

Assignment-4

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May 7, 2022

Question

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

- (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:

$$\text{Sample space } S = \{1, 2, 3, 4, 5, 6\} \quad (1)$$

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

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

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

$$\implies EF = \{3\} \quad (5)$$

$$\implies P(EF) = \frac{1}{6} \quad (6)$$

Now,

$$P(E/F) = \frac{P(EF)}{P(F)} \quad (7)$$

$$= \frac{1}{6} \times \frac{3}{1} \quad (8)$$

$$= \frac{1}{2} \quad (9)$$

And

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

$$= \frac{P(EF)}{P(E)} \quad (11)$$

$$= \frac{1}{6} \times \frac{2}{1} \quad (12)$$

$$= \frac{1}{3} \quad (13)$$

$$(ii) \quad EG = \{3, 5\} \quad (14)$$

$$\implies P(EG) = \frac{1}{3} \quad (15)$$

Now,

$$P(E/G) = \frac{P(EG)}{P(G)} \quad (16)$$

$$= \frac{1}{3} \times \frac{3}{2} \quad (17)$$

$$= \frac{1}{2} \quad (18)$$

And

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

$$= \frac{P(EG)}{P(E)} \quad (20)$$

$$= \frac{1}{3} \times \frac{2}{1} \quad (21)$$

$$= \frac{2}{3} \quad (22)$$

$$(iii) \text{ Let } E + F = A \quad (23)$$

So,

$$A = \{1, 2, 3, 5\} \quad (24)$$

$$P(A) = \frac{4}{6} \quad (25)$$

$$\Rightarrow AG = \{2, 3, 5\} \quad (26)$$

So,

$$P(AG) = \frac{3}{6} \quad (27)$$

$$P(A/G) = \frac{P(AG)}{P(G)} \quad (28)$$

$$\Rightarrow P((E + F)/G) = \frac{3}{4} \quad (29)$$

And

Let

$$EF = B \quad (30)$$

So,

$$B = \{3\} \quad (31)$$

$$P(B) = \frac{1}{6} \quad (32)$$

$$\implies BG = \{3\} \quad (33)$$

$$\text{So, } P(BG) = \frac{1}{6} \quad (34)$$

$$P(B/G) = \frac{P(BG)}{P(G)} \quad (35)$$

$$= \frac{1}{4} \quad (36)$$

$$\implies P((EF)/G) = \frac{1}{4} \quad (37)$$