Assignment 4
Probability and random Variables

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Outline

Question

CBSE class 12 Example 24

Two cards are drawn successively with replacement from a well shuffled deck of 52 cards.Find the probability distribution of the number of aces.

Solution

The number of aces is a random variable.Let it be denoted by $\mathbf{X}$. Clearly $\mathbf{X} \in \{0, 1, 2\}$
Now since the draws are done with replacement, the two draws form independent events.

$$
\begin{aligned}
\mathrm{P}\{\mathbf{X=0}\} &= \mathrm{P}\{\text{non ace and non ace}\} \\
&= \frac{48}{52} \times \frac{48}{52} \\
&= \frac{144}{169} \qquad (1) \\
\mathrm{P}\{\mathbf{X=1}\} &= \mathrm{P}\{\text{ace and non ace or non ace and ace}\} \\
&= \frac{4}{52} \times \frac{48}{52} + \frac{48}{52} \times \frac{4}{52} \\
&= \frac{24}{169} \qquad (2) \\
\mathrm{P}\{\mathbf{X=2}\} &= \mathrm{P}\{\text{ace and ace}\} \\
&= \frac{4}{52} \times \frac{4}{52} \\
&= \frac{1}{169} \qquad (3)
\end{aligned}
$$

Table

Thus from (1), (2), (3) the required probability distribution is:

$\mathbf{X}$	0	1	2
$\mathbf{P\{X\}}$	$\frac{144}{169}$	$\frac{24}{169}$	$\frac{1}{169}$

plot (PMF)

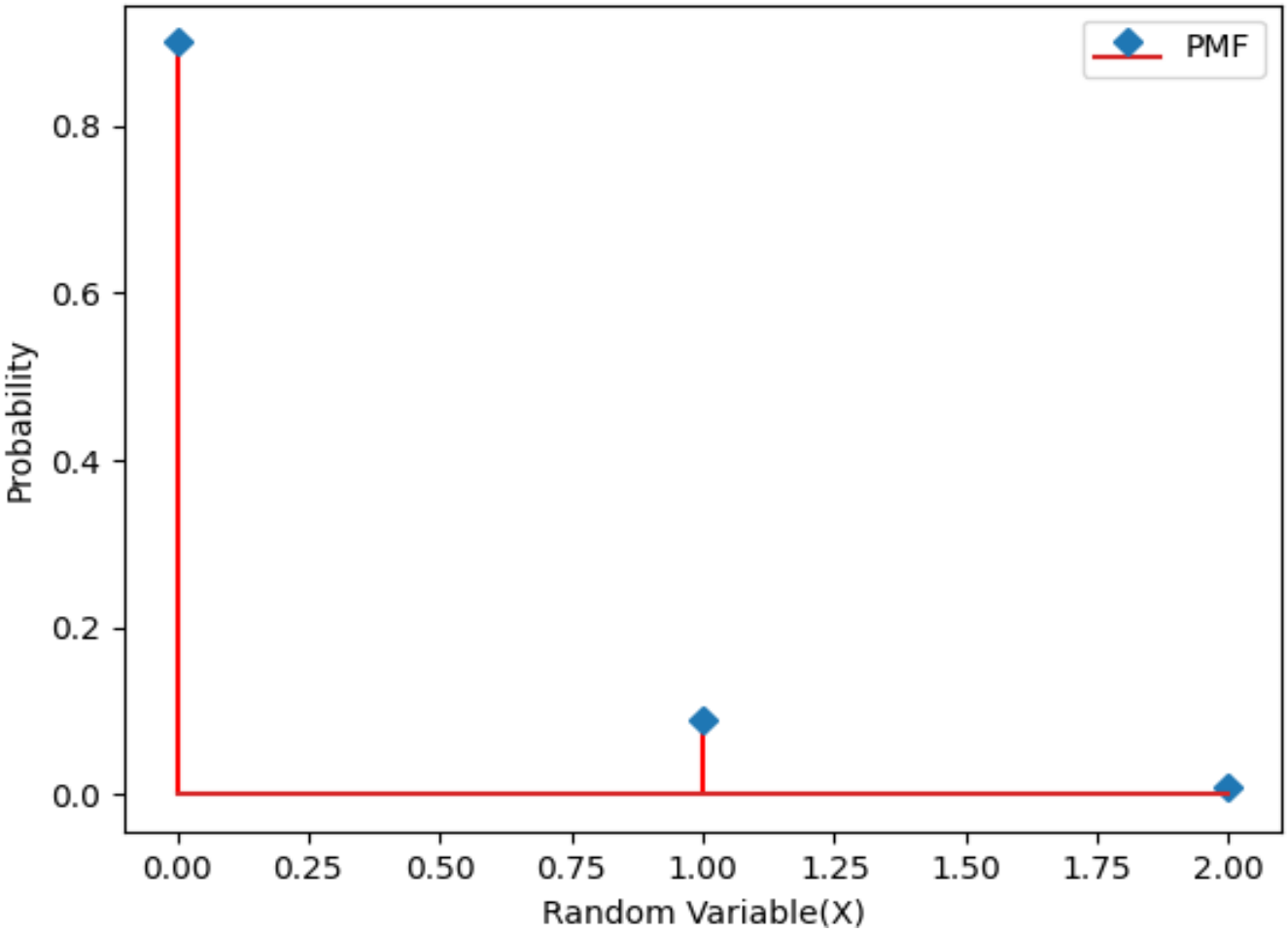

Figure: PMF of distribution

plot (CDF)

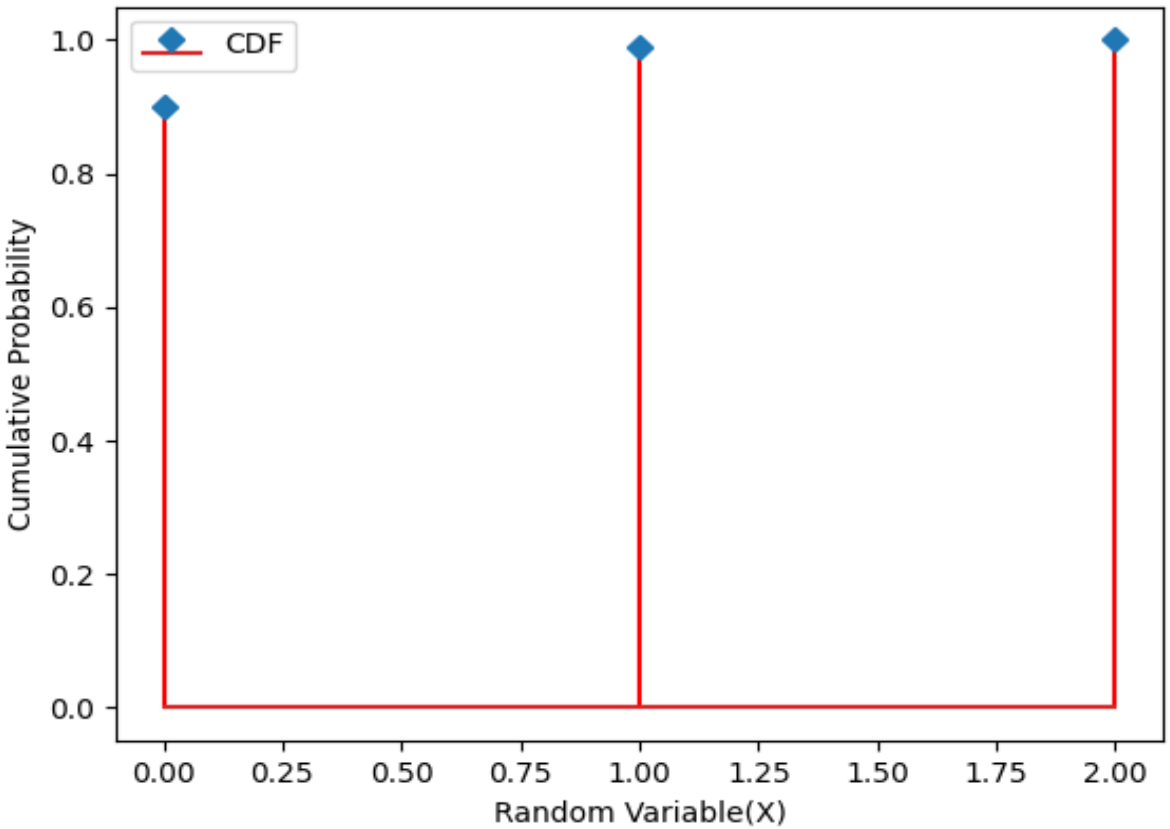

Figure: CDF of distribution