

By O.P. GUPTA

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$



# MULTIPLE CHOICE TYPE QUESTIONS

For CBSE 2026 Exams - Mathematics (041) - Class 12

Topics : Vector Algebra

Max. Marks : 30

☑ Select the correct option in the followings. Each question carries 1 mark.

- Q01. Given that  $|\vec{a}| = 3$  and  $-3 \leq \lambda \leq 2$ , then the range of  $|\lambda\vec{a}|$  is  
 (a)  $[0, 9]$  (b)  $[-9, 6]$  (c)  $[0, 3]$  (d)  $[0, 6]$
- Q02. If  $\theta$  is the angle between two vectors  $\vec{a}$  and  $\vec{b}$ , then  $\vec{a} \cdot \vec{b} \geq 0$  only when  
 (a)  $0 \leq \theta < \frac{\pi}{2}$  (b)  $0 \leq \theta \leq \pi$  (c)  $0 < \theta < \pi$  (d)  $0 \leq \theta \leq \frac{\pi}{2}$
- Q03. If  $\vec{a}$  is a non-zero vector of magnitude 'a' and  $\lambda$  is a non-zero scalar, then  $\lambda\vec{a}$  is unit vector if  
 (a)  $\lambda = 1$  (b)  $\lambda = -1$  (c)  $a = |\lambda|$  (d)  $a = \frac{1}{|\lambda|}$
- Q04. Let  $\vec{a}$  and  $\vec{b}$  be two unit vectors and  $\theta$  is the angle between them. Then  $\vec{a} + \vec{b}$  is a unit vector if  
 (a)  $\theta = \frac{\pi}{4}$  (b)  $\theta = \frac{\pi}{3}$  (c)  $\theta = \frac{\pi}{2}$  (d)  $\theta = \frac{2\pi}{3}$
- Q05. If  $\vec{a} \perp \vec{b}$  and  $\vec{a} \perp \vec{c}$ , then  
 (a)  $\vec{a} \parallel (\vec{b} \times \vec{c})$  (b)  $\vec{a} \perp (\vec{b} \times \vec{c})$  (c)  $\vec{b} \perp (\vec{a} \times \vec{c})$  (d)  $\vec{b} \parallel (\vec{a} \times \vec{c})$
- Q06. How many vectors of unit length perpendicular to the vectors  $\vec{a} = 2023\hat{i} - 2024\hat{j} + 2025\hat{k}$  and  $\vec{b} = 2024\hat{i} + 2025\hat{j} + 2026\hat{k}$  are possible?  
 (a) exactly one (b) exactly two (c) infinite (d) zero
- Q07. Let  $\theta$ ,  $\left(0 < \theta < \frac{\pi}{2}\right)$  be the angle between any two non-zero vectors  $\vec{a}$  and  $\vec{b}$ . Then  $\vec{a} \cdot \vec{b} = |\vec{a} \times \vec{b}|$  implies  
 (a)  $\theta = 0$  (b)  $\theta = \frac{\pi}{4}$  (c)  $\theta = \frac{\pi}{2}$  (d)  $\theta = \frac{\pi}{6}$
- Q08. If  $|\vec{a}| = 3$ ,  $|\vec{b}| = 4$  and  $|\vec{a} + \vec{b}| = 5$ , then  $|\vec{a} - \vec{b}|$  is equal to  
 (a) 6 (b) 5 (c) 4 (d) 3
- Q09. If  $\vec{a}$  and  $\vec{b}$  are two unit vectors such that  $\vec{a} + 2\vec{b}$  and  $5\vec{a} - 4\vec{b}$  are perpendicular to each other, then the angle between  $\vec{a}$  and  $\vec{b}$  is

- (a)  $45^\circ$                       (b)  $60^\circ$                       (c)  $\cos^{-1}\left(\frac{1}{3}\right)$                       (d)  $\cos^{-1}\left(\frac{2}{7}\right)$

Q10. If  $\vec{a} = 6\hat{i} + 3\hat{k} - 2\hat{j}$  then the vector component of  $\vec{a}$  in the direction of Y-axis is

- (a)  $2\hat{j}$                       (b)  $-2$                       (c)  $2$                       (d)  $-2\hat{j}$

Q11.  $|\hat{i} - \sqrt{2}\hat{j} + 3\hat{k}| =$

- (a)  $12$                       (b)  $\pm 2\sqrt{3}$                       (c)  $2\sqrt{3}$                       (d)  $3\sqrt{2}$

Q12. The position vector of the point which divides the join of points with position vectors  $2\vec{a} + 3\vec{b}$  and  $\vec{a} - 3\vec{b}$  in the ratio 1:1 is

- (a)  $\frac{\vec{a} + 2\vec{b}}{3}$                       (b)  $\vec{a}$                       (c)  $\frac{3\vec{a}}{2}$                       (d)  $\frac{4\vec{a} + \vec{b}}{2}$

Q13. The vector with initial point A(2, 0, -3) and terminal point B(3, 1, -2) is

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

Q14. The angle between the vectors  $\hat{i} - \hat{j}$  and  $\hat{j} + \hat{k}$  is

- (a)  $\frac{\pi}{3}$                       (b)  $\frac{2\pi}{3}$                       (c)  $-\frac{\pi}{3}$                       (d)  $\frac{5\pi}{6}$

Q15. The value of  $\left(\frac{\lambda}{8}\right)$  for which the two vectors  $2\hat{i} + \hat{j} + 2\hat{k}$  and  $3\hat{i} - \lambda\hat{j} + \hat{k}$  are perpendicular is

- (a)  $8$                       (b)  $4$                       (c)  $1$                       (d)  $6$

Q16. The area of the parallelogram whose adjacent sides are  $\hat{i} + \hat{k}$  and  $\hat{j} + \hat{k}$  is

- (a)  $\frac{\sqrt{3}}{2}$                       (b)  $\sqrt{3}$                       (c)  $2\sqrt{3}$                       (d)  $4$

Q17. If  $|\vec{a}| = 8$ ,  $|\vec{b}| = 3$  and  $\vec{a} \cdot \vec{b} = 12\sqrt{3}$ , then  $|\vec{a} \times \vec{b}| =$

- (a)  $6\sqrt{3}$                       (b)  $8\sqrt{3}$                       (c)  $12\sqrt{3}$                       (d)  $12$

Q18. If  $|\vec{a}| = 10$ ,  $|\vec{b}| = 2$  and  $|\vec{a} \times \vec{b}| = 16$ , then the value of  $\vec{a} \cdot \vec{b} =$

- (a)  $5$                       (b)  $10$                       (c)  $12$                       (d)  $16$

Q19. Two vectors  $\hat{j} + \hat{k}$  and  $3\hat{i} - \hat{j} + 4\hat{k}$  represent the two sides AB and AC, respectively of a  $\Delta ABC$ . The length of the median through A is

- (a)  $\frac{\sqrt{34}}{2}$                       (b)  $\frac{\sqrt{48}}{2}$                       (c)  $\sqrt{18}$                       (d)  $\sqrt{34}$

- Q20. The area of a parallelogram whose diagonals are  $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$  and  $\vec{b} = \hat{i} + 3\hat{j} - \hat{k}$ , is  $\frac{\sqrt{62}}{2}$  square units. Then  $|(2\hat{i} - \hat{j} + \hat{k}) \times (\hat{i} + 3\hat{j} - \hat{k})| =$
- (a)  $\frac{\sqrt{62}}{2}$                       (b)  $\frac{\sqrt{26}}{2}$                       (c)  $\frac{\sqrt{62}}{3}$                       (d)  $\sqrt{62}$
- Q21. If the scalar projection of  $\hat{i} - \lambda\hat{j} + \hat{k}$  on  $\hat{i} + 2\hat{j} + 2\hat{k}$  is 5, then  $\lambda =$
- (a)  $-6$                       (b)  $6$                       (c)  $2$                       (d)  $\sqrt{6}$
- Q22. A vector in the direction of the vector  $2\hat{i} - 2\hat{j} + \hat{k}$  that has magnitude 6 is
- (a)  $\frac{2\hat{i} - 2\hat{j} + \hat{k}}{3}$                       (b)  $2\hat{i} - 2\hat{j} + \hat{k}$                       (c)  $2(2\hat{i} - 2\hat{j} + \hat{k})$                       (d)  $3(2\hat{i} - 2\hat{j} + \hat{k})$
- Q23. The value of  $\lambda$  for which the vectors  $\hat{i} - 6\hat{j} + \hat{k}$  and  $2\hat{i} - 12\hat{j} + \lambda\hat{k}$  are parallel, is
- (a)  $\frac{1}{2}$                       (b)  $2$                       (c)  $\frac{3}{2}$                       (d)  $\frac{2}{3}$
- Q24. The vectors from origin to the points A and B are  $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$  and  $\vec{b} = 2\hat{i} - 3\hat{j} + \hat{k}$ , respectively, then the area of triangle OAB is
- (a)  $\sqrt{229}$                       (b)  $\sqrt{29}$                       (c)  $2\sqrt{229}$                       (d)  $\frac{1}{2}\sqrt{229}$
- Q25. If  $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ , then
- (a)  $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{c} \times \vec{a}$                       (b)  $\vec{a} \times \vec{b} = \vec{b} \times \vec{c} = \vec{a} \times \vec{c}$   
(c)  $\vec{a} \times \vec{b} = \vec{c} \times \vec{b} = \vec{c} \times \vec{a}$                       (d)  $\vec{a} \times \vec{b} = \vec{c} \times \vec{b} = \vec{a} \times \vec{c}$
- Q26. If  $\vec{a}, \vec{b}, \vec{c}$  are unit vectors such that  $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ , then the value of  $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$  is
- (a)  $1$                       (b)  $3$                       (c)  $-\frac{3}{2}$                       (d)  $\frac{3}{2}$
- Q27. Projection vector of  $\vec{a}$  on  $\vec{b}$  is
- (a)  $\left(\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|^2}\right)\vec{b}$                       (b)  $\frac{\vec{a} \cdot \vec{b}}{|\vec{b}|}$                       (c)  $\frac{\vec{a} \cdot \vec{b}}{|\vec{a}|}$                       (d)  $\left(\frac{\vec{a} \cdot \vec{b}}{|\vec{a}|^2}\right)\vec{b}$
- Q28. The value of  $k$  such that the points  $(-2, -10, 3)$ ,  $(1, k, 3)$  and  $(3, 5, 3)$  are collinear, is
- (a)  $-1$                       (b)  $1$                       (c)  $2$                       (d)  $-2$

Question numbers 29 and 30 are Assertion and Reason based questions. Two statements are given, one labelled **Assertion (A)** and the other labelled **Reason (R)**. Select the correct answer from the codes (a), (b), (c) and (d) as given below.

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).  
(b) Both Assertion (A) and Reason (R) are true and Reason (R) is **not** the correct explanation of Assertion (A).  
(c) Assertion (A) is true but Reason (R) is false.  
(d) Assertion (A) is false but Reason (R) is true.

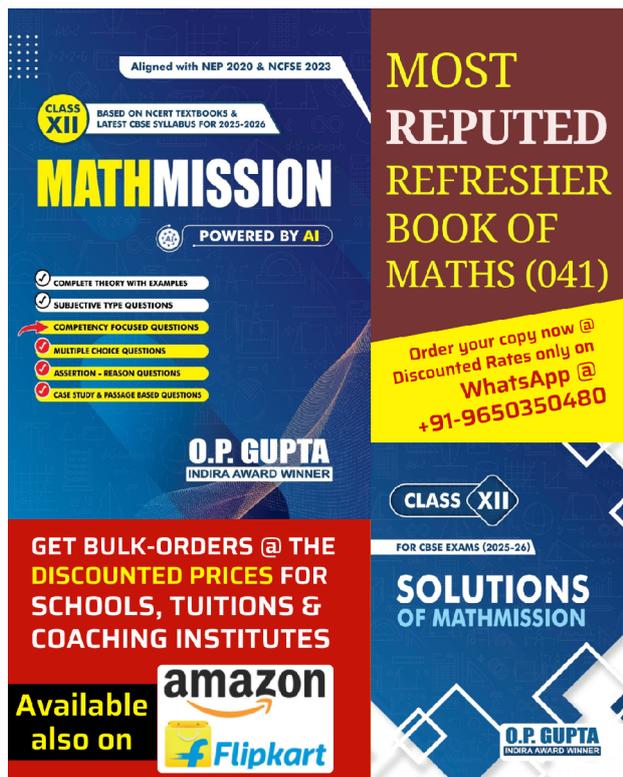
Q29. **Assertion (A)** : The unit vectors which are perpendicular to the vectors  $\hat{i} - \hat{j}$  and  $\hat{i} + \hat{j}$  are  $\pm \hat{k}$ .

**Reason (R)** : The unit vectors perpendicular to  $\vec{a}$  and  $\vec{b}$  are given by  $\pm \frac{\vec{a} \times \vec{b}}{|\vec{a} \times \vec{b}|}$ .

Q30. **Assertion (A)** : The magnitude of the vector  $7\hat{i} - 4\hat{j} - 4\hat{k}$  is 9.

**Reason (R)** : If  $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ , then the magnitude of  $\vec{r}$  can be obtained by  $x^2 + y^2 + z^2$ .

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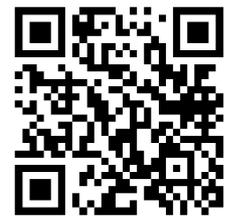
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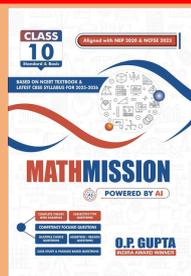
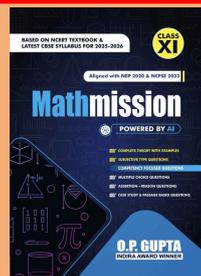
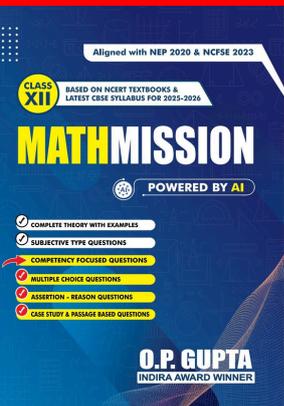
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