

Assignment-4 (CBSE 12th Ex 23)

J Sai Sri Hari Vamshi
AI21BTECH11014

May 20, 2022

L^AT_EX

Contents

1 Question

2 Solution

Question

A bag contains 2 white and 1 red balls. One ball is drawn at random and then put back into the box after noting its colour. The process is repeated again. If X denotes the number of red balls recorded in the two draws, describe X .

Solution

Let the balls in the bag be denoted by w_1, w_2 and r as the two white balls are not identical. Then the sample space is:

$$S = \{w_1 w_1, w_1 w_2, w_2 w_2, w_2 w_1, w_1 r, w_2 r, r w_1, r w_2, r r\}$$

Let ω be an element of the sample space. i.e.,

$$\omega \in S$$

Solution

Given that X denotes the number of red balls, then

$$X(\omega) = \text{No. of red balls in } \omega$$

Therefore,

$$\begin{aligned} X(\{w_1 w_1\}) &= X(\{w_1 w_2\}) = X(\{w_2 w_1\}) = X(\{w_2 w_2\}) = 0 \\ X(\{r w_1\}) &= X(\{r w_2\}) = X(\{w_1 r\}) = X(\{w_2 r\}) = 1 \\ X(\{r r\}) &= 2 \end{aligned}$$

Thus X is a random variable with values 0, 1 and 2.

Solution

The PMF is given by,

$$P_X(k) = \begin{cases} \frac{4}{9}, & k = 0 \\ \frac{4}{9}, & k = 1 \\ \frac{1}{9}, & k = 2 \end{cases}$$

The CDF can be obtained from PMF by,

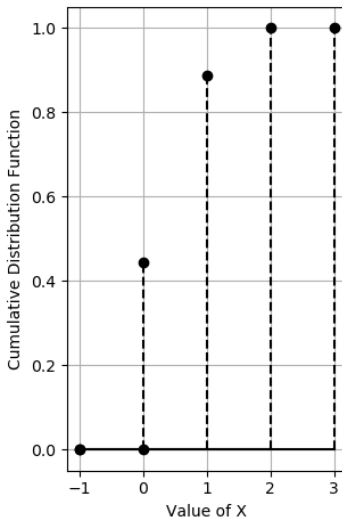
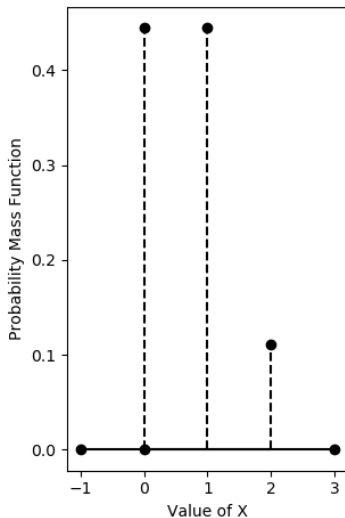
$$F_X(k) = \sum_{i=0}^{i=k} P_X(i)$$

The CDF can be obtained as,

$$F_X(k) = \begin{cases} \frac{4}{9}, & k = 0 \\ \frac{8}{9}, & k = 1 \\ 1, & k = 2 \end{cases}$$

Solution

The PMF and CDF Graphs are below,



The End