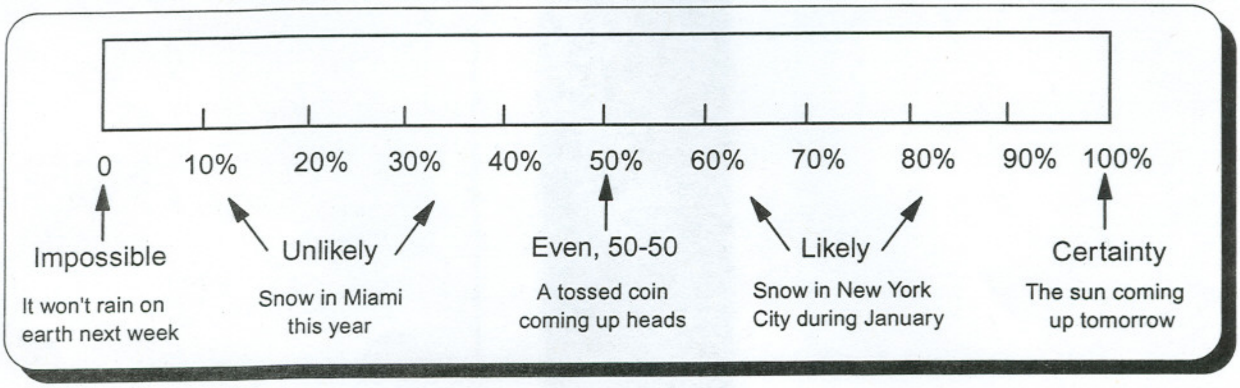
Chapter 7 Understanding Probability

I. Introduction
   A. **Probability**, the likelihood of something happening, deals with uncertainty.
   B. Probability is the basis for inferential statistics.
   C. **Inferential statistics** involves estimating population parameters using sample statistics.

II. Basic data
   A. Linda Smith wants to understand the relationship between monthly advertising expenditures and monthly sales revenue. A recent study (experiment) revealed the following monthly data in thousands of dollars.
   B.

Advertising (000)	5	2	7	6	10	4	6	5	3	8
Sales (000)	50	25	80	50	90	30	60	60	40	80

III. Understanding probability
   A. The data for measuring probability comes from an experiment.
   B. An **experiment** is a repeatable process resulting in measurements (collecting this advertising and sales data).
   C. An **outcome** is a measurement from an experiment (a month's sales).
   D. An **event** is one or more outcomes (10 months of sales).
   E. A **simple event** cannot be divided (a month's sales).
   F. A **compound event** is a collection of simple events (10 months of sales).
   G. Events that do not share common outcomes are **mutually exclusive** (total sales and total advertising).
   H. Events that contain all the outcomes of an experiment are **all-inclusive (collectively exhaustive)**.
   I. Probability may be expressed as a fraction, decimal, or as a percentage.
   J. A **sample space** contains all the outcomes of an experiment.
   K.



IV. Types of probability
   A. **Classical probability**
      1. An experiment is not required to determine an outcome (rate of occurrence) because it is known. For example, the probability of getting a head when flipping a fair coin is known to be one-half.
      2. Each simple event has an equal chance of happening.
      3. The probability of event A; where P(A) is the probability of event A, A is the number of times A occurred, and N is the total number of possible outcomes, is represented by this formula.

$$P(A) = \frac{\text{number of times A occurs}}{\text{total number of possible outcomes}} = \frac{A}{N}$$

      4. For example, this is the probability of drawing a queen out of a 52-card deck containing 4 queens.

$$P(Q) = \frac{Q}{N} = \frac{4}{52} = \frac{1}{13}$$

   B. **Relative probability**
      1. Relative probability requires an experiment to measure outcomes.
      2. Relative probability is called **empirical probability** because it is verifiable by experimentation.
      3. For example, a personnel manager's survey (experiment) revealed 50 out of 1,000 adults are part-time college students.
      4. With relative probability, the population is constantly changing, so the denominator may be thought of as a sample.

$$P(A) = \frac{\text{observations of A}}{\text{sample size}} = \frac{A}{n}$$

$$P(C) = \frac{C}{n} = \frac{50}{1{,}000} = \frac{5}{100} = .05 = 5\%$$