

PYQSide

JEE MAIN VECTOR ALGEBRA — VECTOR (CROSS) PRODUCT, AREA OF TRIANGLE AND PARALLELOGRAM — PYQS

Max. Marks: 64

Questions: 16

Section A (MCQ)

- Q.1** Let $\vec{a} = 2\hat{i} + 3\hat{j} + 3\hat{k}$ and $\vec{b} = 6\hat{i} + 3\hat{j} + 3\hat{k}$. Then the square of the area of the triangle with adjacent sides determined by the vectors $(2\vec{a} + 3\vec{b})$ and $(\vec{a} - \vec{b})$ is :

[JEE Main 2026 (Online) 6th April Evening Shift]

- (1) 450 (2) 900 (3) 1800 (4) 2400

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- Q.2** Let $\hat{u}$ and $\hat{v}$ be unit vectors inclined at an acute angle such that $|\hat{u} \times \hat{v}| = \frac{\sqrt{3}}{2}$. If $\vec{A} = \lambda\hat{u} + \hat{v} + (\hat{u} \times \hat{v})$, then λ is equal to :

[JEE Main 2026 (Online) 4th April Evening Shift]

- (1) $\frac{4}{3}(\vec{A} \cdot \hat{u}) - \frac{2}{3}(\vec{A} \cdot \hat{v})$ (2) $\frac{2}{3}(\vec{A} \cdot \hat{u}) - \frac{1}{3}(\vec{A} \cdot \hat{v})$
 (3) $\frac{4}{3}(\vec{A} \cdot \hat{u}) + \frac{2}{3}(\vec{A} \cdot \hat{v})$ (4) $(\vec{A} \cdot \hat{u}) - \frac{1}{2}(\vec{A} \cdot \hat{v})$

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- Q.3** Let P be a point in the plane of the vectors $\vec{AB} = 3\hat{i} + \hat{j} - \hat{k}$ and $\vec{AC} = \hat{i} - \hat{j} + 3\hat{k}$ such that P is equidistant from the lines AB and AC. If $|\vec{AP}| = \frac{\sqrt{5}}{2}$, then the area of the triangle ABP is :

[JEE Main 2026 (Online) 28th January Evening Shift]

- (1) $\frac{3}{2}$ (2) $\frac{\sqrt{30}}{4}$ (3) $\frac{\sqrt{26}}{4}$ (4) 2

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- Q.4** Let $\vec{a} = 2\hat{i} + \hat{j} - 2\hat{k}$, $\vec{b} = \hat{i} + \hat{j}$ and $\vec{c} = \vec{a} \times \vec{b}$. Let $\vec{d}$ be a vector such that $|\vec{d} - \vec{a}| = \sqrt{11}$, $|\vec{c} \times \vec{d}| = 3$ and the angle between $\vec{c}$ and $\vec{d}$ is $\frac{\pi}{4}$. Then $\vec{a} \cdot \vec{d}$ is equal to

[JEE Main 2026 (Online) 24th January Morning Shift]

- (1) 0 (2) 1 (3) 3 (4) 11

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- Q.5** Let $\vec{a} = 2\hat{i} - 5\hat{j} + 5\hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + 3\hat{k}$. If $\vec{c}$ is a vector such that $2(\vec{a} \times \vec{c}) + 3(\vec{b} \times \vec{c}) = \vec{0}$ and $(\vec{a} - \vec{b}) \cdot \vec{c} = -97$, then $|\vec{c} \times \vec{k}|^2$ is equal to

[JEE Main 2026 (Online) 24th January Evening Shift]

- (1) 193 (2) 205 (3) 218 (4) 233

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- Q.6** Let $\vec{a} = -\hat{i} + \hat{j} + 2\hat{k}$, $\vec{b} = \hat{i} - \hat{j} - 3\hat{k}$, $\vec{c} = \vec{a} \times \vec{b}$ and $\vec{d} = \vec{c} \times \vec{a}$. Then $(\vec{a} - \vec{b}) \cdot \vec{d}$ is equal to :

[JEE Main 2026 (Online) 23rd January Morning Shift]

- (1) 2 (2) -2 (3) 4 (4) -4

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- Q.7** Let $\vec{a}$, $\vec{b}$, $\vec{c}$ be three vectors such that $\vec{a} \times \vec{b} = 2(\vec{a} \times \vec{c})$. If $|\vec{a}| = 1$, $|\vec{b}| = 4$, $|\vec{c}| = 2$, and the angle between $\vec{b}$ and $\vec{c}$ is 60° , then $|\vec{a} \cdot \vec{c}|$ is equal to

[JEE Main 2026 (Online) 23rd January Evening Shift]

- (1) 2 (2) 0 (3) 1 (4) 4

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- Q.8** Let $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = \lambda\hat{j} + 2\hat{k}$, $\lambda \in \mathbb{Z}$ be two vectors. Let $\vec{c} = \vec{a} \times \vec{b}$ and $\vec{d}$ be a vector of magnitude 2 in yz-plane. If $|\vec{c}| = \sqrt{53}$, then the maximum possible value of $(\vec{c} \cdot \vec{d})^2$ is equal to :

[JEE Main 2026 (Online) 22nd January Evening Shift]

- (1) 52 (2) 26 (3) 104 (4) 208

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- Q.9** Let $\vec{c}$ and $\vec{d}$ be vectors such that $|\vec{c} + \vec{d}| = \sqrt{29}$ and $\vec{c} \times (2\hat{i} + 3\hat{j} + 4\hat{k}) = (2\hat{i} + 3\hat{j} + 4\hat{k}) \times \vec{d}$. If λ_1, λ_2 ($\lambda_1 > \lambda_2$) are the possible values of $(\vec{c} + \vec{d}) \cdot (-7\hat{i} + 2\hat{j} + 3\hat{k})$, then the equation

$$K^2x^2 + (K^2 - 5K + \lambda_1)xy + \left(3K + \frac{\lambda_2}{2}\right)y^2 - 8x + 12y + \lambda_2 = 0$$

represents a circle, for K equal to :

[JEE Main 2026 (Online) 21st January Morning Shift]

- (1) 4 (2) -1 (3) 2 (4) 1

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Q.10 For a triangle ABC, let $\vec{p} = \vec{BC}$, $\vec{q} = \vec{CA}$ and $\vec{r} = \vec{BA}$.

If $|\vec{p}| = 2\sqrt{3}$, $|\vec{q}| = 2$ and $\cos \theta = \frac{1}{\sqrt{3}}$, where θ is the

angle between $\vec{p}$ and $\vec{q}$, then $|\vec{p} \times (\vec{q} - 3\vec{r})|^2 + 3|\vec{r}|^2$ is equal to :

[JEE Main 2026 (Online) 21st January Evening Shift]

- (1) 200 (2) 220 (3) 410 (4) 340

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Q.11 Let ABCD be a tetrahedron such that the edges AB, AC and AD are mutually perpendicular. Let the areas of the triangles ABC, ACD and ADB be 5, 6 and 7 square units respectively. Then the area (in square units) of the $\triangle BCD$ is equal to :

[JEE Main 2025 (Online) 2nd April Morning Shift]

- (1) $\sqrt{110}$ (2) 12 (3) $\sqrt{340}$ (4) $7\sqrt{3}$

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Q.12 Let $\vec{a} = 2\hat{i} - 3\hat{j} + \hat{k}$, $\vec{b} = 3\hat{i} + 2\hat{j} + 5\hat{k}$ and a vector $\vec{c}$ be such that $(\vec{a} - \vec{c}) \times \vec{b} = -18\hat{i} - 3\hat{j} + 12\hat{k}$ and $\vec{a} \cdot \vec{c} = 3$. If $\vec{b} \times \vec{c} = \vec{d}$, then $|\vec{a} \cdot \vec{d}|$ is equal to :

[JEE Main 2025 (Online) 2nd April Evening Shift]

- (1) 15 (2) 18 (3) 12 (4) 9

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Q.13 Let $\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}$, $\vec{b} = 3\hat{i} - 5\hat{j} + \hat{k}$ and $\vec{c}$ be a vector such that $\vec{a} \times \vec{c} = \vec{c} \times \vec{b}$ and $(\vec{a} + \vec{c}) \cdot (\vec{b} + \vec{c}) = 168$. Then the maximum value of $|\vec{c}|^2$ is :

[JEE Main 2025 (Online) 29th January Morning Shift]

- (1) 77 (2) 154 (3) 308 (4) 462

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Section B (Numerical)

Q.14 Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 3\hat{i} + 2\hat{j} - \hat{k}$, $\vec{c} = \lambda\hat{j} + \mu\hat{k}$ and $\hat{d}$ be a unit vector such that $\vec{a} \times \hat{d} = \vec{b} \times \hat{d}$ and $\vec{c} \cdot \hat{d} = 1$. If $\vec{c}$ is perpendicular to $\vec{a}$, then $|3\lambda\hat{d} + \mu\vec{c}|^2$ is equal to

[JEE Main 2025 (Online) 3rd April Morning Shift]

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Q.15 Let $\vec{a} = \hat{i} + 2\hat{j} + \hat{k}$, $\vec{b} = 3\hat{i} - 3\hat{j} + 3\hat{k}$, $\vec{c} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{d}$ be a vector such that $\vec{b} \times \vec{d} = \vec{c} \times \vec{d}$ and $\vec{a} \cdot \vec{d} = 4$. Then $|\vec{a} \times \vec{d}|^2$ is equal to _____.

[JEE Main 2025 (Online) 3rd April Evening Shift]

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Q.16 Let $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} + 2\hat{j} + \hat{k}$ and $\vec{d} = \vec{a} \times \vec{b}$. If $\vec{c}$ is a vector such that $\vec{a} \cdot \vec{c} = |\vec{c}|$, $|\vec{c} - 2\vec{a}|^2 = 8$ and the angle between $\vec{d}$ and $\vec{c}$ is $\frac{\pi}{4}$, then $|10 - 3\vec{b} \cdot \vec{c}| + |\vec{d} \times \vec{c}|^2$ is equal to _____.

[JEE Main 2025 (Online) 28th January Morning Shift]

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ANSWER KEY

Section A (MCQ)

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	3	1	2	1	3	2	3	4	4	1	1
Ques.	12	13									
Ans.	1	3									

Section B (Numerical)

Ques.	14	15	16				
Ans.	5	128	6				