Assignment 3
AI1110: Probability and Random Variables
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Question 10.15.1.14 : One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting

1) a king of red colour

2) a face card

3) a red face card

4) the jack of hearts

5) a spade

6) the queen of diamonds
   Solution:

Let X be a Random Variable denoting the Color of the card.

EVENT	DESCRIPTION
X=0	Event of Card be a Black Card.
X=1	Event of Card be a Red Card.

TABLE 1

Let Y be a Random Variable denoting the Type of the card.

EVENT	DESCRIPTION
Y=0	Event of Card picked be a Club.
Y=1	Event of Card picked be a Spade.
Y=2	Event of the card picked be a Heart.
Y=3	Event of the card picked be a Diamond.

TABLE 2

Let Z be a Random Variable denoting the Value of the card.

EVENT	DESCRIPTION
Z=0	Event of the card picked be an Ace[A] .
Z=1	Event of the card picked be a 2.
Z=2	Event of the card picked be a 3.
Z=3	Event of the card picked be a 4.
Z=4	Event of the card picked be a 5.
Z=5	Event of the card picked be a 6.
Z=6	Event of the card picked be a 7.
Z=7	Event of the card picked be a 8.
Z=8	Event of the card picked be a 9.
Z=9	Event of the card picked be a 10.
Z=10	Event of the card picked be a Jack[J].
Z=11	Event of the card picked be a Queen[Q].
Z=12	Event of the card picked be a King[K].

TABLE 3

$$\text{Total number of cards } = 52 \tag{1}$$

$$n(S) = 52 \tag{2}$$

$$\Pr(E) = \frac{n(E)}{n(S)} \tag{3}$$

a) Total number of kings of red colour = 2

$$\Pr((X = 1), (Z = 12)) = \frac{n((X = 1), (Z = 12))}{n(S)} \tag{4}$$

$$\Pr((X = 1), (Z = 12)) = \frac{2}{52} = 0.038 \tag{5}$$

$$\therefore \Pr((X = 1), (Z = 12)) = 0.038 \tag{6}$$

b) Number of cards that are face cards = 12

$$\Pr(((Z = 12) + (Z = 11) + (Z = 10) + (Z = 1))) = \frac{n(((Z = 12) + (Z = 11) + (Z = 10) + (Z = 1)))}{n(S)} \tag{7}$$

$$\Pr(((Z = 12) + (Z = 11) + (Z = 10) + (Z = 1))) = \frac{12}{52} = 0.23 \tag{8}$$

$$\therefore \Pr(((Z = 12) + (Z = 11) + (Z = 10) + (Z = 1))) = 0.23 \tag{9}$$

c) Number of cards that are red face cards = 6

$$\Pr((X = 1), ((Z = 12) + (Z = 11) + (Z = 10) + (Z = 1))) = \frac{n((X = 1), ((Z = 12) + (Z = 11) + (Z = 10) + (Z}{n(S)} \tag{10}$$

$$\Pr((X = 1), ((Z = 12) + (Z = 11) + (Z = 10) + (Z = 1))) = \frac{6}{52} = 0.11 \tag{11}$$

$$\therefore \Pr((X = 1), ((Z = 12) + (Z = 11) + (Z = 10) + (Z = 1))) = 0.11 \tag{12}$$

d) Number of cards that are jack of hearts = 1

$$\Pr\left((Z = 10), (Y = 2)\right) = \frac{n((Z = 10), (Y = 2))}{n(S)} \tag{13}$$

$$\Pr\left((Z = 10), (Y = 2)\right) = \frac{1}{52} = 0.019 \tag{14}$$

$$\therefore \Pr\left((Z = 10), (Y = 2)\right) = 0.019 \tag{15}$$

e) Number of cards that are spade = 13

$$\Pr\left(Y = 1\right) = \frac{n(Y = 1)}{n(S)} \tag{16}$$

$$\Pr\left(Y = 1\right) = \frac{13}{52} = 0.25 \tag{17}$$

$$\therefore \Pr\left(Y = 1\right) = 0.25 \tag{18}$$

f) Number of cards that are queens of diamonds = 1

$$\Pr\left((Z = 11), (Y = 3)\right) = \frac{n((Z = 11), (Y = 3))}{n(S)} \tag{19}$$

$$\Pr\left((Z = 11), (Y = 3)\right) = \frac{1}{52} = 0.019 \tag{20}$$

$$\therefore \Pr\left((Z = 11), (Y = 3)\right) = 0.019 \tag{21}$$