Chapter 15

15-1 Presenting Statistical Data

Frequency distribution: a table that shows how many times each data item occurs.
Histogram: a bar graph displaying a frequency distribution
Stem and leaf plot: A way of displaying the data in a frequency distribution.
Statistics: the methods used to describe a set of data.
Mode: the number that occurs most frequently
Median: the middle number in a distribution (which must be sorted in order) or the mean of the two middle numbers
Mean: the arithmetic average of the numbers in a deviation of a distribution. The sum of all the data items divided by the number of data items.

15-2 Analyzing Statistical Data Part 1

First quartile: the median of the lower half of the data
Third quartile: the median of the upper half of the data

Q_1 = The median between the minimum and the median
Q_3 = The median between the median and the maximum

Range = Maximum – Minimum

Box and whisker plot: is used to show the median, the first and third quartiles, and the range of a distribution.

15-2 Analyzing Statistical Data part 2

Variance: one of the statistics used to measure the dispersion or "spread" of the data.
Standard deviation: the other statistic used to measure the dispersion or "spread" of the data. (Standard deviation is the square root of the variance.)
(Don't memorize these formulas in Chapter 15 Section 2 Part 2. Memorize all of the rest. Refer to these when you are in your college Statistics class.)

Mean = $$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

Variance = $\dfrac{(x_1 - \overline{x})^2 + (x_2 - \overline{x})^2 + \ldots + (x_n - \overline{x})^2}{n}$

Variance = $\sigma^2 = \dfrac{\sum_{i=1}^{n} (\overline{x} - x_1)^2}{n}$

Standard deviation = $\sigma = \sqrt{\dfrac{\sum_{i=1}^{n} (\overline{x} - x_1)^2}{n}}$

$$\sigma = \sqrt{\frac{\text{sum of the squares of the deviations from the mean}}{\text{number of elements in the distribution}}} = \sqrt{\text{variance}}$$

Statistical Symbols and Variables:

$\overline{x}$ = The mean of the x values

$\sum_{i=1}^{n} x$ = The sum of the x values

σ^2 = The variance of the x values

n = The number of elements in the distribution

15-5 Fundamental Counting Principles

Outcome: the result
Event: a subset of outcomes
Compound event: several events which occur together

The Fundamental Counting Principle

In a compound event in which the first event may occur in n_1 ways, the second event may occur in n_2 ways, etc. The k^{th} event may occur in the n_k different ways, so the total number of ways the compound event may occur is:

$$n_1 \cdot n_2 \cdot n_3 \cdot \ldots \cdot n_k$$

Mutually exclusive choices: you can do one or the other but not both at the same time. The outcome of mutually exclusive choices is the **SUM** of each outcome.

15-6 Permutations (order, arrange)

Permutation: An arrangement of the elements of a set of definite order.
Ordered Arrangement: A permutation of a set of objects

$${}_nP_n = n!$$ ***n*** objects arranging all ***n*** of them

$$n! = n \cdot (n-1) \cdot (n-2) \cdot \ldots \cdot 3 \cdot 2 \cdot 1$$ **Factorial Formula**

$${}_nP_r = \frac{n!}{(n-r)!}$$ ***n*** objects arranging ***r*** of them

$$P = \frac{n!}{n_1!n_2!\ldots}$$ Where objects ***n_1*, *n_2***, etc., are **repeated objects.**

15-7 Combinations (choose, select)

The number of combinations of a set of ***n*** objects taken ***r*** at a time is:

$$\binom{n}{r} = {}_nC_r = \frac{n!}{r!(n-r)!}$$

15-8 Sample Spaces and Events

For equally likely outcomes (in theoretical probability), the probability that an event may occur is the ratio of the favorable (or desired) outcomes to the total number of outcomes.

$$P(event) = \frac{\text{number of favorable outcomes}}{\text{number of outcomes in the sample space}}$$

$$0 \leq P(E) \leq 1$$

The probability of any event is greater than or equal to zero and less than or equal to 1.

15-9 Probability

In general, if $\{a_1, a_2, a_3, \ldots a_n\}$ is a sample space containing n equally likely outcomes, then the probability of each simple event is $\frac{1}{n}$:

$$P(a_1) = P(a_2) = P(a_3) = \ldots = P(a_n) = \frac{1}{n}$$

In general, if the sample space for an experiment consists of n equally likely outcomes, and if k of them are in the event E, then:

$$P(E) = \underbrace{\frac{1}{n} + \frac{1}{n} + \frac{1}{n} + \ldots + \frac{1}{n}}_{\text{K addends}} = \frac{k}{n}$$

PS1 – PS2 Probability Standards 1.0 and 2.0

Probability of Independent Events
If A and B are independent events, then
P(A and B) = P(A) · P(B)

Probability of Dependent Events (Multiplication Rule)
(Conditional Probability)
If A and B are dependent events, then
P(A and B) = P(A) · P (B | A)
where P(B | A) is the probability of B, given that A has occurred.

Probability of (A or B) Mutually Exclusive Events
If A and B are **mutually exclusive** events then,
P(A or B) = P(A) + P(B)

Probability of (A or B) Inclusive Events (Addition Rule)
If A and B are **inclusive** events then,
P(A or B) = P(A) + P(B) - P(A and B).

Complement
The probability of the complement of event A is
P(not A) = 1 - P(A)