



INDIAN SCHOOL DARSAIT DEPARTMENT OF PHYSICS



Subject : Physics	Chapter : Motion in a Plane	Worksheet No. 4
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Name of the Student : _____	Class & Division : XI A/B	Roll Number : ____

- 1 The magnitude of the resultant of two vectors \vec{P} and \vec{Q} is given by $R^2 = P^2 + Q^2$. What is the angle between \vec{P} and \vec{Q} 1
- 2 Prove that the vectors $(\hat{i} + 2\hat{j} + 3\hat{k})$ and $(2\hat{i} - \hat{j})$ are perpendicular to each other. 1
- 3 Find the angle between $\vec{A} = \hat{i} + \hat{j} - 2\hat{k}$ and $\vec{B} = \hat{i} + 2\hat{j} - \hat{k}$. 1
- 4 If a bat flies from xyz coordinates $(-2\text{m}, 4\text{m}, -3\text{m})$ to coordinates $(6\text{m}, -2\text{m}, -3\text{m})$, what is its displacement in unit-vector notation? 1
- 5 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
- 6 Find the angle of projection at which the horizontal range and maximum height of a projectile are equal. 1
- 7 A boat man can row with a speed of 10 km/h in still water. If the river flows steadily at 5km/h, in which direction should the boatman row in order to reach a point on the other bank directly opposite to the point from where he started? The width of the river is 2km. 2
- 8 A unit vector is represented by $a\hat{i} + b\hat{j} + c\hat{k}$. If the values a and b are 0.6 and 0.8 respectively, find the value of c. 2
- 9 The ceiling of a long hall is 25 m high. What is the maximum horizontal distance that a ball thrown with a speed of 40 m/s can go without hitting the ceiling of the hall? 2
- 10 A cricket ball is thrown at a speed of 28 m/s in a direction 30° above the horizontal. Calculate - 2
 - (a) The maximum height attained by the ball
 - (b) The time taken by the ball to reach back the same level
 - (c) Horizontal distance from the thrower to point where it returns to the same level. (Take $g = 10 \text{ m/s}^2$)
 - (d)
- 11 Calculate the area of the parallelogram whose adjacent sides are given by the vectors, $\vec{A} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{B} = 2\hat{i} - 3\hat{j} + \hat{k}$. 2

(hint : area of parallelogram = $|\vec{A} \times \vec{B}|$)

- 12 If a shower of rain appears to be falling vertically downwards with a speed of 12 km/h to a person walking due east with speed 5km/h, what is the actual direction of rain? 3
- 13 A cyclist is riding with a speed of 27 km/h. As he approaches a circular turn on the road of radius 80 m, he applies brakes and reduces his speed at constant rate of 0.5 m/s^2 , every second. What is magnitude and direction of the cyclist on the circular track? 3
- 14 A man can swim with a speed of 4km/h in still water. How long does he take to cross a river 1 km wide if the river flows steadily at 3km/h and he makes his strokes normal to the river current? How far down the river does he go when he reaches the other bank? 3
- 15 A body is projected with a velocity of 40 m/s. After 2 s, it crosses a vertical pole of height 20.4 m. Calculate the angle of projection and the horizontal range. 3
- 16 The greatest and the least resultant of two forces acting at a point is 10 N and 6 N respectively. If each force is increased by 3 N, find the resultant of the new forces when acting at a point at an angle 90° with each other. 3
- 17 Determine a unit vector which is perpendicular to both the vectors $2\hat{i} + \hat{j} + \hat{k}$ and $\hat{i} - \hat{j} + 2\hat{k}$. 3
- 18 Given $\vec{A} = \hat{i} - 2\hat{j} - 3\hat{k}$ and $\vec{B} = 4\hat{i} - 2\hat{j} + 6\hat{k}$. Calculate the angle made by $(\vec{A} + \vec{B})$ with the x-axis? 3
- 19 A stone tied to the end of a string 80 cm long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 25 s, what is the magnitude and direction of acceleration of the stone? 3
- 20 A fighter plane flying horizontally at an altitude of 1.5 km with speed 720 km/h passes directly overhead an anti-aircraft gun. At what angle from the vertical should the gun be fired for the shell with a muzzle speed of 600 m/s to hit the plane? At what minimum altitude should the pilot fly to avoid being hit? (take $g = 10\text{m/s}^2$) 3