1

Assignment 6

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Abstract—This document contains the solution to Example 6 of Chapter 13 (Probability) in the NCERT Class 12.

NCERT class 12

Chapter 13(Probability) Example 6

A die is thrown twice and the sum of the numbers appearing is observed to be 6. What is the conditional probability that the number 4 has appeared at least once?

Solution:

Let

- (i) A = Event that sum of the numbers on the die is 6
- (ii) B = Event that at least one of the number on the die is 4.

Let's denote the random variables X_i map to the set $\{0,1\}$ where $X_1=1$ denote that the event A occurs and $X_2=1$ denote that the event B occurs. The sample space for die thrown twice is given by

$$S = \{(x, y) : x, y \in \{1, 2 \dots 6\}\}$$
 (1)

$$\therefore |\mathcal{S}| = 6 \times 6 = 36 \tag{2}$$

The event that $X_1 = 1$ is given by

$$S_A = \{(x, y) : x + y = 6 \& x, y \in \{1, 2 \dots 6\}\}$$

$$\left|\mathcal{S}_{\mathcal{A}}\right| = 5\tag{4}$$

The event that $X_2 = 1$ is given by

$$S_{\mathcal{B}} = \{(4, x) \cup (x, 4) : x \in \{1, 2 \dots 6\}\}$$
 (5)

$$\left| \mathcal{S}_{\mathcal{B}} \right| = 11 \tag{6}$$

The event that $X_1 = 1 \& X_2 = 1$ is given by

$$S_{A \cap B} = \{(2,4), (4,2)\}$$
 (7)

$$\left|\mathcal{S}_{\mathcal{A}\cap\mathcal{B}}\right| = 2\tag{8}$$

The probabilities for different values of X_i are given in Table I

Probability	Value
$\Pr\left(X_1=1\right)$	$\frac{5}{36}$
$\Pr\left(X_2 = 1\right)$	$\frac{11}{36}$
$\Pr\left(X_1 = 1, X_2 = 1\right)$	$\frac{2}{36}$
$\Pr\left(X_1 = 1 X_2 = 1\right)$?

TABLE I

$$\therefore \Pr(X_2 = 1 | X_1 = 1) = \frac{\Pr(X_2 = 1, X_1 = 1)}{\Pr(X_1 = 1)}$$
(9)

$$\implies \Pr(X_2 = 1 | X_1 = 1) = \frac{\frac{2}{36}}{\frac{5}{36}}$$
 (10)

$$\implies \Pr(X_2 = 1 | X_1 = 1) = \frac{2}{5}$$
 (11)