

Ex. 10.4

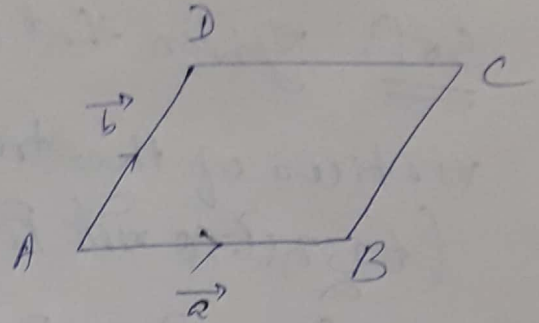
(45)

8. 10) ଏକ ସମାନ୍ତରାକାରର ଦୁଇ ସମ୍ପର୍କିତ ପାର $\vec{a} = i - j + 3k$
(କାର $\vec{b} = 2i - 7j + k$ ସେହି ଦୁଇର ସ୍ଥିର ଭାଗ,
ସମାନ୍ତରାକାରର କାମି ଉଲିଖନ ।

Solⁿ

ସମାନ୍ତରାକାରର କାମି
(area of the parallelogram)

$$= |\vec{a} \times \vec{b}|$$



Now,

$$\vec{a} \times \vec{b} = \begin{vmatrix} i & j & k \\ 1 & -1 & 3 \\ 2 & -7 & 1 \end{vmatrix}$$

$$= i(-1+21) - j(1-6) + k(-7+2)$$

$$= 20i + 5j - 5k$$

$$\therefore |\vec{a} \times \vec{b}| = \sqrt{20^2 + 5^2 + (-5)^2}$$

$$= \sqrt{(5 \times 4)^2 + 5^2 + 5^2}$$

$$= \sqrt{5^2(4^2 + 1 + 1)}$$

$$= 5\sqrt{18}$$

$$= 5 \times 3\sqrt{2} = 15\sqrt{2}$$

\therefore Required area = $15\sqrt{2}$ square unit.

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Ex. 10.4

11. \vec{a} and \vec{b} are two vectors such that $|\vec{a}| = 3, |\vec{b}| = \frac{\sqrt{2}}{3}$.

(The magnitude of $\vec{a} \times \vec{b}$ is equal to the magnitude of \vec{a} and \vec{b}).

Find the angle between \vec{a} and \vec{b} .

- (A) $\pi/6$
- (B) $\pi/4$
- (C) $\pi/3$
- (D) $\pi/2$

Solⁿ

$$\vec{a} \times \vec{b} = |\vec{a}| |\vec{b}| \sin \theta \hat{n}, \text{ where } \theta \text{ is the angle between } \vec{a} \text{ and } \vec{b}.$$

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

$$\Rightarrow 1 = 3 \times \frac{\sqrt{2}}{3} \sin \theta$$

$$\Rightarrow 1 = \sqrt{2} \sin \theta$$

$$\Rightarrow \sin \theta = \frac{1}{\sqrt{2}} = \sin \frac{\pi}{4}$$

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

Ans: (B) $\frac{\pi}{4}$

Q (12) The vectors A, B, C, D are given by

$$A = -i + \frac{1}{2}j + 4k, \quad B = i + \frac{1}{2}j + 4k, \quad C = i - \frac{1}{2}j + 4k$$

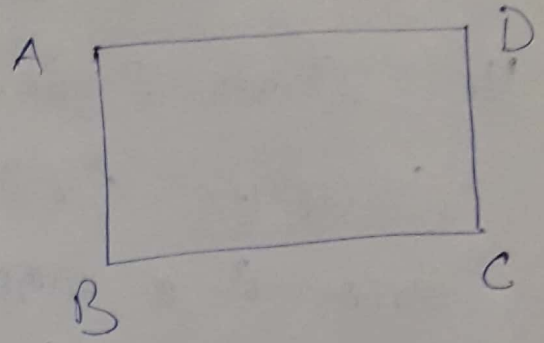
Find the value of $A \cdot B + B \cdot C + C \cdot A$.

- (A) $\frac{1}{2}$
- (B) 1
- (C) 2
- (D) 4

(47)

Solⁿ Area of the rectangle is

$$|\vec{BC} \times \vec{BA}|$$



Now,

$$\begin{aligned}\vec{BC} &= (\text{p.v. of } C) - (\text{p.v. of } B) \\ &= (i - \frac{1}{2}j + 4k) - (i + \frac{1}{2}j + 4k) \\ &= -j\end{aligned}$$

$$\begin{aligned}\vec{BA} &= (\text{p.v. of } A) - (\text{p.v. of } B) \\ &= (-i + \frac{1}{2}j + 4k) - (i + \frac{1}{2}j + 4k) \\ &= -2i\end{aligned}$$

$$\text{Now, } \vec{BC} \times \vec{BA} = (-j) \times (-2i) = -2(\hat{k}) = 2\hat{k}$$

$$\therefore |\vec{BC} \times \vec{BA}| = |2\hat{k}| = 2$$

Ans: (C) 2

