

CLASS 12

MATHEMATICS

EXTRA QUESTIONS

Class 12 Mathematics Chapter 10 Vectors – Extra Questions with Answers

These Vectors questions cover finding a vector's magnitude, testing when two vectors are perpendicular or parallel, and applying the section formula to divide a line segment.

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These Vectors questions cover finding a vector's magnitude, testing when two vectors are perpendicular or parallel, and applying the section formula to divide a line segment.

Very Short Answer Questions (1 mark)

Q1. Find the magnitude of $\mathbf{a}=3\mathbf{i}+4\mathbf{j}$.

Ans: $|\mathbf{a}|=\sqrt{(9+16)}=\sqrt{25}=5$.

Q2. What is the condition for two vectors to be perpendicular?

Ans: Their dot product is zero.

Q3. What is the condition for two vectors to be parallel?

Ans: Their cross product is the zero vector.

Q4. Write the formula for a unit vector along $\mathbf{a}$.

Ans: $\mathbf{a}/|\mathbf{a}|$.

Q5. State the section formula for internal division in ratio $m:n$.

Ans: $(m\mathbf{b}+n\mathbf{a})/(m+n)$.

Short Answer Questions (2–3 marks)

Q6. Find $\mathbf{a} \cdot \mathbf{b}$ if $\mathbf{a}=\mathbf{i}+2\mathbf{j}+3\mathbf{k}$ and $\mathbf{b}=3\mathbf{i}-2\mathbf{j}+\mathbf{k}$.

Ans: $\mathbf{a} \cdot \mathbf{b}=1(3)+2(-2)+3(1)=3-4+3=2$.

Q7. Find the angle between $\mathbf{a}=\mathbf{i}+\mathbf{j}$ and $\mathbf{b}=\mathbf{i}-\mathbf{j}$.

Ans: $\mathbf{a} \cdot \mathbf{b}=1-1=0$. Since dot product is 0, the angle is 90° .

Q8. Find $\mathbf{a} \times \mathbf{b}$ if $\mathbf{a}=\mathbf{i}$ and $\mathbf{b}=\mathbf{j}$.

Ans: $\mathbf{i} \times \mathbf{j}=\mathbf{k}$ (standard result).

Higher-Order Thinking / Application Questions

Q9. Find the area of the triangle with vertices $A(1,2,3)$, $B(2,3,1)$, $C(3,1,2)$ using the vector cross product method, showing full calculation.

Ans: First find two side vectors from A: $\mathbf{AB}=\mathbf{B}-\mathbf{A}=(2-1,3-2,1-3)=(1,1,-2)$, and $\mathbf{AC}=\mathbf{C}-\mathbf{A}=(3-1,1-2,2-3)=(2,-1,-1)$. The area of the triangle is $\frac{1}{2}|\mathbf{AB} \times \mathbf{AC}|$. Compute the cross product $\mathbf{AB} \times \mathbf{AC}$ using the determinant: $\begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ 1 & 1 & -2 \\ 2 & -1 & -1 \end{vmatrix} = \mathbf{i}[(1)(-1)-(-2)(-1)] - \mathbf{j}[(1)(-1)-(-2)(2)] + \mathbf{k}[(1)(-1)-(1)(2)] = \mathbf{i}[-1-2] - \mathbf{j}[-1+4] + \mathbf{k}[-1-2] = -3\mathbf{i}-3\mathbf{j}-3\mathbf{k}$. The magnitude is $|\mathbf{AB} \times \mathbf{AC}|=\sqrt{(9+9+9)}=\sqrt{27}=3\sqrt{3}$. Therefore, the area of the triangle $=\frac{1}{2}(3\sqrt{3})=3\sqrt{3}/2$ square units. This demonstrates how the cross product magnitude directly gives twice the triangle area, following from the geometric definition of cross product as related to the parallelogram spanned by the two vectors, of which the triangle is exactly half.

Q10. Show that the vectors $\mathbf{a}=2\mathbf{i}-3\mathbf{j}+4\mathbf{k}$, $\mathbf{b}=-4\mathbf{i}+6\mathbf{j}-8\mathbf{k}$ are parallel, and explain the geometric significance of this using both the cross product and scalar multiple approaches.

Ans: **Approach 1 (scalar multiple):** Observe that $\mathbf{b}=-4\mathbf{i}+6\mathbf{j}-8\mathbf{k}=-2(2\mathbf{i}-3\mathbf{j}+4\mathbf{k})=-2\mathbf{a}$. Since $\mathbf{b}$ is a scalar multiple of $\mathbf{a}$ (specifically -2 times $\mathbf{a}$), the two vectors are parallel (though pointing in opposite directions, since the scalar is negative). **Approach 2 (cross product):** Compute $\mathbf{a} \times \mathbf{b}$ using the determinant: $\begin{vmatrix} \mathbf{i} & \mathbf{j} & \mathbf{k} \\ 2 & -3 & 4 \\ -4 & 6 & -8 \end{vmatrix} = \mathbf{i}[(-3)(-8)-(4)(6)] - \mathbf{j}[(2)(-8)-(4)(-4)] + \mathbf{k}[(2)(6)-(-3)(-4)] = \mathbf{i}[24-24] - \mathbf{j}[-16+16] + \mathbf{k}[12-12] = 0\mathbf{i}-0\mathbf{j}+0\mathbf{k} = \mathbf{0}$ (the zero vector). Since the cross product is the zero vector, this confirms

(independently of the scalar-multiple observation) that **a** and **b** are parallel — this makes sense because the cross product magnitude is $|\mathbf{a}||\mathbf{b}|\sin\theta$, and $\sin\theta=0$ exactly when $\theta=0^\circ$ or 180° , i.e., when the vectors are parallel or anti-parallel. Geometrically, this means **a** and **b** lie along the same straight line through the origin, just with **b** twice as long as **a** and pointing in the opposite direction.

Class 12 Mathematics Chapter 10 – Solutions and Notes

For complete step-by-step answers and a quick summary, check the [Class 12 Mathematics Chapter 10 Solutions](#) and [Class 12 Mathematics Chapter 10 Revision Notes](#).

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