ماهو علم الاحصاء

What is Statistics?

Chapter 1

Learning Objectives

LO1-1 Explain why knowledge of statistics is important

LO1-2 Define statistics and provide an example of how statistics is applied

LO1-3 Differentiate between descriptive and inferential statistics

LO1-4 Classify variables as qualitative or quantitative, and discrete or continuous

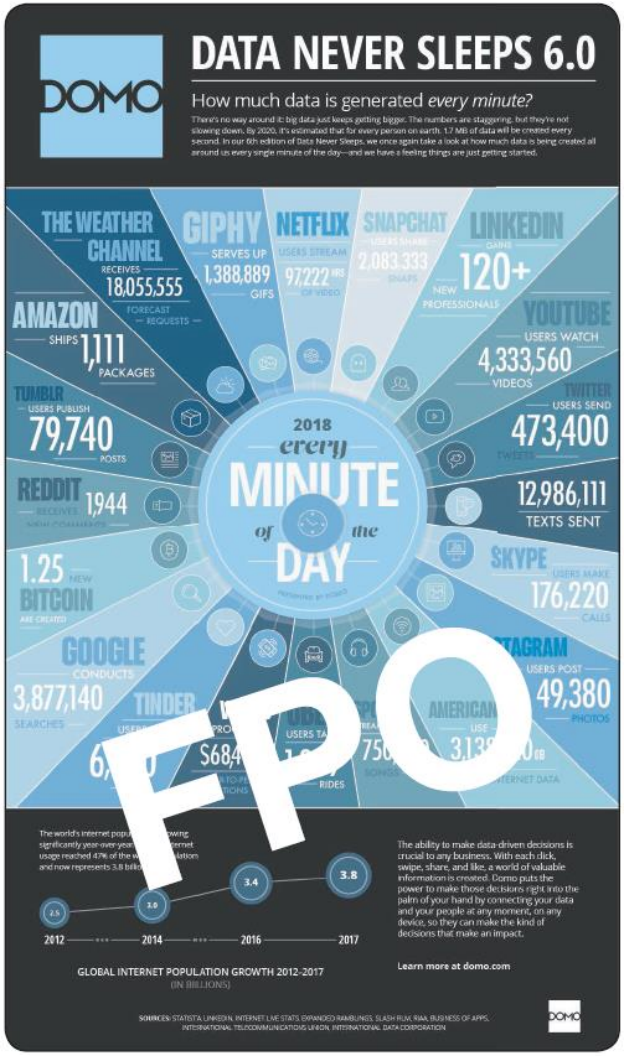
LO1-5 Distinguish between nominal, ordinal, interval, and ratio levels of measurement

LO1-6 List the values associated with the practice of statistics

Why Study Statistics

الاحصاء يحول البيانات الى معلومات مفيدة

- Data are collected everywhere and require statistical knowledge to make the information useful
- Statistics is used to make valid comparisons (مقارنات) and to predict (تنبؤ) the outcomes of decisions (القرارات)
- Statistical knowledge is useful in any career (مهمة لاي وظيفة)



What is Meant by Statistics

الاحصاء ليس فقط عرض للحقائق

- What is statistics?
- It's more than presenting numerical facts

الاحصاء:- علم جمع وتنظيم وعرض وتحليل وشرح البيانات من اجل
اعتماده في اتخاذ القرار الاوثق

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

Example: The inflation rate for the calendar year was 0.7%. By applying statistics we could compare this year's inflation rate to past observations of inflation. Is it higher, lower, or about the same? Is there a trend of increasing or decreasing inflation? Is there a relationship between interest rates and government bonds?

Types of Statistics

- There are two types of statistics, descriptive and inferential
- Descriptive statistics can be used to organize data into a meaningful form
- You can summarize data and provide information that is easy to understand

DESCRIPTIVE STATISTICS Methods of organizing, summarizing, and presenting data in an informative way.

- Example: There are a total of 46,837 miles of interstate highways in the U.S. The interstate system represents 1% of the nation's roads, but carries more than 20% of the traffic. Texas has the most interstate highways and Alaska doesn't have any.

Types of Statistics (2 of 3)

- Inferential statistics can be used to estimate properties of a population
- You can make decisions based on a limited set of data

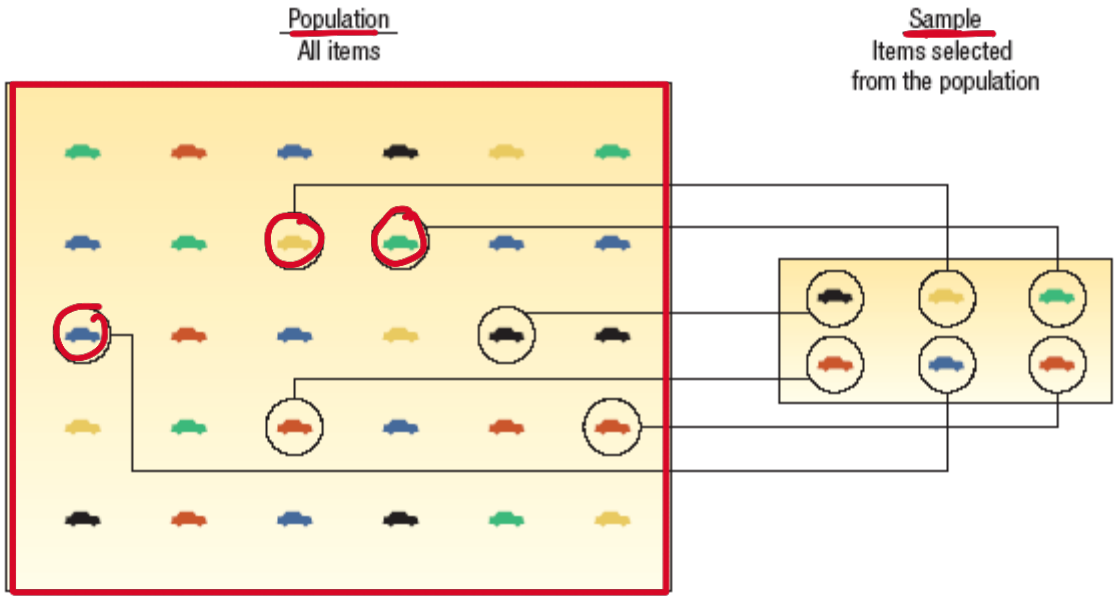
INFERENTIAL STATISTICS The methods used to estimate a property of a population on the basis of a sample.

- Example: In 2015, a sample of U.S. Internal Revenue Service tax preparation volunteers were tested with three standard tax returns. The sample indicated that tax returns were completed with a 49% accuracy rate. In other words, there were errors on about half of the returns.

Types of Statistics (3 of 3)

POPULATION The entire set of individuals or objects of interest or the measurements obtained from all individuals or objects of interest.

SAMPLE A portion or part of the population of interest.



For each of the following, determine whether the group is a sample or a popula

هيز اذا كانت المجموعه هي عينه او مجتمع

a.	The participants in a study of a new cholesterol drug.	Sample
b.	The drivers who received a speeding ticket in Kansas City last month.	Population
c.	People on welfare in Cook County (Chicago), Illinois.	Population
d.	The 30 stocks that make up the Dow Jones Industrial Average.	Sample

Answer:

a.	The participants in a study of a new cholesterol drug.	Sample
b.	The drivers who received a speeding ticket in Kansas City last month.	Population
c.	People on welfare in Cook County (Chicago), Illinois.	Population
d.	The 30 stocks that make up the Dow Jones Industrial Average.	Sample

Types of Variables

- There are two basic types of variables

QUALITATIVE VARIABLE An object or individual is observed and recorded as a non-numeric characteristic or attribute.

Examples: gender, state of birth, eye color

QUANTITATIVE VARIABLE A variable that is reported numerically.

Examples: balance in your checking account, the life of a car battery, the number of people employed by a company

Types of Variables (2 of 2)

- Quantitative variables can be discrete or continuous
- Discrete variables are typically the result of counting
  - Values have "gaps" between the values
  - Examples: the number of bedrooms in a house (1, 2, 3, 4, etc.), the number of students in a statistics course (326, 421, etc.)
- Continuous variables are usually the result of measuring something
  - Can assume any value within a specific range
  - Examples: Duration of flights from Orlando to San Diego (5.25 hours), grade point average (3.258)

Types of Variables Summary

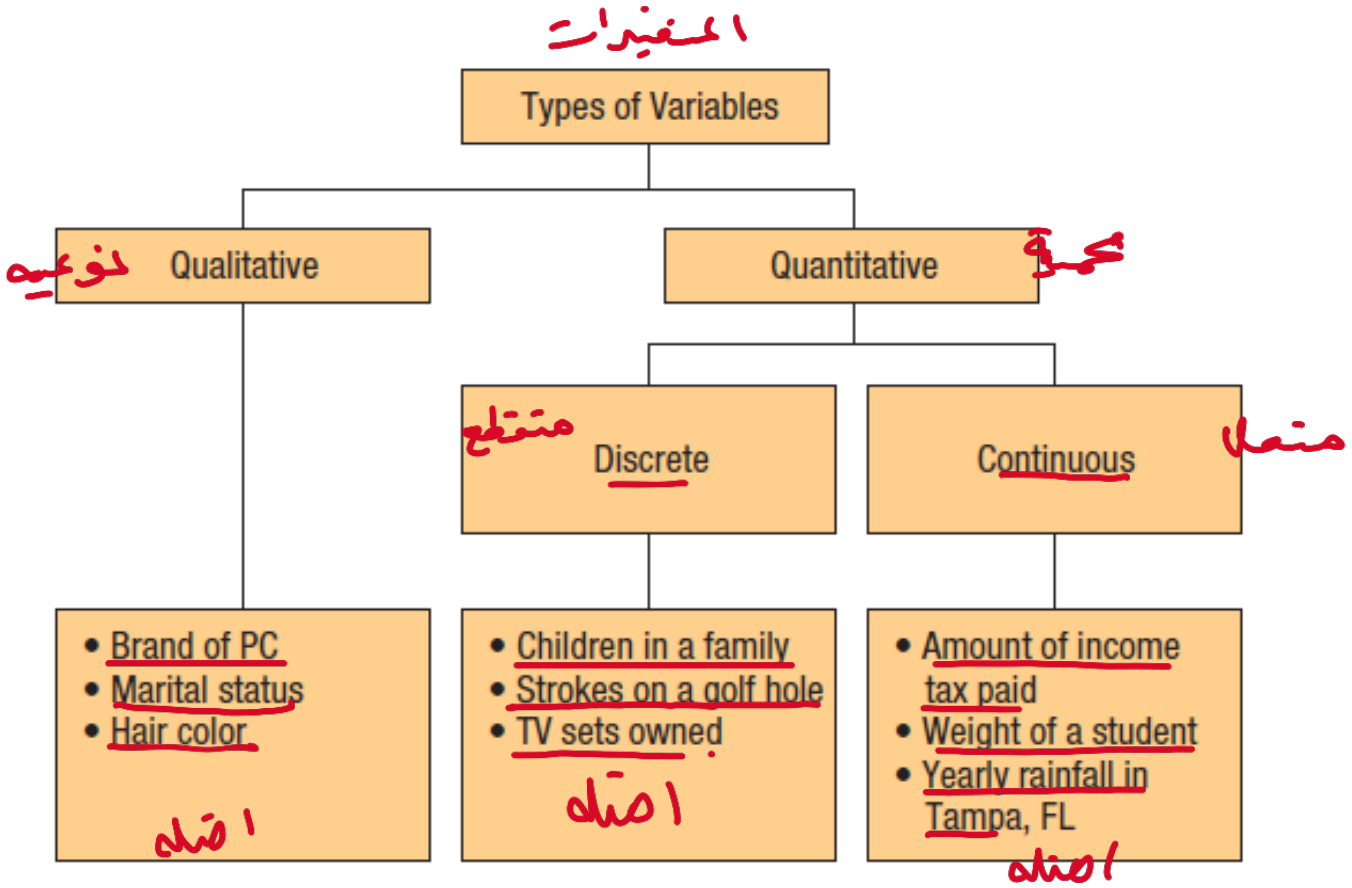


CHART 1–2 Summary of the Types of Variables

Levels of Measurement

- There are four levels of measurement
  - Nominal, ordinal, interval, and ratio
- The level of measurement determines the type of statistical analysis that can be performed
- Nominal is the lowest level of measurement

NOMINAL LEVEL OF MEASUREMENT Data recorded at the nominal level of measurement is represented as labels or names. They have no order. They can only be classified and counted.

- Examples: classifying M&M candies by color, identifying students at a football game by gender

Levels of Measurement (2 of 4)

- The next level of measurement is the ordinal level
- The rankings are known but not the magnitude of differences between groups

ORDINAL LEVEL OF MEASUREMENT Data recorded at the ordinal level of measurement is based on a relative ranking or rating of items based on a defined attribute or qualitative variable. Variables based on this level of measurement are only ranked and counted.

- Examples: the list of top ten states for best business climate, student ratings of professors

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Levels of Measurement (3 of 4)

- The next level of measurement is the interval level
- This data has all the characteristics of ordinal level data, plus the differences between the values are meaningful
- There is no natural 0 point

INTERVAL LEVEL OF MEASUREMENT For data recorded at the interval level of measurement, the interval or the distance between values is meaningful. The interval level of measurement is based on a scale with a known unit of measurement.

- Examples: the Fahrenheit temperature scale, dress sizes

Levels of Measurement (4 of 4)

- The highest level of measurement is the ratio level
- The data has all the characteristics of the interval scale and ratios between numbers are meaningful
- The 0 point represents the absence of the characteristic
- Examples: wages, changes in stock prices, and height

RATIO LEVEL OF MEASUREMENT Data recorded at the ratio level of measurement are based on a scale with a known unit of measurement and a meaningful interpretation of zero on the scale.

Levels of Measurement Summary

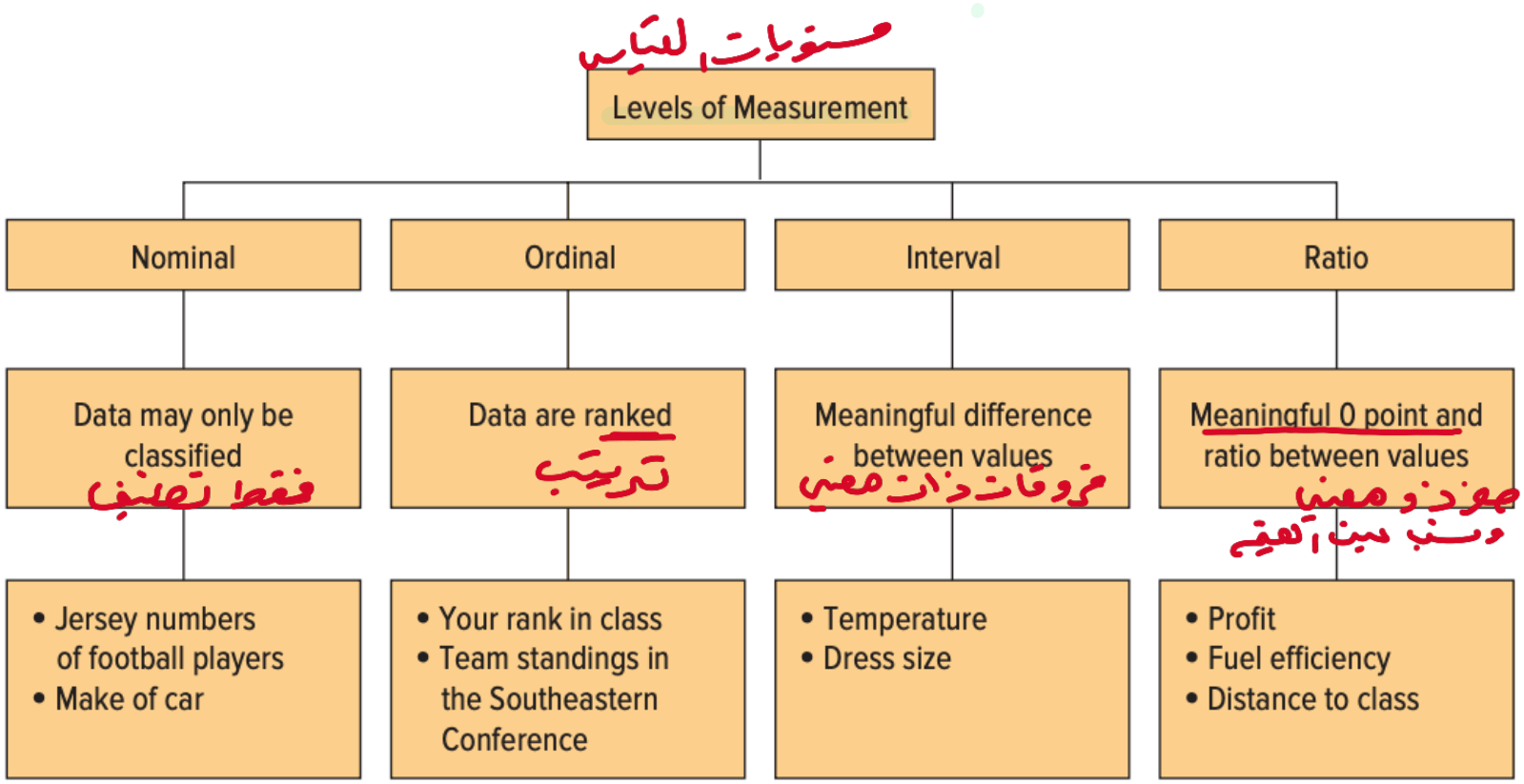


CHART 1–3 Summary and Examples of the Characteristics for Levels of Measurement

Chapter 1 Practice Problems

Question 1

LO1-5

What is the level of measurement for each of the following variables?

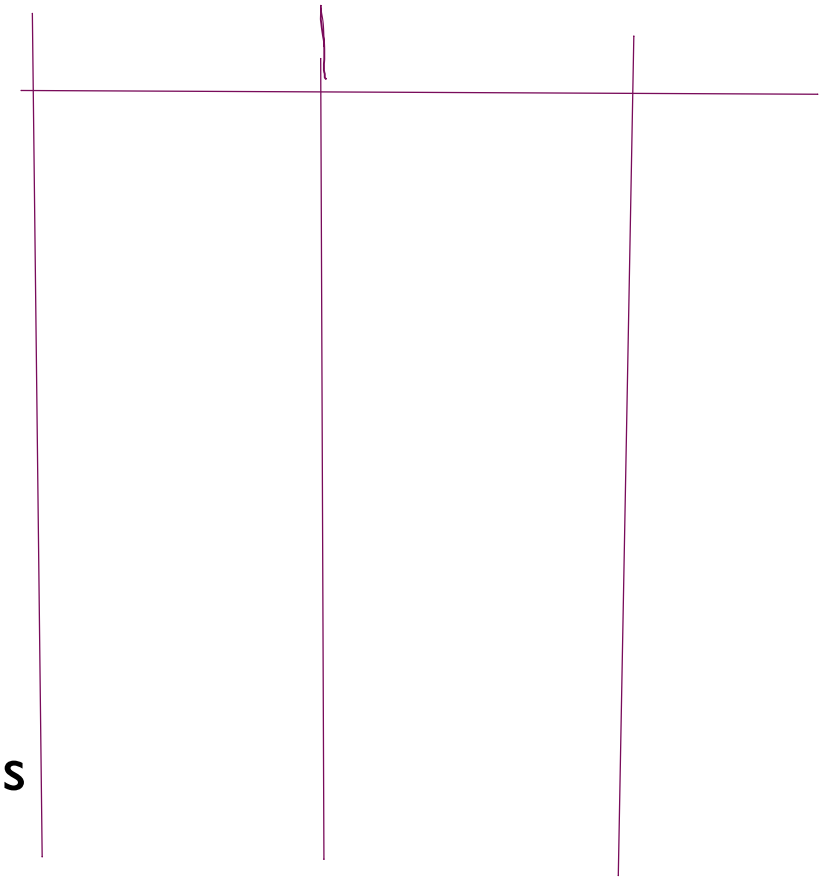
a. Student IQ ratings Interval
b. Distance students travel to class Ratio
c. The jersey numbers of a sorority soccer team Nominal
d. A student's state of birth Nominal
e. A student's academic class – that is, freshman, sophomore, junior, or senior Ordinal
f. Number of hours students study per week Ratio

Question 13

LO1-4,5

For each of the following, determine whether the variable is continuous or discrete, quantitative or qualitative, and level of measurement

a. Salary
b. Gender
c. Sales volume of MP3 players
d. Soft drink preference
e. Temperature
f. SAT scores
g. Student rank in class
h. Rating of a finance professor
i. Number of home video screens



a) **salary**-continuous,quantitative,ratio

b)**gender**- discrete,qualitative,nominal

C) **sales volume of MP3 players**- continuous, quantitative, ratio

D) **soft drink preference**- discrete, qualitative, nominal

E) **Temperature**- continuous,quantitative, interval scale

F) **SAT scores**- continuous, quantitative, ratio

G) **student rank in class**- discrete, quantitative, ordinal

H) **rating of a finance professor**- discrete, quantitative,ordinal

I) **number of home video screens**- discrete, quantitative, ratio

Practice Question

- Q5 AND Q18

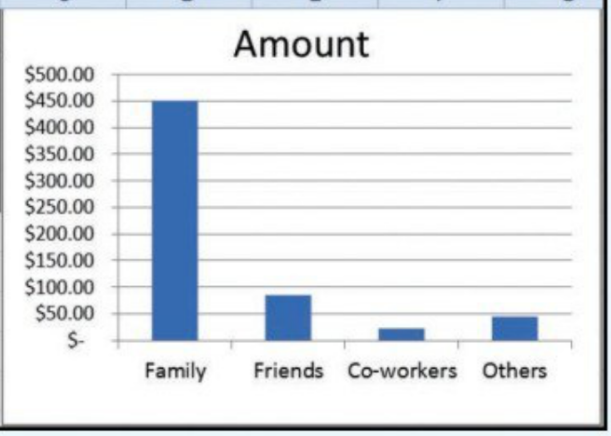
5. Explain the difference between qualitative and quantitative variables. Give an example of qualitative and quantitative variables.

Qualitative data represents the quality or features of a data set like in gender. Its quality is whether the person is male or female, so qualitative data is non numerical.

Quantitative data represents the quantity of the dataset it usually deals with numbers for example number of persons in a bus etc. So quantitative data is numerical.

18. The following chart depicts the average amounts spent by consumers on holiday gifts.

	A	B
1	Holiday Spending	Amount
2	Family	$451.34
3	Friends	$ 85.60
4	Co-workers	$ 22.40
5	Others	$ 44.52



Write a brief report summarizing the amounts spent during the holidays. Be sure to include the total amount spent and the percent spent by each group.

مجموع كل الهدايا — نسبة كل هدية

According to the given chart, the average amounts spent by consumers on holiday gifts are as follows:

- Family: $451.34
- Friends: $85.60
- Co-Workers: $22.40
- Others: $44.52

النسبة = الجزء / الكل

نسبة صافي العائلة = (مبلغ صافي العائلة / المبلغ الكلي) × %100

Total amount spent = $451.34 + $85.60 + $22.40 + $44.52 = $603.86

= 451.34 / 603.86 × 100

- Percentage spent by Family = ($451.34 / $603.86) * 100 ≈ 74.7%
- Percentage spent by Friends = ($85.60 / $603.86) * 100 ≈ 14.2%
- Percentage spent by Co-Workers = ($22.40 / $603.86) * 100 ≈ 3.7%
- Percentage spent by Others = ($44.52 / $603.86) * 100 ≈ 7.4%