

# Indian Statistical Institute

BSDS Ist Year

Academic Year 2024 - 2025: Semester I

Course: Probability Theory I

Instructor: Antar Bandyopadhyay

Assignment # 2

Date Given: August 28, 2024

Date Due: September 05, 2024  
Total Points: 10

**1.3.10** Events  $A$ ,  $B$ , and  $C$  are defined in an outcome space. Find expressions for the following probabilities in terms of  $\mathbf{P}(A)$ ,  $\mathbf{P}(B)$ ,  $\mathbf{P}(C)$ ,  $\mathbf{P}(A \cap B)$ ,  $\mathbf{P}(A \cap C)$ ,  $\mathbf{P}(B \cap C)$ , and  $\mathbf{P}(A \cap B \cap C)$ .

- (a) The probability that exactly one of these events occurs.
- (b) The probability that exactly two of  $A, B, C$  occur.
- (c) The probability that none of these events occur.

**1.3.14** Show that  $\mathbf{P}(A \cap B) \geq \mathbf{P}(A) + \mathbf{P}(B) - 1$ .

**1.4.6** Suppose two cards are dealt from a deck of 52 cards. What is the probability that the second card is a *spade* given that the first card is *black*?

**1.4.8** A hat contains a number of cards, with (i) 30% white on both sides; (ii) 50% black on one side and white on the other; and (iii) 20% black on both sides. The cards are mixed up, then a single card is drawn at random and placed on the table. If the top side is black, what is the chance that the other side is white?