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	Number of six obtained in the first five throws of the die	$\{0,1,2,3,4,5\}$
p	Probability of getting a 6 in the throw of a die	$\frac{1}{6}$
n	number of trials	5

TABLE 0
Parameters and variables used

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

where k is the possible value of X.

$$\Pr(X=k) = {}^{n}C_k \times p^k \times (1-p)^{(n-k)} \tag{1}$$

$$\Pr(X=k) = {}^{5}C_k \times (\frac{1}{6})^k \times (\frac{5}{6})^{(5-k)} \tag{2}$$

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

$$\Pr(X=2) \times \frac{1}{6} = \frac{625}{23328} (Ans.) \tag{3}$$