



THE GURUKUL INSTITUTE

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SCHOOL, VASUNDHARA, GHAZIABAD (U.P)

QUESTION PAPER-1

CLASS XII

MATHEMATICS

VECTORS

1. Find a unit vector in the direction of $\vec{a} = 3\hat{i} - 2\hat{j} + 6\hat{k}$.
2. Find the angle between the vectors $\vec{a} = \hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + \hat{j} - \hat{k}$.
3. For what value of λ are the vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$ perpendicular to each other?
4. If P (1, 5, 4) and Q(4, 1, 2), find the direction ratios of \vec{PQ} .
5. If $\vec{a} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{b} = 3\hat{i} + \hat{j} - 5\hat{k}$, find a unit vector in the direction of \vec{a} and \vec{b} .
6. If $|\vec{a}| = \sqrt{3}$, $|\vec{b}| = 2$ and $\vec{a} \cdot \vec{b} = 3$, find the angle between \vec{a} and \vec{b} .
7. If $\vec{a} \times \vec{b} = \vec{c} \times \vec{b}$ and $\vec{a} \times \vec{c} = \vec{b} \times \vec{d}$, prove that $\vec{a} - \vec{d}$ is parallel to $\vec{b} - \vec{c}$, provided $\vec{a} \neq \vec{d}$ and $\vec{b} \neq \vec{c}$.
8. Define $\vec{a} \times \vec{b}$ and prove that $|\vec{a} \times \vec{b}| = (\vec{a} \cdot \vec{b})\tan\theta$, where θ is angle between \vec{a} and \vec{b} .
9. Find a unit vector perpendicular to both vectors $\vec{a} = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = 2\hat{i} + 3\hat{j} - \hat{k}$.
10. Find the projection of $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ on $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$.
11. Find a vector whose magnitude is 3 units and which is perpendicular to the following two vectors :
 $\vec{a} = 3\hat{i} + \hat{j} - 4\hat{k}$; $\vec{b} = 6\hat{i} + 5\hat{j} - 2\hat{k}$.
12. If $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = 3\hat{i} + 2\hat{j} - \hat{k}$, find $(\vec{a} + 3\vec{b}) \cdot (2\vec{a} - \vec{b})$.
13. If $\vec{a} = \hat{i} + 2\hat{j} - 3\hat{k}$, $\vec{b} = 3\hat{i} - \hat{j} + 2\hat{k}$, show that $(\vec{a} + \vec{b})$ is perpendicular to $(\vec{a} - \vec{b})$.
14. If $|\vec{a}| = 5$, $|\vec{b}| = 13$, $|\vec{a} \times \vec{b}| = 25$, find $\vec{a} \cdot \vec{b}$.
15. If $\vec{a} + \vec{b} + \vec{c} = 0$, show that $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$.
16. Show that area of parallelogram having diagonals $3\hat{i} + \hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} + 4\hat{k}$ is $5\sqrt{3}$ sq. units.
17. Express the vector $\vec{a} = 5\hat{i} - 2\hat{j} + 5\hat{k}$ as sum of two vectors such that one is parallel to the vector $\vec{b} = 3\hat{i} + \hat{k}$ and the other is perpendicular to \vec{b} .
18. If $\vec{a} + \vec{b} + \vec{c} = 0$ and $|\vec{a}| = 3$, $|\vec{b}| = 5$ and $|\vec{c}| = 7$, show that the angle between \vec{a} and \vec{b} is 60° .
19. Find the angle between the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ if $\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + \hat{j} - 2\hat{k}$.
20. Find the projection of $\vec{b} + \vec{c}$ on \vec{a} , where $\vec{a} = 2\hat{i} - 2\hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$.
21. If \vec{a} , \vec{b} and \vec{c} are three mutually perpendicular vectors of equal magnitude, prove that the angle which $(\vec{a} + \vec{b} + \vec{c})$ makes with any of the vectors \vec{a} , \vec{b} or \vec{c} is $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$.