

11.16.3.3.3

EE24BTECH11030 - KEDARANANDA

Question:

A die is rolled. Find the probability that a number greater than or equal to one will appear.

Solution:

Theoretical solution:

Total outcomes = 6.

Favorable outcomes = 6.

$$P(\text{Number} \geq 1) = \frac{\text{Favorable outcomes}}{\text{Total outcomes}} = \frac{6}{6} = 1.$$

Computational solution:

The PMF for a fair die is:

$$P(X = x) = \begin{cases} \frac{1}{n}, & k \in \{1, 2, \dots, n\} \\ 0, & \text{otherwise} \end{cases} \quad (0.1)$$

Conclusion

The probability of rolling a number greater than or equal to one is the sum of all PMF values:

$$P(X \geq 1) = \sum_{k=1}^6 P_X(k) = \frac{6}{6} = 1. \quad (0.2)$$

Cumulative Distribution Function (CDF)

The cumulative distribution function (CDF) $F(x)$ of a discrete random variable X , representing the outcome of a die roll, is defined as:

The CDF for the die roll is:

$$P_X(k) = P(X \leq k) = \begin{cases} 0, & k < 1 \\ \frac{k}{n}, & 1 \leq k < n \\ 1, & k \geq n \end{cases} \quad (0.3)$$

Where n is 6.

\therefore probability that a number greater than or equal to one will appear is ; from (0.3)

$$P(X \geq 1) = 1 - P(X < 1) = 1 \quad (0.4)$$

