PHYSICS

BOOKS - MBD

MOTION IN A PLANE

Example

1. What do you mean by null vector?

Watch Video Solution

2. Define equal vectors.

Watch Video Solution

3. Define negative vectors.

Watch Video Solution

4. Define unit vector.

Watch Video Solution

5. Express the unit vector $\hat{A}$ mathematical form

Watch Video Solution

6. What are scalar quantities?

Watch Video Solution

7. What are vector quantities?

Watch Video Solution

8. What is the resultant vector?

Watch Video Solution

9. Can the magnitude of the resultant vector of te two given vectors is less than the magnitude of any of the given vectors?

Watch Video Solution

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

Watch Video Solution

11. Can we multiply a vector by a real number?

Watch Video Solution

12. Pick out the only vector quantity in the following list : Temperature, pressure, impulse, time, power, total path length, energy, gravitational potential, coefficient of friction, charge.

Watch Video Solution

13. Is pressure a vector qantity?

Watch Video Solution

14. Vectors cannot be added algebraically. Why?

Watch Video Solution

15. Under what conditions, the direction of sum and difference of two vectors will be the same?

Watch Video Solution

16. Give an example of motion in two dimensions.

Watch Video Solution

17. Give an example of motion in three dimensions.

Watch Video Solution

18. Can a body be accelerate without speeding up or slowing down?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

21. Can the velocity of a particle vary even if speed is constant?

Watch Video Solution

22. Define three dimensional motion.

Watch Video Solution

23. When will you say a body is in : uniform acceleration ?

Watch Video Solution

24. Is the rocket in flight an illustration of a projectile?

Watch Video Solution

25. A person sitting in a moving train throws a ball vertically upwards. How does the ball appear to move to an observer inside the train

Watch Video Solution

26. A person sitting in a moving train throws a ball vertically upwards. How does the ball appear to move to an observer outside the train?

Watch Video Solution

27. A projectile is projectile at an angle of 15° to te horizontal with speed v. if another projectile is rojected with the same speed, then at what angle with the horizontal it must be projected so as to have the same range.

Watch Video Solution

28. Keeping the angle of projection same, what is the effect on horizongal range of a projectile when its velocity is doubled?

Watch Video Solution

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

Watch Video Solution

30. At what points on the projectile trajectory is the speed maximum

Watch Video Solution

31. 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.

Watch Video Solution

32. Why the motion of oblique projectile becomes horizontal at the highest point?

Watch Video Solution

33. At what point on the projectile trajectory is the potential energy maximum

Watch Video Solution

34. At what point on the projectile trajectory is the kinetic energy minimum

Watch Video Solution

35. At what point on the projectile trajectory is the total energy is maximum?

Watch Video Solution

36. 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.

Watch Video Solution

37. Pick out the two scalar quantities in the following list : force, angular momentum, work, current, linear momentum, electric field, average velocity, magnetic moment, relative velocity.

Watch Video Solution

38. Pick out the only vector quantity in the following list : Temperature, pressure, impulse, time, power, total path length, energy, gravitational potential, coefficient of friction, charge.

Watch Video Solution

39. State with reasons, whether the following algebraic operations with scalar and vector physical quantities are meaningful :- adding any two scalars,

Watch Video Solution

40. State with reasons, whether the following algebraic operations with scalar and vector physical quantities are meaningful :- adding a scalar to a vector of the same dimensions

Watch Video Solution

41. State with reasons, whether the following algebraic operations with scalar and vector physical quantities are meaningful :- multiplying any vector by any scalar,

Watch Video Solution

42. State with reasons, whether the following algebraic operations with scalar and vector physical quantities are meaningful :- multiplying any two scalars,

Watch Video Solution

43. State with reasons, whether the following algebraic operations with scalar and vector physical quantities are meaningful :- adding any two vectors,

Watch Video Solution

44. Read each statement below carefully and state with reasons, if it is true or false :- The magnitude of a vector is always a scalar,

Watch Video Solution

45. Read each statement below carefully and state with reasons, if it is true or false :- each component of a vector is always a scalar,

Watch Video Solution

46. Read each statement below carefully and state with reasons, if it is true or false :- the total path length is always equal to the magnitude of the displacement vector of a particle,

Watch Video Solution

47. Read each statement below carefully and state with reasons, if it is true or false:

the average speed of a particle is either greater than or equal to the magnitude of average velocity of the particle over the same interval of time.

Watch Video Solution

48. Read each statement below carefully and state with reasons, if it is true or false :- Three vectors not lying in a plane can never add up to give a null vector.

Watch Video Solution

49. Given $\vec{a} + \vec{b} + \vec{c} + \vec{d} = 0$, which of the following statements are correct:

A. $\vec{a}$, $\vec{b}$, $\vec{c}$ and $\vec{d}$ must each be a null vector,

B. the magnitude of $\left(\vec{a}+\vec{c}\right)$ equal the magnitude of $\left(\vec{b}+\vec{d}\right)$,

C. the magnitude of $\vec{a}$ can never be greater than the sum of magnitude of $\vec{b}$, $\vec{c}$ and $\vec{d}$

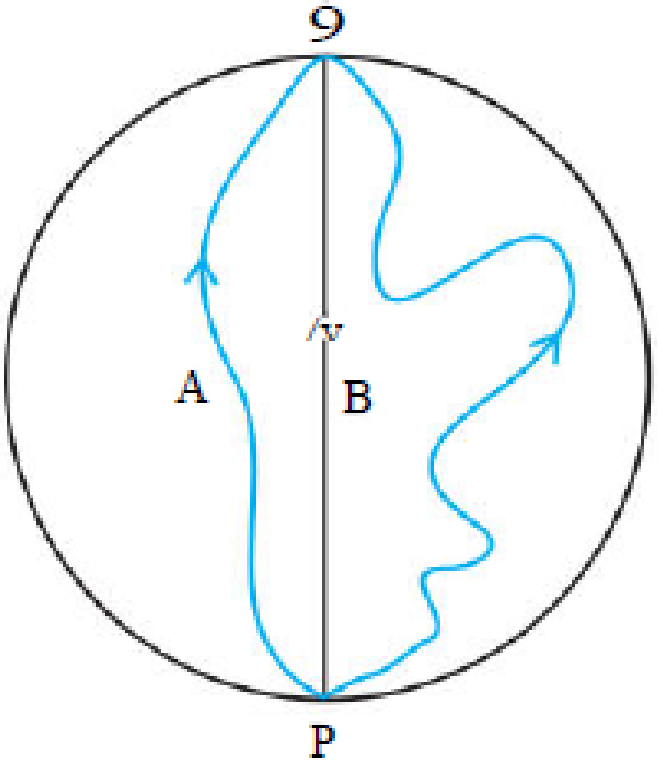
D. $\vec{b}+\vec{c}$ must lie in the place of $\vec{a}$ and $\vec{d}$ if $\vec{a}$ and $\vec{d}$ are not collinear,and in the line of $\vec{a}$ and $\vec{d}$,if they are collinear.

Answer:

Watch Video Solution

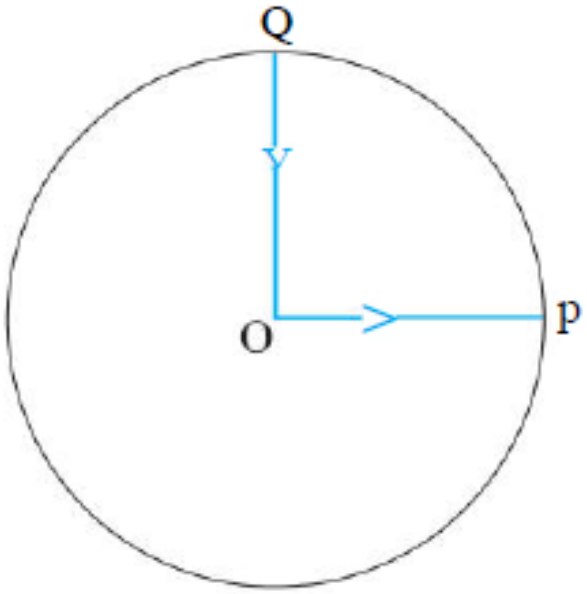
50. Three girls skating on a circular ice ground of radius 200 m start from a point P on the edge of the ground and reach a point Q diametrically opposite to Pfollowing different paths as shown in Fig. 4.20. What is the magnitude of the displacement vector for each ? For which girl is this

equal to the actual length of path skate?



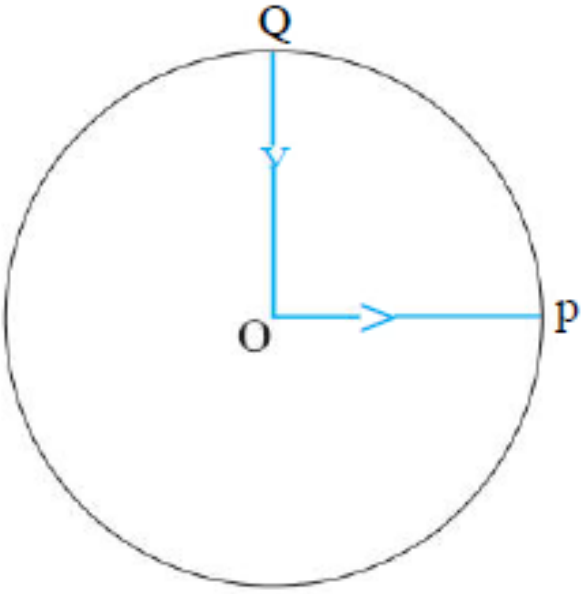
Watch Video Solution

51. 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,



Watch Video Solution

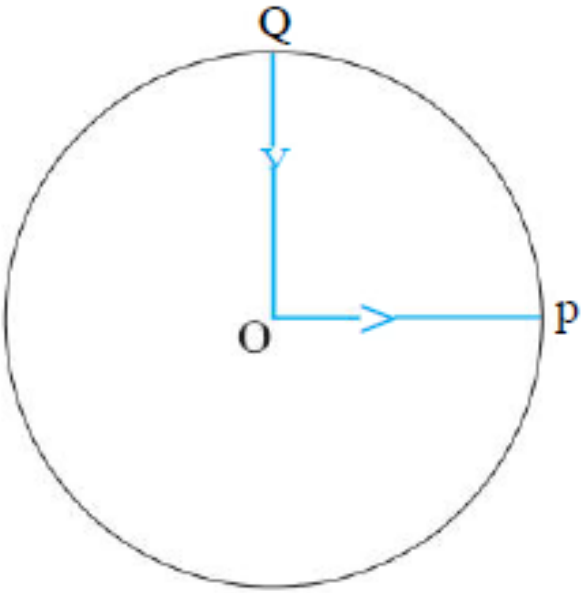
52. A cyclist starts from the centre Oof a circular park of radius 1 km, reaches the edge P of the park, then cycles along the circumference, and returns to the centre along QO as shown in Fig. 4.21. If the round trip takes 10 min, what is the:- average velocity, and



Watch Video Solution

53. 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 speed

of the cyclist ?



Watch Video Solution

54. 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.

Watch Video Solution

55. 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,

Watch Video Solution

Watch Video Solution

56. 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 ?

Watch Video Solution

57. Rain is falling vertically with a speed of $30ms^{-1}$. A woman rides a bicycle with a speed of $10ms^{-1}$ in

the north to south direction. What is the direction in which she should hold her umbrella ?

Watch Video Solution

58. A man can swim with a speed of $4.0 km / h$ in still water. How long does he take to cross a river 1.0 km wide if the river flows steadily at $3.0 km / h$ and he makes his strokes normal to the river current? How far down the river does he go when he reaches the other bank ?

Watch Video Solution

59. In a harbour, wind is blowing at the speed of $72km/h$ and the flag on the mast of a boat anchored in the harbour flutters along the N-E direction. If the boat starts moving at a speed of $51km/h$ to the north, what is the direction of the flag on the mast of the boat ?

Watch Video Solution

60. 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 ?

Watch Video Solution

61. 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 ?

Watch Video Solution

62. 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 ?

Watch Video Solution

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

Watch Video Solution

64. Read each statement below carefully and state, with reasons, if it is true or false :- The net acceleration of a particle in circular motion is always along the radius of the circle towards the centre

Watch Video Solution

65. Read each statement below carefully and state, with reasons, if it is true or false :- The velocity vector of a particle at a point is always along the tangent to the path of the particle at that point

Watch Video Solution

66. Read each statement below carefully and state, with reasons, if it is true or false :- The acceleration vector of a particle in uniform circular motion averaged over one cycle is a null vector

Watch Video Solution

67. The position of a particle is given by $r = 3.0t\hat{i} - 2.0t^2\hat{j} + 4.0\hat{k}m$ where tis in seconds and the coefficients have the proper units for r to be in metres:- Find the v and a of the particle?

Watch Video Solution

68. The position of a particle is given by $r = 3.0t\hat{i} - 2.0t^2\hat{j} + 4.0\hat{k}m$ where tis in seconds and the coefficients have the proper units for r to

be in metres:- What is the magnitude and direction of velocity of the particle at t = 2.0 s ?

Watch Video Solution

69. A particle starts from the origin at t = 0 s with a velocity of $10.0\hat{j}m/s$ and moves in the x-y plane with a constant acceleration of $\left(8.0\hat{i}+2.0\hat{j}\right)ms^{-2}$,:- At what time is the x- coordinate of the particle 16 m? What is the y-coordinate of the particle at that time?

Watch Video Solution

70. A particle starts from the origin at t = 0 s with a velocity of $10.0\hat{j}m/s$ and moves in the x-y plane with a constant acceleration of $\left(8.0\hat{i}+2.0\hat{j}\right)ms^{-2}$,:- What is the speed of the particle at the time ?

Watch Video Solution

71. $\hat{i}$ and $\hat{j}$ are unit vectors along x- and y- axis respectively. What is the magnitude and direction of the vectors $\hat{i}+\hat{j}$, and $\hat{i}-\hat{j}$? What are the components of a vector $A=2\hat{i}+3\hat{j}$ along the directions of $\hat{i}+\hat{j}$ and $\hat{i}-\hat{j}$? [You may use graphical method]

Watch Video Solution

72. For any arbitrary motion in space, which of the following relations are true :-

$v_a vera \geq = \left(\frac{1}{2}\right)(v(t_1)) + (v(t_2))$(The 'average' stands for average of the quantity over the time interval $t_1 \rightarrow t_2$)

Watch Video Solution

73. For any arbitrary motion in space, which of the following relations are true :-

$v_a vera \geq = \left[r(t_2) - r\frac{t_1}{t_2 - t_1}\right.$(The 'average'

stands for average of the quantity over the time interval $t_1 \rightarrow t_2$)

Watch Video Solution

74. For any arbitrary motion in space, which of the following relations are true :- $v(t) = v(O) + at$(The 'average' stands for average of the quantity over the time interval $t_1 \rightarrow t_2$)

Watch Video Solution

75. For any arbitrary motion in space, which of the following relations are true :- $r(t) = r(O) + v(O)t + \left(\frac{1}{2}\right)at^2$(The 'average' stands for average of the quantity over the time interval $t_1 \rightarrow t_2$)

Watch Video Solution

76. For any arbitrary motion in space, which of the following relations are true :- $a_averag\frac{v(t_2) - v(t_1)}{t_2 - t_1}$ (The 'average' stands for average of the quantity over the time interval $t_1 \rightarrow t_2$)

Watch Video Solution

Watch Video Solution

77. Read each statement below carefully and state, with reasons and examples, if it is true or false :-A scalar quantity is one that:- is conserved in a process

Watch Video Solution

78. Read each statement below carefully and state, with reasons and examples, if it is true or false :-A scalar quantity is one that:- can never take negative values

Watch Video Solution

79. Read each statement below carefully and state, with reasons and examples, if it is true or false :- A scalar quantity is one that:- must be dimensionless

Watch Video Solution

80. Read each statement below carefully and state, with reasons and examples, if it is true or false :- A scalar quantity is one that:- does not vary from one point to another in space

Watch Video Solution

81. Read each statement below carefully and state, with reasons and examples, if it is true or false :- A scalar quantity is one that:- has the same value for observers with different orientations of axes.

Watch Video Solution

82. An aircraft is flying at a height of 3400 m above the ground. If the angle subtended at a ground observation point by the aircraft positions 10.0 s apart is 30°, what is the speed of the aircraft ?

Watch Video Solution

83. A vector has magnitude and directions.Does it have a location in space? Can it vary with time ? Will two equal vectors $\vec{a}$ and $\vec{b}$ at different locations in space necessarily have identical physical effects? Give examples in supports for your answer.

Watch Video Solution

84. A vector has both magnitude and direction. Does it mean that anything that has magnitude and direction is necessarily a vector ?The rotation of a body can be specified by the direction of the axis of

rotation, and the angle of rotation about the axis. Does that make any rotation a vector ?

Watch Video Solution

85. Can you associate vectors with:- the length of a wire bent into a loop, Explain.

Watch Video Solution

86. Can you associate vectors with:- a plane area, Explain.

Watch Video Solution

87. Can you associate vectors with:-a sphere ? Explain.

Watch Video Solution

88. 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.

Watch Video Solution

89. A fighter plane flying horizontally at an altitude of 1.5 km with speed $720km/h$ passes directly overhead an anti-aircraft gun. At what angle from the vertical should the gun be fired for the shell with muzzle speed $600ms^{-1}$ to hit the plane ? At what minimum altitude should the pilot fly the plane to avoid being hit ? (Take g = $10ms^2$).

Watch Video Solution

90. A cyclist is riding with a speed of $27km/h$. As he approaches a circular turn on the road of radius 80 m, he applies brakes and reduces his speed at the

constant rate of $0.50 m / s$ every second. What is the magnitude and direction of the net acceleration of the cyclist on the circular turn ?

Watch Video Solution

91. Show that for a projectile the angle between the velocity and the x-axis as a function of time is given by

$$\theta(t) = \tan^{-1}\left[\frac{v_{oy} - gt}{v_{ox}}\right]$$

Watch Video Solution

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

Watch Video Solution

93. The angle between $\left(\hat{i}+\hat{j}\right)$ and $\left(\hat{i}-\hat{j}\right)$ is

A. 45°

B. 90°

C. -45°

D. 180°

Answer:

Watch Video Solution

94. f and h are function from A $\rightarrow$ B, where A = {a, b, c, d} and B = {s, t, u} defined as follows

f(a) = t, f (b) = s, f(c) = s

f(d) = u, h(a) = s, h(b) = t

h(c) = s, h(a) = u, h(d) = u

Which one of the following statement 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 negetive values.

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

D. A scalar quantity has the same value for observers with different orientation of the axes.

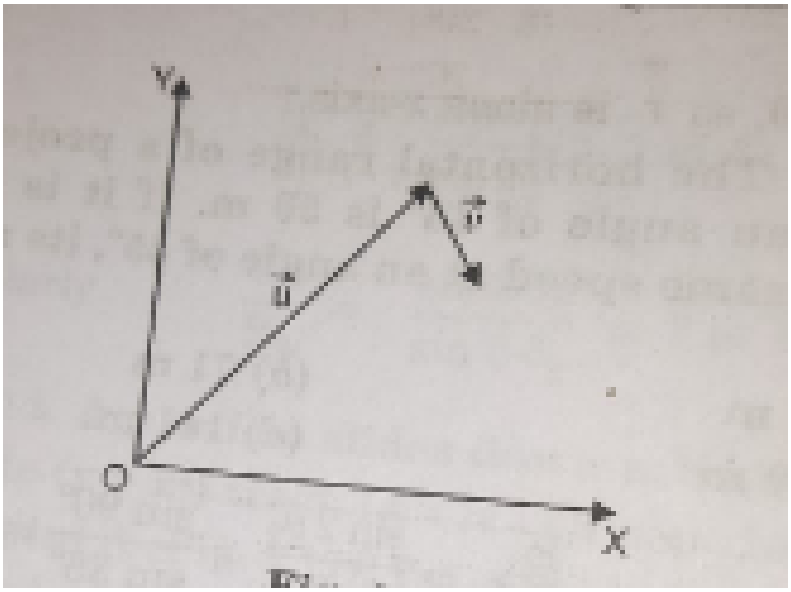
Answer:

95. Shown in the figure the orientation of two vectors $\overrightarrow{u}$ and $\overrightarrow{v}$ in the xy plane

if $\overrightarrow{u} = a\hat{i} + b\hat{j}$ and

$\overrightarrow{v} = p\hat{i} + q\hat{j}$

which of the following is correct?



A. a and p are positive while b and q are negetive

.

B. a,p and b are positive while q is negetive.

C. a,q and b are positive while q is negetive.

D. a,b,p and q are all positive.

Answer:

Watch Video Solution

96. The component of a vector $\hat{r}$ along x-axis will have maximum value if

A. $\vec{r}$ is along positive y-axis.

B. $\vec{r}$ is along positive x-axis.

C. $\vec{r}$ makes an angle of 45° with the x-axis.

D. $\vec{r}$ is along negetive y-axis.

Answer:

Watch Video Solution

97. The horizontal range of a projectile fired at an angle of 15° is 50 m. If it is fired at an angle of 45°, what will be its range?

A. 60 m

B. 71 m

C. 100 m

D. 141 m

Answer:

Watch Video Solution

98. 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:

Watch Video Solution

99. 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 acceleration must always vanish.

C. Displacements in equal time intervals are equal.

D. Equal path length are traversed in equal intervals.

Answer:

Watch Video Solution

100. Three vectors $\overrightarrow{A}$, $\overrightarrow{B}$ and $\overrightarrow{C}$ add up to zero. Find which is false.

A. $\left(\overrightarrow{A} \times \overrightarrow{B}\right) \times \overrightarrow{C}$ is not zero unless $\overrightarrow{B}$, $\overrightarrow{C}$ are paralle.

B. $\left(\overrightarrow{A} \times \overrightarrow{B}\right).\overrightarrow{C}$ is not zero unless $\overrightarrow{B}$, $\overrightarrow{C}$ are parallel.

C. If $\overrightarrow{A}$, $\overrightarrow{B}$, $\overrightarrow{C}$ define a plane, $\left(\overrightarrow{A} \times \overrightarrow{B}\right) \times \overrightarrow{C}$ is in that plane.

D. $\left(\overrightarrow{A} \times \overrightarrow{B}\right).\overrightarrow{C}$ = $\left|\overrightarrow{A}\right|\left|\overrightarrow{B}\right|\left|\overrightarrow{C}\right| \rightarrow C^2 = A^2 + B^2.$

Answer:

Watch Video Solution

101. It is found that $\left|\vec{A}+\vec{B}\right|=\left|\vec{A}\right|$.This necessarily implies:

A. $\vec{B}=0$

B. $\vec{A}$, $\vec{B}$ are antiparallel

C. $\vec{A}$, $\vec{B}$ are perpendicular

D. $\vec{A}-\vec{B}\leq 0$

Answer:

Watch Video Solution

102. Two particles are projected in air with speed v_0 at angles,θ_1 anad θ_2 (both acute) to the horizontal,respectively. If the height reached by the first particle is greater than that of the second,then tick the right choices.

A. angle of projection:$\theta_1 > \theta_2$

B. time of flight:$T_1 > T_2$

C. horizontal range:$R_1 > R_2$

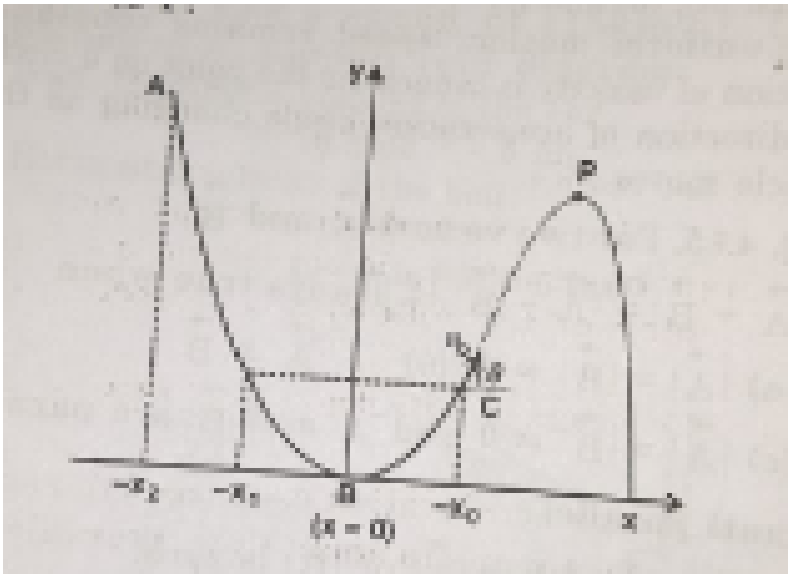
D. total energy:$U_1 > U_2$.

Answer:

Watch Video Solution

103. A particle slides down a frictional parabolic $\left(y = x^2\right)$track (A-B-C)starting from rest at point A (shown in the figure).Point B is at the vertex of parabola and point C is at a height less than that of point A.After C, the particle moves freely in air as a projectile. If the particle reaches highest point at

P,then



A. KE at P=KE at B

B. height at P=height at A

C. total energy at P = total energy at A

D. time of travel from A to B = time of travel from

B to P

Answer:

Watch Video Solution

104. Following are four different relations about displacement, velocity and acceleration for the motion of a particle in general. Choose the incorrect one (s):

A. $v_{av} = \frac{1}{2}[v(t_1) + v(t_2)]$

B. $v_{av} = [r(t_2) + r(t_1)]$

C. $r = \frac{1}{2}(v(t_2) - v(t_1))(t_2 - t_1)$

D. $a_{av} = \frac{v(t_2) - v(t_1)}{t_2 - t_1}$

Answer:

Watch Video Solution

105. For a particle performing uniform circular motion,choos the correct statement(s) from the following::

A. Magnitude of particle velocity (speed) remains constant.

B. Particle velocity remains directed perpendicular to radius vector.

C. Direction of acceleration keeps changing as particular moves.

D. Angular momentum is constant in magnitude but direction keeps changing.

Answer:

Watch Video Solution

106. For two vectors $\vec{A}$ and $\vec{B}$, $\left|\vec{A}+\vec{B}\right|=\left|\vec{A}-\vec{B}\right|$ is always true when

A. $\left|\vec{A}\right|=\left|\vec{B}\right|\neq 0$

B. $\vec{A} \perp \vec{B}$

C. $\left|\vec{A}\right| = \left|\vec{B}\right| \neq 0$ and $\vec{A}$ and $\vec{B}$` are parallel or anti parallel

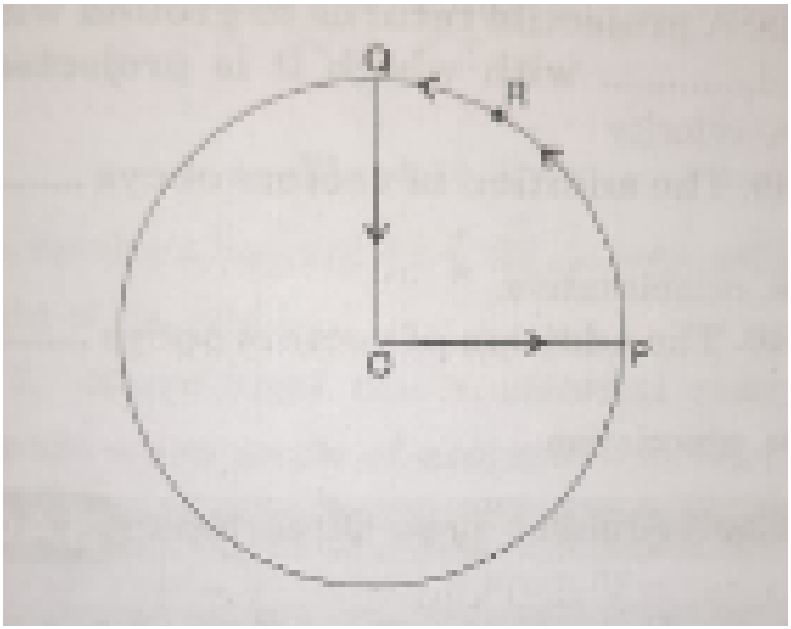
D. when either $\left|\vec{A}\right|$ or $\left|\vec{B}\right|$ is 0

Answer:

Watch Video Solution

107. A cyclist starats from centre O of a circular park of radius 1 km and moves along the path OPRQO as shown in the figure.If he maintains constant speed of $10ms^{-1}$, what is his acceleration at point R in

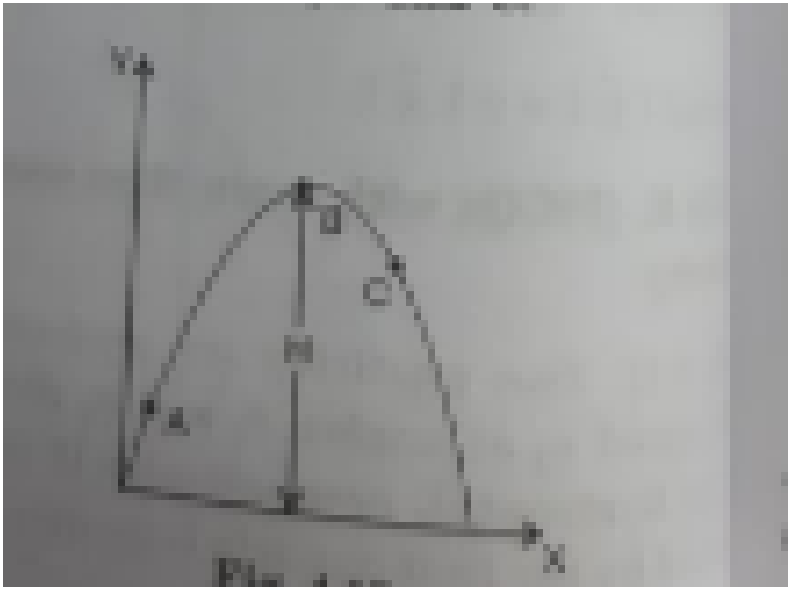
magnitude and direction?



Watch Video Solution

108. A particle is projected in air at some angle to the horizontal , moves along parabola shown in the figure where x and y indicate horizontal and verticle diections, respectively. Shown in the diagram,

direction of velocity and acceleration at point A,B and C.



Watch Video Solution

109. A ball is thrown from a roof top at an angle of 45° above the horizontal. If hits the ground a few second later. At what point during its motion , does

the ball have

Greatest speed.

Watch Video Solution

110. A ball is thrown from a roof top at an angle of 45° above the horizontal. If hits the ground a few second later. At what point during its motion , does the ball have

Smallest speed.

Watch Video Solution

111. A ball is thrown from a roof top at an angle of 45° above the horizontal. If hits the ground a few second later. At what point during its motion , does the ball have

Greatest acceleration?

Watch Video Solution

112. A football is kicked into the air vertically upwards.What is its

Acceleration.

Watch Video Solution

113. A football is kicked into the air vertically upwards.What is its

Velocity at the highest point.

Watch Video Solution

114. $\vec{A}$, $\vec{B}$ and $\vec{C}$ are three non-collinear,non co-planar vectors. What can you say about direction of $\vec{A} \times \left(\vec{B} \times \vec{C}\right)$?

Watch Video Solution

115. A boy travelling in an open car moving on a levelled road with constant speed tosses a ball vertically up in the air and catches it back. Sketch the motion of the ball as observed by a boy standing on the footpath . Give explanation to support your diagram.

Watch Video Solution

116. A boy throws a ball in air at 60° to the horizontal along a road with a speed of 10 m/s (36km/h). Another boy sitting in a passing by car observer the ball. Sketch the motion of the ball as

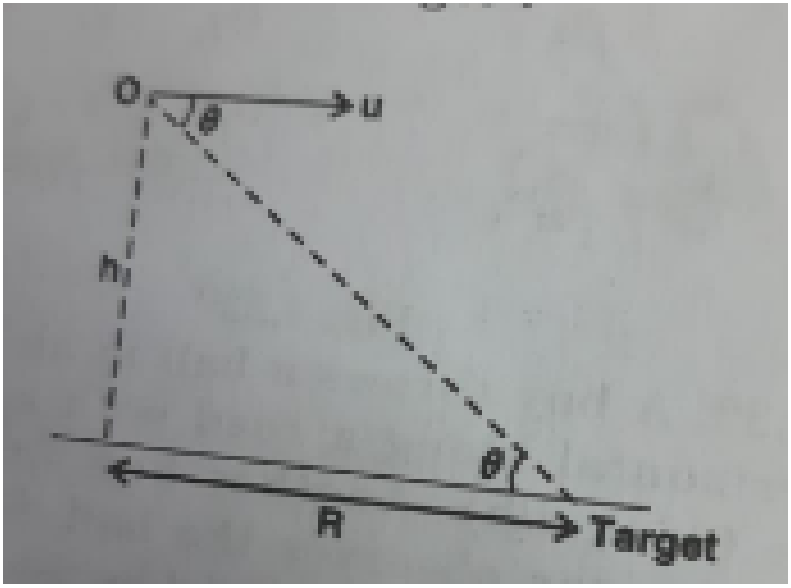
observed by the boy in the car,if car has a speed of (18km/h). Give explanation to support your diagram.

Watch Video Solution

117. In dealing with motion of projectile in air, we ignore effect of air resistance on motion.This gives trajectory as a parabola as you have studied. What would the trajectory look like if air resistance is included? Sketch such a trajectory and explain why you have drawn it that way.

Watch Video Solution

118. A fighter plane is flying horizontally at an altitude of 1.5 km with speed 720 km//h.At what angle of sightb (w.r.t.horizontal),when the target is seen,should the pilot drop the bomb in order to attack the target?



Watch Video Solution

119. Earth can be thought of as a sphere of radius 6400 km.Any object (or a person) is pewrforming circular motion around the axis of the earth due to the earth rotation (period 1 day). What is acceleration of object on the surface of the earth (at equator) towards its centre? What is it at latitude θ? How does these acceleration compare with $g = 9.8m / s^2$?

Watch Video Solution

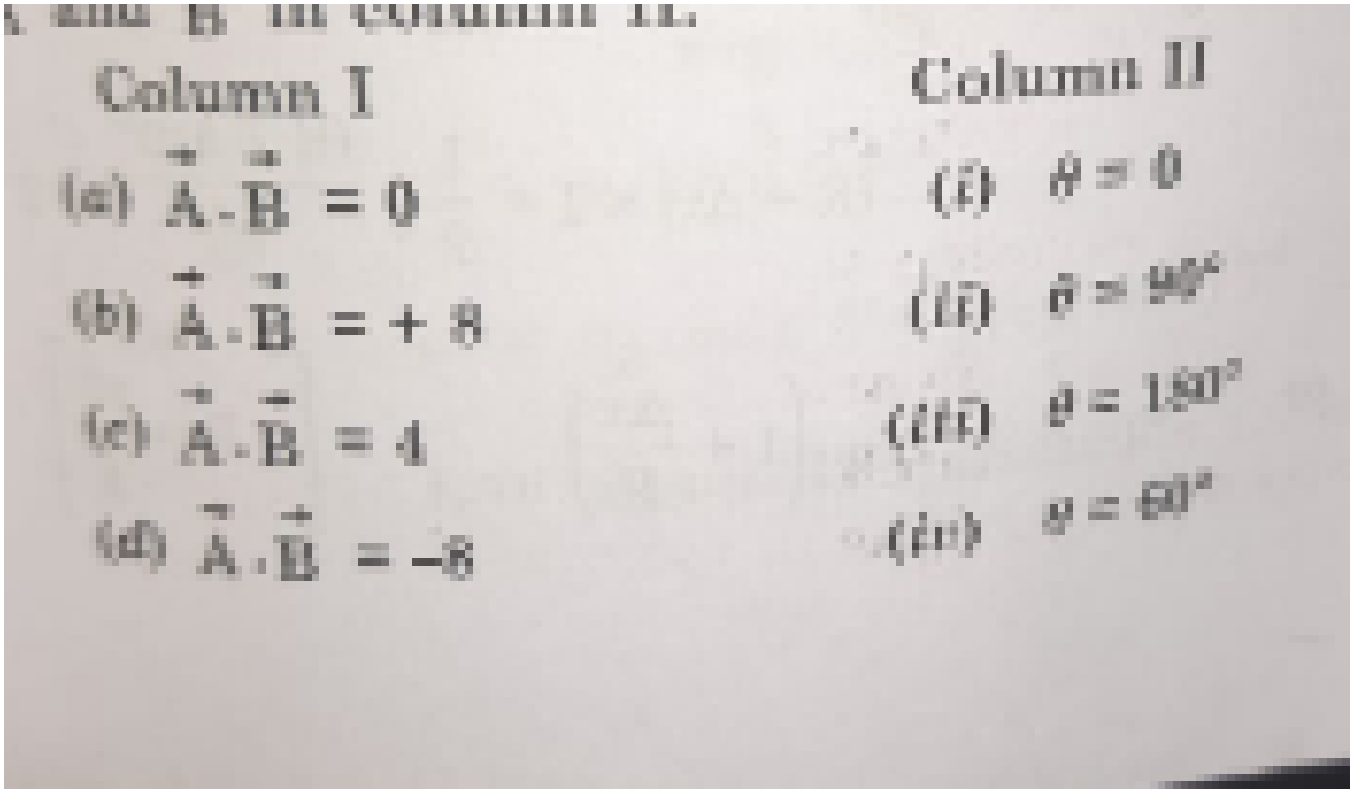
120. Earth also moves in circular orbit around the sun once every year with an orbital radius of

$1.5 \times 10^{11} m$. What is the accerelation of the earth (or any object on the surface of the earth) towards the centre of the sun? How does this acceleration compare with $g = 9.8 m / s^2$?

Watch Video Solution

121. If $\left|\vec{A}\right| = 2$ and $\left|\vec{B}\right| = 4$, then match the relation in column I with the angle θ between $\vec{A}$

and $\vec{B}$ in column II.



Column I	Column II
(a) $\vec{A} \cdot \vec{B} = 0$	(i) $\theta = 0$
(b) $\vec{A} \cdot \vec{B} = +8$	(ii) $\theta = 90^\circ$
(c) $\vec{A} \cdot \vec{B} = 4$	(iii) $\theta = 180^\circ$
(d) $\vec{A} \cdot \vec{B} = -8$	(iv) $\theta = 60^\circ$

Watch Video Solution

122. If $\left|\overrightarrow{A}\right| = 2$ and $\left|\overrightarrow{B}\right| = 4$, then match the relation in column I with the angle θ between $\overrightarrow{A}$ and $\overrightarrow{B}$ in column II .

Column I	Column II
(a) $\lvert\vec{A} \times \vec{B}\rvert = 0$	(i) $\theta = 30°$
(b) $\lvert\vec{A} \times \vec{B}\rvert = 8$	(ii) $\theta = 45°$
(c) $\lvert\vec{A} \times \vec{B}\rvert = 4$	(iii) $\theta = 90°$
(d) $\lvert\vec{A} \times \vec{B}\rvert = 4\sqrt{2}$	(iv) $\theta = 0°$

Watch Video Solution

123. A hill is 500 m high. Supplies are to be sent across the hill using a canon that can hurl packets

at a speed of 125 m//s over the hill. The canon is located at a distance of 800m from the foot of hill and can be moved on the ground at ba speed of 2 m//s, so that its distance from the hill can be adjusted. What is the shortest time in which a packet can reach on the ground across the hill? Take $g = 10m / s^2$.

Watch Video Solution

124. A girl riding a bicycle with a speed of 5m/s towards north direction, observer rain falling vertically down. If she increass her speed to 10 m//s,

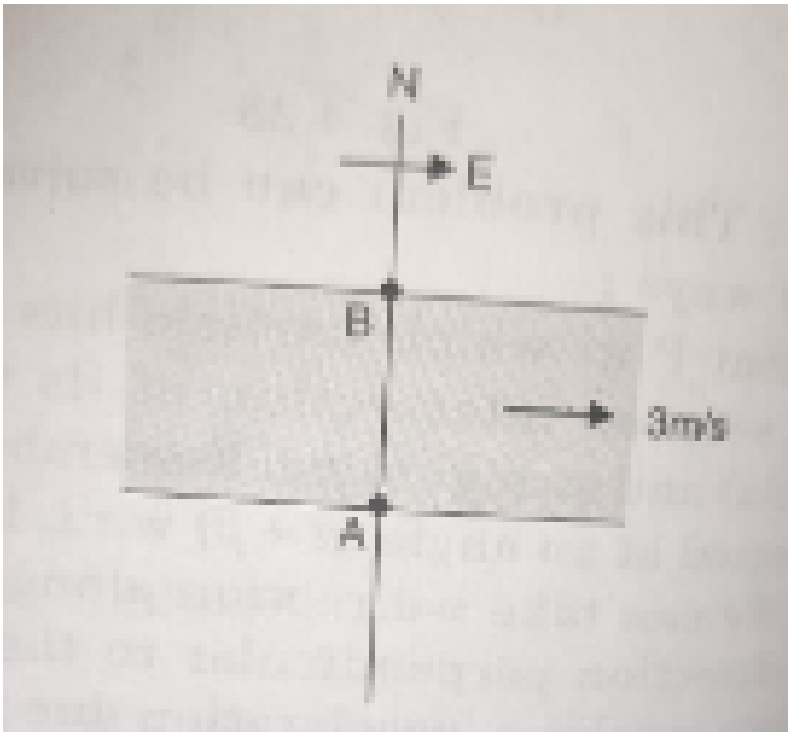
rain appear to meet her at 45° to the vertical. What is the speed of the rain?

Watch Video Solution

125. A river is flowing due east with a speed 3m/s. Swimmer can swim in still water at a speed of 4 m//s (shown in the figure)

If swimmer starts swimming due north, what wil be

his resultant velocity (magnitude and direction).



Watch Video Solution

126. A river is flowing due east with a speed 3m/s. Swimmer can swim in still water at a speed of 4 m//s

If he wants to start from pont A on south bank and reach opposite point B on north bank.

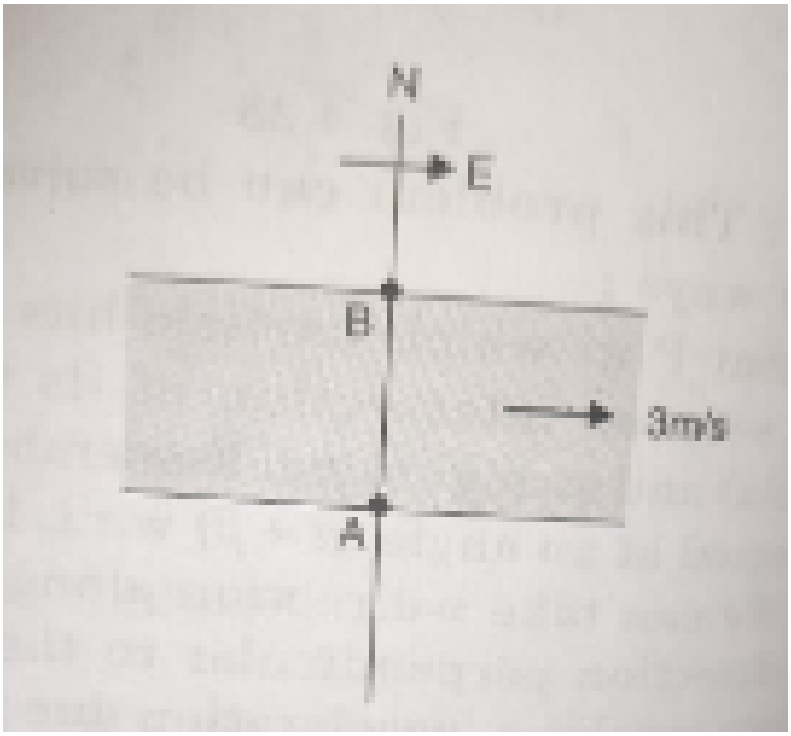
Which direction should he swim.

Watch Video Solution

127. A river is flowing due east with a speed 3m/s. Swimmer can swim in still water at a speed of 4 m//s (shown in the figure)

If he wants to start from pont A on south bank and reach opposite point B on north bank.

What will be his resultant speed?

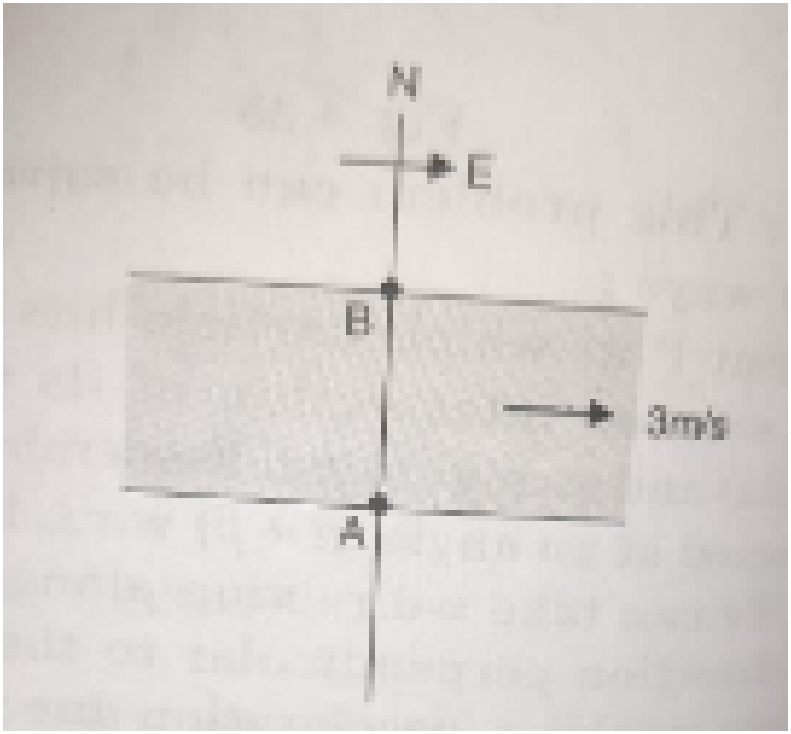


Watch Video Solution

128. A river is flowing due east with a speed 3m/s. Swimmer can swim in still water at a speed of 4 m//s (shown in the figure)

If he wants to start from pont A on south bank and reach opposite point B on north bank.

What will be his resultant speed?



Watch Video Solution

129. A cricketer fielder can throw the cricket ball with a speed v_0. If he throw the ball while running with speed u at an angle θ to the horizontal,find the effective angle to the horizontal at which the ball is projected in air as seen by a spectator.

Watch Video Solution

130. A cricketer fielder can throw the cricket ball with a speed v_0. If he throw the ball while running with speed u at an angle θ to the horizontal,find what will be time of flight.

Watch Video Solution

131. A cricketer fielder can throw the cricket ball with a speed v_0. If he throw the ball while running with speed u at an angle θ to the horizontal,find what will be time of flight.

Watch Video Solution

132. A cricketer fielder can throw the cricket ball with a speed v_0. If he throw the ball while running with speed u at an angle θ to the horizontal,find what will be time of flight.

Watch Video Solution

133. A cricketer fielder can throw the cricket ball with a speed v_0. If he throw the ball while running with speed u at an angle θ to the horizontal,find what will be time of flight.

Watch Video Solution

134. A cricketer fielder can throw the cricket ball with a speed v_0. If he throw the ball while running with speed u at an angle θ to the horizontal,find what will be time of flight.

Watch Video Solution

135. Motion in two dimensions, in a plane can be studied by expressing position, velocity and acceleration as vector in Cartesian co-ordinates $\overrightarrow{A} = A_x\hat{i} + A_y\hat{j}$ where $\hat{i}$ and $\hat{j}$ are unit vectors along x and y directions. respectively and A_x and A_y are corresponding components of $\overrightarrow{A}$ (shown in the figure).Motion can also be studied by expressing vector in circular polar co-ordinates as $\overrightarrow{A} = A_r\hat{r} + A_\theta\hat{\theta}$ where $\hat{r} = \dfrac{\overrightarrow{r}}{r} = \cos\theta\hat{i} + \sin\theta\hat{j}$ and $\hat{\theta} = -\sin\theta\hat{i} + \cos\theta\hat{j}$ are unit vectors along

dirction in which 'r' and $'\theta'$ are increasing.

Express $\hat{i}$ and $\hat{j}$ in terms of $\hat{r}$ and $\hat{\theta}$.

Watch Video Solution

136. Motion in two dimensions, in a plane can be studied by expressing position, velocity and acceleration as vector in Cartesian co-ordinates $\vec{A} = A_x\hat{i} + A_y\hat{j}$ where $\hat{i}$ and $\hat{j}$ are unit vectors along x and y directions. respectively and A_x and A_y are corresponding components of $\vec{A}$ (shown in the figure).Motion can also be studied by expressing vector in circular polar co-ordinates as

$\vec{A} = A_r\hat{r} + A_\theta\hat{\theta}$ where $\hat{r} = \dfrac{\vec{r}}{r} = \cos\theta\hat{i} + \sin\theta\hat{j}$ and $\hat{\theta} = -\sin\theta\hat{i} + \cos\theta\hat{j}$ are unit vectors along dirction in which 'r' and $'\theta'$ are increasing.

Express $\hat{i}$ and $\hat{j}$ in terms of $\hat{r}$ and $\hat{\theta}$.

Watch Video Solution

137. Motion in two dimensions, in a plane can be studied by expressing position, velocity and acceleration as vector in Cartesian co-ordinates $\vec{A} = A_x\hat{i} + A_y\hat{j}$ where $\hat{i}$ and $\hat{j}$ are unit vectors along x and y directions. respectively and A_x and A_y are corresponding components of $\vec{A}$ (shown in

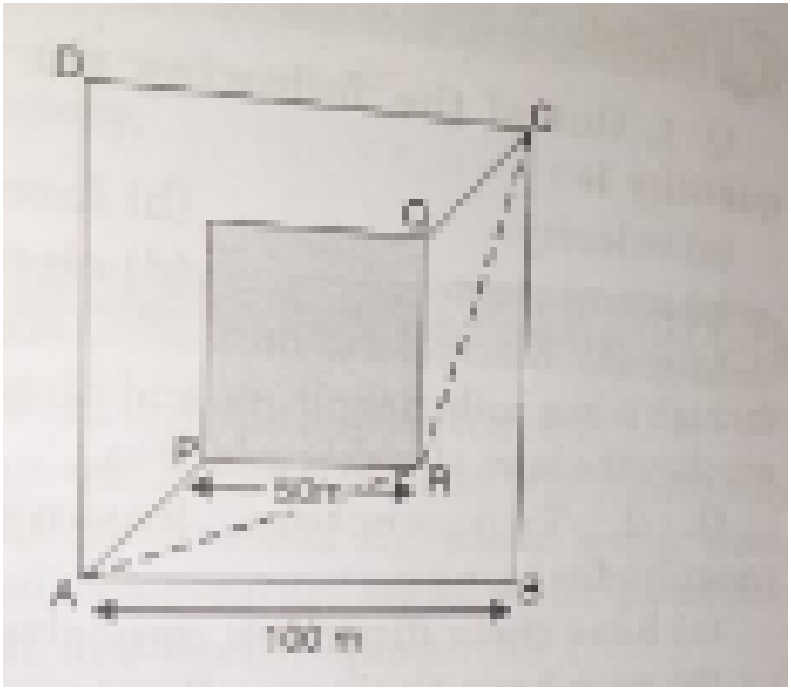
the figure).Motion can also be studied by expressing vector in circular polar co-ordinates as $\vec{A} = A_r\hat{r} + A_\theta\hat{\theta}$ where $\hat{r} = \frac{\vec{r}}{r} = \cos\theta\hat{i} + \sin\theta\hat{j}$ and $\hat{\theta} = -\sin\theta\hat{i} + \cos\theta\hat{j}$ are unit vectors along dirction in which 'r' and $'\theta'$ are increasing.

Show that $\frac{d}{dt}(\hat{r}) = \omega\hat{\theta}$ where $\omega = \frac{d\theta}{dt}$ and $\frac{d}{dt}\left(\hat{\theta}\right) = -\omega\hat{r}$.

Watch Video Solution

138. A man wants to reach from A to the opposite corner of square C (shown in the figure) . The sides of the square are 100m.A central square of

$50m \times 50m$ is filled with sand. Outside this square, he can walk at a speed 1 m/s. In the central square, he can walk only at a speed of v m/s (v>1). What is smallest value of v for which he can reach faster via a straight path through the sand than any path in the square outside the sand.



Watch Video Solution

139. Out of the following the only scalar quantity is:

A. velocity

B. force

C. momentum

D. electric current

Answer:

Watch Video Solution

140. Two vectors having different magnitudes:

A. have their direction opposite

B. may have their resultant zero

C. cannot have their resultant zero

D. none of the above

Answer:

Watch Video Solution

141. What happens,when we multiply a vector by -2 ?

A. Directions reverses and unit changes

B. Direction reverses and magnitude is doubled

C. Direction remains unchanged but unit changes

D. Neither direction reverses nor unit changes but magnitude is doubled.

Answer:

Watch Video Solution

142. The vector sum of N coplanar forces each of magnitude F, when each force is making an angle of $2\frac{\pi}{N}$ with that preceding it, is

A. F

B. $N\frac{F}{2}$

C. NF

D. zero

Answer:

Watch Video Solution

143. Which of the following cannot be resiultant of the vector of magnitude 5 and 10?

A. 7

B. 8

C. 5

D. 2

Answer:

Watch Video Solution

144. Which of the following equation is definitely wrong?

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

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

C. $\overrightarrow{A} + \overrightarrow{C} = \overrightarrow{D}$

D. $\overrightarrow{B} + \overrightarrow{C} = \overrightarrow{E}$

Answer:

Watch Video Solution

145. Two quantities A and B have different dimensions.Which mathematical operation given below is physically meaningful?

A. A/B

B. A+B

C. A-B

D. None

Answer:

Watch Video Solution

146. A particle revolves round a circular path.The centripetal acceleration of the particle is inversely proportional to:

A. radius of the path

B. velocity of particle

C. mass of the particle

D. both (b) and (c)

Answer:

 Watch Video Solution

147. In projectile motion , if air resistance is ignored, the horizontal motion takes place with:

A. constant acceleration

B. constant velocity

C. variable acceleration

D.

Answer: constant retardation

148. A stone is dropped from a running train willl hit the ground following a:

A. parabolic path

B. straight path

C. elliptical path

D. circular path.

Answer:

Watch Video Solution

149. 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

150. For two vectors $\vec{A}$ and $\vec{B}$, $\left|\vec{A}+\vec{B}\right| = \left|\vec{A}-\vec{B}\right|$ is always true when

A. 0°

B. 90°

C. 60°

D. 180°

Answer:

Watch Video Solution

151. An object is thrown along a direction inclined at an angle of 45° with the horizontal direction. The horizontal range of the particle is equal to

A. vertical height

B. twice the vertical height

C. thrice the vertical height

D. four times the vertical height.

Answer:

Watch Video Solution

152. A number of bullets are filled in all directions with the same initial velocity u. The maximium area of ground covered by bullets is:

A. $\frac{\pi u^2}{g^2}$

B. $\frac{\pi u^2}{4g^2}$

C. $\frac{\pi u^4}{g^2}$

D. $\frac{\pi u^4}{4g^2}$

Answer:

 Watch Video Solution

153. Velocity of a body reaching the point from which it was projected upwards is

A. $v=0.54$

B. $v=0$

C. $v=24$

D. $v=u$

Answer:

Watch Video Solution

154. Fill in the blanks:

A unit vector is _____and _____vector.

Watch Video Solution

155. Fill in the blanks:

A zero vector is represented by ____.

Watch Video Solution

156. Fill in the blanks:

Velocity vector of a stationary particle is a _____

vector.

Watch Video Solution

157. Fill in the blanks:

Walking of a man is an example of _____ of forces.

Watch Video Solution

158. Fill in the blanks:

The path followed by a projectile is called its _____.

Watch Video Solution

159. What are scalar quantities?

Watch Video Solution

160. What are vector quantities?

Watch Video Solution

161. What is the resultant vector?

Watch Video Solution

162. What is equilibriant vector?

Watch Video Solution

163. Why is zero vector needed?

Watch Video Solution

164. What is unit vector?

Watch Video Solution

165. What is a negetive vector?

Watch Video Solution

166. What is meant by resolution of a vector?

Watch Video Solution

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

Watch Video Solution

168. Can the sum of two vectors can be scalar? Can it be numeric?

Watch Video Solution

169. If $\vec{a}$ and $\vec{b}$ are two vectors, can $\vec{a} + \vec{b}$ be equal to zero?

Watch Video Solution

170. The sum and difference of two vectors are equal in magnitude. What conclusion do you draw from this?

Watch Video Solution

171. Can a vector change with time? Give one example.

Watch Video Solution

172. What is meant by projectile and trajectory?

Watch Video Solution

173. What is the need for vectors?

Watch Video Solution

174. A vector has both magnitude and direction. Does it mean that anything that has magnitude and direction is necessarily a vector ?The rotation of a body can be specified by the direction of the axis of rotation, and the angle of rotation about the axis. Does that make any rotation a vector ?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

177. Why is zero vector needed?

Watch Video Solution

178. What is the physical meaning of zero vector?

Watch Video Solution

179. State the properties of vector addition.

Watch Video Solution

180. What is meant by angular displacement?

Watch Video Solution

181. Define the terms time period and frequency of an oscillating body. Give their units and write the relation between them.

Watch Video Solution

182. What is the relation between angular velocity ω, frequenct v and time period T?

Watch Video Solution

183. What is radial force?

Watch Video Solution

184. Can there be motion in two dimensions with an acceleration only in one dimension?

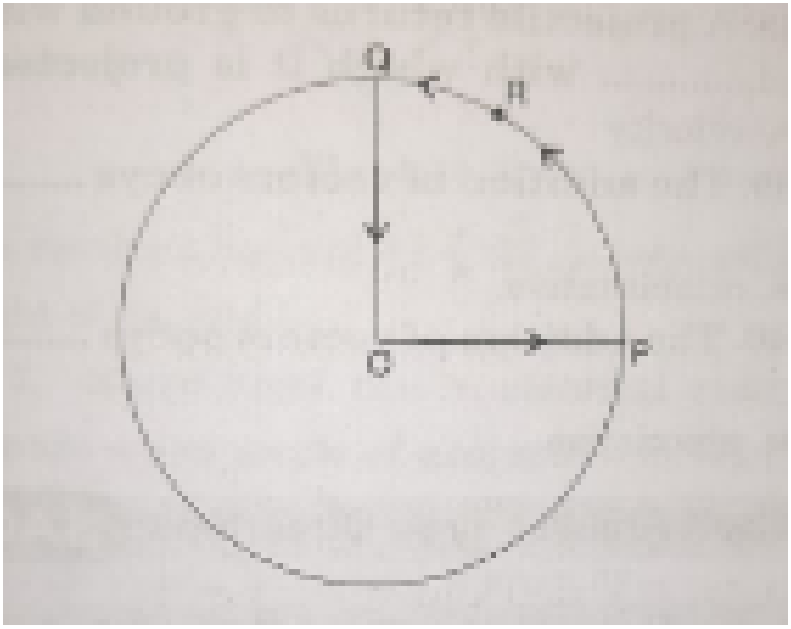
Watch Video Solution

185. What is an angular acceleration? Give its unit and dimensions.

Watch Video Solution

186. A cyclist starats from centre O of a circular park of radius 1 km and moves along the path OPRQO as

shown in the figure.If he maintains constant speed of $10ms^{-1}$, what is his acceleration at point R in magnitude and direction?



Watch Video Solution

187. A ball is thrown from a roof top at an angle of 45° above the horizontal. If hits the ground a few

second later. At what point during its motion , does the ball have

Greatest speed.

Watch Video Solution

188. A ball is thrown from a roof top at an angle of 45° above the horizontal. If hits the ground a few second later. At what point during its motion , does the ball have

Smallest speed.

Watch Video Solution

189. A ball is thrown from a roof top at an angle of 45° above the horizontal. If hits the ground a few second later. At what point during its motion , does the ball have

Greatest acceleration?

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

193. A vector divided by its magnitude is called a_____ vector.

Watch Video Solution

194. ____ is the process of splitting of a vector into two or more vectors.

Watch Video Solution

195. Fill in the blanks:

The path followed by a projectile is called its _____.

Watch Video Solution

196. Velocity of a body reaching the point from which it was projected upwards is

Watch Video Solution

197. A projectile returns to ground with the same_____with which it is projcted.

Watch Video Solution

198. State the properties of vector addition.

Watch Video Solution

199. State the properties of vector addition.

Watch Video Solution

200. Can we multiply a vector by a real number?

Watch Video Solution

201. Define unit vector.

Watch Video Solution

202. What is null (or zero) vector? What are its characterstics and what is the physical meaning of null vector?

Watch Video Solution

203. Can a vector be multiplied with both dimensional and non- dimensional scalars?

Watch Video Solution

204. The magnitude of the resultant of vectors $\vec{P}$ and $\vec{Q}$ is given by $R^2 = P^2 + Q^2$.What is the angle

between $\overrightarrow{P}$ and $\overrightarrow{Q}$.

Watch Video Solution

205. Is the flying of a bird an example of parallelogram law of addition of vectors?Explain.

Watch Video Solution

206. Show that the horizontal range is maximum when angle of projection is 45°.

Watch Video Solution

207. Show that there are two angles of projections for a projectile to have same horizontal range.

Watch Video Solution

208. The time of flight of a body projected with initial velocity u at an angle θ is T. What will be th time of flight if thebody is projected with same velocity at an angle $(90^\circ - \theta)$?

Watch Video Solution

209. Show that maximum horizontal range is 4 times the maximum height attained by the projectile.

Watch Video Solution

210. Explain the working a sling on the basis of a parallelogram law of addition of vector.

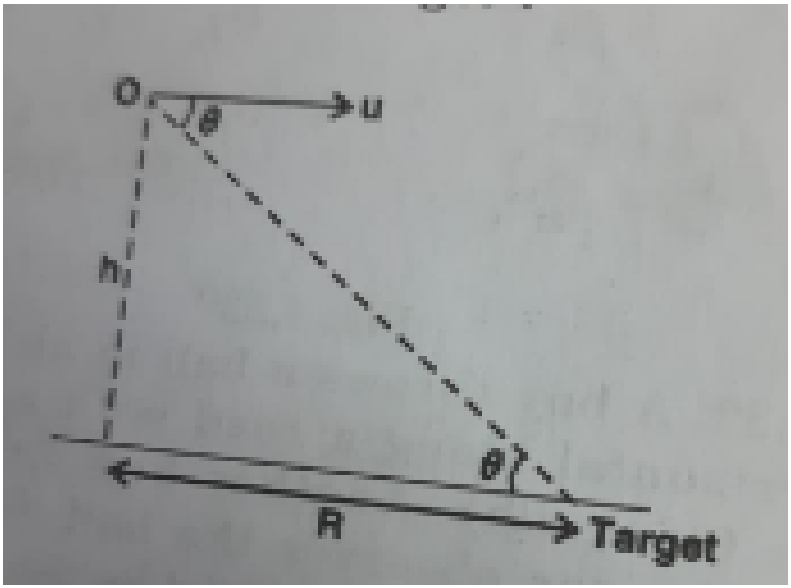
Watch Video Solution

211. Show that for elevation which exced or fall short of 45° by equal amount,the range is equal.

Watch Video Solution

212. A fighter plane is flying horizontally at an altitude of 1.5 km with speed 720 km//h.At what angle of sightb (w.r.t.horizontal),when the target is seen,should the pilot drop the bomb in order to

attack the target?



Watch Video Solution

213. Distinguish between scalar and vector quantities.Give examples.

Watch Video Solution

214. How is a vector represented graphically? How is it written?

Watch Video Solution

215. Define position vector and displacement vector in two dimensions.

Watch Video Solution

216. What is the resultant vector?

Watch Video Solution

217. Explain the working a sling on the basis of a parallelogram law of addition of vector.

Watch Video Solution

218. What is resultant of two vectors inclined at an angle θ.

Discuss when $\theta = 0, \pi$and $\frac{\pi}{2}$ radian.

Watch Video Solution

219. Show that vector addition is commutative.

Watch Video Solution

220. What do you mean by vector subtraction?

Watch Video Solution

221. State Polygon law of vector addition and prove it using Triangle law of vector addition.

Watch Video Solution

222. Define and explain scalar product or dot product of two vectors.Give geometrical interpretation of dot product.

Watch Video Solution

223. Give the characteristics of the dot product.

Watch Video Solution

224. Give an example of scalar product.

Watch Video Solution

225. What is meant by vector product or cross product of two vectors?

Watch Video Solution

226. What are the properties of cross product?

Watch Video Solution

227. What is meant by resolution of a vector?

Watch Video Solution

228. Resolve a given vector into two rectangular (or orthogonal) components(i.e. in a plane)

Watch Video Solution

229. Resolve a given vector into three rectangular components (in space i.e. In three dimensions)

Watch Video Solution

230. Show that the rectangular components of displacement vectors are the differences of the

rectangular components of the position vector at two instants.

Watch Video Solution

231. Find the displacement of a particle after certain time in two dimensions moving with uniform velocity.

Watch Video Solution

232. $\vec{r} = \vec{r}_0 + \vec{v}t$ and hence derive the relation $x = x_0 + v_x t$ and $y = y_0 + v_y t$.

Watch Video Solution

233. What is a projectile? What do you understand by trajectory? Show that motion of a projectile fired horizontally is a prabola.

Watch Video Solution

234. 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.

Watch Video Solution

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

Watch Video Solution

236. Show that $v=r\omega$.

Watch Video Solution

237. Derive the relation between linear acceleration and angular velocity.

Watch Video Solution

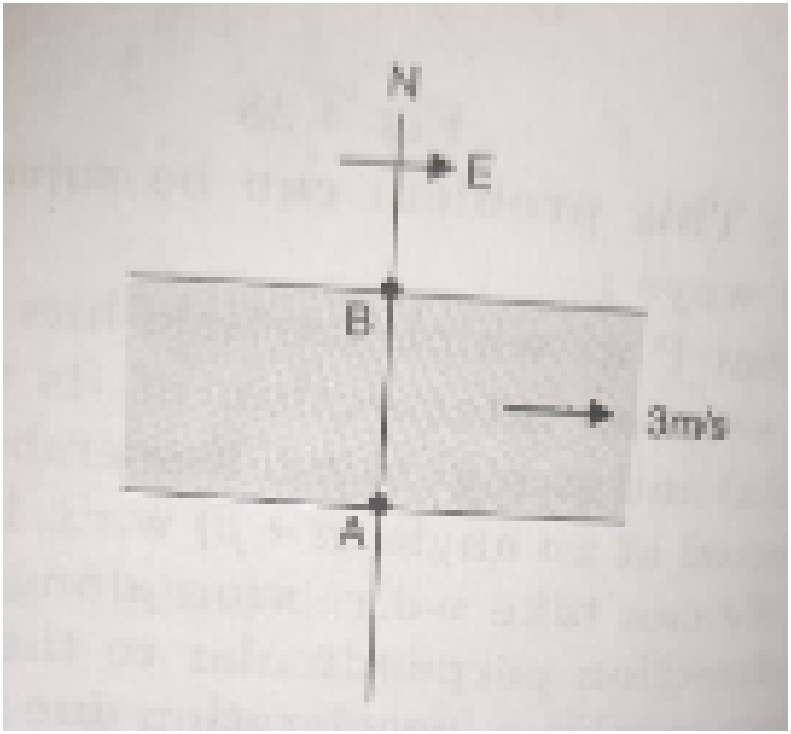
238. Show that $a = r\omega^2$.

Watch Video Solution

239. A river is flowing due east with a speed 3m/s. Swimmer can swim in still water at a speed of 4 m//s (shown in the figure)

If he wants to start from pont A on south bank and reach opposite point B on north bank.

What will be his resultant speed?



Watch Video Solution

240. A man travels 30m due north on a straight road and reaches a road junction. He then turns through 90° towards th east and moves 40m straight.Find

what is the distance travelled.

Watch Video Solution

241. A man travels 30m due north on a straight road and reaches a road junction. He then turns through 90° towards th east and moves 40m straight.Find what is the displacement?

Watch Video Solution

242. An aeroplane is in level flight at 144 km per hour at an altitude of 1000m. How far from a given targets should it release a bomb sa as to hit the target?

Watch Video Solution

243. A bomb is dropped from an aircraft when it is directly above a target at a height of 1000 km. The aircraft is moving with a velocity of 500 km/hr. Will the bomb hit the target? If not, by how much distance will the bomb miss the target?

Watch Video Solution

244. An aeroplane by the flying horizontally with a speed of $72kmh^{-1}$ releases a bomb at a height of 1000m. Find the time taken by the bomb to reach the ground.

Watch Video Solution

245. The angular elevation of an enemies position on a hill of height 'h' is α. Show that in order to hit a shell on it, the initial velocity 'u' of projection

should not be less than $\sqrt{(gh(1+\cos ec\alpha))}$ where g is acceleration due to gravity.

Watch Video Solution

246. An object is covering distance in direct proporiton to t^3, where t is the time elapsed.

What conclusions might you draw about the acceleration ? Is it constant or increasing or decreasing or zero?

Watch Video Solution

247. An object is covering distance in direct proporiton to t^3, where t is the time elapsed. What might you conlcude about the force acting on the object?

Watch Video Solution

248. $\vec{A} = -2\hat{i} + 3\hat{j} - 4\hat{k}$ and $\vec{B} = 3\hat{i} - 4\hat{j} + 5\hat{k}$ where, $\hat{i}$, $\hat{j}$ and $\hat{k}$ are unti vectors along x,y and axes respectively. Find $\vec{A} + \vec{B}$, $\vec{A} - \vec{B}$, $\vec{A} . \vec{B}$ and $\vec{A} \times \vec{B}$.

Watch Video Solution

249. Find a unit vector that is perendicular to both $\overrightarrow{A}$ and $\overrightarrow{B}$ where $\overrightarrow{A} = 2\hat{i} + \hat{j} + \hat{k}$ and $\overrightarrow{B} = \hat{i} - \hat{j} + 2\hat{k}$.

Watch Video Solution

250. A ball is thrown from a roof top at an angle of 45° above the horizontal. If hits the ground a few second later. At what point during its motion , does the ball have

Smallest speed.

Watch Video Solution

251. A ball is projected from O with an intial velocity 700 cm/s in a direction 37° above the horizotal. A ball B, 500 cm away from O on the line of the intial velocity of A, is released from rest at the instant A is projected. Find

the direction and magnitude of the velocity A at the time of impact.

$[giveng = 10m/s^2, \sin 37^\circ = 0.6 \text{ and } \cos 37^\circ = 0.8]$

Watch Video Solution

Exercise

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

Watch Video Solution

2. Can we divide a vector by vector?

Watch Video Solution

3. Can scalar product of two vectors be negetive?

Watch Video Solution

4. What is position vector of origin?

Watch Video Solution

5. Can we subtract the vector from zeero vector?

Watch Video Solution

6. For two vectors $\vec{A}$ and $\vec{B}$,

$\left|\vec{A}+\vec{B}\right|=\left|\vec{A}-\vec{B}\right|$ is always true when

Watch Video Solution

7. Define unit vector.

Watch Video Solution

8. When can the resultant vector be zero?

Watch Video Solution

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

Watch Video Solution

10. Show that the range of a projectile for two angles α and β is the same where $\alpha + \beta = 90^\circ$.

Watch Video Solution

11. What is centripetal acceleration? Derive an expression for it in terms of constant speed of the body.

Watch Video Solution

12. A stone thrown horizontally falls on the ground after 0.5 second at a distance of 5m from where it was thrown.

From what height was it thrown?

Watch Video Solution

13. A stone thrown horizontally with velocity u, falls on the ground after 0.5 second at a distance of 5m from where it was thrown.The velocity of the stone 0.5s later is 3u/2

What was the initial velocity?

Watch Video Solution

14. A stone thrown horizontally falls on the ground after 0.5 second at a distance of 5m from where it was thrown.

From what height was it thrown?

Watch Video Solution

15. A stone thrown horizontally falls on the ground after 0.5 second at a distance of 5m from where it was thrown.

What angle was formed by the trajectory of the stone with the ground? $\left(g = 10ms^{-2}\right)$

Watch Video Solution

16. What is resultant of two vectors inclined at an angle θ.

Discuss when $\theta = 0, \pi$and $\frac{\pi}{2}$ radian.

Watch Video Solution

17. A projectile is fired with velocity making an angle θ with the horizontal. Show that it follows a parabolic trajectory. Obtain an expression for the maximum height attained by it.

Watch Video Solution

Watch Video Solution