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, $\therefore \theta = 90^o$ i.e.,

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

$$\overrightarrow{a}\cdot\overrightarrow{b} = \left|\overrightarrow{a}\right|\left|\overrightarrow{b}\right|\cos 90^o.$$

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

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

(ii)

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

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

Required:

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

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

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.