

Sharjah Indian School, Sharjah.

Work Sheet - 2

Sub: Physics (Motion in a plane)

Std: XI

1. One of the rectangular components of a velocity of 100 km/h is 50 km/h . Find the other component.
2. An aeroplane takes off at an angle of 30° to the horizontal. If the component of its velocity along horizontal is 250 km/h . What is its actual velocity? Also find the vertical component of its velocity.
3. Find a unit vector parallel to the resultant of the vectors $\vec{A} = \hat{i} + 4\hat{j} - 2\hat{k}$ and $\vec{B} = 3\hat{i} - 5\hat{j} + \hat{k}$.
4. At what angle the two forces \vec{A} and \vec{B} act so that their resultant is $\sqrt{3A^2 + B^2}$. (Ans: 60°)
5. The vector sum of two vectors \vec{P} and \vec{Q} is \vec{R} . If the vector \vec{Q} is reversed, the resultant become \vec{S} , then P.T $R^2 + S^2 = 2(P^2 + Q^2)$.
6. Rain is falling vertically with a speed of 35 m/s . Wind starts blowing after some time with a speed of 12 m/s in east to west direction. In which direction should a boy waiting at a bus stop hold his umbrella.
7. A football player kicks a ball at angle of 45° with a velocity of 20 m/s . At the same time, 2nd player at a distance of 30 m run towards the ball. How fast should he run to catch the ball just before it hits the ground?
8. A food packet is dropped from an aircraft flying horizontally at a height of 100 m with a speed of 72 km/h . When & where will the packet strike the ground? With what velocity will it strike?
9. From the top of a building 19.6 m high, a ball is projected horizontally. After how long does it strike the ground, if the line joining the point of projection to the point where it strikes makes an angle 45° with the horizontal. Also find the initial velocity of the ball.
10. A body is projected at an angle to the ground such that at the top of the trajectory the K.E is $\frac{3}{4}$ th of its initial K.E. Find the angle of projection.

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11. A river is flowing at a constant speed of 5 km/h. A boat moving at a speed of 10 km/h wants to reach the opposite point from where it started. In which direction the man should row the boat to reach the opposite point?
12. Two vectors \vec{A} and $2\vec{A}$ are such that their resultant is perpendicular to \vec{A} . Find the angle between the vectors.
13. A projectile is fired with a horizontal velocity of 330 m/s from the top of a cliff 80 m high. How long will it take to strike the ground? With what velocity will it strike? ($g = 10 \text{ m/s}^2$)
14. A projectile is thrown with a velocity of $u_x \hat{i} + u_y \hat{j}$. The range of the projectile is twice the maximum height. Calculate u_y/u_x .
15. The position of a particle is given by

$$\vec{r} = 3.0t \hat{i} - 2.0t^2 \hat{j} + 4.0 \hat{k} \text{ m}$$
 where t is in seconds and the unit of \vec{r} is metre.
 (a) Find the \vec{v} and \vec{a} of the particle
 (b) Find the magnitude & direction of velocity of the particle at $t = 2 \text{ s}$
16. The maximum range of a projectile is 3 km. What would be its range when launched at an angle of 15° with the horizontal.
17. The equation of trajectory of a projectile is

$$y = \sqrt{3}x - \frac{g}{2}x^2$$
 What is the initial velocity and the angle of projection of the projectile?
18. From the top of a tower 156.8 m high, a projectile is thrown up with a velocity of 39.2 m/s making an angle 30° with the horizontal direction. Find the distance from the foot of the tower where it strikes the ground & the time taken by it to do so.
 (Ans: $t = 8 \text{ s}$, $x = 271.58 \text{ m}$).
19. A wheel is 0.6 m in radius & is moving with a speed of 10 m/s. Find the angular speed. (Ans: 16.67 rad/s)
20. A ball is whirled around a circular path of radius 2 m. The ball makes 5 revolutions in 8 s. Calculate the centripetal acceleration of the ball. (Ans: 30.84 m/s^2)