PHYSICS

BOOKS - AAKASH SERIES

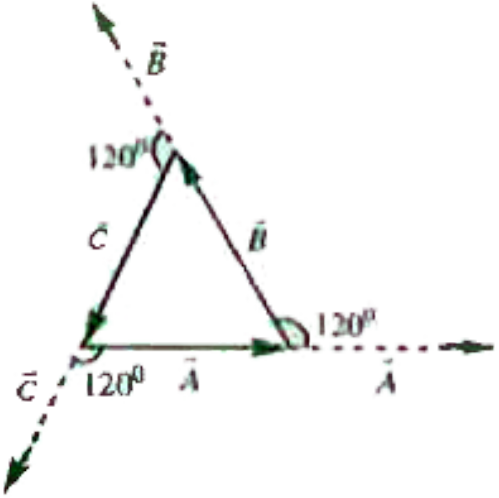
MOTION IN A PLANE

Problem

1. Three vectors $\vec{A}$, $\vec{B}$, $\vec{C}$ are shown in the figure. Find angle between (i) $\vec{A}$ and $\vec{B}$ (ii) $\vec{B}$ and $\vec{C}$, (iii) $\vec{A}$ and $\vec{C}$

Watch Video Solution

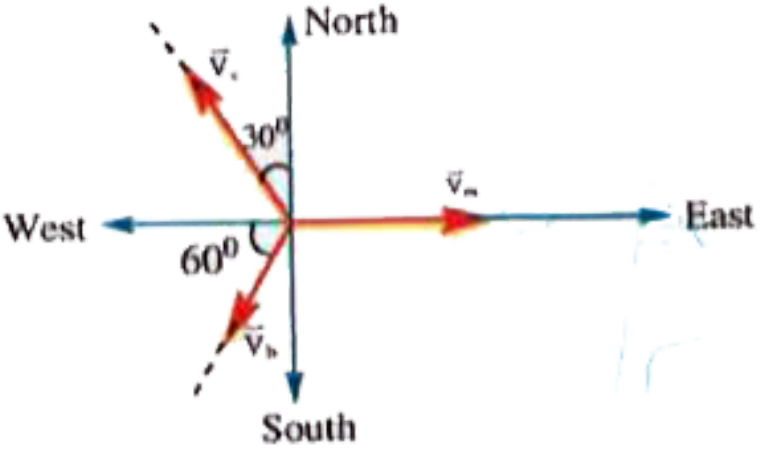
2. If $\vec{A}, \vec{B}, \vec{C}$ represents the three sides of an equilateral triangle taken in the same order then find the angle between (i) $\vec{A}$ and $\vec{B}$ $(ii)\vec{B}$ and $\vec{C}$ $(iii)A$ and $\vec{C}$.



Watch Video Solution

3. A man walks east with certain velocity .A car is travelling along a road which is 30° west of north . While a bus is travelling in another road which is 60° south of west . Find the angle between velocity vector of (a)

man and car (b) car and bus (c) bus and man



Watch Video Solution

4. A vector A makes on angle 30° with the y-axis in anticlockwise direction. Another vector B makes on angle 30° with the x-axis in clockwise direction. Find angle between yectors A and B.

Watch Video Solution

5. A vector $\sqrt{3}\hat{i}+\hat{j}$ rotates about its tail through an angle 30° in clock wise direction then the new vector is

Watch Video Solution

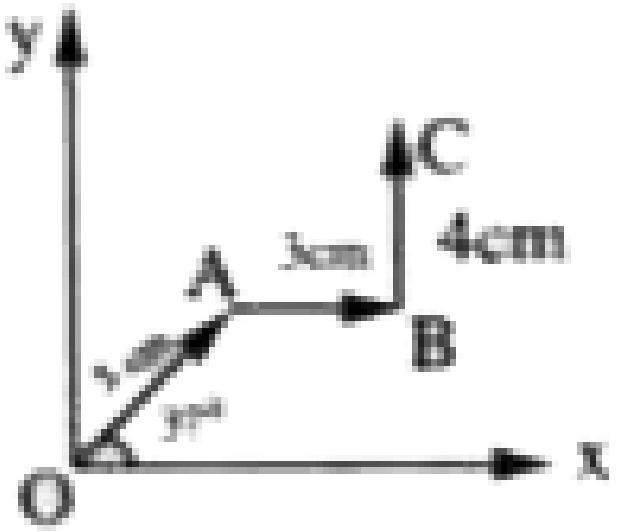
6. A weight Mg is suspended from the middle of a rope whose ends are at the same level. The rope is no longer horizontal. The minimum tension required to completely straighten the rope is

Watch Video Solution

7. The sum of magnitudes of two forces acting at a point is $16N$. If their resultnat is normal to the smaller fore and has a magnitude of $8N$. Then the forces are

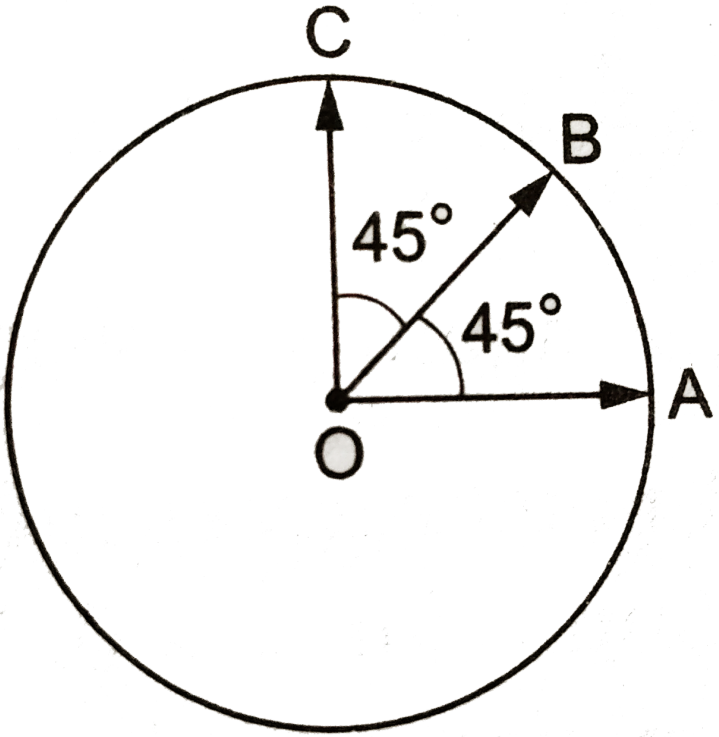
Watch Video Solution

8. Find the resultant of the vectors shown in figure.



Watch Video Solution

9. Find the resultant of the three vectors $\overrightarrow{OA}, \overrightarrow{OB}$ and $\overrightarrow{OC}$ shown in figure. Radius of the circle is R.



Watch Video Solution

10. Rain is falling vertically with a speed of 30 m/s. wind starts blowing after some time with a speed of 15 m/s in east to west direction. In which direction should a boy waiting at a bus hold his umbrella ?

Watch Video Solution

11. Vector $\vec{A}$ is 2 cm long and is 60° above the x - axis in the first quadrant, vector $\vec{B}$ is 2cm long and is 60° below the x - axis in the fourth quadrant. Find $\vec{A} + \vec{B}$

Watch Video Solution

12. A vector has x component of -25.0 units and y component of 40.0 units find the magnitude and direction of the vector.

Watch Video Solution

13. A particle is moving eastwards with velocity of $5m/s$. In $10\sec$ the velocity changes to $5m/s$ northwards. The average acceleration in this time is.

Watch Video Solution

14. Two vectors $\vec{A}$ and $\vec{B}$ have equal magnitudes. The magnitude of $\left(\vec{A}+\vec{B}\right)$ is n times the magnitude of $\left(\vec{A}-\vec{B}\right)$. The angle between $\vec{A}$ and $\vec{B}$ is :

Watch Video Solution

15. Two forces whose magnitudes are in the ratio $3:5$ give a resultant of 28N. If the angle of their inclination is 60°, find the magnitude of each force.

Watch Video Solution

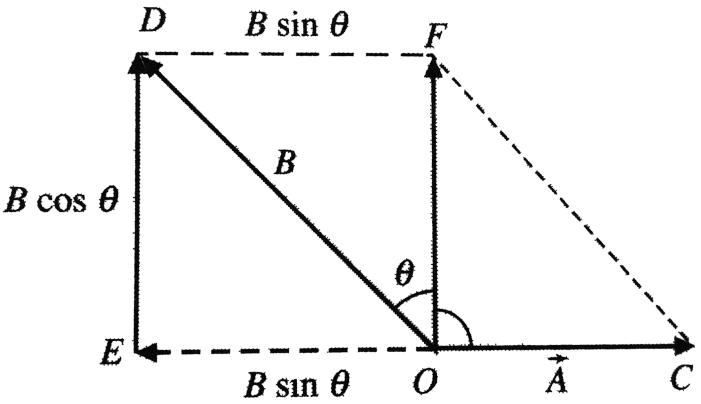
16. If vectors $\vec{A}$ and $\vec{B}$ are $3\hat{i}-4\hat{j}+5\hat{k}$ and $2\hat{i}+3\hat{j}-4\hat{k}$ respectively then the unit vector parallel to $\vec{A}+\vec{B}$

Watch Video Solution

17. If $A = 3\hat{i} + 4\hat{j}$ and $B = 7\hat{i} + 24\hat{j}$ the vector having the same magnitude as B and parallel to A is

Watch Video Solution

18. The resultant of two vectors $\vec{A}$ and $\vec{B}$ is perpendicular to the vector $\vec{A}$ and its magnitude is equal to half of the magnitude of the vector $\vec{B}$. Find out the angles between $\vec{A}$ and $\vec{B}$.

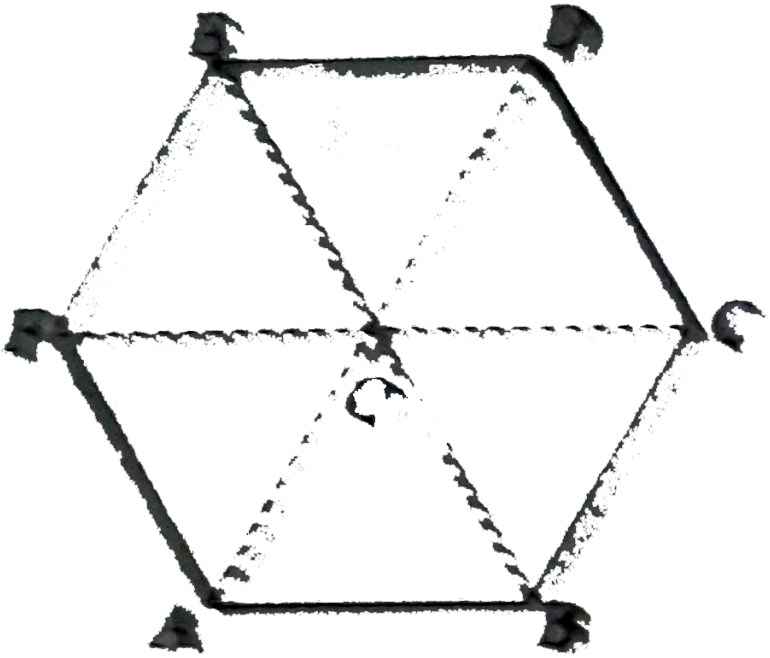


Watch Video Solution

19. What is the displacement of the point of a wheel initially in contact with the ground when the wheel rolls forward half a revolution? Take the radius of the wheel as R and the x-axis as the forward direction?

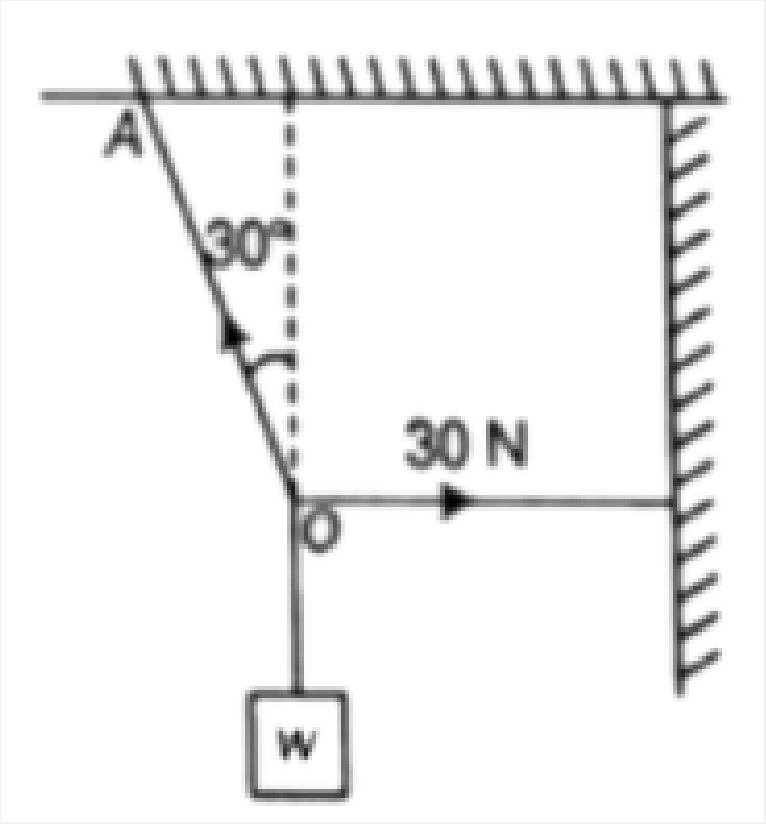
Watch Video Solution

20. IN the figure shown ,ABCDEF is a regular hexagon . What is the of $AB + AC + AD + AE + AF$?



Watch Video Solution

21. As shown in figure, the tension in the horizontal cord is 30 N. The weight w and tension in the string OA in newton are



Watch Video Solution

22. The position of a particle is given by $r = 3.0t\hat{i} + 2.0t^2\hat{j} + 5.0\hat{k}$. Where t is in seconds and the coefficients hav the proper units for r to be in matres. (a) find v(t) and a(t) of the particle (b). Find the magnijtude of direction of v(t) or t=1.0 s

Watch Video Solution

23. Velocity and acceleration of a particle at time $t = 0$are $u = \left(2\hat{i} + 3\hat{j}\right)m/s$ and $a = \left(4\hat{i} + 3\hat{j}\right)m/s^2$ respectively. Find the velocity and displacement if particle at $t = 2s$.

Watch Video Solution

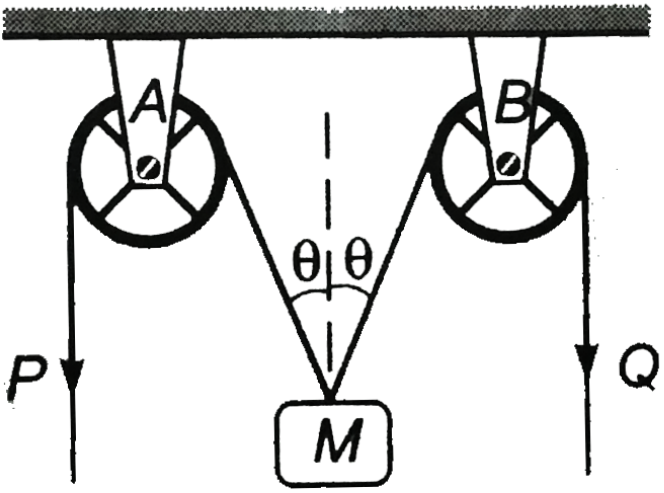
24. The coordinates of a body moving in a plane at any instant of time t are $x = \alpha t^2$ and $y = \beta t^2$. The velocity of the body is

Watch Video Solution

25. A particle starts from origin at t=0 with a velocity $5.0\hat{i}m/s$ and moves in x-y plane under action of a force which produces a constant acceleration of $\left(3.0\hat{i}+2.0\hat{j}\right)m/s^2$. A) What is the y-coordinate of the particle at the instant its x-coordinate is 84m ? b) What is the speed of the particle at this time? `

Watch Video Solution

26. In the arrangement shown in figure, the ends P and Q of an unstretchable string move downwards with uniform speed U. Pulleys A and B are fixed. Mass M moves upwards with a speed

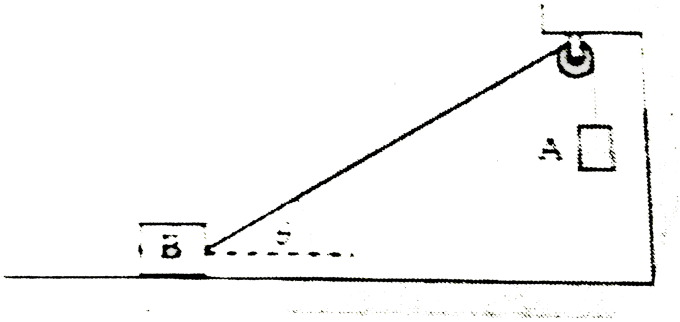


(a) $2U\cos\theta$ (b) $\frac{U}{\cos\theta}$ (c) $\frac{2U}{\cos\theta}$ (d) $U\cos\theta$

Watch Video Solution

27. The block A is moving downward with constant velocity v_0. Find the velocity of the block B. When the string makes an angle θ with the

horizontal



Watch Video Solution

28. An object A is moving with 5 m/s and B is moving with 20 m/s in the direction . (positive x-axis)

(I) find velocity of B with respect to A

Watch Video Solution

29. Two object A and B are moving each with velocities 10 m/s. A is moving towards East and B is moving towards North from the same point as shown. Find velocity of A relative to B $\left(\vec{V}_{AB}\right)$

Watch Video Solution

Watch Video Solution

30. What are the speeds of two objects if they move uniformly towards each other, they get 4 m closer in each second and if they move uniformly in the same direction with the original speeds they get 4 m closer in each 10 sec?

Watch Video Solution

31. At a metro station, a girl walks up a stationary escalator in time t_1. If she remains stationary on the escalator, then the escalator take her up in time t_2. The time taken by her to walk up on the moving escalator will be

Watch Video Solution

32. Ship A is 10km due west of ship B. Ship A is heading directly north at a speed of 30 kmph while ship B is heading in a direction 60° west of north at a speed 20kmph. Their closest distance of approach will be.....

Watch Video Solution

33. Let us consider a boat which moves with a velcity $v_{be} = 5kmh^{-1}$ relative to water, At time $t = 0$, the boat passes through a piece of cord floating in water while moving downstream. If itturns back at time $t = t_1$, when and wher does the boat meet the cork again ? Assume $t_1 = 30 \text{ min}$,

Watch Video Solution

34. Two persons P and Q crosses the river starting from point A on one side to exactly opposite point B on the other bank of the river. The person P crosses the river in the shortest path. The person Q crosses the river in shortest time and walks back to point B. Velocity of river is 3 kmph and speed of each boat is 5 kmph w.r.t river. If the two persons reach the point B in the same time, then the speed of walk of Q is

Watch Video Solution

35. A swimmer crosses a flowing stream of width ω to and fro in time t_1. The time taken to cover the same distance up and down the stream is t_2. It t_3 is the time the swimmer would take to swim a distance 2ω in still water, then

Watch Video Solution

36. Rain is falling vertically with a speed of 20 m/s relative to air. A person is running in the rain with a velocity of 5 m/s and a wind is also blowing with a speed of 15 m/s (both towards east). Find the angle with the vertical at which the person should hold his umbrella for best protection from rain

Watch Video Solution

37. To a man walking at the rate of 4 km/h the rain appears to fall vertically. When he increases his speed 8 km/h it appears to meet him at

an angle of 45 with vertical. Find the angle made by the velocity of rain with the vertical and its value.

Watch Video Solution

38. Rain is falling vertically with a speed of $1ms^{-1}$. A woman rides a bicycle with a speed of 1.732 ms^{-1} in east to west direction. What is the direction in which she should hold her umbrella ?

Watch Video Solution

39. A particle is projected horizontally with speed u from the top of a plane inclined at an angle θ with the horizontal. How far from the point of projection will the particle strike the plane?

Watch Video Solution

40. 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

41. A cannon and a target are 5.10Km apart and located at the same level. How soon will the shell launched with the initial velocity 240m/s reach the target in the absence of air drag?

Watch Video Solution

42. The celing 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

43. The speed with which a bullent can be fired is $150ms^{-1}$. Calculate the greatest distance to which it can be projected and also the maximum height to which it would rise .

Watch Video Solution

44. A particle is projectedfrom the origin in X-Yplane. Acceleration of particle in Y direction is a. If equation of path of the particle isy = $ax - bx^2$, then find initial velocity of the particle.

Watch Video Solution

45. A ball is throw from the top of a tower of 61 m high with a velocity $24.4ms^{-1}$ at an elevation of 30° above the horizon. What is the distance from the foot of the tower to the point where the ball hits the ground ?

Watch Video Solution

46. A particle is thrown over a triangle from one end of a horizontal base and after grazing the vertex falls on the other end of the base. If α and β be the base angles and θ the angle of projection, prove that $\tan\theta = \tan\alpha + \tan\beta$.

Watch Video Solution

47. The velocity of a projectile when it is at the greatest height is $\left(\sqrt{2/5}\right)$ times its velocity when it is at half of its greatest height. Determine its angle of projection.

Watch Video Solution

48. The maximum range of a projectile is 500m. If the particle is thrown up a plane, which is inclined at an angle of 30° with the same speed, the distance covered by it along the inclined plane will be

Watch Video Solution

49. A foot ball is kicked of with an initial speed of 19.6 mlsec at a projection angle 45°. A receiver on the goal line 67.4 m away in the direction of the kick starts running to meet the ball at that instant. What must his speed be if he is to catch the ball before it hits the ground ?

Watch Video Solution

50. A grasshopper can jump a maximum distance $1.6m$. It spends negligible time on the ground. How far can it go in $10s$?

Watch Video Solution

51. A particle is projected with a velocity of $10\sqrt{2}$ m/s at an angle of 45° with the horizontal Find the interval between the moments when speed is $\sqrt{125}$ m/s

Watch Video Solution

52. A projectile of mass 2 kg has velocities 3 m/s and 4 m/s at two points during its flight in the uniform gravitational field of the earth. If these two velocities are perpendicular to each other, then the minimum kinetic energy of the particle during its flight is:

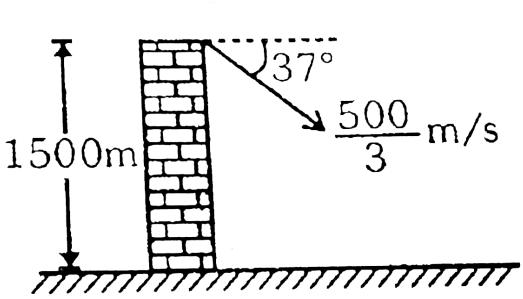
Watch Video Solution

53. The horizontal range and miximum height attained by a projectile are R and H, respectively. If a constant horizontal acceleration $a = g/4$ is imparted to the projectile due to wind, then its horizontal range and maximum height will be

Watch Video Solution

54. A particle is projected from a towaer as shown in figure, then the distance from the foot of the tower where it will strike the ground will be

:- $(\text{take } g = 10m/s^2)$



Watch Video Solution

55. A golfer standing on level ground hits a ball with a velocity of $52ms^{-1}$ at an angle θ above the horizontal. If $\tan\theta = 5/12$, then find the time for which then ball is atleast $15m$ above the ground $(takeg = 10ms^{-2})$.

Watch Video Solution

56. A particle is projected from the ground with an initial speed u at an angle θ with the horizontal. The average velocity of the particle between its point of projection and highest point of trajectory is

Watch Video Solution

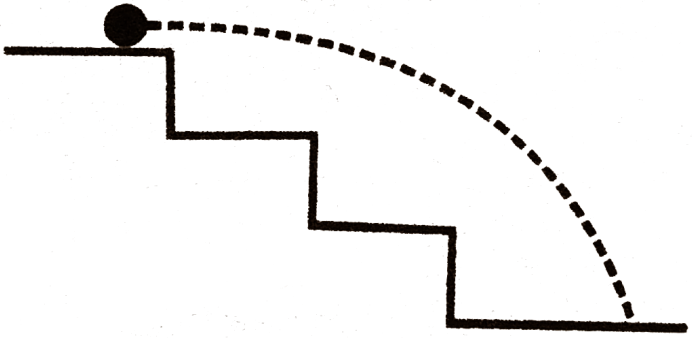
57. Two paper screens A and B are separated by a distance of 100m. A bullet pierces A and then B. the hole in B is 10 cm below the hole in A. if the bullet is travelling horizontally at the time of hitting A, then the velocity of the bullet at A is

Watch Video Solution

58. Two particles move in a uniform gravitational field with an acceleration g. At the initial moment the particles were located over a tower at one point and moved with velocities $v_1 = 3m/s$ and $v_2 = 4m/s$ horizontally in opposite directions. Find the distance between the particles at the moment when their velocity vectors become mutually perpendicular.

Watch Video Solution

59. A staircase contains three steps each $10cmhigh$ and $20cm$ wide. What should be the minimum horizontal velocity of the ball rolling off the uppermost plane so as to hit directly the lowest plane ? $\left(\text{in}ms^{-1}\right)$.



Watch Video Solution

60. An enemy plane is flying horizontally at an altitude of 2 km with a speed of $300ms^{-1}$ An army man with an anti-aircraft gun on the ground sights hit enemy plane when it is directly overhead and fires a shell with a muzzle speed of $600ms^{-1}$. At what angle with the vertical should the gun be fired so as to hit the plane ?

Watch Video Solution

61. When a motor cyclist takes a U-turn in 4s what is the average angular velocity of the motor cyclist?

Watch Video Solution

62. A car is moving in a circular path with a uniform speed v. Find the magnitude of change in its velocity when the car rotates through an angle θ.

Watch Video Solution

63. A stone is thrown horizontally with the velocity 15m/s. Determine the tangential and normal accelerations of the stone in 1 second after it begins to move.

Watch Video Solution

64. An insect trapped in a circular groove of radius 12 cm moves along the groove steadily and completes 7 revolutions in 100s. A) What is the angular speed. And the linear speed of the motion? B) is the acceleration vector a constant vector? What is the its magnitude?

Watch Video Solution

65. A ball of200 g is at one end of a string of length 20 cm. It is revolved in a horizontal circle at an angular frequency of 6 rpm. Find (i) the angular velocity, (ii) the linear velocity, (Hi) the centripetal acceleration,

Watch Video Solution

Exercise A Vectors Scalars

1. In Latin, the word vector means a) magnitude b) direction c) carrier d) cap

A. magnitude

B. direction

C. carrier

D. cap

Answer: C

Watch Video Solution

2. Which of the following statements is false regarding the vectors?

A. The magnitude of a vector is always a scalar

B. Each component of a vector is always a scalar.

C. Two vectors having different magnitudes cannot have their resultant zero

D. Vectors obey triangle law of addition

Answer: B

Watch Video Solution

3. 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: B

Watch Video Solution

4. Of the following the vector quantity is

A. Time

B. Electric Current

C. Velocity of light

D. Gravitational force

Answer: D

Watch Video Solution

5. Of the following the scalar quantity is

A. Temperature

B. Moment of force

C. Moment of couple

D. Magnetic moment

Answer: A

Watch Video Solution

6. Choose the correct statement.

A. Temperature is a scalar but temperature gradient is a vector

B. Velocity of a body is a vector but velocity of light is a scalar

C. Electric intensity and Electric current density are vectors

D. All the above

Answer: D

Watch Video Solution

7. Choose the false statement

A. Electric current is a vector because it has both magnitude and direction

B. Time is a vector which has direction always in the forward direction

C. All quantities having magnitude and direction are vector quantities

D. All the above

Answer: D

Watch Video Solution

8. The pair containing a scalar quantity and vector quantity is

A. Impulse and Angular momentum

B. Work and Frequency

C. Electromotive force and force

D. Electric power and Energy

Answer: C

Watch Video Solution

9. Which one of the following statements is true ?

A. A scalar quantity is the one that is con served 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 in space.

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

Answer: D

Watch Video Solution

10. Which of the following units could be associated with a vector quantity ?

A. newton/metre

B. newton metre/second

C. kgm^2s^{-2}

D. newton second

Answer: D

Watch Video Solution

11. The set containing only vector quantities is

A. Thermal capacity, Magnetic susceptibility and Electric charge

B. Magnetic moment, Electric intensity and Torque

C. Magnetic flux, Electric potential and Force

D. Magnetic induction, Electric capacity and Impulse

Answer: B

Watch Video Solution

12. Which of the following is meaningful?

A. Vector/Vector

B. $\frac{\text{Scalar}}{\text{vector}}$

C. Scalar + vector

D. Vector / scalar

Answer: D

Watch Video Solution

13. Choose the correct statement.

A. Scalar + vector = scalar/vector vector

B. $\frac{\text{vector}}{\text{vector}} = \text{scalar}$

C. scalar/vector = scalar (or) vector

D. vector - vector = vector.

Answer: D

Watch Video Solution

14. If angle between $\vec{a}$ and $\vec{b}$ is $\frac{\pi}{3}$, then angle between $\vec{a}$ and $-3\vec{b}$ is

A. $\frac{\pi}{3}$

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

C. $\frac{\pi}{6}$

D. $\frac{5\pi}{3}$

Answer: B

Watch Video Solution

15. Which one of the following is a null vector ?

A. net displacement of a particle moving once around, a circle

B. velocity of a body projected vertically up, when the body is at the highest point

C. acceleration of a particle executing S.H.M. at the mean position

D. all the above

Answer: D

Watch Video Solution

16. 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. mpulse and elementary area

C. Area and gravitational potential

D. Impulse and pressure

Answer: B

Watch Video Solution

17. Gibbs-Helmoholtz equation relates the free energy change to the enthalpy and entropy changes of the process as

$(\Delta G)_{PT} = \Delta H - T\Delta S$

The magnitude of ΔH does not change much with the change in temperature but the energy factor $T\Delta S$ changes appreciably. Thus, spontaneity of a process depends very much on temperature.

A reaction has value of $\Delta H = 20kcal$ at $200K$, the reaction is spontaneous, below this temperature, it is not. the values ΔG and ΔS at $200K$ are, respectively

A. It is rotated through an arbitrary angle

B. it is multiplied by an arbitrary scalar

C. it is cross multiplied by a unit vector

D. it is slid parallel to itself. Resolution of Vectors

Answer: D

Watch Video Solution

18. The component of a vector is

A. always less than its magnitude

B. always greater than its magnitude

C. always equal to its magnitude

D. less than or equal to its magnitude

Answer: D

Watch Video Solution

19. The horizontal component of the weight of a body of mass m is

A. mg

B. $\frac{mg}{2}$

C. Zero

D. Infinity

Answer: C

Watch Video Solution

20. What are the maximum number of rectangular components of a vector can be split in space and in plane respectively.

A. 3,2

B. 3,3

C. 2,2

D. ∞, ∞

Answer: A

Watch Video Solution

21. The maximum number of components into which a vector can be resolved in its own plane is

A. 2

B. 3

C. 4

D. Infinity

Answer: D

Watch Video Solution

22. The component of a vector r along X-axis will have maximum value if :

A. r is along positive Y-axis

B. r is along positive X-axis

C. r makes an angle of 450 with the X-axis

D. r is along negative Y-axis

Answer: B

Watch Video Solution

23. The x-component of the resultant of several vectors

A. only a

B. a, b & d

C. a,b&c

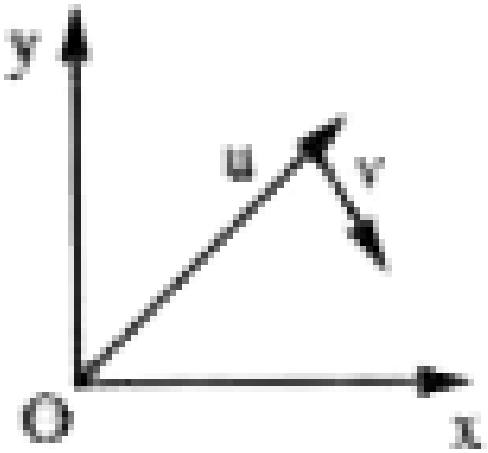
D. b &d

Answer: B

Watch Video Solution

24. Figure shows the orientation of two vectors u and v in the XY-plane If

$u = a\hat{i} + b\hat{j}$ and $v = p\hat{i} + q\hat{j}$



which of the following is correct ?

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

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

C. a, q and b are positive while p is negative.

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

Answer: B

Watch Video Solution

25. Read each statement below carefully and state with reason and examples, if it is true or false. A scalar quantity is one that

A. is conserved in a process

B. can never take negative values and must be dimensionless

C. does not vary from one point to another in space

D. has the same value for observers with dif ferent orientations of axes

Answer: D

Watch Video Solution

Exercise A Addition Subtractions Of Vectors

1. The resultant of two forces cannot exceed

A. average of the forces

B. algebraic sum of the two forces

C. difference of the two forces

D. none

Answer: B

Watch Video Solution

2. Subtraction of vectors obeys

A. Commutative law

B. Associative law

C. Distributive law

D. All the above

Answer: C

Watch Video Solution

3. Associative law is obeyed by

A. Addition of vectors

B. Subtraction of vectors

C. Both

D. none

Answer: A

Watch Video Solution

4. Choose the correct statement.

A. If $\vec{A} \mid \vec{B} = \vec{A} - \vec{B}$ is a null vector

B. If $\left|\vec{A} + \vec{B}\right| = \left|\vec{A} - \vec{B}\right|$, then $\vec{A}$ and $\vec{B}$ are perpendicular vectors

C. Both of the above

D. None of the above

Answer: C

Watch Video Solution

5. The maximum value of magnitude of $\left(\vec{A} - \vec{B}\right)$ is

A. A-B

B. $A + B$

C. $A^2 + B^2$

D. $A^2 - B^2$

Answer: B

Watch Video Solution

6. When two vectors a and b of magnitudes 'a' and 'b' respectively are added, the magnitude of resultant vector is always

A. Equal to (a + b)

B. Less than (a + b)

C. Greater than (a + b)

D. Not greater than (a + b)

Answer: D

Watch Video Solution

7. If $\vec{C} = \vec{A} + \vec{B}$ then

A. $\vec{C}$ is always greater than $\left|\vec{A}\right|$

B. C is always equal to A+B

C. C is never equal to A+B

D. It is possible to have $\left|\vec{C}\right| < \left|\vec{A}\right|$ and $\left|\vec{C}\right| < \left|\vec{B}\right|$

Answer: D

Watch Video Solution

8. It is found that $|A+B|=|A|$. This necessarily implies.

A. B=0

B. A,B are antiparallel

C. A,B are perpendicular

D. $A.B \leq 0$

Answer: D

Watch Video Solution

9. 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. I and ii are true

B. ii, ii and iv are ture

C. I, ii and c are true

D. ii and iv are true

Answer: D

Watch Video Solution

10. Let the angle between two non zero vectors A and B be 120° and its resultant be C.

A. C must be equl to $|A - B|$

B. C must be less then $|A - B|$

C. C mus be greatyer than |A-B|

D. C may be equal to |A-B|

Answer: C

Watch Video Solution

Exercise A Lami S Theorem

1. The minimum number of forces of equal magnitude in a plane that can keep a particle in equilibrium is

A. 4

B. 2

C. 3

D. 5

Answer: B

Watch Video Solution

2. The minimum number of unequal forces in a plane that can keep a particle in equilibrium is

A. 4

B. 2

C. 3

D. 6

Answer: C

Watch Video Solution

3. The minimum number of non coplanar forces that can keep a particle in equilibrium is

A. 1

B. 2

C. 3

D. 4

Answer: D

Watch Video Solution

1. A motor car is going due north at a speed of 50 km/h. It makes a 90^0 left turn without changing the speed. The change in the velocity of the car is about

A. 50 lm/h towards west

B. 70 km/h towards south-west

C. 70 km/h towards north-West

D. zero

Answer: B

Watch Video Solution

2. Which of the following four statements is false?

A. A body can have zero velocity and still be accelerated

B. A body can have a constant velocity and still have a varying speed.

C. A body can have a constant speed and still have a varying velocity.

D. The direction of the velocity of a body can change when its acceleration is constant

Answer: B

Watch Video Solution

3. 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 lengths are traversed in equal intervals

Answer: D

Watch Video Solution

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

A. The acceleration of the particle is zero

B. The acceleration of the particle is bounded

C. The acceleration of the particle is neces sarily in the plane of motion

D. The particle must be undergoing a uniform circular motion

Answer: C

Watch Video Solution

5. Three different objects of masses m_1, m_2 and m_3 are allowed to fall from rest and from the same point O along three different frictionless paths. The speeds of the three objects on reaching the ground will be in the ratio of

A. $m_1 : m_2 : m_3$

B. $m_1 : 2m_2 : 3m_3$

C. $1 : 1 : 1$

D. $\frac{1}{m_1} : \frac{1}{m_2} : \frac{1}{m_3}$

Answer: C

Watch Video Solution

Exercise A Relative Velocity

1. A train is moving towards East and a car is along North, both with same speed. The observed direction of car to the passenger in the train is

A. North - East

B. North-West

C. South - West

D. South - East

Answer: B

Watch Video Solution

2. A bus moves over a straight level road with a constant acceleration a. A boy in the bus drops a ball outside. The acceleration of the ball with respect to the bus and the earth are respectively

A. $\sqrt{a^2+g^2}, g$

B. $g, \sqrt{a^2+g^2}$

C. a,g

D. g,a

Answer: A

Watch Video Solution

3. A particle P moves with speed V along AB and BC, sides of a square ABCD. Another particle Q also starts at A and moves with the same speed but along AD and DC of the same square ABCD. Then their respective changes in velocities are

A. equal in magnitude but different in direction

B. different in magnitude but same in directions

C. different both in magnitude and direction

D. same both in magnitude and direction

Answer: A

Watch Video Solution

4. f A and B persons are moving with V_A and V_B. velocities in opposite directions. Magnitude of relative velocity of B w.r.t. A is x and magni-tude of relative velocity of A w.r.t B is y. Then

A. $x > y$

B. $x = y$

C. $x = 2y$

D. $2x = y$

Answer: B

Watch Video Solution

5. Winds is blowing west to east along two parallel tracks. Two trains moving with same speed in opposite directions have the steam track of one double than other. The speed of each train is

A. Equal to that of the wind

B. Three times that of the wind

C. Double that of the wind

D. Half that of the wind

Answer: B

Watch Video Solution

6. A river is flowing from West to East at a speed of 8 m per min A. man on the South bank of the river, capable of swimming at 20 m/min in still water, wants to swim across the river in the shortest time. He should swim in a direction.

A. Due north

B. 30° east of west

C. 30° west of north

D. 60° east of north

Answer: A

Watch Video Solution

7. Galileo writes that for angles of projection of a projectile at angles $(45^\circ + \theta)$ and $(45^\circ - \theta)$, the horizontal ranges described by the projectile are in the ratio of (if $\theta \leq 45^\circ$)

A. $2:1$

B. $1:2$

C. $1:1$

D. $2:3$

Answer: C

Watch Video Solution

8. Keeping the velocity of projection constant, the angle of projection is increased from 0º to 90º. Then the horizontal range of the projectile

A. goes on increasing up to 90°

B. decreases up to 90°

C. increases up to 45° and decreases after- words

D. decreases up to 45° and increases after wards

Answer: C

Watch Video Solution

9. Keeping the velocity of projection constant, the angle of projection is increased from 0º to 90º. Then the horizontal range of the projectile

A. goes on increasing up to 90°

B. decreases up to 90°

C. increases up to 45° and decreases beyond it

D. decrease up to 45° and increases beyond it

Answer: A

Watch Video Solution

10. A projectile has

A. minimum velocity at the point of projection and maximum at the maximum height

B. maximum at the point of projection and maximum at the maximum height

C. same velocity at any point in its path

D. zero velocity at the maximum height irrespective of the velocity of projection

Answer: B

Watch Video Solution

11. Two particles are projected in air with speed u at angles θ_1 and theta_(2)` (both acute) to the horizontal, respectively. If the height reached by the first particle is greater than that of the second. Then which one of the following is correct ?

A. $\theta_1 > \theta_2$

B. $\theta_1 = \theta_2$

C. $T_1 < T_2$

D. $T_1 = T_2$

Answer: A

Watch Video Solution

12. If a body is projected with an angle θ to the horizontal then

A. its velocity is always perpendicular to its acceleration

B. its velocity becomes zero at its maximum height.

C. its velocity makes zero angle with the horizontal at its maximum height.

D. the body just before hitting the fround, the direction of velocity coincides with the acceleation.

Answer: C

Watch Video Solution

13. In the following questions a statement of assertion (A) is followed by a statement of reason (R).

A: Path of a projectile with respect of another projectile is straight line .

R : Acceleration of a projectile with respect to another projectile is zero.

A. $-g$

B. g

C. 2g

D. 0

Answer: D

Watch Video Solution

14. Two bullets are fired simultaneously, horizontally and with different speeds from the same place. Which bullet will hit the ground first?

A. the faster one

B. the slower one

C. both will reach simultaneously

D. depends on the masses

Answer: C

Watch Video Solution

15. A number of bullets are fired horizontally with different velocities from the top of a tower they reach the ground

A. at same time with same velocity

B. at different times with different velocities

C. at same time with different velocities

D. at different times with same velocity

Answer: C

Watch Video Solution

16. For body thrown horizontally from the top of a tower,

A. the time of flight depends both on h and v

B. the horizontal Range depends only on v but not on h

C. the time of flight and horizontal Range depend on h but not on v

D. the horizontal Range depends on both v and h

Answer: D

Watch Video Solution

17. A stone is just dropped from the window of a train moving along a horizontal straight track with uniform speed. The path of the stone is

A. a parabola for an observer standing by the side of the track

B. a horizontal straight line for an observer inside the train

C. both of the above are true

D. none of the above is true

Answer: C

Watch Video Solution

18. A and B are two trains moving parallel to each other. If a ball is thrown vertically up from the train A, the path of the ball is

A. parabola for an observer standing on the ground

B. vertical straight line for an observer in B when B is moving with the same speed in the same direction of A

C. a parabola for an observer in B when B is moving with same speed but in opposite direction

D. all the above are true

Answer: D

Watch Video Solution

Exercise A Circular Motion

1. The term centripetal acceleration was proposed by

A. Huygens

B. Kepler

C. Newton

D. Galileo

Answer: C

Watch Video Solution

2. Centripetal acceleration is

A. a constant vector

B. a constant scalar

C. a magnitude changing vector

D. not a constant vector

Answer: D

Watch Video Solution

3. Velocity vector and acceleration vector in a uniform circular motion are related as

A. both in the same direction

B. perpendiculat to each other

C. both in opposite direction

D. not related to each other

Answer: B

Watch Video Solution

4. When milk is churned, cream gets separated due to

A. centripetal force

B. centrifugal force

C. frictional force

D. gravitational force

Answer: B

Watch Video Solution

5. A disc is rotating in the anticlockwise direction in the xy plane with decreasing angular velocity: What is direction of the angular acceleration ?

A. It's angular velocity vector will be perpen dicular to the page pointing up out of the page

B. It's angular velocity vector will be perpen dicular to the page pointing inwards

C. It's angular velocity vector acts along the tangent to the disc.

D. None of the above is correct

Answer: A

Watch Video Solution

6. When a particle is moving in a circle of radius (r) with changing speed (v) then centripetal acceleration and tangential acceleration respectively

given by

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

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

C. $v^2 r$

D. zero

Answer: A

Watch Video Solution

7. A body is in pure rotation. The linear speed 'v' of a particle, the distance 'r' of the particle from the axis and the angular velocity ω of the body are related as $\omega = \frac{v}{r}$. Thus

A. $\omega\alpha\frac{1}{r}$

B. $\omega\alpha r$

C. v

D. ω is independent of r

Answer: D

Watch Video Solution

8. A particle revolves round a circular path with uniform speed. The acceleration of the particle is

A. mass of particle

B. radius

C. velocity

D. both (a) and (b)

Answer: B

Watch Video Solution

9. The position vectors os a particle is $r = (a\cos\omega t)\hat{i} + (a\sin\omega t)\hat{j}$. The velocity of particle is

A. directed towards the origin

B. directedaway from the origin

C. parallel to the position vector

D. perpendicular to the position vector.

Answer: D

Watch Video Solution

10. Two racing cars of masses m_1 and m_2 are moving in circles of radii r_1 and r_2 respectively. Their speeds are such that each makes a complete circle in the same time t. The ratio of the angular speed of the first to the second car is

A. $r_1 : r_2$

B. $m_1 : m_2$

C. $1 : 1$

D. $m_1 m_2 : r_1 r_2$

Answer: C

Watch Video Solution

11. Two particles having mass 'M' and 'm' are moving in a circular path having radius R & r respectively. If their time period are same then the ratio of angular velocity will be : -

A. $\frac{r}{R}$

B. $\frac{R}{r}$

C. 1

D. $\sqrt{\frac{R}{r}}$

Answer: C

Watch Video Solution

12. A particle moves such that its position vector $\vec{r}(t) = \cos\omega\hat{i} + \sin\omega t\hat{j}$ where ω is a constant and t is time . Then which of the following statements is ture for the velocity $\vec{v}$ (t) and acceleration $\vec{a}$ (t) fo the particle:

A. Velocity and acceleration both are perpendicular to $\vec{r}$.

B. Velocity and acceleration both are parallel to $\vec{r}$

C. Velocity is perpendicular to $\vec{r}$ and acceleration is directed towards the origin.

D. Velocity is perpendicular to $\vec{r}$ and acceleration is directed away from the origin.

Answer: C

Watch Video Solution

13. A particle moves along a horizontal circle with constant speed. If 'a' is its acceleration and 'E' is its kinetic energy

A) a is constant B) E is constant C) a is variable D) E is variable

A. A and B are correct

B. C and D are correct

C. A and D are correct

D. B and C are correct

Answer: D

Watch Video Solution

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

a) The net acceleration of a particle in circular motimn is always along the radius of the circle towards the center.

b) The velocity vector of a particle at a point is always along the tangent

to the path of the particle at that point.

c) The acceleration vector of a particle in uniform circular motion averaged over one cycle is a null vector.

A. A only true

B. B only true

C. Both A & B are true

D. Both A & B are false

Answer: B

Watch Video Solution

15. The acceleration vector of a particle in uniform circular motion averaged over the cycle is a null vector. This statement is

A. A only true

B. B only true

C. Both A & B are true

D. Both A & B are false

Answer: C

Watch Video Solution

16. Identify, the increasing order of angular velocities of following

a) Earth rotating about its own axis

b) Hour's hand of clock

c) Seconds hand of clock

d) Fly wheel of radius 2m making 300 r.p.m.

A. a,b,c,d

B. b,c,d,a

C. c,d,a,b

D. d,a,b,c

Answer: A

Watch Video Solution

Exercise A Vector Scalar

1. Write two different vectors having same direction.

A. a & ae true

B. b,c & d are true

C. only c and d are true

D. a,b,c & d are true

Answer: B

Watch Video Solution

2. Which of the following is a null vector

a) velocity vector of a body moving in a circle with a uniform speed

b) velocity vector of a body moving in a straight line with a uniform speed

c) position vector of the origin of the rectangular coordinate system

d) displacement vector of a stationary object

A. both a & b

B. both b & c

C. a, b & c

D. both c & d

Answer: D

Watch Video Solution

Exercise A Resolution Motion In Plane And Motion Of Boat

1. Find the unit vector perpendicular to the two vectors $\hat{i} + 2\hat{j} - \hat{k}$ and $2\hat{i} + 3\hat{j} + \hat{k}$.

A. Both A and B false

B. A is true B is false

C. B is true but A is false

D. Both A and B are false

Answer: B

Watch Video Solution

2. A boat moves relative to water with a velocity which is 'n' times the river flow

a) If $n < 1$ boat can not cross the river

b) If n = 1 boat can not cross the river without drifting

c) If $n > 1$ boat can cross the river along shortest path

d) Boat can cross the river what ever is the value of n excluding zero value

A. only a is correct

B. a, b are correct

C. c, d are correct

D. b, c & d are correct

Answer: D

Watch Video Solution

3. Set the drifts suffered by boat in increasing order

(a) d=1000 m, $V_R = 2m/s$, $V_b = 4m/s$

(b) $d = 500m$, $V_R = 1m/s$, $V_b = 6m/s$

(c) $d = 1000m$, $V_R = 6m/s$, $V_b = 6m/s$

($d \rightarrow$ width of river $V_R \rightarrow$ velocity of river $V_b \rightarrow$ velocity of botat). The boat moves perpendicular to width of the river

A. a,b,c

B. b,c,a

C. b,a,c

D. c,b,a

Answer: C

Watch Video Solution

4. In a projectile motion the velocity

a) is always perpendicular to the acceleration

b) is not always perpendicular to the acceleration

c) is perpendicular to the acceleration for one instant only

d) is perpendicular to the acceleration for two instants.

A. a & b are correct

B. b & c are correct

C. c & d are correct

D. a & d are correct Projectiles

Answer: B

Watch Video Solution

Exercise A Projections

1. A body is projected from a point with different angles of projections 20°, 35°, 45°, 60° with the horizontal but with same initial speed. Their respective horizontal ranges are R_1, R_2, R_3 and R_4. Identify the correct order in which the horizontal ranges are arranged in increasing order

A. R_1, R_4, R_2R_4

B. R_2, R_1, R_4, R_3

C. R_1, R_2, R_4, R_3

D. R_4, R_1, R_2, R_3

Answer: A

Watch Video Solution

2. An object projected with same speed at two different angles covers the same horizontal range R. If the two times of flight be t_1 and t_2 . The range is $\frac{1}{\alpha}gt_1t_2$, the value of α is

A. a, b, d are correc

B. a, c, d are correct

C. b, c, d are correct

D. a,b,c are correct

Answer: A

Watch Video Solution

3. A body is projected with an initial speed of $100\sqrt{3}ms^{-1}$ at an angle of 60° above the horizontal. If g = $10ms^{-2}$ then velocity of the projectile

a)is perpendicular to its acceleration at instant t = 15 sec.

b) Is perpendicular to initial velocity of projection at t = 20 sec.

c) Is minimum at the highest point

d) Changes both in magnitude and direction, during its flight.

Mark the answer as

A. If a, b, c and d are correct

B. If a, c and d are correct

C. If b, c and d are correct

D. If a, b and d are correct

Answer: A

Watch Video Solution

4. Two projectiles thrown from the same point at angles 60° and 30° with the horizontal attain the same height. The ratio of their initial velocities is

A. If a, b, c and d are correct

B. If only a, b and c are correct

C. If only a and c are correct

D. If a, c and d are correct

Answer: D

Watch Video Solution

5. Velocity of the body on reaching the ground is same in magnitude in the following cases

a) a body projected vertically from the top of tower of height 'h' with velocity 'u'

b) a body thrown down wards with velocity 'u' from the top of tower of height 'h'

c) a body projected horizontally with a velocity 'u' from the top of tower height 'h'

d) a body dropped from the top tower of height 'h'

A. a, d, c and d are correct

B. a, b and c are correct

C. a and d are correct

D. d only correct

Answer: B

Watch Video Solution

Watch Video Solution

6. A bomber flying horizontally with constant speed releases a bomb from an aeroplane.

a) The path of bomb as seen by the observer on the ground is parabola

b) The path of the bomb as seen by a pilot is a straight line.

c) The path of the aeroplane with respect to bomb is a straight line

d) The path of the bomb as seen by pilot observed as parabola.

A. a is correcy

B. a and b are correct

C. a, b and c are correct

D. only d is correct

Answer: C

Watch Video Solution

Exercise A Ascending Descending Order

1. Set the following vectors in the increasing order of their magnitude.

(a) $3\hat{i}+4\hat{j}$, (b) $2\hat{i}+4\hat{j}+6\hat{k}$

(c) $2\hat{i}+2\hat{j}+2\hat{k}$,

A. a,b,c

B. c,a,b

C. a,c,b

D. b,c,a

Answer: B

Watch Video Solution

2. Arrange the vectors subtractions so that their magnitudes are in decreasing order. If the two vectors $\vec{A}$ and $\vec{B}$ are acting at an angle $\left(\left|\vec{A}\right|>\left|\vec{B}\right|\right)$

a) 60° b) 90° c) 180° d) 120°

A. d,c,b,a

B. a,b,d,c

C. c,d,b,a

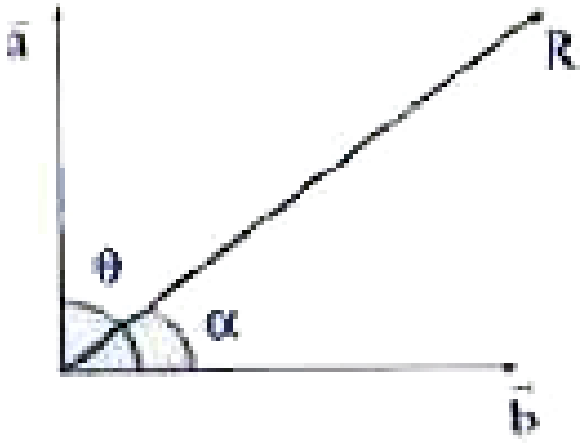
D. c,d,a,b

Answer: C

Watch Video Solution

Exercise A Matching

1. If $\vec{a}$ and $\vec{b}$ are the two vectors $\vec{R}$ resultant of $\vec{a}$, $\vec{b}$ as shown.



List-I	List-II
A: component of $\vec{a}$ along $\vec{b}$	$(1) a^2 + b^3$
B: component of $\vec{b}$ along $\vec{a}$	$(2) 0$
C: component of R along $\vec{a}$	$(3) R \sin\alpha$
D: component of R along $\vec{a}$	$(R) R \cos\alpha$

A. a-1, b-2, c-3, d-4

B. a-2,b-2,c-3,d-4

C. c-2,d-4,a-2,d-2

D. a-2,b-1, c-4, d-3

Answer: B

Watch Video Solution

2. Let $\vec{a}, \vec{b}, \vec{c}$ be three unit vectors such that angle between $\vec{a}$ and $\vec{b}$ $is\alpha$, $\vec{b}$ and $\vec{c}$ is β and $\vec{c}$ and $\vec{a}$ is γ. if $\left|\vec{a}. + \vec{b} + \vec{c}\right.$, then $\cos\alpha + \cos\beta + \cos\gamma$ =

A. a-1,b-2,c-3

B. a-1,b-3,c-2

C. a-3,b-2,c-3

D. a-2,b-3,c-1

Answer: C

Watch Video Solution

3. Angle batween velocity and acceleration vectors in the following case

List-I	List-II
(A)Vertically projected body	$(e)90^{\circ}$
(b)For freely falling body	(f)Changes from point to point
(C)For projectile	(g)Zero
(d)In uniform circular motion	$(h)180^{\circ}$

A. a-h, b-g, c-f, d-e

B. a-f, b-g, c-h, d-e

C. a-e, b-f, c-h, d-g

D. a-g, b-h, c-e, d-f

Answer: A

Watch Video Solution

4. For a projectile 'R' is range and 'H' is maximum height

List - I	List - II
a) R = H	e) Angle of projection $\tan^{-1}(1)$
b) R = 2H	f) Angle of projection $\tan^{-1}(4)$
c) R = 3H	g) Angle of projection $\tan^{-1}(2)$
d) R = 4H	h) Angle of projection $\tan^{-1}(4/3)$

A. a-g, b-h, c-e, d-f

B. a-h, b-g, c-e, d-f

C. a-f, b-g, c-h,d-e

D. a-e, b-g, c-f, d-h

Answer: C

Watch Video Solution

5. The equation of motion of a projectile is $y = ax - bx^2$, where a and b are constants of motion. Match the quantities in Column I with the

relations in Column II.

Column I		Column II	
(A)	The initial velocity of projection	(p)	$\frac{a}{b}$
(B)	The horizontal range of projectile	(q)	$a\sqrt{\frac{2}{bg}}$
(C)	The maximum vertical height attained by projectile	(r)	$\frac{a^2}{4b}$
(D)	The time of flight of projectile	(s)	$\sqrt{\frac{g(1+a^2)}{2b}}$

A. A-p, B-q, C-r, D-s

B. A-s,B-p,C-q,D-r

C. A-s,B-p,C-r,D-q

D. A-p, B-s,C-r, D-q

Answer: C

Watch Video Solution

6. Match list I with list II for a projectile.

List-I

(A)For two angles θ and $(90-\theta)$with same magnitude of velocity of pro

(b)Equation of parabola of projectile$y = Px - Qx^2$

(C)Radius of curvature of path of projectile projected with a velocity$\left(P\hat{i}\right.$

(d)Angles of projection$\theta = \tan^{-1}(4)$

Watch Video Solution

7. Match list I with list II

List-I

(A)Ratio of angular velocities of hours hand of a clock and self rotation of t

(b)Ratio of angular velocities of seconds hand to minutes hand of a clock

(c)Ratio of angular velocities of seconds hand to hours hand of a clock

(d)Ratio of angular velocities of minutes hand to hours hand of a clock

A. a-h,b-f,c-e,d-h

B. a-f,b-g,c-h,d-e

C. a-g,b-f,c-h,d-e

D. a-g,b-e,c-f,d-h

Answer: C

Watch Video Solution

Exercise Ib Vectors And Scalars

1. (A): Electric current density is a vector

(R): A physical quantity having magnitude and direction should be always a vector.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

2. (A): The direction of velocity vector remains unchanged though the coordinate system is changed

(R) : The direction of real vector is independent of coordinate system

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

3. The component of a vector is

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

4. check Wether the vector $\left(\frac{\hat{i}}{\sqrt{2}}+\frac{\hat{j}}{\sqrt{2}}\right)$ is a unit vector or not .

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: B

Watch Video Solution

5. vector is not changed if

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

1. The resultant of $\vec{A}$ and $\vec{B}$ makes an angle α with $\vec{A}$ and β and $\vec{B}$,

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

2. What is a unit vector?

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: C

Watch Video Solution

3. Which is a vector quantity?

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: C

Watch Video Solution

4. Consider the following two statements:

A The linear momentum of a particle is independent of the frame of reference.

B. The kinetic energy of a particle is independent of the frame of reference

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: D

Watch Video Solution

5. The minimum number of vectors of equal magnitude required to produce a zero resultant is :

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: B

Watch Video Solution

6. $\vec{A}$ is a vector of magnitude 2.7 units due east . What is the magnitude and direction of vector 4 $\vec{A}$?

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: D

Watch Video Solution

7. The sum of two vector A and B is at right angles to their difference .Then

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

8. Two waves are said to be coherent, if they have

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: D

Watch Video Solution

9. A particle shows uniform circular motion. Its motion is .

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: B

Watch Video Solution

10. A vector is not changed if

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: C

Watch Video Solution

1. The magnitude of a vector cannot be :

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

Exercise Ib Motion In A Plane

1. Assertion: A body, whatever its motion is always at rest in a frame of reference which is fixed to the body itself.

Reason: The relative velocity of a body with respect to itself is zero.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: C

Watch Video Solution

2. A body is said to be in uniform motion if it has uniform velocity.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: C

Watch Video Solution

3. A truck travelling due north at 20 m/s turns west and travels at the same speed. The change in its velocity is

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: D

Watch Video Solution

1. A plane mirror and a person are moving towards each other with same velocity v. Then the velocity of the image is

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: D

Watch Video Solution

2. (A): A man is on the northern bank of a river. To cross the river in a shortest time he should swim due south.

(R) : Man should move opposite to the river flow to cross in shortest time.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: C

Watch Video Solution

3. What is the direction of velocity and acceleration in shm ?

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

4. Assertion : Magnitude of average velocity is equal to average speed, if velocity is constant.

Reson : If velocity is constant, then there is no change in the direction of motion.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

1. In a projectile motion the velocity

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

2. (A): The path followed by one projectile as observed by another projectile is a straight line in uniform gravitation field.

(R): The relative velocity between two projectiles at a given place doesn't change with time. Because their relative acceleration is zero.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

3. A bomb is dropped from an aeroplane moving horizontally at constant speed. If air resistance is neglected then the bomb

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

4. An aeroplane takes off at an angle of 60° to the horizontal.If the velocity of the plane is $200kmh^{-1}$,calculate its horizontal and vertical component of its velocity.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: B

Watch Video Solution

5. For body thrown horizontally from the top of a tower,

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: C

Watch Video Solution

6. Statement-I: Two particles of different mass are projected with same velocity and angle of projection. The maximum height attained by both the particles will be same.

Statement -II : The acceleration due to gravity is independent of particle mass

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

7. (A): The maximum horizontal range of projectile is proportional to square of velocity.

(R): The maximum horizontal range of projectile is equal to maximum height at tained by projectile

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: C

Watch Video Solution

8. Assertion: Horizontal range is same for angle of projection θ and $(90^\circ - \theta)$, if speed of projection is same.

Reason: Horizontal range is independent of angle of projection.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: C

Watch Video Solution

9. Assertion For projection angle $\tan^{-1}(4)$, the horizontal and maximum height of a projectile are equal.

Reason The maximum range of projectile is directly proportional to square of velocity and inversely proportional to acceleration due to gravity.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: B

Watch Video Solution

10. Assertion : $-$ The trajectory of projectile in XY plane is quadratic in x and linear in y if x is independent of $X-$ coordinate.

Reason : $-$ $y-$ coordinate of trajetory is independent of $x-$ coordinate.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: B

Watch Video Solution

11. Assertion : In javelin throw, the athlete throws the projectile at an angle slightly more than 45°.

Reason: The maximum range does not depend Uoseay upon angle of projection.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: D

Watch Video Solution

12. Assertion: A body is dropped from a given height and another body is projected horizontally from the same height strike the ground simultaneously.

Reason: Horizontal velocity has no effect in the vertical directiongt

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

13. Assertion The maximum height of projectile is always 50% of the maximum range.

Reasons For maximum height, projectile should be projected at 90°

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: D

Watch Video Solution

14. (A) : When range of a projectile is maximum, its angle of projection may be 45° or 135°

(R): Whether is 45° or 135° value of range remains the same, only the sign changes.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

15. In the following questions a statement of assertion (A) is followed by a statement of reason (R).

A: Horizontal range of a projectile is always same for angle of projection θ with horizontal or θ with vertical .

R : Horizontal range depends only on angle of projection .

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: D

Watch Video Solution

Exercise Ib Circular Motion

1. (A): When a particle moves in a circle with a uniform speed, its velocity and accele ration both changes.

(R): The centripetal acceleration in circular motion is dependent on angular velocity of the body.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: B

Watch Video Solution

2. (A): Two similar trains are moving along the equatorial line with the same speed but in opposite direction. They will exert equal pressure on the rails.

(R): In uniform circular motion the magnitude and direction of acceleration remains constant but the direction of motion continuously changes.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: D

Watch Video Solution

3. Assertion : An object may have varying speed without having varying velocity.

Reason : If the velocity is zero at an instant, the acceleration may not be zero at that instant.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: D

Watch Video Solution

4. Which of the following graph for a body moving along a straight line is possible ?

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: C

Watch Video Solution

5. Assertion : A body is momentarily at rest at the instant it reverses the direction.

Reason : A body cannot have acceleration if its velocity is zero at a given instant of time.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: C

Watch Video Solution

Watch Video Solution

6. Assertion : On a curved path, average speed of a particle can never be equal to average velocity.

Reason : Average speed is total distance travelled divided by total time. Whereas average velocity is, final velocity plus initial velocity divided by two.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: C

Watch Video Solution

7. Assertion : Acceleration of a moving particle can change its direction without any change in direction of velocity.

Reason : If the direction of change in velocity vector changes, direction of acceleration vector also changes.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: B

Watch Video Solution

8. (A): When a body is projected at angle 45° its range is maximum

(R): For maximum of range, the value of $\sin 2\theta$ should be equal to one.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

9. (A): A cyclist leans inwards while taking a turn, while a man sitting in a car leans outwards on a curve.

(R) : Centripetal acceleration is acting towards the centre of the curve.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

10. (Assertion) :A body can have acceleration even if its velocity is zero at a given instant of time.

(Reason): A body is momentarily at rest when it reverses its direction of motion.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

11. (A): Electric Current and velocity of light both have direction as well as magnitude but still are not considered as vectors.

(R): They do not follow laws of vector addition.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A

Watch Video Solution

12. Assertion : Generally the path of a projectile from the earth is parabolic but it is elliptical for projectiles going to very great height.

Reason : Up to ordinary height the projectile moves under a uniform gravitational force, but for great heights, projectile moves under a variable force.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true and (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are fals

Answer: A

Watch Video Solution

Exercise 2 Addition Subtraction And Resolution

1. A person runs along a circular path of radius 5 m. If he completes half of the circle find the magnitude of the displacement vector, How far the

person ran ?

A. $10, , 5\pi m$

B. $5\pi m10m$

C. $5\pi m, 19m$

D. $14m, 10pm$

Answer: A

Watch Video Solution

2. A car makes a displacement of 100 m towards east and then 200 m towards north. Find the magnitude and direction of the resultant.

A. $223.7m \tan^{-1}(2)$ N of E

B. $223.7m \tan^{-1}(2)$ E of N

C. $300m \tan^{-1}(2)$ N of E

D. $100m \tan^{-1}(2)$ N of E

Answer: A

Watch Video Solution

3. If $\vec{A} = 3\hat{i} - 4\hat{j}$ and $\vec{B} = -\hat{i} - 4\hat{j}$, calculate the direction of $\vec{A} + \vec{B}$

A. $\tan^{-1}(4)$ with +x- axis in clock wise

B. $\tan^{-1}(4)$ with -x- axis in clock wise

C. $\tan^{-1}(4)$ with +x- axis in anti clock wise

D. $\tan^{-1}(4)$ with -x- axis in anti clock wise

Answer: A

Watch Video Solution

4. Two vectors are given by $\vec{a} = -2\hat{i} + \hat{j} - 3\hat{k}$ and $\vec{b} = 5\hat{i} + 3\hat{j} - 2\hat{k}$. If $3\vec{a} + 2\vec{b} - \vec{c} = 0$

then third vector $\overrightarrow{c}$ is

A. $4\hat{i} + 9\hat{j} - 13\hat{k}$

B. $-4\hat{i} - 9\hat{j} + 13\hat{k}$

C. $4\hat{i} - 9\hat{k} - 13\hat{k}$

D. $2\hat{i} - 3\hat{j} - 13\hat{k}$

Answer: A

Watch Video Solution

5. One of the rectangular components of a velocity of 20 ms^{-1} is 10 ms^{-1}. Find the other component.

A. $10\sqrt{3}ms^{-1}$

B. $20\sqrt{3}ms^{-1}$

C. $5\sqrt{3}ms^{-1}$

D. $35\sqrt{3}ms^{-1}$

Answer: A

Watch Video Solution

6. A car weighing 100kg is on a slope that makes an angle 30° with the horizontal. The component of car's weight parallel to the slope is $(g = 10ms^{-2})$

A. 500 N

B. 1000 N

C. 15,000 N

D. 20,000 N

Answer: A

Watch Video Solution

7. To go from town A to town B a plane must fly about 1780 km at an angle of 30° West of North. How far north of A is B ?

A. 1542 km

B. 1452 km

C. 1254 km

D. 11 km

Answer: A

Watch Video Solution

8. Two vectors a and b have equal magnitudes of 12 units. These vectors are making angles $30^{\circ}$and 120° with the x axis respectively. Their sum is r . Find the x and y components of r .

A. $\left(6\sqrt{3}-6\right), \left(6+6\sqrt{3}\right)$

B. $\left(6\sqrt{3}+6\right), \left(6+6\sqrt{3}\right)$

C. $\left(6\sqrt{3}-6\right), \left(6-6\sqrt{3}\right)$

D. $\left(6\sqrt{3}+6\right), \left(6-6\sqrt{3}\right)$

Answer: A

Watch Video Solution

9. Angle (in rad) made by the vector $\sqrt{3}\hat{i}+\hat{j}$ with the x-axis is

A. $\pi/6$

B. $\pi/4$

C. $\pi/3$

D. $\pi/4$

Answer: A

Watch Video Solution

10. A bird moves in such a way that it has a displacement of 12 m towards east, 5 m towards north and 9 m vertically upwards. Find the magnitude of its displacement.

A. $5\sqrt{2}m$

B. $5\sqrt{10}m$

C. $5\sqrt{5}m$

D. 5m

Answer: B

Watch Video Solution

11. The direction cosines of a vector a are $\cos\alpha = \frac{4}{5\sqrt{2}}, \cos\beta = \frac{1}{\sqrt{2}}$ and $\cos\gamma = \frac{3}{5\sqrt{2}}$ then the vector $\vec{A}$ is

A. $4\hat{i} + \hat{j} + 3\hat{k}$

B. $4\hat{i} + 5\hat{j} + 3\hat{k}$

C. $4\hat{i} - 5\hat{j} - 3\hat{k}$

D. $\hat{i} + \hat{j} - \hat{k}$

Answer: B

Watch Video Solution

12. If $\vec{P} = \hat{i} + 2\hat{j} + 6\hat{k}$ its direction cosines are

A. $\frac{1}{41}, \frac{2}{41}$ and $\frac{6}{41}$

B. $\frac{1}{\sqrt{41}}, \frac{2}{\sqrt{41}}$ and $\frac{6}{\sqrt{41}}$

C. $\frac{3}{\sqrt{41}}, \frac{8}{\sqrt{41}}, \frac{7}{\sqrt{41}}$

D. 1,2 and 6

Answer: B

Watch Video Solution

13. If A = 2i - 3 j + 4k its components in yz plane and zx plane are respectively

A. $\sqrt{13}$ and 5

B. 5 and $2\sqrt{5}$

C. $2\sqrt{5}$ and $\sqrt{13}$

D. $\sqrt{13}$ and $\sqrt{29}$

Answer: B

Watch Video Solution

14. If vectors $\vec{A}$ and $\vec{B}$ are $3\hat{i} - 4\hat{j} + 5\hat{k}$ and $2\hat{i} + 3\hat{j} - 4\hat{k}$ respectively then the unit vector parallel to $\vec{A} + \vec{B}$

A. $\frac{(5i - j + k)}{\sqrt{27}}$

B. $\frac{(5i + j + k)}{\sqrt{27}}$

C. $\frac{(5i + j + k)}{27}$

D. $\frac{(5i - j - k)}{27}$

Answer: A

Watch Video Solution

15. A vector $\sqrt{3}\hat{i} + \hat{j}$ rotates about its tail through an angle 30° in clock wise direction then the new vector is

A. $-2\hat{i} + 4\hat{j}$

B. $3\hat{i} - 4\hat{j}$

C. $5\hat{j}$

D. $5\hat{i}$

Answer: C

Watch Video Solution

16. Maximum and minimum magnitudes of the resultant of two vectors of magnitudes P and Q are in the ratio 3:1. Which of the following relation is true?

A. $P = Q$

B. $P = 2Q$

C. $P = 4Q$

D. $P = Q/3$

Answer: B

Watch Video Solution

17. The resultant of two equal forces is 141.4N when they are mutually perpendicular. When they are inclined at an angle 120°, then the resultant force will be

A. 100 N

B. $141.4N$

C. $196N$

D. zero

Answer: A

Watch Video Solution

18. The magnitudes of two vectors $\vec{P}$ and $\vec{Q}$ differ by 1. The magnitude of their resultant makes an angle of $\tan^{-1}(3/4)$ with P. The angle between P and Q is

A. 45°

B. 0°

C. 180°

D. 90°

Answer: D

Watch Video Solution

19. Which of the following statement is incorrect

A. a,b,c and d must each be a null vector.

B. The magnitude of (a+c) equals the magni tude of (b+d)

C. The magnitude of a can never be greater than the sum of the magnitudes of b, c and d

D. b + c must lie in the plane of a and b if a and d are not collinear, and in the line of a and d, if they are collinear

Answer: A

Watch Video Solution

20. The resultant of two forces 2P and $\sqrt{2}P$ is $\sqrt{10}P$ The angle between the forces is

A. 30°

B. 60°

C. 45°

D. 90°

Answer: C

Watch Video Solution

21. Eleven forces each equal to 5N act on a particle simultaneously. If each force makes an angle 30^o with the next one, the resultant of all forces is

A. 15N

B. 55 N

C. 5 N

D. zero

Answer: C

Watch Video Solution

22. Which of the following sets of forces acting simultaneously on a particle keep it in equilibrium?

A. 3N,5N,10 N

B. 4N,7N,12N

C. 2N,6N,5N

D. 5N,8N,1N

Answer: C

Watch Video Solution

23. The resultant of two forces 1 and P is perpendicular to ' 1' and equal to 1. What is the value of 'P' and angle between the forces

A. $\sqrt{2}, N, 135^\circ$

B. $\sqrt{2}, N, 150^\circ$

C. $2N, 120^\circ$

D. $2N, 150^\circ$

Answer: A

Watch Video Solution

24. If the difference of two unit vectors is also a vector of unit magnitude, the magnitude of the sum of the two unit vectors is

A. 1 units

B. 2 units

C. $\sqrt{3}$ units

D. zero

Answer: C

Watch Video Solution

25. If $\vec{P} + \vec{Q} = \vec{R}$ and $\vec{P} - \vec{Q} = \vec{S}$, then $R^2 + S^2$ is equal to

A. $P^2 + Q^2$

B. $2\left(P^2 - A^2\right)$

C. $2\left(P^2 + Q^2\right)$

D. $4PQ$

Answer: C

Watch Video Solution

26. The greater and least resultant of two forces are 7 N and 3 N respectively. If each of the force is increased by 3N and applied at 60°. The magnitude of the resultant is

A. 7 N

B. 3 N

C. 10 N

D. $\sqrt{129}N$

Answer: D

Watch Video Solution

27. Two forces are such that the sum of their magnitudes is 18 N, the resultant is $\sqrt{228}$ when they are at 120°. Then the magnitude of the forces are

A. 12N,6N

B. 13N,5N

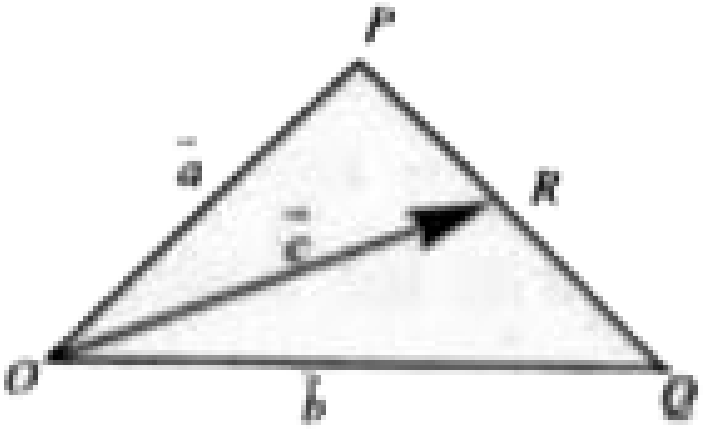
C. 10N, 9N

D. 16N, 2N

Answer: D

Watch Video Solution

28. Figure shows three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ where R is the midpoint of PQ. Then which of the following relations is correct?



A. $\vec{a} + \vec{b} = 2\vec{c}$

B. $\vec{a} + \vec{b} = \vec{c}$

C. $\vec{a} - \vec{b} = \vec{2}\,c$

D. $\vec{a} - \vec{b} = \vec{c}$

Answer: A

Watch Video Solution

29. The resultant of two vectors $\vec{P}$ and $\vec{Q}$ is $\vec{R}$. If $\vec{Q}$ is doubled then the new resultant vector is perpendicular to $\vec{P}$. Then magnitude of $\vec{R}$ is :-

A. $\frac{P^2 - Q}{2PQ}$

B. $\frac{P + Q}{P - Q}$

C. Q

D. $\frac{P}{Q}$

Answer: C

Watch Video Solution

Exercise 2 Lami S Theorem

1. If 'O' is at equilibrium then the values of the tension T_1 and T_2 respectively.

A. 20N, 30N

B. $20\sqrt{3}, 20N$

C. $20\sqrt{3}N, 20\sqrt{3}N$

D. $10N, 30N$

Answer: B

Watch Video Solution

2. A body of mass $\sqrt{3}$ kg is suspended by a string to a rigid support. The body is pulled horizontally by a force F until the string makes an angle of 30^{o} with the vertical. The value of F and tension in the string are.

A. $9.8N, 9.8N$

B. $9.8N, 19.6N$

C. $19.6N, 19.6N$

D. $19.6N, 9.8N$

Answer: B

Watch Video Solution

3. Two light strings of length 4 cm and 3 cm are tied to a bob of weight 500 gm. The free ends of the strings are tied to pegs in the same horizontal line and separated by 5 cm. The ratio of tension in the longer string to that in the shorter string is

A. $4:3$

B. $3:4$

C. $4:5$

D. $5:4$

Answer: B

Watch Video Solution

4. A boy is hanging from a horizontal branch of a tree. The tension in the arms will be maximum when the angle between the arms is

A. 0°

B. 30°

C. 60°

D. 120°

Answer: D

Watch Video Solution

5. The position vector of a moving particle at't' sec is given by $\vec{r} = 3\hat{i} + 4t^2\hat{j} - t^3\hat{k}$. Its displacement during an interval of t = Is to 3 sec is

A. $\hat{j} - \hat{k}$

B. $3\hat{i} + 4\hat{j} - \hat{k}$

C. $9\hat{i} + 36\hat{j} - 27\hat{k}$

D. $32\hat{j} - 26\hat{k}$

Answer: D

Watch Video Solution

6. If $\vec{u} = 2\hat{i} - 2\hat{j} + 3\hat{k}$ and the final velocity is $\vec{v} = 2\hat{i} - 4\hat{j} + 5\hat{k}$ and it is covered in a time of 10 sec, find the acceleration vector.

A. $\frac{3\bar{i}-2\bar{j}+2\bar{k}}{10}$

B. $\frac{-3\bar{i}+\bar{j}+2\bar{k}}{10}$

C. $\frac{-3\bar{i}-2\bar{j}+2\bar{k}}{10}$

D. $\frac{-\bar{j}+\bar{k}}{5}$

Answer: D

Watch Video Solution

7. A train moving at a constnt velocity of 54 km/hr moves eastwards for 30 minuts, then due north with the same speed for 40 minutes. What is the average velocity of the train during this run? (in km/hr)

A. 30

B. 35

C. 38.6

D. 49.3

Answer: C

Watch Video Solution

8. A particle starts from the origin at t = 0 s with a velocity of $10.0\hat{j}$ m/s and moves in plane with a constant acceleration of $\left(8\hat{i}+2\hat{j}\right)ms^{-2}$. The y-coordinate of the particle in 2 sec is

A. 24 m

B. 16 m

C. 8 m

D. 12 m

Answer: A

Watch Video Solution

Exercise 2 Relative Velocity

1. A train of $150m$ length is going towards North direction at a speed of $10m/s$. A parrot flies at the speed of $5m/s$ towards South direction parallel to the railways track. The time taken by the parrot to cross the train is

A. 12 sec

B. 8 sec

C. 15 sec

D. 10 sec

Answer: D

Watch Video Solution

2. The driver of a car moving towards a rocket launching with a speed of 6 ms^{-1} observed that the rocket is moving with speed of 10 ms^{-1} The upward speed of the rocket as seen by the stationary observer is nearly

A. $4ms^{-1}$

B. $6ms^{-1}$

C. $8ms^{-1}$

D. $11ms^{-1}$

Answer: C

Watch Video Solution

3. An aeroplane is flying with the velocity of V_1 =800 kmph relative to the air towards south. A wind with velocity of $V_2 = 15ms^{-1}$ is blowing from West to East. What is the velocity of the aeroplane with respect to the earth.

A. $222.7ms^{-1}$

B. $150ms^{-1}$

C. $82ms^{-1}$

D. $40ms^{-1}$

Answer: A

Watch Video Solution

4. 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 starst moving at a speed of $51km/h$ to the north. What is the direction of the flag on the mass of the boat?

A. East (approximately)

B. North-East

C. West

D. North West

Answer: A

Watch Video Solution

5. The wind is blowing from south at 10 ms^{-1}, but to a cyclist it appears blowing from the east at 10 ms^{-1}. The velocity of cyclist is

A. $10\sqrt{2}ms^{-1}$ towards S-W

B. $10\sqrt{2}ms^{-1}$ towards N-W

C. $10\sqrt{2}ms^{-1}$ towards S-E

D. $10\sqrt{2}ms^{-1}$ towards N-E

Answer: D

Watch Video Solution

6. A particles is moving eastwards with a velocity of $5ms^{-1}$. In 10 s, the velocity changes to $5ms^{-1}$ northwards. The average acceleration in this time is

A. $\frac{1}{\sqrt{2}ms^{-2}}$ towards norht east

B. $\frac{1}{2ms^{-2}}$ towards north

C. Zero

D. $\frac{1}{\sqrt{2}} ms^{-2}$ towards northwest.

Answer: D

Watch Video Solution

7. A Ship A steams down north at a speed of 8 kmph. and ship B due west at a speed of 6 kmph. The velocity of A w.r.t. B is.

A. 10 kmph, $\tan^{-1}\left(\frac{4}{3}\right) N$ of E

B. 10 kmph, $\tan^{-1}\left(\frac{4}{3}\right) E$of N

C. 10 kmph NE

D. 2 kmph, $\tan^{-1}\left(\frac{4}{3}\right) N$ of E

Answer: A

Watch Video Solution

8. Rain drops are falling down ward vertically at 4 kmph. For a person,moving forward at 3 kmph feels the rain at

A. 7kmph

B. 1 kmph

C. 5kmph

D. 25kmph

Answer: C

Watch Video Solution

9. A man is travelling at 10.8 kmph in a topless car on a rainy day. He holds an umbrella at an angle of 37° with the vertical so that he does not wet. If rain drops falls vertically downwards, what is the rain velocity ?

A. $1ms^{-1}$

B. $2ms^{-1}$

C. $3ms^{-1}$

D. $4ms^{-1}$

Answer: D

Watch Video Solution

10. When a man is standing, rain drops appears to him falling at 60° from the horizontal from his front side. When he is travelling at 5 kmph on a horizontal road they appear to him falling at 30° from the horizontal from his front side. The actual speed of the rain is (in kmph)

A. 3

B. 4

C. 5

D. $5\sqrt{3}$

Answer: C

Watch Video Solution

11. Two ships A and B are 10 km apart on a line running South to North. Ship A father North is streaming West at $20kmh^{-1}$ and as ship B is streaming North at $20kmh^{-1}$. What id their distance of closest approach and how long do they take to reach it ?

A. $5\sqrt{2}km15$ min

B. $5\sqrt{2}km1.5$ min

C. $5\sqrt{2}km0.5$ min

D. $5\sqrt{5}km$ 15 sec

Answer: A

Watch Video Solution

12. A man walking with a speed of 3 km/h finds the rain drops falling vertically downwards. When the man increases his speed to 6km/h he find

that the rain drops are falling making an angle of 30° with the vertical . Find the speed of the rain drops (in km/h)/

A. 4m//s

B. 8m//s

C. 6 m//s

D. 5m//s

Answer: A

Watch Video Solution

13. Wind is blowing from the south at 5 ms^{-1} . To a cyclist it appears to be blowing from the east at 5 ms^{-1} . so that the velocity of the cyclist is

A. $5\sqrt{2}ms^{-1}$ towards north-west

B. $5\sqrt{2}ms^{-1}$ towards north-east

C. $5\sqrt{2}ms^{-1}$ towards south-west

D. $5\sqrt{2}ms^{-1}$ towards south-east

Answer: B

Watch Video Solution

14. Rain is falling vertically with a speed of $35ms^{-1}$. Winds starts blowing after sometime with a speed of 12 ms^{-1} in east to west direction. In which direction should a boy waiting at a bus stop hold his umbrella ?

A. At an angle of $\tan^{-1}\left(\frac{2}{5}\right)$ with the vertical towards the east.

B. At an angle of $\tan^{-1}\left(\frac{5}{2}\right)$ with the vertical towards the west.

C. At an angle of $\tan^{-1}\left(\frac{5}{2}\right)$ with the vertical towards the east

D. At an angle of $\tan^{-1}\left(\frac{5}{2}\right)$ with the vertical towards the west

Answer: B

Watch Video Solution

15. Two boys are standing at the ends A and B of a ground where AB = a. The boy at B starts running in a direction perpendicular to AB with velocity v_1 . The boy at A starts running simultaneously with velocity v and catches the other in a time t, where t is

A. $\frac{a}{\sqrt{v^2+v_1^2}}$

B. $\frac{a}{v+v_1}$

C. $\frac{a}{v-v_1}$

D. $\sqrt{\frac{a^2}{v^2-v_1^2}}$

Answer: D

Watch Video Solution

Exercise 2 A Boat In A River

1. A man can swim in still water at a speed of 6 kmph and he has to cross the river and reach just opposite point on the other bank. If the river is

flowing at a speed of 3 kmph, he has to swim in the direction

A. 30° with the river flow

B. 60° with the river flow

C. 135° with the river flow

D. 120° with the river flow

Answer: D

Watch Video Solution

2. A person can swim in still water at 5 m/s. He moves in a river of velocity 3 m/s. First down the stream next same distance up the steam the ratio of times taken are

A. $1:1$

B. $1:2$

C. $1:4$

D. $4:1$

Answer: C

Watch Video Solution

3. A man can swim in still water at a speed of 6 kmph and he has to cross the river and reach just opposite point on the other bank. If the river is flowing at a speed of 3 kmph, and the width of the river is 2 km, the time taken to cross the river is (in hours)

A. $\frac{2}{27}$

B. $\frac{2}{\sqrt{27}}$

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

D. $\frac{2}{\sqrt{45}}$

Answer: B

Watch Video Solution

4. The velocity of water in a river is 2 kmph, while width is 400 m. A boat is rowed from a point rowing always aiming opposite point at 8 kmph of still water velocity. On reaching the opposite bank the drift obtained is

A. 93 m

B. $100.8m$

C. $112.4m$

D. 100 m

Answer: D

Watch Video Solution

5. A person swims at 135° to current of river, to meet target on reaching opposite point. The ratio of person's velocity to river water velocity is

A. $\sqrt{3}:1$

B. $\sqrt{2}:1$

C. $1:\sqrt{2}$

D. $1:\sqrt{3}$

Answer: B

Watch Video Solution

6. A boat moves perpendicular to the bank with a velocity of 7.2 km/h. The current carries it 150 m downstream, find the velocity of the current. (The width of the river is 0.5 km).

A. $0.4ms^{-1}$

B. $1.2ms^{-1}$

C. $0.5ms^{-1}$

D. $0.6ms^{-1}$

Answer: D

Watch Video Solution

7. A swimmer is capable of swimming 1.65 ms^{-1} in still water. If she swims directly across a 180m wide river whose current is 0.85 m/s, how far downstream (from a point opposite her starting point) will she reach ?

A. $92.7m$

B. $40m$

C. 48 m

D. 20 m

Answer: A

Watch Video Solution

Exercise 2 Oblique Project

1. A body is projected with a velocity $60ms^{-1}at30^{\circ}$ to horizontal . Its initial velocity vector is

A. $10\hat{i} + 10\sqrt{3}\hat{j}$

B. $30\hat{i} + 30\sqrt{3}\hat{i}$

C. $10\sqrt{3}\hat{j}$

D. $30\sqrt{3}\hat{i}$

Answer: C

Watch Video Solution

2. A body is projected with velocity 60m/sec at 30 degree horizontal, its initial velocity vector is ? In the above problem velocity after 3 seconds is-

A. $20\hat{i} + 20\sqrt{3}\hat{j}$

B. $30\hat{i}$

C. $10\sqrt{3}\hat{j}$

D. $30\sqrt{3}\hat{i}$

Answer: D

Watch Video Solution

3. In the above problem the displacement after 2 s is:

A. $30\sqrt{3}\hat{i} + 30\hat{j}$

B. $60\sqrt{3}\hat{i} + 40\hat{j}$

C. $10\sqrt{3}\hat{i} + 10\hat{j}$

D. $40\sqrt{3}\hat{j} + 40\hat{i}$

Answer: B

Watch Video Solution

4. A body is projected down from height of 60 m with a velocity $10ms^{-1}$ at angle 30° to horizontal. The time of flight of the body is $[g = 10ms^{-2}]$

A. 1s

B. 2s

C. 3s

D. 4s

Answer: D

Watch Video Solution

5. A body is projected with velocity u such that its horizontal range and maximum vertical heights are same. The maximum heights is

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

B. $\frac{3u^2}{4g}$

C. $\frac{16u^2}{17g}$

D. $\frac{8u^2}{17g}$

Answer: D

Watch Video Solution

6. A stone is projected from the ground with a velocity of $14ms^{-1}$. One second later it clears a wall 2m high. The angle of projection is $(g = 10ms^{-2})$

A. 45°

B. 30°

C. 60°

D. 15°

Answer: B

Watch Video Solution

7. The height y and horizontal distance x covered by a projectile in a time t seconds are given by the equations y = $8t - 5t^2$ and x = 6t. If x and y are measured in metres, the velocity of projection is

A. $8ms^{-1}$

B. $6ms^{-1}$

C. $14ms^{-1}$

D. $10ms^{-1}$

Answer: D

Watch Video Solution

8. A body is projected at an angle of 30° with the horizontal and with a speed of $30ms^{-1}$. What is the angle with the horizontal after $1.5s$? $(g = 10ms^{-2})$.

A. zero

B. 60°

C. 45°

D. 90°

Answer: A

Watch Video Solution

9. A ball is projected obliquely with a velocity 49 ms^{-1} strikes the ground at a distance of 245 m from the point of projection. It remained in air for

A. 10 sec

B. $5\sqrt{2}$ sec

C. 3 sec

D. 2.5 sec

Answer: B

Watch Video Solution

10. The potential energy of a projectile at maximum height is 3/4 times kinetic energy of projection. Its angle of projection is

A. 30°

B. 45°

C. 60°

D. none

Answer: C

Watch Video Solution

11. Two bodies are thrown from the same point with the same velocity of 50 ms^{-1} . If their angles of projection are complimentary angles and the difference of maximum heights is 30m, their maximum heights (g=10 ms^{-2})

A. 50 m and 80 m

B. 47.5 m and 77.5 m

C. 30 m and 60 m

D. 25 m and 55 m

Answer: B

Watch Video Solution

12. A gun fires a bullet at a speed of 140 ms^{-1}. If the bullet is to hit a target at the same level as the gun and at 1km distance, the angle of projection may be

A. 60° or 30°

B. 40° or 50°

C. 15° or 75°

D. 20° or 70°

Answer: C

Watch Video Solution

13. A body is projected with velocity 24 ms^{-1} making an angle 30° with the horizontal. The vertical component of its velocity after 2s is (g=10 ms^{-1})

A. $8ms^{-1}$ upward

B. $8ms^{-1}$ down ward

C. $32ms^{-1}$ upward

D. $32ms^{-1}$ down word

Answer: B

Watch Video Solution

14. A particle is thrown with velocity u at an angle $\propto$ from the horizontal. Another particle is thrown with the same velocity at an angle $\propto$ from the verticle. What will be the ratio of times of flight of two particles ?

A. $\tan 2\theta : 1$

B. $\cot 2\theta : 1$

C. $\tan \theta : 1$

D. $\cot \theta : 1$

Answer: C

Watch Video Solution

15. The equation of trajectory of a projectile is $y = 10x - \left(\frac{5}{9}\right)x^2$. If we assume $g = 10ms^{-2}$ the range of projectile (in meters) is

A. 36

B. 24

C. 18

D. 9

Answer: C

Watch Video Solution

16. An object is projected with a velocity of $20ms^{-1}$ making an angle of 45° with horizontal. The equation for the trajectory is h=$Ax - Bx^2$ where 'h' is height, x is horizontal distance, A and B are constants. The ratio A and B is (g=10ms^{-2})

A. $1:5$

B. $5:1$

C. $1:40$

D. $40:1$

Answer: D

Watch Video Solution

17. For a projectile, the ratio of maximum height reached to the square of flight time is (Take, $g = 10ms^{-2}$)

A. $5:4$

B. $5:2$

C. $5:1$

D. $10:1$

Answer: A

Watch Video Solution

18. The speed of a projectile at its maximum height is $\sqrt{3}/2$ times its initial speed. If the range of the projectile is P times the maximum height attained by it, P is equal to

A. $4/3$

B. $2\sqrt{3}$

C. $4\sqrt{3}$

D. $3/4$

Answer: C

Watch Video Solution

19. The velocity at the maximum height of a projectile is half of its initial velocity of projection. The angle of projection is

A. 30°

B. 45°

C. 60°

D. 76°

Answer: C

Watch Video Solution

20. A person throws a bottle into a dustbin at the same height as he is 2m away at an angle of 45º. The velocity of thrown is

A. g

B. $\sqrt{g}$

C. 2g

D. $\sqrt{2}g$

Answer: D

Watch Video Solution

21. A body is projected at angle 30° to horizontal with a velocity 50 ms^{-1} . Its time of flight is (g=10 m/s^2)

A. 4s

B. 5s

C. 6s

D. 7s

Answer: B

Watch Video Solution

22. A body is projected at angle 30° to horizontal on a planet with a velocity of 80 ms^{-1} its time of flight is 4 seconds then acceleration due to gravity on that planet is

A. $125\sqrt{3}$

B. $250\sqrt{3}$

C. 125

D. 250

Answer: A

Watch Video Solution

23. A body is projected at angle 30° to horizontal on a planet with a velocity of 80 ms^{-1} its time of flight is 4 seconds then acceleration due to gravity on that planet is

A. $2ms^{-2}$

B. $5ms^{-2}$

C. $10ms^{-2}$

D. $20ms^{-2}$

Answer: D

Watch Video Solution

24. Abody is thrown with velocity (4i +3j) metre per second. Its maximum height is (g =10 ms^{-2})

A. $2.5m$

B. $0.8m$

C. $0.9m$

D. $0.45m$

Answer: D

Watch Video Solution

25. Two particles are projected with same velocity but at angles of projection 35° and 55°. Then their horizontal ranges are in the ratio of

A. $1:2$

B. $2:1$

C. $1:1$

D. $4:1$

Answer: C

Watch Video Solution

26. The potential energy of a projectile at its maximum height is equal to its kinetic energy there. If the velocity of projection is 20 ms^{-1} , its time of flight is (g=10 ms^{-2})

A. 2s

B. $2\sqrt{2}$

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

D. $\frac{1}{\sqrt{2}}s$

Answer: B

Watch Video Solution

27. If the maximum vertical height and horizontal ranges of a projectile are same, the angle of projection will be

A. 45°

B. $\tan^{-1} 4$

C. $\tan^{-1} 2$

D. 30°

Answer: B

Watch Video Solution

28. A body is projected with a certain speed at angles of projection of θ and $90 - \theta$ The maximum height attained in the two cases are 20m and 10m respectively. The range for angle of projection θ is

A. 20 m

B. 30 m

C. 60 m

D. 80 m

Answer: C

Watch Video Solution

29. From a point on the ground a particle is projected with initial velocity u, such that its horizontal range is maximum. The magnitude of average velocity during its ascent is

A. $\frac{\sqrt{5}u}{2}$

B. $\frac{\sqrt{5}u}{2\sqrt{2}}$

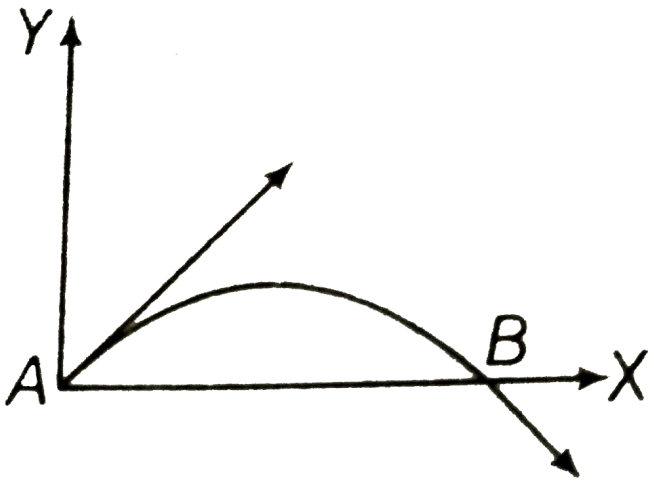
C. $\frac{5u}{2\sqrt{2}}$

D. $\frac{\sqrt{2}u}{\sqrt{5}}$

Answer: B

Watch Video Solution

30. the velocity of a projectile at initial point a is $\left(2\hat{i}+3\hat{j}\right)$ m/s. Its velocity 0inm/s) at point B is



A. $-2\hat{i}+3\hat{j}m/s$

B. $2\hat{i}-3\hat{j}m/s$

C. $2\hat{i}+3\hat{j}m/s$

D. $-\left(2\hat{i}+3\hat{j}\right)m/s$

Answer: B

Watch Video Solution

Exercise 2 Horizontal Projectile Motion

1. A body is projected horizontally from a height of 78.4 m with a velocity 10 ms^{-1} . Its velocity after 3 seconds is [g = 10 ms^{-2}] (Take direction of projection on $\overrightarrow{i}$ and vertically upward direction on j)

A. $10\hat{i}-30\hat{j}$

B. $10\hat{i}+30\hat{j}$

C. $20\overset{\frown}{-}30\hat{j}$

D. $10\hat{i} + 10\sqrt{3}\hat{j}$

Answer: A

Watch Video Solution

2. A body is projected horizontally from a height of 78.4 m with a velocity 10 ms^{-1} .In the above problem angle made by velocity vector with x axis after 4 seconds is $\tan^{-1}$

A. 3

B. 4

C. 5

D. 6

Answer: B

Watch Video Solution

3. A stone is thrown horizontally with velocity g ms^{-1} from the top of a tower of height g metre. The velocity with which it hits the ground is (in ms^{-1})

A. g

B. 2g

C. $\sqrt{3}g$

D. 4g

Answer: C

Watch Video Solution

4. A body is thrown horizontally from the top of a tower. It reaches the ground after 4s at an angle 45° to the ground. The velocity of projection is

A. $9.8ms^{-1}$

B. $19.6ms^{-1}$

C. $29.4ms^{-1}$

D. $39.2ms^{-1}$

Answer: D

Watch Video Solution

5. Two cliff of heights 120m and 100.4m are separated by a horizontal distance of 16m. If a car has to reach from the first cliff to the second, the horizontal velocity of the car should be

A. $16ms^{-1}$

B. $4ms^{-1}$

C. $2v$

D. $8ms^{-1}$

Answer: D

Watch Video Solution

6. An aeroplane flying horizontally at an altitude of 490m with a speed of 180 kmph drops a bomb. The horizontal distance at which it hits the ground is

A. 500 m

B. 1000 m

C. 250 m

D. 50 m

Answer: A

Watch Video Solution

7. A ball thrown horizontally with velocity v from the top of a tower of height h reaches the ground in t seconds. If another ball of double the mass is thrown horizontally with velocity 3v from the top of another tower of height 4h it reaches the ground in (seconds)

A. $3t/4$

B. $t/2$

C. $4t$

D. $2t$

Answer: D

Watch Video Solution

8. A ball thrown horizontally with velocity v from the top of a tower of height h reaches the ground in t seconds. If another ball of double the mass is thrown horizontally with velocity 3v from the top of another tower of height 4h it reaches the ground in (seconds). In the above problem if the first ball reaches the ground at a horizontal distance d, the second ball reaches the ground at a horizontal distance

A. 6d

B. 3d

C. 12d

D. 4d

Answer: A

Watch Video Solution

9. A ball is projected horizontally from the top of a building 19.6 m high. If the line joining the point of projection to the point where it hits the ground makes an angle of 45° to the horizontal, the initial velocity of the ball is

A. $4.9ms^{-1}$

B. $9.1ms^{-1}$

C. $19.6ms^{-1}$

D. $14.7ms^{-1}$

Answer: B

Watch Video Solution

10. A body is projected horizontally from the top of a hill with a velocity of 9.8 m/s. What time elapses before the vertical velocity is twice the horizontal velocity?

A. 0.5 sec

B. 1 sec

C. 2 sec

D. 1.5 sec

Answer: C

Watch Video Solution

11. A stone is projected horizontally with a velocity $9.8ms^{-1}$ from a tower of height 100 m. Its velocity one second after projection is $\left(g = 9.8ms^{-2}\right)$.

A. $9.8ms^{-1}$

B. $4.9ms^{-1}$

C. $9.8\sqrt{2}ms^{-1}$

D. $4.9\sqrt{2}ms^{-1}$

Answer: C

Watch Video Solution

12. A body is thrown horizontally from the top of a tower of height 5m. It touches the ground at a distance of 10m from the foot of the tower. The initial velocity of the body is $\left(g = 10ms^{-2}\right)$

A. $2.5ms^{-1}$

B. $5ms^{-1}$

C. $10ms^{-1}$

D. $20ms^{-1}$

Answer: C

Watch Video Solution

13. Two thin wood screens A and B are separated by 200m. A bullet travelling horizontally at a speed of $600ms^{-1}$ hits the screen A, penetrates through it and finally emerges out from B making holes in A and B. If the resistance of air and wood arc negligible, the difference of heights of the holes in A and B is

A. m

B. $\frac{49}{90}$

C. $\frac{7}{\sqrt{90}}m$

D. zero

Answer: B

Watch Video Solution

14. The height and width of each step of a staircase are 20cm and 30cm respectively. A ball rolls off the top of a stair with horizontal velocity v and hits the fifth step. The magnitude of v is (g=10 ms^{-2})

A. $1.5\sqrt{5}ms^{-1}$

B. $3\sqrt{5}ms^{-1}$

C. $7.5ms^{-1}$

D. $1.5ms^{-1}$

Answer: A

Watch Video Solution

Exercise 2 Circular Motion

1. A point on the rim of a wheel 3 m in diameter has linear velocity of 18 ms^{-1} . The angular velocity of the wheel is

A. $4rads^{-1}$

B. $12rads^{-1}$

C. $6rads^{-1}$

D. $18rads^{-1}$

Answer: B

Watch Video Solution

2. A car is moving with a speed of 30 ms^{-1} on a circular path of radius 500 m. If its speed is increasing at the rate of 2 ms^{-2} , the net acceleration of the car is

A. $3.6ms^{-2}$

B. $2.7ms^{-2}$

C. $1.8ms^{-2}$

D. $2ms^{-2}$

Answer: B

Watch Video Solution

3. The speed of a motor increases from 1200 rpm to 1800 rpm in 20 S. How many revolutions does it make in this period of time?

A. 400

B. 200

C. 500

D. 800

Answer: C

Watch Video Solution

4. The angular frequency of a fan increases from 30 rpm to 60 rpm in πs. A dust particle is present at a distance of 20 cm from axis of rotation. The

tangential acceleration of the particle in ns is

A. $0.8ms^{-2}$

B. $0.34ms^{-2}$

C. $0.2ms^{-2}$

D. $1.2ms^{-2}$

Answer: C

Watch Video Solution

5. A cyclist is riding with a speed of 27 kmh^{-1} . As he approaches a circular turn on the road of radius 80m, he applies brakes and reduces his speed at the constant rate of $0.50ms^{-1}$ every second. The net acceleration of the cyclist on the circular turn is

A. $0.68ms^{-2}$

B. $0.86ms^{-2}$

C. $0.56ms^{-2}$

D. $0.76ms^{-2}$

Answer: B

Watch Video Solution

6. Two stones of masses m and 2m are whirled in horizontal circles, the heavier one in the radius $\frac{r}{2}$ and the lighter one in radius r. The tangential speed of lighter stone is n times that of the value of heavier stone when they experience same centripetal forces. The value of n is

A. 1

B. 2

C. 3

D. 4

Answer: B

Watch Video Solution

7. The x and y coordinates if the particle at any time are $x = 5t - 2t^2$ and t = 10t respectively, where x and y are in meters and t in second.The acceleation of the aprticle at t = 2 s is

A. $-8m/s^2$

B. 0

C. $-5m/s^2$

D. $-4m/s^2$

Answer: D

Watch Video Solution

Exercise 3 Parallelogram Law Triangle Law Polygon Law

1. Magnitude of resultant of two vectors $\vec{P}$ and $\vec{Q}$ is equal to magnitude of $\vec{P}$. Find the angle between $\vec{Q}$ and resultant of $\vec{2}\,P$ and $\vec{Q}$.

A. 30°

B. 90°

C. 60°

D. 120°

Answer: B

Watch Video Solution

2. Three forces are acting on a particle of mass m intially in equilibrium. If the first two forces $(R_1 \text{ and } R_2)$ are perpendicular to each other and suddenly the third force (R_3) is removed, then the acceleration on the particle is

A. F_1/m

B. $F_1, F_3/mF_1$

C. $(F_2 - F_3)/m$

D. F_2/m

Answer: A

Watch Video Solution

3. The square of the resultant of two forces 4N and 3 N exceeds the square of the resultant of the two forces by 12 when they are mutually perpendicular. The angle between the vectors is

A. 30°

B. 60°

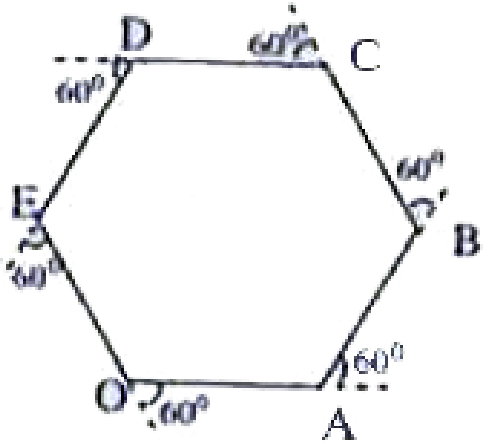
C. 90°

D. 120°

Answer: B

Watch Video Solution

4. A person moving on a motor cycle in a ground takes a turn through 60° on his left after every 50m. Then find the magnitude of displacement suffered by him after 9th turn



A. 100 m

B. 50 m

C. $50\sqrt{3}$

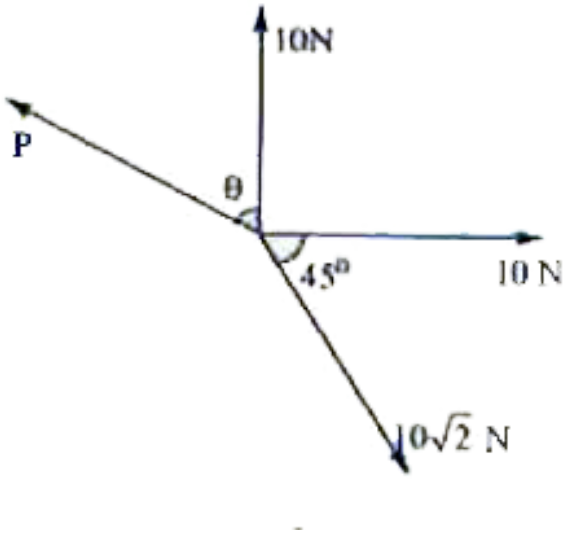
D. 20 m

Answer: A

Watch Video Solution

Exercise 3 Lamni S Theorem

1. If four forces act at a point 'O' as shown in the figure and if O is in equilibrium then the value of $'\theta'$ & 'P' are



A. $15^\circ, 10\sqrt{2}N$

B. $45^\circ, 10N$

C. $75^\circ, 10\sqrt{2}N$

D. $90^\circ, 20N$

Answer: D

Watch Video Solution

2. The components of a vector along the x- and y- directions are $(n+1)$ and 1, respectively. If the coordinate system is rotated by an angle $\theta = 60^\circ$, then the components change to n and 3. The value of n is

A. 2

B. 3

C. 2.5

D. 3.5

Answer: D

Watch Video Solution

3. A mass M kg is suspended by a weightless string. The horizontal force required to hold the mass at 60° with the vertical is

A. Mg

B. $Mg\sqrt{3}$

C. $Mg(\sqrt{3}+1)$

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

Answer: B

Watch Video Solution

Exercise 3 Motion In A Plane

1. Two particles having position vectors $r_1 = \left(3\hat{i} + 5\hat{j}\right)$ metres and $r_2 = \left(-5\hat{i} - 3\hat{j}\right)$ metres are moving with velocities $v_1 = \left(4\hat{i} + 3\hat{j}\right)m/s$ and $v_2 = \left(\alpha\hat{i} + 7\hat{j}\right)m/s$. If they collide after 2 seconds, the value of α is

A. 2

B. 4

C. 6

D. 8

Answer: D

Watch Video Solution

2. A particle moving with a velocity equal to $0.4ms^{-1}$ is subjected to an acceleration of $0.15ms^{-2}$ for 2 seconds in a direction at right angles to the direction of motion. The magnitude of the final velocity is

A. $0.3ms^{-1}$

B. $0.4ms^{-1}$

C. $0.5ms^{-1}$

D. $0.7ms^{-1}$

Answer: C

Watch Video Solution

3. A particle has an initial velocity $3\hat{i} + 3\hat{j}$ and acceleration of $0.41\hat{i} + 0.3\hat{j}$. Its speed after 10s is

A. 10 units

B. $7\sqrt{2}$ units

C. 7 units

D. 8.5 units

Answer: B

Watch Video Solution

4. A particle starts from the origin at t =0 with a velocity of $10.0\hat{j}$ m/s and moves in the X-Y plane with a constant acceleration of

$8.0\hat{i} + 2. \ -\hat{j}m/s$

What is the speed of the particle at that time?

A. t = 2s

B. t=4s

C. t=3s

D. t=1s

Answer: A

Watch Video Solution

5. An aeroplane is to go along straight line from A to B, and back again. The relative speed with respect to wind is V. The wind blows perpendicular to line AB with speed v. The distance between A and B is l. The total time for the round trip is:

A. a, b, d are correct

B. a, b, c are correct

C. only a, d are correct

D. only b, d are correct Relative velocity

Answer: A

 Watch Video Solution

Exercise 3 Relative Velocity

1. A ship is moving due east with a velocity of 12 m/ sec, a truck is moving across on the ship with velocity 4 m/sec. A monkey is climbing the vertical pole mounted on the truck with a velocity of 3m/sec. Find the velocity of the monkey as observed by the man on the shore

A. 10 m/sec

B. 15 m/sec

C. 13 m/sec

D. 20 m/sec

Answer: C

Watch Video Solution

2. Two stones are projected from the top of a tower in opposite directions, with the same velocity V but at 30° & 60° with horizontal respectively. The relative velocity of first stone relative to second stone is

A. 2 V

B. $\sqrt{2}V$

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

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

Answer: B

Watch Video Solution

3. When two bodies approach each other with the different speeds, the distance between them decreases by 120 m for every one minute. If they are moving in direction, the distance between them increases by 90 m for very one minute. The speeds of the bodies are

A. $2ms^{-1}$ and $0.5ms^{-1}$

B. $3ms^{-1}$ and $2ms^{-1}$

C. $1.75ms^{-1}$ and $0.25ms^{-1}$

D. $2.5ms^{-1}$ and $0.5ms^{-1}$

Answer: C

Watch Video Solution

4. Rain pouring down at an angle a with the vertical has a constant speed of 10 m/s. A woman runs against the rain with a speed of 8 m/s and sees that the rain makes an angle þ with the vertical. Find the relation between a and þ.

A. $\tan\beta = \dfrac{8 + 10\sin\alpha}{10\cos\alpha}$

B. $\tan\beta = \dfrac{8 + 10\cos\alpha}{10\sin\alpha}$

C. $\tan\beta = \dfrac{10\sin\alpha}{8 + 10\cos\alpha}$

D. $\tan\beta = \dfrac{10\cos\alpha}{8 + 10\sin\alpha}$

Answer: A

Watch Video Solution

5. A ship A is moving Westwards with a speed of $10kmh^{-10}$ and a ship B 100 km South of A, moving Northwards with a speed of $10kmh^{-1}$ The time after which the distance between them becomes shortest is

A. $5\sqrt{2}h$

B. $10\sqrt{h}$

C. 0h

D. 5h

Answer: D

Watch Video Solution

Exercise 3 A Boat In A River

1. The velocity of a boat in still water is 10 m/s. If water flows in the river with a velocity of 6 m/s what is the difference in times taken to cross the river in the shortest path and the shortest time. The width of the river is 80 m.

A. 1s

B. 10s

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

D. 2 s

Answer: D

Watch Video Solution

2. A river is of width 120m which flows at a speed pf $8ms^{-1}$. If a man swims with a speed of $5ms^{-1}$ at an angle of 127° with the stream, his drift on reaching other bank is

A. 50 m

B. 150 m

C. 200 m

D. 300 m

Answer: B

Watch Video Solution

3. A boatman finds that he can save $6s$ in crossing a river by the quickest path than by the shortest path. If the velocity of the boat and the river be, respectively, $17ms^{-1}$ and $8ms^{-1}$, find the river width.

A. 675 m

B. 765 m

C. 567 m

D. 657 m

Answer: B

Watch Video Solution

Exercise 3 Oblique Projection

1. A projectile is thrown at an angle of 30° with a velocity of 10m/s. the change in velocity during the time interval in which it reaches the highest point is

A. 10 m/s

B. 5 m/s

C. $5\sqrt{3}m/s$

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

Answer: B

Watch Video Solution

2. A body projected obliquely with velocity $19.6ms^{-1}$ has its kinetic energy at the maximum height equal to 3 times its potential energy there. Its position after t second of projection from the ground is (h = maximum height)

A. $\frac{h}{2}$

B. $\frac{h}{4}$

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

D. h

Answer: D

Watch Video Solution

3. It is possible to project a particle with a given speed in two possible ways so that it has the same horizontal range 'R'. The product of time taken by it in the two possible ways is

A. R/g

B. 2R/g

C. 3R/g

D. 4R/g

Answer: B

Watch Video Solution

4. A ball A is projected from the ground such that its horizontal range is maximum. Another ball B is dropped from a height equal to the maximum range of A. The ratio of the time of flight of A to the time of fall of B is

A. $\sqrt{2}:1$

B. $1:2$

C. $1:1$

D. $1:\sqrt{2}$

Answer: C

Watch Video Solution

5. A particle is projected from the ground with velocity u making an angle θ with the horizontal. At half of its maximum heights,

A. its horizontal velocity is $u\cos\theta$

B. its vertical velocity is $\frac{u\sin\theta}{\sqrt{2}}$

C. its velocity is $\left(\frac{1+\cos^2\theta}{2}\right)^{\frac{1}{2}}$

D. all the above are true

Answer: D

Watch Video Solution

6. A hose pipe lying on the ground shoots a stream of water upward at an angle 60° to the horizontal at a speed of $20ms^{-1}$. The water strikes a wall 20m away at a height of $(g = 10ms^2)$

A. 14.64 m

B. 7.32 m

C. 29.28 m

D. 10 m

Answer: A

Watch Video Solution

7. A body is projected with a velocity u at an angle of 60° to the horizontal. The time interval after which it will be moving in a direction of 30° to the horizontal is

A. $\frac{u}{\sqrt{3}g}$

B. $\frac{\sqrt{3}u}{g}$

C. $\frac{\sqrt{3}u}{2g}$

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

Answer: A

Watch Video Solution

8. A body of mass 2kg is projected from the ground with a velocity $20ms^{-1}$ at an angle 30° with the vertical. If t_1 is the time in seconds at which the body is projected and t_2 is the time in seconds at which it reaches the ground, the change in momentum in $kgms^{-1}$ during the time $(t_2 - t_1)$ is

A. 40

B. $40\sqrt{3}$

C. $50\sqrt{3}$

D. 60

Answer: B

Watch Video Solution

9. The maximum distance to which a man can throw a ball by projecting it horizontally from a height h is h. The maximum distance to which he can throw it vertically up is

A. h

B. 2h

C. $h/2$

D. $h/4$

Answer: D

Watch Video Solution

10. A body projected at 45° with a velocity of 20 m/s has a range of 10m. The decrease in range due to air resistance is $(g = 10ms^{-1})$

A. 0

B. 10 m

C. 20 m

D. 30 m

Answer: D

Watch Video Solution

11. A particle is projected from the ground with an initial speed u at an angle θ with the horizontal. The average velocity of the particle between its point of projection and highest point of trajectory is

A. $\frac{v}{2}\sqrt{1+2\cos^2\theta}$

B. $\frac{v}{2}\sqrt{1+2\sin^2\theta}$

C. $\frac{v}{2}\sqrt{1+3\cos^2\theta}$

D. $v\cos\theta$

Answer: C

Watch Video Solution

12. A ball of mass 1 kg is projected with a velocity of $20\sqrt{2}$ m/s from the origin of an xy co-ordinate axis system at an angle 45° with x-axis (horizontal). The angular momentum [In Sl units] of the ball about the point of projection after 2 s of projection is [take $g = 10m/s^2$] (y - axis is taken as vertical).

A. 0.1 rad/s

B. 0.2 rad/s

C. 0.3 rad/s

D. 0.4 rad/s

Answer: B

Watch Video Solution

13. Two seconds after projection, a projectile is travelling in a direction inclined at 30° to the horizontal. After one more second, it is travelling horizontally. Find the magnitude and direction of its velocity.

A. $10\sqrt{3}ms^{-1}$

B. 20 m/s

C. 10 m/s

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

Answer: D

Watch Video Solution

14. A stone is projected from the top of a tower with velocity $20ms^{-1}$ making an angle 30° with the horizontal. If the total time of flight is 5s and $g = 10ms^{-2}$

A. the height of the tower is 75m

B. the maximum height of the stone from the ground is 80m

C. both of the above are true

D. none of the above is true

Answer: C

Watch Video Solution

15. It is possible to project a particle with a given velocity in two possible ways so as to make it pass through a point at a distance r from the point of projection. The product of times taken to reach this point in the two possible ways is then proportional to

A. $\frac{1}{r}$

B. r

C. r^2

D. $\frac{1}{r^2}$

Answer: B

Watch Video Solution

16. A two particles P and Q are separated by distance d apart. P and Q move with velocity v and u making an angle 60° and θ with line PQ the graph between their relative separation (8) when time t is shown in figure (2). The velocity v in terms of u

Fig (1)

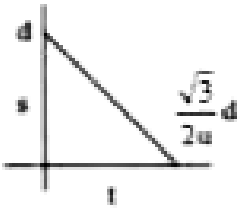


Fig (2)

A. $\sqrt{3}u$

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

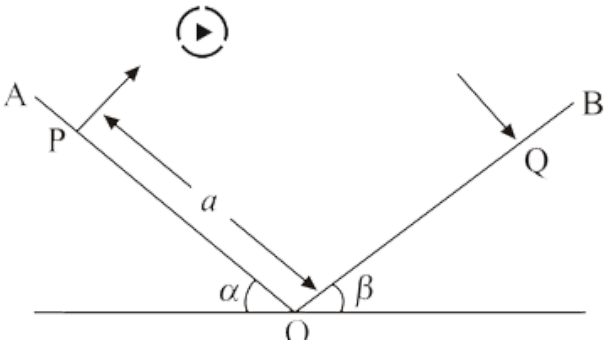
C. u

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

Answer: B

Watch Video Solution

17. Two inclined planes OA and OB intersect in a horizontal plane having their inclinations α and β with the horizontal as shown in figure. A particle is projected from P with velocity u along a direction perpendicular to plane OA. The particle strikes plane OB perpendicularly at Q.



If $\alpha = 30^\circ, \beta = 30^\circ$ the time of flight from P to Q is

A. $\frac{g}{\tan\alpha - \tan\beta}$

B. $\frac{\mathrm{gt}}{\tan\alpha - \tan\beta}$

C. $\frac{t}{g(\tan\alpha - \tan\beta)}$

D. $\frac{\mathrm{gt}}{g(\tan\alpha - \tan\beta)}$

Answer: B

Watch Video Solution

18. If v_1 and v_2 be the velocities at the end of focal chord of projectile path and u is the velocity at the vertex of the path, then

A. $\frac{1}{v^1} + \frac{1}{v^2} = \frac{1}{u}$

B. $\frac{1}{v_2^2} + \frac{1}{v_2^2} = \frac{1}{u^2}$

C. $v_1^2 + v_2^2 = u^2$

D. $u = v_1 + v_2$

Answer: B

Watch Video Solution

19. A projectile is fired with a velocity u at right angles to the slope, which is inclined at an angle θ with the horizontal. Derive an expression for the

distance R to the point of impact.

A. $\frac{2u^2}{g}\tan\theta$

B. $\frac{2u^2}{g}\sec\theta$

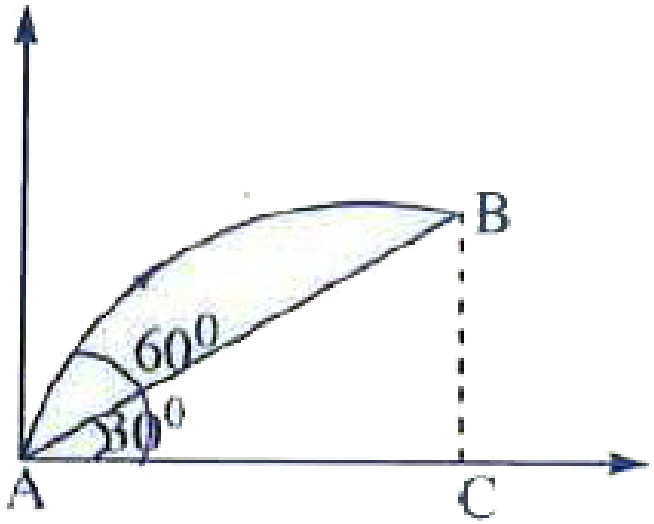
C. $\frac{2u^2}{g}\tan^2\theta$

D. $\frac{2u^2}{g}\tan\theta\sec\theta$

Answer: D

Watch Video Solution

20. In figure shown below, the time taken by the projectile to reach from A to B is t then, the distance AB is equal to



A. $\frac{ut}{\sqrt{3}}$

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

C. $\sqrt{3}ut$

D. $2ut$

Answer: A

Watch Video Solution

21. At a certain height a body at rest explodes into two equal fragments with one fragment receiving a horizontal velocity of $10ms^{-1}$. The time interval after the explosion for which the velocity vectors of the two fragments become perpendicular to each other is $\left(g = 10ms^{-2}\right)$

A. 1s

B. 2s

C. 1.5s

D. 1.75 s

Answer: A

Watch Video Solution

22. In the above problem, this horizontal distance between the two fragments when their position vectors are perpendicular to each other is

A. 10m

B. 20 m

C. 40 m

D. 50 m

Answer: B

Watch Video Solution

23. In the above problem, the time taken by the displacement vectors of the two fragments to become perpendicular to each other is

A. 1s

B. 1.5s

C. 2s

D. 4s

Answer: C

Watch Video Solution

24. In the above problem, this horizontal distance between the two fragments when their position vectors are perpendicular to each other is

A. 40 m

B. 20m

C. 10 m

D. 5m

Answer: A

Watch Video Solution

25. At a certain height a shell at rest explodes into two equal fragments. One of the fragments receives a horizontal velocity u. The time interval after which, the velocity vectors will be inclined at 120° to each other is

A. $\frac{u}{\sqrt{3}g}$

B. $\frac{\sqrt{3}u}{g}$

C. $\frac{2u}{\sqrt{3}g}$

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

Answer: A

Watch Video Solution

Exercise 3 Circular Motion

1. A particle 'P' is moving in a circle of radius 'a' with a uniform speed 'u' 'C' is the centre of the circle and AB is a diameter. The angular velocity of P about A and C are in the ratio

A. $1:1$

B. $1:2$

C. $2:1$

D. $4:1$

Answer: B

Watch Video Solution

2. Starting from rest a wheel rotates with uniform angular acceleration $2\pi rads^{-2}$. After 4s, if the angular acceleration ceases to act, its angular displacement in the next 4s is

A. $8\pi rad$

B. $16\pi rad$

C. $24\pi rad$

D. $32\pi rad$

Answer: D

Watch Video Solution

3. A cyclist is riding with a speed of 27 kmh^{-1} . As he approaches a circular turn on the road of radius 80m, he applies brakes and reduces his speed at the constant rate of $0.50ms^{-1}$ every second. The net acceleration of the cyclist on the circular turn is

A. $0.5m/s^2$

B. $0.8m/s^2$

C. $0.86m/s^2$

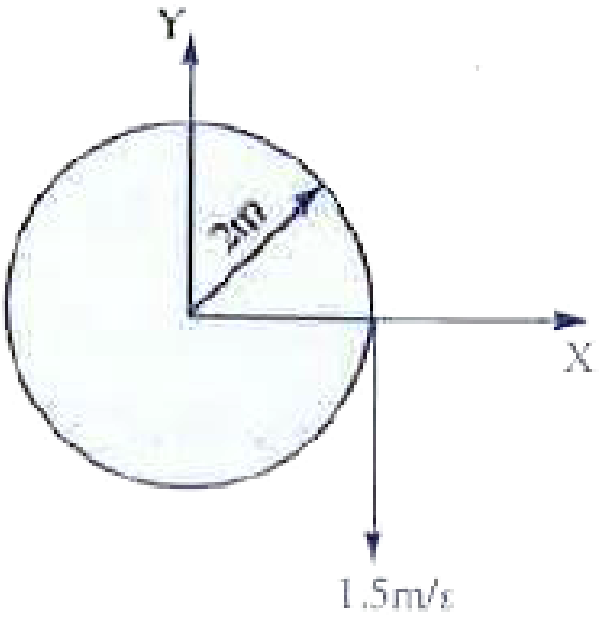
D. $1m/s^2$

Answer: C

Watch Video Solution

4. A particle is moving along a circular path in xy-plane. When it crosses x-axis, it has an acceleration along the path of $1.5m/s^2$, and is moving with

a speed of 10m/s in -ve y - direction. The total acceleration is



A. $50\hat{i} - 1.5\hat{j}m/s^2$

B. $10\hat{i} - 1.5\hat{j}m/s^2$

C. $-50\hat{i} - 1.5\hat{j}m/s^2$

D. $1.5\hat{i} - 50\hat{j}m/s^2$

Answer: C

Watch Video Solution

5. A particle moves on a circle of radius r with centripetal acceleration as function of time as $a_c = k^2rt^2$, where k is a positive constant. Find the following quantities as function of time at an instant :

(a) The speed of the particle

(b) The tangential acceleration of the particle

(c) The resultant acceleration, and

(d) Angle made by the resultant acceleration with tangential acceleration direction.

A. kt^2

B. kr

C. $kr\sqrt{k^2t^4+1}$

D. $kr\sqrt{k^2r^4-1}$

Answer: C

Watch Video Solution

6. The position vector of a particle R as a function of time is given by

$R = 4\sin(2\pi)\hat{i} + 4\cos(2\pi)\hat{j}$

where R is in meter, is in second and $\hat{i}$ and $\hat{j}$ denote unit cvectors along x along a and y- direction, respectively. Which one of the following statement is wrong of particle ?

A. Path of the particle is a circle of radius 4 meter

B. Acceleration vectors is along $-\overrightarrow{R}$

C. Magnitude of acceleration vector is $\frac{v^2}{R}$ where v is the velocity of particle

D. Magnitude of the velocity of particle is 8 meter/ second.

Answer: D

Watch Video Solution

7. A particle moves in a circular path such that its speed v varies with distance as $v = \alpha\sqrt{s}$ where α is a positive constant. Find the

acceleration of particle after traversing a distance S?

A. $\alpha^2\sqrt{\frac{1}{4}-\frac{S^2}{R^2}}$

B. $\alpha^2\sqrt{\frac{1}{4}+\frac{S^2}{R^2}}$

C. $\alpha\sqrt{\frac{1}{2}+\frac{S^2}{R^2}}$

D. $\alpha^2\sqrt{\frac{1}{2}+\frac{S^2}{R^2}}$

Answer: B

Watch Video Solution