Assignment-4
(CBSE 12th Ex 23)

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Contents

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,

$$X(\{w_1 w_1\}) = X(\{w_1 w_2\}) = X(\{w_2 w_1\}) = X(\{w_2 w_2\}) = 0$$
$$X(\{r\ w_1\}) = X(\{r\ w_2\}) = X(\{w_1\ r\}) = X(\{w_2\ r\}) = 1$$
$$X(\{r\ r\}) = 2$$

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,

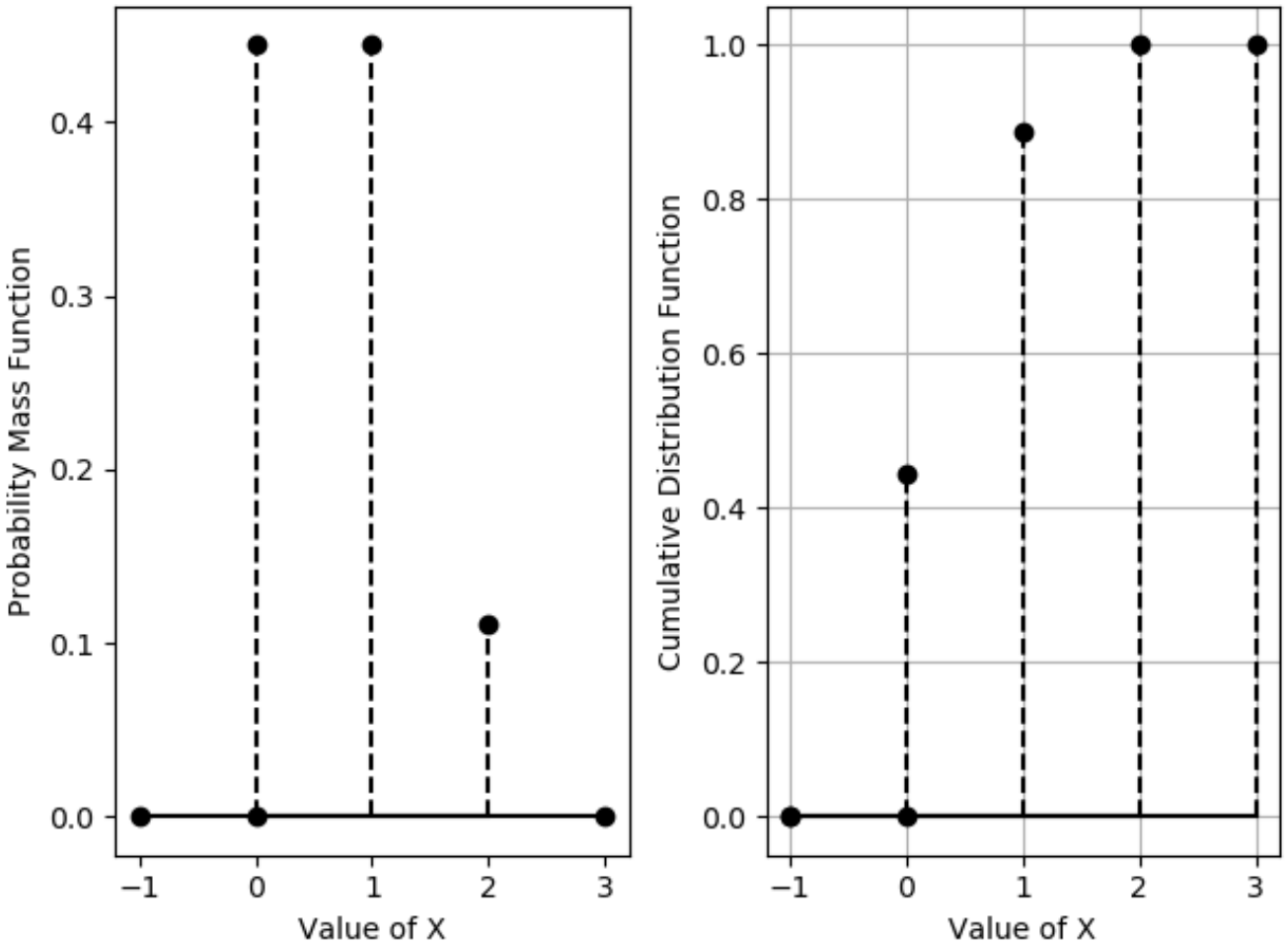
$$F_X(k) = \sum_{i=0}^{i=k} P_X(i)$$

The CDF can be obtaines 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,



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