Assignment 1

AI1110: Probability and Random Variables
Indian Institute of Techonology Hyderabad

Anshika Gupta
CS22BTECH11007

12.13.6.7: Question. A die is thrown again and again until three sixes are obtained. Find the probability of obtaining the third six in the sixth throw of the die.

Answer: $\frac{625}{23328}$.

Solution:

Parameter	Description	Value
X	Random variable representing number of six obtained in the first five throws of the die	-
p	Probability of getting a 6 in the throw of a die	$\frac{1}{6}$
n	number of trials	5

$x \in \{0, 1, 2, 3, 4, 5\}$

where x is the possible value of X.

$P(X = x) = {}^{n}C_{x} \times p^{x} \times (1-p)^{(n-x)}$

$P(X = x) = {}^{5}C_{x} \times (\frac{1}{6})^{x} \times (\frac{5}{6})^{(5-x)}$

$$P(X = x) = \begin{cases} \frac{3125}{7776} & x = 0 \\ \frac{3125}{7776} & x = 1 \\ \frac{625}{3888} & x = 2 \\ \frac{125}{3888} & x = 3 \\ \frac{25}{7776} & x = 4 \\ \frac{1}{7776} & x = 5 \end{cases}$$

Let E_1: Event that two sixes are obtained in first five throws of the die

E_2: Event that a six is obtained at the sixth throw of the die

Event that both E_1 and E_2 occur is favourable

$P(E_1E_2) = P(E_1) \times P(E_2)$

[$\because$ The events E_1 and E_2 are independent]

$P(E_1E_2) = P(X = 2) \times \frac{1}{6}$

$P(E_1E_2) = \frac{625}{23328}$