

Definition 1. The **mode** of a data set is the value that occurs most frequently. Note: If a data set has no single value that occurs more frequently than any other, then that data set has no mode.

Remark: Not every data set has a mode.

Example 1: 1, 5, 7, 5, 3, 2, 5 \longrightarrow mode: 5

Example 2: 1, 3, 5, 9, 7 \longrightarrow mode: No mode

Example 3: 1, 3, 4, 5, 3, 7, 5 \longrightarrow mode: 3, 5

Definition 2. The **median** tells us the middle value of a data set that has been arranged in order from smallest to largest.

Q 1. How can we find the median?

Step 1: Order the data from SMALLEST to LARGEST.

Step 2: For an ODD number of data median: the MIDDLE data value.

Step 3: For an EVEN number of data, median = $\frac{\text{sum of middle two}}{2}$

Example: 3, 4, 9, 7, 5. Find the medium

Step 1: Smallest to Largest: 3, 4, 5, 7, 9 = Medium (the number in middle) = 5

Example 2: 3, 5, 7, 9, 10, 10

Step 1: already ordered from Smallest to Largest = Medium = $\frac{7 + 9}{2} = 8$

Definition 3. The **mean**(average) tells us the value obtained by adding up all the data and dividing by the number of data.

Q 2. How can we find the mean?

$$\text{Mean} = \frac{\text{Sum of all entries}}{\# \text{ of entries}} = \frac{\overset{\text{sum}}{\downarrow} \sum x}{n}$$

Sample Mean: $\bar{X} = \frac{\sum x}{n}$, $n = \text{number of data values in the sample}$ (STATISTIC)

Population Mean: $\mu = \frac{\sum x}{N}$, $N = \text{number of data values in the population}$ (PARAMETERS)

Example 1. Consider the data set 1, 8, 7, 2, 7

1. Compute the mode, median, and mean. (Enter your answers to one decimal place.)

Mode: 1, 8, 7, 2, 7 \rightarrow **Mode = 7**

Median: 1, 8, 7, 2, 7 = 1, 2, 7, 7, 8 \rightarrow **Median = 7**

Mean: 1, 8, 7, 2, 7 = 25 $\frac{25}{5} = 5 \rightarrow$ **Mean = 5**

2. Add 7 to each of the data values. Compute the mode, median, and mean.

New Data: 8, 9, 14, 14, 15

Mode: 8, 9, 14, 14, 15

Mode = 14

Median: 8, 9, 14, 14, 15 = 8, 9, 14, 14, 15

Median = 14

Mean: 8, 9, 14, 14, 15 = 60 = $\frac{60}{5}$ =

Mean = 12

Conclusion: Adding the same constant (C, in this case 7) to each data value results in the MODE, MEDIAN, and MEAN increasing by C units.

3. Multiply each data value by 3. Compute the mode, median, and mean.

New data: 3, 24, 21, 6, 21

Example 2. Consider a data set of 11 distinct measurements with mean A and median B.

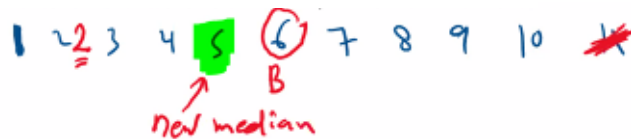
1. If the highest number were increased, what would be the effect on the median and mean? Explain. **1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11**

Median: (number in middle) = 6

Mean: $\frac{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}{11} = \frac{66}{11} = 6$

The MEAN would INCREASE while the MEDIAN would remain the same

2. If the highest number were decreased to a value smaller than B, what would be the effect on the median and mean?



Both the MEDIAN and the MEAN increased

Example 3. (YOU TRY) Suppose you have the data set 3, 5, 6, 7, 9. Find:

1. Mean **= 6**
2. Median **= 6**
3. Mode **= No Mode**
4. If the data point **9** is replaced by **19**. What is the mean and median for the new data set?