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) $P((E+F)/G) and P((EF)/G)$

Solution:-

(i) Given:

$$E = \{1,3,5\}\ P(E) = \frac{3}{6} = \frac{1}{2} \tag{1}$$
$$F = \{2,3\}\ P(F) = \frac{2}{6} = \frac{1}{3} \tag{2}$$
$$G = \{2,3,4,5\}\ P(G) = \frac{4}{6} = \frac{2}{3} \tag{3}$$
$$\implies EF = \{3\} \tag{4}$$
$$\implies P(EF) = \frac{1}{6} \tag{5}$$

Now,

$$P(E/F) = \frac{P(EF)}{P(F)} \tag{6}$$
$$= \frac{1}{6} \times \frac{3}{1} \tag{7}$$
$$= \frac{1}{2} \tag{8}$$

And

$$P(F/E) = \frac{P(FE)}{P(E)} \tag{9}$$
$$= \frac{P(EF)}{P(E)} \tag{10}$$
$$= \frac{1}{6} \times \frac{2}{1} \tag{11}$$
$$= \frac{1}{3} \tag{12}$$

(ii) $EG = \{3,5\}$ (13)

$$\implies P(EG) = \frac{1}{3} \tag{14}$$

Now,

$$P(E/G) = \frac{P(EG)}{P(G)} \tag{15}$$
$$= \frac{1}{3} \times \frac{3}{2} \tag{16}$$
$$= \frac{1}{2} \tag{17}$$

And

$$P(G/E) = \frac{P(GE)}{P(E)} \tag{18}$$
$$= \frac{P(EG)}{P(E)} \tag{19}$$
$$= \frac{1}{3} \times \frac{2}{1} \tag{20}$$
$$= \frac{2}{3} \tag{21}$$

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

So,

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

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

$$\implies AG = \{2, 3, 5\} \tag{25}$$

So,

$$P(AG) = \frac{3}{6} \tag{26}$$

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

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

And
Let

$$EF = B \tag{29}$$

So,

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

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

$$\implies BG = \{3\} \tag{32}$$

$$So, P(BG) = \frac{1}{6} \tag{33}$$

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

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

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