

**Statistics 1:
Introduction to Probability
and Statistics**

Section 1-2

More Definitions

- **Parameter**
 - a numerical characteristic of a population
 - “population parameter”

More Definitions

- **Statistic**
 - a numerical characteristic of a sample
 - “sample statistic”

Examples of “numerical characteristics”

1. Average or Mean
2. Biggest (maximum) value
3. Smallest (minimum) value
4. Range :
maximum - minimum

A Statistic is:

- A function of data
- Function : $y = f(x)$
 - the value of “x” determines the value of “y”
- The average is a function of a set of “x” values; the average of 4, 6, and 8 = 6.

Start with the sample or the population?

- Sometimes we have a sample and we need to consider the population or populations that the sample represents

Start with the sample or the population?

- A sample is likely to be “representative” (it looks like the population) if it is collected in a well-planned and well-executed manner

The Nature of Data

Definitions

- Quantitative vs. Qualitative
- Discrete vs. Continuous
- Four “levels” of measurement

Definitions

- **Quantitative vs. Qualitative**

- **Quantitative Data are numbers that represent counts or measurements**

- **Qualitative Data may represent categories based on a non-numerical characteristic**
- **Sometimes called categorical or attribute data**

Definitions

- Discrete vs. Continuous

Definitions

- Discrete
- The set of possible values can be counted (possibly infinite)
- Main example: “Counts”

Definitions

- Continuous
- The possible values cannot be counted. Even in a small range, the possibilities are infinite.
- Main example: “Measurements”

Definitions

- Four “levels” of measurement
 - Nominal
 - Ordinal
 - Interval
 - Ratio

Definitions

- Four “levels” of measurement
 - Nominal
 - “name”
 - not quantitative
 - cannot compare magnitudes

Definitions

- Four “levels” of measurement
 - Nominal
 - New York, San Francisco, Sacramento, Lodi
 - Other attributes of these cities can be compared as quantities, but not the names

Definitions

- Four “levels” of measurement
 - Ordinal
 - “names” or categories
 - not quantitative
 - can be compared in magnitude as “less than” or “greater than” only

Definitions

- Four “levels” of measurement
 - Ordinal
 - small, medium, large
 - can be put in order according to magnitude, but other comparisons cannot be done

Definitions

- Four “levels” of measurement
 - Interval
 - values represent magnitude explicitly
 - can be put in order, and
 - intervals can be compared, but
 - ratios cannot be compared

Definitions

- Four “levels” of measurement

- Interval

- Temperatures
- 0°C, 10°C, 20°C
- can be put in order
- interval from 0 to 10 is the same as 10 to 20

Definitions

- Four “levels” of measurement

- Interval

- Temperatures
- 0°C, 10°C, 20°C
- 20 is not “twice as hot” as 10

Definitions

- Four “levels” of measurement

- Interval

- These temperatures are the same
- 0°C, 10°C, 20°C; $20 \div 10 = 2$
- 32°F, 50°F, 68°F; $68 \div 50 = 1.36$
- 273°K, 283°K, 293°K
 $293 \div 283 = 1.04$

Definitions

- Four “levels” of measurement

–Ratio

- Values represent magnitude explicitly
- Can be put in order
- Intervals can be compared
- Ratios can be compared

Definitions

- Four “levels” of measurement

–Ratio

- Natural not arbitrary “zero”
- Speed, weight, elapsed time, voltage, distance
- 60 miles per hour is twice as fast as 30 miles per hour
