DPP

DAILY PRACTICE PROBLEMS

CLASS : XIIth | **SUBJECT : MATHS**

DATE : | **DPP NO. : 4**

Topic :- VECTOR ALGEBRA

1. If $\vec{r}\cdot\vec{a}=\vec{r}\cdot\vec{b}=\vec{r}\cdot\vec{c}=0$ for some non-zero vector $\vec{r}$, then the value of $[\vec{a}\vec{b}\vec{c}]$, is

   a) 2 b) 3 c) 0 d) None of these

2. If the angle between $\hat{\mathbf{i}}+\hat{\mathbf{k}}$ and $\hat{\mathbf{i}}+\hat{\mathbf{j}}+a\hat{\mathbf{k}}$ is $\frac{\pi}{3}$, then the value of a is

   a) 0 or 2 b) -4 or 0 c) 0 or -2 d) 2 or -2

3. A vector which makes equal angles with the vectors $\frac{1}{3}(\hat{i}-2\hat{j}+2\hat{k}),\frac{1}{5}(-4\hat{i}-3\hat{k})$, and $\hat{j}$, is

   a) $5\hat{i}+\hat{j}+5\hat{k}$ b) $-5\hat{i}+\hat{j}+5\hat{k}$ c) $-5\hat{i}+\hat{j}+5\hat{k}$ d) $5\hat{i}+\hat{j}-5\hat{k}$

4. Which one of the following vectors is of magnitude 6 and perpendicular to both $\vec{\mathbf{a}}=2\hat{\mathbf{i}}+2\hat{\mathbf{j}}+\hat{\mathbf{k}}$ and $\vec{\mathbf{b}}=\hat{\mathbf{i}}-2\hat{\mathbf{j}}+2\hat{\mathbf{k}}$?

   a) $2\hat{\mathbf{i}}-\hat{\mathbf{j}}-2\hat{\mathbf{k}}$ b) $2(2\hat{\mathbf{i}}-\hat{\mathbf{j}}+2\hat{\mathbf{k}})$ c) $3(2\hat{\mathbf{i}}-\hat{\mathbf{j}}-2\hat{\mathbf{k}})$ d) $2(2\hat{\mathbf{i}}-\hat{\mathbf{j}}-2\hat{\mathbf{k}})$

5. In a right angled triangle ABC, the hypotenuse $Ab=p$, then $\vec{AB}.\vec{AC}+\vec{BC}.\vec{BA}+\vec{CA}.\vec{CB}$ is equal to

   a) $2p^2$ b) $\frac{p^2}{2}$ c) p^2 d) None of these

6. Which one of the following is not correct?

   a) If $\vec{\mathbf{p}}\cdot\vec{\mathbf{a}}=\vec{\mathbf{p}}\cdot\vec{\mathbf{b}}=\vec{\mathbf{p}}\cdot\vec{\mathbf{c}}$ for some non-zero vector $\vec{\mathbf{p}}$ then $\vec{\mathbf{a}},\vec{\mathbf{b}},\vec{\mathbf{c}}$ are coplanar b) The vectors $\hat{\mathbf{i}}+3\hat{\mathbf{j}}$, $2\hat{\mathbf{i}}+\hat{\mathbf{k}}$ and $\hat{\mathbf{j}}+\hat{\mathbf{k}}$ are coplanar

   c) The vector $\vec{\mathbf{a}}\times(\vec{\mathbf{b}}\times\vec{\mathbf{c}})$ is coplanar with $\vec{\mathbf{a}}$ and $\vec{\mathbf{b}}$ d) If $\vec{\mathbf{a}},\vec{\mathbf{b}}$ are unit vectors and angle between $\vec{\mathbf{a}}$ and $\vec{\mathbf{b}}$ is $\frac{\pi}{3}$, then $|\vec{\mathbf{a}}+\vec{\mathbf{b}}|<1$

7. The length of the shortest distance between the two lines $\vec{\mathbf{r}}=(-3\hat{\mathbf{i}}+6\hat{\mathbf{j}})+s(-4\hat{\mathbf{i}}+3\hat{\mathbf{j}}+2\hat{\mathbf{k}})$ and $\vec{\mathbf{r}}=(-2\hat{\mathbf{i}}+7\hat{\mathbf{k}})+t(-4\hat{\mathbf{i}}+\hat{\mathbf{j}}+\hat{\mathbf{k}})$ is

   a) 7 units b) 13 units c) 8 units d) 9 units

8. A vector perpendicular to the plane containing the points $A(1.-1,2)$, $B(2,0,-1)$, $C(0,2,1)$ is

   a) $4\hat{\mathbf{i}}+8\hat{\mathbf{j}}-4\hat{\mathbf{k}}$ b) $8\hat{\mathbf{i}}+4\hat{\mathbf{j}}+4\hat{\mathbf{k}}$ c) $3\hat{\mathbf{i}}+\hat{\mathbf{j}}+2\hat{\mathbf{k}}$ d) $\hat{\mathbf{i}}+\hat{\mathbf{j}}-\hat{\mathbf{k}}$

9. If $\vec{\mathbf{a}}$ and $\vec{\mathbf{b}}$ are unit vectors such that $[\vec{\mathbf{a}}\ \vec{\mathbf{b}}\ \vec{\mathbf{a}}\times\vec{\mathbf{b}}]=\frac{1}{4}$, then angle between $\vec{\mathbf{a}}$ and $\vec{\mathbf{b}}$ is

   a) $\frac{\pi}{3}$ b) $\frac{\pi}{4}$ c) $\frac{\pi}{6}$ d) $\frac{\pi}{2}$

10. If $|\vec{\mathbf{a}}|=3$, $|\vec{\mathbf{b}}|=4$, then a value of λ for which $\vec{\mathbf{a}}+\lambda\vec{\mathbf{b}}$ is perpendicular to $\vec{\mathbf{a}}-\lambda\vec{\mathbf{b}}$, is

a) $\frac{9}{16}$ b) $\frac{3}{4}$ c) $\frac{3}{2}$ d) $\frac{4}{3}$

11. $(\vec{\mathbf{x}} - \vec{\mathbf{y}}) \times (\vec{\mathbf{x}} + \vec{\mathbf{y}}) =$ .... where $\vec{\mathbf{x}}, \vec{\mathbf{y}} \in R^3$

a) $2(\vec{\mathbf{x}} \times \vec{\mathbf{y}})$ b) $|\vec{\mathbf{x}}|^2 - |\vec{\mathbf{y}}|^2$ c) $\frac{1}{2}(\vec{\mathbf{x}} \times \vec{\mathbf{y}})$ d) None of these

12. If the vectors $\vec{\mathbf{a}} = \hat{\mathbf{i}} - \hat{\mathbf{j}} + 2\hat{\mathbf{k}}$, $\vec{\mathbf{b}} = 2\hat{\mathbf{i}} + 4\hat{\mathbf{j}} + \hat{\mathbf{k}}$ and $\vec{\mathbf{c}} = \lambda\hat{\mathbf{i}} + \hat{\mathbf{j}} + \mu\hat{\mathbf{k}}$ are mutually orthogonal, then (λ, μ) is equal to

a) $(-3, 2)$ b) $(2, -3)$ c) (-2.3) d) $(3, -2)$

13. Given that $\vec{a} = (1, 1, 1)$, $\vec{c} = (0, 1, -1)$ and $\vec{a}.\vec{b} = 3$. If $\vec{a} \times \vec{b} = \vec{c}$, then $\vec{b} =$

a) $\left(\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\right)$ b) $\left(\frac{2}{3}, \frac{2}{3}, \frac{4}{3}\right)$ c) $\left(\frac{5}{3}, \frac{2}{3}, \frac{2}{3}\right)$ d) None of these

14. If $\hat{a}$, $\hat{b}$ and $\hat{c}$ are three unit vectors such that $\hat{a} + \hat{b} + \hat{c}$ is also a unit vector and θ_1, θ_2 and θ_3 are the angles between the vectors $\hat{a}, \hat{b}; \hat{b}, \hat{c}$ and $\hat{c}, \hat{a}$ respectively, then among θ_1, θ_2 and θ_3

a) All are acute angles
b) All are right angles
c) At least one is obtuse angle
d) None of these

15. Given vectors $\vec{x} = 3\hat{i} - 6\hat{j} - \hat{k}$, $\vec{y} = \hat{i} + 4\hat{j} - 3\hat{k}$ and $\vec{z} = 3\hat{i} + 4\hat{j} + 12\hat{k}$, then the projection of $\vec{x} \times \vec{y}$ on vector $\vec{z}$ is

a) 14 b) -14 c) 12 d) 15

16. If the vectors $\vec{a}$ and $\vec{b}$ are mutually perpendicular, then $\vec{a} \times \{\vec{a} \times \{\vec{a} \times (\vec{a} \times \vec{b})\}\}$ is equal to

a) $|\vec{a}|^2\vec{b}$ b) $|\vec{a}|^3\vec{b}$ c) $|\vec{a}|^4\vec{b}$ d) None of these

17. Let G be the centroid of ΔABC. If $\vec{AB} = \vec{a}$, $\vec{AC} = \vec{b}$, then the $\vec{AG}$, in terms of $\vec{a}$ and $\vec{b}$ is

a) $\frac{2}{3}(\vec{a} + \vec{b})$ b) $\frac{1}{6}(\vec{a} + \vec{b})$ c) $\frac{1}{3}(\vec{a} + \vec{b})$ d) $\frac{1}{2}(\vec{a} + \vec{b})$

18. The moment of the couple formed by the forces $5\hat{i} + \hat{k}$ and $-5\hat{i} - \hat{k}$ acting at the point $(9, -1, 2)$ and $(3, -2, 1)$ respectively is

a) $-\hat{i} + \hat{j} + 5\hat{k}$ b) $\hat{i} - \hat{j} - 5\hat{k}$ c) $2\hat{i} - 2\hat{j} - 10\hat{k}$ d) $-2\hat{i} + 2\hat{j} + 10\hat{k}$

19. The value of c so that for all real x, then vectors $ocx\,\hat{\mathbf{i}} - 6\hat{\mathbf{j}} + 3\hat{\mathbf{k}}$, $x\hat{\mathbf{i}} + 2\hat{\mathbf{j}} + 2cx\hat{\mathbf{k}}$ make an obtuse angle are

a) $c < 0$ b) $0 < c < \frac{4}{3}$ c) $-\frac{4}{3} < c < 0$ d) $c > 0$

20. If θ be the angle between the vectors $\vec{\mathbf{a}} = 2\hat{\mathbf{i}} + 2\hat{\mathbf{j}} - \hat{\mathbf{k}}$ and $\vec{\mathbf{b}} = 6\hat{\mathbf{i}} - 3\hat{\mathbf{j}} + 2\hat{\mathbf{k}}$, then

a) $\cos\theta = \frac{4}{21}$ b) $\cos\theta = \frac{3}{19}$ c) $\cos = \frac{2}{19}$ d) $\cos\theta = \frac{5}{21}$