Assignment 3
AI1110: Probability and Random Variables
INDIAN INSTITUTE OF TECHNOLOGY, HYDERABAD

SUVEDH
CS22BTECH11016

12.13.1.14: Given that the two numbers appearing on throwing two dice are different. Find the probability of the event the sum of numbers on the dice is 4.

Solution:

When a dice is thrown, the number of observations in the sample space is $6 \times 6 = 36$. Let A be the event that the sum of the numbers on the dice is 4 and B be the event that the two numbers appearing on throwing the two dice are different.

Therefore, we have:

$$A = \left\{ (1,3) \quad (2,2) \quad (3,1) \right\}$$

$$B = \left\{ \begin{matrix} (1,2) & (1,3) & (1,4) & (1,5) & (1,6) \\ (2,1) & (2,3) & (2,4) & (2,5) & (2,6) \\ (3,1) & (3,2) & (3,4) & (3,5) & (3,6) \\ (4,1) & (4,2) & (4,3) & (4,5) & (4,6) \\ (5,1) & (5,2) & (5,3) & (5,4) & (5,6) \\ (6,1) & (6,2) & (6,3) & (6,4) & (6,5) \end{matrix} \right\}$$

$$(A.B) = \left\{ (1,3) \quad (3,1) \right\}$$

Therefore, we can calculate the probabilities:

$$P(B) = \frac{30}{36} = \frac{5}{6} \tag{1}$$

$$P(A.B) = \frac{2}{36} = \frac{1}{18} \tag{2}$$

Let $P(A|B)$ represent the probability that the sum of the numbers on the dice is 4, given that the two numbers appearing on throwing the two dice are different.

Therefore, we have:

$$P(A|B) = \frac{P(A.B)}{P(B)} \tag{3}$$

$$= \frac{6}{5} \cdot \frac{1}{18} \tag{4}$$

$$= \frac{1}{15} \tag{5}$$

Therefore, the required probability is $\frac{1}{15}$.