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

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

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

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

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

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$$\Pr(x) = \begin{cases} \frac{1}{6}, & \text{if } x \in \{1, 2, 3, 4, 5, 6\} \\ 0, & \text{otherwise.} \end{cases}$$
 **CDF:**  $F_X(n) = \Pr(X \le x) = \begin{cases} 0, & \text{if } n < 1 \\ \frac{n}{6}, \\ 1, & \text{otherwise.} \end{cases}$ 

$$\Pr(A) = \Pr(x \in \{2, 3, 5\}) = \frac{1}{6} + \frac{1}{6} + \frac{1}{6} = \frac{1}{2}$$
 (4)

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

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

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

$$(6)$$

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

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