Assignment 4

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***Abstract*—This document contains the solution to Question 4 of exercise 16.3 of Chapter 16 (Probability) in the NCERT Class 11 Textbook.**

Probability Excercise 16.3 Q4.
A card is selected from a pack of 52 cards.

(i) How many points are there in the sample space?
(ii) Calculate the probability that the card is an ace of spades.
(iii) Calculate the probability that the card is an ace.
(iv) Calculate the probability that the card is black.

Solution: Let $X \in \{0, 1, 2\}$ is a random variable that denotes outcome of the experiment, where $X = 0$ denotes occurrence of an ace card of spades, $X = 1$ denotes occurrence of an ace card, $X = 2$ denotes occurrence of a black card.

1) Total number of points in sample space

$$n(S) = 52 \tag{1}$$

In PMF approach :

$$\Pr(X = r) = \binom{n}{r} \times p^r \times (1-p)^{n-r} \tag{2}$$

2) Probability that the card is an ace of spades, for this $n = 1, r = 1, p = \frac{1}{52}$

$$\Pr(X = 0) = \binom{1}{1} \times (\frac{1}{52})^1 \times (1 - \frac{1}{52})^{1-1} \tag{3}$$

$$= \frac{1}{52} \tag{4}$$

3) Probability that the card is an ace card, for this $n = 1, r = 1, p = \frac{4}{52}$

$$\Pr(X = 1) = \binom{1}{1} \times (\frac{4}{52})^1 \times (1 - \frac{4}{52})^{1-1} \tag{5}$$

$$= \frac{1}{13} \tag{6}$$

4) Probability that the card is black, for this $n = 1, r = 1, p = \frac{26}{52}$

$$\Pr(X = 2) = \binom{1}{1} \times (\frac{26}{52})^1 \times (1 - \frac{26}{52})^{1-1} \tag{7}$$

$$= \frac{1}{2} \tag{8}$$

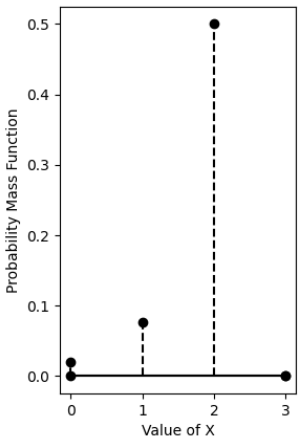

Fig. 1: Plot of the PMF