

2.5 Measures of Center of the Data

Learning Objectives

In this section, you will:

- Measure the centers of data, including mean, median, and mode.

The "center" of a data set is also a way of describing location. The two most widely used measures of the "center" of the data are the **mean** (average) and the **median**.

Mean and Median

Mean: add all data, divide by the total number of values.

Formulas: $\bar{x} = \frac{\sum x}{n}$ for sample mean or $\mu = \frac{\sum x}{N}$ for population mean.

Median: middle value when the data are placed in order. If there is no middle value, find the mean of the two middle values.

- The median is generally a better measure of the center when there are extreme values or outliers because it is not affected by the precise numerical values of the outliers.
- You can quickly find the location of the median by using the expression $(n + 1)/2$.

Example 1

Consider the following data: 19; 18; 18; 25; 24; 32; 45; 29; 17; 18; 53; 30; 20; 21.

Find mean.

Find median.

Using the graphing calculator to find the mean and median.

- Clear list L1. Press STAT 4: ClrList. Enter 2nd 1 for list L1. Press ENTER.
- Enter data into the list editor. Press STAT 1: EDIT.
- Put the data values into list L1.
- Press STAT and arrow to CALC. Press 1:1-VarStats. Press 2nd 1 for L1 and then Calculate.
- Press the down and up arrow keys to scroll.

Example 2

AIDS data indicating the number of months a patient with AIDS lives after taking a new antibody drug are as follows (smallest to largest): 3; 4; 8; 8; 10; 11; 12; 13; 14; 15; 15; 16; 16; 17; 17; 18; 21; 22; 22; 24; 24; 25; 26; 26; 27; 27; 29; 29; 31; 32; 33; 33; 34; 34; 35; 37; 40; 44; 44; 47.

Calculate the mean and the median.

Mode

Another measure of the center is the mode. The is the most frequent value. There can be more than one mode in a data set as long as those values have the same frequency and that frequency is the highest. A data set with two modes is called bimodal.

Example 3

Statistics exam scores for 20 students are as follows: 50; 53; 59; 59; 63; 63; 72; 72; 72; 72; 72; 76; 78; 81; 83; 84; 84; 84; 90; 93.

Find the mode.

Calculating the Mean of Frequency Distribution

When only grouped data is available, you do not know the individual data values (we only know intervals and interval frequencies); therefore, you cannot compute an exact mean for the data set. What we must do is estimate the actual mean by calculating the mean of a frequency table.

Mean of frequency table = $\frac{\Sigma(f*m)}{\Sigma f}$, where:

- o f = the frequency of the interval
- o m = the midpoint of the interval

Example 4

A frequency table displaying Professor Blount's last statistic test is shown. Find the best estimate of the class mean.

Grade Interval	Number of Students
50.5-56.4	1
56.5-62.4	0
62.5-68.4	4
68.5-74.4	4
74.5-80.4	2
80.5-86.4	2
86.5-92.4	4
92.5-98.4	1

Using the graphing calculator to find the mean of grouped frequency tables.

- Clear list L1. Press STAT 4:ClrList. Enter 2nd 1 for list L1. Press ENTER.
- Enter data into the list editor. Press STAT 1:EDIT.
- Put the midpoint values into list L1.
- Put the frequency values into list L2.
- Press STAT and arrow to CALC. Press 1:1-VarStats.
- List: Press 2nd 1 for L1.
- FreqList: Press 2nd 2 for L2. and then Calculate.
- Press the down and up arrow keys to scroll.

For more information and examples see online textbook OpenStax Introductory Statistics pages 100- 106.

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