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QUESTION BANK

CHAPTER -10 . VECTORS

ANSWER THE FOLLOWING QUESTIONS:

1. Find $|\vec{x}|$, if for a unit vector $\vec{a}$, $(\vec{x}-\vec{a})\bullet(\vec{x}+\vec{a})$ = 15.
2. Let $\vec{a} = \hat{\imath} + 4\hat{\jmath} + 2\hat{k}$, $\vec{b} = 3\hat{\imath} - 2\hat{\jmath} + 7\hat{k}$ and $\vec{c} = 2\hat{\imath} - \hat{\jmath} + 4\hat{k}$. Find a vector $\vec{p}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{p} \bullet \vec{c} = 1$
3. Find the angle between the vectors $\vec{a} = \hat{\imath} - \hat{\jmath} + \hat{k}$ *and* $\vec{b} = \hat{\imath} + \hat{\jmath} - \hat{k}$.
4. For what value of μ are the vectors $\vec{a} = 2\hat{\imath} + \mu\hat{\jmath} + \hat{k}$ *and* $\vec{b} = \hat{\imath} - 2\hat{\jmath} + 3\hat{k}$ perpendicular to each other?
5. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ if $|\vec{a}| = 3$, $|\vec{b}| = 4$ and $|\vec{a} \times \vec{b}| = 6$.
6. Find the direction cosines of a line, passing origin and lying in the first octant, making equal angles with the three coordinate axes.
7. The scalar product of the vector $\hat{\imath} + \hat{\jmath} + \hat{k}$ with the unit vector along the sum of vectors $2\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$ and $\lambda\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ is equal to one. Find the value of λ.
8. If $\vec{a}$ is a unit vector perpendicular to $\vec{b}$ and $(\vec{a} + 3\vec{b}) \bullet (2\vec{a} - \vec{b}) = -10$, find $|\vec{b}|$.
9. Find the projection of $\overrightarrow{AB}$ on $\overrightarrow{CD}$,where A(4 – 3 , 2) ,B (1,– 1,– 1),C(2,2,2) and D (3,3,3).
10. If $\overrightarrow{a} = \hat{i} + \hat{j} + \hat{k}$ *and* $\vec{b} = \hat{j} - \hat{k}$, *find a vector* $\vec{c}$ *such that* $\vec{a} \times \vec{c} = \vec{b}$ *and* $\vec{a} \bullet \vec{c} = 3$
11. If $\vec{a}$ *and* $\vec{b}$ are the position vectors of the points (1,-1) and (-2, m) respectively. Find the value of m for which $\vec{a}$ *and* $\vec{b}$ are collinear.
12. If a unit vector $\vec{a}$ makes angle $\frac{\pi}{4}$ with $\hat{\imath}$, $\frac{\pi}{3}$ with $\hat{\jmath}$ and an acute angle θ with $\hat{k}$,then find the component of $\vec{a}$ and the angle θ .
13. Find the area of the parallelogram whose adjacent sides are determined by the vectors $\vec{a} = \hat{\imath} - \hat{\jmath} + \hat{k}$ and $\vec{b} = 2\hat{\imath} - 7\hat{\jmath} + \hat{k}$.
14. Let $\vec{a} = \hat{\imath} + 4\hat{\jmath} + 2\hat{k}$, $\vec{b} = 3\hat{\imath} - 2\hat{\jmath} + 7\hat{k}$ and $\vec{c} = 2\hat{\imath} - \hat{\jmath} + 4\hat{k}$. Find a vector $\vec{p}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{p} \bullet \vec{c} = 18$.
15. If $\vec{a} = 2\hat{\imath} - 3\hat{\jmath} + \hat{k}$, $\vec{b} = -\hat{\imath} + \hat{k}$, $\vec{c} = 2\hat{\jmath} - \hat{k}$ are three vectors , find the area of the parallelogram having diagonals $(\vec{a} + \vec{b})$ and $(\vec{b} + \vec{c})$.
16. If the three vectors a, b and c are coplanar prove that the vectors a+ b, b+ c , c + a are also coplanar.
17. Find the projection of $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ on $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$.
18. Find the value of λ if $(2\hat{i} + 6\hat{j} + 14\hat{k}) \times (\hat{i} - \lambda\hat{j} + 7\hat{k}) = \vec{0}$.
19. Find the direction cosines of the line passing through the points (–2, 4, –5) & (1, 2, 3).

20. Let $\vec{a} = 2\bar{i} + 2\vec{j} + \vec{k}$, $\vec{a}.\vec{b} = 14$, $\vec{a} \times \vec{b} = 3\bar{i} + \vec{j} - 8\vec{k}$. Find $\vec{b}$.

21. If the vectors a i + a j +c k, i +k and c i + c j+ b k are coplanar ,show that $c^2 = ab$.

22. If $\vec{a}$ and $\vec{b}$ are two unit vectors and θ is the angle between them , then find the value of θ such that $\vec{a}+\vec{b}$ is a unit vector.

23. The magnitude of the vector product of the vector $\hat{\imath} + \hat{\jmath} + \hat{k}$ with the unit vector along the sum of vectors $\hat{\imath} + 4\hat{\jmath} - 5\hat{k}$and $\lambda\hat{\imath} + 2\hat{\jmath} + 3\hat{k}$ is equal to $\sqrt{2}$. Find the value of λ.

24. Show that three vectors $\vec{a} = 2\vec{\imath} - \vec{\jmath} + \vec{k}$, $\vec{b} = \vec{\imath} - 3\vec{\jmath} - 5\vec{k}$ and $\vec{c} = 3\vec{\imath} - \overrightarrow{4j} - 4\vec{k}$ are coplanar.

25. Find the projection of vectors $\vec{a} on \vec{b} if \vec{a} \cdot \vec{b} = 8 \;\; and \vec{b} = 2\hat{\imath} + 6\hat{\jmath} + 3\hat{k}$.

26. If $\vec{a} = 5\vec{\imath} - \vec{\jmath} - 3\vec{k} and \vec{b} = \vec{\imath} + 3\vec{\jmath} - 5\vec{k}$, then show that $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are orthogonal.

27. Find the vector and Cartesian equation of the plane passing through the points A(2,2,-1), B(3,4,2) and C(7,0,6).

28. Evaluate the value of $\hat{i} \bullet (\hat{j} \times \hat{k}) + \hat{j} \bullet (\hat{k} \times \hat{i}) + \hat{k} \bullet (\hat{i} \times \hat{j})$,

29. Prove that $\vec{a} \bullet \left(\vec{b} \times \vec{c} \right\rangle \times \left(\vec{a} + \vec{b} + \vec{c} \right) = 0$.

30. Find the value of λ so that the lines $\frac{1-x}{3} = \frac{7y-14}{2\lambda} = \frac{z-3}{2}$ and $\frac{7-7x}{3\lambda} = \frac{y-5}{1} = \frac{6-z}{5}$ are perpendicular to each other.

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