MATHS

BOOKS - JEEVITH PUBLICATIONS MATHS (KANNADA ENGLISH)

VECTOR ALGEBRA

One Marks Questions With Answers

1. Compute the magnitude of the following vectors : $a = \hat{i} + \hat{j} + \hat{k}, b = 2\hat{i} - 7\hat{j} - 3\hat{k}, c = \frac{1}{\sqrt{3}}\hat{i} + \frac{1}{\sqrt{3}}\hat{j} - \frac{1}{\sqrt{3}}\hat{k}.$

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2. Write two different vectors having same magnitude.

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3. Write two different vectors having same direction.

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4. Find the value of x and y so that the vectors $2\hat{i} + 3\hat{j}$ and $x\hat{i} + y\hat{j}$ are equal .

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5. Find the scalar and vector components of the vector with initial point $(2, 1)$ and terminal point $(-5, 7)$.

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Two Marks Three Marks Questions With Answers

1. Find the sum of vectos $a = \hat{i} - 2\hat{j} + \hat{k}, b = -2\hat{i} + 4\hat{j} + 5\hat{k}$ and $c = \hat{i} - 6\hat{j} - 7\hat{k}$.

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2. Find unit vector in the direction of vector $\hat{i} + \hat{j} + 2\hat{k}$

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3. Find the unit vector in the direction of vector $\overline{PQ}$, where P and Q are the points $P = (1, 2, 3)$. $Q = (4, 5, 6)$ respectively.

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4. For given vectors , $a = 2\hat{i} - j + 2\hat{k}$ and $b = -\hat{i} + j - \hat{k}$, find the unit vector in the direction of the vector $\vec{a} + \vec{b}$.

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5. Find a vector in the direction of vector $5\hat{i} - \hat{j} + 2\hat{k}$ which has magnitude 8 unit.

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6. Show that the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $-4\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear.

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7. Find the direction cosines of the vector $\hat{i} + 2\hat{j} + 3\hat{k}$

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8. Find the direction cosines of the vector joining the points $A(1, 2, -3)$ and $B(-1, -2, 1)$ directed from A to B.

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9. Show that the vector $\hat{i} + \hat{j} + \hat{k}$ is equally inclined to the axes OX,OY and OZ.

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10. Find the position vectors of a point R which divides the line joining two points P and Q whose position vectors are $\hat{i} + 2\hat{j} - \hat{k} -$ and $-\hat{i} + \hat{j} - \hat{k}$ respectively, in the ration $2:1$. (i) Internally, (ii) Externally.

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11. Find the position vector of the mid-point of the vector joining point $P(2, 3, 4)$ and $Q(4, 1, -2)$

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12. Show that the points A, B and C with position vectors , $\vec{a} = 3\hat{i} - 4\hat{j} - 4\hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{c}\,\hat{i} - 3\hat{j} - 5\hat{k}$ respectively, from the vertices of a right angled triangle.

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13. Find the angle between two vectors a and b with magnitudes $\sqrt{3}$ and 2 respectively, having $a.\, b = \sqrt{6}$.

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14. Find the angle between the vectors $\hat{i} - 2\hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$.

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15. Find the projection of the vector $\hat{i} - \hat{j}$ on the vector $\hat{i} + \hat{j}$.

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16. Find the projection of the vector $\hat{i}+3\hat{j}+7\hat{k}$ on the vector $7\hat{i}-\hat{j}+8\hat{k}$.

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17. Find $\left|\vec{a}\right|$ and $\left|\vec{b}\right|$, if $\left(\vec{a}+\vec{b}\right).\left(\vec{a}-\vec{b}\right)=8$ and $\left|\vec{a}\right|=8\left|\vec{b}\right|$.

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18. Evaluate the product $\left(3\vec{a}-5\vec{b}\right).\left(2\vec{a}+7\vec{b}\right)$.

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19. Find the magnitude of two vectors $\vec{a}$ and $\vec{b}$ having the same magnitude and such that the angle between them is 60° and their scalar product is $1/2$.

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20. Find $|x|$, if for a unit vector a, $\left(\vec{x}-\vec{a}\right).\left(\vec{x}+\vec{a}\right)=12$.

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21. If $a=2\hat{i}+2\hat{j}+3\hat{k}, b=\hat{i}+2\hat{j}+\hat{k}$ and $c=3\hat{i}+\hat{j}$ such that $a+\lambda b$ is perpendicular to c, then find the value of λ.

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22. Show that $|a|b+|b|$ a is perpendicular to $|a|b-|b|$ a for any two non-zero vectors a and b.

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23. If a,b,c are unit vectors such that $a+b+c=0$, then find the value of $a.\ b+b.\ c+c.\ a.$

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24. If either $a=0, b=0$, then a.b=0. But the converse need not to be true . Justify your answer with an example.

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25. If the vertices A,B,C of a triangle ABC have position vectors $(1,2,3),(-1,0,0)(0,1,2)$ respectively then find $\angle ABC(\angle ABC$ is the angle between the factors BA and BC).

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26. Show that the points $A(1, 2, 7), B(2, 6, 3)$ and $C(3, 10, -10)$ are collinear.

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27. Show that the vectors $2\hat{i} - \hat{j} + \hat{k}, \hat{i} - 3\hat{j}$. And $3\hat{i} - 4\hat{j} - 3\hat{k}$. Form the vertices of a right angled triangle.

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

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29. Find a unit vector perpendicular to each of the vectors $\left(\vec{a} + \vec{b}\right)$ and $\left(\vec{a} - \vec{b}\right)$ where $\vec{a} = 3\hat{i} + 2\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j}$

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30. If a unit vector $\hat{a}$, makes angles $\frac{\pi}{3}$ with $\hat{i}$, $\frac{\pi}{4}$ with $\hat{j}$ and an acute angle θ with $\hat{k}$, then find θ and hence the components of a.

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31. Show that $\left(\vec{a}-\vec{b}\right)\times\left(\vec{a}+\vec{b}\right)=2\left(\vec{a}\times\vec{b}\right)$.

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32. Find λ and u, if $\left(2\hat{i}+6\hat{j}+27\hat{k}\right)\times\left(\hat{i}+\lambda\hat{j}+\mu\hat{k}\right)=0$.

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33. Given that a.b=0 and $a\times b=0$. What can you conclude about the vectors a and b?

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34. Prove that $\left[\vec{a}+\vec{b}, \vec{b}+\vec{c}, \vec{c}+\vec{a}\right]=2\left[\vec{a}, \vec{b}, \vec{c}\right]$.

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35. Prove that $\left[\vec{a}, \vec{b}, \vec{c}+\vec{d}\right]=\left[\vec{a}, \vec{b}, \vec{c}\right]+\left[\vec{a}, \vec{b}, \vec{d}\right]$.

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36. Find the volume of the parallelopiped whose cotermius edges are $2\hat{i}+\hat{j}+3\hat{k}, -\hat{i}+2\hat{j}+\hat{k}$ and $3\hat{i}+\hat{j}+2\hat{k}$.

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37. Show that the vectors $\vec{a}=\hat{i}-2\hat{j}+3\hat{k}\,\vec{b}=-2i+3\hat{j}-4\hat{k}\,\vec{c}=\hat{i}-3\hat{j}+5\hat{k}$ are coplanar.

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Try Yourself

1. Find the area of the triangle with vertices A(1,1,2), B(2,3,5) and C(1,5,5).

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2. Find the area of the parallelogram whose adjacent sides are determined by the vectors $a = \hat{i} - \hat{j} + 3\hat{k}$ and $b = 2\hat{i} - 2\hat{j} + 5\hat{k}$.

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3. Let the vectors a and b be such that $|a| = 3$ and $|b| = \frac{\sqrt{2}}{3}$, then $a \times b$ is a unit vector, if the angle between a and b is

A. $\frac{\pi}{6}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{3}$

D. $\frac{\pi}{2}$.

Answer:

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4. Area of a rectangle having vertices $A\left(-\hat{i}+\frac{1}{2}\hat{j}+4\hat{k}\right), B\left(\hat{i}+\frac{1}{2}\hat{j}+4\hat{k}\right), C\left(\hat{i}-\frac{1}{2}\hat{j}+4\hat{k}\right)$, and $D\left(-\hat{i}\right.$ is

A. $\frac{1}{2}$

B. 1

C. 2

D. 4

Answer:

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