1.

The angle of projection at which the horizontal range and maximum height of projectile are equal is:

(1) 45°

(2) $\tan^{-1}\left(\frac{1}{4}\right)$

(3) $\tan^{-1}(4)$

(4) 60°

2.

A projectile is fired from the surface of the earth with a velocity of 5 m/s and angle θ with the horizontal. Another projectile fired from another planet with a velocity of 3 m/s at the same angle follows a trajectory, which is identical to the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet (in m/s^2) is: [Given, g = 9.8 m/s^2]

1. 3.5

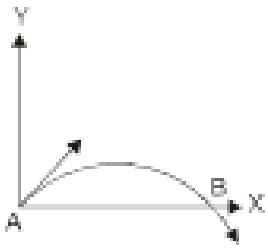
2. 5.9

3. 16.3

4. 110.8

3.

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



1. $-2\hat{i}+3\hat{j}$
2. $2\hat{i}-3\hat{j}$
3. $2\hat{i}+3\hat{j}$
4. $-2\hat{i}-3\hat{j}$

4.

An aeroplane is flying horizontally with a velocity u = 600 *km/h* at a height of 1960 *m*. When it is vertically at a point A on the ground, a bomb is released from it. The bomb strikes the ground at point *B*. The distance *AB* is:

1. 1200 m

2. 0.33 km

3. 3.33 km

4. 33 km

5.

A cannon ball has the same range R on a horizontal plane for two different angles of projection. If h_1 and h_2 are the greatest height in the two paths for which this is possible, then:

1. $R=(h_1h_2)^{1/4}$

2. $R=3\sqrt{h_1h_2}$

3. $R=4\sqrt{h_1h_2}$

4. $R=\sqrt{h_1h_2}$

6.

A projectile is projected with initial kinetic energy K. If it has kinetic energy 0.25K at its highest point, then the angle of projection is:

1. 30°

2. 45°

3. 60°

4. 75°

7.

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

1. 40 m

2. 45 m

3. 500 m

4. 50 m

8.

The equation of motion of a projectile is given by x = 36 t metre and 2y = 96 t – 9.8 t^2 metre. The angle of projection is:

1. $\sin^{-1}\left(\frac{4}{5}\right)$
2. $\sin^{-1}\left(\frac{3}{5}\right)$
3. $\sin^{-1}\left(\frac{4}{3}\right)$
4. $\sin^{-1}\left(\frac{3}{4}\right)$

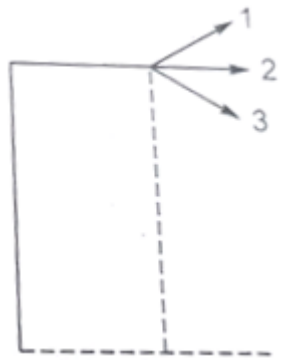
9.

A body is projected with velocity $\vec{v} = \left(\alpha\hat{i} + \beta\hat{j}\right)$ m/s. The time of flight of body is [considering x as horizontal and y as vertical axis and g is acceleration due to gravity]

1. $\frac{2\beta}{g}$
2. $\frac{2\alpha}{g}$
3. $\frac{2\alpha\beta}{g}$
4. $\frac{2\alpha}{g\beta}$

10.

Three balls are thrown from the top of a building with equal speeds at different angles. When the balls strike the ground, their speeds are v_1, v_2 and v_3 respectively, then:



1. $v_1 > v_2 > v_3$
2. $v_3 > v_2 = v_1$
3. $v_1 = v_2 = v_3$
4. $v_1 < v_2 < v_3$

11.

The position vector of a particle as a function of time is given by r = 4 sin (2πt) $\hat{i}$+ 4 cos (2πt) $\hat{j}$ where r is in metre, t is in seconds, $\hat{i}$ and $\hat{j}$ denote unit vectors along x and y-directions, respectively. Which one of the following statements is wrong for the motion of particle?

1. Acceleration is along $-\vec{R}$
2. Magnitude of the acceleration vector is v^2/R where v is the velocity of the particle
3. Magnitude of the velocity of the particle is 8 m/s
4. Path of the particle is a circle of radius 4 m

12.

If a particle is moving in a circular orbit with constant speed, then

(1) Its velocity is variable

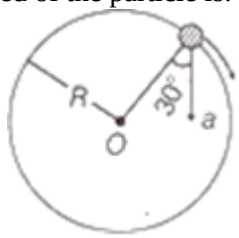
(2) Its acceleration is variable

(3) Its angular momentum is constant

(4) All of these

13.

In the given figure, a = 15m /s^2 represents the total acceleration of a particle moving in the clockwise direction in a circle of radius R = 2.5 m at a given instant of time. The speed of the particle is:



1. 4.5 m/s
2. 5.0 m/s
3. 5.7 m/s
4. 6.2 m/s

14.

A particle moves with constant speed *v* along a circular path of radius *r* and completes the circle in time *T*. The acceleration of the particle is:

(1) $2\pi v/T$

(2) $2\pi r/T$

(3) $2\pi r^2/T$

(4) $2\pi v^2/T$

15.

Which of the following can be the angle between velocity and acceleration of a particle in a circular motion with increasing speed?

(1) 30°

(2) 90°

(3) 120°

(4) 0°

16.

If the equation for the displacement of a particle moving on a circular path is given by $(\theta) = 2t^3 + 0.5$, where θ is in radians and *t* in seconds, then the angular velocity of the particle after 2 *sec* from its start is:

(1) 8 *rad/sec*

(2) 12 *rad/sec*

(3) 24 *rad/sec*

(4) 36 *rad/sec*

17.

A car moves on a circular path such that its speed is given by v = Kt, where K =constant and t is time, the radius of the circular path is r, then the net acceleration of the car at time t is

(1) $\sqrt{K^2 + \left(\frac{K^2t^2}{r}\right)^2}$

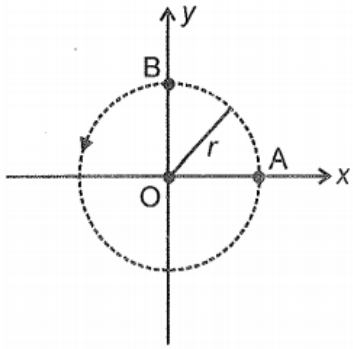
(2) 2K

(3) K

(4) $\sqrt{K^2 + K^2t^2}$

18.

A particle is moving with speed v on a circle (of radius r and centred at the origin) as shown in the given figure in anticlockwise fashion. The average acceleration of the particle during its motion from point A to point B is:



1. $\frac{-2v^2}{\pi r}\left(\hat{i} - \hat{j}\right)$

2. $\frac{-2v^2}{\pi r}\left(\hat{i} + \hat{j}\right)$

3. $\frac{2v^2}{\pi r}\left(\hat{i} - \hat{j}\right)$

4. $\frac{2v^2}{\pi r}\left(\hat{i} + \hat{j}\right)$

19.

At a certain moment, the angle between the velocity vector $\vec{v}$ and the acceleration $\vec{a}$ of a particle is greater than 90°. What can be inferred about its motion at that moment?

(1) It moves along a curve and its speed is decreasing.

(2) It moves along a straight line and accelerated.

(3) It moves along a curve and its speed is increasing.

(4) It moves along a straight line and it is decelerated.

20.

A particle is moving on a circular path of radius 1 m with a speed of 10 m/s. The magnitude of change in its velocity in the interval it subtends an angle 60° at the center is:

1. 10 m/s

2. 20 m/s

3. $20\sqrt{2}$ m/s

4. Zero

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