# PHYSICS

# BOOKS - DISHA PHYSICS (HINGLISH)

# MOTION IN A PLANE

Physics

**1.** A man whirls a stone round his head on the end of a string 4.0 metre long. Can the string be in a horizontal, plane? If the stone has a

mass of 0.4 kg and the string will break, if the tension in it exceeds 8 N. The smallest angle the string can make with the horizontal and the speed of the stone will respectively be (Take $g = 10\frac{m}{s^2}$)?

A. $30^\circ, 7.7m/s$

B. $60^\circ, 7.7m/s$

C. $45^\circ, 8.2m/s$

D. $60^\circ, 8.7m/s$

**Answer:**

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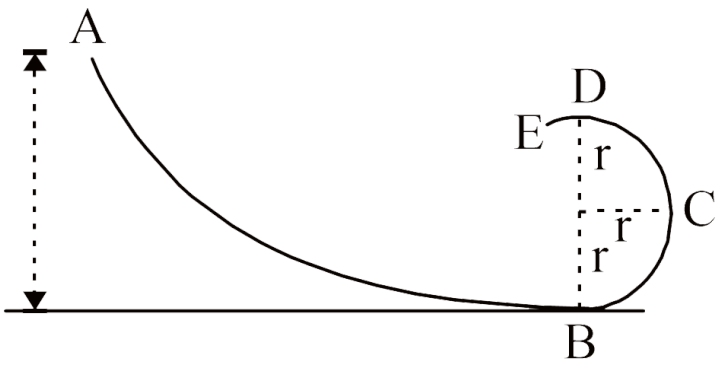
**2.** In figure ABCDE is a channel in the vertical plane, part BCDE being circular with radius r. A ball is released from A and slides without friction and without rolling. It will complete the loop path when




A. $h > 5r/2$

B. $h < 5r/2$

C. $h < 2r/5$

D. $h > 2r/5$

**Answer:**

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**3.** An aircraft loops the loop of radius R = 500 m with a constant velocity v = 360km//h. The weight of the flyer of mass m = 70 kg in the

lower, upper and middle points of the loop will respectively be-

A. 210N,700N,1400N,

B. 1400N, 700N, 2100N,

C. 700N, 1400N, 210N,

D. 2100 N, 700 N, 1400 N

**Answer:**

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**4.** A particle of mass 3 kg is moving under the action of a central force whose potential energy is given by U(r) = 10r3 joule. For what energy and angular momentum will the orbit be a circle of radius 10 m ?

A. $2.5 \times 10^4 J, 3000 \mathrm{kgm}^2 / \mathrm{sec}$

B. $3.5 \times 10^4 J, 2000 \mathrm{kgm}^2 / \mathrm{sec}$

C. $2.5 \times 10^3 J, 300 \mathrm{kgm}^2 / \mathrm{sec}$

D. $3.5 \times 10^3 J, 300 \mathrm{kgm}^2 / \mathrm{sec}$

**Answer:**

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**5.** A string of length 1 m is fixed at one end and carries a mass of 100 gm at the other end. The string makes $2/\pi$ revolutions per second about a vertical axis through the fixed end. The angle of inclination of the string with the vertical, and the linear velocity of the mass will respec- tively be - (in M.K.S. system)

A. $52^\circ 14', 3.16$

B. $50^\circ 14', 1.6$

C. $52^\circ 14', 1.6$

D. $50^\circ 14', 3.16$

**Answer:**

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**6.** A particle of mass $m$ is moving in a circular path of constant radius $r$, such that its centripetal force $F_r$ varies with time $t$ as $F_r = K^2 r t^2$, where k is a constant. What is

the power delivered to the particle by the forces acting on it?

A. $mk^2t^2r$

B. $mk^2r^2t^2$

C. $m^2k^2t^2r^2$

D. $mk^2r^2t$

**Answer:**

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**7.** A car is moving in a circular path of radius 100 m with velocity of 200 m/sec such that in each sec its velocity increases by 100 m/s, the net acceleration of car will be - (in m/sec)

A. $100\sqrt{17}$

B. $10\sqrt{7}$

C. $10\sqrt{3}$

D. $100\sqrt{3}$

**Answer:**

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**8.** A 4 kg balls is swing in a vertical circle at the end of a cord 1 m long. The maximum speed at which it can swing if the cord can sustain maximum tension of 163.6 N will be

A. $6m/s$

B. $36m/s$

C. $8m/s$

D. $64m/s$

**Answer:**

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**9.** The string of a pendulum is horizontal. The mass of the bob is m. Now the string is released. The tension in the string in the lowest position is -

A. 1 mg

B. 2 mg

C. 3 mg

D. 4 mg

**Answer:**

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**10.** A swimmer can swim in still water at a rate 4.0 km/h. If he swims in a river flowing at 3.0 km/h and keeps his direction (with respect to water) perpendicular to the current, find his velocity with respect to the ground.

A. $3km / hr$

B. $5km/hr$

C. $4km/hr$

D. $7km/hr$

**Answer:**

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**11.** The roadway bridge over a canal is the form of an arc of a circle of radius 20 m. What is the minimum speed with which a car can cross the

bridge without leaving contact with the ground at the highest point (g = 9.8 m/s2

A. $7m/s$

B. $14m/s$

C. $289m/s$

D. $5m/s$

**Answer:**

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**12.** A cane filled with water is revolved in a vertical circle of radius 0.5 m and the water does not fall down. The maximum period of revolution must be -

A. 1.45

B. 2.45

C. 14.15

D. 4.25

**Answer:**

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**13.** A particle of mass m slides down from the vertex of semi- hemisphere, without any initial velocity. At what height from horizontal will the particle leave the sphere-

A. $\frac{2}{3}R$

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

C. $\frac{5}{8}R$

D. $\frac{8}{5}R$

**Answer:**

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**14.** A body of mass m tied at the end of a string of length l is projected with velocity $\sqrt{4lg}$, at what height will it leave the circular path

A. $\frac{5}{3}l$

B. $\frac{3}{5}l$

C. $\frac{1}{3}l$

D. $\frac{2}{3}l$

**Answer:**

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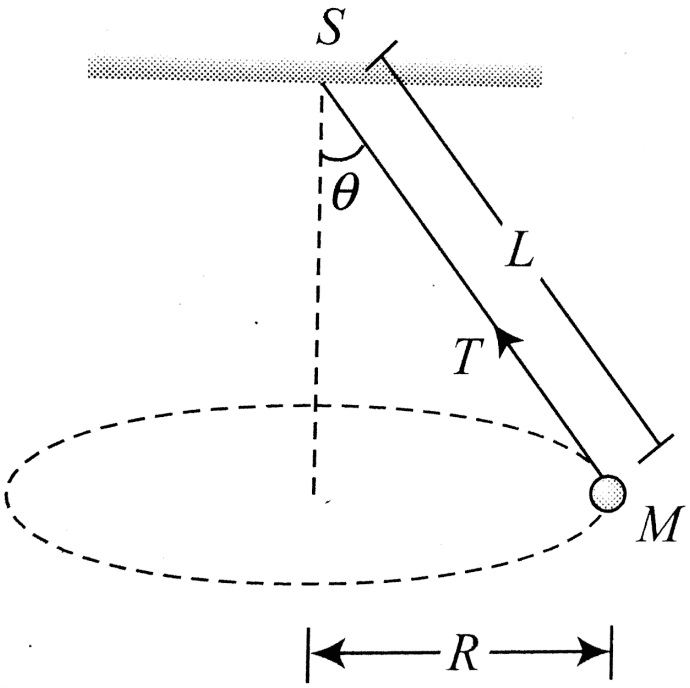
**15.** A string of length $L$ is fixed at one end and carries a mass $M$ at the other end. The string makes $2/\pi$ revolution per second around the vertical axis through the fixed end as shown in

the figure, then tension in the string is.




A. ML

B. 2 ML

C. 4 ML

D. 16 ML

**Answer:**

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**16.** A train has to negotiate a curve of radius 400 m. By how much should the outer rail be raised with respect to inner rail for a speed of 48 km/hr. The distance between the rails is 1 m.

A. 12 m

B. 12 cm

C. 4.5 cm

D. 4.5 m

**Answer:**

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**17.** A ship is streaming due West at $12m^{-1}$. A boy runs across the beach at $5ms^{-1}$ in a direction at right angles to the direction of

motion of the ship towards South, Calculate the velocity of the boy relative to sea.

A. $13m/s$

B. 5 m//5`

C. $12m/s$

D. $17m/s$

**Answer:**

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**18.** A man is walking on a level road at a speed of 3.0 km/h. Rain drops fall vertically with a speed of 4.0 km/h. Find the velocity of the raindrops with respect to the man.

A. $3km/hr$

B. $4km/hr$

C. $5km/hr$

D. $7km/hr$

**Answer:**

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**19.** A stone of mass 1kg tied to a light inextensible sstring of length $L = 10m$ is whirling in a circular path of radius $L$ in vertical plane. If the ratio of the maximum tension in the string to the minimmum tension in the string is 4 and if $g$ is taken to be $10ms^{-2}$ , the speed of the stone at the highest point of the circle is.

A. $20m/\sec$

B. $10\sqrt{3}m/\sec$

C. $5\sqrt{2}m/\sec$

D. $10m/\sec$

**Answer:**

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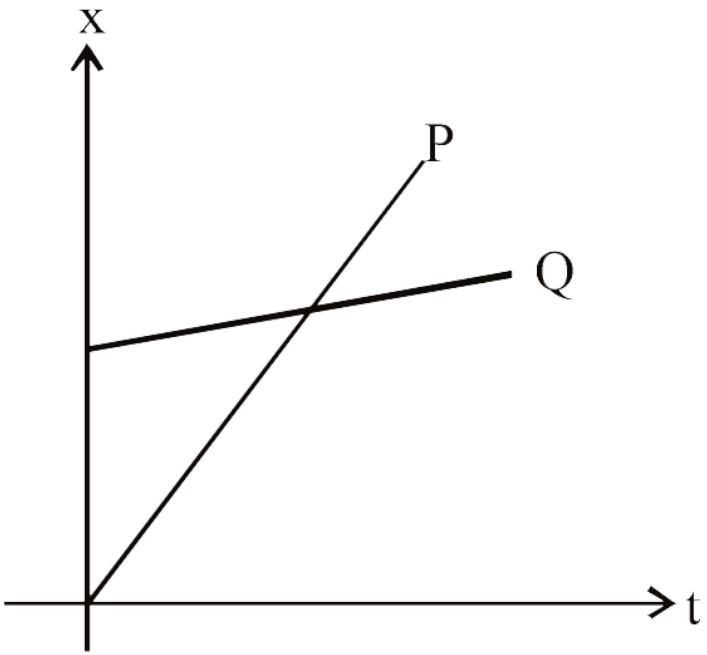
**20.** Two bodies P and Q are moving along positive x-axis their position-time graph is

shown below. If $\overrightarrow{V}_{PQ}$ is velocity of




A. $\left|\overrightarrow{V}_{pQ}\right| = \left|\overrightarrow{V}_{Qp}\right| = \text{constant}$

B. $\overrightarrow{V}_{PQ}$ towards origin

C. $\overrightarrow{V}_{QP}$ towards origin

D. $\left|\overrightarrow{V}_{pQ}\right| \neq \left|\overrightarrow{V}_{Qp}\right| = \text{constant}$

**Answer:**

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**21.** Consider two children riding on the merry-go-round Child 1 sits near the edge, Child 2 sits closer to the centre. Let`V_(1)"and"V_(2) denote the linear speed of child 1 and child 2, respectively. Which of the following is/are wrong ?

A. We cannot determine $V_1 \& V_2$ without more information

B. $V_1 = V_2$

C. $V_1 < V_2$

D. $V_1 > V_2$

**Answer:**

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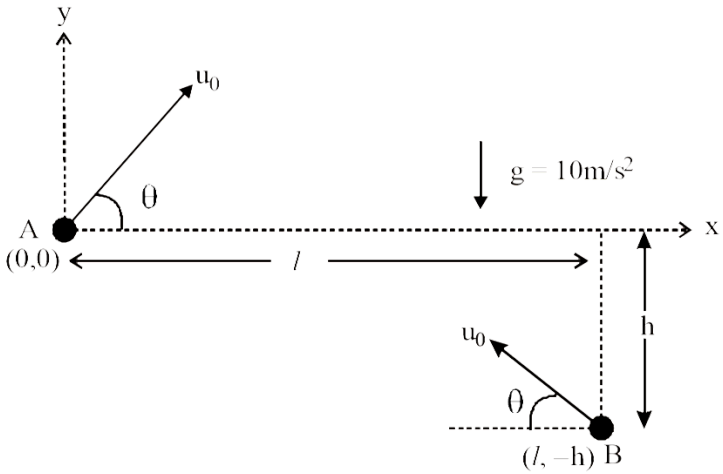
**22.** There of the fundamental constant of physics are the universal gravitational constant, $G = 6.7 \times 10^{-11} m^3 kg^- s^{-2}$, the speed of light $c = 3.0 \times 10^8 m/s$ and Planck's constant, $h = 6.6 \times 10^{-34} Js^{-1}$. two particles A and V are projected in the vertical plane with same initial velocity $u_0$ fro part (0,0) and (l,-h) towards each other as shwon in figure

The path of particle A with respect to particle

B will be –




A. Parabola

B. straigh line parallel to x-axis

C. straight line parallel to y-axis

D. none of these

**Answer:**

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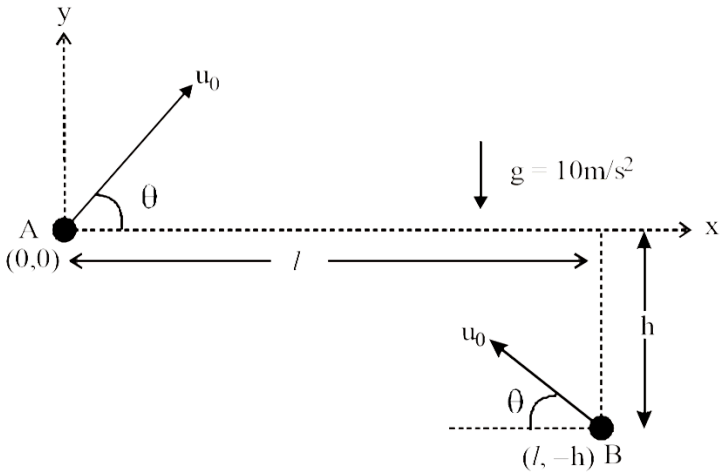
**23.** There of the fundamental constant of physics are the universal gravitational constant, $G = 6.7 \times 10^{-11} m^3 kg^- s^{-2}$, the speed of light $c = 3.0 \times 10^8 m/s$ and Planck's constant, $h = 6.6 \times 10^{-34} Js^{-1}$. two particles A and V are projected in the vertical plane with same initial velocity $u_0$ fro part (0,0) and (l,-h) towards each other as shwon in figure

Minimum distance between particle A and B

during motion




A. l

B. h

C. $\sqrt{l_2 + h_2}$

D. l+h

**Answer:**

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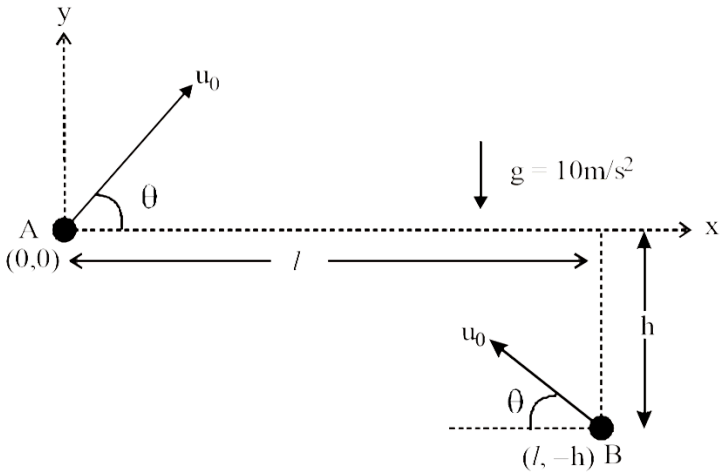
**24.** There of the fundamental constant of physics are the universal gravitational constant, $G = 6.7 \times 10^{-11} m^3 kg^- s^{-2}$, the speed of light $c = 3.0 \times 10^8 m/s$ and Planck's constant, $h = 6.6 \times 10^{-34} Js^{-1}$. two particles A and V are projected in the vertical plane with same initial velocity $u_0$ fro part (0,0) and (l,-h) towards each other as shwon in figure

The time when separation between A and B is

minimum is




A. $\frac{x}{2u_o \cos 0}$

B. $\sqrt{\frac{2h}{g}}$

C. $\frac{l}{2u_o \cos 0}$

D. $\frac{2l}{2u_o \cos 0}$

**Answer:**

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**25.** Statement-1 : The relative velocity between any two bodies moving in opposite direction is equal to sum of the velocities of two bodies. Statement-2 : Sometimes relative velocity between two bodies is equal to difference in velocities of the two.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is False, Statement-2 is True

D. Statement-1 is True, Statement-2 is FalseStatement-1 is True, Statement-2 is False

**Answer:**

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**26.** Statement-1: A river is flowing from east to west at a speed of 5m/min. A man on south bank of river, capable of swimming 10 m/min in still water, wants to swim across the river in shortest time. He should swim due north. Statement-2 : For the shortest time the man needs to swim perpendicular to the bank.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. Statement-1 is False, Statement-2 is True

D. Statement-1 is True, Statement-2 is FalseStatement-1 is True, Statement-2 is False

**Answer:**

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**27.** Statement-1 : Rain is falling vertically downwards with velocity 6 km/h. A man walks with a velocity of 8 km/h. Relative velocity of rain w.r.t. the man is 10 km/h. Statement-2 : Relative velocity is the ratio of two velocities

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation

for Statement-1

C. Statement-1 is False, Statement-2 is True

D. Statement-1 is True, Statement-2 is FalseStatement-1 is True, Statement-2 is False

**Answer:**

**28.** The path followed by a body projected along y axis is given by $y = \sqrt{3}x - (1/2)x^2$ . If $g = 10ms^2$, then the initial velocity of projectile will be – (x and y are in m)

A. $3\sqrt{10}$ $m/s$

B. $2\sqrt{10}$ $m/s$

C. $10\sqrt{3}$ $m/s$

D. $10\sqrt{2}$ $m/s$

**Answer:**

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**29.** When the angle of elevation of a gun are $60^\circ$ and $30^\circ$ respectively, the height it shoots are $h_1$ and $h_2$ respectively, $h_1/h_2$ equal to –

A. $3/1$

B. $1/3$

C. $1/2$

D. $2/1$

**Answer:**

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**30.** If $t_1$ be the time taken by a body to clear the top of a building and $t_2$ be the time spent in air, then $t_2 : t_1$ will be -

A. $1:2$

B. $2:1$

C. $1:1$

D. $1:4$

**Answer:**

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**31.** The co-ordinates of a moving particle at any time t are given by $x = ct^2$ and $y = bt^2$ The speed of the particle is

A. $2t(c + b)$

B. $2t\sqrt{c^2 - b^2}$

C. $t\sqrt{c^2 + b^2}$

D. $2t\sqrt{c^2 + b^2}$

**Answer:**

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**32.** The height $y$ and the distance $x$ along the horizontal plane of a projectile on a certain planet (with no surrounding atmosphere) are given by $y = \left(8t - 5t^2\right)m$ and $x = 6tm$, where $t$ is in seconds. The velocity with which the projectile is projected at $t = 0$ is.

A. $8m/s$

B. $6m/s$

C. $10m/s$

D. Data is insufficient

**Answer:**

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**33.** A body is thrown at an angle $30^\circ$ to the horizontal with the velocity of $30m/$ After 1 sec. its velocity will be ("in"m//s) $\left(g = 10m/s^2\right)$

A. $10\sqrt{7}$

B. $700\sqrt{10}$

C. $100\sqrt{7}$

D. $\sqrt{10}$

**Answer:**

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**34.** A particle is moving in a plane with a velocity given by, $\overrightarrow{u} = u_0\hat{i} + (\omega\cos\omega t)\hat{j},$ are unit vectors along x and y-axes respectively. If the particle is at the origin an $t = 0,$ then its

distance from the origin at time $t = 3\pi / 2\omega$ will be

A. $\sqrt{\left[\left(\frac{3\pi u_0}{2\omega}\right)^2 + a^2\right]}$

B.

C.

D.

**Answer:**

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**35.** A ball thrown by one player reaches the other in $2s$. The maximum height attained by the ball above the point of projection will be about.

A. $2.5m$

B. 5m

C. $7.5m$

D. 10m

**Answer:**

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**36.** A ball is projeced from O with an initial velocity 700 cm/ s in a direction $37^\circ$ above the horizontal. A ball B, 500 cm away from O on the line of the initial velocity of A, is released from rest at the instant A is projected. The height through which B falls, before it is hit by A and the direction of the velocity A at the time of impact will respectively be [Given $g = 10m/s^2, \sin 37^\circ = 0.6$ and $\cos 37^\circ = 0.8$ ]

A. $250cm28^\circ 42'$

B. $225cm27^\circ 43'$

C. $245cm20^\circ 44'$

D. $300cm27^\circ 43'$

**Answer:**

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**37.** 5A ball is thrown horizontally from a height of 20 m. It hits the ground with a velocity

three times its initial velocity. The initial velocity of ball is

A. 2 m//s

B. 3m//s

C. 5m//s

D. 7m//s

**Answer:**

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**38.** A projectile thrown from a height of 10 m with velocity of $\sqrt{2}m/s$ the projectile will fall, from the foot of projection, at distance- $(g = 10m/s^2)$

A. 1m

B. 2m

C. 3m

D. $\sqrt{2}m$

**Answer:**

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**39.** Savita throws a ball horizontally with a velocity of 8 m/s from the top of her building. The ball strikes to her brother Sudhir playing at 12 m away from the building. What is the height of the building ?

A. 11m

B. 10m

C. 8m

D. 7m

**Answer:**

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**40.** A body is projected downwards at an angle of $30^\circ$ to the horizontal with a velocity of $9.8m/s$ from the top of a a tower $29.4m$ high. How long will it take before striking the ground ?

A. 1s

B. 2s

C. 3s

D. 4s

**Answer:**

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**41.** A ball is thrown from the top of a tower with an initial velocity of 10 m//s at an angle of $30^\circ$ above the horizontal. It hits the ground at a distance of 17.3 m from the base of the

tower. The height of the tower $\left(g = 10m/s^2\right)$ will be

A. 10m

B. 12m

C. 110m

D. 100m

**Answer:**

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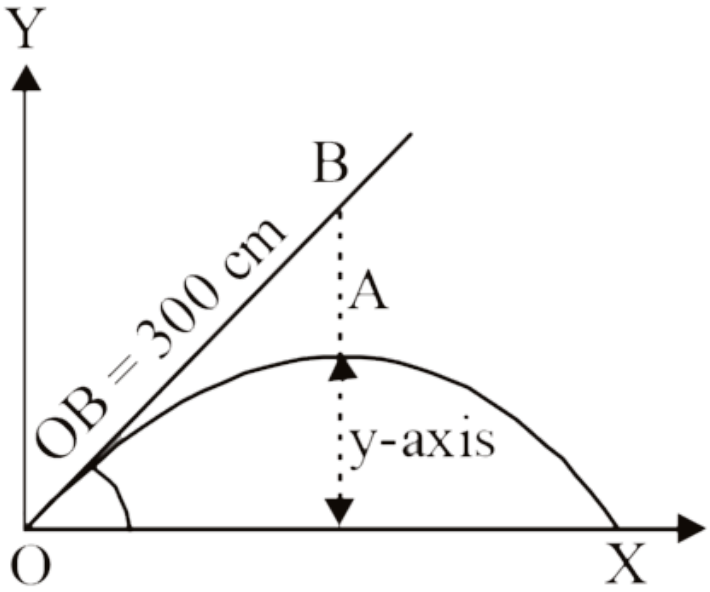
**42.** A ball 'A' is projected from origin with an initial velocity $v_0$ = 700 cm/sec in a direction $37^\circ$ above the horizontal as shown in fig .Another ball 'B' 300 cm from origin on a line $37^\circ$ above the horizontal is released from rest at the instant A starts. How far will B have

fallen when it is hit by A ?




A. 9cm

B. 90cm

C. `0.9cm

D. 900cm

**Answer:**

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**43.** A ball projected with speed 'u' at an angle of projection $15^\circ$ has range R. The other angle of projection at which the range will not be same with same initial speed 'u' is

A. $45^\circ$

B. $35^\circ$

C. $90^\circ$

D. $75^\circ$

**Answer:**

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**44.** A projectille can have the same range $R$ for two angles of projection. If $t_1$ and $t_2$ be the time of flight in the two cases, then find the relation between $t_1, t_2$ and $R$.

A. $t_1 t_2 \alpha 1 / R^2$

B. $t_1 t_2 \alpha R^2$

C. $t_1 t_2 \alpha 1/R$

D. $t_1 t_2 \alpha R$

**Answer:**

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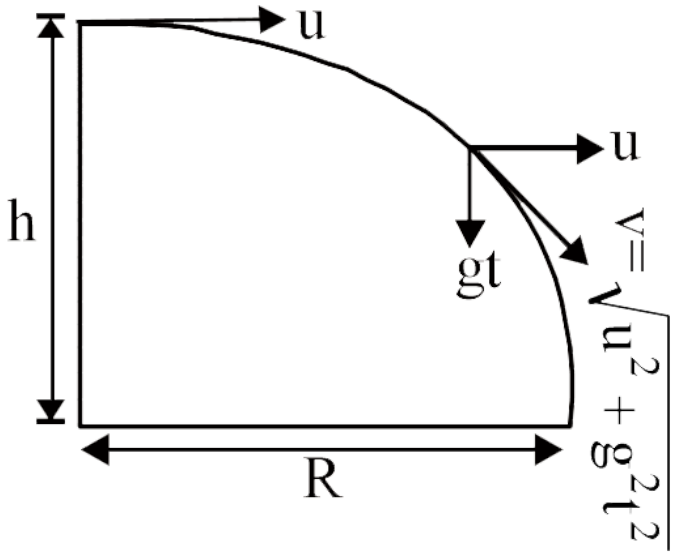
**45.** Velocity at a general point P(x, y) for a horizontal projectile motion is given by

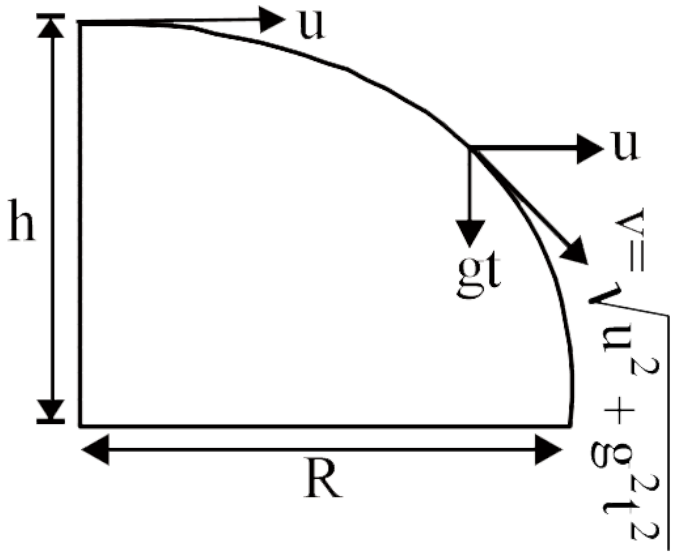
$$v = \sqrt{\left(v_x^2 + v_y{}^2\right)}, \tan\alpha = \frac{v_y}{v_x}$$




$\alpha$is angle made by v with horizontal in clockwise direction Trajectory equation for a horizontal projectile motion is given by

$x = v_x t = ut$

y=-$(1/2)gt^2$




eliminating t, we get $y = -(1/2)\frac{gx^2}{u^2}$

A ball rolls off top of a stair way with a horizontal velocity u m//s. If the steps are h m high and b meters wide, the ball will just hit the edge of nth step if `n^(th) equals to

A. $\frac{hu^2}{gb^2}$

B. $\frac{u^2 g}{gb^2}$

C. $\frac{2hu^2}{gb^2}$

D. $\frac{2u^2}{hb^2}$

**Answer:**

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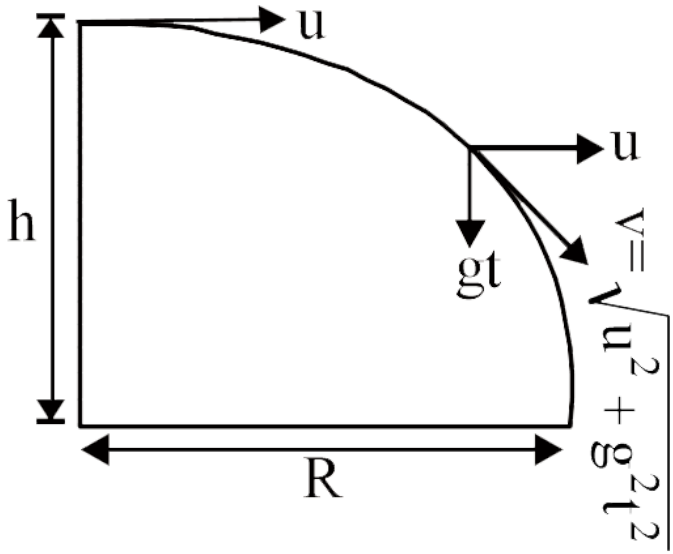
**46.** elocity at a general point P(x, y) for a horizontal projectile motion is given by

$v = \sqrt{\left(v_{\mathrm{x}}^2 + {v_{\mathrm{y}}}^2\right)}, \tan\alpha = \frac{v_y}{v_x}$

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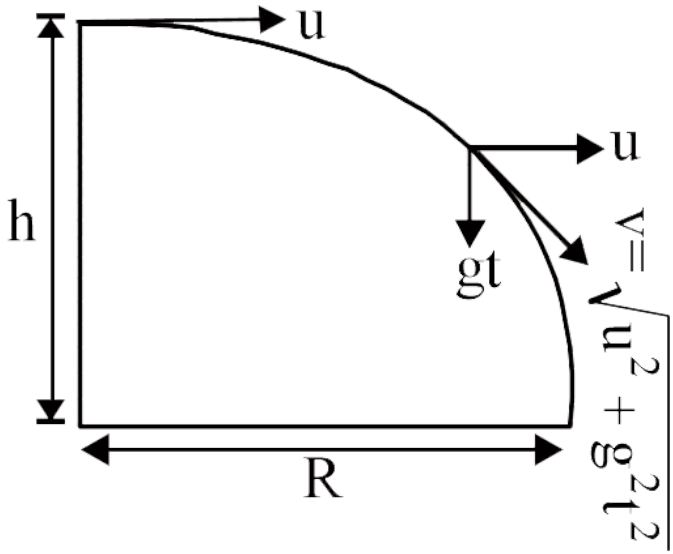


eliminating t, we get $y = -(1/2)\frac{gx^2}{u^2}$

5An aeroplane is in a level flying at an speed of 144 km//hr at an altitude of 1000 m. How far horizontally from a given target should a bomb be released from it to hit the target ?

A. $571.43$

B. $671.43$

C. $471.34$

D. $371.34$

**Answer:**

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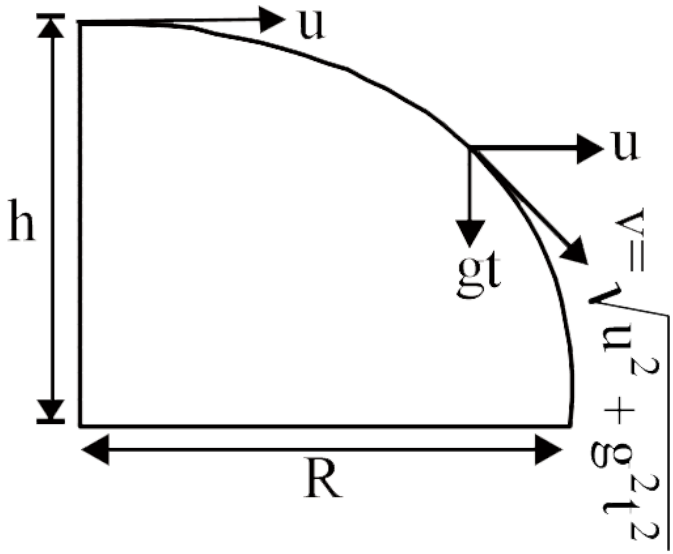
**47.** Velocity at a general point P(x, y) for a horizontal projectile motion is given by

$$v = \sqrt{\left(v_{\mathrm{x}}^2 + {v_{\mathrm{y}}}^2\right)}, \tan\alpha = \frac{v_y}{v_x}$$

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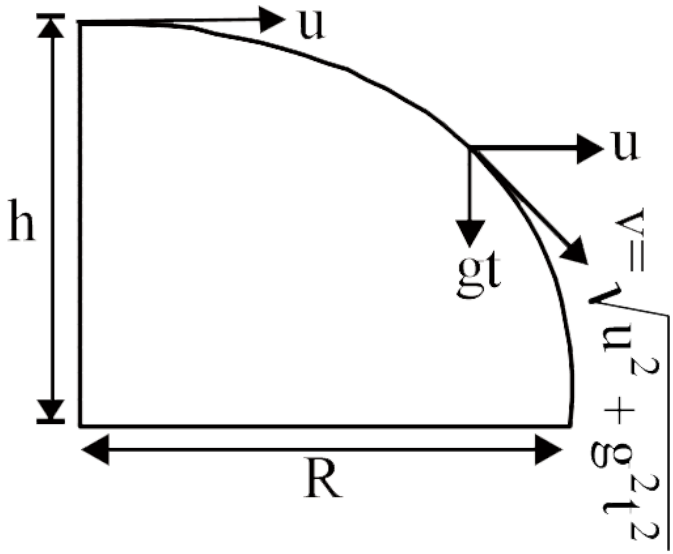


eliminating t, we get $y = -(1/2)\frac{gx^2}{u^2}$

An aeroplane is flying horizontally with a velocity of 720 km/h at an altitude of 490 m. When it is just vertically above the target a bomb is dropped from it. How far horizontally it missed the target?

A. 1000m

B. 2000m

C. 100m

D. 200m

**Answer:**

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**48.** Statement -1 : Two projectiles are launched from the top of a cliff with same initial speed with different angles of projection. They reach

the ground with the same speed. Statement -2 : The work done by gravity is same in both the case

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

**Answer:**

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**49.** Statement-1 : A man projects a stone with speed u at some angle. He again projects a stone with same speed such that time of flight

now is different. The horizontal ranges in both the cases may be same. (Neglect air friction)
Statement-2 : The horizontal range is same for two projectiles projected with same speed if one is projected at an angle q with the horizontal and other is projected at an angle $(90^\circ\theta)$with the horizontal. (Neglect air friction)

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

**Answer:**

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**50.** A particle completes 1.5 revolutions in a circular path of radius 2 cm. The angular displacement of the particle will be – (in radian)

A. $6\pi$

B. $3\pi$

C. $2\pi$

D. $\pi$

**Answer:**

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**51.** A particle revolving in a circular path completes first one third of circumference in 2 sec, while next one third in 1 sec. The average angular velocity of particle will be – ("in "rad//sec)

A. $2\pi/3$

B. $\pi/3$

C. $4\pi/3$

D. $5\pi/3$

**Answer:**

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**52.** The ratio of angular speeds of minute hand and hour hand of a watch is

A. $1:12$

B. $6:1$

C. $12:1$

D. $1:6$

**Answer:**

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**53.** The angular displacement of a particle is given by $\theta = \omega_0 t + \frac{1}{2}\alpha^2, \text{and}\alpha$ are constatnt velocity at time, $t = 2$ sec will be ("in" rad//sec)-

A. 1

B. 5

C. 3

D. 4

**Answer:**

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**54.** Find the magnitude of the linear acceleration of a particle moving in a circle of radius 10 cm with uniform speed completing the circle in 4s.

A. $5\pi cm / s^2$

B. $2.5\pi cm/s^2$

C. $5\pi^2 cm/s^2$

D. $2.5\pi^2 cm/s^2$

**Answer:**

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**55.** A cane filled with water is revolved in a vertical circle of radius 4 m and water just does not fall down. The time period of revolution will be –

A. 1s

B. 10s

C. 8s

D. 4s

**Answer:**

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**56.** The length of second's hand in watch is $1cm$. The change in Velocity of its tip in 15 seconds is

A. 0

B. $\frac{\pi}{30\sqrt{2}} cm/s$

C. $\frac{\pi}{3} cm/s$

D. $\frac{\pi\sqrt{2}}{30} cm/s$

**Answer:**

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**57.** An electron is moving in a circular orbit of radius $5.3 \times 10^{-11}$ metre around the atomic nucleus at a rate of $6.6 \times 10^{15}$ revolutions per

second. The centripetal force acting on the electron will be - (The mass of the electron is $9.1 \times 10^{-31}$kg)

A. $8.3 \times 10^{-8} N$

B. $3.8 \times 10^{-8} N$

C. $4.15 \times 10^{-8} N$

D. $2.07 \times 10^{-8} N$

**Answer:**

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**58.** An air craft executes a horizontal loop of radius $1km$ with steady speed of $900kmh^{-1}$. Compare its centripetal acceleration with the acceleration due to gravity.

A. $1:6.38$

B. $6.38:1$

C. $2.25:98$

D. $2.5:9.8$

**Answer:**

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**59.** A car driver is negotiating a curve of radius 100 m with a speed of $18km/hr$. The angle through which he has to lean from the vertical will be -

A. $\tan^{-1}\frac{1}{40}$

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

C. $\tan^{-1}\left(\frac{1}{2}\right)$

D. $\tan^{-1}\left(\frac{1}{20}\right)$

**Answer:**

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**60.** Statement - 1 : If net force $\overrightarrow{F}$ acting on a system is changing in direction only, the linear momentum $\left(\overrightarrow{p}\right)$ of system changes in direction. Statement - 2 : In case of uniform circular motion, magnitude of linear momentum is constant but direction

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement -1 is False, Statement-2 is True.

D. Statement -1 is True, Statement-2 is False.

**Answer:**

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