DPP

DAILY PRACTICE PROBLEMS

CLASS : XIIth **SUBJECT : MATHS**

DATE : **DPP NO. : 9**

Topic :- VECTOR ALGEBRA

1. If $\vec{a}$ and $\vec{b}$ are unit vectors and θ is the angle between them then $\left|\frac{\vec{a}-\vec{b}}{2}\right|$, is

   a) $\sin\frac{\theta}{2}$ b) $\sin\theta$ c) $2\sin\theta$ d) $\sin 2\theta$

2. If $\vec{\mathbf{a}}$ and $\vec{\mathbf{b}}$ are two non-collinear vectors and $x\,\vec{\mathbf{a}} + y\,\vec{\mathbf{b}} = 0$

   a) $x = 0$, but y is not necessarily zero b) $y = 0$, but x is not necessarily zero

   c) $x = 0, y = 0$ d) None of the above

3. Two adjacent sides of a parallelogram $ABCD$ are given by $\overrightarrow{\mathbf{AB}} = 2\hat{\mathbf{i}} + 10\hat{\mathbf{j}} + 11\hat{\mathbf{k}}$ and $\overrightarrow{\mathbf{AD}} = -\hat{\mathbf{i}} + 2\hat{\mathbf{j}} + 2\hat{\mathbf{k}}$. The side AD is rotated by an acute angle α in the plane of the parallelogram so that AD becomes AD'. If AD' makes a right angle with the side AB, then the cosine of the angle α is given by

   a) $\frac{8}{9}$ b) $\frac{\sqrt{17}}{9}$ c) $\frac{1}{9}$ d) $\frac{4\sqrt{5}}{9}$

4. If the scalar projection of the vector $x\hat{\mathbf{i}} + \hat{\mathbf{j}} + \hat{\mathbf{k}}$ on the vector $2\hat{\mathbf{i}} - \hat{\mathbf{j}} + 5\hat{\mathbf{k}}$ is $\frac{1}{\sqrt{30}}$ then the value of x is

   a) $-3/2$ b) 6 c) -6 d) 3

5. If $\vec{\mathbf{a}} = -\hat{\mathbf{i}} + \hat{\mathbf{j}} + 2\hat{\mathbf{k}}$, $\vec{\mathbf{b}} = 2\hat{\mathbf{i}} - \hat{\mathbf{j}} - \hat{\mathbf{k}}$ and $\vec{\mathbf{c}} = -2\hat{\mathbf{i}} + \hat{\mathbf{j}} + 3\hat{\mathbf{k}}$, then the angle between $2\vec{\mathbf{a}} - \vec{\mathbf{c}}$ and $\vec{\mathbf{a}} + \vec{\mathbf{b}}$ is

   a) $\frac{\pi}{4}$ b) $\frac{\pi}{3}$ c) $\frac{\pi}{2}$ d) $\frac{3\pi}{2}$

6. Let $\vec{a}, \vec{b}, \vec{c}$ three non-zero vectors such that no two of which are collinear and the vector $\vec{a} + \vec{b}$ is collinear with $\vec{c}$ and $\vec{b} + \vec{c}$ is collinear with $\vec{a}$. Then, $\vec{a} + \vec{b} + \vec{c} =$

   a) $\vec{a}$ b) $\vec{b}$ c) $\vec{c}$ d) $\vec{0}$

7. The value of $[\,\vec{\mathbf{a}}\;\vec{\mathbf{b}} + \vec{\mathbf{c}}\;\vec{\mathbf{a}} + \vec{\mathbf{b}} + \vec{\mathbf{c}}]$ is

   a) $[\vec{\mathbf{a}}\;\vec{\mathbf{b}}\;\vec{\mathbf{c}}]$ b) 0 c) $2[\vec{\mathbf{a}}\;\vec{\mathbf{b}}\;\vec{\mathbf{c}}]$ d) $\vec{\mathbf{a}} \times (\vec{\mathbf{b}} \times \vec{\mathbf{c}})$

8. If the points with position vectors $60\hat{i} + 3\hat{j}$, $40\hat{i} - 8\hat{j}$ and $a\hat{i} - 52\hat{j}$ are collinear, then $a =$

   a) -40 b) 40 c) 20 d) 30

9. Let $\vec{\mathbf{a}} = 2\hat{\mathbf{i}} + \hat{\mathbf{j}} + \hat{\mathbf{k}}$, $\vec{\mathbf{b}} = \hat{\mathbf{i}} + 2\hat{\mathbf{j}} - \hat{\mathbf{k}}$ and a unit vector $\vec{\mathbf{c}}$ be coplanar. If $\vec{\mathbf{c}}$ is perpendicular to $\vec{\mathbf{a}}$ and $\vec{\mathbf{c}}$ is equal to

a) $\pm\frac{1}{\sqrt{2}}(-\hat{\mathbf{j}}+\hat{\mathbf{k}})$ b) $\pm\frac{1}{\sqrt{3}}(-\hat{\mathbf{i}}-\hat{\mathbf{j}}-\hat{\mathbf{k}})$ c) $\pm\frac{1}{\sqrt{5}}(\hat{\mathbf{i}}-2\hat{\mathbf{j}})$ d) $\pm\frac{1}{\sqrt{3}}(\hat{\mathbf{i}}-\hat{\mathbf{j}}-\hat{\mathbf{k}})$

10. If the vectors $\vec{\mathbf{a}}=2\hat{\mathbf{i}}+\hat{\mathbf{j}}+4\hat{\mathbf{k}}$, $\vec{\mathbf{b}}=4\hat{\mathbf{i}}-2\hat{\mathbf{j}}+3\hat{\mathbf{k}}$ and $\vec{\mathbf{c}}=2\hat{\mathbf{i}}-3\hat{\mathbf{j}}-\lambda\hat{\mathbf{k}}$ are coplanar, then the value of λ is equal to
a) 2 b) 1 c) 3 d) -1

11. The vectors
$\vec{u}=(al+a_1l_1)\hat{i}+(am+a_1m_1)\hat{j}+(an+a_1n_1)\hat{k}$,
$\vec{v}=(bl+b_1l_1)\hat{i}+(bm+b_1m_1)\hat{j}+(bn+b_1n_1)\hat{k}$,
$\vec{w}=(cl+c_1l_1)\hat{i}+(cm+c_1m_1)\hat{j}+(cn+c_1n_1)\hat{k}$
a) Form an equilateral triangle
b) Are coplanar
c) Are collinear
d) Are mutually perpendicular

12. If A, B, C, D are any four points in space, then $|\vec{AB}\times\vec{CD}+\vec{BC}\times\vec{AD}+\vec{CA}\times\vec{BD}|$ is equal to
a) 2Δ b) 4Δ c) 3Δ d) 5Δ

13. If $\vec{a}$ lies in the plane of vectors $\vec{b}$ and $\vec{c}$, then which of the following is correct?
a) $[\vec{a}\vec{b}\vec{c}]=0$ b) $[\vec{a}\vec{b}\vec{c}]=1$ c) $[\vec{a}\vec{b}\vec{c}]=3$ d) $[\vec{b}\vec{c}\vec{a}]=1$

14. What is the value of $(\vec{\mathbf{d}}+\vec{\mathbf{a}}]\cdot[\vec{\mathbf{a}}\times\{\vec{\mathbf{b}}\times(\vec{\mathbf{c}}\times\vec{\mathbf{d}})\}]$?
a) $(\vec{\mathbf{d}}\cdot\vec{\mathbf{a}})\cdot[\vec{\mathbf{b}}\,\vec{\mathbf{c}}\,\vec{\mathbf{d}}]$ b) $(\vec{\mathbf{a}}\cdot\vec{\mathbf{d}})\cdot[\vec{\mathbf{b}}\,\vec{\mathbf{c}}\,\vec{\mathbf{d}}]$ c) $(\vec{\mathbf{b}}\cdot\vec{\mathbf{d}})\cdot[\vec{\mathbf{a}}\,\vec{\mathbf{c}}\,\vec{\mathbf{d}}]$ d) $(\vec{\mathbf{b}}\cdot\vec{\mathbf{d}})\cdot[\vec{\mathbf{a}}\,\vec{\mathbf{d}}\,\vec{\mathbf{c}}]$

15. A parallelogram is constructed on the vectors $\vec{a}=3\vec{\alpha}-\vec{\beta}$, $\vec{b}=\vec{\alpha}+3\vec{\beta}$. If $|\vec{\alpha}|=|\vec{\beta}|=2$ and the angle between $\vec{\alpha}$ and $\vec{\beta}$ is $\frac{\pi}{3}$, then the angle of a diagonal of the parallelogram are
a) $4\sqrt{5}, 4\sqrt{3}$ b) $4\sqrt{3}, 4\sqrt{7}$ c) $4\sqrt{7}, 4\sqrt{5}$ d) None of these

16. If the vectors $\hat{\mathbf{i}}-2\hat{\mathbf{j}}+3\hat{\mathbf{k}}$, $-2\hat{\mathbf{i}}+3\hat{\mathbf{j}}-4\hat{\mathbf{k}}$, $\lambda\hat{\mathbf{i}}-\hat{\mathbf{j}}+2\hat{\mathbf{k}}$ are linearly dependent, then the value of λ is equal to
a) 0 b) 1 c) 2 d) 3

17. For any vector $\vec{\mathbf{a}}$, the value of $(\vec{\mathbf{a}}\times\hat{\mathbf{i}})^2+(\vec{\mathbf{a}}\times\hat{\mathbf{j}})^2+(\vec{\mathbf{a}}\times\hat{\mathbf{k}})^2$ is equal to
a) $4\vec{\mathbf{a}}^2$ b) $2\vec{\mathbf{a}}^2$ c) $\vec{\mathbf{a}}^2$ d) $3\vec{\mathbf{a}}^2$

18. If $\vec{\mathbf{a}}=\hat{\mathbf{i}}+\hat{\mathbf{j}}+\hat{\mathbf{k}}$, $\vec{\mathbf{b}}=2\hat{\mathbf{i}}-4\hat{\mathbf{k}}$, $\vec{\mathbf{c}}=\hat{\mathbf{i}}+\lambda\hat{\mathbf{j}}+3\hat{\mathbf{k}}$ are coplanar, then the value of λ is
a) $\frac{5}{2}$ b) $\frac{3}{5}$ c) $\frac{7}{3}$ d) None of these

19. If the position vectors of P and Q are $\hat{i}+3\hat{j}-7\hat{k}$ and $5\hat{i}-2\hat{j}+4\hat{k}$ then the cosine of the angle between $\vec{PQ}$ and y-axis is

a) $\frac{5}{\sqrt{162}}$ b) $\frac{4}{\sqrt{162}}$ c) $-\frac{5}{\sqrt{162}}$ d) $\frac{11}{\sqrt{162}}$

20. The value of `a' so that volume of parallelopiped formed by $\hat{\mathbf{i}} + a\hat{\mathbf{j}} + \hat{\mathbf{k}}$, $\hat{\mathbf{j}} + a\hat{\mathbf{k}}$ and $a\hat{\mathbf{i}} + \hat{\mathbf{k}}$ becomes minimum, is

a) -3 b) 3 c) $1/\sqrt{3}$ d) $\sqrt{3}$