Assignment 1 in LaTeX

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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 = $\{1, 3, 5\}$

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

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

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

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

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

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

$$\Pr(B) = \Pr(X > 2 \text{ and } X < 6) = \Pr(X \le 5) \cdot \Pr(X \ge 3 | X \le 5) = \frac{5}{6} \cdot \frac{3}{5} = \frac{3}{6} = \frac{1}{2} \tag{7}$$

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

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