Class XII
Chapter 10-Vector

WORKSHEET (HOTS)

1. If $\vec{b}$ and $\vec{c}$ are any two non-collinear unit vectors, $\vec{a}$ is any vector, then show that

$$(\vec{a}.\vec{b})\vec{b} + (\vec{a}.\vec{c})\vec{c} + \frac{\vec{a}.(\vec{b}\times\vec{c})}{|\vec{b}\times\vec{c}|^2}(\vec{b}\times\vec{c}) = \vec{a}$$

2. In a rectangular hexagon ABCDEF, $\overrightarrow{AB} = \vec{a}$ and $\overrightarrow{BC} = \vec{b}$, then express

$$find\ \overrightarrow{FA} + \overrightarrow{AC} + \overrightarrow{AD} + \overrightarrow{AE} + \overrightarrow{CE}$$ in terms of $\vec{a}$ and $\vec{b}$.

3. ABCD is a parallelogram and AC, BD are its diagonals, show that

(i) $\overrightarrow{AC} + \overrightarrow{BD} = 2\overrightarrow{BC}$, (ii) $\overrightarrow{AC} - \overrightarrow{BD} = 2\overrightarrow{AB}$

4. Show that the value of $|a\times\hat{\imath}|^2 + |a\times\hat{\jmath}|^2 + |a\times\hat{k}|^2 = 2$ if $|\vec{a}| = 1$.

5. If the vector $\vec{\alpha} = a\hat{\imath}+\hat{\imath}+\hat{\imath}$, $\vec{\beta} = \hat{\imath}+b\hat{\jmath}+\hat{k}$ and $\vec{\gamma} = \hat{\imath}+b\hat{\jmath}+c\hat{k}$ are coplanar,

Then prove that $\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c} = 1$, where $a \neq 1$, $b \neq 1$ and $c \neq 1$

6. Given that vectors $\vec{a}$, $\vec{b}$, $\vec{c}$ form a triangle such that $\vec{a} = \vec{b} + \vec{c}$. Find p,q,r,s such that

Area of triangle is $5\sqrt{6}$ where $\vec{a} = p\hat{\imath} + qj + r\hat{k}\vec{b} = s\hat{\imath} + 3\hat{\jmath} + 4\hat{k}\vec{c} = 3\hat{\imath}+\hat{\imath}-2\hat{k}$

7. For any three vectors $\vec{a}$, $\vec{b}$, $\vec{c}$, show that $(\vec{a}-\vec{b})$, $(\vec{b}-\vec{c})$, $(\vec{c}-\vec{a})$ are coplanar.

8. Let ABC be a triangle whose circumcentre is at P. If the position vectors of

A, B, C and P are $\vec{a}, \vec{b}, \vec{c}$ and $\frac{\vec{a}+\vec{b}+\vec{c}}{4}$ respectively,

then find the position vector of the orthocenter of the triangle.

9. **Let** $\vec{a}$, $\vec{b}$ and $\vec{c}$ be the unit vectors such that $\vec{a}\times(\vec{b}\times\vec{c}) = \frac{\sqrt{3}}{2}(\vec{b}+\vec{c})$.

If $\vec{b}$ is not parallel to $\vec{c}$, then find the angle between $\vec{a}$ and $\vec{b}$.

10. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are unit vectors satisfying $|\vec{a}-\vec{b}|^2 + |\vec{b}-\vec{c}|^2 + |\vec{c}-\vec{a}|^2 = 9$,

Find the value of $|2\vec{a} + 5\vec{b} + 3\vec{c}|$