

Question 12: Let a , b and c be vectors with magnitudes 3, 4 and 5 respectively and $a + b + c = 0$, then the values of $a \cdot b + b \cdot c + c \cdot a$ is _____.

Date : _____

$$\vec{a} + \vec{b} + \vec{c} = 0$$

$$|\vec{a}|=3, |\vec{b}|=4, |\vec{c}|=5$$

$$\vec{a} + \vec{b} = -\vec{c}$$

$$|\vec{a} + \vec{b}|^2 = |-\vec{c}|^2$$

$$\vec{b} + \vec{c} = -\vec{a}$$

$$|\vec{b} + \vec{c}|^2 = a^2$$

$$b^2 + c^2 + 2\vec{b} \cdot \vec{c} = a^2$$

$$a^2 + b^2 + 2\vec{a} \cdot \vec{b} = c^2$$

$$2\vec{a} \cdot \vec{b} = 25 - 9 - 16$$

$$\vec{a} \cdot \vec{b} = 0$$

$$2\vec{b} \cdot \vec{c} = 9 - 25 - 16$$

$$\vec{b} \cdot \vec{c} = -16$$

$$\text{Hly } \vec{c} \cdot \vec{a} = -9$$

$$\begin{aligned} \therefore \vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a} &= 0 + (-16) - 9 \\ &= -25 \end{aligned}$$