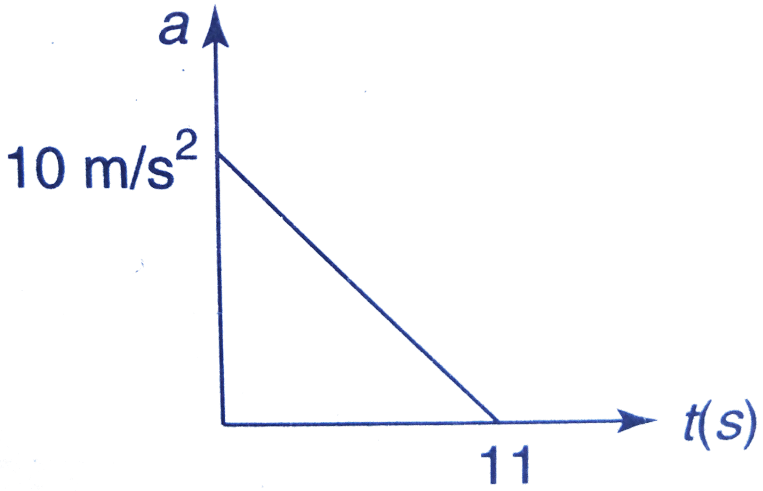
D. $6m/s$

Answer: B

Watch Video Solution

123. A particle starting from rest. Its acceleration (a) versus time (t) is as shown in the figure.

The maximum speed of the particle will be.



A. $110m/s$

B. $55m/s$

C. $550m/s$

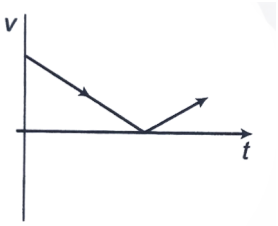
D. $660m/s$

Answer: B

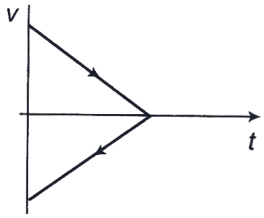
Watch Video Solution

124. A ball is thrown vertically upwards. Which of the following graph/graphs represent velocity time graph of the ball during its flight (air resistance is neglected).

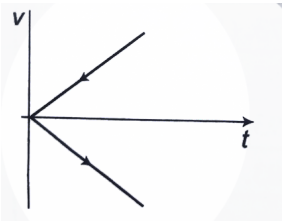
A.



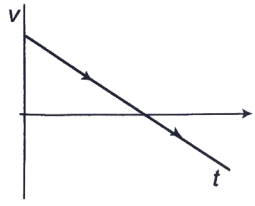
B.



C.



D.

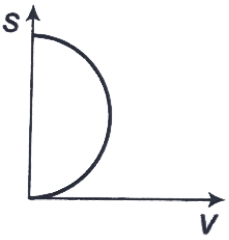


Answer: D

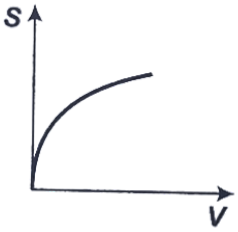
Watch Video Solution

125. An object is moving with a uniform acceleration which is parallel to its instantaneous direction of motion. The dispalcement (s)-velocity (v) graph of this object is.

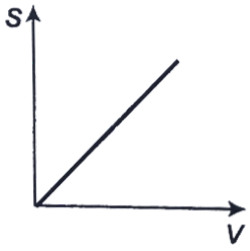
A.



B.



C.



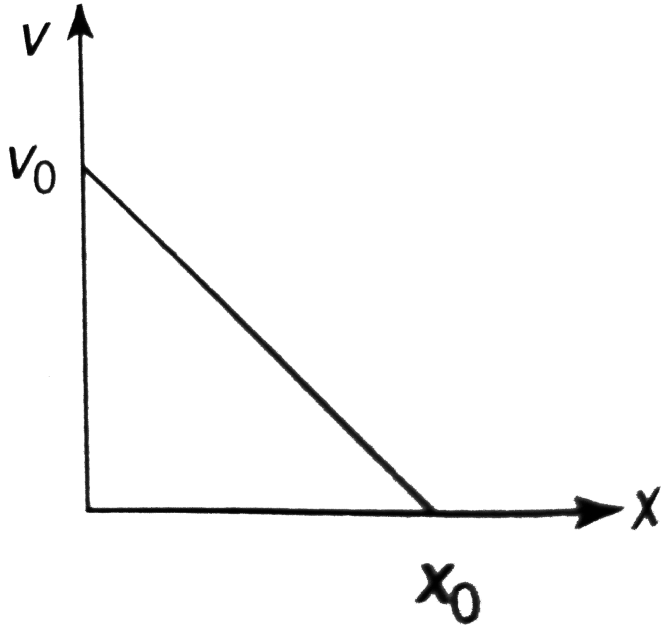
D.

Answer: C

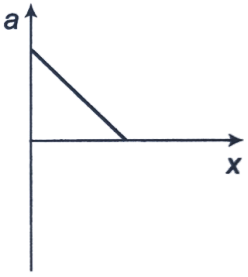
Watch Video Solution

126. The given graph shows the variation of velocity with displacement. Which one of the graphs given below correctly represents the variation

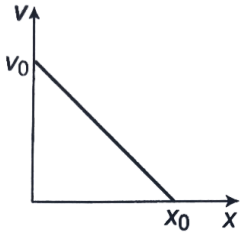
of acceleration with displacement ?



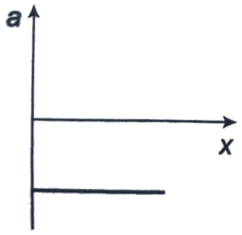
A.



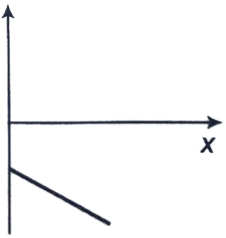
B.



C.



D.

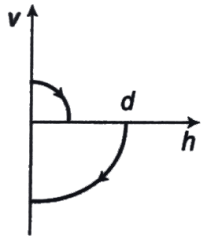


Answer: B

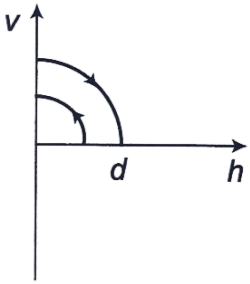
Watch Video Solution

127. A ball is dropped vertically from a height d above the ground . It hits the ground and bounces up vertically to a height $(d)/(2). Neg \leq ct \in g \subset sequentmotion$ and $airresis\tan ce, itsvelocity$ v$varieswiththeheight$h` above the ground as

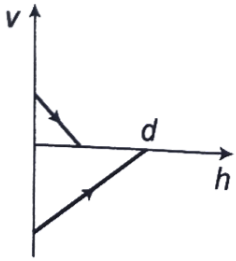
A.



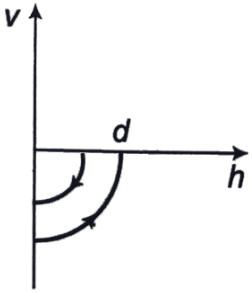
B.



C.



D.



Answer: A

Watch Video Solution

128. A particle is moving such that its position coordinates (x, y) are $(2m, 3m)$ at time $t = 0$, $(6m, 7m)$ at time $t = 2s$, and $(13m, 14m)$ at time $t = 5s$.

Average velocity vector $\left(\overrightarrow{V}_{av}\right)$ from $t = 0$ to $t = 5s$ is

A. $\frac{7}{3}\left(\hat{i} + \hat{j}\right)$

B. $2\left(\hat{i} + \hat{j}\right)$

C. $\frac{11}{5}\left(\hat{i} + \hat{}\right)j$

D. $\frac{1}{5}\left(13\hat{i} + 14\hat{j}\right)$

Answer: C

Watch Video Solution