TOPIC: VECTORS

1.Find the value of λ, if the vectors $2\hat{i}+\lambda\hat{j}+3\hat{k}$ & $3\hat{i}+2\hat{j}-4\hat{k}$ are perpendicular to each other.

2.If $\left|\vec{a}\right|$ = 2 , $\left|\vec{b}\right|=3$ and $\vec{a}.\vec{b}$ = 3, then find the projection of $\vec{b}$ on $\vec{a}$.

3.Vectors $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}\right|=\sqrt{3},\left|\vec{b}\right|=2/3$ and $\vec{a}\ X\ \vec{b}$ is a unit vector. Write the angle between $\vec{a}$ & $\vec{b}$.

4.If $\vec{a}$ and $\vec{b}$ are two vectors such that $\left|\vec{a}.\vec{b}\right|=\left|\vec{a}\ X\ \vec{b}\right|$, then find the angle between $\vec{a}\ X\ \vec{b}$.

5.Find $\vec{a}.(\vec{b}\ X\ \vec{c})$,

if $\vec{a}$ = $2\hat{i}+\hat{j}+3\hat{k}$, $\vec{b}$ = $-1\hat{i}+2\hat{j}+\hat{k}$ and $\vec{a}$ = $3\hat{i}+\hat{j}+2\hat{k}$

6.If $\vec{a}$ and $\vec{b}$ are unit vector, then find the angel between $\vec{a}$ and $\vec{b}$, given that $(\sqrt{3}\vec{a}-\vec{b})$ is a unit vector.

7.If $\left|\vec{a}\right|=8,\left|\vec{b}\right|=3$ and $\left|\vec{a}\ X\ \vec{b}\right|=12$, find the angle between $\vec{a}$ & $\vec{b}$

8.Write the projection of the vector

$\vec{a}=2\hat{i}-\hat{j}+\hat{k}$ on the vector $\vec{b}=\hat{i}+2\hat{j}+2\hat{k}$

9.Write the value of λ, so that the vector $\vec{a}=2\hat{i}+\lambda\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}-2\hat{j}+3\hat{k}$ are perpendicular to each other.

10.Write the projection of the vector $7\hat{i}+\hat{j}-4\hat{k}$ on the vector $2\hat{i}+6\hat{j}+3\hat{k}$.

11.Write the value of P, for which $\vec{a}=3\hat{i}+2\hat{j}+9\hat{k}$ and $\vec{b}=\hat{i}+P\hat{j}+3\hat{k}$ are parallel vector.

12.Find the projection of $\vec{a}$ on $\vec{b}$, if $\vec{a}.\vec{b}=8$ and $\vec{b}=2\hat{i}+6\hat{j}+3\hat{k}$

13.Find value of the following:

$$\hat{i}.(\hat{j}\ X\ \hat{k})+\hat{j}.(\hat{j}X\hat{k})+k.(\hat{i}X\ \hat{j})$$

14.Find $\left|\vec{a}\ X\ \vec{b}\right|$, if $\vec{a}=\hat{i}-7\hat{j}+7\hat{k}$ and $\vec{b}=3\hat{i}-2\hat{j}+2\hat{k}$

15.If $\left|\vec{a}\right|=\sqrt{3},\left|\vec{b}\right|=2$ & $\vec{a}.\vec{b}=3$, then find the angle between $\vec{a}$ and $\vec{b}$

16.Find angle between vector $\vec{a}=\hat{i}-\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}+\hat{j}-\hat{k}$.

17.If $\vec{a}$ and $\vec{b}$ are perpendicular vector, $\left|\vec{a}+\vec{b}\right|$ = 13 and $\left|\vec{a}\right|=5$, then find the value of $\left|\vec{b}\right|$.

18.If $\vec{a}$ and $\vec{b}$ are two unit vectors such that $\vec{a}+\vec{b}$ is also a unit vector , then find the angle between $\vec{a}$ and $\vec{b}$

19.Find the projection of the vector $\vec{a}$ and $\hat{i}+3\hat{j}+7\hat{k}$ on the vector $2\hat{i}-3\hat{j}+6\hat{k}$

20.Write the projection of vector $\hat{i}+\hat{j}+\hat{k}$ along the vector $\hat{j}$.

21.If $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}\right|=3,\left|\vec{b}\right|=2/3$ and $\vec{a}\ X\ \vec{b}$ is a unit vector, then write the angle between $\vec{a}$ and $\vec{b}$.

22.Write the projection of vector $\hat{i}-\hat{j}$ on the vector $\hat{i}+\hat{j}$

23.Write the angle between vector $\hat{a}$ *and* $\hat{b}$ with magnitude $\sqrt{3}$ & 2 respectively, having $\vec{a}.\vec{b} = \sqrt{6}$

24.For what value of λ are the vectors $\hat{i}+2\lambda\hat{j}+\hat{k}$ & $2\hat{i}+\hat{j}-3\hat{k}$ perpendicular?

25.If $\left|\vec{a}\right| = \sqrt{3}, \left|\vec{b}\right| = 2$, and angle between $\vec{a}$ and $\vec{b}$ is 60^0, then find $\vec{a}.\vec{b}$

26.Find λ if $(2\hat{i}+6\hat{j}+14\hat{k})\ X\ (\hat{i}-\lambda\hat{j}+7\hat{k}) = \vec{0}$

27.Find $\vec{a}.\vec{b}$, if $\vec{a} = -\hat{i}+\hat{j}-2\hat{k}$ and $\vec{b} = 2\hat{i}+3\hat{j}-\hat{k}$

28.Find $\vec{a}.\vec{b}$, if $\vec{a} = 3\hat{i}-\hat{j}+2\hat{k}$ and $\vec{b} = 2\hat{i}+3\hat{j}+3\hat{k}$

29.Find the value of P , if $(2\hat{i}+6\hat{j}+27\hat{k})\ X\ (\hat{i}+3\hat{j}+P\hat{k}) = \vec{0}$

30.If $\hat{P}$ is a unit vector and $(\vec{x}-\hat{P}).(\vec{x}+\hat{P}) = 80$, then find $\left|\vec{x}\right|$.

31.Find the angle between $\vec{a}$ and $\vec{b}$ with magnitude 1 and 2 respectively, when $\left|\vec{a}\ X\ \vec{b}\right| = \sqrt{3}$.

32.If $\vec{a}$ and $\vec{b}$ are two vectors such that $\left|\vec{a}+\vec{b}\right| = \left|\vec{a}\right|$, then prove that vector $2\vec{a}+\vec{b}$ is perpendicular to vector $\vec{b}$

33.Find $\left|\vec{x}\right|$, if for a unit vector $\vec{a}$, $(\vec{x}-\vec{a}).(\vec{x}+\vec{a}) = 15$

34.Find λ, when projection of $\vec{a} = \lambda\hat{i}+\hat{j}+4\hat{k}$ *on* $\vec{b} = 2\hat{i}+6\hat{j}+3\hat{k}$ is 4 units.

35.Write the value of $(\vec{a}+\vec{b}).\vec{i}+\vec{j}.\vec{k}$

36.If $\vec{a}.\vec{a} = 0$ & $\vec{b}.\vec{b} = 0$, then what can be concluded about the vector $\vec{b}$?

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1. The scalar product of vector $\hat{i}+\hat{j}+\hat{k}$ with the unit vector along the sum of vectors $2\hat{i}+4\hat{j}-5\hat{k}$ *and* $\lambda\hat{i}+2\hat{j}+3\hat{k}$ is equal to one. Find the value of λ.
2. If $\vec{a}\ X\ \vec{b}=\vec{c}\ X\ \vec{d}$ and $\vec{a}\ X\ \vec{c}=\vec{b}\ X\ \vec{d}$ then show that $\vec{a}-\vec{d}$ is parallel to $\vec{b}-\vec{c}$, where $\vec{a}\neq\vec{d}$ and $\vec{b}\neq\vec{c}$
3. Three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ satisfy the condition $\vec{a}+\vec{b}+\vec{c}=0$. Find the value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$, if $\left|\vec{a}\right|=1,\left|\vec{b}\right|=4$ *and* $\left|\vec{c}\right|=2$
4. Find a vector of magnitude 5 units, perpendicular to each of the vectors $(\vec{a}+\vec{b})$ and $(\vec{a}-\vec{b})$, where $\vec{a}=\hat{i}+\hat{j}+\hat{k}\ \&\ \vec{b}=\hat{i}+2\hat{j}+3\hat{k}$
5. Prove that , for any three vectors $\vec{a},\vec{b}$ *and* $\vec{c}$, $[\vec{a}+\vec{b}\ \vec{b}+\vec{c}\ \vec{c}+\vec{a}]=2[\vec{a}\ \vec{b}\ \vec{c}]$
6. Vectors $\vec{a},\vec{b}$ *and* $\vec{c}$ are such that $\vec{a}+\vec{b}+\vec{c}=0\ \&\ \left|\vec{a}\right|=3,\left|\vec{b}\right|=5\ \&\ \left|\vec{c}\right|=7$. Find the angle between $\vec{a}\ \&\vec{b}$
7. Show that the four points A, B, C and D with position vectors $4\hat{i}+5\hat{j}+\hat{k},-\hat{j}-\hat{k},3\hat{i}+9\hat{j}+4\hat{k}$ *and* $4(-\hat{i}+\hat{j}+\hat{k})$ respectively are coplanar.
8. The scalar product of the vector $\vec{a}=\hat{i}+\hat{j}+\hat{k}$ with a unit vector along the sum of vectors $\vec{b}=2\hat{i}+4\hat{j}-5\hat{k}\ \&\ \vec{c}=\lambda\hat{i}+2\hat{j}+3\hat{k}$ is equal to one. Find the value of λ and hence, find the unit vector along $\vec{b}+\vec{c}$
9. Find the vector $\vec{p}$ which is perpendicular to both $\vec{\alpha}=4\hat{i}+5\hat{j}-\hat{k}\ \&\ \vec{\beta}=\hat{i}-4\hat{j}+5\hat{k}$ *and* $\vec{p}.\vec{q}=21$, where $\vec{q}=3\hat{i}+\hat{j}-\hat{k}$
10. If $\vec{a}$ and $\vec{b}$ are two vectors, such that $\left|\vec{a}\right|=2,\left|\vec{b}\right|=1\ \&\ \vec{a}.\vec{b}=1$ then find $(3\vec{a}-4\vec{b}).(2\vec{a}+7\vec{b})$

11. If vectors $\vec{a}=2\hat{i}+2\hat{j}+3\hat{k}, \vec{b}=-\hat{i}+2\hat{j}+\hat{k}$ and $\vec{c}=2\hat{i}+\hat{j}$ are such that $\vec{a}+\lambda\vec{b}$ is perpendicular to $\vec{c}$, then find the value of λ.
12. Using vectors, find the area of triangle with vertices A(1,1,2), B(2,3,5) and C(1,5,5).
13. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three vectors, such that $\left|\vec{a}\right|=3, \left|\vec{b}\right|=4$ and $\left|\vec{c}\right|=5$ and each one of these is perpendicular to the sum of other two, then find $\left|\vec{a}+\vec{b}+\vec{c}\right|$
14. Using vectors, find the area of triangle with vertices A(2,3,5), B(3,5,8) and C(2,7,8)
15. If $\vec{a}=\hat{i}-\hat{j}+7\hat{k}$ and $\vec{b}=5\hat{i}-\hat{j}+\lambda\hat{k}$, then find the value of λ, so that $\vec{a}+\vec{b}$ & $\vec{a}-\vec{b}$ are perpendicular vectors.
16. If $\vec{p}=5\hat{i}+\lambda\hat{j}-3\hat{k}$ and $\vec{q}=\hat{i}+3\hat{j}-5\hat{k}$,, then find the value of If λ, so that If $\vec{p}+\vec{q}$ and $\vec{p}-\vec{q}$ are perpendicular vectors.
17. If $\vec{a},\vec{b}$ and $\vec{c}$ are three vectors, such that $\left|\vec{a}\right|=5, \left|\vec{b}\right|=12, \left|\vec{c}\right|=13$ & $\vec{a}+\vec{b}+\vec{c}=0$, then find the value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$
18. Let $\vec{a}=\hat{i}+4\hat{j}+2\hat{k}$, $\vec{b}=3\hat{i}-2\hat{j}+7\hat{k}$ and $\vec{b}=2\hat{i}-1\hat{j}+4\hat{k}$. Find a vector $\vec{p}$, which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{p}.\vec{c}$ = 18.
19. Find a unit vector perpendicular to each of the vectors $\vec{a}+\vec{b}$ & $\vec{a}-\vec{b}$, where $\vec{a}=3\hat{i}+2\hat{j}+2\hat{k}$ and $\vec{b}=\hat{i}+2\hat{j}-2\hat{k}$.
20. Find a unit vector perpendicular to both of the vectors $\vec{a}+\vec{b}$ and $\vec{a}-\vec{b}$ Where, $\vec{a}=\hat{i}+\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}+2\hat{j}+3\hat{k}$
21. Find the unit vector perpendicular to the plane ABC where the position vectors of A, B and C are $2\hat{i}-\hat{j}+\hat{k}, \hat{i}+\hat{j}+2\hat{k}$ & $2\hat{i}+3\hat{k}$ respectively.
22. Show that the vectors $\vec{a}, \vec{b}$ & $\vec{c}$ are coplanar, if and only if $\vec{a}+\vec{b}$, $\vec{b}+\vec{c}$ & $\vec{c}+\vec{a}$ are coplanar.

23. If $\vec{a}, \vec{b}$ & $\vec{c}$ are three mutually perpendicular vectors of the same magnitude, then prove that $\vec{a}+\vec{b}+\vec{c}$ is equally inclined with the vectors $\vec{a}, \vec{b}$ & $\vec{c}$.

24. If $\vec{a} = \hat{i}+\hat{j}+\hat{k}$ *and* $\vec{b} = \hat{j}-\hat{k}$, then find a vector $\vec{c}$, such that $\vec{a} \times \vec{c} = \vec{b}$ *and* $\vec{a}.\vec{c} = 3$

25. Using vectors, find the area of the ΔABC, whose vertices are A(1,2,3) , B(2, – 1,4) and C(4,5, – 1)
