

What Is Statistics

Chapter 01





LEARNING OBJECTIVES

- LO 1-1** List ways that statistics is used.
- LO 1-2** Know the differences between descriptive and inferential statistics.
- LO 1-3** Understand the differences between a sample and a population.
- LO 1-4** Explain the difference between qualitative and quantitative variables.
- LO 1-5** Compare discrete and continuous variables.
- LO 1-6** Recognize the levels of measurement in data.

Uses of Statistics

- One of the tools used to make decisions in business.
- We apply statistical concepts in our lives.
- As a student of business or economics, basic knowledge and skills to organize, analyze, and transform data and to present the information.

Why Study Statistics?

Statistics is required for many college programs. Why?

1. Numerical information is everywhere.
2. Statistical techniques are used to make decisions that affect our daily lives.
3. Knowledge of statistical methods will help you understand how decisions are made and give you a better understanding of how they affect you.

No matter what line of work you select, you will find yourself faced with decisions where an understanding of data analysis is helpful.

Understanding of Statistics Helps us Make Informed Decisions

In making informed decisions, you need to:

1. Determine if the existing information is adequate or additional information is required.
2. Gather additional information, if needed, in such a way that it does not provide misleading results.
3. Summarize the information in a useful and informative manner.
4. Analyze the available information.
5. Draw conclusions and make inferences while assessing the risk of an incorrect conclusion.

What Is Meant by Statistics?

STATISTICS The science of collecting, organizing, presenting, analyzing, and interpreting data to assist in making more effective decisions.



Collect



Organize



Present



Interpret



Who Uses Statistics?

Statistical techniques are used extensively by marketers, accountants, quality control personnel, consumers, professional sports people, hospital administrators, educators, politicians, physicians, etc...



Types of Statistics – Descriptive Statistics and Inferential Statistics

LO 1-2 Know the differences between descriptive and inferential statistics.

Descriptive Statistics - methods of organizing, summarizing, and presenting data in an informative way.

EXAMPLE 1: The United States government reports the population of the US was 179,323,000 in 1960; 203,302,000 in 1970; 226,542,000 in 1980; 248,709,000 in 1990; 265,000,000 in 2000; and 308,400,000 in 2010.

EXAMPLE 2: There are a total of 46,837 miles of interstate highways in the United States. The interstate system represents only 1% of the nation's total roads but carries more than 20% of the traffic.

EXAMPLE 3: The average person spent \$103.00 on traditional Valentine's Day merchandise in 2010. This is an increase of \$0.50 from 2009.

Types of Statistics – Descriptive Statistics and Inferential Statistics

Inferential Statistics: A decision, estimate, prediction, or generalization about a population, based on a sample.

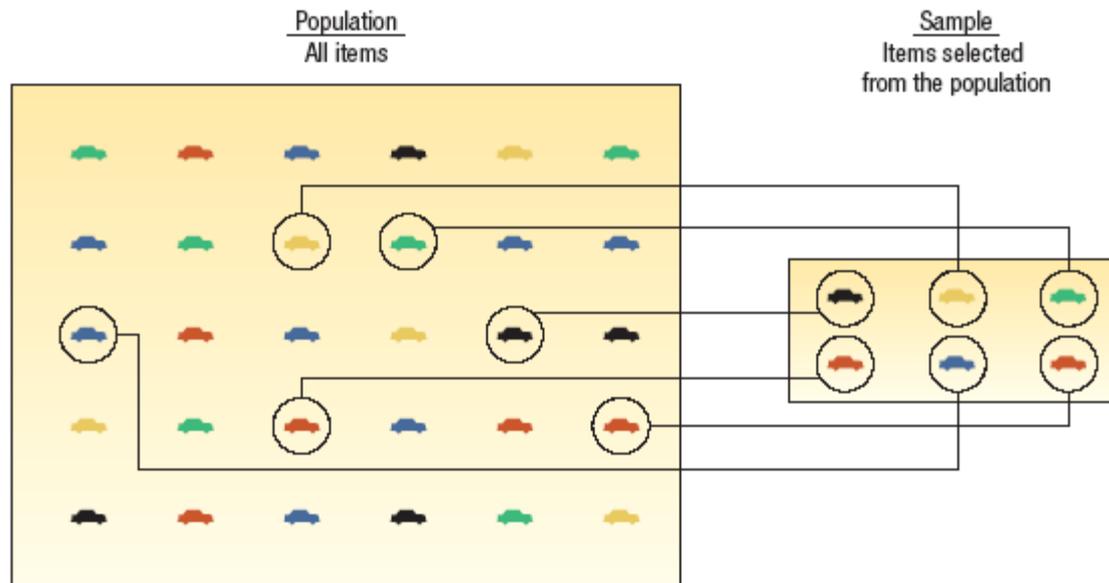
Note: In statistics, the word *population* and *sample* have a broader meaning. A population or sample may consist of ***individuals*** or ***objects***.

LO 1-3 Understand the differences between a sample and a population.

Population vs. Sample

A **population** is the entire set of individuals or objects of interest, or the measurements obtained from all individuals or objects of interest.

A **sample** is a *portion*, or *part*, of the population of interest.



Why Take a Sample Instead of Studying Every Member of the Population?

1. Prohibitive cost of census
2. Destruction of item being studied may be required
3. Not possible to test or inspect all members of a population being studied

Usefulness of a Sample in Learning about a Population

Using a sample to learn something about a population is done extensively in business, agriculture, politics, and government.

EXAMPLE: Television networks constantly monitor the popularity of their programs by hiring Nielsen and other organizations to sample the preferences of TV viewers.

Types of Variables

A. Qualitative or attribute variable - the characteristic being studied is *nonnumeric*.

EXAMPLES: gender, religious affiliation, type of automobile owned, state of birth, and eye color are examples.

B. Quantitative variable - information is reported *numerically*.

EXAMPLES: balance in your checking account, minutes remaining in class, or number of children in a family.

Quantitative Variables - Classifications

Quantitative variables can be classified as either *discrete* or *continuous*.

A. Discrete variables can only *assume certain values*, and there are *usually “gaps”* between values.

EXAMPLE: the number of bedrooms in a house, or the number of hammers sold at the local Home Depot (1,2,3,...,etc).

B. Continuous variable can *assume any value* within a specified range.

EXAMPLE: the pressure in a tire, the weight of a pork chop, or the height of students in a class.

Summary of Types of Variables

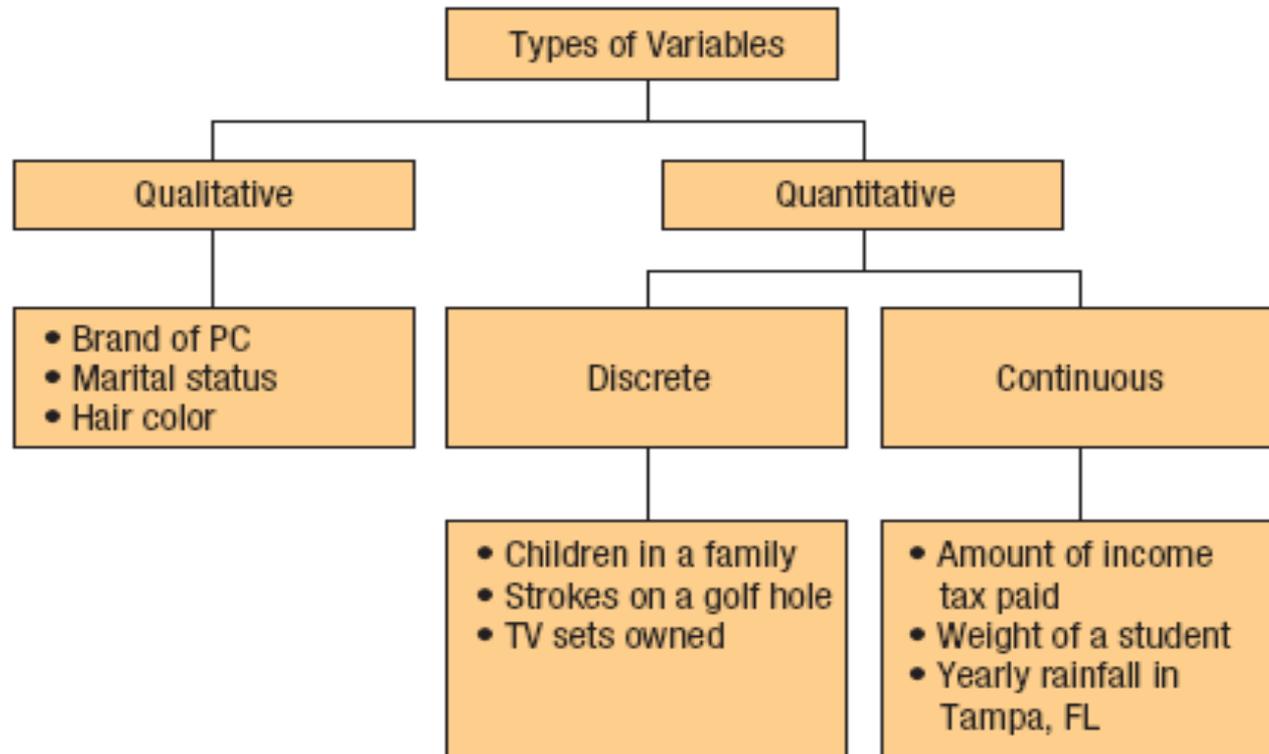


CHART 1-2 Summary of the Types of Variables

Four Levels of Measurement

Nominal level – data that is classified into categories and cannot be arranged in any particular order.

Interval level – similar to the ordinal level, with the additional property that meaningful amounts of differences between data values can be determined. There is no natural zero point.

Ordinal level – data arranged in some order, but the differences between data values cannot be determined or are meaningless.

Ratio level – the interval level with an inherent zero starting point. Differences and ratios are meaningful for this level of measurement.

Nominal-Level Data

Properties:

1. Observations of a qualitative variable can only be ***classified*** and ***counted***.
2. There is ***no particular order*** to the labels.



By Anne R. Carey and Chad Palmer, USA TODAY
Source: hudson-index.com



Ordinal-Level Data

Properties:

1. Data classifications are represented by sets of labels or names (high, medium, low) that have ***relative values***.
2. Because of the relative values, the ***data classified can be ranked or ordered***.

Rating of a Finance Professor

Rating	Frequency
Superior	6
Good	28
Average	25
Poor	12
Inferior	3

Interval-Level Data

Properties:

1. Data classifications are ordered according to the amount of the characteristic they possess.
2. Equal differences in the characteristic are represented by equal differences in the measurements.

Example: Women's dress sizes listed on the table.

Size	Bust (in)	Waist (in)	Hips (in)
8	32	24	35
10	34	26	37
12	36	28	39
14	38	30	41
16	40	32	43
18	42	34	45
20	44	36	47
22	46	38	49
24	48	40	51
26	50	42	53
28	52	44	55

Ratio-Level Data

- Practically all quantitative data is recorded on the ratio level of measurement.
- Ratio level is the “highest” level of measurement.

Properties:

1. Data classifications are **ordered** according to the amount of the characteristics they possess.
2. Equal differences in the characteristic are represented by equal differences in the numbers assigned to the classifications.
3. The zero point is the absence of the characteristic, and the ratio between two numbers is meaningful.

Why Know the Level of Measurement of a Data?

- The level of measurement of the data dictates the calculations that can be done to summarize and present the data.
- To determine the statistical tests that should be performed on the data.

Summary of the Characteristics for Levels of Measurement

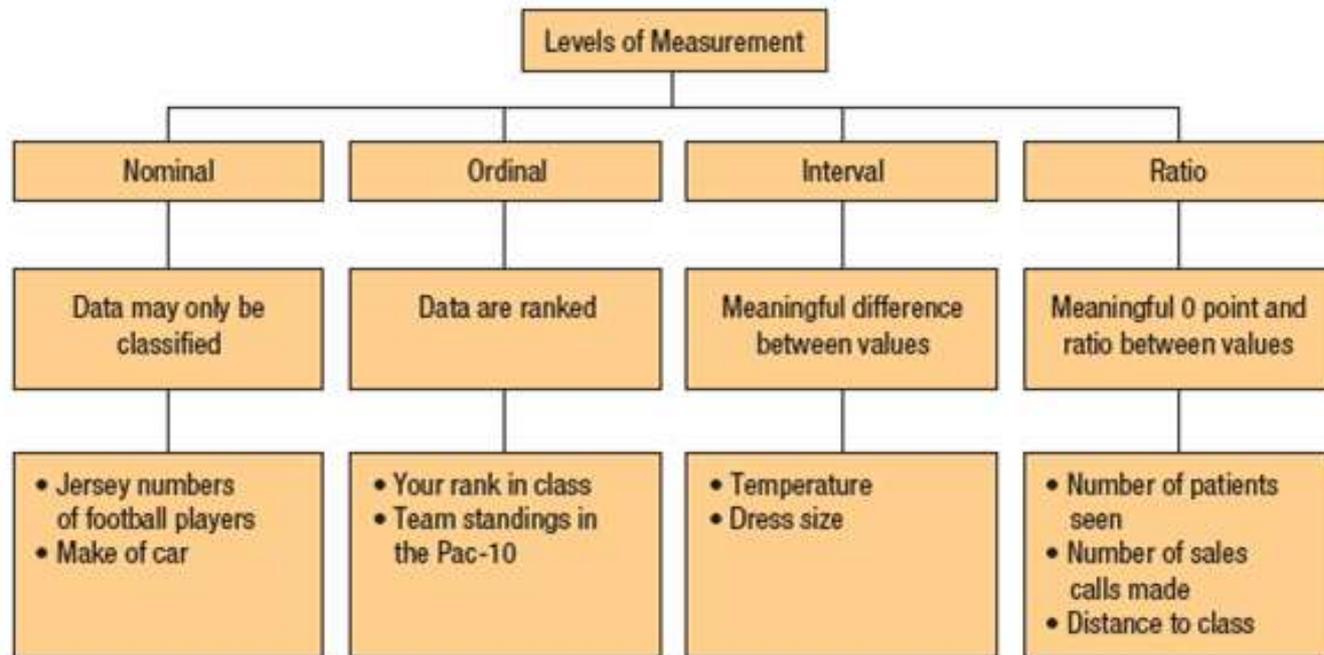


CHART 1-3 Summary of the Characteristics for Levels of Measurement



Ethics and Statistics

- Practice statistics with integrity and honesty.
- “Do the right thing” when collecting, organizing, summarizing, analyzing, and interpreting numerical information.
- The real contribution of statistics to society is a moral one.



Computer Applications

- Computers are now available to students at most colleges and universities.
 - Spreadsheets (Microsoft Excel)
 - Statistical software (Minitab, SPSS, etc.)