

Chapter 11

Probability Distributions



Probability theory is nothing but common sense reduced to calculation

-Laplace



Laplace
(1749-1827)

The history of random variables and how they evolved into mapping from sample space to real numbers was a subject of interest. The modern interpretation certainly occurred after the invention of sets and maps (1900), but as Eremenko says, random variables were used much earlier. Mathematicians felt the need to interpret random variables as maps. In 1812, Laplace published his book on *Theory analytique des probabilités* in which he laid down many fundamental results in statistics. The first half of this treatise was concerned with probability methods and problems and the second half with statistical applications.



Learning Objectives

Upon completion of this chapter, students will be able to

- define a random variable, discrete and continuous random variables
- define probability mass (density) function
- determine probability mass (density) function from cumulative distribution function
- obtain cumulative distribution function from probability mass (density) function
- calculate mean and variance for random variable
- identify and apply Bernoulli and binomial distributions.

11.1 Introduction

The concept of a sample space that completely describes the possible outcomes of a random experiment has been developed in volume 2 of I year higher secondary course.

In this chapter, we learn about a function, called random variable defined on the sample space of a random experiment and its probability distribution.

11.2 Random Variable

The outcome from a random experiment is not always a simple thing to represent in notion. In many random experiments that we have considered, the sample space S has been a description of possible outcomes. That is the outcome of an experiment, or the points in the sample space S , need