

# Probability Assignment 2

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Question : Verify that

$$(\mathbf{A} - \mathbf{H})^\top (\mathbf{B} - \mathbf{C}) = 0 \quad (1)$$

**Solution:** Given that,

$$\mathbf{A} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} \quad \mathbf{C} = \begin{pmatrix} -3 \\ -5 \end{pmatrix} \quad (2)$$

From Problem 1.3.5 We know that, The point  $\mathbf{H}$  is

$$\mathbf{H} = \begin{pmatrix} \frac{17}{6} \\ \frac{-5}{6} \end{pmatrix} \quad (3)$$

From the values of  $\mathbf{A}, \mathbf{B}, \mathbf{C}$  and  $\mathbf{H}$ ,

$$\mathbf{A} - \mathbf{H} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} - \begin{pmatrix} \frac{17}{6} \\ \frac{-5}{6} \end{pmatrix} \quad (4)$$

$$= \begin{pmatrix} \frac{-11}{6} \\ \frac{-1}{6} \end{pmatrix} \quad (5)$$

$$\mathbf{B} - \mathbf{C} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} - \begin{pmatrix} -3 \\ -5 \end{pmatrix} \quad (6)$$

$$= \begin{pmatrix} -1 \\ 11 \end{pmatrix} \quad (7)$$

Evaluating the L.H.S of the (1), we get

$$(\mathbf{A} - \mathbf{H})^\top (\mathbf{B} - \mathbf{C}) = \begin{pmatrix} \frac{-11}{6} & \frac{-1}{6} \end{pmatrix} \begin{pmatrix} -1 \\ 11 \end{pmatrix} \quad (8)$$

$$= 0 \quad (9)$$

Hence verified that,

$$(\mathbf{A} - \mathbf{H})^\top (\mathbf{B} - \mathbf{C}) = 0 \quad (10)$$