Statistics 300:
Introduction to
Probability and Statistics

Section 4-2

Probability

- **Chapter 4**
  - **Section 2: Fundamentals**
  - **Section 3: Addition Rule**
  - **Section 4: Multiplication Rule #1**
  - **Section 5: Multiplication Rule #2**
  - **Section 6: Simulating Probabilities**
  - **Section 7: Counting**

Fundamentals

- **Vocabulary (Terms)**
  - **Event**
  - **Simple Event**
  - **Sample Space**

Example Procedures

- **Roll a die; record value**
- **Roll 2 dice; record sum**
- **Survey 50 people; count "no's"**
- **Select 200 people at random; take heights; record average**

Event

- **The result of a procedure**
- **Examples:**
  - **Value of die is 4**
  - **Sum of 2 dice is 10**
  - **The average height of 200 people is 64.83 inches**

Events: Simple or Compound

- **Simple**
  - **Can only occur in one way**
- **Compound**
  - **Can occur in multiple ways**

Events: Simple or Compound

- **Examples:**
  - –Value of die is 4 : simple
  - –Sum of 2 dice is 10 : compound
  - –The avg. height of 200 people is 64.83 inches : compound

Sample Space

- **The collection of all possible simple events**
- **See EXCEL example for rolling two dice**

Notation for Probabilities

- **"P" denotes "the probability of"**
- **A, B, C, etc. denote specific events**
- **So we read "P(A)" as "the probability of A"**

Probability Notation
(try some on overhead)

What is a Probability?

- **No definition is universally accepted**
- **Mine: A relative frequency that has not happened yet**
- **Sophisticated math definitions**
- **Degree of belief**

Determining Probabilities

- **Experience**
  - **Rule 1: Observe the relative frequency over many trials**
- **Logic**
  - **Rule 2: Deduce the relative frequency based on principles**

Experience: Rule 1

- **Relative Frequency Approximation of Probability**
- **Conduct a procedure many times; observe the relative frequency**
- **P(A) = (count A / total count)**

Try this:
If I drop my right shoe from shoulder height, what is the probability that it will land upright?

Logic: Rule 2

- **Classical Approach to Probability**
- **Determine the number of ways that event "A" can occur**
- **Determine the number of all possible outcomes**
- **P(A) = (ways for A)/(all ways)**

Try this:
What is the probability that I
will get a 6 when I roll a die?

Complementary Events

- **The complement of event "A" consists of all possible outcomes for which "A" does not occur**
- **Denoted "$\overline{A}$" with a line over the top**
- **$P(\overline{A})$ is "Probability of not A"**
  - **A = a woman is selected, then**
  - **$\overline{A}$ = a woman is not selected**