MATHS

BOOKS - RS AGGARWAL MATHS (HINGLISH)

CROSS,OR VECTOR, PRODUCT OF VECTORS

Solved Examples

1. If $\vec{a} = \left(3\hat{i} + \hat{j} - 4\hat{k}\right)$ and $\hat{b} = \left(6\hat{i} + 5\hat{j}, 2\hat{k}\right)$, find $\left(\vec{a} \times \vec{b}\right)$ and $\left|\vec{a} \times \vec{b}\right|$.

Watch Video Solution

2. If $\vec{a} = \left(\hat{i} - 2\hat{j} + 3\hat{k}\right)$ and $\vec{b} = \left(2\hat{i} + 3\hat{j} - 5\hat{k}\right)$ then find $\left(\vec{a} \times \vec{b}\right)$ and verify that $\left(\vec{a} \times \vec{b}\right)$ is perpendicular to each one of $\vec{a}$ and $\vec{b}$.

Watch Video Solution

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

A. $\frac{1}{3}\left(5\hat{i} + 2\hat{j} + 2\hat{k}\right)$

B. $5\hat{i} + 2\hat{j} + 2\hat{k}$

C. $\frac{1}{2}\left(5\hat{i} + 2\hat{j} + 2\hat{k}\right)$

D. None of these

Answer: A

Watch Video Solution

4. Find a unit vector perpendicular to each one of the vectors $\vec{a} = \left(4\hat{i} - \hat{j} + 3\hat{k}\right)$ and $\vec{b} = \left(2\hat{i} + 2\hat{j} - \hat{k}\right)$.

Watch Video Solution

5. Find a vector of magnitude 15, which is perpendicular to both the vectors $\left(4\hat{i}-\hat{j}+8\hat{k}\right)$ and $\left(-\hat{j}+\hat{k}\right)$.

Watch Video Solution

6. Let $\vec{a}=\left(\hat{i}+4\hat{j}+2\hat{k}\right), \vec{b}=\left(3\hat{i}-2\hat{j}+7\hat{k}\right)$ and $\vec{c}=\left(2\hat{i}-\hat{j}+4\hat{k}\right)$. fin

Watch Video Solution

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

Watch Video Solution

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

Watch Video Solution

9. If $\left|\vec{a}\right| = \sqrt{26}, \left|\vec{b}\right| = 7$ and $\left|\vec{a} \times \vec{b}\right| = 35$, then $\vec{a} \cdot \vec{b} =$

Watch Video Solution

10. If

$\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 7$ and $\left(\vec{a} \times \vec{b}\right) = \left(3\hat{i} + 2\hat{j} + 6\hat{k}\right)$, find the angle betv

Watch Video Solution

11. Find the sine of the angle between the vectors $\vec{a} = \left(2\hat{i} - \hat{j} + 3\hat{k}\right)$ and $\vec{b} = \left(\hat{i} + 3\hat{j} + 2\hat{k}\right)$.

Watch Video Solution

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

Watch Video Solution

13. Find the area of the parallelogram whose adjacent sides are represented by the vectors $\left(3\hat{i}+\hat{j}-2\hat{k}\right)$ and $\left(\hat{i}-3\hat{j}+4\hat{k}\right)$.

Watch Video Solution

14. Find the area of the parallelogram whose diagonals are represented by the vectors $\vec{d}_1=\left(2\hat{i}-\hat{j}+\hat{k}\right)$ and $\vec{d}_2=\left(3\hat{i}+4\hat{j}-\hat{k}\right)$.

Watch Video Solution

15. Find the area of the triangle whose adjacent sides are determined by the vectors $\vec{a}=\left(-2\hat{i}-5\hat{k}\right)$ and $\vec{b}=\left(\hat{i}-2\hat{j}-\hat{k}\right)$.

Watch Video Solution

16. Using vectors, find the area of the $\triangle ABC$, whose vertices are $A(1, 2, 3), B(2, -1, 4)$ and $C(4, 5, -1)$.

Watch Video Solution

17. Show that the points whose position vectors are $\left(5\hat{i} + 6\hat{j} + 7\hat{k}\right), \left(7\hat{i} - 8\hat{j} + 9\hat{k}\right)$ and $\left(3\hat{i} + 20\hat{j} + 5\hat{k}\right)$ are collinear.

Watch Video Solution

18. Using vector method, show that the points $A(2, -1, 3), B(4, 3, 1)$ and $C(3, 1, 2)$ are collinear

Watch Video Solution

19. Show that the points with position vectors $\vec{a} - 2\vec{b} + 3\vec{c}, -2\vec{a} + 3\vec{b} + 2\vec{c}$ and $-8\vec{a} + 13\vec{b}$ are collinear

whatever be $\vec{a}, \vec{b}, \vec{\cdot}$

Watch Video Solution

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

Watch Video Solution

21. If $\vec{a}\times\vec{b}=\vec{c}\times\vec{d}$ and $\vec{a}\times\vec{c}=\vec{b}\times\vec{d}$, show that $\left(\vec{a}-\vec{d}\right)$ is p

, it being given that$a\neq d$ and $b\neq c$.

Watch Video Solution

22. For any three vectors $\vec{a}, \vec{b}, \vec{c}$ show 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

23. If $\vec{a}+\vec{b}+\vec{c}=0$, prove that $\left(\vec{a}\times\vec{b}\right)=\left(\vec{b}\times\vec{c}\right)=\left(\vec{c}\times\vec{a}\right)$

Watch Video Solution

24. Prove that the points $A, BandC$ with position vectors $\vec{a}, \vec{b}\, and\, \vec{c}$ respectively are collinear if and only if $\vec{a}\times\vec{b}+\vec{b}\times\vec{c}+\vec{c}\times\vec{a}=\vec{0}$.

Watch Video Solution

25. If $\vec{a}.\vec{b}=0$ and $\vec{a}\times\vec{b}=0$, prove that $\vec{a}=\vec{0}$ or $\vec{b}=\vec{0}$.

Watch Video Solution

26. If $\vec{a}, \vec{b}, \vec{c}$ are vectors such that $\vec{a}\,\dot{\vec{b}}=\vec{a}\,\dot{\vec{c}}, \vec{a}\times\vec{b}=\vec{a}\times\vec{c}, \vec{a}\neq\vec{0}$, then show that $\vec{b}=\dot{\cdot}$

Watch Video Solution

27. Prove that $\left|\vec{a} \times \vec{b}\right|^2 = \begin{vmatrix} \vec{a} \cdot \vec{a} & \vec{a} \cdot \vec{b} \\ \vec{a} \cdot \vec{b} & \vec{b} \cdot \vec{b} \end{vmatrix}$.

Watch Video Solution

Exercise 24

1. Find $\left(\vec{a} \times \vec{b}\right)$ and $\left|\vec{a} \times \vec{b}\right|$,when

(i) $\vec{a} = \hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = 2\hat{i} + 3\hat{j} - 4\hat{k}$

(ii) $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + 5\hat{j} - 2\hat{k}$

(iii) $\vec{a} = \hat{i} - 7\hat{j} + 7\hat{k}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 2\hat{k}$

(iv) $\vec{a} = 4\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = 3\hat{i} + \hat{k}$

(v) $\vec{a} = 3\hat{i} + 4\hat{j}$ and $\vec{b} = \hat{i} + \hat{j} + \hat{k}$

Watch Video Solution

2. 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

3. If $\vec{a}=\left(-3\hat{i}+4\hat{j}-7\hat{k}\right)$ and $\vec{b}=\left(6\hat{i}+2\hat{j}-3\hat{k}\right)$, find $\left(\vec{a}\times\vec{b}\right)$.

Verify that (i) $\vec{a}$ and $\left(\vec{a}\times\vec{b}\right)$ are perpendicular to each other and (ii) $\vec{b}$ and $\left(\vec{a}\times\vec{b}\right)$ are perpendicular to each other.

Watch Video Solution

4. Find the value of :

(i) $\left(\hat{i}\times\hat{j}\right)\cdot\hat{k}+\hat{i}\cdot\hat{j}$ (ii) $\left(\hat{k}\times\hat{j}\right)\cdot\hat{i}+\hat{j}\cdot\hat{k}$

$\hat{i}\times\left(\hat{j}+\hat{k}\right)+\hat{j}\times\left(\hat{k}+\hat{i}\right)+\hat{k}\times\left(\hat{i}+\hat{j}\right)$

Watch Video Solution

5. Find the unit vectors perpendicular to both $\vec{a}$ and $\vec{b}$ when

(i) $\vec{a} = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{b} = 2\hat{i} + 3\hat{j} - \hat{k}$

(ii) $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$

(iii) $\vec{a} = \hat{i} + 3\hat{j} - 2\hat{k}$ and $\vec{b} = -\hat{i} + 3\hat{k}$

(iv) $\vec{a} = 4\hat{i} + 2\hat{j} - \hat{k}$ and $\vec{b} = \hat{i} + 4\hat{j} - \hat{k}$

Watch Video Solution

6. Find the unit vectors perpendicular to the plane of the vectors

$\vec{a} = 2\hat{i} - 6\hat{j} - 3\hat{k}$ and $\vec{b} = 4\hat{i} + 3\hat{j} - \hat{k}$.

Watch Video Solution

7. Find a vector of magnitude 6 which is perpendicular to both the vectors

$\vec{a} = 4\hat{i} - \hat{j} + 3\hat{k}$ and $\vec{b} = -2\hat{i} + \hat{j} - 2\hat{k}$.

Watch Video Solution

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

Watch Video Solution

9. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes 1 and 2 respectively and $\left|\vec{a} \times \vec{b}\right| = \sqrt{3}$.

Watch Video Solution

10. Let $\vec{a} = \hat{i} - \hat{j}, \vec{b} = 3\hat{j} - \hat{k}$ and $\vec{c} = 7\hat{i} - \hat{k}$. Find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$, and $\vec{c} \cdot \vec{d} = 1$.

A. $\vec{d} = \frac{1}{4}\left(\hat{i} - \hat{j} + 3\hat{k}\right)$

B. $\vec{d} = \hat{i} + \hat{j} + 3\hat{k}$

C. $\vec{d} = \frac{1}{4}\left(\hat{i} + \hat{j} + 3\hat{k}\right)$

D. $\vec{d} = \frac{1}{4}\left(\hat{i} + \hat{j} + \hat{k}\right)$

Answer: C

Watch Video Solution

11. If $\vec{a} = \left(4\hat{i} + 5\hat{j} - \hat{k}\right)$, $\vec{b} = \left(\hat{i} - 4\hat{j} + 5\hat{k}\right)$, and $\vec{c} = \left(3\hat{i} + \hat{j} - \hat{k}\right)$ find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and for which $\vec{c} \cdot \vec{d} = 21$.

Watch Video Solution

12. Prove that $\left|\vec{a} \times \vec{b}\right| = \left(\vec{a} \cdot \vec{b}\right)\tan\theta$, where $\theta$is the angle between $\vec{a}$ and $\vec{b}$.

Watch Video Solution

13. 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 vectors.

Watch Video Solution

Watch Video Solution

14. verify that $\vec{a} \times \left(\vec{b} + \vec{c}\right) = \left(\vec{a} \times \vec{b}\right) + \left(\vec{a} \times \vec{c}\right)$, "when"

(i) $\vec{a} = \hat{i} - \hat{j} - 3\hat{k}$, $\vec{b} = 4\hat{i} - 3\hat{j} + \hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 2\hat{k}$

(ii) $\vec{a} = 4\hat{i} - \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{c} = \hat{i} - \hat{j} + \hat{k}$.

Watch Video Solution

15. Find the area of the parallelogram whose adjacent sides are represented by the vectors (i) $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{b} = -3\hat{i} - 2\hat{j} + \hat{k}$ (ii) $\vec{a} = \left(3\hat{i} + \hat{j} + 4\hat{k}\right)$ and $\vec{b} = \left(\hat{i} - \hat{j} + \hat{k}\right)$ (iii) $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = \hat{i} - \hat{j}$ (iv) $\vec{b} = 2\hat{i}$ and $\vec{b} = 3\hat{j}$.

Watch Video Solution

16. Find the area of the parallelogram whose diagonals are represented by the vectors

(i) $\vec{d}_1 = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\vec{d}_2 = \hat{i} - 3\hat{j} + 4\hat{k}$

(ii) $\vec{d}_1 = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{d}_2 = 3\hat{i} + 4\hat{j} - \hat{k}$

(iii) $\vec{d}_1 = \hat{i} - 3\hat{j} + 2\hat{k}$ and $\vec{d}_2 = -\hat{i} + 2\hat{j}$.

Watch Video Solution

17. Find the area of the trinagle whose two adjacent sides are determined by the vectors

(i) $\vec{a} = -2\hat{i} - 5\hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} - \hat{k}$

(ii) $\vec{a} = 3\hat{i} + 4\hat{j}$ and $\vec{b} = -5\hat{i} + 7\hat{j}$.

Watch Video Solution

18. Using vectors, find the area of Δ ABC whose vertices are

(i) A(1,1,2),B(2,3,5) and C(1,5,5)

(ii) A(1,2,3),B(2,-1,4) and C(4,5,-1)

(iii) A(3,-1,2),B(1,-1,-3) and C(4,-3,1)

(iv) A (1,-1,2),B(2,1,-1) and C(3,-1,2).

Watch Video Solution

19. Using vector method, show that the given points A,B,C are collinear:

(i) A(3,-5,1),(-1,0,8) and C(7,-10,-6)

(ii) A(6,-7,-1),B(2,-3,1) and C(4,-5,0).

Watch Video Solution

20. Show that the points A,B,C with position vectors $\left(3\hat{i}-2\hat{j}+4\hat{k}\right)$, $\left(\hat{i}+\hat{j}+\hat{k}\right)$ and $\left(-\hat{i}+4\hat{j}-2\hat{k}\right)$ respectively are collinear.

Watch Video Solution

21. Show that the points having position vectors $\vec{a}$, $\vec{b}$, $\left(\vec{c}=3\vec{a}-2\vec{b}\right)$ are collinear, whatever be $\vec{a}$, $\vec{b}$, $\vec{c}$.

Watch Video Solution

22. Show that the points having position vectors $\left(-2\vec{a}+3\vec{b}+5\vec{c}\right), \left(\vec{a}+2\vec{b}+3\vec{c}\right)$ and $\left(7\vec{a}-\vec{c}\right)$ are collinear, whatever be $\vec{a}, \vec{b}, \vec{c}$.

Watch Video Solution

23. Find a unit vector perpendicular to the plane ABC, where the coordinates of $A, B, and\, C$ are $A(3, -1, 2), B(1, -1, -3) and\, C(4, -3, 1)$.

Watch Video Solution

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

Watch Video Solution

25. If $\left|\vec{a}\right|=2, |b|=5$ and $\left|\vec{a}\,x\,\vec{b}\right|=8$, find $\vec{a}\cdot\vec{b}$.

Watch Video Solution

26. If

$\left|\vec{a}\right| = 2, \left|\vec{b}\right| = 7$ and $\left(\vec{a} \times \vec{b}\right) = \left(3\hat{i} + 2\hat{j} + 6\hat{k}\right)$, find the angle betv

Watch Video Solution