AI-1110 Assignment-1

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12.13.1.11 Question: A fair die is rolled. Consider events E = {1,3,5}, F = {2,3} and G = {2,3,4,5} Find

1) $\Pr(E|F)$ and $\Pr(F|E)$
2) $\Pr(E|G)$ and $\Pr(G|E)$
3) $\Pr((E+F)|G)$ and $\Pr((EF)|G)$

Solution: Sample space when a die is rolled = {1,2,3,4,5,6}.

E = {1,3,5}	Pr(E) = 1/2
F = {2,3}	Pr(F) = 1/3
G = {2,3,4,5}	Pr(G) = 2/3
EF = {3}	Pr(EF) = 1/6
FG = {2,3}	Pr(FG) = 1/3
EG = {3,5}	Pr(EG) = 1/3
(EF)G = {3}	Pr((EF)G) = 1/6

TABLE 3: From given data

1)

$$\Pr(E|F) = \frac{\Pr(EF)}{\Pr(F)} \tag{1}$$

table 3,

$$\Pr(E|F) = \frac{1/6}{1/3} \tag{2}$$

$$\Pr(E|F) = 1/2 \tag{3}$$

2)

$$\Pr(F|E) = \frac{\Pr(EF)}{\Pr(E)} \tag{4}$$

table 3,

$$\Pr(F|E) = \frac{1/6}{1/2} \tag{5}$$

$$\Pr(F|E) = 1/3 \tag{6}$$

3)

$$\Pr(E|G) = \frac{\Pr(EG)}{\Pr(G)} \tag{7}$$

table 3,

$$\Pr(E|G) = \frac{1/3}{2/3} \tag{8}$$

$$\Pr(E|G) = 1/2 \tag{9}$$

4)

$$\Pr(G|E) = \frac{\Pr(EG)}{\Pr(E)} \tag{10}$$

table 3,

$$\Pr(G|E) = \frac{1/3}{1/2} \tag{11}$$

$$\Pr(G|E) = 2/3 \tag{12}$$

5)

$$\Pr((E+F)|G) = \frac{\Pr((E+F)G)}{\Pr(G)} \tag{13}$$

$$\Pr((E+F)G) = \Pr((EG) + (FG)) \tag{14}$$

$$\Pr((E+F)G) = \Pr(EG) + \Pr(FG) - \Pr((EF)G) \tag{15}$$

table 3,

$$\Pr((E+F)G) = 1/3 + 1/3 - 1/6 \tag{16}$$

$$\Pr((E+F)G) = 1/2 \tag{17}$$

$$\Pr((E+F)|G) = \frac{1/2}{2/3} \tag{18}$$

$$\Pr((E+F)|G) = 3/4 \tag{19}$$

6)

$$\Pr((EF)|G) = \frac{\Pr((EF)G)}{\Pr(G)} \tag{20}$$

table 3,

$$\Pr((EF)|G) = \frac{1/6}{2/3} \tag{21}$$

$$\Pr((EF)|G) = 1/4 \tag{22}$$

Answer:

$$\Pr(E|F) = 1/2, \quad (23)$$
$$\Pr(F|E) = 1/3, \quad (24)$$
$$\Pr(E|G) = 1/2, \quad (25)$$
$$\Pr(G|E) = 2/3, \quad (26)$$
$$\Pr((E + F)|G) = 3/4, \quad (27)$$
$$\Pr((EF)|G) = 1/4 \quad (28)$$