Chapter 13
From Randomness to Probability

The results from one sample experiment will differ from the results of another experiment. Is this difference just due to "random variability" (chance or luck) or is this difference so unusual to require another explanation?

How unusual do the observed results need to be to be considered statistically significant?

Continue to believe in The Law of Large Numbers (LNN)…over the long run, events will occur with a certain relative frequency, and we call that the *probability* of the event.

$P(A)$ **is the probability of event A.**

For calculating probabilities…

- **"not" means to subtract from 1. If 30% of people have blue eyes, then 70% do not. This is known as the complement of the event and is denoted $P(A^c)$.**

- **"or" means add. $P(A \cup B) = P(A) + P(B)$, provided that the events are disjoint.**

disjoint (mutually exclusive) – the events have no outcomes in common

- **"and" means multiply. $P(A \cap B) = P(A) \cdot P(B)$, provided that the events are independent.**

independent – the outcome of one event does not influence the outcome of the other event

What can go wrong?

- ✓ **There is no such thing as a Law of Averages. The common misunderstanding of the LNN is that random phenomena are supposed to *compensate* somehow for what happened in the past.**
  A baseball player who is recently 0 for 12 is "due" for a hit.

  Many people believe that if a coin has landed on heads five times in a row they should now bet on tails.

- ✓ **Don't confuse disjoint and independent. Disjoint events *can't* be independent. If A = {you get an A in the class} and B = {you get a B in the class}, A and B are disjoint. Are they independent? If you find out that A is true, does that change the probability of B? You bet it does! So they *can't* be independent!**