Assignment 2

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Abstract—This PDF contains the solution for Assignment 2 (ICSE Class 12 Maths 2019 Q.15(a))

QUESTION:

If \overrightarrow{a} and \overrightarrow{b} are perpendicular vectors, $\left| \overrightarrow{a} + \overrightarrow{b} \right| = 13$ and $\left| \overrightarrow{a} \right| = 5$, find the value of $\left| \overrightarrow{b} \right|$.

Solution:

Given:

(i) \overrightarrow{a} and \overrightarrow{b} are perpendicular, $\theta = 90^{o}$ i.e.,

$$\overrightarrow{a} \cdot \overrightarrow{b} = |\overrightarrow{a}| |\overrightarrow{b}| \cos \theta.$$

$$\overrightarrow{a} \cdot \overrightarrow{b} = |\overrightarrow{a}| |\overrightarrow{b}| \cos 90^{\circ}.$$

$$\overrightarrow{a} \cdot \overrightarrow{b} = |\overrightarrow{a}| |\overrightarrow{b}| \times 0$$

$$\overrightarrow{a} \cdot \overrightarrow{b} = 0. \tag{1}$$

(ii)

$$|\overrightarrow{a}| = 5 \tag{2}$$

$$\left| \overrightarrow{a} + \overrightarrow{b} \right| = 13.$$
 (3)

Required:

(i) value of $\left| \overrightarrow{b} \right|$.

$$\left|\overrightarrow{a} + \overrightarrow{b}\right| = \sqrt{\left|\overrightarrow{a}\right|^2 + \left|\overrightarrow{b}\right|^2 + 2\left(\overrightarrow{a} \cdot \overrightarrow{b}\right)}$$
 (4)

by substituting (1), (2) and (3) in (4),

$$13 = \sqrt{5^2 + \left| \overrightarrow{b} \right|^2 + 0}$$

$$\left| \overrightarrow{b} \right| = \sqrt{13^2 - 5^2}.$$

$$\left| \overrightarrow{b} \right| = \sqrt{144}.$$

$$\left| \overrightarrow{b} \right| = 12.$$

Result:

 \therefore , value of $\left| \overrightarrow{b} \right| = 12$.