

# AI1103-Assignment-6

Name: Vikhyath Sai Kothamasu  
Roll Number: CS20BTECH11056



भारतीय प्रौद्योगिकी संस्थान हैदराबाद  
Indian Institute of Technology Hyderabad

Download all python codes from

<https://github.com/Vikhyath-vec/AI1103/tree/main/Assignment-6/codes>

and latex-tikz codes from

<https://github.com/Vikhyath-vec/AI1103/blob/main/Assignment-6/Assignment-6.tex>

## QUESTION

Consider an unbiased cubic dice with opposite faces coloured identically and each face coloured red, blue or green such that each colour appears only two times on the dice. If the dice is thrown thrice, the probability of obtaining red colour on top face of the dice at least twice is \_\_\_\_\_ .

## SOLUTION

Let  $X \in \{0, 1, 2, 3\}$  be the random variable representing the number of times a red face is obtained.

Then  $X$  is a binomial distributions with parameter:

$$p = \frac{\text{number of red coloured faces}}{\text{total number of faces}} \quad (0.0.1)$$

$$= \frac{2}{6} \quad (0.0.2)$$

$$= \frac{1}{3} \quad (0.0.3)$$

Then,

$$\Pr(X = i) = \begin{cases} {}^3C_i(p)^i(1-p)^{3-i} & i \in \{0, 1, 2, 3\} \\ 0 & \text{otherwise} \end{cases} \quad (0.0.4)$$

$$= \begin{cases} {}^3C_i(\frac{1}{3})^i(1-\frac{1}{3})^{3-i} & i \in \{0, 1, 2, 3\} \\ 0 & \text{otherwise} \end{cases} \quad (0.0.5)$$

$$F_X(i) = \begin{cases} \sum_{k=0}^i {}^3C_k(p)^k(1-p)^{3-k} & i \in \{0, 1, 2, 3\} \\ 0 & \text{otherwise} \end{cases} \quad (0.0.6)$$

$$\Pr(X \geq 2) = \Pr(X = 2) + \Pr(X = 3) \quad (0.0.7)$$

$$= \frac{6}{27} + \frac{1}{27} \quad (0.0.8)$$

$$= \frac{7}{27} \quad (0.0.9)$$

Thus, the probability of obtaining red colour on top face of the dice at least twice is  $\frac{7}{27} = 0.25926$ .

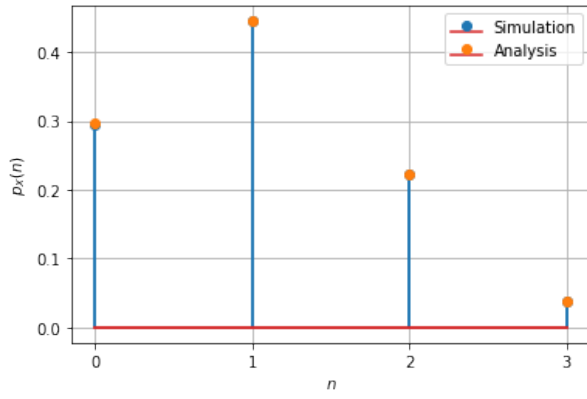


Fig. 0: The PMF distribution of  $X$

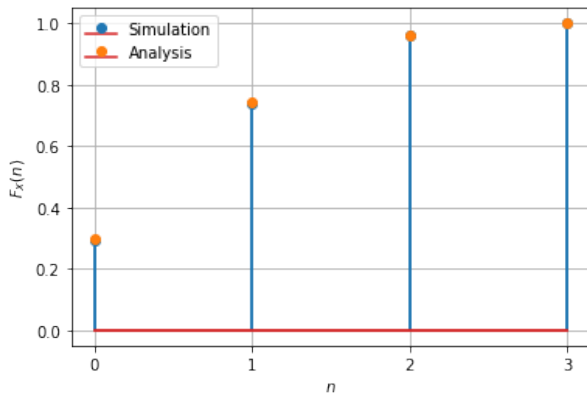


Fig. 0: The CDF distribution of  $X$