Assignment-4

AI1110: Probability And Random Variables
IIT Hyderabad

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I. PROBLEM-CBSE-12TH EXERCISE 13.1

Q-11 A fair die is rolled. Consider events E = {1,3,5}, F={2,3} and G = {2,3,4,5}. Find F={2,3} and G = {2,3,4,5}. Find
(i) $P(E/F) and P(F/E)$
(ii) $P(E/G) and P(G/E)$
(iii) $P((E \cup F)/G) and P((E \cap F)/G)$

Solution:-

(i) Given:

$$E = \{1,3,5\}\ P(E) = \frac{3}{6} = \frac{1}{2} \quad (1)$$

$$F = \{2,3\}\ P(F) = \frac{2}{6} = \frac{1}{3} \quad (2)$$

$$G = \{2,3,4,5\}\ P(G) = \frac{4}{6} = \frac{2}{3} \quad (3)$$

$$\implies E \cap F = \{3\} \quad (4)$$

$$\implies P(E \cap F) = \frac{1}{6} \quad (5)$$

Now,

$$P(E/F) = \frac{P(E \cap F)}{P(F)} \quad (6)$$

$$= \frac{1}{6} \times \frac{3}{1} \quad (7)$$

$$= \frac{1}{2} \quad (8)$$

And

$$P(F/E) = \frac{P(F \cap E)}{P(E)} \quad (9)$$

$$= \frac{P(E \cap F)}{P(E)} \quad (10)$$

$$= \frac{1}{6} \times \frac{2}{1} \quad (11)$$

$$= \frac{1}{3} \quad (12)$$

(ii) $E \cap G = \{3,5\}$ (13)

$$\implies P(E \cap G) = \frac{1}{3} \quad (14)$$

Now,

$$P(E/G) = \frac{P(E \cap G)}{P(G)} \quad (15)$$

$$= \frac{1}{3} \times \frac{3}{2} \quad (16)$$

$$= \frac{1}{2} \quad (17)$$

And

$$P(G/E) = \frac{P(G \cap E)}{P(E)} \quad (18)$$

$$= \frac{P(E \cap G)}{P(E)} \quad (19)$$

$$= \frac{1}{3} \times \frac{2}{1} \quad (20)$$

$$= \frac{2}{3} \quad (21)$$

(iii) $Let E \cup F = A$ (22)

So,

$$A = \{1, 2, 3, 5\} \tag{23}$$

$$P(A) = \frac{4}{6} \tag{24}$$

$$\implies A \cap G = \{2, 3, 5\} \tag{25}$$

So,

$$P(A \cap G) = \frac{3}{6} \tag{26}$$

$$P(A/G) = \frac{P(A \cap G)}{P(G)} \tag{27}$$

$$\implies P((E \cup F)/G) = \frac{3}{4} \tag{28}$$

And
Let

$$E \cap F = B \tag{29}$$

So,

$$B = \{3\} \tag{30}$$

$$P(B) = \frac{1}{6} \tag{31}$$

$$\implies B \cap G = \{3\} \tag{32}$$

$$So, P(B \cap G) = \frac{1}{6} \tag{33}$$

$$P(B/G) = \frac{P(B \cap G)}{P(G)} \tag{34}$$

$$= \frac{1}{4} \tag{35}$$

$$\implies P((E \cap F)/G) = \frac{1}{4} \tag{36}$$