

# VECTORS

## 12<sup>th</sup> Math - Chapter 10

This is Problem-8 from Exercise 10.3

Find the magnitude of two vectors  $\vec{a}$  and  $\vec{b}$ , having the same magnitude and such that the angle between them is  $60^\circ$  and their scalar product is  $\frac{1}{2}$ .

**Solution:** Given

$$\mathbf{a}^\top \mathbf{b} = \frac{1}{2} \quad (1)$$

$$\|\mathbf{a}\| = \|\mathbf{b}\| \quad (2)$$

$$\theta = 60^\circ \quad (3)$$

$$\text{We know that} \quad (4)$$

$$\theta = \cos^{-1} \left( \frac{\mathbf{a}^\top \mathbf{b}}{\|\mathbf{a}\| \|\mathbf{b}\|} \right) \quad (5)$$

$$\|\mathbf{a}\| \|\mathbf{b}\| = \frac{\mathbf{a}^\top \mathbf{b}}{\cos \theta} \quad (6)$$

$$\|\mathbf{a}\|^2 = \frac{\frac{1}{2}}{\cos(60^\circ)} \quad (7)$$

$$= 1 \quad (8)$$

$$\Rightarrow \|\mathbf{a}\| = 1 \quad (9)$$

$$\Rightarrow \|\mathbf{b}\| = 1 \quad (10)$$