PHYSICS

BOOKS - MBD

MOTION IN A STRAIGHT LINE

Example

1. State in each case, whether the motion is one, two or three dimensional. An ant crawling on globe

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2. State in each case, whether the motion is one, two or three dimensional. A piece of paper flying in the sky.

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3. State in each case, whether the motion is one, two or three dimensional. A speeding bus on a straight highway Moon revolving around the earth.

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4. Is it possible that displacement is zero, but not the distance? Give example.

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5. Can earth be regarded as a point object when it is describing its yearly journey around the sun?

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6. Can a body have a constant velocity but varying speed?

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7. Can a body have a constant speed but a varying velocity?

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8. What will be the nature of x - t graph for a uniform motion?

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9. Can x - t graph be a striaght line parallel to position axis?

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10. Define kinematics.

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11. Can the speed of a body be negative?

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12. What can you say about the motion of object whose distance - time graph is a straight line parallel to time axis ?

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13. What does the slope of position-time graph represents?

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14. Under what condition is the average velocity equal to instantaneous velocity?

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15. What is the numerical ratio of velocity to speed of an object?

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16. Show that rest and motion are relative terms.

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17. What do you understand by positive and negative time?

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18. What does slope of (v-t) graph represent?

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19. A ball is thrown straight up. What is its velocity ad acceleration at the highest point?

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20. Why does time occur twice in a unit of acceleration?

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21. Can a body have zero velocity and still be accelerated?

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22. What is the acceleration of a particle moving with a uniform velocity?

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23. What is the nature of acceleration-time graph when the body moves with constant acceleration ?

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24. If the instantaneous velocity of a particle is zero will its instantaneous acceleration be necessarily zero?

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25. Can the velocity of an object be in a direction other than the direction of acceleration?

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26. Two balls of different masses (one lighter and other heavier) are thrown vertically upward with same initial speed. Which one will rise to

the greater height)?

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27. Which of the two velcotiy and acceleration, gives the direction of motion of the body? Explain.

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28. In which of the following examples of motion, can the body be considered approximately a point object:

A. a railway carriage moving without jerks between two stations

B. a monkey sitting on top of a man cycling smoothly on a circular traqck

C. a spinning cricket bal that turn sharply on hitting the ground.

D. a tumbling beaker that has slipped off the edge of a table?

Answer:

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29. A woman starts from her home at 9.00 am, walks with a speed of $5kmh^{-1}$ on a straight road up to her office 2.5 km away, stays at the office up to 5.00 pm, and returns home by an auto with a speed of $25kmh^{-1}$.Choose suitable scales and plot the x-t graph of her motion.

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30. A drunkard walking in a narrow lane takes 5 steps forward and 3 steps backward, followed again by 5 steps forward and 3 steps backward, and so on. Each step is 1 in long and requires 1 s. Plot the x-t graph of his motion. Determine graphically and otherwise how long the drunkard takes to fall in a pit 13 m away from the start.

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31. A jet airplane travelling at the speed of $500kmh^{-1}$' ejects its products of combustion at the speed of $1500kmh^{-1}$' relative to the jet plane. What is the speed of the latter with respect to an observer on the ground ?

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32. A car moving along a straight highway with speed of `126 km h^-1' is brought to a stop within a distance of 200 m. What is the retardation of the car (assumed uniform), and how long does it take for the car to stop ?

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33. Two trains A and B of length 400 m each are moving on two parallel tracks with a uniform speed of $72kmh^{-1}$ in the same direction, with A ahead of B. The driver of B decides to overtake A and accelerates by $1ms^{-2}$. If after 50 s, the guard of B just brushes past the driver of A, what was the original distance between them ?

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34. On a two-lane road, car A is travelling with a speed of $36 kmh^{-1}$. Two cars B and C approach car A in opposite directions with a speed of $54 kmh^{-1}$ each. At a certain instant, when the distance AB is equal to AC, both being 1 km, B decides to overtake A before C does. What minimum acceleration of car B is required to avoid an accident ?

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35. Two towns A and B are connected by a regular bus service with a bus leaving in either direction every T minutes. A man cycling with a speed of $20 kmh^{-1}$ in the direction A to B notices that a bus goes past him every 18 min in the direction of his motion, and every 6 min in the opposite direction. What is the period Tof the bus service and with what speed (assumed constant) do the buses ply on the road?

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36. A player throws a ball upwards with an initial speed of $29.4ms^{-1}$:- What is the direction of acceleration during the upward motion of the ball ?

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37. A player throws a ball upwards with an initial speed of $29.4ms^{-1}$:- What are the velocity and acceleration of the ball at the highest point of its motion ?

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38. A player throws a ball upwards with an initial speed of $29.4ms^{-1}$:- What are the velocity and acceleration of the ball at the highest point of its motion ?

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39. A boy standing on a stationary lift (open from above) throws a ball upwards with the maximum initial speed he can, equal to $49ms^{-1}$. How much time does the ball take to return to his hands? If the lift starts moving up with a uniform speed of $5ms^{-1}$ and the boy again throws the ball up with the maximum speed he can, how long does the ball take to return to his hands ?

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40. Read each statement below carefully and state with reasons and examples, if it is true or false :- A particle In one-dimensional motion:- with zero speed at an instant may have non-zero acceleration at that instant

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41. Read each statement below carefully and state with reasons and examples, if it is true or false :- A particle In one-dimensional motion:-

with zero speed may have non-zero velocity,

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42. Read each statement below carefully and state with reasons and examples, if it is true or false :- A particle In one-dimensional motion:- with constant speed must have zero acceleration,

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43. Read each statement below carefully and state with reasons and examples, if ti is true or false: A particle in one dimensional motion. with positive value of acceleration must be speeding up.

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44. A ball is dropped from a height of 90 m on a floor. At each collision with the floor, the ball loses one tenth of its speed. Plot the speed-time

graph of its motion between t = 0 to 12 s.

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45. Explain clearly, with examples, the distinction between :- magnitude of displacement (sometimes called distance) over an interval of time, and the total length of path covered by a particle over the same interval,

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46. Explain clearly, with examples, the distinction between :- magnitude of average velocity over an interval of time, and the average speed over the same interval. [Average speed of a particle over an interval of time is defined as the total path length divided by the time interval]. Show in both (a) and (b) that the second quantity is either greater than or equal to the first. When is the equality sign true ? [For simplicity, consider one-dimensional motion only].

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47. A man walks on a straight road from his home to a market 2.5 km away with a speed of $5kmh^{-1}$. Finding the market closed, he instantly turns and walks back home with a speed of $7.5kmh^{-1}$. What is the :- magnitude of average velocity, and

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48. A man walks on a straight road from his home to a market 2.5 km away with a speed of $5kmh^{-1}$. Finding the market closed, he instantly turns and walks back home with a speed of $7.5kmh^{-1}$. What is the :- magnitude of average velocity, and

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49. In Exercises 3.13 and 3.14, we have carefully distinguished between average speed and magnitude of average velocity. No such distinction is necessary when we consider instantaneous speed and magnitude of

velocity. The instantaneous speed is always equal to the magnitude of instantaneous velocity. Why ?

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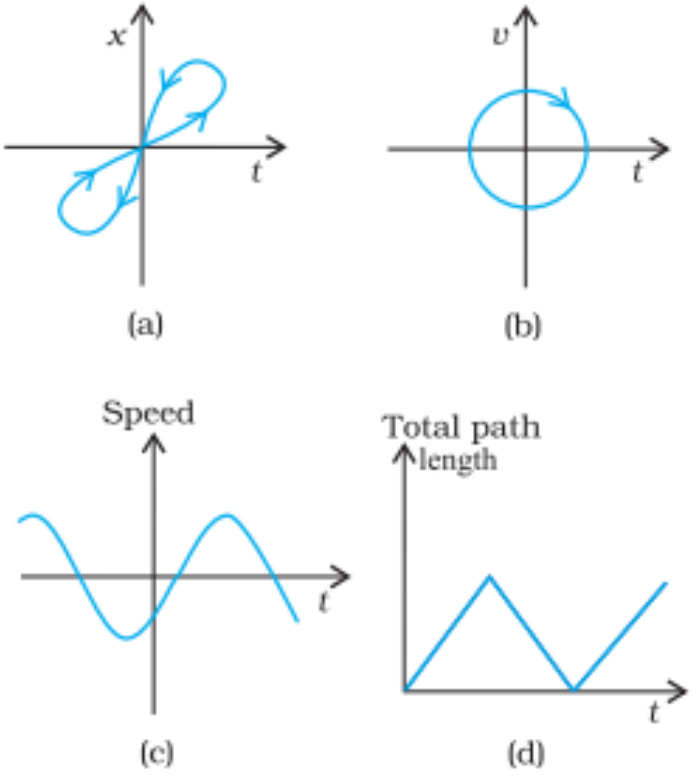
50. Look at the graphs (Fig. 3.20) carefully and state, with reasons, which of these cannot possibly represent one-dimensional motion of a particle.



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51. Figure 3.21 shows the x-t plot of one-dimensional 4 motion of a particle. Is it correct to say from the graph that the particle moves in a straight line for t< 0 and on a parabolic path for t >0 ? If not, suggest a suitable physical context for this graph.

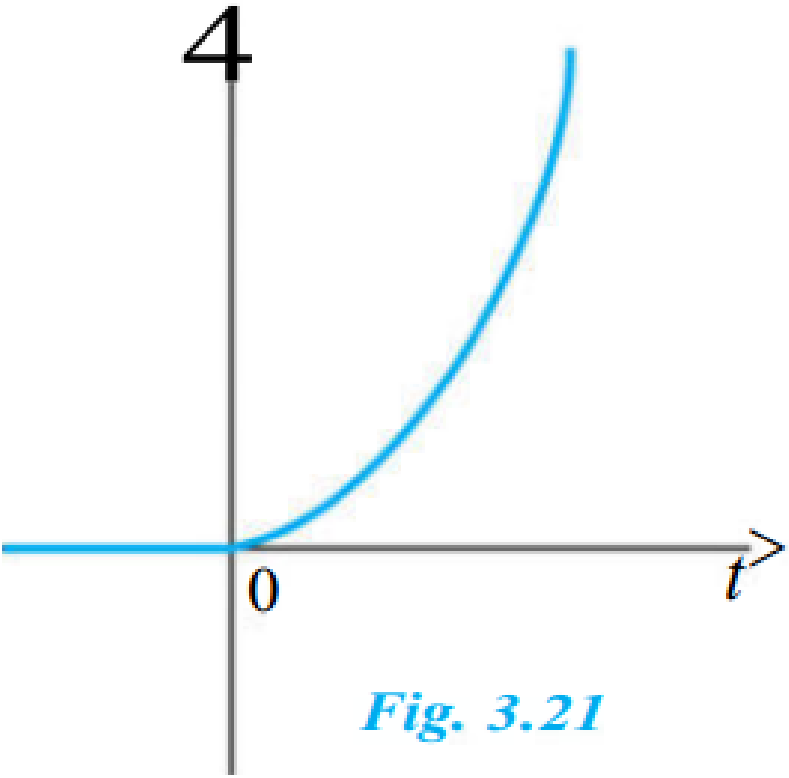

Fig. 3.21

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52. A police car running on a highway with a speed of $30km/h$ fires on the vehicle of thiefs running in the same direction at a speed of$192km/h$. If the velocity of the bullet is $150m/s$then with what velocity the bullet will hit the thiefs ?

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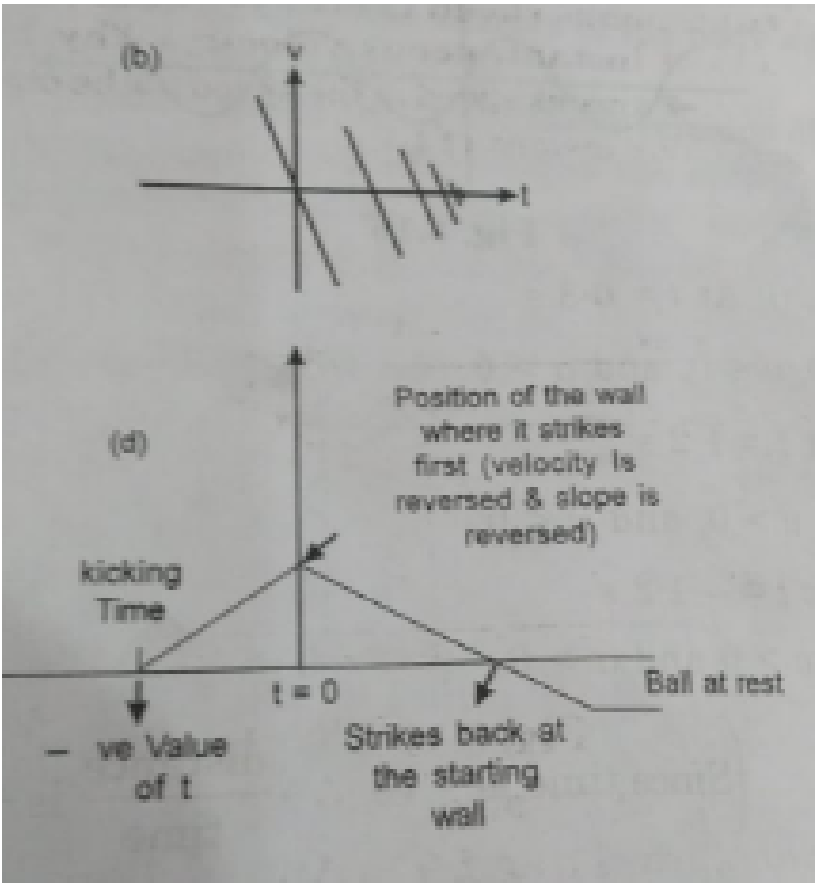
53. Suggest a suitable physical situation for each of the following graphs:



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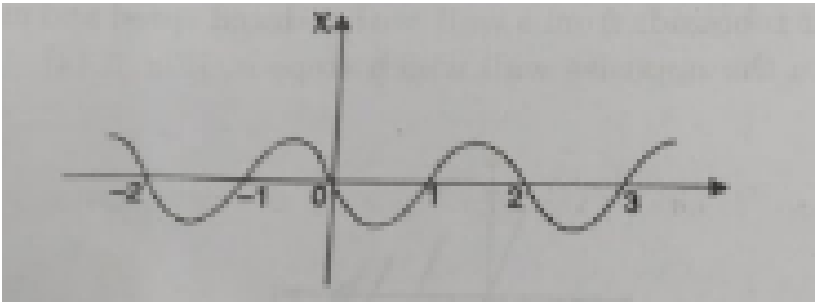
54. In the figure gives the (x-t) plot of a particle executign one-dimensional simple harmonic motion. Give the signs of position, velocity

and acceleration variables of the particle at t = 0.3 s, 1.2 s, - 1.2 s.



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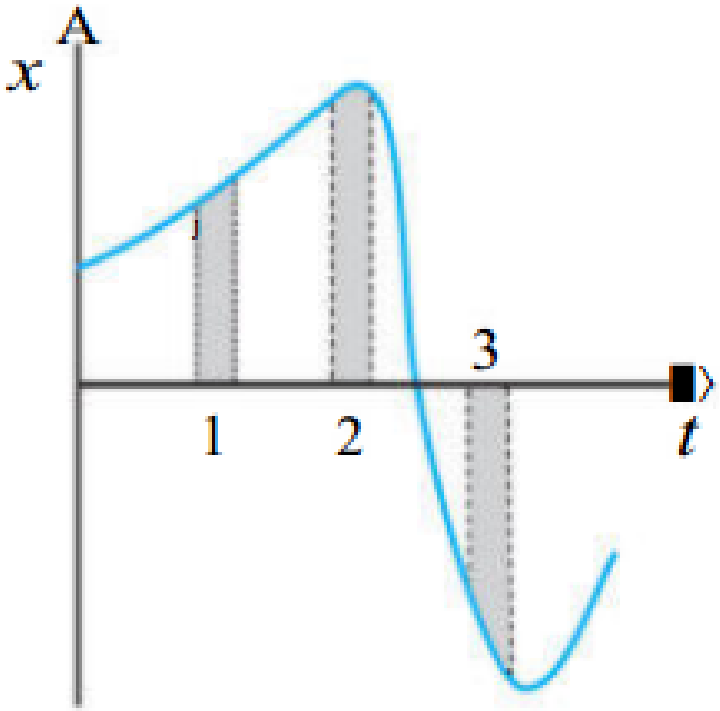
55. Figure 3.24 gives the x-t plot of a particle in one-dimensional motion. Three different equal intervals of time are shown. In which interval is the average speed greatest, and in which is it the least ? Give the sign of

average velocity for each interval.



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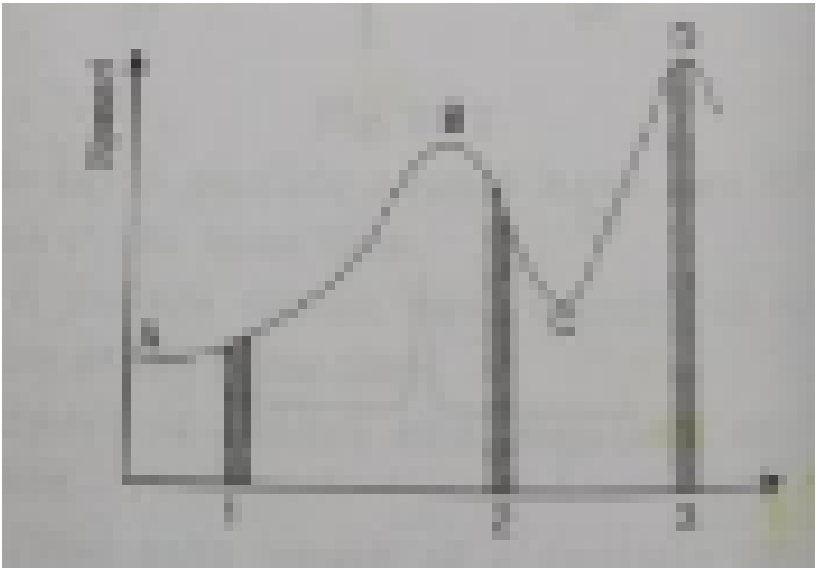
56. In the figure gives a speed-time graph of a particle in motion along a constant direction. Three equal intervals of time are shwon. In which interval is the average acceleration greatest in magnitude ? In which interval is the average speed greatest ? Choosing the positive direction as the constant direction of motion, give the signs of v and a in the three

intervals. What are the acceleration at the points A,B,C and D?



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57. A three-wheeler starts from rest, accelerates uniformly with $1ms^{-2}$ on a straight road for 10 s, and then moves with uniform velocity. Plot the distance covered by the vehicle during the 11th second (n = 1,2,3....) versus 11. What do you expect this plot to be during accelerated motion : a straight line or a parabola ?

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58. A boy standing on a stationary lift (open from above) throws a ball upwards with the maximum initial speed he can, equal to $49ms^{-1}$. How much time does the ball take to return to his hands? If the lift starts moving up with a uniform speed of $5ms^{-1}$ and the boy again throws the ball up with the maximum speed he can, how long does the ball take to return to his hands ?

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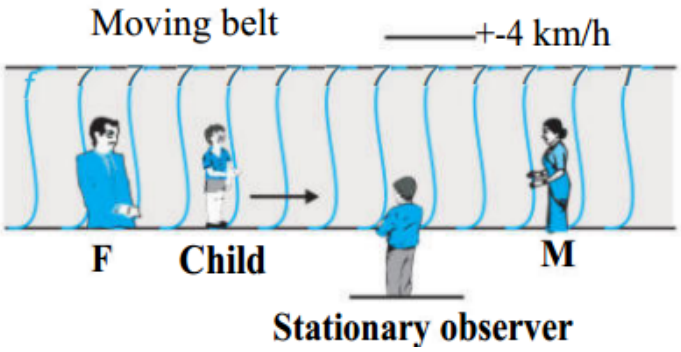
59. On a long horizontally moving belt (Fig. 3.26), a child runs to and fro with a speed $9kmh^{-1}$ (with respect to the belt) between his father and mother located 50 m apart on the moving belt. The belt moves with a speed of $4kmh^{-1}$. For an observer on a stationary platform outside, what is the:- speed of the child running in the direction of motion of the

belt ?.



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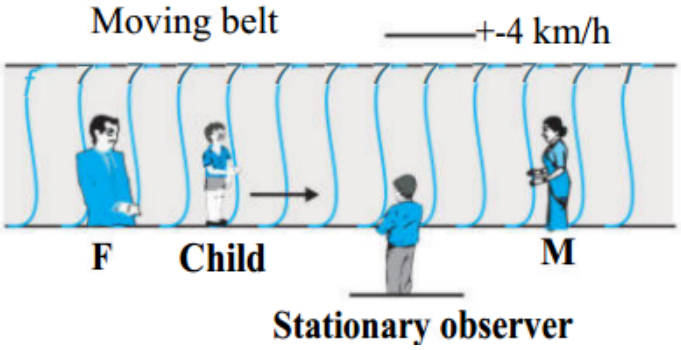
60. On a long horizontally moving belt (Fig. 3.26), a child runs to and fro with a speed $9kmh^{-1}$ (with respect to the belt) between his father and mother located 50 m apart on the moving belt. The belt moves with a speed of $4kmh^{-1}$. For an observer on a stationary platform outside, what is the:- speed of the child running opposite to the direction of

motion of the belt ?



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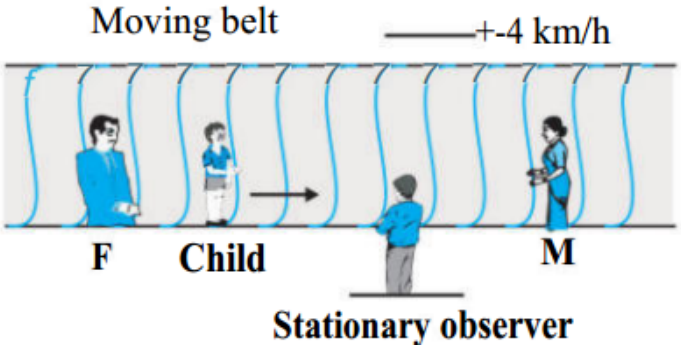
61. On a long horizontally moving belt (Fig. 3.26), a child runs to and fro with a speed $9kmh^{-1}$ (with respect to the belt) between his father and mother located 50 m apart on the moving belt. The belt moves with a speed of $4kmh^{-1}$. For an observer on a stationary platform outside, what is the:- time taken by the child in (a) and (b) ? Which of the answers

alter if motion is viewed by one of the parents ?



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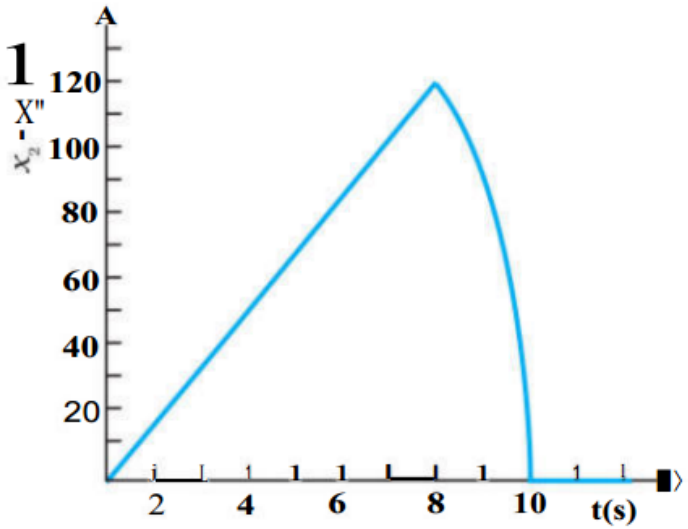
62. Two stones are thrown up simultaneously from the edge of a cliff 200 m high with initial speeds of $15ms^{-1}$ and 30 m s^-1

$. Ver \quad \text{if} \quad yt\hat{t}hegraphshown \in Fig.\ 3.27c \ \text{or} \ rectlyrepresentsthetimevar \leq ctairresis\tan ce \ \text{and} \ as\sum et\hat{t}hes \rightarrow \neq sdo\neg reboundafterhi \in gth$

10 m s^-2`. Give the equations for the linear and curved parts of the plot.



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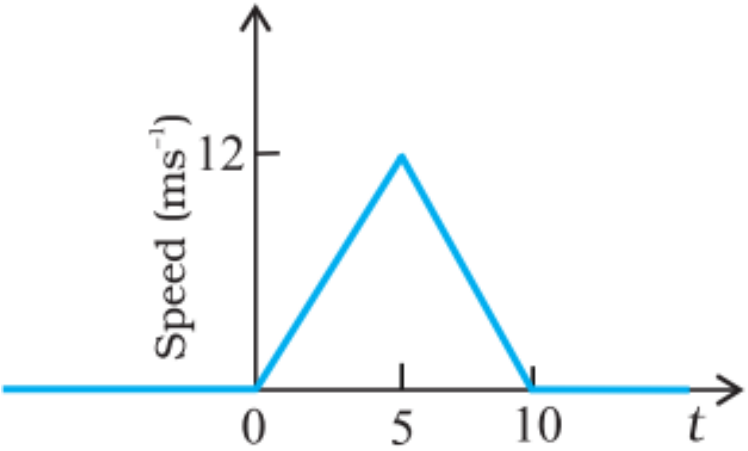
63. The speed-time graph of a particle moving along a fixed direction is shown in Fig. 3.28. Obtain the distance traversed by the particle between:-

t = 0 s to 10 s,



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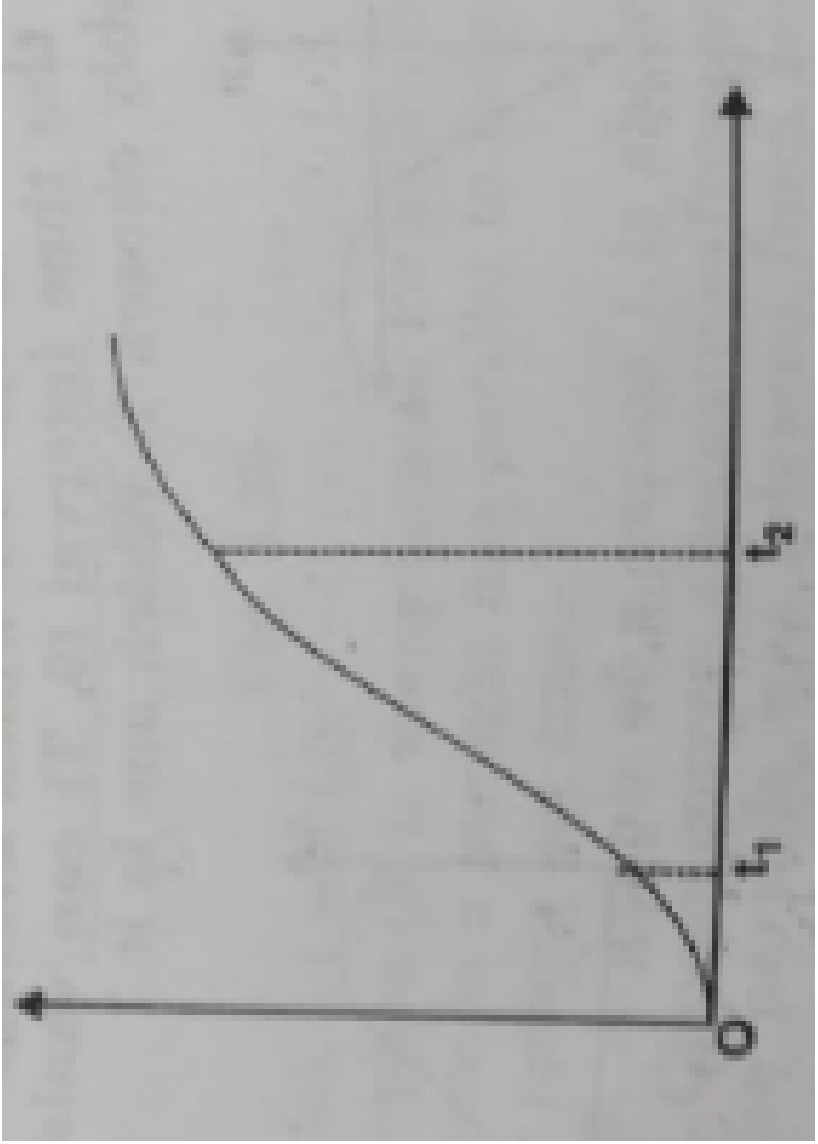
64. The velocity-time graph of particle in one dimensional motion is shown in the fig.



Which if the following formulae are correct for describing the motion of the pawrticle over the time interval $t_1 \rightarrow t_2$

$v(t_2) = v(t_1) + a(t_2 - t_2)$, $v_{avera\geq} = \dfrac{[x(t_2) - x(t_1)]}{(t_2 - t_1)}$, $x(t_2) - x(t_1)$= area under the v - t curve. bounded by the t-axis and the dotted line shown.

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65. A lift is coming form 8th floor and is just about to reach 4th floor. Taking ground floor as origin and positive direction upwards for all quantities, which one of the folowing is correct?

A. $x < 0, v < 0, a > 0$

B. $x > 0, v < 0, a > 0$

C. $x > 0, v < 0, a > 0$

D. $x > 0, v > 0, a < 0$

Answer:

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66. In one dimensional motion, instaneous speed v satisfies $0 \leq v < v_0$

A. The displacement in time T must always take non-negative values.

B. The displacement x in time T satisfies $-v_0T < x < v_0T$.

C. The aceleration is always a non-negative number.

D. The motion has no turning points.

Answer:

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67. A vehicle travels half the distance L with speed V_1 and the other half with dspeed v_2, then its average speed is

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

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

C. $\frac{2v_1v_2}{v_1 + v_2}$

D. $\frac{L(v_1v_2)}{v_1v_2}$

Answer:

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68. The displacement of a particle is given by $x = (t-2)^2$ where x is in metres and t in seconds. The distance covered by the particle in first 4 seconds is

A. 4 m

B. 8 m

C. 12 m

D. 16 m

Answer:

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69. At a metro station, a girl walks up a stationary esclator 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. $(t_1 + t_2 + 2)/2$

B. $t_1 t_2/(t_2 - t_1)$

C. $t_1 t_2/(t_2 + t_1)$

D. $t_1 - t_2$

Answer:

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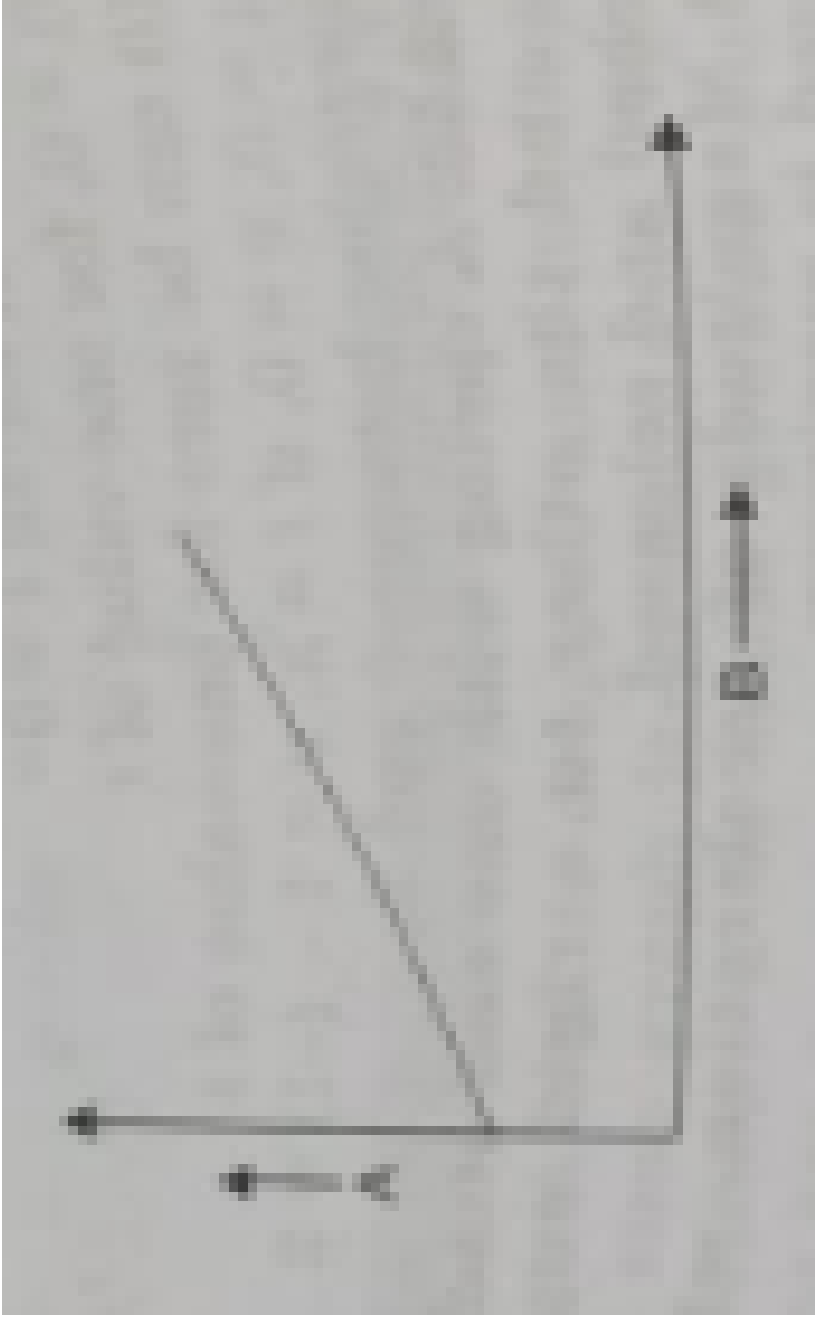
70. The variation of quantity A with quantity B, plotted in fig. describes the motion of a particle in a straight line.



A. Quantity B may represent time

B. Quantity A is velocity if motion is uniform

C. Quantity A is displacement is motion is uniform

D. Quantity A is velocity if motion is uniformly accelerated.

Answer:

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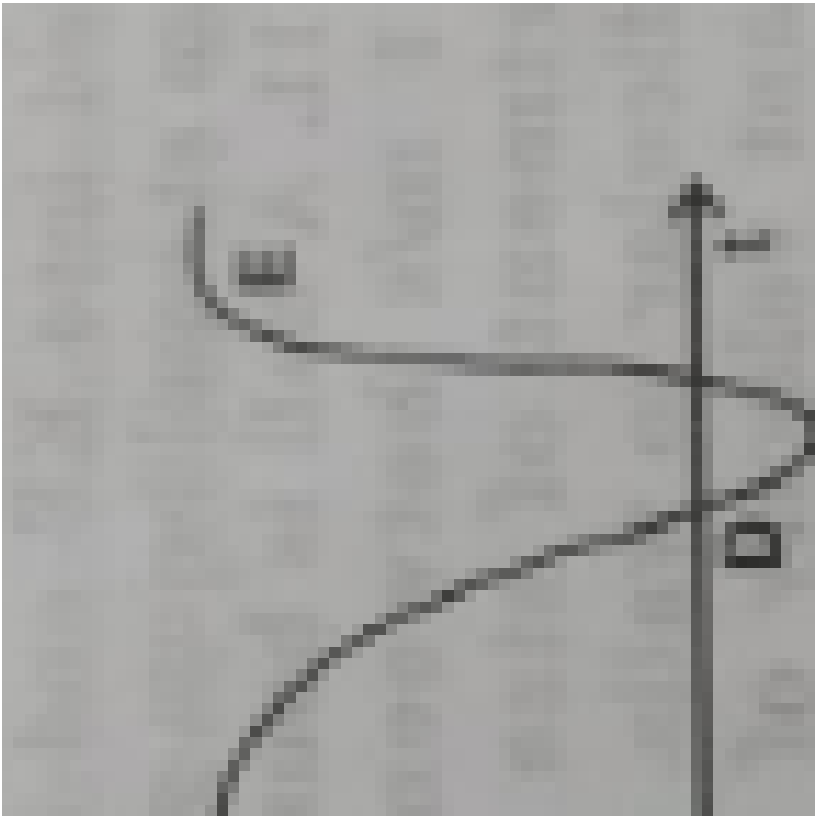
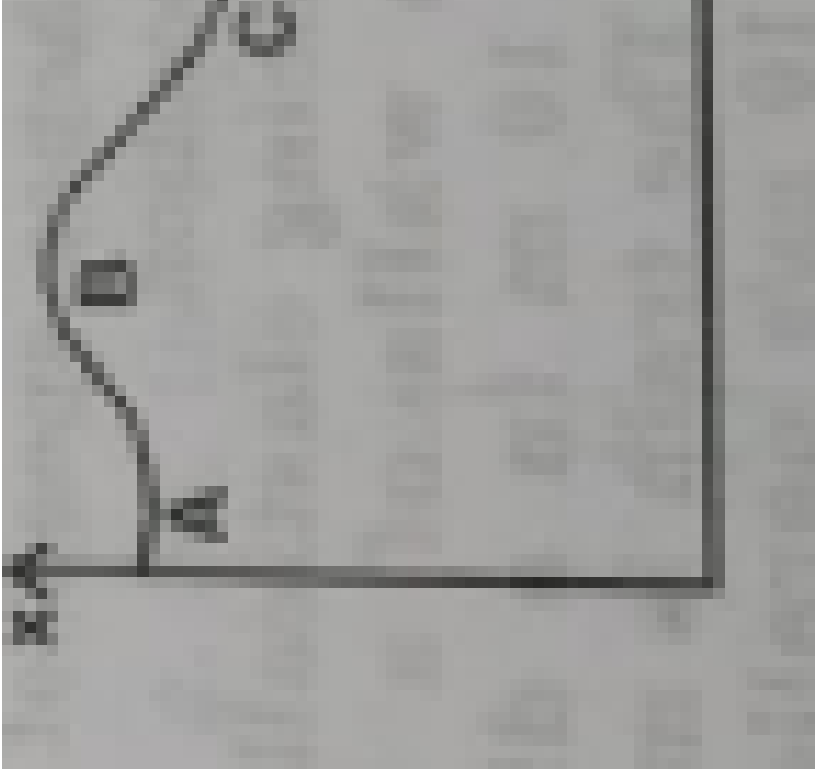
71. A graph of x versus t is shown in fig. choose corredt alternatives from below.





A. The particle was released from rest at t = 0

B. At B, the acceleration a gt 0

C. At C, the fvelocity and the acceleration vanish , Average velocity for the motion between A and D is positive

D. The speed at D exceeds that at E.

Answer:

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72. A particle executes the motion described by $x(t) = x_0\left(1 - e^{-\gamma t}, t \leq 0, x_0 > 0\right.$. Where does the particle start and with what velocity?

A. $x(t) > 0$ for all $t > 0$

B. $v(t) > 0$ for all $t > 0$

C. $a(t) > 0$ for all $t > 0$

D. v (t) lies between 0 and 2.

Answer:

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73. A spring with one end attached to a mass and the other to a rigid suppord is stretched and released.

A. Magnitude of acceleration, when just released is maximum.

B. Magnitude of acceleration, when at equilibrium position, is maximum.

C. Speed is maximum when mass is at equilibrium position.

D. Magnitude of displacement is always maximum whenever speed is minimum.

Answer:

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74. A ball is bouncing elastically with a speed 1 m/s between walls of a railways compartment of size 10 m in a direction perpendicular to wals. The train is moving at a constant velocity of 10 m/s parallel to the direction of motion of the ball . As seen from the ground

A. the drection of motion of the ball changes every 10 seconds

B. speed of ball changes every 10 seconds

C. average speed of ball is the same as from the train.

D.

Answer:

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75. Refer to the graph in fig match the following graph characteristic.

A. has v gt 0 a lt 0 throughout

B. has x gt 0 throughout and has a point with v = 0 a point with a = 0

C. has a point with zero displacement for t gt 0

D. has v lt 0 and a gt 0

Answer:

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76. A uniformly moving cricket ball is turned back by hitting it with a bat for a very short time interval. Show the variation of its acceleration with time. (Take acceleration in the bakward direction as positive).

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77. Give examples of a one-dimensional motion where the particle moving along positive x-direction comes to rest periodically and moves forward.

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78. Give examples of a one-dimensional motion where the particle moving along positive x-direction comes to rest periodically and moves backward.

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79. Give example of a motion wehre x > 0. v < 0, a > 0 at a particular instant.

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80. An object falling through a fluid is observed to have acceleration given by a = g - bv where g = gravitational acceleration and b is constant. After a long time of release, it is observed to fall with constant speed.What must be the value of constant speed?

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81. A particle executes the motion described by $x(t) = x_0\left(1 - e^{-\gamma t}, t \leq 0, x_0 > 0\right.$. Where does the particle start and with what velocity?

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82. A particle executes the motion described by $x(t) = x_0\left(1 - e^{-\gamma t}, t \leq 0, x_0 > 0\right.$. Find maximum and minimum vlaues of x(t), v(t), a (t). Show that x (t) and a (t) increase with time and v (t) decreases with time.

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83. A bird is tossing (flying to and fro 0 between two cars moving towards each other on a straight road. On car has a speed of 18 km /h while the other has the speed of 27 km /h. The bird starts moving from first caer towards the other and is moving with the speed of 36 km /h and when the two cars were separated by 36 km. What is the total distance comered by the bird ? What is the total displacement of the bird ?

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84. A man runs across the roof-top of a tall building and jumps horizontally with the hope of landing on the roof of the next building

which is of a lower height than the first. If his speed is 9 m/s, the distance between the two buildings is 10 m and the height difference is 9 m, will he be able to land on the next building?

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85. It is a common observation that rain clouds can be at about a kilometer altitude above the ground.

If a rain drop falls from such a height freely under gravity, what will be its speed? Also calculate in km/h. $\left(G = 10m / s^2\right)$.

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86. It is a common observation that rain clouds can be at about a kilometer altitude above the ground.

A typical rain drop is about 4 mm diameter. Momentum is mass $\times$ speed in magnitude. Estimate its momentum when it hits the ground.

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87. It is a common observation that rain clouds can be at about a kilometer altitude above the ground.

If the diameter of the rain drop is 4mm then Estimate the time required to flatten the drop.

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88. It is a common observation that rain clouds can be at about a kilometer altitude above the ground.

Rate of change of momentum is force. Estimate how much force such a drop would exert on you.

($g = 10\frac{m}{s^2}$ and diameter of drop = 4mm)

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89. It is a common observation that rain clouds can be at about a kilometer altitude above the ground.

Estimate the order of magnitude force on umbrella. Typical lateral separation between two rain drops is 5 cm.

($g = 10\frac{m}{s^2}$ and diameter of drop = 4mm)

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90. A motor car moving at a speed of 72 km /h can not come to a stop in less than 3.0 s while for a truch this time interval is 5.0s On a highway the car is behind the truck both moving at 72 km /h The truck geives a signal that it is going to stop at emergency. At what distance the car should be from the truck so that it does bot bump onto (collide with) the truck. Human responde time id 0.5 s. (comment : This is to illustrate why vehicles carr the message on the rear side. "Keep safe Distance").

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91. A monkey climbs up a slippery pole for 3 seconds and susequently slips for 3 seconds. Its velocity at time t is given by v (t) = 2t (3-t) , 0 < t < 3 and v (t) = - t-3) (6-t) for 3 < t < 6 s I m/s. It repeats this cycle till it reaches

the height of 20 m.

At what time is its velocity maximum?

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At what time is its average velocity maximum?

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93. A monkey climbs up a slippery pole for 3 seconds and susequently slips for 3 seconds. Its velocity at time t is given by v (t) = 2t (3-t) , 0 < t < 3 and v (t) = - t-3) (6-t) for 3 < t < 6 s I m/s. It repeats this cycle till it reaches the height of 20 m.

At what time is its average velocity maximum?

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94. A monkey climbs up a slippery pole for 3 seconds and susequently slips for 3 seconds. Its velocity at time t is given by v (t) = 2t (3-t) , 0 < t < 3 and v (t) = - t-3) (6-t) for 3 < t < 6 s I m/s. It repeats this cycle till it reaches the height of 20 m.

How many cycles (counting fractions) are required to reach the top?

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95. A man is standing on top of a building 100 m high. He throws two balls vertically, one at t = 0 and other after a time interval (less than 2 s). The later ball is thrown at a velocity of half the first. The vertical gap between first and second ball is 15 m at t = 2 s. The gap is found to remain constant. The velocities with which the balls were thrown.

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96. Choose the correct statement from the followoing:

A. the magnitude of the average velocity in an interval is equal to its average speed in that interval.

B. The magntiude of velocity of a particle is equal to its speed.

C. It is possible to have a situation in which the speed of the particle is never zero but the average iin an interval is zero.

D. It is possible to have a situation in which the speed of particle is zero but the average speed is not zero.

Answer:

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97. The study of motion, without consideration of its cause is stuidied in

A. statistics

B. kinematics

C. mechanics

D. modern physics.

Answer:

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

A. unity

B. unity or less

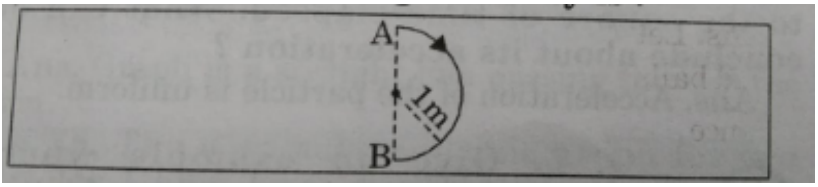
C. unity or more

D. less than unity

Answer:

Watch Video Solution

99. In 1.0 s, a particle goes form point A to point B, moving in a semicircle of radius 1.0 m. The magntiude of average ve3lcity is :



A. $3.14ms^{-1}$

B. $2.0ms^{-1}$

C. $1.0ms^{-1}$

D. zero

Answer:

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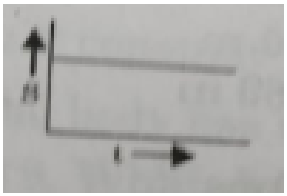
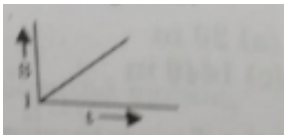
100. Which one of the following graphs represents motoin with unifrom speed?

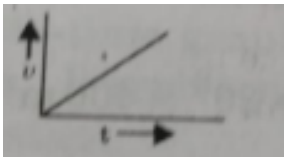
A.



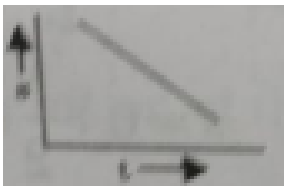
B.



C.



D.



Answer:

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101. The displacement of a body is zero. The distance covered

A. is zero

B. is not zero

C. may or may not be zero

D. depends upon the acceleration

Answer:

Watch Video Solution

102. Does the speedometer of a car measure its average speed ?

A. average speed

B. instantaneous velocity

C. acceleration

D. instantaneous speed.

Answer:

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103. A car travelling on a straight track moves with unifrom velocity of v_1 for some time and uniform velocity V_2 for the next equal time.The average velocity v is given by

A. $\left(\sqrt{v_1 v_2}\right)$

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

C. $\left(\left(\frac{1}{v_1}\right) + \left(\frac{1}{v_2}\right)\right)^{-1}$

D. $2\left(\left(\frac{1}{v_1}\right) + \left(\frac{1}{V_2}\right)\right)^{-1}$

Answer:

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104. A body is imparted motion from rest of move in straight line. If it is then obstructed, by an opposite force, then:

A. the body may necessarily change direction

B. the body is sure to slow down

C. thebody will necessarily continue to move in the same direction at the same speed

D. None of the above.

Answer:

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105. A car travels due east on a level road for 3 km. It then turns due north at an intersection and travels 4 km before stopping. The magnitude of the resultant displacement of car is

A. 5 km

B. 7 km

C. 1 km

D. -1 km

Answer:

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106. If a car at rest accelerates uniformly to a speed of $144 kmh^{-1}$ in 20 s, it cross a distance of

A. 20 m

B. 400 m

C. 1440 m

D. 2980 m

Answer:

Watch Video Solution

107. A particle moves alopng x-axis in such a way that its coordinates x varies with time t according to the equation. $x = \left(2 - 5t + 6t^2\right)$ m. The initial velocity of the pawrticle is

A. $-5ms^{-1}$

B. $6ms^{-1}$

C. $-3ms^{-1}$

D. $3ms^{-1}$

Answer:

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108. If a train travelling at $72mkh^{-1}$ is to be brouhgt to rest in a distance 200 m, then its retardation should be

A. $20ms^{-2}$

B. $10ms^{-2}$

C. $2ms^{-2}$

D. $1ms^{-2}$

Answer:

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109. Find the total displacement of a body in 8 s starting from rest with an acceleration of $20cms^{-2}$

A. 64 cm

B. 64 cm

C. 640 cm

D. 0.064 m

Answer:

Watch Video Solution

110. A body is dropped form the top of the tower and reaches the ground in 3s. Then the height of the tower is

A. 44.8 m

B. 44.1 m

C. 40.2 m

D. 15.6 m

Answer:

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111. Fill in the blanks:

when a body starts from rest and falls freely, its initial velocity is _____.

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112. Fill in the blanks:

If the x-t graph is a straight line parallel to x-axis , then the body is _____.

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113. Fill in the blanks:

If the x-t graph is a straight line inclined to time axis, the graph represent constant ____.

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114. Fill in the blanks:

The __ and ___ of a body need not be in same direction.

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115. Fill in the blanks:

Speed is always a positive quantity however it may _____ or _____ with time.

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116. Fill in the blanks:

Distance-time graph can not be _____ time axis.

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117. Fill in the blanks:

x - t graph of uniformly accelerated motion is a _____.

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118. Fill in the blanks:

Relative velocity _____.

Watch Video Solution

119. Fill in the blanks:

Time rate of change of ____ with time is called velocity.

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120. Fill in the blanks:

The _____ of displacement is equal to the actual distance moved.

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121. Define kinematics.

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122. What is particle dynamics?

Watch Video Solution

123. Define relative velocity?

Watch Video Solution

124. A particle starts from rest and covers a distance on a straight path in direct proportion to the square of time elapsed. What can one conclude about its acceleration?

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125. Give an example where displacement of a particle is equal to the distance covered by it.

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126. What is the nature of displacement-time graph of a particle moving with constant acceleration ?

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127. The distance travelled by a body varies directly proportional to the square of time. What type of motion this body has?

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128. What does the tangent at a point to the velocity-time graph represent?

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129. What does the tangent at a point to the displacement-time graph represent?

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130. Is it possible, that the direction of acceleration and velocity be oppsoite to each other, in case, a body is moving?

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131. Is it possible, that the direction of acceleration and velocity be oppsoite to each other, in case, a body is moving?

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132. What do you mean by one dimensional motion?

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133. What causes variation in velocity?

Watch Video Solution

134. Is it possible to accelerate a body if its speed is constant?

Watch Video Solution

135. If both the magnitude and direction of acceleration of a body is constant, does it mean that the path of the body be necessarily be a straight line?

Watch Video Solution

136. Does the speedometer of a car measure its average speed ?

Watch Video Solution

137. What does the tangent at a point to the velocity-time graph represent?

Watch Video Solution

138. What does the tangent at a point to the velocity-time graph represent?

Watch Video Solution

139. A ball is thrown straight up. What is its velocity ad acceleration at the highest point?

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140. Which of the two velcotiy and acceleration, gives the direction of motion of the body? Explain.

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141. A body is moving with uniform velocity of $10ms^{-1}$ for last 10 s, what is its acceleration?

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142. Show that rest and motion are relative terms.

Watch Video Solution

143. A particle is a ___ of negligible dimensions.

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144. The displacement has _____ of length.

Watch Video Solution

145. Speed is a _____ quantity.

Watch Video Solution

146. For an object to be in uniform motion no ____ is required.

Watch Video Solution

147. When an object moves with varible velocity, either its ___ or _____ of motion change with time.

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148. The position-time graph for non-uniform motion is _ a straight line.

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149. What do you mean by mechanics

Watch Video Solution

150. What do you mean by statics

Watch Video Solution

151. What do you mean by kinematics

Watch Video Solution

152. What do you mean by Dynamics.

Watch Video Solution

153. Define motion. Give examples.

Watch Video Solution

154. Explain how far is it correct to consider an object as a "point" object.

Watch Video Solution

155. Represent graphically the motion of particle which is stationary.

Watch Video Solution

156. Show that rest and motion are relative terms.

Watch Video Solution

157. Give some points of differences between distance and displacement.

Watch Video Solution

158. Distinguish between speed and velocity.

Watch Video Solution

159. What does the slope of position-time graph represents?

Watch Video Solution

160. Distinguish between speed and velocity.

Watch Video Solution

161. If the distance covered by a moving object varies directly on time, what conclusions could you draw about the motion and the forces.

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162. If the distance travelled by a moving object varies directly as the cube of time, how does the acceleration of the body depend on time?

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163. A particle moving along a straight line reverses its direction of motion once. What can we say about the nature of its acceleration?

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164. A particle moving along a straight line path reverses its direction of motion twice. What can we say about the nature of its acceleration?

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165. Why the direction of motion of a particle is given by its velocity and not by acceleration?

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166. What do you mean by positive and negative acceleration?

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167. Does speeding up and slowing down refer to acceleration and decelerating respectively?

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168. Derive the expression for distance traveled by an object in nth second of its motion.

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169. A bird is tossing (flying to and fro 0 between two cars moving towards each other on a straight road. On car has a speed of 18 km /h while the other has the speed of 27 km /h. The bird starts moving from first caer towards the other and is moving with the speed of 36 km /h and when the two cars were separated by 36 km. What is the total distance comered by the bird ? What is the total displacement of the bird ?

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170. What are the different theorems of differentiation.

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171. Give the differential ocoefficient of trigonometric functions.

Watch Video Solution

172. Differentiate following w.r.t.x.

cos 2x

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173. Differentiate following w.r.t.x.

sin 2x cos 3 x.

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174. Differentiate following w.r.t.x.

x^2

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175. Differentiate following w.r.t.x.

$5x^2$

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176. What do you mean by integration ?

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177. Evluate $\int (1+x^2)\,dx$

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178. Integrate of following w.r.t.x.

$\int x^{\frac{1}{2}} dx$

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179. Integrate of following w.r.t.x.

$\int \left(x + \frac{1}{x}\right) dx$

Watch Video Solution

180. Integrate of following w.r.t.x.

$$\int\left(\sqrt{x}+\frac{1}{\sqrt{x}}dx\right.$$

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181. Integrate of following w.r.t.x.

$$\int e^{2x+3}dx$$

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182. Integrate of following w.r.t.x.

$$\int 2x^6\left(\frac{1}{2}\right)dx.$$

Watch Video Solution

183. Integrate of following w.r.t.x.

$ax^2 + bx + c$

Watch Video Solution

184. Integrate of following w.r.t.x.

$6x^2 + 2x^2 - \frac{1}{x} + 2x^{\frac{2}{3}} + 7$

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185. Integrate of following w.r.t.x.

$\int 3\cos x dx$

Watch Video Solution

186. Integrate of following w.r.t.x.

$\int \cos(x + 2) dx$

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187. Evaluate $\int \frac{1}{1-\sin x} dx$

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188. $\int \frac{\sin^2 x - \cos^2 x}{\sin^2 x \cos^2 x} dx$ is equal to :

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189. State and explan definite integral.

Watch Video Solution

190. Evaluate the following integrals:

$\int_1^5 x^2 dx$

Watch Video Solution

Watch Video Solution

191. Evaluate the following integrals:

$$\int_R^{\infty} \frac{Gm_1m_2}{x^2} dx$$

Watch Video Solution

192. Evaluate the following integrals:

$$\int_u^v mvdv$$

Watch Video Solution

193. Evaluate the following integrals:

$$\int_0^{\pi/2} \sin x dx$$

Watch Video Solution

194. Evaluate the following integrals:

$$\int_0^{\pi/2} \cos x dx$$

Watch Video Solution

195. Evaluate the following integrals:

$$\int_{-\pi/2}^{\pi/2} \cos x dx$$

Watch Video Solution

196. Evaluate the following integrals:

$$\int_0^{\pi/2} \sin^2 x dx$$

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197. Discuss the terms origin.

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198. Discuss origin, unit and direction for position measurement of an object in motion along a straight line.

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199. Define displacement of a particle in linear motion in one dimension. Does it depend upon the origin? Can actual distance travelled by object in the time interval t to t' be greater than or equal to the magnitude of the displacement?

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200. What is meant by uniform motion ? Give an example.

Watch Video Solution

201. How do you define velocity?

Watch Video Solution

202. What do you mean by +ve value of velocity or -ve value of velocity?

Watch Video Solution

203. What will be the nature of x - t graph for a uniform motion?

Watch Video Solution

204. What will be the nature of x - t graph for a uniform motion?

Watch Video Solution

205. How does velocity-time graph give a geometrical way of calculating the distance covered from time t to time t'?

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206. Derive the formula to find position at t' when the initial position at instant t is known as object is moving with uniform velocity.

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207. Define Relative Velocity?. Show that the relative velocity of an object '2' relawtive to another object '1' moving in one dimension is $(v_2 - v_1)$.

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208. What is the significance of -ve value of instantaneous current?

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209. Derive the following relations for uniformly accelerated motion.

Velocity-time relation

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210. Derive the following relations for uniformly accelerated motion.

Displacement-time relation.

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211. For uniform accelerated motion, draw by graphical method establish the following equations of motion:$v^2 = u^2 + 2aS$

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212. For uniform accelerated motion, draw by graphical method establish the following equations of motion : $v = u + at$

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213. Derive the expression for distance traveled by an object in nth second of its motion.

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214. Show that the slope of velocity-time graph for uniformly acceleratied motion is equal to the acceleration of the body.

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215. Show that the distance covered by a particle having uniform acceleration in time interval (t'-t) is the area under v - t graph for time t'

and t.

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216. Two parallel rail tracks run north-south. Train A moves north with a speed of 54 kmh^{-1} and train B moves south with a speed of $90kmh^{-1}$. What is the relative velocity of B with respect to A

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217. Two parallel rail tracks run north-south. Train A moves north with a speed of 54 kmh^{-1} and train B moves south with a speed of $90kmh^{-1}$ .relative velocity of ground with respect to B?

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218. Two parallel rail tracks run north-south. Train A moves north with a speed of 54 kmh^{-1} and train B moves south with a speed of $90kmh^{-1}$

.Velocity of a monkey running on the roof of the train A against its motion (With a velocity of $18kmh^{-1}$ with respect to the train A) as observed by a man standing on the ground?

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219. A car travels a distance from A to B at a speed of $60kmh^{-1}$ and returns to A at a speed of $30kmh^{-1}$. The average speed of the car for the whole journey is:

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220. A body is dropped from rest at a height of 150 m and simultaneously another body is dropped from rest from a point 100 m above the ground. What is their difference in height after they have fallen 2s? How does the differences in height vary with time.

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221. A hundred metre sprinter increases her speed from rest unifromly at the rate of $1ms^{-2}$ upto three-quarters of the total run and covers the last quarter with unifrom speed. How much time does she take to cover the first half, the second of the run?

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222. A ballon is ascending at the rate of $14ms^{-1}$ at a height of 98 m above ground when a packet is dropped from the balloon. After how much time and with what velocity does it reach the ground.

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223. A car A is travelling on a straight level road with a uniform speed of 60 km/h. It is followed by another car B which in moving with a speed of 70 km/h. When the distance between then is 2.5km, the car B is given a deceleration of $20km/h^2$. After how much time will B catch up with A

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224. A bus is beginning to move with aceleratino of $1ms^{-2}$. A man wo wants to board it can run at $9ms^{-1}$. Show that he3 can catch it in 8 sec., if he is 40 m behind when it starts.

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225. A body travels 200 cm in first two second and 220 cm in next four seconds. What will be the velocity at the end of the seventh second from the start?

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226. A truck starts from rest with an acceleration of $1.5ms^{-2}$ while a car 150 metre behind starts from rest with an acceleration of $2ms^{-2}$. How long will it take beforeboth the truck and car side by side, and how much distance is travelled by each?

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227. An express train is moving with a velocity v_1. Its driver finds another train is movig on the same track in the same direction with velocity v_2. To escape collision, driver applies a retardation a on the train. The minimum time of escaping collision be

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228. A stone is dropped from the top of a tall cliff and n seconds later another stone is thrown vertically downwards with a velocity u m/s. How far below the top of the cliff the second stone will overtake the first?

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229. A body starts from rest and moving with uniform acceeration of $4m/s^2$ covers half of its total path during the last second of its motion. Find the itme taken and the total distance covered.

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Exercise

1. In which of the following examples of motion, can the body be considered approximately a point object:

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2. Give an example where displacement of a particle is equal to the distance covered by it.

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3. Is it true that a body is always at rest in a frame which is fixed to the body itself?

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4. Does the speedometer of a car measure its average speed ?

Watch Video Solution

5. What does the slope of position-time graph represents?

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6. Which of the following is true for displacement ?

(i) it cannot be zero

(ii) Its magnitude is greater than the distance travelled by the object

(iii) Its magnitude is less than or equal to distance travelled by the object.

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7. Read each statement below carefully and state with reasons and examples, if it is true or false :- A particle In one-dimensional motion:-

with zero speed may have non-zero velocity,

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8. Discuss if a body moving with uniform velocity is in equilibriuim or not.

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9. Can the velocity of an object be in a direction other than the direction of acceleration?

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10. Can an object be at rest as well as in motion at the same time ?

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11. Define motion in one, two and three dimensions giving one example of each.

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12. State and explain the concept of displacement. Mention its characteristics.

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13. Show that $x = x_0 + vt$ or $s = vt$

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14. Fill in the blanks:

Relative velocity _____.

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