DPP
DAILY PRACTICE PROBLEMS

CLASS : XIIth | **SUBJECT : MATHS**
DATE : | **DPP NO. : 6**

Topic :- VECTOR ALGEBRA

1. If $\vec{\mathbf{a}},\vec{\mathbf{b}},\vec{\mathbf{c}}$ be three non-coplanar vectors and $\vec{\mathbf{p}},\vec{\mathbf{q}},\vec{\mathbf{r}}$ constitute the corresponding reciprocal system of vectors then for any arbitrary vector $\vec{\alpha}$

   a) $\vec{\alpha} = (\vec{\alpha}\cdot\vec{\mathbf{a}})\vec{\mathbf{a}} + (\vec{\alpha}\cdot\vec{\mathbf{b}})\vec{\mathbf{b}} + (\vec{\alpha}\cdot\vec{\mathbf{c}})\vec{\mathbf{c}}$
   b) $\vec{\alpha} = (\vec{\alpha}\cdot\vec{\mathbf{p}})\vec{\mathbf{p}} + (\vec{\alpha}\cdot\vec{\mathbf{q}})\vec{\mathbf{q}} + (\vec{\alpha}\cdot\vec{\mathbf{r}})\mathbf{r}$
   c) $\vec{\alpha} = (\vec{\alpha}\cdot\vec{\mathbf{p}})\vec{\mathbf{a}} + (\vec{\alpha}\cdot\vec{\mathbf{q}})\vec{\mathbf{b}} + (\vec{\alpha}\cdot\vec{\mathbf{r}})\vec{\mathbf{c}}$
   d) None of the above

2. The vector $\vec{\mathbf{a}} \times (\vec{\mathbf{b}} \times \vec{\mathbf{c}})$ is coplanar with the vectors

   a) $\vec{\mathbf{b}},\vec{\mathbf{c}}$ b) $\vec{\mathbf{a}},\vec{\mathbf{b}}$ c) $\vec{\mathbf{a}},\vec{\mathbf{c}}$ d) $\vec{\mathbf{a}},\vec{\mathbf{b}},\vec{\mathbf{c}}$

3. If $\vec{\mathbf{b}}$ is a unit vector, then $(\vec{\mathbf{a}}\cdot\vec{\mathbf{b}})\vec{\mathbf{b}} + \vec{\mathbf{b}} \times (\vec{\mathbf{a}} \times \vec{\mathbf{b}})$is

   a) $|\vec{\mathbf{a}}|^2\vec{\mathbf{b}}$ b) $|\vec{\mathbf{a}}\cdot\vec{\mathbf{b}}|\vec{\mathbf{a}}$ c) $\vec{\mathbf{a}}$ d) $\vec{\mathbf{b}}$

4. If $\sum_{i=1}^{n} \left|\vec{\mathbf{a}}_i\right| = \vec{\mathbf{0}}$, where $\left|\vec{\mathbf{a}}_i\right| = 1 \forall i$, then the value of $\sum_{1\le i<}\sum_{j\le n} \vec{\mathbf{a}}_i \cdot \vec{\mathbf{a}}_j$ is

   a) n^2 b) $-n^2$ c) n d) $-\frac{n}{2}$

5. If the vector $3\hat{\mathbf{i}} - 2\hat{\mathbf{j}} - 5\hat{\mathbf{k}}$ is perpendicular to $c\hat{\mathbf{k}} - \hat{\mathbf{j}} + 6\hat{\mathbf{i}}$ then c is equal to

   a) 3 b) 4 c) 5 d) 6

6. If $\vec{\mathbf{a}} \times \vec{\mathbf{b}} = \vec{\mathbf{0}}$ and $\vec{\mathbf{a}}\cdot\vec{\mathbf{b}} = 0$, then

   a) $\vec{\mathbf{a}} \perp \vec{\mathbf{b}}$ b) $\vec{\mathbf{a}} || \vec{\mathbf{b}}$ c) $\vec{\mathbf{a}} = \vec{\mathbf{0}}$ and $\vec{\mathbf{b}} = \vec{\mathbf{0}}$ d) $\vec{\mathbf{a}} = \vec{\mathbf{0}}$ or $\vec{\mathbf{b}} = \vec{\mathbf{0}}$

7. If $2\hat{\mathbf{i}} + 4\hat{\mathbf{j}} - 5\hat{\mathbf{k}}$ and $\hat{\mathbf{i}} + 2\hat{\mathbf{j}} + 3\hat{\mathbf{k}}$ are adjacent side of a parallelogram, then the lengths of its diagonals are

   a) $7,\sqrt{69}$ b) $6,\sqrt{59}$ c) $5,\sqrt{65}$ d) $5,\sqrt{55}$

8. Let $\vec{\mathbf{a}},\vec{\mathbf{b}},\vec{\mathbf{c}}$ be unit vectors such that $\vec{\mathbf{a}} + \vec{\mathbf{b}} + \vec{\mathbf{c}} = 0$. Which of the following is correct?

   a) $\vec{\mathbf{a}} \times \vec{\mathbf{b}} = \vec{\mathbf{b}} \times \vec{\mathbf{c}} = \vec{\mathbf{c}} \times \vec{\mathbf{a}} = \vec{\mathbf{0}}$
   b) $\vec{\mathbf{a}} \times \vec{\mathbf{b}} = \vec{\mathbf{b}} \times \vec{\mathbf{c}} = \vec{\mathbf{c}} \times \vec{\mathbf{a}} \neq \vec{\mathbf{0}}$
   c) $\vec{\mathbf{a}} \times \vec{\mathbf{b}} = \vec{\mathbf{b}} \times \vec{\mathbf{c}} = \vec{\mathbf{a}} \times \vec{\mathbf{c}} = \vec{\mathbf{0}}$
   d) $\vec{\mathbf{a}} \times \vec{\mathbf{b}},\vec{\mathbf{b}} \times \vec{\mathbf{c}},\vec{\mathbf{c}} \times \vec{\mathbf{a}}$ are mutually perpendicular

9. If G is the centre of a regular hexagon $ABCDEF$, then $\vec{AB} + \vec{AC} + \vec{AD} + \vec{AE} + \vec{AF} =$

   a) $3\vec{AG}$ b) $2\vec{AG}$ c) $6\vec{AG}$ d) $4\vec{AG}$

10. **I.** Two non-zero. Non-collinear vectors are linearly independent .
II. Any three coplanar vectors are linearly dependent. Which of the above statements is /are true?

a) Only **I** b) Only **II** c) Both **I** and **II** d) Neither **I** nor **II**

11. If $\vec{a}, \vec{b}$ and $\vec{c}$ are unit coplanar vectors, then $[2\vec{a} - 3\vec{b}\ 7\vec{b} - 9\vec{c}\ 12\vec{c} - 23\vec{a}]$ is equal ro

a) 0 b) 1/2 c) 24 d) 32

12. $[\vec{\mathbf{a}} + \vec{\mathbf{b}}\ \vec{\mathbf{b}} + \vec{\mathbf{c}}\ \ \vec{\mathbf{c}} + \vec{\mathbf{a}}] = [\vec{\mathbf{a}}\ \vec{\mathbf{b}}\ \vec{\mathbf{c}}]$, then

a) $[\vec{\mathbf{a}}\ \vec{\mathbf{b}}\ \vec{\mathbf{c}}] = 1$ b) $\vec{\mathbf{a}}, \vec{\mathbf{b}}, \vec{\mathbf{c}}$ are coplanar

c) $[\vec{\mathbf{a}}\ \vec{\mathbf{b}}\ \vec{\mathbf{c}}] = -1$ d) $\vec{\mathbf{a}}, \vec{\mathbf{b}}, \vec{\mathbf{c}}$ are mutually perpendicular

13. If $\vec{\mathbf{a}} + \vec{\mathbf{b}} + \vec{\mathbf{c}} = \vec{\mathbf{0}}$ and $|\vec{\mathbf{a}}| = \sqrt{37}$, $|\vec{\mathbf{b}}| = 3$, $|\vec{\mathbf{c}}| = 4$, then the angle between $\vec{\mathbf{b}}$ and $\vec{\mathbf{c}}$

a) 30° b) 45° c) 60° d) 90°

14. A unit vector coplanar with $\hat{\mathbf{i}} + \hat{\mathbf{j}} + 2\hat{\mathbf{k}}$ and $\hat{\mathbf{i}} + 2\hat{\mathbf{j}} + \hat{\mathbf{k}}$, and perpendicular to $\hat{\mathbf{i}} + \hat{\mathbf{j}} + \hat{\mathbf{k}}$ is

a) $\left(\frac{\hat{\mathbf{j}} - \hat{\mathbf{k}}}{\sqrt{2}}\right)$ b) $\left(\frac{\hat{\mathbf{i}} + \hat{\mathbf{j}} + \hat{\mathbf{k}}}{\sqrt{3}}\right)$ c) $\left(\frac{\hat{\mathbf{i}} + \hat{\mathbf{j}} + 2\hat{\mathbf{k}}}{\sqrt{6}}\right)$ d) $\left(\frac{\hat{\mathbf{i}} + \hat{\mathbf{j}} + \hat{\mathbf{k}}}{\sqrt{6}}\right)$

15. The projection of the vector $\hat{i} + \hat{j} + \hat{k}$ along the vector of $\hat{j}$, is

a) 1 b) 0 c) 2 d) -1

16. Volume of the parallelopiped having vertices at $O \equiv (0,0,0)$, $A \equiv (2,-2,4)$, $B \equiv (5,-4,4)$ and $C \equiv (1,-2,4)$

a) 5 cu units b) 10 cu units c) 15 cu units d) 20 cu units

17. The area of parallelogram constructed on the vectors $\vec{a} = \vec{p} + 2\vec{q}$ and $\vec{b} = 2\vec{p} + \vec{q}$, where $\vec{p}$ and $\vec{q}$ are unit vectors forming an angle of 30° is

a) 3/2 b) 5/2 c) 7/2 d) None of these

18. If $\vec{a}$ is a vector perpendicular to the vectors $\vec{b} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $c = -2\hat{i} + 4\hat{j} + \hat{k}$ and satisfies the condition $\vec{a}.(\hat{i} - 2\hat{j} + \hat{k}) = -6$, then $\vec{a} =$

a) $5\hat{i} + \frac{7}{2}\hat{j} - 4\hat{k}$ b) $10\hat{i} + 7\hat{j} - 8\hat{k}$ c) $5\hat{i} - \frac{7}{2}\hat{j} + 4\hat{k}$ d) None of these

19. The projection of $\vec{\mathbf{a}} = 3\hat{\mathbf{i}} - \hat{\mathbf{j}} + 5\hat{\mathbf{k}}$ on $\vec{\mathbf{b}} = 2\hat{\mathbf{i}} + 3\hat{\mathbf{j}} + \hat{\mathbf{k}}$ is

a) $\frac{8}{\sqrt{35}}$ b) $\frac{9}{\sqrt{39}}$ c) $\frac{8}{\sqrt{14}}$ d) $\sqrt{14}$

20. Let $ABCDEF$ be a regular hexagon and $\overrightarrow{\mathbf{AB}} = \vec{\mathbf{a}}$, $\overrightarrow{\mathbf{BC}} = \vec{\mathbf{b}}$, $\overrightarrow{\mathbf{CD}} = \vec{\mathbf{c}}$, then $\overrightarrow{\mathbf{AE}}$ is equal to

a) $\vec{\mathbf{a}} + \vec{\mathbf{b}} + \vec{\mathbf{c}}$ b) $\vec{\mathbf{b}} + \vec{\mathbf{c}}$ c) $\vec{\mathbf{a}} + \vec{\mathbf{b}}$ d) $\vec{\mathbf{a}} + \vec{\mathbf{c}}$