Assignment 2

Gautham Bellamkonda - CS20BTECH11017

Download all python codes from

https://github.com/GauthamBellamkonda/AI1103/tree/main/Assignment2/Codes

and latex-tikz codes from

https://github.com/GauthamBellamkonda/AI1103/tree/main/Assignment2

1 Problem

(Prob, 5.24) One card is drawn from a well-shuffled deck of 52 cards. Calculate the probability that the card will

(i) be an ace.
(ii) not be an ace.

2 Solution

For convinience, let's denote the cards Ace, J, Q, K by the numbers $\{1, 11, 12, 13\}$ respectively. Let $X \in \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13\}$ denote the outcome of the experiment. We know that there exist exactly 4 cards with a particular number in a deck of 52 cards.

$$\therefore n(X = i) = 4\ ,\ i \in \{1, 2, 3, \ldots 12, 13\} \tag{2.0.1}$$

Assuming that the deck of cards is well-shuffled, the probability mass function for this experiment is expressed as

$$\Pr(X = i) = \begin{cases} \frac{4}{52} = \frac{1}{13} & 1 \le i \le 13,\ i \in \mathbb{N} \\ 0 & \text{otherwise} \end{cases} \tag{2.0.2}$$

(i) Hence, the probability of getting an Ace is

$$\Pr(X = 1) = \frac{1}{13} \tag{2.0.3}$$

(ii) Hence, the probability of not getting an Ace is

$$\Pr(X \neq 1) = \sum_{i=2}^{13} \Pr(X = i) \tag{2.0.4}$$

$$= 1 - \Pr(X = 1) \tag{2.0.5}$$

$$= 1 - \frac{1}{13} \tag{2.0.6}$$

$$= \frac{12}{13} \tag{2.0.7}$$