Q1. 21 January Shift 1

Let $\overrightarrow{a}=-\hat{i}+2\hat{j}+2\hat{k}$, $\overrightarrow{b}=8\hat{i}+7\hat{j}-3\hat{k}$ and $\overrightarrow{c}$ be vector such that $\overrightarrow{a}\times\overrightarrow{c}=\overrightarrow{b}$. If $\vec{c}\cdot(\hat{i}+\hat{j}+\hat{k})=4$, then $|\vec{a}+\vec{c}|^2$ is equal to :

(1) 27 (2) 33 (3) 35 (4) 30

Q2. 21 January Shift 2

For a triangle ABC, let $\overrightarrow{p}=\overrightarrow{BC}$, $\overrightarrow{q}=\overrightarrow{CA}$ and $\overrightarrow{r}=\overrightarrow{BA}$. If $|\overrightarrow{p}|=2\sqrt{3}$, $|\overrightarrow{q}|=2$ 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 :

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

Q3. 22 January Shift 1

Let $\overrightarrow{AB}=2\hat{i}+4\hat{j}-5\hat{k}$ and $\overrightarrow{AD}=\hat{i}+2\hat{j}+\lambda\hat{k}, \lambda\in\mathbb{R}$. Let the projection of the vector $\vec{v}=\hat{i}+\hat{j}+\hat{k}$ on the diagonal $\overrightarrow{AC}$ of the parallelogram ABCD be of length one unit. If α, β, where $\alpha>\beta$, be the roots of the equation $\lambda^2x^2-6\lambda x+5=0$, then $2\alpha-\beta$ is equal to

(1) 3 (2) 4 (3) 1 (4) 6

Q4. 22 January Shift 2

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

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

Q5. 22 January Shift 2

Let a vector $\overrightarrow{a}=\sqrt{2}\hat{i}-\hat{j}+\lambda\hat{k}, \lambda>0$, make an obtuse angle with the vector $\overrightarrow{b}=-\lambda^2\hat{i}+4\sqrt{2}\hat{j}+4\sqrt{2}\hat{k}$ and an angle θ, $\frac{\pi}{6}<\theta<\frac{\pi}{2}$, with the positive z-axis. If the set of all possible values of λ is $(\alpha,\beta)-\{\gamma\}$, then $\alpha+\beta+\gamma$ is equal to ____。

Q6. 23 January Shift 1

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

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

Q7. 23 January Shift 2

Let $\vec{a}=\hat{\mathrm{i}}-2\hat{\mathrm{j}}+3\hat{\mathrm{k}}, \vec{b}=2\hat{\mathrm{i}}+\hat{\mathrm{j}}-\hat{\mathrm{k}}, \vec{c}=\lambda\hat{\mathrm{i}}+\hat{\mathrm{j}}+\hat{\mathrm{k}}$ and $\vec{v}=\vec{a}\times\vec{b}$. If $\vec{v}\cdot\vec{c}=11$ and the length of the projection of $\vec{b}$ on $\vec{c}$ is p, then $9p^2$ is equal to

(1) 12 (2) 6 (3) 4 (4) 9

Q8. 23 January Shift 2

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

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

Q9. 24 January Shift 1

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

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

Q10. 24 January Shift 2

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 $|\vec{c} \times \hat{k}|^2$ is equal to

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

Q11. 24 January Shift 2

Let $\vec{a} = 2\hat{i} - \hat{j} - \hat{k}, \vec{b} = \hat{i} + 3\hat{j} - \hat{k}$ and $\vec{c} = 2\hat{i} + \hat{j} + 3\hat{k}$. Let $\vec{v}$ be the vector in the plane of the vectors $\vec{a}$ and $\vec{b}$, such that the length of its projection on the vector $\vec{c}$ is $\frac{1}{\sqrt{14}}$. Then $|\vec{v}|$ is equal to

(1) 13 (2) $\frac{\sqrt{35}}{2}$ (3) $\frac{\sqrt{21}}{2}$ (4) 7

Q12. 28 January Shift 1

For three unit vectors $\vec{a}, \vec{b}, \vec{c}$ satisfying $|\vec{a} - \vec{b}|^2 + |\vec{b} - \vec{c}|^2 + |\vec{c} - \vec{a}|^2 = 9$ and $|2\vec{a} + k\vec{b} + k\vec{c}| = 3$, the positive value of k is

(1) 4 (2) 3 (3) 5 (4) 6

Q13. 28 January Shift 1

Let PQR be a triangle such that $\overrightarrow{PQ} = -2\hat{i} - \hat{j} + 2\hat{k}$ and $\overrightarrow{PR} = a\hat{i} + b\hat{j} - 4\hat{k}, a, b \in \mathbb{Z}$. Let S be the point on QR, which is equidistant from the lines PQ and PR. If $|\overrightarrow{PR}| = 9$ and $\overrightarrow{PS} = \hat{i} - 7\hat{j} + 2\hat{k}$, then the value of $3a - 4b$ is ____

Q14. 28 January Shift 2

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

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

ANSWER KEYS

1. (1)	**2.** (3)	**3.** (1)	**4.** (3)	**5.** 5	**6.** (3)	**7.** (1)	**8.** (1)
9. (3)	**10.** (2)	**11.** (2)	**12.** (3)	**13.** 37	**14.** (2)		