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

\[ Q_1 = \text{The median between the minimum and the median} \]
\[ Q_3 = \text{The median between the median and the maximum} \]

**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. (The square root of the variance.)

\[ \text{Mean} = \bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i \]

\[ \text{Variance} = \frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + \ldots + (x_n - \bar{x})^2}{n} \]
Variance = \[ \sigma^2 = \frac{\sum_{i=1}^{n} (\bar{x} - x_i)^2}{n} \]

Standard deviation = \[ \sigma = \sqrt{\frac{\sum_{i=1}^{n} (\bar{x} - x_i)^2}{n}} \]

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

**Statistical Symbols and Variables:**
- \( \bar{x} \): The mean of the x values
- \( \sum_{i=1}^{n} x_i \): The sum of the x values
- \( \sigma^2 \): 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:
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

\[ n \, P_n = n! \]

\[ n! = n \cdot (n-1) \cdot (n-2) \cdot \ldots \cdot 3 \cdot 2 \cdot 1 \]

\[ n \, P_r = \frac{n!}{(n-r)!} \]

\[ P = \frac{n!}{n_1! \cdot n_2! \ldots} \quad \text{Where objects } n_1, n_2, \text{ etc., are repeated objects.} \]

### 15-7 Combinations (choose, select)

The number of combinations of a set of \( n \) objects taken \( r \) at a time is:

\[ \binom{n}{r} = n \, C_r = \frac{n!}{r! \cdot (n-r)!} \]