

Topic 4.1

Introducing Statistics: Random and Non-Random Patterns?

Random and Non-Random Patterns?

Unit 4 introduces the concept of probability. Probabilistic reasoning helps us determine the likelihood of random events over many repetitions (over the long run). We can understand the abstract definitions and calculations of probability using real-world examples and simulations. A good understanding of simulated or empirical data distributions and of the fundamental principles of probability are necessary to calculate and interpret parameters for theoretical probability distributions.

In this unit, we will estimate probability using simulations or empirical data to model random events. We will calculate the relative frequency of outcomes or events in simulated data to estimate their probability according to the law of large numbers. We will also learn to use the basic rules of probability to calculate and interpret the probability of a single event or outcome or a combination of events or outcomes. The skills developed during the first part of the unit will become building blocks for the second part of the unit, where we will be introduced to (discrete) random variables and probability distributions. Specifically, we will learn to represent the probability distribution of binomial and geometric random variables, calculate and interpret their parameters (mean and standard deviation), and use those parameters to calculate probabilities for a binomial or geometric distribution.

To prepare for the AP exam, we suggest focusing on developing the following skills:

- Estimate probabilities using simulation.
- Explain why two events are (or are not) mutually exclusive.
- Apply the multiplication rule for conditional probabilities.
- Apply the addition rule for the probability of the union of events.
- Identify when two events are independent.
- Represent the probability distribution of a discrete random variable.
- Calculate the parameters of a discrete random variable.
- Calculate the parameters of linear combinations of random variables.
- Describe the effects of linear transformations of parameters of random variables.
- Identify whether a discrete random variable is a binomial or a geometric random variable.
- Calculate the parameters of a binomial and a geometric random variable.
- Calculate the probabilities of a binomial and a geometric distribution.