

Assignment 1 in L^AT_EX

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EE22BTECH11216

Probability and Random Variables (10.15.1.13)

Problem Statement:

A die is thrown once. Find the probability of getting (i) a prime number; (ii) a number lying between 2 and 6; (iii) an odd number

Solution: Let set **S** include all possible outcomes of a fair dice roll. Then **S** = {1, 2, 3, 4, 5, 6}, considering all elements of **S** are equally likely to occur.

'A' = Event that the number is prime = {2, 3, 5}

'B' = Event that the number is between 2 and 6 = {3, 4, 5}

'C' = Event that the number is odd = {1, 3, 5}

$$\Pr(A) = \frac{n(A)}{n(S)} = \frac{3}{6} = 0.5 \quad (1)$$

$$\Pr(B) = \frac{n(B)}{n(S)} = \frac{3}{6} = 0.5 \quad (2)$$

$$\Pr(C) = \frac{n(C)}{n(S)} = \frac{3}{6} = 0.5 \quad (3)$$

$$\textbf{PMF: } \Pr(x) = \begin{cases} \frac{1}{6}, & \text{if } x \in \{1, 2, 3, 4, 5, 6\} \\ 0, & \text{otherwise.} \end{cases} \quad (4)$$

$$\textbf{CDF: } F_X(n) = \Pr(X \leq x) = \begin{cases} 0, & \text{if } n < 1 \\ \frac{n}{6}, & \\ 1, & \text{otherwise.} \end{cases} \quad (5)$$

$$\Pr(A) = \Pr(x \in \{2, 3, 5\}) = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{1}{2} \quad (6)$$

$$\Pr(B) = \Pr(X > 2 \text{ and } X < 6) = \Pr(X \leq 5) \cdot \Pr(X \geq 3 | X \leq 5) = \frac{5}{6} \cdot \frac{3}{5} = \frac{3}{6} = \frac{1}{2} \quad (7)$$

$$\Pr(C) = \Pr(x \in \{1, 3, 5\}) = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2} \quad (8)$$