

VECTOR ALGEBRA

Assignment 4 Practice by O.P. GUPTA • M. +91-9650350480

- Q01. If $(2\hat{i} + 6\hat{j} + 27\hat{k}) \times (\hat{i} + p\hat{j} + q\hat{k}) = \vec{0}$, then the value of p and q are
(a) $p = 6, q = 27$ (b) $p = 3, q = \frac{27}{2}$ (c) $p = 6, q = \frac{27}{2}$ (d) $p = 3, q = 27$
- Q02. The magnitude of projection of $(2\hat{i} - \hat{j} + \hat{k})$ on $(\hat{i} - 2\hat{j} + 2\hat{k})$ is
(a) 2 (b) 3 (c) 1 (d) 0
- Q03. Vector of magnitude 5 units and in the direction opposite to $2\hat{i} + 3\hat{j} - 6\hat{k}$ is
(a) $\frac{5}{7}(-2\hat{i} - 3\hat{j} - 6\hat{k})$ (b) $\frac{5}{7}(-2\hat{i} - 3\hat{j} + 6\hat{k})$ (c) $(-2\hat{i} - 3\hat{j} + 6\hat{k})$ (d) $\frac{1}{7}(-2\hat{i} - 3\hat{j} + 6\hat{k})$
- Q04. A unit vector in the direction opposite to $-\frac{3}{4}\hat{j}$ is
(a) \hat{j} (b) \hat{i} (c) \hat{k} (d) $\frac{3}{4}\hat{j}$
- Q05. Area (in Sq. units) of the triangle whose two sides are represented by the vectors $2\hat{i}$ and $-3\hat{j}$, is
(a) 1 (b) 2 (c) 3 (d) 4
- Q06. Angle between the unit vectors \hat{a} and \hat{b} , given that $|\hat{a} + \hat{b}| = 1$, is
(a) $\frac{5\pi}{6}$ (b) $\frac{2\pi}{3}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$
- Q07. If $\hat{i}, \hat{j}, \hat{k}$ are unit vectors along three mutually perpendicular directions, then
(a) $\hat{i} \cdot \hat{j} = 1$ (b) $\hat{i} \times \hat{j} = 1$ (c) $\hat{i} \cdot \hat{k} = 0$ (d) $\hat{i} \times \hat{k} = 0$
- Q08. ABCD is a rhombus whose diagonals intersect at E. Then $\vec{EA} + \vec{EB} + \vec{EC} + \vec{ED}$ equals
(a) $\vec{0}$ (b) \vec{AD} (c) $2\vec{BC}$ (d) $2\vec{AD}$
- Q09. If $\vec{a} \cdot \vec{b} = \frac{1}{2}|\vec{a}||\vec{b}|$, then the angle between \vec{a} and \vec{b} is
(a) 0° (b) 30° (c) 60° (d) 90°
- Q10. If \vec{a} is a non-zero vector, then $(\vec{a} \cdot \hat{i})\hat{i} + (\vec{a} \cdot \hat{j})\hat{j} + (\vec{a} \cdot \hat{k})\hat{k}$ equals
(a) $\vec{0}$ (b) $-\vec{a}$ (c) \vec{a} (d) $2\vec{a}$
- Q11. The projection of the vector $\hat{i} - \hat{j}$ on the vector $\hat{i} + \hat{j}$ is
(a) $\vec{0}$ (b) 1 (c) 2 (d) 0
- Q12. Let $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$. If \vec{b} is a vector such that $\vec{a} \cdot \vec{b} = |\vec{b}|^2$ and $|\vec{a} - \vec{b}| = \sqrt{7}$, then $|\vec{b}|$ equals
(a) 7 (b) 14 (c) $\sqrt{7}$ (d) 21
- Q13. The value of p for which $p(\hat{i} + \hat{j} + \hat{k})$ is a unit vector is
(a) 0 (b) $\frac{1}{\sqrt{3}}$ (c) 1 (d) $\sqrt{3}$
- Q14. The area of the parallelogram, whose diagonals are $2\hat{i}$ and $-3\hat{k}$, is _____ square units.
(a) 2 (b) 3 (c) 1 (d) $\sqrt{3}$
- Q15. The value of λ for which the vectors $2\hat{i} - \lambda\hat{j} + \hat{k}$ and $\hat{i} + 2\hat{j} - \hat{k}$ are orthogonal, is
(a) 1 (b) 2 (c) $\frac{1}{2}$ (d) $\sqrt{2}$
- Q16. If $|\vec{a}| = 4$ and $-3 \leq \lambda \leq 2$ then $|\lambda\vec{a}|$ lies in

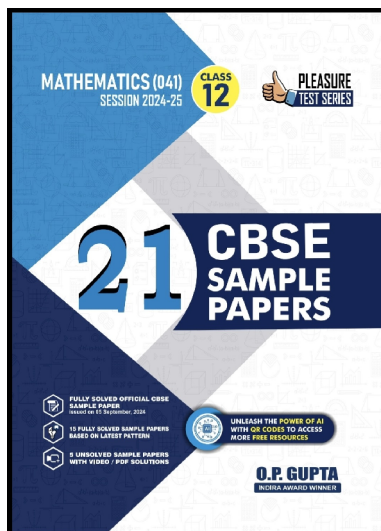
- (a) $[0,12]$ (b) $[2,3]$ (c) $[8,12]$ (d) $[-12,8]$
- Q17. The area of a triangle formed by vertices O, A and B, where $\vec{OA} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{OB} = -3\hat{i} - 2\hat{j} + \hat{k}$ is
 (a) $3\sqrt{5}$ sq. units (b) $5\sqrt{5}$ sq. units (c) $6\sqrt{5}$ sq. units (d) 4 sq. units
- Q18. The angle between the vectors $\hat{i} - \hat{j}$ and $\hat{j} - \hat{k}$ is
 (a) $-\frac{\pi}{3}$ (b) 0 (c) $\frac{\pi}{3}$ (d) $\frac{2\pi}{3}$
- Q19. If $|\vec{a}| = 3$, $|\vec{b}| = 4$ and $|\vec{a} \times \vec{b}| = 6$, then the value of $\vec{a} \cdot \vec{b}$ is
 (a) 12 (b) 6 (c) $3\sqrt{3}$ (d) $6\sqrt{3}$
- Q20. If the projection of $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ on $\vec{b} = 2\hat{i} + \lambda\hat{k}$ is zero, then the value of λ is
 (a) 0 (b) 1 (c) $\frac{-2}{3}$ (d) $\frac{-3}{2}$
- Q21. The position vectors of two points A and B are $\vec{OA} = 2\hat{i} - \hat{j} - \hat{k}$ and $\vec{OB} = 2\hat{i} - \hat{j} + 2\hat{k}$, respectively. The position vector of a point P which divides the line segment joining A and B in the ratio 2:1 is
 (a) $2\hat{i} - \hat{j} - \hat{k}$ (b) $2\hat{i} + \hat{j} - \hat{k}$ (c) $2\hat{i} - \hat{j} + \hat{k}$ (d) $\hat{i} - 2\hat{j} + \hat{k}$
- Q22. If $\vec{a} = \hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} + \hat{j} + \hat{k}$ and $|\vec{a} + \vec{b}| = |\vec{a}| + |\vec{b}|$, then the value of λ is
 (a) 1 (b) -1 (c) 2 (d) -2
- Q23. Write the projection of vector $\vec{r} = 3\hat{i} - 4\hat{j} + 12\hat{k}$ on (i) x-axis, and (ii) y-axis.
- Q24. If $\vec{a} = \alpha\hat{i} + 3\hat{j} - 6\hat{k}$ and $\vec{b} = 2\hat{i} - \hat{j} - \beta\hat{k}$, then find the value of α and β so that \vec{a} and \vec{b} may be collinear.
- Q25. Find the magnitude of vector \vec{a} given by $\vec{a} = (\hat{i} + 3\hat{j} - 2\hat{k}) \times (-\hat{i} + 3\hat{k})$.
- Q26. If \vec{a} , \vec{b} and \vec{c} are three mutually perpendicular unit vectors, find the value of $|\vec{a} + 2\vec{b} + 3\vec{c}|$.
- Q27. If the sides AB and BC of a parallelogram ABCD are represented as vectors $\vec{AB} = 2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\vec{BC} = \hat{i} + 2\hat{j} + 3\hat{k}$, then find the unit vector along diagonal AC.
- Q28. If $\vec{a} = 2\hat{i} - \hat{j} + 2\hat{k}$ and $\vec{b} = 5\hat{i} - 3\hat{j} - 4\hat{k}$, then find the ratio $\frac{\text{projection of vector } \vec{a} \text{ on vector } \vec{b}}{\text{projection of vector } \vec{b} \text{ on vector } \vec{a}}$.
- Q29. Let \hat{a} and \hat{b} be two unit vectors. If the vectors $\vec{c} = \hat{a} + 2\hat{b}$ and $\vec{d} = 5\hat{a} - 4\hat{b}$ are perpendicular to each other, then find the angle between the vectors \hat{a} and \hat{b} .
- Q30. Find the area of the parallelogram whose one side and a diagonal are represented by coinitial vectors $\hat{i} - \hat{j} + \hat{k}$ and $4\hat{i} + 5\hat{k}$ respectively.
- Q31. Find a unit vector perpendicular to each of the vectors \vec{a} and \vec{b} where $\vec{a} = 5\hat{i} + 6\hat{j} - 2\hat{k}$ and $\vec{b} = 7\hat{i} + 6\hat{j} + 2\hat{k}$.
- Q32. Find a vector \vec{r} equally inclined to the three axes and whose magnitude is $3\sqrt{3}$ units.
- Q33. Find the angle between unit vectors \vec{a} and \vec{b} so that $\sqrt{3}\vec{a} - \vec{b}$ is also a unit vector.
- Q34. Show that for any two non-zero vectors \vec{a} and \vec{b} ,

$|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$ iff \vec{a} and \vec{b} are perpendicular vectors.

- Q35. Show that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $3\hat{i} + 7\hat{j} + \hat{k}$ and $5\hat{i} + 6\hat{j} + 2\hat{k}$ form the sides of a right-angled triangle.
- Q36. If $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ and $|\vec{a}| = 3$, $|\vec{b}| = 5$, $|\vec{c}| = 7$ then, find the value of $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$.
- Q37. If $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{b} = 2\hat{i} + 4\hat{j} - 5\hat{k}$ represent two adjacent sides of a parallelogram, find unit vectors parallel to the diagonals of the parallelogram.
- Q38. Using vectors, find the area of the triangle with vertices A(1, 2, 3), B(2, -1, 4) and C(4, 5, -1).
- Q39. Find $|\vec{a}|$ and $|\vec{b}|$, if $|\vec{a}| = 2|\vec{b}|$ and $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b}) = 12$.
- Q40. If \hat{a} and \hat{b} are unit vectors inclined at an angle θ , then prove that $\sin \frac{\theta}{2} = \frac{1}{2} |\hat{a} - \hat{b}|$.
- Q41. Show that $|\vec{a}||\vec{b}| + |\vec{b}||\vec{a}|$ is perpendicular to $|\vec{a}||\vec{b}| - |\vec{b}||\vec{a}|$, for any two non-zero vectors \vec{a} and \vec{b} .

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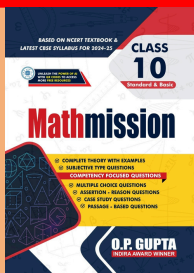
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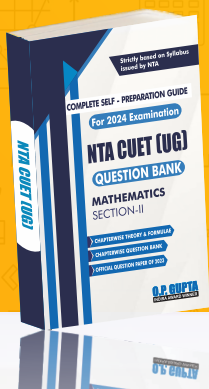


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