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CBSE Class 12 · Maths

Vector Algebra

10 most probable questions for Boards 2027

Q1. 0.5 marks · Very short answer

Find $|3\hat{i} + 4\hat{j}|$.

Answer

$|3\hat{i} + 4\hat{j}| = \sqrt{(3^2 + 4^2)}$
$= \sqrt{25}$
$\therefore |3\hat{i} + 4\hat{j}| = 5$

Q2. 1 mark · Multiple choice

Which statement correctly describes the zero vector?
(A) It has magnitude 1 and a definite direction.
(B) Its initial and terminal points coincide, and it has no definite direction.
(C) Its initial and terminal points are distinct, and it has zero magnitude.
(D) It has the same magnitude as every unit vector.

Answer

(B) Its initial and terminal points coincide, and it has no definite direction — a zero vector has coincident initial and terminal points and zero magnitude.

Q3. 1.5 marks · Short answer

Determine whether $a = 2\hat{i} + 3\hat{j} - \hat{k}$ and $b = 2\hat{i} - 3\hat{j} - \hat{k}$ are equal by comparing their corresponding components.

Answer

$a = (2, 3, -1)$
$b = (2, -3, -1)$
$3 \neq -3$
$\therefore a \neq b$

Q4. 2 marks · Multiple choice

For which value of t are the vectors $2\hat{i} + 3\hat{j} - \hat{k}$ and $2\hat{i} + t\hat{j} - \hat{k}$ equal?
(A) −1
(B) 0
(C) 2
(D) 3

Answer

(D) 3 — equal vectors have equal corresponding components, so t = 3.

Q5. 3 marks · Medium answer

Find the value of λ for which $\vec{a} = \lambda\hat{i} + 2\hat{j} - \hat{k}$ and $\vec{b} = 2\hat{i} - \hat{j} + 4\hat{k}$ are perpendicular. Verify your value using their component-form scalar product.

Answer

Since a and b are perpendicular, a · b = 0.
$(\lambda\hat{i} + 2\hat{j} - \hat{k}) \cdot (2\hat{i} - \hat{j} + 4\hat{k}) = 0$
$2\lambda - 2 - 4 = 0$
$2\lambda = 6$
$\therefore \lambda = 3$

For λ = 3, $a = 3\hat{i} + 2\hat{j} - \hat{k}$.
$a \cdot b = 3(2) + 2(-1) + (-1)(4)$
$= 6 - 2 - 4$
∴ a · b = 0, verifying that a and b are perpendicular.

Q6. 4 marks · Long answer

Find the projection vector of $\vec{a} = 2\hat{i}+3\hat{j}+2\hat{k}$ on $\vec{b} = 2\hat{i}+\hat{j}+\hat{k}$, and hence find the magnitude of the projection of $\vec{a}$ on $\vec{b}$.

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/maths/vector-algebra

Q7. 5 marks · Long answer

For vectors $\vec{a} = a_1\hat{i} + a_2\hat{j} + a_3\hat{k}$ and $\vec{b} = b_1\hat{i} + b_2\hat{j} + b_3\hat{k}$, describe how multiplication of $\vec{a}$ by a scalar affects its components. State the distributive laws for vector addition and scalar multiplication. Also state the condition for two vectors to be collinear, including its component-form equivalent. (5 marks)

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/maths/vector-algebra

Q8. 0.5 marks · Very short answer

Find the scalar projection of $2\hat{i}$ on $\hat{i}$.

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/maths/vector-algebra

Q9. 1 mark · Multiple choice

A nonzero vector a has magnitude 5. Which expression gives the unit vector in its direction?
(A) 5a
(B) a/5
(C) a + 5
(D) 5/a

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/maths/vector-algebra

Q10. 2 marks · Short answer

Find the vector directed from P(1, −2, 3) to Q(4, 2, −1).

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/maths/vector-algebra

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