

# Assignment-4

## (CBSE 12th Ex 16.3)

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### example 23:

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:

$$S = \{w_1w_1, w_1w_2, w_2w_2, w_2w_1, w_1r, w_2r, rw_1, rw_2, rr\}$$

Let  $\omega$  be an element of the sample space. i.e.,

$$\omega \in S$$

Given that  $X$  denotes the number of red balls, then

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

Therefore,

$$X(\{w_1w_1\}) = X(\{w_1w_2\}) = 0$$

$$X(\{w_2w_1\}) = X(\{w_2w_2\}) = 0$$

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

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

$$X(\{r r\}) = 2$$

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

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,

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

The PMF and CDF Graphs are below,

