MATHS

BOOKS - ARIHANT PUBLICATION

VECTOR ALGEBRA

Sample Question

1. Classify the following measures as scalars nad vectors.

40 watt

Watch Video Solution

2. Classify the following measures as scalars and vectors.

$20m / s^2$

Watch Video Solution

3. Classify the following measures as scalars and vectors.

$100m^2$

Watch Video Solution

4. Classify the following measures as scalars and vectors.

2m North-West.

Watch Video Solution

5. Find a vector $\vec{a}$ of magnitude $5\sqrt{2}$, making an angle of $\frac{\pi}{4}$ with X-axis, $\frac{\pi}{2}$ with Y-axis and an acute θ with Z-axis.

Watch Video Solution

6. If A, B and C are the vertices of a ΔABC, then what is the value of $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CA}$?

Watch Video Solution

7. Vectors drawn from the origin O to the points A, B and C are respectively $\vec{a}$, $\vec{b}$ and $4\vec{a} - 3\vec{b}$. Find $\overrightarrow{AC}$ and $\overrightarrow{BC}$.

Watch Video Solution

8. If $\vec{a}$ and $\vec{b}$ are two non-collinear vectors having the same initial point. What are the vectors represented by $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$?

Watch Video Solution

9. Find the position vectors of the points which divide the line joining the two points $3\vec{a} - 2\vec{b}$ and $2\vec{a} - 5\vec{b}$ internally and externally in the ratio 3:2.

Watch Video Solution

10. Find a vector in the direction of vector $\vec{a} = \hat{i} - 2\hat{j}$ that has magnitude 7 units.

Watch Video Solution

Watch Video Solution

11. If $\vec{a} = 3\hat{i} - 2\hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - 4\hat{j} - 3\hat{k}$, then find $\left|\vec{a} - 2\vec{b}\right|$.

Watch Video Solution

12. For what values of a, the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $a\hat{i} + 6\hat{j} - 8\hat{k}$ are collinear ?

Watch Video Solution

13. Write the direction ratios of the vector $\vec{a} = \hat{i} + \hat{j} - 2\hat{k}$ and hence calculate its direction cosines.

Watch Video Solution

14. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitude 2 and 1 respectively, such that $\vec{a} . \vec{b} = \sqrt{3}$.

Watch Video Solution

15. Find $\left(\vec{a} + 2\vec{b}\right) . \left(3\vec{a} - \vec{b}\right)$, if $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = 3\hat{i} + 2\hat{j} - \hat{k}$.

Watch Video Solution

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

Watch Video Solution

17. If $\vec{a} = 7\hat{i} + \hat{j} - 4\hat{k}$ and $\vec{b} = 2\hat{i} + 6\hat{j} + 3\hat{k}$, then find the projection of $\vec{a}$ on $\vec{b}$.

Watch Video Solution

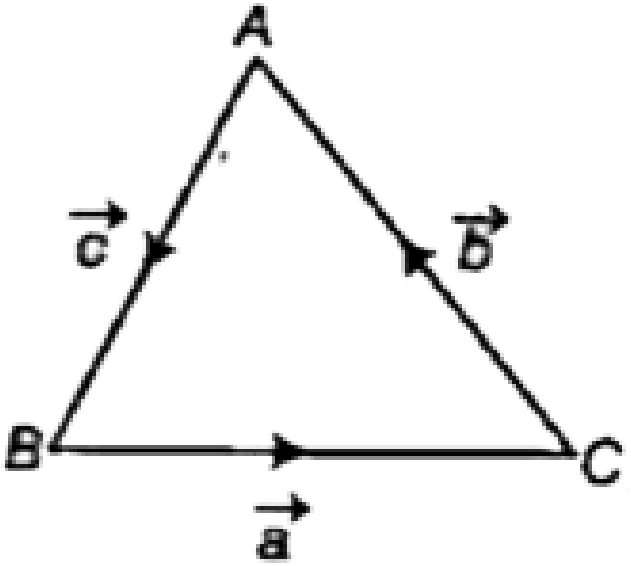
18. If vectors $\vec{a}$ and $\vec{b}$ are such that $\vec{a} = 3$, $\left|\vec{b}\right| = \frac{2}{3}$ and $\vec{a} \times \vec{b}$ is a unit vector, then find the angle between $\vec{a}$ and $\vec{b}$.

Watch Video Solution

19. For any three vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$, prove that $\vec{a} \times \left(\vec{b} - \vec{c}\right) = \left(\vec{a} \times \vec{b}\right) - \left(\vec{a} \times \vec{c}\right)$.

Watch Video Solution

20. It the vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ form the sides $\overrightarrow{BC}$, $\overrightarrow{CA}$ and $\overrightarrow{AB}$ respectively of a triangle ABC, then write the value of $\vec{a} \times \vec{c} + \vec{b} \times \vec{c}$.



Watch Video Solution

21. If $\vec{A} = 3\hat{i} + \hat{j} + 2\hat{k}$ and $\vec{B} = 2\hat{i} - 2\hat{j} + 4\hat{k}$, then find $\vec{A} \times \vec{B}$ and $\left|\vec{A} \times \vec{B}\right|$.

Watch Video Solution

22. Find the unit vector perpendicular to the plane ABC, where the position vectors of A, B and C are $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} + \hat{j} + 2\hat{k}$ and $2\hat{i} + 3\hat{k}$, respectively.

Watch Video Solution

23. Find a vector of magnitude 3, which is perpendicular to both the vectors $3\hat{i} + \hat{j} - 4\hat{k}$ and $6\hat{i} + 5\hat{j} - 2\hat{k}$.

Watch Video Solution

24. Find a unit vector perpendicular to the plane ABC, where A, B and C are the points (3, -1, 2), (1, -1, -3) and (4, -3, 1), respectively.

Watch Video Solution

25. Find the area of the triangle whose vertices are P(-1, 2, -1), Q(3, -1, 2) and R(2, 3, -1).

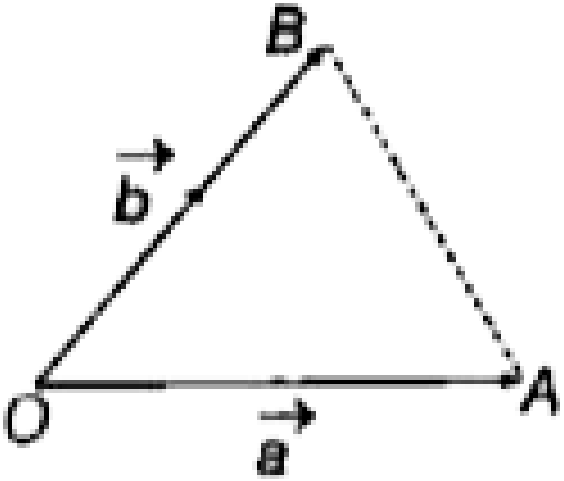
Watch Video Solution

26. If $\vec{a} = 2\hat{i} - 3\hat{j} + \hat{k}$, $\vec{b} = -\hat{i} + \hat{k}$ and $\vec{c} = 2\hat{j} - \hat{k}$ are three vectors, then find the area of the parallelogram

having diagonals $\left(\vec{a}+\vec{b}\right)$ and $\left(\vec{b}+\vec{c}\right)$.

Watch Video Solution

27. A ΔOAB is determined by the vectors $\vec{a}$ and $\vec{b}$ as shown in the figure. Show that the triangle has the area is given by



$$\Delta=\frac{1}{2}\sqrt{\left|\vec{a}\right|^2\left|\vec{b}\right|^2-\left(\vec{a}.\vec{b}\right)^2}.$$

Watch Video Solution

28. If $\vec{a}$ and $\vec{b}$ are two vectors such that $\left|\vec{a} \times \vec{b}\right| = 2$, then find the value of $\left[\vec{a}\ \vec{b}\ \vec{a} \times \vec{b}\right]$.

Watch Video Solution

29. If $\vec{a} = 2\hat{i} + 3\hat{j} + \hat{k}$, $\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$ and $\vec{c} = -3\hat{i} + \hat{j} + 2\hat{k}$, then find $\left[\vec{a}\ \vec{b}\ \vec{c}\right]$.

Watch Video Solution

30. If the vectors $2\hat{i} - 3\hat{j}$, $\hat{i} + \hat{j} - \hat{k}$ and $3\hat{i} - \hat{k}$ form three concurrent edges of a parallelopiped, then find the volume of the parallelopiped.

Watch Video Solution

31. Prove that for any three vectors $\vec{a}, \vec{b}$ and $\vec{c}, \left[\vec{a}+\vec{b}\,\vec{b}+\vec{c}\,\vec{c}+\vec{a}\right]=2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$

Watch Video Solution

32. If $\vec{p}=\frac{1}{\lambda}\left(\vec{b}\times\vec{c}\right), \vec{q}=\frac{1}{\lambda}\left(\vec{c}\times\vec{a}\right)$ and $\vec{r}=\frac{1}{\lambda}\left(\vec{a}\times\vec{b}\right)$ where $\lambda=\left[\vec{a}\,\vec{b}\,\vec{c}\right]\neq 0$, then show that $\left(\vec{a}+\vec{b}+\vec{c}\right).\left(\vec{p}+\vec{q}+\vec{r}\right)=3.$

View Text Solution

33. Prove that the following vectors are coplanar $-4\hat{i}+4\hat{j}+4\hat{k}, 4\hat{i}+5\hat{j}+\hat{k}-\hat{j}-\hat{k}, 3\hat{i}+9\hat{j}+4\hat{k}.$

Watch Video Solution

34. For $\vec{a}=\hat{i}-\hat{j}$, $\vec{b}=\hat{i}-2\hat{k}$ and $\vec{c}=\hat{j}+\hat{k}$, obtain $\vec{a}\times\left(\vec{b}\times\vec{c}\right)$.

Watch Video Solution

35. Show that $\hat{i}\times\left(\vec{a}\times\hat{i}\right)+\hat{j}\times\left(\vec{a}\times\hat{j}\right)+\hat{k}\times\left(\vec{a}\times\hat{k}\right)=2\vec{a}$.

Watch Video Solution

Questions For Practice Part I Basic Concepts Very Short Answer Type Questions

1. If A, B, P, Q and R are the five points in a plane, then show that the sum of the vectors $\overrightarrow{AP}, \overrightarrow{AQ}, \overrightarrow{AR}, \overrightarrow{PB}, \overrightarrow{QB}$ and $\overrightarrow{RB}$ is $3\overrightarrow{AB}$.

Watch Video Solution

2. If $\overrightarrow{a} = x\hat{i} + 2\hat{j} - z\hat{k}$ and $\overrightarrow{b} = 3\hat{i} - y\hat{j} + \hat{k}$ are two equal vectors, then find the value of x + y +z.

Watch Video Solution

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

Watch Video Solution

4. Is $\vec{0}$ unique

Watch Video Solution

5. How many directions a null vector has ?

Watch Video Solution

6. If P(1, 5, 4) and Q(4, 1, -2), then find the direction ratios of $\overrightarrow{PQ}$.

Watch Video Solution

7. L and M are two points with position vectors $2\vec{a} - \vec{b}$ and $\vec{a} + 2\vec{b}$, respectively. Write the position vector of a point N which divides the line segment LM in the ratio 2 :11`externally.

Watch Video Solution

8. Write a vector in the direction of the vector $\hat{i} - 2\hat{j} + 2\hat{k}$ that has magnitude 9 units.

Watch Video Solution

9. Write the directions cosines of vector $-2\hat{i}+\hat{j}-5\hat{k}$.

Watch Video Solution

10. Write a unit vector in the direction of the sum of the vectors $\vec{a}=2\hat{i}+2\hat{j}-5\hat{k}$ and $\vec{b}=2\hat{i}+\hat{j}-7\hat{k}$.

Watch Video Solution

11. Find the value of p for which the vectors $3\hat{i}+2\hat{j}+9\hat{k}$ and $\hat{i}-2p\hat{j}+3\hat{k}$ are parallel.

Watch Video Solution

12. Write the value of cosine of the angle which the vector $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ makes with Y-axis.

Watch Video Solution

13. Write the values of m and n for which the vectors $(m-1)\hat{i} + (n+2)\hat{j} + 4\hat{k}$ and $(m+1)\hat{i} + (n-2)\hat{j} + 8\hat{k}$ will be parallel.

Watch Video Solution

14. Write the values of a and b, for which the vectors $(a-1)\hat{i} + (b+2)\hat{j} + 4\hat{k}$ and $(a+1)\hat{i} + (b-2)\hat{j} + 8\hat{k}$ will be parallel.

Watch Video Solution

15. If the position vectors of the points A, B, C are $2\hat{i}+\hat{j}-\hat{k}, 3\hat{i}-2\hat{j}+\hat{k}$ and $\hat{i}+4\hat{j}-3\hat{k}$ respectively, then prove that A, B, C are collinear.

Watch Video Solution

Questions For Practice Part I Basic Concepts Short Answer Type Questions

1. If $\vec{a}$ and $\vec{b}$ are the position vectors of $\vec{A}$ and $\vec{B}$ respectively, then find the position vector of a point $\vec{C}$ and $\overrightarrow{BA}$ produced such that $\overrightarrow{BC}=1.5\overrightarrow{BA}$. Also, it is shown by graphically.

Watch Video Solution

2. Find the position vector of a point C which divides the line segment joining A and B, whose position vectors are $2\vec{a}+\vec{b}$ and $\vec{a}-3\vec{b}$, externally in the ratio $1:2$. Also, show that A is the mid-point of the line segment BC.

Watch Video Solution

3. Points L, M and N divide the side BC, CA and AB of ΔABC in the ratio $1:4, 3:2$ and $3:7$, respectively. Prove that $\overrightarrow{AL}+\overrightarrow{BM}+\overrightarrow{CN}$ is a vector parallel to $\overrightarrow{CK}$, where K divides AB in the ratio $1:3$.

View Text Solution

4. If the position vectors of the points A, B, C and D are $2\hat{i}+4\hat{k}, 5\hat{i}+3\sqrt{3}\hat{j}+4\hat{k}, -2\sqrt{3}\hat{j}+\hat{k}$ and $2\hat{i}+\hat{k}$ respectively, then prove that $\overrightarrow{CD}$ is parallel to $\overrightarrow{AB}$ and $\overrightarrow{CD}=\frac{2}{3}\overrightarrow{AB}$.

Watch Video Solution

5. If $\vec{a}=(2,-2,1)$, $\vec{b}=(2,3,6)$ and $\vec{c}=(-1,0,2)$,Find the magnitude and direction of $\vec{a}+\vec{b}-\vec{c}$.

Watch Video Solution

6. Show that the points (3,-2,4)(1,1,1) and (-1,4,-1) are collinear.

Watch Video Solution

7. Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}, \vec{b} = 4\hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{c} = \hat{i} - 2\hat{j} + \hat{k}$ and find a vector of magnitude 6 units which is parallel to the vector $2\vec{a} - \vec{b} + 3\vec{c}$.

Watch Video Solution

8. A vector $\vec{r}$ is inclined at equal angles to the three axes. If the magnitude of $\vec{r}$ is $2\sqrt{3}$ units, then find the value of $\vec{r}$.

Watch Video Solution

9. Show that the vectors $\vec{a} = 3\hat{i} - 2\hat{j} + \hat{k}, \vec{b} = \hat{i} - 3\hat{j} + 5\hat{k}$ and

$\vec{c} = 2\hat{i} + \hat{j} - 4\hat{k}$ form a right angled triangle.

Watch Video Solution

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

Watch Video Solution

Questions For Practice Part Ii Scalar Or Dot Product Of Two Vectors Very Short Answer Type Questions

1. Write the angle between vectors $\vec{a}$ and $\vec{b}$ with magnitude $\sqrt{3}$ and 2 respectively, having $\vec{a} . \vec{b} = \sqrt{6}$.

Watch Video Solution

2. If $\vec{a}$ and $\vec{b}$ are unit vectors and $\vec{a}+\vec{b}$ is also a unit vector, then write the measure of the angle between $\vec{a}$ and $\vec{b}$

Watch Video Solution

3. Find $\left|\vec{a}-\vec{b}\right|$, if two vectors $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}\right|=2, \left|\vec{b}\right|=3$ and $\vec{a}.\vec{b}=4.$

Watch Video Solution

4. If $\hat{a}$ is a unit vector and $\left(\vec{x}-\hat{a}\right).\left(\vec{x}+\hat{a}\right)=8$, then find $\left|\vec{x}\right|$

Watch Video Solution

5. If $\vec{a}$ and $\vec{b}$ are two vectors, such that $\left|\vec{a}\right|=2, \left|\vec{b}\right|=1$ and $\vec{a}.\vec{b}=1$, then find $\left(3\vec{a}-5\vec{b}\right).\left(2\vec{a}+7\vec{b}\right)$.

Watch Video Solution

6. For any two vectors $\vec{a}$ and $\vec{b}$, we always have $\left|\vec{a}.\vec{b}\right| \leq \left|\vec{a}\right|\left|\vec{b}\right|$. (Cauchy Schwartz inequality)

Watch Video Solution

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

Watch Video Solution

8. If $\vec{a} = 5\hat{i} - \hat{j} - 3\hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} - 5\hat{k}$, then show that the vectors $\left(\vec{a} + \vec{b}\right)$ and $\left(\vec{a} - \vec{b}\right)$ are perpendicular.

Watch Video Solution

9. If $\hat{a}$, $\hat{b}$ and $\hat{c}$ are mutually perpendicular unit vectors, then find the value of $\left|2\hat{a} + \hat{b} + \hat{c}\right|$.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

13. Find the component of the vector $\vec{b} = 8\hat{i} + \hat{j}$ in the direction of the vector $\vec{a} = \hat{i} + 2\hat{j} - 2\hat{k}$.

Watch Video Solution

14. Determine the value of m, for which the following vectors are orthogonal.

$(m+1)\hat{i} + m^2\hat{j} - m\hat{k}, \left(m^2 - m + 1\right)\hat{i} - m\hat{j} + \hat{k}$

Watch Video Solution

15. For what value of λ, the vectors $\lambda\hat{i} + 3\hat{j} + \lambda\hat{k}$ and $\lambda\hat{i} - 2\hat{j} + \hat{k}$ are perpendicular to each others.

Watch Video Solution

16. Find the scalar projection of the vector $\vec{a} = 3\hat{i} + 6\hat{j} + 9\hat{k}$ on $\vec{b} = 2\hat{i} + 2\hat{j} - \hat{k}$.

Watch Video Solution

17. What is the angle between the vectors $2\hat{i} - \hat{j} - \hat{k}$ and $\hat{i} + \hat{j} + \hat{k}$?

Watch Video Solution

Questions For Practice Part Ii Scalar Or Dot Product Of Two Vectors Short Answer Type Questions

1. Prove by vector method that in a ΔABC, $c^2 = a^2 + b^2 - 2ab\cos C$.

Watch Video Solution

2. Resolve the vector $\vec{b} = \hat{i} + \hat{j} + \hat{k}$ into vectors parallel and perpendicular to the vector $\vec{a} = \hat{i} + \hat{j}$.

Watch Video Solution

3. If the dot products of a vector with vectors $3\hat{i} - 5\hat{k}$, $2\hat{i} + 7\hat{j}$ and $\hat{i} + \hat{j} + \hat{k}$ are respectively -1, 6 and 5,

then find the vector.

Watch Video Solution

4. Vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ and $|\vec{a}|=3, |\vec{b}|=5$ and $|\vec{c}|=7$. Then, find the angle between $\vec{a}$ and $\vec{b}$.

Watch Video Solution

5. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are unit vectors such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$, then find the value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$.

Watch Video Solution

6. If $\vec{a}$ and $\vec{b}$ are unit vectors inclined at an angle θ, then prove that $\sin\frac{\theta}{2} = \frac{1}{2}\left|\hat{a} - \hat{b}\right|$.

Watch Video Solution

7. Find the value of p for which the vectors $\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} + p\hat{j} + 3\hat{k}$ are

(i) perpendicular. (ii) parallel.

Watch Video Solution

8. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are three mutually perpendicular vectors of equal magnitude, then find the angle between $\vec{a}$ and $\left(\vec{a} + \vec{b} + \vec{c}\right)$.

Watch Video Solution

9. Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three vectors of magnitudes 3, 4 and 5, respectively. If each one is perpendicular to the sum of the other two vectors, then prove that $\left|\vec{a}+\vec{b}+\vec{c}\right| = 5\sqrt{2}$.

Watch Video Solution

Questions For Practice Part Ii Scalar Or Dot Product Of Two Vectors Long Answer Type Questions

1. Prove the following by vector method. Altitudes of a triangle are concurrent.

Watch Video Solution

Questions For Practice Part Iii Vector Or Cross Product Of Two Vectors Very Short Answer Type Questions

1. Find the magnitude of $\vec{a}$ given by $\vec{a} = \left(\hat{i} + 3\hat{j} - 2\hat{k}\right) \times \left(-\hat{i} + 3\hat{k}\right)$.

Watch Video Solution

2. Find a vector of magnitude 9, which is perpendicular to both the vectors $4\hat{i} - \hat{j} + 3\hat{k}$ and $-2\hat{i} + \hat{j} - 2\hat{k}$.

Watch Video Solution

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

Watch Video Solution

4. If $\left|\vec{a}\right|=8, \left|\vec{b}\right|=3$ and $\left|\vec{a}\times\vec{b}\right|=12$, then find the angle between $\vec{a}$ and $\vec{b}$.

Watch Video Solution

5. Write a vector normal to $\hat{i}+\hat{k}$ and $\hat{i}+\hat{j}$.

Watch Video Solution

6. If $\vec{a} . \vec{b} = 0$ and $\vec{a} \times \vec{b} = \vec{0}$, then draw the conclusion.

Watch Video Solution

7. Determine the area of the parallelogram whose sides are the vectors $2\hat{i} + 2\hat{j}$ and $\hat{i} - \hat{k}$.

Watch Video Solution

Questions For Practice Part Iii Vector Or Cross Product Of Two Vectors Short Answer Type Questions

1. Find a vector $\vec{b}$ such that $\vec{a} \times \vec{b} = \vec{c}$ and $\vec{a} . \vec{b} = 3$, where $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{c} = \hat{j} - \hat{k}$.

Watch Video Solution

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

Watch Video Solution

3. The diagonals of a parallelogram are given by $\vec{a} = 2\hat{i} - 3\hat{j} + 5\hat{k}$ and $\vec{b} = -2\hat{i} + 2\hat{j} + 2\hat{k}$

Show that that parallelogram is a rhombus. Determine the

area the area of the rhombus and the length of each side

where, d_1 and d_2 are the diagonals of a rhombus.

View Text Solution

4. If $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + 5\hat{j} - 2\hat{k}$, then find $\left|\vec{a} \times \vec{b}\right|$.

Watch Video Solution

5. If $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} + \hat{j}$ and $\vec{c} = 3\hat{i} - 4\hat{j} - 5\hat{k}$, then find a unit vector perpendicular to both of the vectors $\left(\vec{a} - \vec{b}\right)$ and $\left(\vec{c} - \vec{b}\right)$.

Watch Video Solution

6. If the three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ are given as $a_1\hat{i} + a_2\hat{j} + a_3\hat{k}, b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$ and $c_1\hat{i} + c_2\hat{j} + c_3\hat{k}$. Then, show that $\vec{a} \times \left(\vec{b} + \vec{c}\right) = \left(\vec{a} \times \vec{b}\right) + \left(\vec{a} \times \vec{c}\right)$.

Watch Video Solution

7. For any three vectors $\vec{a}, \vec{b}$ and $\vec{c}$, evaluate $\vec{a} \times \left(\vec{b} + \vec{c}\right) + \vec{b} \times \left(\vec{c} + \vec{a}\right) + \vec{c} \times \left(\vec{a} + \vec{b}\right)$.

Watch Video Solution

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

Watch Video Solution

9. Show that $\left(\vec{a} \times \vec{b}\right)^2 = \begin{vmatrix} \vec{a}.\vec{a} & \vec{a}.\vec{b} \\ \vec{a}.\vec{b} & \vec{b}.\vec{b} \end{vmatrix}$.

Watch Video Solution

10. If $\vec{a}, \vec{b}$ and $\vec{c}$ are three vectors such that $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, then prove that $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$.

Watch Video Solution

11. If $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$, then find $\left(\vec{r} \times \hat{i}\right).\left(\vec{r} \times \hat{j}\right) + xy$.

Watch Video Solution

12. Calculate the area of the triangle ABC (by vector method) where A(1,1,2), B(2,2,3), C(3,-1,-1)

Watch Video Solution

13. Prove that by vector methord, in any $\Delta ABC, \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}.$

Watch Video Solution

Questions For Practice Part Iv Vector Or Cross Product Of Two Vectors Very Short Answer Type Questions

1. Evaluate $\left[\hat{i}\hat{k}\hat{j}\right] + \left[\hat{i}\hat{j}\hat{k}\right]$.

Watch Video Solution

2. Find the value of $\hat{i}.\left(\hat{j}\times\hat{k}\right)+\hat{j}.\left(\hat{k}\times\hat{i}\right)+\hat{k}.\left(\hat{i}\times\hat{j}\right)$.

Watch Video Solution

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

Watch Video Solution

4. Show that the vectors $2\hat{i}+3\hat{j}, 5\hat{i}-5\hat{k}$ and $6\hat{j}+4\hat{k}$ are coplanar.

Watch Video Solution

5. Show that the vectors $-\hat{i}+\hat{j}-\hat{k}, \hat{i}+\hat{j}+\hat{k}$ and $\hat{i}+\hat{k}$ are coplanar.

Watch Video Solution

Questions For Practice Part Iv Vector Or Cross Product Of Two Vectors Short Answer Type Questions

1. Find the value of λ such that the following vectors are coplanar: $-\hat{i}+\lambda\hat{j}-\lambda\hat{k}, 2\hat{i}+4\hat{j}+5\hat{k}, \ -2\hat{i}+4\hat{j}-4\hat{k}$

Watch Video Solution

2. For any three vectors $\vec{a}, \vec{b}$ and $\vec{c}$, show that $\vec{a}-\vec{b}, \vec{b}-\vec{c}, \vec{c}-\vec{a}$ are coplanar.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

5. Find the value of λ, if the vectors $\vec{a}=2\hat{i}-\hat{j}+\hat{k}, \vec{b}=\hat{i}+2\hat{j}-3\hat{k}$ and $\vec{c}=3\hat{i}+\lambda\hat{j}+5\hat{k}$ are coplanar.

Watch Video Solution

6. Find the value of λ for which the three points with position vectors $2\hat{i}+3\hat{j}-4\hat{k}, -\hat{i}+\hat{j}+2\hat{k}$ and $4\hat{i}+5\hat{j}+\lambda\hat{k}$ are coplanar.

Watch Video Solution

7. Find the volume of a parallelopiped determined by the vectors $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} + 4\hat{j} - \hat{k}$ and $\vec{c} = \hat{i} + \hat{j} + 3\hat{k}$,

Watch Video Solution

8. Let $\vec{a}$, $\vec{b}$, $\vec{c}$ be three non-zero vectors such that $\vec{c}$ is a unit vector perpendicular to both $\vec{a}$ and $\vec{b}$. If the angle between $\vec{a}$ and $\vec{b}$ is $\pi/6$, then prove that $\left[\vec{a}\ \vec{b}\ \vec{c}\right]^2 = \frac{1}{4}\left|\vec{a}\right|^2\left|\vec{b}\right|^2$.

Watch Video Solution

Questions For Practice Part Iv Vector Or Cross Product Of Two Vectors Long Answer Type Questions

1. Obtain the volume of the parallelopiped whose sides are vectors $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$, $\vec{c} = 3\hat{i} - \hat{j} + 2\hat{k}$. Also find the vector $\left(\vec{a} \times \vec{b}\right) \times \vec{c}$.

Watch Video Solution

2. Prove that

$$\left[\vec{p} - \vec{q}\,\vec{q} - \vec{r}\,\vec{r} - \vec{p}\right] = 0$$

Watch Video Solution

3. Prove that

$$\vec{a} \times \left(\vec{b} + \vec{c}\right) + \vec{b} \times \left(\vec{c} + \vec{a}\right) + \vec{c} \times \left(\vec{a} + \vec{b}\right) = \vec{0}$$

Watch Video Solution

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

Watch Video Solution

5. Prove analytically : The perpendicular bisector of the sides of a triangle are concurrent.

Watch Video Solution

6. Prove that the four points with position vectors $\hat{i}+\hat{j}+3\hat{k}$, $\hat{i}-2\hat{j}+2\hat{k}$ and $2\hat{i}+2\hat{k}$ are coplanar.

Watch Video Solution

Odisha Bureau S Textbook Solutions Exericise 12 A

1. Each question given below has four possible answers out of which only one is correct. Choose the correct one.

If $a=\hat{i}+2\hat{j}+\hat{k}, b=2\hat{i}-2\hat{j}+2\hat{k}$ and $c=-\hat{i}+2\hat{j}+\hat{k}$, then

A. a and b have the same directions

B. a and c have opposite directions

C. b and c have opposite directions

D. no pair of vectors have same directions

Answer: D

View Text Solution

2. Each question given below has four possible answers out of which only one is correct. Choose the correct one.

If the vectors $a = 2\hat{i} + 3\hat{j} - 6\hat{k}$, and $b = \alpha\hat{i} - \hat{j} + 2\hat{k}$ are parallel , then α = ...

A. 2

B. $\frac{2}{3}$

C. $-\frac{2}{3}$

D. $\frac{1}{3}$

Answer: C

Watch Video Solution

3. If the position vectors of two points A and B are $3\hat{i}+\hat{k}$ and $2\hat{i}+\hat{j}-\hat{k}$, then the vector $\overrightarrow{BA}$ is

A. $-\hat{i}+\hat{j}-2\hat{k}$

B. $\hat{i}+\hat{j}$

C. $\hat{i}-\hat{j}+2\hat{k}$

D. $\hat{i}-\hat{j}-2\hat{k}$

Answer: C

Watch Video Solution

4. Each question given below has four possible answers out of which only one is correct. Choose the correct one.

If |ka| = 1, then

A. $a = \frac{1}{k}$

B. $a = \frac{1}{|k|}$

C. $k = \frac{1}{|a|}$

D. $k = \frac{\pm 1}{|a|}$

Answer: D

Watch Video Solution

5. The direction cosines of the vectors $\overrightarrow{PQ}$ where $\overrightarrow{PQ}$ = (1, 0, -2) and $\overrightarrow{OQ}$ = (3, -2, 0) are

A. 2, -2, 2

B. 4, -2, 2

C. $\frac{1}{\sqrt{3}}, -\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}$

D. $\frac{2}{\sqrt{6}}, -\frac{1}{\sqrt{6}}, \frac{1}{\sqrt{6}}$

Answer: C

Watch Video Solution

6. Rectify the mistakes, if any

a - a = 0

Watch Video Solution

Watch Video Solution

7. Reactify the mistakes if any. The vector $\overrightarrow{0}$ has unique direction.

Watch Video Solution

8. Reactify the mistakes if any. All unit vectors are equal.

Watch Video Solution

9. Rectify the mistakes, if any

$|a| = |b| \Rightarrow a = b$

Watch Video Solution

10. Subtraction of two vectors is not commutative.

Watch Video Solution

11. If a = (2, 1), b = (-1, 0), find 3a + 2b.

Watch Video Solution

12. If a = (1, 1, 1), b = (-1, 3, 0) and c = (2, 0, 2), find $a + 2b - \frac{1}{2}c.$

Watch Video Solution

13. If A, B, C and D are the vertices of a square, find $\overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD} + \overrightarrow{DA}$.

Watch Video Solution

14. The given points A, B, C are the vertices of a triangle. Determine the vectors $\overrightarrow{AB}$, $\overrightarrow{BC}$ and $\overrightarrow{CA}$ and the lengths of these vectors in the following case.

A(4,5,5), B(3,3,3), C(1,2,5)

Watch Video Solution

15. The given points A, B, C are the vertices of a triangle. Determine the vectors $\overrightarrow{AB}$, $\overrightarrow{BC}$ and $\overrightarrow{CA}$ and the lengths of

these vectors in the following case.

A(8,6,1), B(2,0,1), C(-4,0,-5)

Watch Video Solution

16. Find the vector from origin to the mid-point of the vector $\overrightarrow{P_1P_2}$ joining the points P_1 (4,3) and P_2(8, -5).

Watch Video Solution

17. Find the vectors from the origin to the points of trisection the vector $\overrightarrow{P_1P_2}$ joining $P_1(-4, 3)$ and P_2(5, -12).

Watch Video Solution

18. Find the vectors from the origin to the intersection of the medians of the triangle whose vertices are A(5,2,1), B(-4,7,0) and C(5, -3,5)

Watch Video Solution

19. Prove that the sum of all the vectors drawn from the centre of a regular octagon to its vertices is the null vector.

Watch Video Solution

20. Prove that the sum of the vectors represented by the sides of a closed polygon taken in order is a zero vector.

Watch Video Solution

21. Prove that

$|a+b| \leq |a| + |b|$

State when equality will hold,

Watch Video Solution

22. Prove that

$|a-b| \geq |a| - |b|$

Watch Video Solution

23. What is geometrical significance of the relation $\left|\vec{a} + \vec{b}\right| = \left|\vec{a} - \vec{b}\right|$

Watch Video Solution

24. Find the magnitude of the vector $\overrightarrow{PQ}$, its scalar components and the component vectors along the co-ordinate axes, if P and Q have the co-ordinates

P(-1,30, Q(1,2)

Watch Video Solution

25. Find the magnitude of the vector $\overrightarrow{PQ}$, its scalar components and the component vectors along the co-ordinate axes, if P and Q have the co-ordinates

P(-1,-2), Q(-5,-6)

Watch Video Solution

26. Find the magnitude of the vector $\overrightarrow{PQ}$, its scalar components and the component vectors along the co-ordinate axes, if P and Q have the co-ordinates

P(1,4,-), Q(2,-2,-1)

Watch Video Solution

27. In each of the following find the vector `vec(PQ), its magnitude and direction cosines, if P and Q have co-ordinates.

P(2,-1,-1), Q(-1,-3,2)

Watch Video Solution

28. In each of the following find the vector `vec(PQ), its magnitude and direction cosines, if P and Q have co-ordinates.

P(3,-1,7), Q(4,-3,-1).

Watch Video Solution

29. If a = (2, -2, 1), b = (2, 3, 6) and c = (-1, 0, 2) find the magnitude and direction of a-b+2c.

Watch Video Solution

30. Determine the unit vector having the direction of the given vector in each of the following problems: $5\hat{i} - 12\hat{j}$

Watch Video Solution

31. Determine the unit vector having the direction of the given vector in each of the following problems. $2\hat{i} + \hat{j}$

Watch Video Solution

32. Determine the unit vector having the direction of the given vector in each of the following problems. $3\hat{i} + 6\hat{j} - \hat{k}$

Watch Video Solution

33. Determine the unit vector having the direction of the given vector in each of the following problems. $3\hat{i} + \hat{j} - 2\hat{k}$

Watch Video Solution

34. Find the unit vector in the direction of the vector $r_1 - r_2$, where $r_1 = \hat{i} + 2\hat{j} + \hat{k}$ and $r_2 = 3\hat{i} + \hat{j} - 5\hat{k}$.

Watch Video Solution

35. Find the unit vector parallel to the sum of the vectors $\vec{a}$ = $2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\vec{b}$ = `hati+2hatj+3hatk. Also find its direction cosines.

Watch Video Solution

36. If the sum of two unit vectors is a unit vector, show that the magnitude of their difference is $\sqrt{3}$.

Watch Video Solution

37. The position vectors of the points A, B, C and D are $4\hat{i}+3\hat{j}-\hat{k}, 5\hat{i}+2\hat{j}+2\hat{k}, 2\hat{i}-2\hat{j}-3\hat{k}$ and $4\hat{i}-4\hat{j}+3\hat{k}$ respectively. Show that AB and CD are parallel.

Watch Video Solution

38. In each of the following problems, show by vector method that the given points are collinear. A(2,6,3), B(1,2,7) and C(3,10,-1)

Watch Video Solution

39. In each of the following problems, show by vector method that the given points are collinear. P(2,-1,3), Q(3,-5,1) and R(-1,11,9).

Watch Video Solution

40. Prove that the vectors $2\hat{i}-\hat{j}+\hat{k}, \hat{i}-3\hat{j}-5\hat{k}, 3\hat{i}-4\hat{j}-4\hat{k}$ are the sides of a right angled triangle.

Watch Video Solution

41. Prove by vector method that the medians of a triangle are concurrent.

Watch Video Solution

42. Prove by vector method that the diagonals of a parallelogram bisect each other.

Watch Video Solution

43. Prove by vector method that the line segment joining the mid points of two sides of a triangle is parallel to the third and half of it.

Watch Video Solution

44. Prove by vector method that the lines joining the mid points of consecutive sides of a quadrilateral is a

parallelogram.

Watch Video Solution

45. Prove by vector method that in any triangle ABC, the point P being on the side $\overrightarrow{BC}$, if $\overrightarrow{PQ}$ is the resultant of the vectors $\overrightarrow{AP}$, $\overrightarrow{PB}$ and $\overrightarrow{PC}$, then ABQC is a parallelogram.

Watch Video Solution

46. Prove by vector method that in a parallelogram, the line joining a vertex to the midpoint of an oppositeside trisects the other diagonal.

Watch Video Solution

1. Each question given below has four possible answers, out of which only one is correct. Choose the correct one. $\left(2\hat{i}-4\hat{j}\right).\left(\hat{i}+\hat{j}+\hat{k}\right)$ = _____

A. -3

B. $+2$

C. -1

D. -2

Answer: D

Watch Video Solution

2. Each question given below have four possible answers, out of which only one is correct. Choose the correct one.

If $a = \hat{i} + 2\hat{j} - \hat{k}, b = \hat{i} + \hat{j} + 2\hat{k}, c = 2\hat{i} - \hat{j}$, then

A. $a \perp b$

B. $a \perp c$

C. $a \perp c$

D. no pair of vectors are perpendicular

Answer: C

Watch Video Solution

3. Each question given below have four possible answers, out of which only one is correct. Choose the correct one.

$(-3, \lambda, 1) \perp (1, 0, -3) \Rightarrow \lambda =$ .....

A. 0

B. 1

C. impossible to find

D. any real number

Answer: C

Watch Video Solution

4. If $\vec{a} \cdot \vec{b} = \vec{c} \cdot \vec{a}$ for all vectors $\vec{a}$, then

A. $\vec{a} + \vec{b} - \vec{c}$

B. $\vec{b} - \vec{c} = 0$

C. $\vec{b} \neq \vec{c}$

D. $\vec{b} + \vec{c} = 0$

Answer: B

Watch Video Solution

5. Find the scalar product of the following pairs of vectors and the angle between them.

$3\hat{i} - 4\hat{j}$ and $-2\hat{i} + \hat{j}$

Watch Video Solution

6. Find the scalar product of the following pairs of vectors and the angle between them. $2\hat{i} - 3\hat{j} + 6\hat{k}$ and

$2\hat{i} - 3\hat{j} - 5\hat{k}$

Watch Video Solution

7. Find the scalar product of the following pairs of vectors and the angle between them. $\hat{i} - \hat{j}$ and $\hat{j} + \hat{k}$

Watch Video Solution

8. Find the scalar product of the following pairs of vectors and the angle between them. $\vec{a}$ = (2,-2,1) and $\vec{b}$ (0,2,4)

Watch Video Solution

9. If A,B,C are the points (1,0,2), (0,3,1) and (5,2,0) respectively, find $m\angle ABC$

Watch Video Solution

10. Find the value of λ so that the vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other. $\vec{a} = 3\hat{i} + 4\hat{j}$, $\vec{b} = -5\hat{i} + \lambda\hat{j}$.

Watch Video Solution

11. Find the value of λ so that the vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other. $\vec{a} = \hat{i} + \hat{j} + \lambda\hat{k}$, $\vec{b} = 4\hat{i} - 3\hat{k}$

Watch Video Solution

12. Find the value of λ so that the vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other. $\vec{a} = 2\hat{i} - \hat{j} - \hat{k}$, $\vec{b} = \lambda\hat{i} + \hat{j} + 5\hat{k}$

Watch Video Solution

13. Find the value of λ so that the vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other. $\vec{a}$ = (6,2,-3), $\vec{b}$ = (1,-4,λ)

Watch Video Solution

14. Find the scalar and vector projection of $\vec{a}$ on $\vec{b}$. $\vec{a} = \hat{i}$, $\vec{b} = \hat{j}$

Watch Video Solution

15. Find the scalar and vector projections of $\vec{a}$ on $\vec{b}$

$\vec{a} = \hat{i} + \hat{j}, \qquad \vec{b} = \hat{j} + \hat{k}$

Watch Video Solution

16. Find the scalar and vector projections of $\vec{a}$ on $\vec{b}$

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

Watch Video Solution

17. In each of the problems given below, find the work done by a force F acting on a particle, such that the particle is displaced from a point A to a point B.

[Hint Work done = F.S, where S is the displacement.]

$F = 4\hat{i} + 2\hat{j} + 3\hat{k}, A(1, 2, 0), B(2, -1, 3)$

Watch Video Solution

18. In each of the problems given below, find the work done by a force F acting on a particle, such that the particle is displaced from a point A to a point B.

[Hint Work done = F.S, where S is the displacement.]

$F = 2\hat{i} + \hat{j} - \hat{k}, A(0, 1, 2), B(-2, 3, 0)$

Watch Video Solution

19. In each of the problems given below, find the work done by a force $\vec{F}$ acting on a particle, such that the particle is

displaced from a point A to a point B. $\overrightarrow{F} = 4\hat{i} - 3\hat{k}$

A(1,2,0), B(0,2,3).

Watch Video Solution

20. In each of the problems given below, find the work done by a force F acting on a particle, such that the particle is displaced from a point A to a point B.

[Hint Work done = F.S, where S is the displacement.]

$F = 3\hat{i} - \hat{j} - 2\hat{k}, A(-3, -4, 1), B(-1, -1, -2)$

Watch Video Solution

21. If $(a+b).(a-b) = 0$ show that $|a| = |b|$.

Watch Video Solution

22. If a and b are perpendicular vectors show that $\left(\vec{a}+\vec{b}\right)^2 = \left(\vec{a}-\vec{b}\right)^2$.

$\left[\left(\vec{a}+\vec{b}\right)^2 means$(veca+vecb).(veca+vecb), $sodoes$(veca-vecb)^2`.]

Watch Video Solution

23. Prove that two vactors are perpendicular iff

$\left|\vec{a}+\vec{b}\right|^2 = \left|\vec{a}\right|^2 + \left|\vec{b}\right|^2$

Watch Video Solution

24. If $\vec{a}, \vec{b}, \vec{c}$ are mutually perpendicular vectors of equal magnitude, show that $\vec{a} + \vec{b} + \vec{c}$ is equally inclined to $\vec{a}. \vec{b}. \vec{c}.$

Watch Video Solution

25. Prove the following by vector method. Altitudes of a triangle are concurrent.

Watch Video Solution

26. Prove the following by vector method. Median to the base of an isosceles triangle is perpendicular to the base.

Watch Video Solution

27. Prove the following by vector method. The parallelogram whose diagonals are equal is a rectangle.

Watch Video Solution

28. Prove the following by vector method. The diagonals of a rhombus are at right angles.

Watch Video Solution

29. Prove the following by vector method. An angle inscribed in a semi-circle is a right angle.

Watch Video Solution

30. Prove the following by vector method. in any triangle ABC,

a = bcosC+c cosB.

Watch Video Solution

31. Prove the following by vector method. In a triangle AOB, $m\angle AOB = 90^\circ$. If P and Q are the points of trisection of AB, prove that

$OP^2 + OQ^2 = \frac{5}{9}AB^2$

Watch Video Solution

32. Prove the following by vector method. Measure of the angle between two diagonals of a cube is $\cos^{-1}\left(\frac{1}{3}\right)$

Watch Video Solution

Odisha Bureau S Textbook Solutions Exercise 12 C

1. Each question given below has four possible answers, out of which only one is correct. Choose the correct one. $\left(\hat{i}+\hat{k}\right)\times\left(\hat{i}+\hat{j}+\hat{k}\right)$ = ___

A. $\hat{i}-\hat{k}$

B. $\hat{k}-\hat{i}$

C. $\hat{k}-2\hat{i}-\hat{j}$

D. 2

Answer: B

Watch Video Solution

2. Each question given below have four possible answers, out of which only one is correct. Choose the correct one.

A vector perpendicular to the vectors $\hat{i}+\hat{j}$ and $\hat{i}+\hat{k}$ is .....

A. $\hat{i}-\hat{j}-\hat{k}$

B. $\hat{j}-\hat{k}+\hat{i}$

C. $\hat{k}-\hat{j}-\hat{i}$

D. $\hat{j}+\hat{k}+\hat{i}$

Answer: A::B::C::D

Watch Video Solution

3. Each question given below have four possible answers, out of which only one is correct. Choose the correct one.

The area of the triangle with vertices (1, 0, 0), (0, 1, 0) and (0, 0, 1) is .....

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

B. 1

C. $\frac{\sqrt{3}}{2}$

D. 2

Answer: C

Watch Video Solution

4. Each question given below have four possible answers, out of which only one is correct. Choose the correct one.

If $\hat{a}$ and $\hat{b}$ are unit vectors such that $\hat{a} \times \hat{b}$ is a unit vector, then the angle between $\hat{a}$ and $\hat{b}$ is .....

A. of any measure

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

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

D. π

Answer: C

Watch Video Solution

5. Each question given below have four possible answers, out of which only one is correct. Choose the correct one.

If a, b and c are non-zero vectors, then $a \times b = a \times c \Leftrightarrow$ .....

A. b = c

B. $a \| (b - c)$

C. $b \| c$

D. $b \perp c$

Answer: B

Watch Video Solution

6. Let $a = 2\hat{i} + \hat{j}, b = -\hat{i} + 3\hat{k}$ and $c = \hat{i} + 2\hat{j} + 5\hat{k}$ be three vectors. Find

$c \times a$

Watch Video Solution

7. Let $a = 2\hat{i} + \hat{j}, b = -\hat{i} + 3\hat{k}$ and $c = \hat{i} + 2\hat{j} + 5\hat{k}$ be three vectors. Find

$a \times (-b)$

Watch Video Solution

8. Let $a = 2\hat{i} + \hat{j}, b = -\hat{i} + 3\hat{k}$ and $c = \hat{i} + 2\hat{j} + 5\hat{k}$ be three vectors. Find

$(a - 2b) \times c$

Watch Video Solution

9. Let $a = 2\hat{i} + \hat{j}, b = -\hat{i} + 3\hat{k}$ and $c = \hat{i} + 2\hat{j} + 5\hat{k}$ be three vectors. Find

$(a - c) \times c$

Watch Video Solution

10. Let $a = 2\hat{i} + \hat{j}, b = -\hat{i} + 3\hat{k}$ and $c = \hat{i} + 2\hat{j} + 5\hat{k}$ be three vectors. Find

$(a - b) \times (c - a)$

Watch Video Solution

11. Find the unit vectors perpendicular to the vectors. $\hat{i}, \hat{k}$

Watch Video Solution

12. Find the unit vector perpendicular to the vectors

$\hat{i} + \hat{j}, \hat{i} - \hat{k}$

Watch Video Solution

13. Find the unit vector perpendicular to the vectors

$2\hat{i} + 3\hat{k}, \hat{i} - 2\hat{j}$

Watch Video Solution

14. Find the unit vector perpendicular to the vectors

$2\hat{i} - 3\hat{k}, \ -\hat{i} + 2\hat{j} - \hat{k}$

Watch Video Solution

15. Determine the area of parallelogram whose adjacent sides are the vector $2\hat{i}, \hat{j}$

Watch Video Solution

16. Determine the area of parallelogram whose adjacent sides are the vector $\hat{i} + \hat{j}, \ -\hat{i} + 2\hat{j}$

Watch Video Solution

17. Determine the area of parallelogram whose adjacent sides are the vector $2\hat{i} + \hat{j} + 3\hat{k}, \hat{i} - \hat{j}$

Watch Video Solution

18. Determine the area of parallelogram whose adjacent sides are the vector (1, -3, 1), (1,1,1)

Watch Video Solution

19. Calculate the area of the triangle ABC (by vector method) where A(1,2,4), B(3,1,-2), C(4,3,1)

Watch Video Solution

20. Calculate the area of the triangle ABC (by vector method) where A(1,1,2), B(2,2,3), C(3,-1,-1)

Watch Video Solution

21. Determine the sine of the angle between the vectors $5\hat{i}-3\hat{j}, 3\hat{i}-2\hat{k}$

Watch Video Solution

22. Determine the sine of the angle between the vectors $\widehat{-}3\hat{j}+\hat{k}, \hat{i}+\hat{j}+\hat{k}$

Watch Video Solution

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

Watch Video Solution

24. If $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} \neq \vec{0}$, prove that $\vec{a} + \vec{c} = m\vec{b}$, where m is a scalar.

Watch Video Solution

25. If $a = 2\hat{i} + \hat{j} - \hat{k}, b = -\hat{i} + 2\hat{j} - 4\hat{k}, c = \hat{i} + \hat{j} + \hat{k}$ and $(a \times b).(a \times c)$

Watch Video Solution

26. If $a = 3\hat{i} + \hat{j} + 2\hat{k}, b = 2\hat{i} - 3\hat{j} + 4\hat{k}$, then verify that $a \times b$ is perpendicular to both a and b.

Watch Video Solution

27. Find the area of the parallelogram whose diagonals are vectors $3\hat{i} + \hat{j} - 2\hat{k}$ and $\hat{i} - 3\hat{j} + 4\hat{k}$.

Watch Video Solution

28. Show that $\left(\vec{a} - \vec{b}\right) \times \left(\vec{a} + \vec{b}\right) = 2\left(\vec{a} \times \vec{b}\right)$. Interpret this result geometrically.

Watch Video Solution

1. Each question given below has four possible answers out of which only one is correct. Choose the correct one. $\vec{a} . \vec{b} \times \vec{a} =$

A. 0

B. 0

C. 1

D. $a^2 b$

Answer: B

Watch Video Solution

2. $\left(-\vec{a}\right).\vec{b}\times\left(-\vec{c}\right)\Big)$ =

A. $a\times b.c$

B. $-a.(b\times c)$

C. $a\times c.b$

D. $a.(c\times b)$

Answer: A

Watch Video Solution

3. Each question given below have four possible answers, out of which only one is correct. Choose the correct one.

For the non-zero vectors a, b and c, $a.(b\times c)=0$ if

A. $b \perp c$

B. $a \perp b$

C. $a \| c$

D. $a \perp c$

Answer: C

Watch Video Solution

4. Find the scalar triple product $b.(c \times a)$ where a, b and c are respectively

$\hat{i} + \hat{j}, \hat{i} - \hat{j}, 5\hat{i} + 2\hat{j} + 3\hat{k}$

Watch Video Solution

5. Find the scalar triple product $b.(c \times a)$ where a, b and c are respectively

$5\hat{i} - \hat{j} + 4\hat{k}, 2\hat{i} + 3\hat{j} + 5\hat{k}, 5\hat{i} - 2\hat{j} + 6\hat{k}$

Watch Video Solution

6. Find the volume of the parallelopiped whose sides given by the vectors

$\hat{i} + \hat{j} + \hat{k}, \hat{k}, 3\hat{i} - \hat{j} + 2\hat{k}$

Watch Video Solution

7. Find the volume of the Parallelepiped whose sides are given by the vectors. (1,0,0), (0,1,0), (0,0,1)

Watch Video Solution

8. Show that the following vectors are coplanar.

$\hat{i} - 2\hat{j} + 2\hat{k}, 3\hat{i} + 4\hat{j} + 5\hat{k}, \ -2\hat{i} + 4\hat{j} - 4\hat{k}$

Watch Video Solution

9. Show that the following vectors are coplanar.

$\hat{i} + 2\hat{j} + 3\hat{k}, \ -2\hat{i} - 4\hat{j} + 5\hat{k}, 3\hat{i} + 6\hat{j} + \hat{k}$

Watch Video Solution

10. Find the value of λ so that the three vectors are coplanar.

$\hat{i} + 2\hat{j} + 3\hat{k}, 4\hat{i} + \hat{j} + \lambda\hat{k}$ and $\lambda\hat{i} - 4\hat{j} + \hat{k}$

Watch Video Solution

11. Find the value of λ so that the three vectors are co-planar. (2,-1,1), (1,2,-3) and (3,λ,5)

Watch Video Solution

12. If $\vec{a}, \vec{b}$ and $\vec{c}$ are mutually perpendicular, show that $\left[\vec{a}.\left(\vec{b}\times\vec{c}\right)\right]^2 = a^2b^2c^2.$

Watch Video Solution

13. Prove that for any three vectors $\vec{a}, \vec{b}$ and $\vec{c}, \left[\vec{a}+\vec{b}\,\vec{b}+\vec{c}\,\vec{c}+\vec{a}\right] = 2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$

Watch Video Solution

14. Prove that $\left[\vec{a} \times \vec{b} \quad \vec{b} \times \vec{c} \quad \vec{c} \times \vec{a}\right] = \left[\vec{a} \quad \vec{b} \quad \vec{c}\right]^2$

Watch Video Solution

15. For $\vec{a} = \hat{i} + \hat{j}, \vec{b} = -\hat{i} + 2\hat{k}, \vec{c} = \hat{j} + \hat{k}$, obtain $\vec{a} \times \left(\vec{b} \times \vec{c}\right)$ and also verify the formula $\vec{a} \times \left(\vec{b} \times \vec{c}\right) = \left(\vec{a} . \vec{c}\right)\vec{b} - \left(\vec{a} . \vec{b}\right)\vec{c}$.

Watch Video Solution

16. Prove that $\vec{a} \times \left(\vec{b} \times \vec{c}\right) + \vec{b} \times \left(\vec{c} \times \vec{a}\right) + \vec{c} \times \left(\vec{a} \times \vec{b}\right) = \vec{0}$ and hence prove that $\vec{a} \times \left(\vec{b} \times \vec{c}\right), \vec{b} \times \left(\vec{c} \times \vec{a}\right), \vec{c} \times \left(\vec{a} \times \vec{b}\right)$ are coplanar.

Watch Video Solution

17. If $\hat{a}, \hat{b}, \hat{c}$ are unit vectors and $\hat{a} \times \left(\hat{b} \times \hat{c}\right) = \frac{1}{2}\hat{b}$, then find the angles that $\hat{a}$ makes with $\hat{b}$ and $\hat{c}$ where $\hat{b}, \hat{c}$ are not parallel.

Watch Video Solution

Odisha Bureau S Textbook Solutions Additional Exercise

1. Prove that the sum of the vectors directed from the vertices to the mid points of opposite sides of a triangle is zero

Watch Video Solution

2. Prove by vector method that the diagonals of a quadrilateral bisect each other iff is a parallelogram.

Watch Video Solution

3. If G is the centroid of a triangle ABC, prove that $\overrightarrow{GA} + \overrightarrow{GB} + \overrightarrow{GC} = 0$

Watch Video Solution

4. If M is the midpoint of the side $\overrightarrow{BC}$ of a triangle ABC, prove that $\overrightarrow{AB} + \overrightarrow{AC} = 2\overrightarrow{AM}$

Watch Video Solution

5. If $\vec{a}$ and $\vec{b}$ are unit vectors represented by the adjacent sides of a regular hexagon, taken in order, what are the vectors represented by the other sides taken in order?

Watch Video Solution

6. If the points with position vector $10\hat{i} + 3\hat{j}, 12\hat{i} - \hat{j}$ and $a\hat{i} + 11\hat{j}$ are collinear, find the value of a.

Watch Video Solution

7. Prove that the four points with position vectors $2\vec{a}+3\vec{b}-\vec{c}, \vec{a}-2\vec{b}+3\vec{c}$, $3\vec{a}+4\vec{b}-2\vec{c}$ and $\vec{a}-6\vec{b}+6\vec{c}$ are coplanar.

Watch Video Solution

8. For an vector $\vec{r}=x\hat{i}+y\hat{j}+z\hat{k}$, prove that $\vec{r}=\left(\vec{r}.\hat{i}\right)\hat{i}+\left(\vec{r}.\hat{j}\right)\hat{j}+\left(\vec{r}.\hat{k}\right)\hat{k}$

Watch Video Solution

9. If two vector $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}\right| = 3, \left|\vec{b}\right| = 2$ and $\vec{a} . \vec{b} = 6$ find $\left|\vec{a} + \vec{b}\right|$ and $\left|\vec{a} - \vec{b}\right|$.

Watch Video Solution

10. If $\vec{a}$ makes equal angles with $\hat{i}, \hat{j}$ and $\hat{k}$ has magnitude 3, prove that the angle between $\vec{a}$ and each of $\hat{i}, \hat{j}$ and $\hat{k}$ is $\cos^{-1} \frac{1}{\left(\sqrt{3}\right)}$.

Watch Video Solution

11. If $\vec{a}, \vec{b}, \vec{c}$ are such that $\vec{a} . \vec{b} = \vec{a} . \vec{c}$ then show that $\vec{a} = 0$ or $\vec{b} = \vec{c}$ or $\vec{a}$ is perpendicular to $\vec{b} - \vec{c}$.

Watch Video Solution

12. Vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ and $\left|\vec{a}\right|=3, \left|\vec{b}\right|=5$ and $\left|\vec{c}\right|=7$. Then, find the angle between $\vec{a}$ and $\vec{b}$.

Watch Video Solution

13. If $\vec{a}$, $\vec{b}$ and $\vec{c}$ are unit vectors such that $\vec{a}+\vec{b}+\vec{c}=\vec{0}$, then find the value of $\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}$.

Watch Video Solution

14. Find the angles which the vector $\vec{a} = \hat{i} - \hat{j} + \sqrt{2}\hat{k}$ makes with the coordinates axes.

Watch Video Solution

15. Find the angles between $\vec{a}$ and $\vec{b}$, if $\left|\vec{a} \times \vec{b}\right| = \vec{a}.\vec{b}$.

Watch Video Solution

Chapter Practice Very Short Answer Type Questions

1. Write the direction ratio's of the vector $3\vec{a} + 2\vec{b}$ where $\vec{a} = \hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = 2\hat{i} - 4\hat{j} + 5\hat{k}$.

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

5. 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.

Watch Video Solution

6. 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 $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$.

Watch Video Solution

7. Find the projection of the vector $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ on the vector $\vec{b} = 2\hat{i} + 2\hat{j} + \hat{k}$.

Watch Video Solution

8. If $\vec{a} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{b} = 3\hat{j} - 5\hat{k}$, then find a unit vector in the direction of $\vec{a} - \vec{b}$.

Watch Video Solution

9. Write the value of $\left(\hat{k} \times \hat{j}\right).\hat{i} + \hat{j}.\hat{k}$.

Watch Video Solution

10. If $\vec{a}.\vec{a} = 0$ and $\vec{a}.\vec{b} = 0$, then what can be concluded about $\vec{b}$?

Watch Video Solution

11. L and M are two points with position vectors $2\vec{a} - \vec{b}$ and $\vec{a} + 2\vec{b}$, respectively. Write the position vector of a point N which divides the line segment LM in the ratio 2 :11`externally.

Watch Video Solution

12. Find $\left|\vec{a} - \vec{b}\right|$, if two vectors $\vec{a}$ and $\vec{b}$ are such that $\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 3$ and $\vec{a} . \vec{b} = 4.$

Watch Video Solution

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

Watch Video Solution

14. Find the vector product of the vectors $3\hat{i} - \hat{k}$ and $-\hat{i} - \hat{j} + 5\hat{k}$.

Watch Video Solution

15. Find the unit vector perpendicular to $3\hat{i} + \hat{j} + 2\hat{k}$ and $2\hat{i} - 2\hat{j} + 4\hat{k}$.

Watch Video Solution

16. Find the area of parallelogram determined by the vectors $\hat{i} + 2\hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$.

Watch Video Solution

17. If θ is the angle between any two vectors $\vec{a}$ and $\vec{b}$, then $\left|\vec{a}.\ \vec{b}\right| = \left|\vec{a} \times \vec{b}\right|$. Find the value of θ.

Watch Video Solution

18. Find the value of p for which the vectors $\vec{a} = 3\hat{i} + 2\hat{j} + 9\hat{k}$ and $\vec{b} = \hat{i} + p\hat{j} + 3\hat{k}$ are

(i) perpendicular. (ii) parallel.

Watch Video Solution

19. Find $\left[\vec{a}\ \vec{b}\ \vec{c}\right]$, when $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{c} = 3\hat{i} - \hat{j} + 2\hat{k}$.

Watch Video Solution

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

Watch Video Solution

21. Find λ, if $\left(2\hat{i}+6\hat{j}+14\hat{k}\right)\times\left(\hat{i}-\lambda\hat{j}+7\hat{k}\right)=\vec{0}$.

Watch Video Solution

Chapter Practice Short Answer Type Questions

1. If $\vec{a}$ and $\vec{b}$ are unit vectors, then what is the angle between $\vec{a}$ and $\vec{b}$ so that $\sqrt{2}\vec{a} - \vec{b}$ is a unit vector ?

Watch Video Solution

2. Find the volume of a parallelopiped whose sides are given by $\vec{a} = -2\hat{i} + 3\hat{j} + \hat{k}$, $\vec{b} = \hat{i} - 2\hat{j} + 2\hat{k}$ and $\vec{c} = -\hat{i} + 2\hat{j} + 3\hat{k}$.

Watch Video Solution

3. Show that the projection vector of $\vec{b}$ on $\vec{a}$, $a \neq 0$ is $\left(\frac{\vec{a} \cdot \vec{b}}{\left|\vec{a}\right|^2}\right)\vec{a}$.

Watch Video Solution

4. If $\hat{a}$ and $\hat{b}$ are two unit vectors and θ is angle between them, then what is the value of $\left|\frac{\hat{a}-\hat{b}}{2}\right|$?

Watch Video Solution

5. Determine k such that a vector $\vec{r}$ is at right angles to each of the vectors $\vec{a}=k\hat{i}+\hat{j}+3\hat{k}$, $\vec{b}=2\hat{i}+\hat{j}-k\hat{k}$ and $\vec{c}=-2\hat{i}+k\hat{j}+3\hat{k}$.

Watch Video Solution

6. Find the position vector 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 internally

Watch Video Solution

7. Find the position vector 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 externally

Watch Video Solution

8. 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 $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular vectors.

Watch Video Solution

Chapter Practice Long Answer Type Questions

1. The dot product of a vector with vectors $\hat{i} + \hat{j} - 3\hat{k}$, $\hat{i} + 3\hat{j} - 2\hat{k}$ and $2\hat{i} + \hat{j} + 4\hat{k}$ are 0, 5 and 8, respectively. Find the vector.

Watch Video Solution

2. Find the unit vector perpendicular to the plane ABC, where the position vectors of A, B and C are $2\hat{i}-\hat{j}+\hat{k}$, $\hat{i}+\hat{j}+2\hat{k}$ and $2\hat{i}+3\hat{k}$, respectively.

Watch Video Solution

3. If $\vec{b}\times\vec{c}=\vec{c}\times\vec{a}\neq\vec{0}$, then prove that $\vec{a}+\vec{b}=\lambda\vec{c}$, where λ is a scalar.

Watch Video Solution

4. If $\vec{a}=\hat{i}+4\hat{j}+2\hat{k}$, $\vec{b}=3\hat{i}-2\hat{j}+7\hat{k}$ and $\vec{c}=2\hat{i}-\hat{j}+4\hat{k}$. Find a vector $\vec{p}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{p}.\vec{c}=18$.

Watch Video Solution

5. If $\vec{a}, \vec{b}$ and $\vec{c}$ are three vectors such that $\left|\vec{a}\right| = 5, \left|\vec{b}\right| = 12, \left|\vec{c}\right| = 13$ and $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, then find the value of $\vec{a} . \vec{b} + \vec{b} . \vec{c} + \vec{c} . \vec{a}$.

Watch Video Solution

6. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}, \left|\vec{a}\right| = \sqrt{37}, \left|\vec{b}\right| = 3$ and $\left|\vec{c}\right| = 4$, then what will be the angle between $\vec{b}$ and $\vec{c}$?

Watch Video Solution

7. Find the value of x such that the four points A(3, 2, 1), B(4, x, 5), C(4, 2, -2) and D(6, 5, -1) are coplanar.

Watch Video Solution

8. If $\vec{a} = \hat{i} + \hat{j}$ and $\vec{b} = 2\hat{i} - \hat{k}$ are two vectors, then what will be the intersection point of two lines $\vec{r} \times \vec{a} = \vec{b} \times \vec{a}$ and $\vec{r} \times \vec{b} = \vec{a} \times \vec{b}$?

Watch Video Solution