Chapter 2 - Probability

1. Definitions

- Experiment Any activity or process whose outcome is subject to uncertainty.
- Sample Space Set of all possible outcomes of an experiment, denoted by S.
- *Event* A subset of the sample space.
- *Probability (of an event)* The chance of this event occurring. It is equal to the sum of sample point probabilities in the event. Under the *Equally Likely* model (also known as the *Uniform* model), it reduces to

$$P(E) = \frac{\text{no. of favorable outcomes}}{\text{no. of possible outcomes}}$$

2. Axioms of Probability

- **a.** AXIOM 1: For any $A, P(A) \ge 0$.
- **b.** AXIOM 2: P(S) = 1.
- c. AXIOM 3: If A_1, A_2, \ldots , is an infinite collection of disjoint events, then

$$P(A_1 \cup A_2 \cup A_3 \cup \cdots) = \sum_{i=1}^{\infty} P(A_i)$$

- 3. Properties
 - **a.** $0 \le P(E) \le 1$; P(S) = 1; and $P(\phi) = 0$
 - **b.** Probability of the Complement: $P(E^c) = 1 P(E)$
 - **c.** Probability of the Union:

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

If A and B are mutually exclusive(disjoint) events (they don't intersect), then

$$P(A \cup B) = P(A) + P(B).$$

- 4. Example. In a small town of 2000 people, there are 800 males, 700 of whom are employed. If a total 250 people are unemployed in this town, find the probability that a randomly selected person is
 - a. a male?
 - **b.** an unemployed?
 - c. a male and unemployed (an unemployed male)?
 - **d.** male or unemployed?
 - e. female and employed (an employed female)?
 - **f.** female or employed?

5. Homework.

Sec 2.1; (pp. 54-55) 3, 5, 7, 9. Sec 2.2; (pp. 62-64) 11, 13, 15, 17, 21, 25.