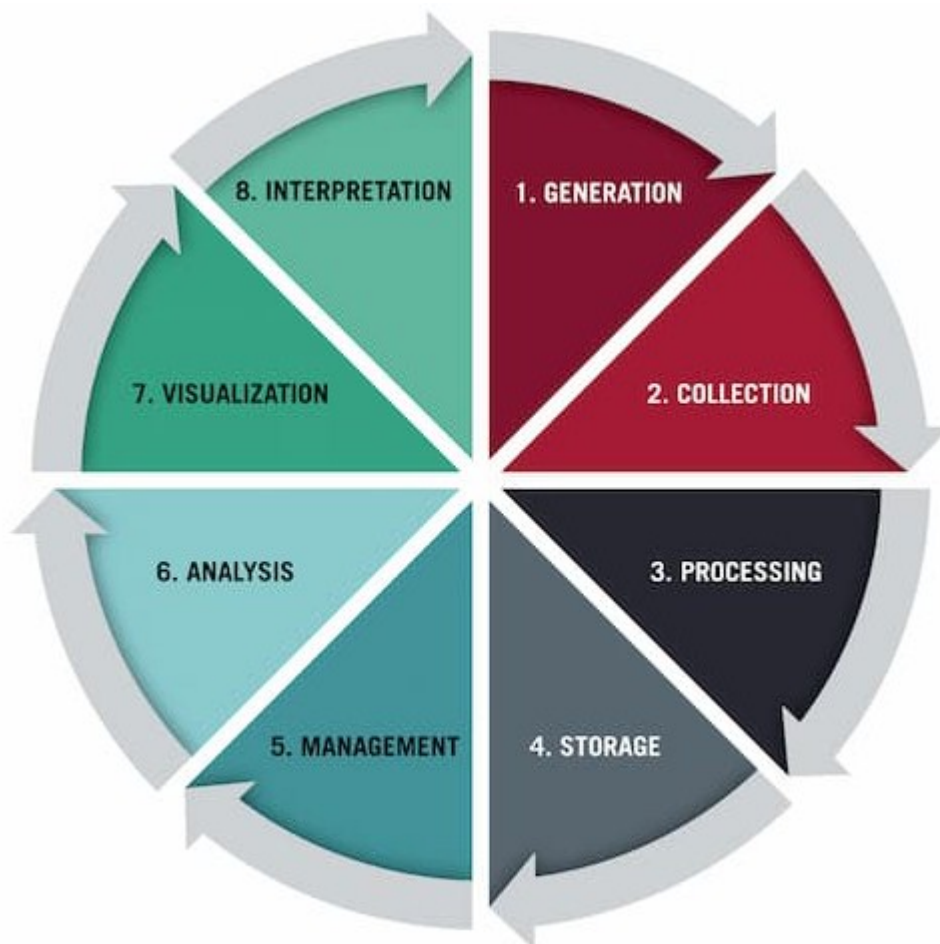


Measurement scale of variables

1. Statistics

1.1 Definition: is the methodology for collecting, analyzing, interpreting and drawing conclusions from information. Putting it in other words, statistics is the methodology which scientists and mathematicians have developed for interpreting and drawing conclusions from collected data.

Statistics is the science of gaining information from numerical and categorical data. Statistical methods can be used to find answers to the questions.



Statistics provides methods for:

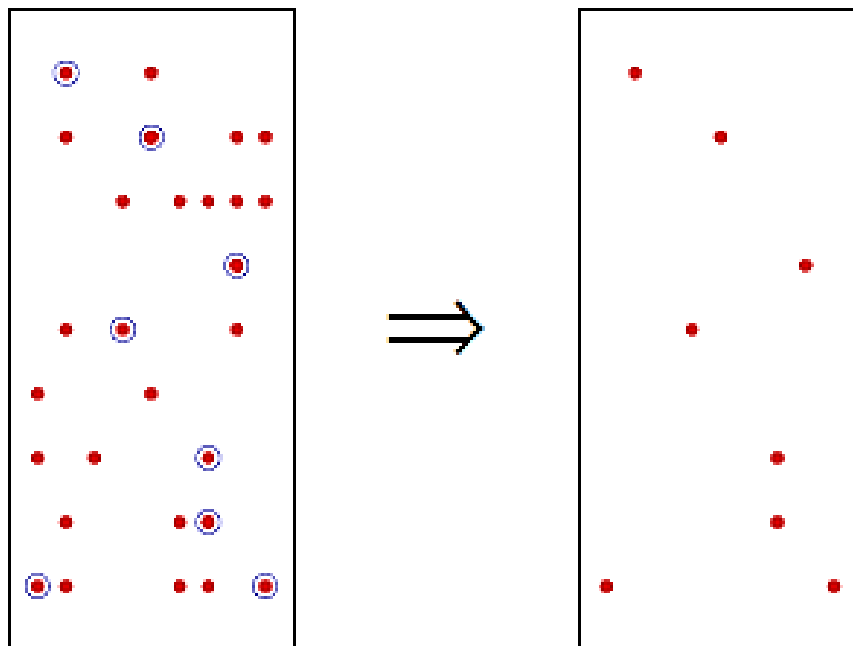
1. Design: Planning and carrying out research studies.
2. Description: Summarizing and exploring data.
3. Inference: Making predictions and generalizing about phenomena represented by the data.

1.2 Population and Sample

-Population is the collection of all individuals or items under consideration in a statistical study.

-Sample is that part of the population from which information is collected.

Population vs. Sample



1.3 Descriptive and Inferential Statistics

There are two major types of statistics

1- Descriptive statistics consist of methods for organizing and summarizing information. it includes the construction of graphs, charts, and tables, and the calculation of various descriptive measures such as averages, measures of variation, and percentiles.

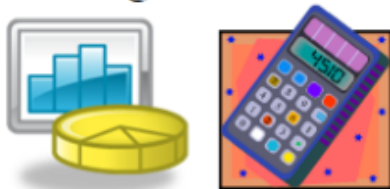
2- Inferential statistics consist of methods for drawing and measuring the reliability of conclusions about population based on information obtained from a sample of the population. It includes methods like point estimation, interval estimation and hypothesis testing which are all based on probability theory.

Branches of Statistics

Descriptive Statistics

Involves organizing,
summarizing, and
displaying data.

e.g. Tables, charts,
averages



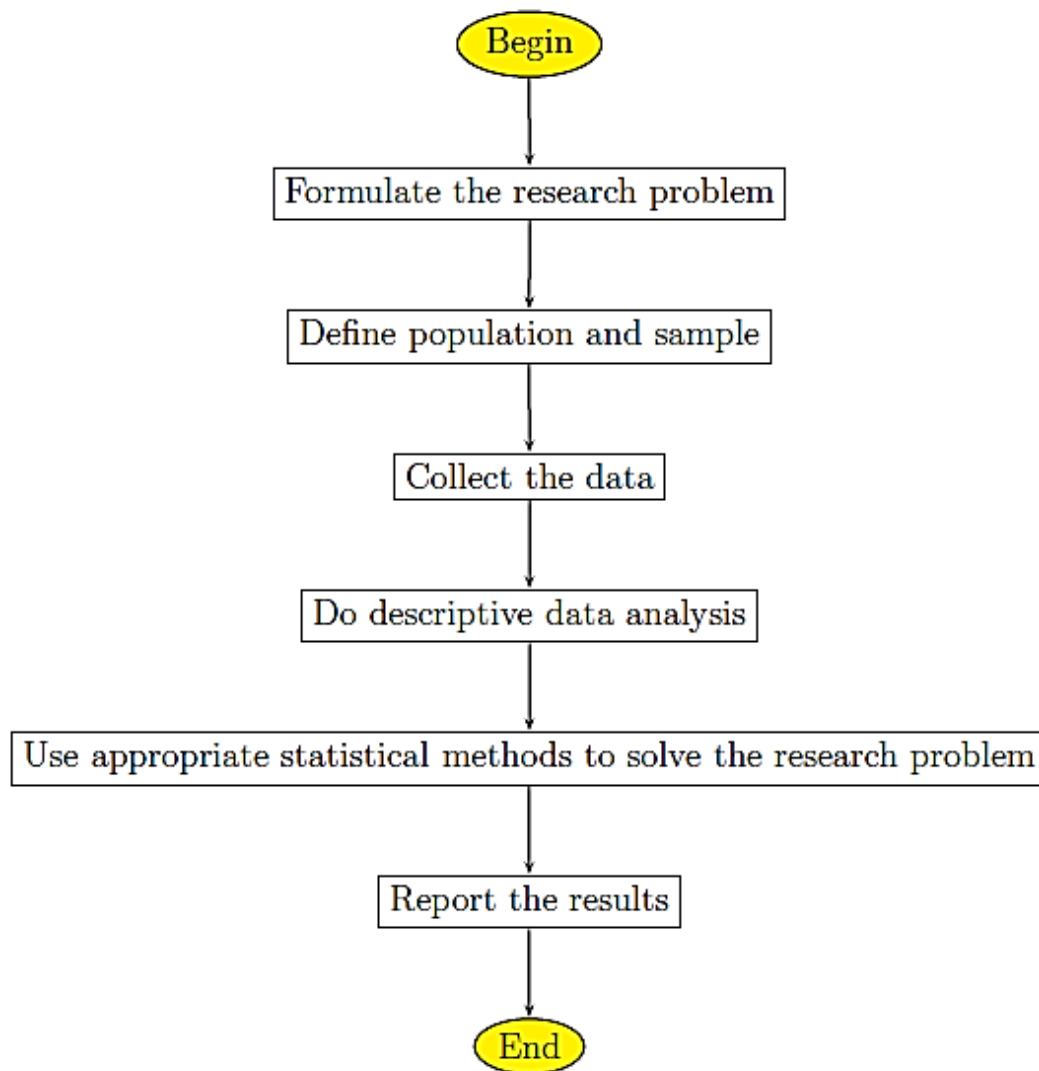
Inferential Statistics

Involves using *sample data* to draw conclusions about a *population*.



1.4 Statistical data analysis

The goal of statistics is to gain understanding from data. Any data analysis should contain following steps:



2. Variables and organization of the data

2.1 Variables: A characteristic that varies from one person or thing to another.

Examples of variables for humans are height, weight, number of siblings, sex, marital status, and eye color.

The variables are divided into two classes:

1- **quantitative (or numerical) variables:** e.g. height, weight, number of siblings. Quantitative variables can be classified as either discrete or continuous

a- Discrete variables: such as the numbers of children in family, the numbers of car accident on the certain road on different days, or the numbers of students taking basics of statistics course are the results of counting.

b- Continuous variables: such as length, weight, or temperature can in principle be measured arbitrarily accurately. Weight may be measured to the nearest gram, but it could be measured more accurately, say to the tenth of a gram.

2- **qualitative (or categorical) variables:** is non-numerical information. e.g. sex, marital status, and eye color.

2.2 Scales

1- **Scales for Quantitative Variables:** are defined either on an interval scale or on a ratio scale.

a- **Interval scale:** measure data on a continuous scale in the form of numbers (just like ordinal data) but without a meaningful zero point. we can find the exact difference between the two values, e.g. temperature in degrees Celsius. We can clearly say that 50 degrees C is greater than 40 degrees C. That means there is an order. there is no absolute or true zero. For example, 0 degrees C does not mean "no temperature."

b- Ratio scale: measure data on a continuous scale, with a meaningful zero point. support the comparison of ratios, so it is possible to perform all mathematical operations on this type of data, e.g. weight, height, volume etc. A weight of 0 Kg means that there is no weight.

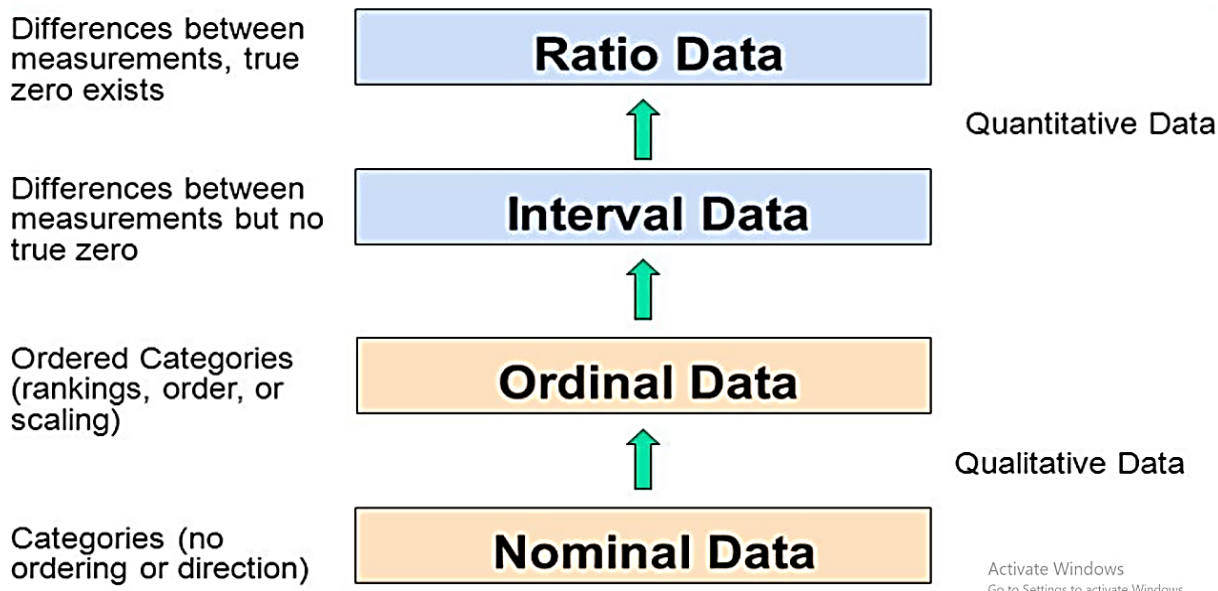
- For Interval and Ratio scale, you can use any of three measurements of central tendency (Mean, Mode or Median).

2- Scales for Qualitative Variables: qualitative variable falls may or may not have a natural ordering.

a-nominal scale: qualitative variables are unordered (**merely names**), such as human can be classified as (male and female).

b-ordinal scale: can be put in order, such as education (classified e.g. as low, high)

Levels of Measurement Scale



Questions

- Define the science of “statistics”
- Compare the sample and the population
- Enumerate and explain the types of statistics
- What are the steps of statistical analysis?
- Define variables and enumerate its types.
- Compare the interval and ratio scale with example.
- Draw a shape to represent the levels of measurement scale.