

# 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:**

VARIABLE	RANGE	DESCRIPTION
X	{0,1}	The Random variable denoting the Color of the card.
Y	{0,1,2,3}	The Random variable denoting the Type of the card.
Z	{0,1,2,3,4,5,6,7,8,9,10,11,12}	The Random variable denoting the Value of the card.

TABLE 1

$$\text{Total number of cards} = 52 \quad (1)$$

$$n(S) = 52 \quad (2)$$

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

a) Total number of kings of red colour = 2

$$\Pr(\text{A King of Red colour}) = \Pr((X = 1), (Z = 12)) \quad (4)$$

$$= \frac{n((X = 1), (Z = 12))}{n(S)} \quad (5)$$

$$= \frac{2}{52} = 0.038 \quad (6)$$

$$\therefore \Pr((X = 1), (Z = 12)) = 0.038 \quad (7)$$

b) Number of cards that are face cards = 12

$$\Pr(\text{A Face card}) = \Pr((Z=12)+(Z=11)+(Z=10)+(Z=1)) \quad (8)$$

$$= \frac{n(Z=12)+n(Z=11)+n(Z=10)+n(Z=1)}{n(S)} \quad (9)$$

$$= \frac{12}{52} = 0.23 \quad (10)$$

$$\therefore \Pr((Z=12)+(Z=11)+(Z=10)+(Z=1)) = 0.23 \quad (11)$$

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

$$\Pr(\text{A Red Face card}) = \Pr((X=1),((Z=12)+(Z=11)+(Z=10)+(Z=1))) \quad (12)$$

$$= \frac{n((X=1),((Z=12)+(Z=11)+(Z=10)+(Z=1)))}{n(S)} \quad (13)$$

$$= \frac{6}{52} = 0.11 \quad (14)$$

$$\therefore \Pr((X=1),((Z=12)+(Z=11)+(Z=10)+(Z=1))) = 0.11 \quad (15)$$

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

$$\Pr(\text{The Jack of Hearts}) = \Pr((Z=10),(Y=2)) \quad (16)$$

$$= \frac{n((Z=10),(Y=2))}{n(S)} \quad (17)$$

$$= \frac{1}{52} = 0.019 \quad (18)$$

$$\therefore \Pr((Z=10),(Y=2)) = 0.019 \quad (19)$$

e) Number of cards that are spade = 13

$$\Pr(\text{A Spade}) = \Pr(Y=1) \quad (20)$$

$$= \frac{n(Y=1)}{n(S)} \quad (21)$$

$$= \frac{13}{52} = 0.25 \quad (22)$$

$$\therefore \Pr(Y=1) = 0.25 \quad (23)$$

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

$$\Pr(\text{The Queen of Diamonds}) = \Pr((Z=11),(Y=3)) \quad (24)$$

$$= \frac{n((Z=11),(Y=3))}{n(S)} \quad (25)$$

$$= \frac{1}{52} = 0.019 \quad (26)$$

$$\therefore \Pr((Z=11),(Y=3)) = 0.019 \quad (27)$$