Madhuka and Rajinda

Introduction to Probability First Edition

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Preface

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Fundamentals of Probability and Its Axioms

1.1 Combinations and Permutations

Counting plays a very important role in probability. In probability, we often deal with sets, and counting methods such as combinations and permutations help us find the number of elements in a set. Specifically, in probability, we deal with a set called the **sample space** which is the set of all possible outcomes of some random experiment and **events**, which are subsets of the sample space. Typically, the sample space is denoted by S or Ω. Consider the following example:

Example 1.1. Suppose a fair coin is flipped twice.What is the probability of flipping at least one head?

Solution The sample space of this experiment can expressed as $S = \{HH, HT, TH, TT\}$. Now, consider the event:

$$A = \{\text{At least one outcome is a head}\}$$

Notice that $A \subset S$ (A is a subset of S). Since $A = \{HH, HT, TH\}$, we can find the probability as follows:

$$P(A) = \frac{\#\text{elements in A}}{\#\text{elements in S}} = \frac{3}{4}.$$

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Basic Probability