PHYSICS

BOOKS - JBD PUBLICATION

KINEMATICS

Exercise

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1. Three balls profected upwards with the same uinitial speed at angle $\theta = 30^\circ, 45^\circ$ and 60° respectively.Let the range of the ball be expressed by R_θ.Then:

A. $R_{30} > R_{45} > R_{60}$

B. $R_{60} > R_{45} > R_{30}$

C. $R_{45} > R_{30}$

D. $R_{45} < R_{60}$.

Answer:

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2. When the momentum of body is increased by three times,its K.E. becomes:

A. Twice

B. Half

C. Four times

D. Nine times.

Answer:

3. Which of the following vectors identities is/are false?

A. $\vec{A} + \vec{B} = \vec{B} + \vec{A}$.

B. $\vec{A} + \vec{B} = -\left(\vec{B} + \vec{A}\right)$

C. $\left(\vec{A} + \vec{B}\right) + \vec{C} = \vec{A} + \left(\vec{B} + \vec{C}\right)$

D. $\vec{A} + \left(\vec{B} + \vec{C}\right) = \left(\vec{A} + \vec{C}\right) + \vec{B}$

Answer:

4. If $\vec{A} + \vec{B} = \vec{A} - \vec{B}$,then:

A. $\vec{A}$ is a null vector

B. $\vec{B}$ is a null vector

C. both $\vec{A}$ and $\vec{B}$ are null vecors

D. neither $\vec{A}$ nor $\vec{B}$ is a null vector.

Answer:

5. What happens if a vector if a ector is multiplied by a number 10?

    A. The magnitude off the vector is ten times but its direction reains same

    B. The magnitude of the vector remains same but its direction is reversed

C. The magnitude of the vector is ten times and

its direction is reversed

D. neither the magnitude nor the direction of

the vector undergo any change.

Answer:

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6. Two vectors of the same physical quantity are

equal if:

A. they have different direction and different

   magnitudes

B. they have different directions but have same

   magnitudes

C. they have same directions but different

   magnitudes

D. they have same directions and have the

   same magnitudes.

Answer:

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7. A body A is going frm south to north and body B is going from west to east .then the directin of relative velocity of A with respect to B is :

A. north-west

B. south-west

C. north-east

D. south-east.

Answer:

8. Numerical value of magnitude of a physical quantity is :

A. directly propotional to magnitude of the unit

B. inversely proportional to magnitude of unit

C. independent of system of unit

D. depends on the quantity.

Answer:

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9. A man walks at a speed of 6 km h^{-1} for 1 km and 8 km h^{-1} for the next 1 km.What is the average speed for the walk fo 2 km?

A. $7kmh^{-1}$

B. $16kmh^{-1}$

C. $12kmh^{-1}$

D. $6kmh^{-1}$.

Answer:

10. A body covers $\frac{1}{4}th$ part of a circular path.Calculate the ration of distance and displacement.

A. π

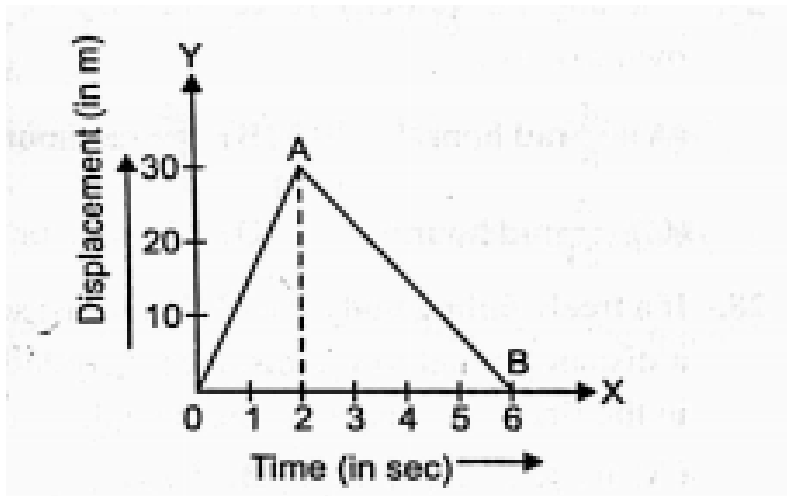B. $\dfrac{\pi}{2\sqrt{s}}$

C. $\dfrac{\pi}{2}$

D. $\dfrac{\pi}{\sqrt{2}}$

Answer:

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11. The displacement-time graph of a motion is shown in figure.The ratio of the speeds during the rfirst two seconds and the next four seconds is :

A. $1:1$

B. $1:2$

C. $2:1$

D. $1:\sqrt{2}$.

Answer:

12. The acceleration fo a body in ms^{-2} starting from rest varies with time in secnds as per the relation $a = 3t + 4$ then the magnitude of velocity of the body at t=2 s will be :
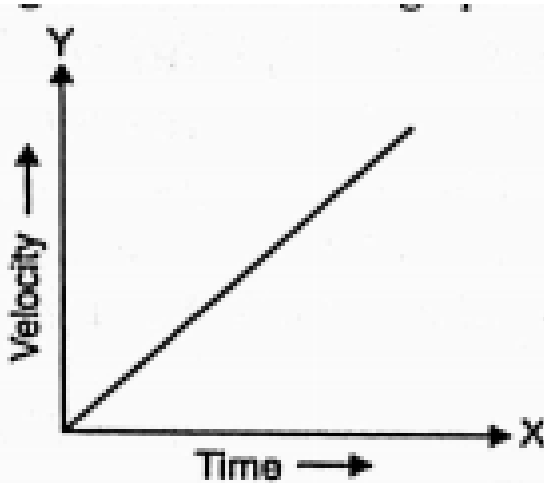
A. $14ms^{-1}$

B. $16ms^{-1}$
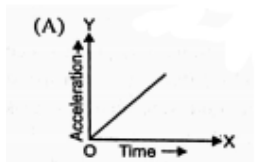
C. $12ms^{-1}$
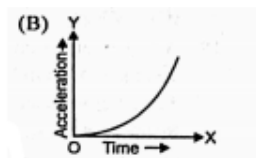
D. $10ms^{-1}$.

Answer:

13. Figure below shows the velocity-time graph of a car moving on a straight road.The corresponding acceleration-=time graph will be:
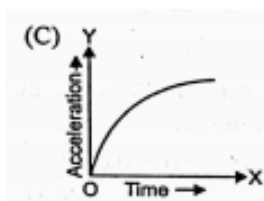
A.
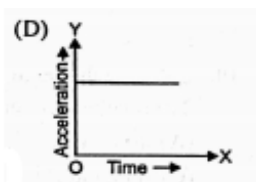

B.

C.

D.

Answer:

14. A ball is projected upwards at a certain angle with th ehorizontal .Which of the following statement is // are correct?

A. At the highest point the velocity of the projectile is zero

B. At the highest point the acceleration of the projectile is zero

C. At the highest point the velocity of the

projectile is along the vertical direction

D. At the highest point the acceleration of the

projectile is vertically.

Answer:

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15. A bomb is dropped from an aeroplane when it

is at a heigth h directly abovve a target .If the

aeroplane is moving horizontally at a spee u,the

distance by which the bomb will mis the target is given by:

A. $2u\sqrt{\dfrac{h}{g}}$

B. $u\sqrt{\dfrac{h}{g}}$

C. $u\sqrt{s\dfrac{h}{g}}$

D. $\sqrt{\dfrac{h}{2g}}$.

Answer:

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16. An athelete completes one round of a circular track radius R in 40 s.What will be his displacement at the end of 2 minutes 20 sec?

A. Zero

B. 2R

C. $2\pi R$

D. $7\pi R$.

Answer:

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17. A particle is gien a displacement of 4 m in the xy-plane.If the x-component of the displacement vector is 2 m,the y-component wll be:

A. 2m

B. $2\sqrt{2}m$

C. $2\sqrt{3}m$

D. $4m$.

Answer:

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18. A 120 m long train is moving west at a speed of 10 m s^{-1}.A small bird flying cast at a speed of $5ms^{-1}$ crosses the train.What is the time taken by the bird to cross the train?

A. 24 s

B. 12 s

C. 8s

D. 4 s.

Answer:

19. Calculate the angular speed of the wheel making 240 revolutions per minute.

A. $40\pi rads^{-1}$

B. $\pi rads^{-1}$

C. $60\pi rads^{-1}$

D. $80\pi rads^{-1}$.

Answer:

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20. A boy whirls a stone in a horizontal circle 2 m above the ground by mean of a string 1.25 m long .The string breaks nd the stone flies off horizontally,striking the ground 10 m away.What is the magnitude of the centripetal acceleration during circular motion ?Take $g = 10ms^{-2}$.

A. $1000ms^{-2}$

B. $200ms^{-2}$

C. $300ms^{-2}$

D. $400ms^{-2}$.

Answer:

21. A particle executing circular motion of radius 5

m and linear speed of $3ms^{-1}$ which is increasing

at the rate of $2ms^{-2}$.What is the acceleration of

the particle?

   A. $5ms^{-2}$

   B. $\dfrac{9}{25}ms^{-2}$

   C. $2.7ms^{-2}$

   D. $2ms^{-2}$.

Answer:

22. Which of the following remains constant during the motion of a projectile fired from a planet?

A. Horizontal component of velocity

B. Vertical comopnent of velocity

C. Momentu

D. Kinetic energy

Answer:

23. A pendulum is suspended from the roof of a car. The car is moving with an acceleration of $4.9ms^{-2}$ .Then angle to which the vertical string will be inclined is :

A. $0°$

B. $30°$ nearly

C. $10°$ nearly

D. $20°$.

Answer:

24. A body is thrown vertically up from earth with a velocity of $100 ms^{-1}$.It will return to earth approximaterly after:

A. 10 s

B. 20 s

C. 15 s

D. 5 s.

Answer:

25. A particle starts moving from the position of rest under a constant acceleration.It travels a distance x in the first 10 s and distance y is next 10 s,then:

A. $x = y$

B. $y = 2x$

C. $y = 3x$

D. $y = 4x$.

Answer:

26. The angle of projection at which the horixontal range and maximum heigth of projectile are equal is :

A. $45°$

B. $60°$

C. $\theta = tn^{-1}(4)$

D. $\theta = \tan^{-1}(0.25)$.

Answer:

27. The angulr velocity of earth's rotation on its own axis is :

A. $\dfrac{\pi}{6} rad hour^{-1}$

B. $\dfrac{\pi}{r} ad hour^{-1}$

C. $\dfrac{\pi}{24} rad hour^{-1}$

D. $15 rad hour^{-1}$.

Answer:

28. If a freely falling body travels in the last second a distane equal to the distance travelled by it in the frist three seconds,the time of travel is :

A. 6 sec

B. 5 sec

C. 4 sec

D. 3 sec.

Answer:

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29. Name the physical quantities which remains constant for a particle moving along a circular path in a horizontal plane in uniform motion.
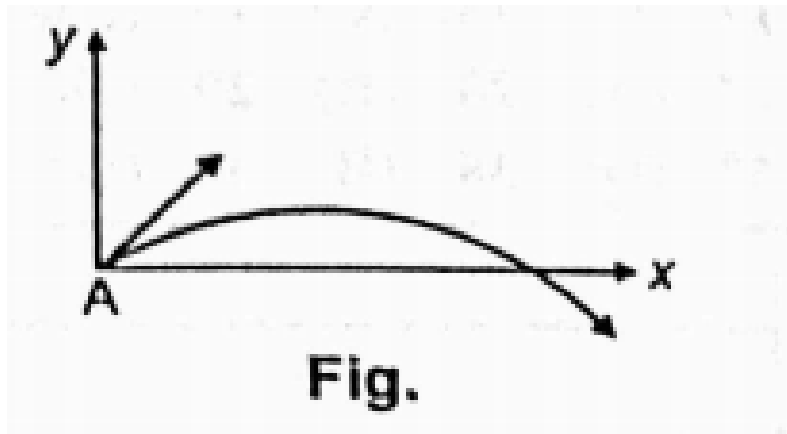
    A. angular momentum

    B. constant cceleration

    C. constant velocity

    D. no work done.

Answer:

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30. The velocity of a projectile at the intital pont A is $\left(2\hat{i} + 3\hat{j}\right) m/s$. It's velocity (in m//s) at the piont B is [fig.]

Fig.

A. $2\hat{i} - 3\hat{j}$

B. $2\hat{i} + 3\hat{j}$

C. $-2\hat{i} - 3\hat{j}$

D. $-2\hat{i} + 3\hat{j}$

Answer:

31. A projectile is fired at an angle of $45°$ with the horizontal.Elevation angle of the projectile at its highest piont as seen from the point of projection is :

A. $60°$

B. $\tan^{-1}\left(\dfrac{1}{2}\right)$

C. $\tan^{-1}\left(\dfrac{\sqrt{3}}{2}\right)$

D. $45^°$.

Answer:

32. The vectors $\overrightarrow{A}$ and $\overrightarrow{B}$ are such that $\left|\overrightarrow{A} + \overrightarrow{B}\right| = \left|\overrightarrow{A} - \overrightarrow{B}\right|$,then the angle between

two vectros will be :

A. $0^°$

B. $60^°$

C. $90^°$

D. 180^@`.

Answer:

33. A particle is actedsimultaneously by mutually perpendicular simple hormonic motions $x = a \cos 1\omega t$ and $y = a \sin \omega t$. The trajectory of motion of the particle will be

A. an elliptical path

B. a circular path

C. a parabolic path

D. a straigth line path inclined equally to x- and

y- plane.

Answer:

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34. In the entire path of a projectile,the quantity

that remain unchaged is :

A. vertical component of velocity

B. horizontal component of velocity

C. kinetic energy

D. potential energy.

Answer:

35. Three vectors

$\overrightarrow{A} = a\hat{i} + \hat{j} + \hat{k}, \overrightarrow{B} = \hat{i} + b\hat{j} + \hat{k}$ and

$\overrightarrow{C} = \hat{i} + \hat{j} + c\hat{k}$ are mutually perpendicular .The

respective values of a,b and c are

A. 0,0,0

B. $-\dfrac{1}{2},\ -\dfrac{1}{2},\ -\dfrac{1}{2}$

C. 1,-1,1`

D. $\dfrac{1}{2},\ \dfrac{1}{2},\ \dfrac{1}{2}.$

Answer:

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36. The angle between $A = \hat{i} + \hat{j}$ and $B = \hat{i} - \hat{j}$

is :

A. $45\,^\circ$

B. $90\,^\circ$

C. $-45°$

D. $180°$.

Answer:

37. Which one of the following statements is true ?

A. A scalar quantity is the one that is conserved

in a process.

B. A scalar quantity is the one that can never

take negative values.

C. A scalar quantity is the one that does not vary from one point to another is space.

D. A scalar quanity has the same vaue for observers with different orientations of the axes.

Answer:

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38. Consider the quantities,pressure,power,energy,impulse,gravitational

potential,electrical charge,temperature,area.Out of these, the only vector quantities are:

A. Impulse,pressure and area

B. Impulse and area

C. Area and gravitational potential

D. Impulse and pressure

Answer:

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39. In a two dimensional motion,instantaneous speed v_0 is a positive constant.Then which of the following are necessarily true?

    A. The average velocity is not zero at any time.

    B. Average acceleratin must always vanish.

    C. Displacements in equal time inervals are

       equal.

    D. Equal path lengths are traversed in equal

       intervals.

Answer:

40. In a two dimensional motion,instantaneous speed v_0 is a positive constant.Then which of the following are necessarily true?

A. The acceleratin of the particle is zero.

B. The acceleration of the particle is bounded.

C. the acceleration of the particle is necessarily in the plane of motion.

D. The particle must be undergoing in uniform circular motion.

Answer:

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Example

1. Is it possible that the velocity of an object be in a direction other than the direction of acceleration?

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2. Under what condition is the relation S= ut correct?

3. The displacement of a particle is directly proportional to the square of the time.Explain whether the object is moving with uniform velocity or with uniform acceleration.

4. 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 ?

5. What will be the shape of displacement-time graph when acceeration or retarddation is uniform?

6. Can a constant acceleration change the direction of motion of an objet?

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

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8. How can the distance travelled by an object be calculated from the velocity - time graph?

9. What will be the shape of displacement-time graph when acceeration or retarddation is uniform?

10. If $\vec{A} + \vec{B} = \vec{A} - \vec{B}$,then:

11. What is subtraction of a vector?

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12. Vectors cannot be added algebraically. Why?

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13. Is commutative law applicable too vector subtraction?

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14. If $\vec{A} = 2\hat{i} + 5\hat{j}$,what is the unit vector perpendicular to $\vec{A}$?

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15. What is unit vector?

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16. Is the magnitude of $\left(\vec{A} - \vec{B}\right)$ same as that of $\left(\vec{B} - \vec{A}\right)$?

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17. A vector of magnitude 5,makes an angle $60°$ with the y-axis .Express the vector in mathematical terms?

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18. At what points on the projectile trajectory is the speed minimum

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19. What is the vertical component of velocity of a projectile at its maximum height?

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20. Shells of different masses are fired from a cannon at same angle with same speed.Will their range and time fo flight differ?

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21. A ball will project with a speed u at an angle of projection $30°$ has a range R.Is there any other value of angle of projection at which the range with same initial speed u is R?

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22. At what angle ith the verticle should a projectile be projected so that its range is maximum?

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23. If u is the velocity of projection ,what is the value of maximum horizontal range?

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24. Name the quantity which remains unchanged during the flight of an oblique projectile.

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25. How many directions of projection are possible for the same horizontal range?

26. A bomb is dropped from an aeroplane when it is at a heigth h directly abovve a target .If the aeroplane is moving horizontally at a spee u,the distance by which the bomb will mis the target is given by:

27. A ball is thrown up and then it returns to the thrower .Is it a projectile?

28. If the angle of projection fo a projectile is doubled ,will the horizontal range become double ,keeping its velocity constant?

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29. Write the relation between linear velocity (v),angular velocity(omega) and radius of circle(r).

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30. What is the effect of air resistance on the time of flight and horizontal range of the projectile?

31. State, for each of the following physical quantities, if it is a scalar or a vector : volume, mass, speed, acceleration, density, number of moles, velocity, angular frequency, displacement, angular velocity.

32. What is the essential condition for addition of two vectors?

33. What is the physical meaning of zero vector?

34. Write expression for a position vector in space.

35. Write expression for displacement vector.

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36. What is the direction of velocity at any point on the path of an object?

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37. Displacement vector is fundamentally a position? Comment on this statement.

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38. If fifty vectors,each of magnitude 10 units ,are represented by the sides of a polygon ,all taken in the same order.What will be the resultant?

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39. What is the minimum number of vectors of unequal magnitude required to produce a zero resultant?

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40. What is the angle made by vector $\vec{A} = \hat{i} + 2\hat{j}$ with x-axis?

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41. Calculate the magnitude off position vector R $\left(3\hat{i} + 4\hat{j} + 7\hat{k}\right)$.

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42. If the magnitude of vectors $\vec{P}, \vec{Q}$ and $oversert \to R$ are 3,4 and 5 units respectively,and

if $\vec{P} + \vec{Q} = \vec{R}$,then what will be the angle between $\vec{P}$ and $\vec{R}$?

43. A vector quantity is multiplied by a scalar quantity .What will be the angle between the new vector and the original vector?

44. Does the order ,in which a number of vectors are added ,matter or not?

45. If $\left|\overrightarrow{A} \times \overrightarrow{B}\right| = \left|\overrightarrow{A} \cdot \overrightarrow{B}\right|$,then find the angle between $\overrightarrow{A}$ and $\overrightarrow{B}$.

46. If $\overrightarrow{A} = \hat{i} - 2\hat{j} + 3\hat{k}k$.Find the direction cosines of $\overrightarrow{A}$.

47. Can two non -zero vectors give zero resultant when they cross-multiply each other?

48. If $\vec{A}$, $\vec{B}$ and $\vec{C}$ are mutually perpendicular to each other ,then find the value of $\vec{A} \cdot \left(\vec{C} + \vec{B} \right)$.

49. For what value of a are $\vec{A} = a\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{B} = 2a\hat{i} - a\hat{j} - 4\hat{k}$ perpendicular.

50. Explain addition of vectors using graphical method.

51. State, for each of the following physical quantities, if it is a scalar or a vector : volume, mass, speed, acceleration, density, number of moles, velocity, angular frequency, displacement, angular velocity.

52. Can three vector not in one plane give a zero resultant?Can four vectors do?

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53. Can a vectro be zero if its components is not zero?

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54. Is it necessary to mention the direction of a vector having zero magnitude?

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55. What is the component method for adding vector?

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56. An object originally at the opint (2,5,1) m is given a displacement $8\hat{i} - 2\hat{j} + \hat{k}$ m.Find the

coordinates of its new position.

57. Three vectors $\vec{P}, \vec{Q}$ and $\vec{R}$ satisfy the relations $\vec{P} \cdot \vec{Q} = 0$ and $\vec{P} \cdot \vec{R} = 0$.To which vector, the vector $\vec{P}$ is parallel to .

58. Calculate the angle between 2 newton and a 3 newton force so that their resultant is 4 newton.

59. At what angles do the two fores $\left(\overrightarrow{P} + \overrightarrow{Q}\right)$ adn $\left(overst \to P - \overrightarrow{Q}\right)$ act so that the agnitude of the resultantts is $\sqrt{2(P^2 + Q^2)}$?

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60. Two forces of 6 N and 8 N act at a point at an angle $90°$ with each other.Find the magnitude and direction fo the resultant force.

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61. A skilled gunman always keeps his gun tilted above the line of sight while shooting .Why?

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62. At what points on the projectile trajectory is the speed minimum

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63. At what point of trajectory an object thrown upward is the acceleration perpen-dicular to the

velocity.

64. A tennis ball jumps higher at hills than at planes. Explain.

65. Explain that a uniform circular motion is an accelerated motion.

66. A body is projected horizontally from the to of a cliff with a velcity of $9.8ms^{-1}$.Wghat time elapses before the horizontal and vertical velocitties become equal ?

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67. Two paper screens A and B are separated by a distance of 100m.A bullet plerces A and than B. The hole is B is 10 cm below the hole in A.If teh bullet is travelling horizontally at the time of hitting A,then what is the velocity of the bullet at A?

68. Shows that the projection angle θ_o for a projectile launched from the origin is given by $\theta_o = \tan^{-1}\left(\dfrac{4h_m}{R}\right)$ where the symbols have their usual meaning.

69. A cricket ball is hit at $45°$ to the horizontal with a kineti energy K.Find teh kinetic energy at the hitghest point.

70. A body is projected with a velocity u in a direction making angle θ with the horizontal. Show that path of the projectile is a parabola. Find the maximum heighth reached, the time of flight and horizontal range.

71. A body is projected with a velocity u in a direction making angle θ with the horizontal. Show that path of the projectile is a parabola. Find the

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72. A body is projected with a velocity u in a direction making angle θ with the horizontal. Show that path of the projectile is a parabola. Find the maximum heighth reached, the time of flight and horizontal range.

73. A body P of mass m is thrown with velocity u at an angle $30°$ to the horizontal and another body Q is of teh same mass be projected with velocity u at an angle $60°$ to the horizontal .Find the ratio of the horizonta range nd maximum heights of P and Q.

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74. The range of a particle when launched at an angle of $15°$ with horizontal is 1.5 km.What is the

range of the projectile when launched at an angle of $45°$ to the horizonta?

75. A ball is projected horizontally with a velocity of $4ms^{-1}$.What will be its velocity after 0.7 sec $(g = 10ms^{-2})$?

76. Two bodies A and B are projected $\sqrt{2}u$ and u respectively.They cover the same horizontal

range.If body A is projected at $15°$ with horizontal,then what is the angle of projectio of bodyB?

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77. A body is projected with a velocity u in a direction making angle θ with the horizontal. Show that path of the projectile is a parabola. Find the maximum heighth reached, the time of flight and horizontal range.

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

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79. Give one physical difference between average velocity and instantaneous velocity.

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80. Define relative velocity?

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81. Is the speed-time graph shown in fig. possible?

Fig.
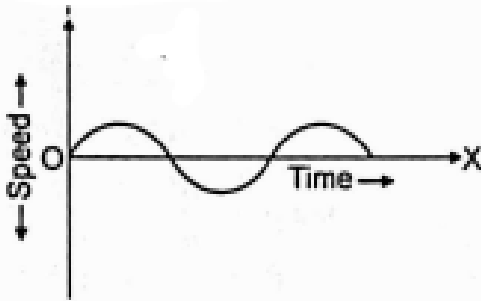
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82. What is common among two position - time graphs in fig.?
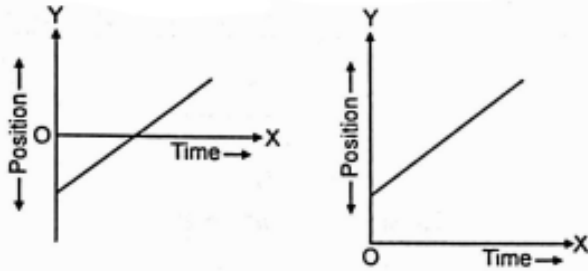
Fig.

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83. Following ,fig.shows a velocity-time graph.At which of the marked points is the acceleration
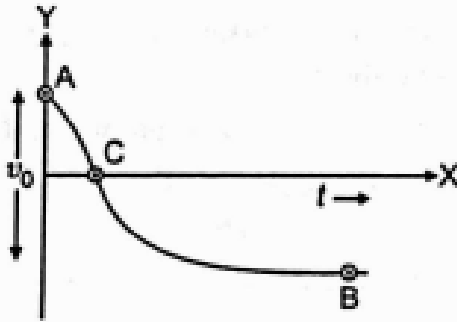
Zero

Fig.

> ▶ Watch Video Solution

84. Following ,fig.shows a velocity-time graph.At which of the marked points is the acceleration
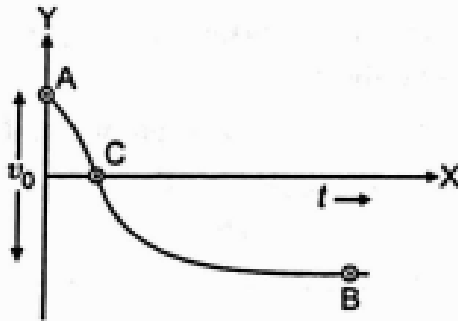
maximum?

Fig.

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85. Galileo's experminet showed that if the two objects of unequal masses are dropped from the sme height in vaccum,the times required by tehm are equal to reach the ground.But,if they are shown vertically upwards in vaccum with the same

initial velocity what is the ratio of the times required to reach the ground?

86. 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).

87. Which of the following is NOT the characteristic of displacement ?

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88. Show that rest and motion are relative terms.

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89. A body has a uniform velocity in frame of reference X.Is there any other frame of reference in which the body can be at rest?

90. Two stones of different sizes are dropped simultaneously from the top of a bulding.Which stone would reach the ground earlier?

91. 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)?

92. A racing car accelerates uniformly on a straight road from rest to a speed of $180 kmh^{-1}$ in 25 sec.Find the total distance covered by the car in this time.

93. A ca travelling at $9ms^{-}$ accelerates and attains a speed of $27ms^{-1}$ in 5s. Calculate the average acceleration and the distance travelled in 5 s.

94. A player throws a ball upwards with an initial velocity u.What is the direction of accdeleration during the upward motion of the ball?

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95. Define uniformly accelerated motion and non-uniformly accelerated motion.

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96. What will be the shape of displacement-time graph when acceeration or retarddation is uniform?

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97. How can the distance travelled by an object be calculated from the velocity - time graph?

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98. Is the acceleration of a car greater when teh accelerator is pushed to the floor or when brake pedal is pushed hard?

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99. What will be the shape of displacement-time graph when acceeration or retarddation is uniform?

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100. A particule travelling due east at $2ms^{-1}$ is uniformly accelerated at $5ms^{-2}$ for 4 sec.Calculate the displacement of the particle.

101. A truck travelling at a speed at a speed of $25ms^{-2}$,slows down to a speed of $5ms^{-1}$ in 10 s.Calculate the acceleration of the truck during these 10 seconds.

102. Obtain equation of motion $S = ut + \dfrac{1}{2}at^2$ for constant acceleration using method of calculus .S = displacement,u = initial velocity, t = time.

103. Define acceleration .What are positive and negative accelerations?

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

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105. Define position-time relation.

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106. Derive the following relations for uniformly accelerated motion.

Velocity-time relation

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107. Write short note on free fall.

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108. Two trains A and B of length 400 m each are moving on two parallel tracks with a uniform

speed of $72 kmh^{-1}$ in the same direction, with A ahead of B. The driver of B decides to overtake A and accelerates by $1 ms^{-2}$. If after 50 s, the guard of B just brushes past the driver of A, what was the original distance between them ?

109. 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
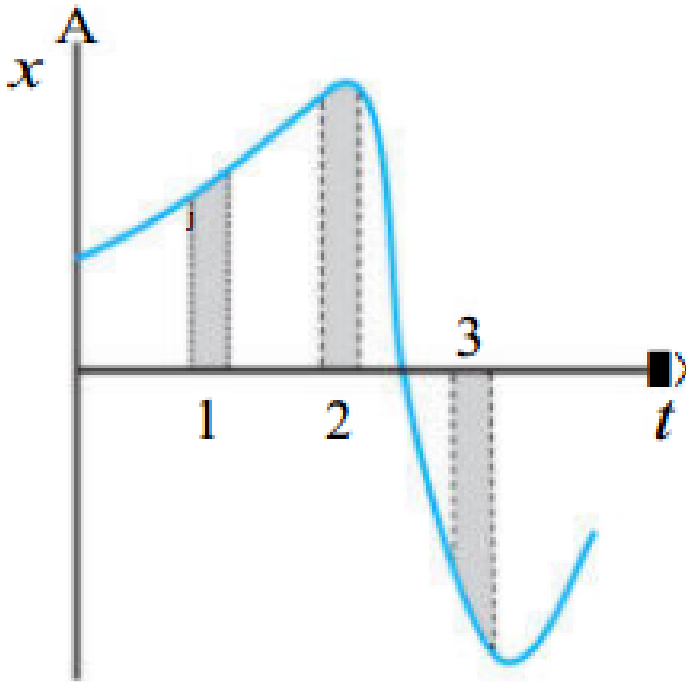
decides to overtake A before C does. What minimum acceleration of car B is required to avoid an accident ?

110. 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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111. Plot ,displacement-time graph when an object is moving with infinite velocity.Is such a motion of

an object ever possible?

112. A steam boat goes across a lake and comes back (a) On a quit day when the water is still and (b) On a rough day when there is uniform air current so as to help the journey onward and to impede the journey back. If the speed of the launch on both days was same, in which case it will complete the journey in leaser time.

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

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

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

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

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117. The position-time(x-t) graphs for two children A and B returning from their school O to their homes P and Q respectively are shown in fig. Choose the correct entries in the brackets below:

(A/B)overtakes (B/A) on the road $(once/twice)$.

A. (A//B) lives closer to the school than (B//A).

B. (A/B) starts from the school earlier than (B/A).

C. (A/B) walks faster than (B/A)

D. A and B reach home at the (same/different) time

(A/B) overtakes (B/A) on the road (once/twice).

Answer:

118. The position-time(x-t) graphs for two children A and B returning from their school O to their

homes P and Q respectively are shown in fig.

Choose the correct entries in the brackets below:

119. The position-time(x-t) graphs for two children A and B returning from their school O to their homes P and Q respectively are shown in fig. Choose the correct entries in the bracets below:

(A/B) walks faster than (B/A).

120. The position-time(x-t) graphs for two children A and B returning from their school O to their homes P and Q respectively are shown in fig. Choose the correct entries in the bracets below:

A and B reach home at the (same / different)time.

121. The position-time(x-t) graphs for two children A and B returning from their school O to their homes P and Q respectively are shown in fig. Choose the correct entries in the bracets below:

(A/B)overtakes (B/A) on the road $(once/twice)$.

122. 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.

123. 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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124. 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 ?

125. If $\vec{A}$, $\vec{B}$ and $\vec{C}$ are mutually perpendicular to each other ,then find the value of $\vec{A} \cdot \left(\vec{C} + \vec{B} \right)$.

126. Explain why we express the laws of physics in vector form ?

127. If $\vec{A} = \hat{i} - 2\hat{j} + 3\hat{k}k$.Find the direction cosines of $\vec{A}$.

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128. If $\left|\vec{A} \times \vec{B}\right| = \left|\vec{A} \cdot \vec{B}\right|$,then find the angle between $\vec{A}$ and $\vec{B}$.

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129. Can two non -zero vectors give zero resultant when they cross-multiply each other?

130. In $\overrightarrow{F} = q\left(\overrightarrow{v} \times \overrightarrow{B} \right)$, which pair of vectors are always at right angles to each other?

131. Show that $\left| \overrightarrow{A} + \overrightarrow{B} \right|^2 - \left| \overrightarrow{A} - \overrightarrow{B} \right|^2 = 4\overrightarrow{A} \cdot \overrightarrow{B}$

.

132. Show that vector addition is commutative.

133. Does the nature of a vector change when it is multiplied by a scalar?

134. Does the order ,in which a number of vectors are added ,matter or not?

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135. Explain addition of vectors using graphical method.

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136. What is the resultant vector?

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137. Calculate the magnitude off position vector R $\left(3\hat{i} + 4\hat{j} + 7\hat{k} \right).$

138. If the magnitude of vectors $\overrightarrow{P}, \overrightarrow{Q}$ and $oversert \rightarrow R$ are 3,4 and 5 units respectively,and if $\overrightarrow{P} + \overrightarrow{Q} = \overrightarrow{R}$,then what will be the angle between $\overrightarrow{P}$ and $\overrightarrow{R}$?

139. Displacement vector is fundamentally a position? Comment on this statement.

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140. Why is zero vector needed?

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141. If sum and difference of two vectors $\overrightarrow{R}$ and $\overrightarrow{S}$ are at right angle equal to each other, then show that the vectors are equal in magnitude.

142. Differentiate between scalars and vectors with examples.

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143. Define Resolution ?

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144. Derive the relation between linear velocity and angular velocity.

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145. What are the two angles of projection of a projectile with velocity $30ms^{-1}$, so that the horizontal range is 45 m.Take $g = 10ms^{-2}$.

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146. How many directions of projection are possible for the same horizontal range?

147. If a man wants to hit a target,in what direction should be ponts his rifle (higher,lower or in the same direction as the target)?

148. Shows that the projection angle θ_o for a projectile launched from the origin is given by $\theta_o = \tan^{-1}\left(\dfrac{4h_m}{R}\right)$ where the symbols have their usual meaning.

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149. A body is projected so that it has maxium hoizontal range R.What is the maximum height reached during the flight?
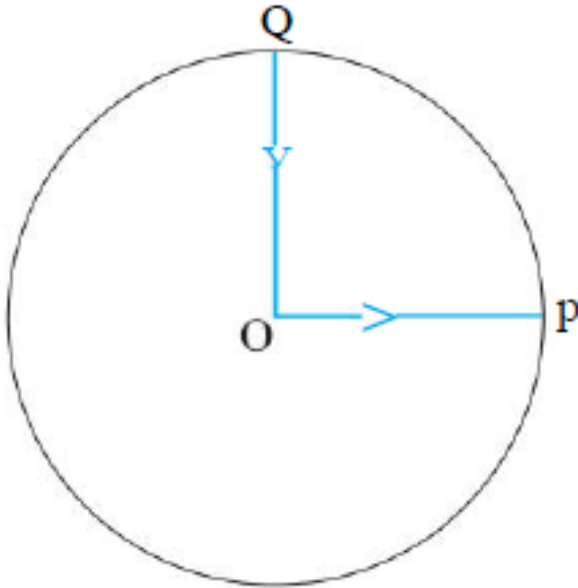
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150. A particle is projected with a given velocity in two possible ways so as to make it pass through a point at a distant from the point of projection.Obtain a relation for the product of times taken to reach the point in the two possible ways.

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151. A cyclist starts from the centre Oof a circular park of radius 1 km, reaches the edge P of the park, then cycles along the circumference, and returns to the centre along QO as shown in Fig. 4.21. If the
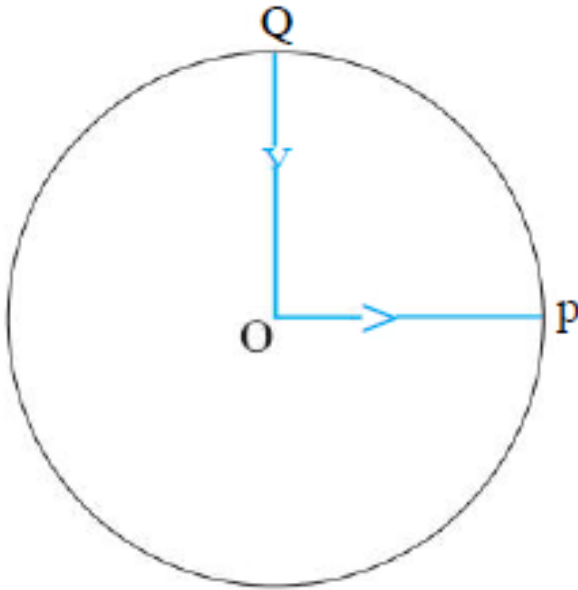
round trip takes 10 min, what is the:- net

displacement,

152. A cyclist starts from the centre Oof a circular

park of radius 1 km, reaches the edge P of the park,

then cycles along the circumference, and returns

to the centre along QO as shown in Fig. 4.21. If the

round trip takes 10 min, what is the:- average

velocity, and

153. A cyclist starts from the centre O of a circular park of radius 1 km, reaches the edge P of the park, then cycles along the circumference, and returns to the centre along QO as shown in Fig. 4.21. If the round trip takes 10 min, what is the:- average speed of the cyclist ?
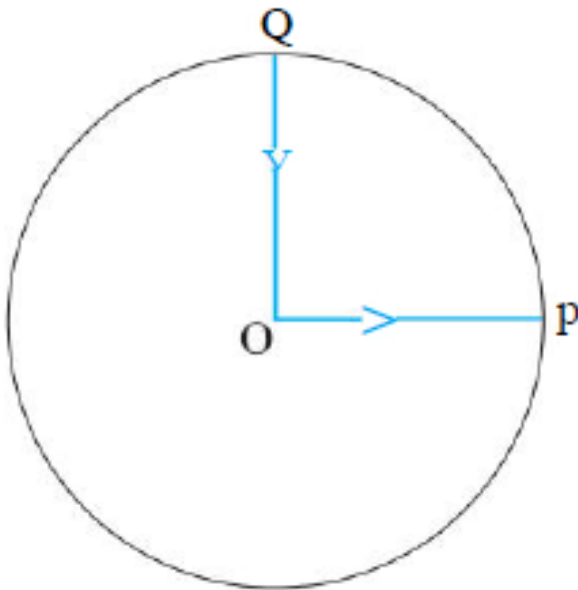
154. On an open ground, a motorist follows a track that turns to his left by an angle of $60°$ after every 500 m. Starting from a given turn, specify the displacement of the motorist at the third, sixth and eighth turn. Compare the magnitude of the displacement with the total path length covered by the motorist in each case.

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155. A passenger arriving in a new town wishes to go from the station to a hotel located 10 km away on a straight road from the station. A dishonest cabman takes him along a circuitous path 23 km long and reaches the hotel in 28 min. What is:- the average speed of the taxi,

156. A passenger arriving in a new town wishes to go from the station to a hotel located 10 km away on a straight road from the station. A dishonest

cabman takes him along a circuitous path 23 km long and reaches the hotel in 28 min. What is:- the magnitude of average velocity ? Are the two equal ?

157. Tire ceiling of a long hall is 25 m high. What is the maximum horizontal distance that a ball thrown with a speed of $40ms^{-1}$ can go without hitting the ceiling of the hall ?

158. A cricketer can throw a ball to a maximum horizontal distance of 100 m. How much high above the ground can the cricketer throw the same ball ?

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159. A stone tied to the end of a string 80 cnr long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 25 s, what is the magnitude and direction of acceleration of the stone ?

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160. An aircraft executes a horizontal loop of radius 1.00 knr with a steady speed of $900 km/h$. Compare its centripetal acceleration with the acceleration due to gravity.

161. A bullet fired at an angle of $30°$ with the horizontal hits the ground 3.0 km away. By adjusting its angle of projection, can one hope to

hit a target 5.0 km away ? Assume the muzzle speed to be fixed, and neglect air resistance.

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162. Distinguish between speed and velocity.

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163. What do you understand by relative velocity?

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