BASIC CONCEPTS

- **Statistics:** is concerned with scientific methods for collecting, organizing, summarizing, presenting, and analyzing data as well as with drawing valid conclusions and making reasonable decisions on the basis of such analysis.

In a narrower sense, the term **statistics is used to denote the data themselves** or numbers derived from the data, such as averages. Thus we speak of employment statistics, accident statistics, etc.

- **Descriptive statistics**: The use of graphs, charts, and tables and the calculation of various statistical measures to organize and summarize information.
Descriptive statistics help to reduce our information to a manageable size and put it into focus.

- **Inferential statistics** consists of techniques for reaching conclusions about a population based upon information contained in a sample.

- A **population** is the complete collection of individuals, items or set of all objects or measurements under consideration in a statistical study.

A population can be finite or infinite. For example, the population consisting of all bolts produced in a factory on a given day is finite, whereas the population consisting of all possible outcomes (heads, tails) in successive tosses of a coin is infinite.

- weights of students in a university

- The **sample** is a portion or a subset of data selected from a population for analysis.

Other common examples of sample and population are:
Political polls: The population will be all voters, whereas the sample will be the subset of voters we poll.
Quality control: The population will be the entire batch of items produced, say, by a machine or by a plant, whereas the sample will be the subset of items we tested.
Clinical studies: The population will be all the patients with the same disease, whereas the sample will be the subset of patients used in the study.
Finance: All common stock listed in stock exchanges such as the New York Stock Exchange, the American Stock Exchanges, and over-the-counter is the population. A collection of 20 randomly picked individual stocks from these exchanges will be a sample.

- A characteristic of interest concerning the individual elements of a population or a sample is called a **variable**. A variable is often represented by a letter such as x, y, or z.

- the number of defective parts produced in a factory on a given day.

- The value of a variable for one particular element from the sample or population is called an **Observation**.

- A **quantitative variable** is determined when the description of the characteristic of interest results in a numerical value.
A discrete variable is a quantitative variable whose values are countable. Discrete variables usually result from counting.
A **continuous variable** is a quantitative variable that can assume any numerical value over an interval or over several intervals. A continuous variable usually results from making a measurement of some type.

A **qualitative variable** is determined when the description of the characteristic of interest results in a nonnumerical value. A qualitative variable may be classified into two or more categories.

Example

- Identify the population, the sample and the characteristic of interest in each of the following.
- State which of the following represent discrete variable and which represent continuous variable.

(a) A survey was mailed to 2000 households in a state and one question asked for the number of children per household
(b) the heights of 100 students at O. E. B. university
(c) Lifetimes of 300 lamps produced by a company on a given day
(d) Lengths of 1000 screws produced in a factory
(e) Number of qualified workers in 20 company in an industrial zone

Ans

	the population	the sample	the characteristic of interest	Variable type
a	Number of households in the state	2000 households	number of children per household	Discrete
b	Number of students at O. E. B. university	100 students	the heights of students	Continuous
c	Number of lamps produced on a given day	300 lamps	Lifetime of lamps	Continuous
d	Number of screws produced	1000 screws	Length screws	Continuous
e	Number of company in an industrial zone	20 company	qualified workers	Discrete