4.1 Probability Distribution Function (PDF) for a Discrete Random Variable

Learning Objective:

In this section, you will:

• Understand and apply the fundamentals of random variables and their probability distribution functions

A **random variable** describes the outcomes of a statistical experiment in words.

- Upper case letters such as *X* or *Y* denote a random variable.
- Lower case letters like *x* or *y* denote the value of a random variable.
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A discrete **probability distribution function (PDF)** has two characteristics:

1. Each probability is between zero and one, inclusive.
2. The sum of the probabilities is one.

Example 1: A hospital researcher is interested in the number of times the average post-op patient will ring the nurse during a 12-hour shift. For a random sample of 50 patients, the following information was obtained.

X	P(x)
0	
1	
2	
3	
4	
5	

1. Describe the random variable X in words.
2. For this exercise, what are the values of x?

Notes 4.1

3. What is the probability that the number of times a patient rings the nurse is 4?
4. What is the probability that the number of times a patient rings the nurse is at least 4?
5. What is the probability that the number of times a patient rings the nurse does not exceed 4?
6. What is the probability that the number of times a patient rings the nurse is at least 1?

Example 2: Suppose Nancy has classes three days a week. She attends classes three days a week 80% of the time, two days 15% of the time, one day 4% of the time, and no days 1% of the time. Suppose one week is randomly selected.

1. Describe the random variable X in words.
2. For this exercise, what are the values of x?
3. Suppose one week is randomly chosen. Construct a probability distribution table. What does the P(x) column sum to?

For more information and examples see online textbook OpenStax Introductory Statistics pages 244-246.