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

Solution:

Given:

(i) $\mathbf{a}$ and $\mathbf{b}$ are perpendicular, $\therefore$ θ = 90^o
i.e.,

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

$$\mathbf{a}\cdot\mathbf{b} = \|\mathbf{a}\|\,\|\mathbf{b}\|\cos 90^o.$$

$$\mathbf{a}\cdot\mathbf{b} = \|\mathbf{a}\|\,\|\mathbf{b}\| \times 0$$

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

(ii)

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

$$\|\mathbf{a}+\mathbf{b}\| = 13. \tag{3}$$

Required:

(i) value of $\|\mathbf{b}\|$.

$$\|\mathbf{a}+\mathbf{b}\| = \sqrt{\|\mathbf{a}\|^2 + \|\mathbf{b}\|^2 + 2\,(\mathbf{a}\cdot\mathbf{b})} \tag{4}$$

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

$$13 = \sqrt{5^2 + \|\mathbf{b}\|^2 + 0}$$

$$\|\mathbf{b}\| = \sqrt{13^2 - 5^2}.$$

$$\|\mathbf{b}\| = \sqrt{144}.$$

$$\|\mathbf{b}\| = 12.$$

Result:

$\therefore$,value of $\|\mathbf{b}\|$ = 12.