Section 3.1: Mean, Median, and Mode: Calculations

Mean, median, and mode are three types of averages. These values tend to be near the center of the data.

The **mean** is the sum of the data divided by the number of data.

For example, given the data 25 16 28 12 20, the mean = (25+16+28+12+20) / 5 = 20.2.

The **median** is in the middle of the *ordered* list of data. If finding the median by hand, first put the data in either low-to-high or high-to-low order. Example 1 on the next page will explain how to do this using the ALEKS or the TI calculator.

If there is an odd number of data, then the median is the middle number.

For example, given the data 15 25 12 16 30, list the data in order from lowest to highest: 12 15 ***16*** 25 30. The median is the middle number, so the median = 16.

If there is an even number of data, then the median is the mean of the two middle numbers.

For example, given the data 38 30 56 49 80 77, list the data in order from lowest to highest: 30 38 ***49 56*** 77 80. There are two middle numbers, so the median is the mean of 49 and 56, which is (49 + 56) / 2 = 105 / 2 = 52.5.

The **mode** is the number or numbers that appear the most in the set of data.

There could be no mode, one mode, two modes, or more.

For example, given the data 44 68 76 33 27 11 25, each value appears only once, so there is not a number or numbers that appear more than the others, so there is no mode.

For example, given the data 21 36 24 78 45 30 21 45 21, the value 45 appears twice, the value 21 appears three times, the rest appear only once each, so there is one mode, 21.

For example, given the data 52 45 60 25 33 60 72 52 39, the value 52 appears twice, the value 60 appears twice, the rest appear only once each, so there are two modes, 52 and 60.

Note: For larger data sets, it is easier to see the mode if the data are in order, say low to high.

I will present examples on finding the mean, median, and mode and will give two methods for finding these values: the first is by hand, and the second is by using the TI-83 or -84 calculator. The “by hand” method is to give you the understanding of the topic, and the “calculator” method gives you a quick and easy way to find the solution.

Read the problem carefully. Sometimes, ALEKS asks for the mean first and sometimes the median first.

Example 1: Test scores for eight students are as follows. 83 78 90 80 78 88 95 70

a. What is the mean score (rounded to one decimal place)?
b. What is the median score (rounded to one decimal place)?
c. How many modes are there, and what are their values?

Solution: **BY HAND**

a. Mean = (83 + 78 + 90 + 80 + 78 + 88 + 95 + 70) / 8 = 662 / 8 ≈ 82.8
b. To find the median, list data in order from lowest to highest.

70 78 78 ***80 83*** 88 90 95

***Note: Use the ALEKS calculator to sort the data.*

Left-click on first piece of data; while holding the left mouse button down, move the mouse to the right to highlight all of the data. You will now see the data on the ALEKS calculator screen. *Press the sort key.*

Because there is an even number of data, the median is the mean of the two middle numbers: (80 + 83) / 2 = 163 / 2 = 81.5

c. Using the ordered list in part (b), it is easy to see that there is one mode, 78.

Solution: **USING TI-83 OR -84 CALCULATOR**

Press STAT, then press 1 for EDIT.

If there are data in L1, clear the list: Move cursor up to L1, press CLEAR, then ENTER.

Input the data into L1 as shown in the problem, pressing ENTER after each data.

Check data in L1. If there is an error, type over incorrect data, then press ENTER.

Press STAT, use right arrow to highlight CALC, then press 1 for 1-Var Stats.

TI-83 OR OLDER TI-84: You will see a blinking cursor; press 2nd, then 1, then ENTER.

UPDATED TI-84: You will see List:
FreqList:
Calculate
Next to List, press 2nd, then 1, then press ENTER three times.

Always use the top number on the screen, $\bar{x}$, for the mean:
$\bar{x}$ is the mean of a sample; μ is the mean of a population.
s is the sample standard deviation, *Sx* on calculator (used in a later topic).
$\sigma$is the population standard deviation,σxon calculator (used in a later topic).
n is the sample size.
Scroll down, and you will see the median, written as med.
Also, you will see minX, Q1, med, Q3, maxX (used for box-and-whisker plot, later).

You will see that the mean is 82.8 (rounded), and the median is 81.5.

The calculator will not tell you the mode; however, you can have the calculator list the data from lowest to highest, which makes it easier to find the mode.

Press STAT, then 2 for SortA(. Then press 2nd 1 (for L1), then ENTER.
Press STAT, then 1 for EDIT. Scroll through the list to find the mode, 78.

Example 2: A random sample of temperatures (in degrees Fahrenheit) in Frigidville are as follows.

-20 30 -8 -10 13 -12 22

a. What is the mean temperature (rounded to one decimal place)?
b. What is the median temperature (rounded to one decimal place)?
c. How many modes are there, and what are their values?

Note: The negative key is located in bottom row of calculator, just left of the ENTER key.

Solution: **BY HAND**

a. Mean = (-20 + 30 + -8 + -10 + 13 + -12 + 22) / 7 = 15 / 7 ≈ 2.1
b. To find the median, list data in order from lowest to highest.

   -20 -12 -10 ***-8*** 13 22 30

   Because there is an odd number of data, the median is the middle value, -8.
c. Using the ordered list in part (b), it is easy to see that there is no mode.

Solution: **USING TI-83 OR -84 CALCULATOR**

Press STAT, then press 1 for EDIT.

To clear the old data in L1: Move cursor up to L1, press CLEAR, then ENTER.

Input the data into L1 as shown in the problem, pressing ENTER after each data.

Check data in L1. If there is an error, type over incorrect data, then press ENTER.

Press STAT, use right arrow to highlight CALC, then press 1 for 1-Var Stats.

TI-83 OR OLDER TI-84: You will see a blinking cursor; press 2nd, then 1, then ENTER.

UPDATED TI-84: You will see List: FreqList: Calculate *Press 2nd, then 1, then ENTER three times.*

You will see that the mean is 2.1 (rounded), and the median is -8.

To find the mode, list the data from lowest to highest.

Press STAT, then 2 for SortA(. Then press 2nd 1 (for L1), then ENTER.

Press STAT, then 1 for EDIT. Scroll through the list to find the mode.

Again, there is no mode.