• **A Population** is a collection of people, objects, or measurements that we are interested in analyzing. For example, all students at RCC make up a population.

• **A sample** is a small portion of a population. Mathematically speaking, a sample is a subset of a population. For example, Math 170-V1 is a sample that was taken from all RCC students.

Now, make up one or two populations and then from these populations select a few samples.

• Numbers that are obtained from samples are called **statistics**. For example, the average age of students in my Differential Equations class is a statistic.

• Numbers that are obtained from populations are called **parameters**. For example, the average age of all students at RCC is a parameter.

Now, make up one or more for each.

We usually divide statistics into two branches: Descriptive & Inferential.

• **Descriptive statistics** (DS) deals with collecting, organizing, representing...a set of data.

• **Inferential statistics** (IS) deals with analyzing, making judgment, drawing conclusions...(using a sample) about a population.

**Note:**

a. Descriptive statistics deals with facts (given that the sample represents the population unbiasedly).

b. Inferential statistics could be true or false (since we make conclusions by studying a sample).

For example, let Mr. X and Ms. Y study 2 hours for a quiz in Math 171; and suppose Ms. Y makes a 90% and Mr. X makes a 70% on this quiz. Now, because Y got a higher percentage than X, I conclude that Y is smarter than X. This is a scenario with statistics in it. Can you determine which sentence represents DS and which sentence represents IS? Explain............................................................................................................

• **Data** are information that we collect. The data are either categorical (qualitative) or numerical (quantitative).

• **Qualitative data** are nonnumerical or numbers (such as telephone numbers, 23 on Michael Jordan's jersey, SS#, colors of the cars in the parking lot...). You should note that the numbers are just labels. No mathematical operations are done with these numbers.

• **Quantitative data** are numbers. We can perform mathematical operations, such as adding, with these numbers.

**Levels of measurement:**

*Qualitative data* can be broken down into nominal and ordinal level of measurement.
a. **Nominal** level of measurement is just labels.
b. **Ordinal** level of measurement is one step higher than nominal level of measurement. They are labels, which can be put in order. T-shirt sizes: Small, Medium, and Large.

Quantitative data can be broken down into interval and ratio level of measurement.

a. **Interval** level of measurement is a step higher than the ordinal level of measurement. The difference between two values is meaningful. Zero is just a reference point.

Temperature is the best example for this level. Ratio between values is not meaningful.

b. **Ratio** level of measurement is one step higher than the interval level of measurement (since the ratio at this level makes sense). You are 20 years old and I am 40 years old; I am twice as old as you are. Also, zero means nothing here. You have zero money means that you have no money. This would not apply to the interval level of measurement. Zero temperature does not mean no temperature.

**NUMERICAL DATA**

We can also classify numerical data into continuous and discrete.

A **continuous** set of data consists of all real numbers for which the entries make sense. Examples: Height, weight.... Continuous data has to do with measuring subjects.

A **discrete** set of data consists of whole numbers. Examples: Number of students in my Math 170, number of chairs in this room.... Discrete data has to do with counting subjects.

**COLLECTING DATA**

- Perform an experiment,
- Use simulation,
- Take a census,
- Take a sample (random sample, cluster sample, systematic sample, and convenience sample).

Read section 1.3 for details.