

Investigating a Fundamental Difference Between the Mean and the Median.

Part 1. The table below shows each score and its frequency for a 10-item tryout test of questions that are similar to those on the upcoming state mathematics exam.

Tryout Scores			
Score	Frequency	Score	Frequency
1	0	6	8582
2	217	7	6753
3	714	8	6526
4	926	9	5114
5	1259	10	4049

What is the mean, rounded to the nearest hundredth, of the data?

How many students took the test?

What is the median of the data?

Part 2. The frequencies of the scores for 9 and 10 were recorded incorrectly. The correct scores are shown in the table below.

Tryout Scores			
Score	Frequency	Score	Frequency
1	0	6	8582
2	217	7	6753
3	714	8	6526
4	926	9	4049
5	1259	10	5114

What is the mean, rounded to the nearest hundredth, of the correct scores?

Since the frequencies are the same, there is no change in the number of students that took the test.

What is the median of the data?

This example illustrates the fact that the mean of a data set is affected by every value, but the median is not sensitive to a change in an extreme value.

Part 3. The heights of the five starting basketball players on two teams are shown in the table below.

Heights of Starting Basketball Players					
Team A	5'9"	6'1"	6'3"	6'7"	6'9"
Team B	5'9"	6'1"	6'3"	6'7"	7'1"

WITHOUT DOING ANY CALCULATION, answer the following questions.

Are the means heights for the two teams the same? Explain why you think this is so.

Are the median heights for the two teams the same? Explain why you think this is so.

Teacher Notes

To enter data into the statistics register, press "MODE," then "." (the decimal point). You will see "SD" appear in the upper-right corner of the screen. Note the blue background around the statistics mode in the list of modes below the screen. All functions enclosed in blue brackets (above the 4 through 9 keys and the red AC key, and below the "M+" key) are only accessible when in the statistics mode.

Even though the statistics register is clear when first entering the statistics mode, it is good practice to clear the register by pressing "SHIFT" and then "AC." This process accesses the function in yellow above the red "AC" key: Statistics All Clear. The register should be cleared each time a new exercise is begun.

The following procedure enters the same value multiple times.

- Enter the value.
- Press the multiplication sign key.
- Enter the number of times the value is to be entered.
- Press the "M+" key. Both "DATA" and "DEL" appear enclosed in blue brackets beneath the "M+" key. "DATA" enters values into the data register. "DEL," which is in yellow and accessed using the "SHIFT" key, deletes values.

When the calculator is in the statistics mode, these are the keystrokes for entering a value of 1 into the register 217 times:

$\boxed{1} \boxed{\times} \boxed{2} \boxed{1} \boxed{7} \boxed{M+}$

NOTE: Entering $\boxed{2} \boxed{1} \boxed{7} \boxed{\times} \boxed{1} \boxed{M+}$ would enter the value 217 into the register one time. To enter a value multiple times, the value must precede the number of entries.

The number of elements in the data register is represented by "*n*" which can be seen in yellow and enclosed in blue brackets above the "6" key. When all values in part 1 have been entered, the value for *n* should be 34140.

Most of the values in the second part of the exercise are the same. Rather than clearing the register and starting anew, it is possible to delete the incorrect entries and preserve those that are correct. The procedure for deleting multiple entries is nearly identical to the procedure for entering. The only difference is that in the last step "SHIFT" must be pressed before "M+" so that the yellow function – DEL – can be accessed.

When the entries in Part 1 of the exercise have been made, these are the keystrokes for deleting the 5114 entries of 9.

$\boxed{9} \boxed{\times} \boxed{5} \boxed{1} \boxed{1} \boxed{4} \boxed{SHIFT} \boxed{M+}$

To exit the statistics mode, press MODE, 0.

Correct Responses

Part 1

The mean is approximately 7.32.

34140 students took the test.

The median is 7.

Part 2

The mean is approximately 7.36

The median is still 7.

Part 3

Sample responses:

The means are not the same. The first four heights are the same for both teams but the greatest heights are different. Therefore, the sums of the heights will be different. Each sum would be divided by 5 to get the mean of the heights, so the means will be different.

The medians are the same. The heights are arranged from least to greatest, and the middle height for both teams is 6'3".