Subject : Physics	**Chapter** : Motion in a Plane		**Worksheet No**. 3
Resource Person : Mrs. Jayalakshmi Ratish		**Date** : 21.05.19	
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 (-2m, 4m, -3m) to coordinates (6m, -2m, -3m), 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 30º 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 m/s^2)

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   3
    to a person walking due east with speed 5km/h, what is the actual direction of rain?

13 A cyclist is riding with a speed of 27 km/h. As he approaches a circular turn on the road   3
    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 acceleration of the cyclist on the
    circular track?

14 A man can swim with a speed of 4km/h in still water. How long does he take to cross a   3
    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?

15 A body is projected with a velocity of 40 m/s. After 2 s, it crosses a vertical pole of height   3
    20.4 m. Calculate the angle of projection and the horizontal range.

16 The greatest and the least resultant of two forces acting at a point is 10 N and 6 N   3
    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.

17 Determine a unit vector which is perpendicular to both the vectors $2\hat{\imath} + \hat{\jmath} + \hat{k}$ and $\hat{\imath} -$ 3
    $\hat{\jmath} + 2\hat{k}$.

18 Given $\vec{A} = \hat{\imath} - 2\hat{\jmath} - 3\hat{k}$ and $\vec{B} = 4\hat{\imath} - 2\hat{\jmath} + 6\hat{k}$. Calculate the angle made by ($\vec{A} + \vec{B}$)   3
    with the x-axis?

19 A stone tied to the end of a string 80 cm long is whirled in a horizontal circle with a   3
    constant speed. If the stone makes 14 revolutions in 25 s, what is the magnitude and
    direction of acceleration of the stone?

20 A fighter plane flying horizontally at an altitude of 1.5 km with speed 720 km/h passes   3
    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 =10m/s^2)