Quantitative Data: Numerical Methods for Describing Distributions of Data

Interpreting Position, Center & Variability in a Distribution

Adapted from Statistics and Data Analysis, 5th edition - For AP*

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Warm-UP: Oct 6, 2022

- 1. What is meant by the statement: “Sara is in the 84^{th} percentile of heights for girls of the same age”?
- 2. Define the standard deviation of a sample.
- 3. What are the three common measures of position for observations in a data set?
- 4. What is normal? What is a Normal distribution?

Warm-UP: Oct 6, 2022 - Answers

- 1. “Sara is in the 84th percentile of heights” means that she is ***as tall or taller*** than 84 percent of the girls her same age.
- 2. Define the standard deviation of a sample:

$$s_x = sample\ standard\ deviation$$

A **statistic** that measures the typical distance from the mean for values (observations) in a distribution. It is calculated by finding the “average” of the squared distances, and then taking the square root

Warm-Up (Answers cont.)

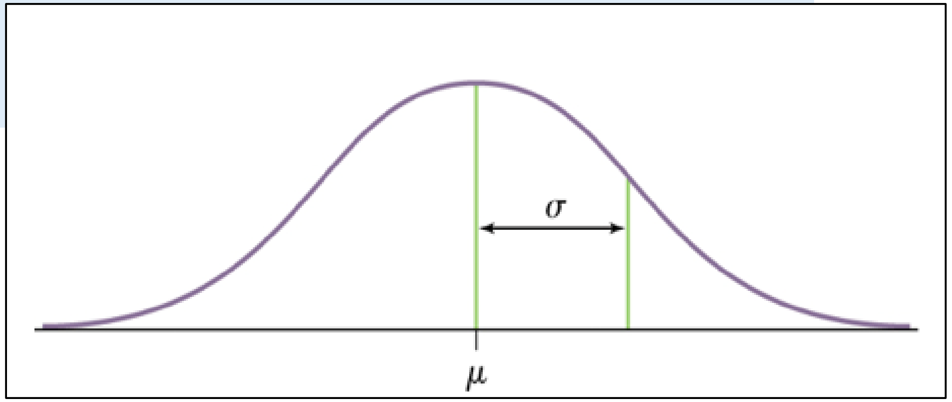
3. What are the three common measures of position for observations in a data set?

1. Percentiles
2. Quartiles
3. Standard scores (or *z-scores*)

Note: a z-score (or standard score) is a measure of position for an observation within a data set that provides a "standardized" measure of *distance* and *direction* in relation to The mean of the data, in terms of standard deviation

Warm-UP: Oct, 2022 - Answers

- 4. Normal is what you are accustomed to experiencing. Maybe eating eggs and bacon every morning is “normal” for you. Maybe you normally eat cereal with almond milk. Maybe normal breakfast is a bowl of rice and fried fish.
- A Normal distribution is the commonly referred parametric distribution in statistics. It is symmetric, bell-shaped, and has equivalent measures of center (mean = median= mode). Every Normal distribution is clearly defined by the value of it’s mean and its standard deviation.



Modeling Distributions of Data
Concept objectives

- **Describing Location in a Distribution**
- **Percentiles**
- Density Curves
- Normal Distributions
- The Empirical Rule
- Calculating z Scores

Normal Distributions & z-scores
Describing Location in a Distribution

Learning Objectives

After this section, you should be able to…

- ✓MEASURE position using percentiles & quartiles
- ✓MEASURE position using *z*-scores
- ✓TRANSFORM data (z-scores)
- ✓DEFINE and DESCRIBE density curves

- **Measuring Position: Percentiles**
  - One way to describe the location of a value in a distribution is to tell what percent of observations are less than it.

Definition:

The ***p*^th^ percentile** of a distribution is the value with *p* percent of the observations less than or equal to it.

Example

Jenny earned a score of 86 on her test. How did she perform relative to the rest of the class?

6	7
7	2334
7	5777899
8	00123334
8	569
9	03

Her score was greater than 21 of the 25 observations. Since 22 of the 25, or 88%, of the scores are less than or equal to hers, Jenny is at the 88th percentile in the class's test score distribution.

Percentiles: **2 Definitions of Percentile**

NOTE: There is no universally accepted, single definition of a percentile.

Definition 1 : Using the 65th percentile as an example, the 65th percentile can be defined *as the lowest score that is **greater than 65%** of the scores*.

Definition 2: The 65th percentile can also be defined as the smallest score **that is greater than or equal to 65%** of the scores.

"Unfortunately, these two definitions can lead to dramatically different results, especially when there is relatively little data. Moreover, neither of these definitions is explicit about how to handle rounding.