

VECTOR PRODUCT OF TWO VECTORS

PREVIOUS EAMCET BITS

1. Let $a_1\vec{i} + a_2\vec{j} + a_3\vec{k}$

[EAMCET 2007]

Assertion (A) : The identity $|\vec{a} \times \vec{i}|^2 + |\vec{a} \times \vec{j}|^2 + |\vec{a} \times \vec{k}|^2 = 2|\vec{a}|^2$ holds for \vec{a}

Reason (R) : $\vec{a} \times \vec{i} = a_3\vec{j} - a_2\vec{k}$, $\vec{a} \times \vec{j} = a_1\vec{k} - a_3\vec{i}$, $\vec{a} \times \vec{k} = a_2\vec{i} - a_1\vec{j}$

Which of the following is correct

- 1) Both A and R are true and R is the correct reason for A
- 2) Both A and R are true but R is not the correct reason for A
- 3) A is true, R is false
- 4) A is false, R is true

Ans: 1

Sol. $a_1\vec{i} = a_3\vec{j} - a_2\vec{k}$; $a_2\vec{j} = a_1\vec{k} - a_3\vec{i}$; $a_3\vec{k} = a_2\vec{i} - a_1\vec{j}$

\therefore R is true

$$|\vec{a}|^2 = a_1^2 + a_2^2 + a_3^2$$

$$|a_1\vec{i}|^2 + |a_2\vec{j}|^2 + |a_3\vec{k}|^2 = 2(a_1^2 + a_2^2 + a_3^2) = 2|\vec{a}|^2$$

2. If \vec{a} and \vec{b} are unit vectors, then the vector $(\vec{a} + \vec{b}) \times (\vec{a} \times \vec{b})$ is parallel to the vector

[EAMCET 2005]

- 1) $\vec{a} - \vec{b}$ 2) $\vec{a} + \vec{b}$ 3) $2\vec{a} - \vec{b}$ 4) $2\vec{a} + \vec{b}$

Ans: 2

Sol. By verification

$$(\vec{a} + \vec{b}) \times (\vec{a} \times \vec{b}) \cdot (\vec{a} + \vec{b}) = [\vec{a} + \vec{b} \quad \vec{a} \times \vec{b} \quad \vec{a} + \vec{b}] = 0$$

$$(\because [\vec{a} \quad \vec{b} \quad \vec{a}] = 0)$$

3. Let $\vec{a}, \vec{b}, \vec{c}$ be the position vectors of the vertices, A, B, C respectively of ΔABC . The vector area of ΔABC is

[EAMCET 2003]

1) $\frac{1}{2} \{ \vec{a} \times (\vec{b} \times \vec{c}) + \vec{b} \times (\vec{c} \times \vec{a}) + \vec{c} \times (\vec{a} \times \vec{b}) \}$ 2) $\frac{1}{2} \{ \vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a} \}$

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

$$4) \frac{1}{2} \{ (\vec{b} \cdot \vec{c}) \vec{a} + (\vec{c} \cdot \vec{a}) \vec{b} + (\vec{a} \cdot \vec{b}) \vec{c} \}$$

Ans: 2

$$\text{Sol. } \Delta = \frac{1}{2} (\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a})$$

4. If θ is the angle between \vec{a} and \vec{b} and $|\vec{a} \times \vec{b}| = |\vec{a} \cdot \vec{b}|$, then $\theta =$ [EAMCET 2001]

- 1) 0 2) π 3) $\frac{\pi}{2}$ 4) $\frac{\pi}{2}$

Ans: 4

$$\text{Sol. Given } |\vec{a} \times \vec{b}| = |\vec{a} \cdot \vec{b}|$$

$$\Rightarrow |\vec{a}| |\vec{b}| \sin \theta = |\vec{a}| |\vec{b}| \cos \theta$$

$$\tan \theta = 1 \Rightarrow \theta = \frac{\pi}{4}$$

5. If θ is the angle between the vectors $2\vec{i} - 2\vec{j} + 4\vec{k}$ and $3\vec{j} + \vec{j} + 2\vec{k}$, then $\sin \theta =$ [EAMCET 2000]

- 1) $\frac{2}{7}$ 2) $\frac{2}{\sqrt{7}}$ 3) $\frac{\sqrt{2}}{7}$ 4) $\sqrt{\frac{2}{7}}$

Ans: 2

$$\text{Sol. } \sin \theta = \frac{|\vec{a} \times \vec{b}|}{|\vec{a}| |\vec{b}|} = \frac{2}{\sqrt{7}}$$
