

Measures of the Middle and Variation

Objective: To find the mean, median, mode, UP,LQ, range, and interquartile range of any set of data.

Virtues/Skills: You need these to make different types of conclusions from your data.

Measures of the Center

Are used to describe the middle of the data:

-Mean

-Median

-Mode

Mean

The **mean** of a set is the average when all the data is added together and then divided by how many numbers there are. Is thrown off by outliers.

Mode

The **mode** of a set is the number that occurs most often. Data sets, can have more than one mode.

Median

The **median** of the set is to find the middle number. Set must be in numerical order. Not thrown off by outliers

Even # of Data Points

1	2	3	4	5	6	7	8
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median 4.5

Odd # of Data Points

9	10	11	12	13	14	15
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median 12

$\frac{4+5}{2} = \frac{9}{2} = 4.5$

Measures of Variation

Change

Are used to describe the distribution or spread of the data

-Range- the distance between the smallest and greatest data values; thrown off by outliers

-Quartiles

-Interquartile range IQR -The best way to describe the spread of data

Range-

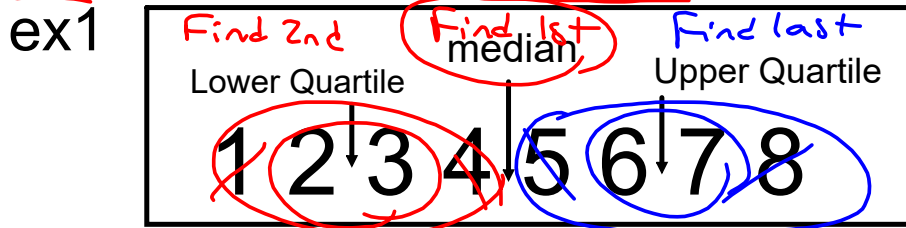
The difference between the maximum and minimum, including outliers. This will be thrown off by outliers.

ex1 $\text{max} : 8$
 $\text{min} : 1$
 $\text{Range} : 8 - 1 = 7$

ex2 $\text{max} : 15$
 $\text{min} : 9$
 $\text{Range} : 15 - 9 = 6$

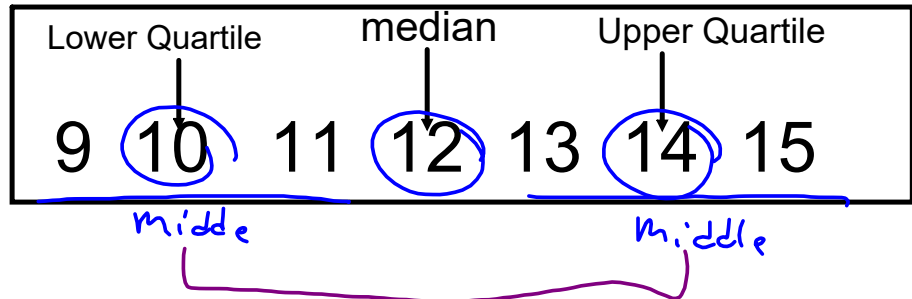
Quartiles

The median, lower quartile and upper quartile are numbers that break the data into quarters by using medians. LQ is the median of the lower half, UQ is the median of the upper half.



Median: 4.5
 LQ: 2.5
 UQ: 6.5

ex2



Interquartile range-

IQR

The range between quartiles to see how the main 50% of data is spread. Subtract the UQ and the LQ.

ex1 $\text{IQR} = 6.5 - 2.5 = 4$
 $\text{LQ} : 2.5$
 $\text{UQ} : 6.5$

ex2 $\text{UQ} : 14$
 $\text{LQ} : 10$
 $\text{IQR} = 14 - 10 = 4$

Outliers-

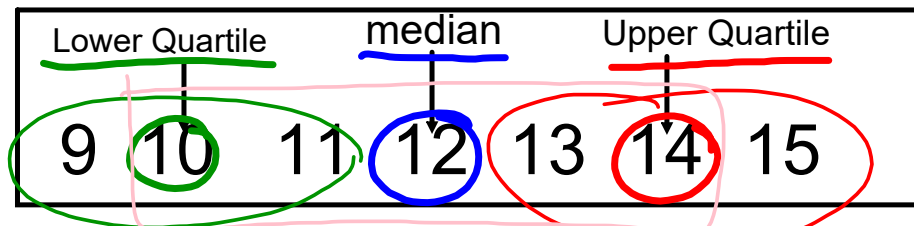
values that are more than 1.5 times the value of the interquartile range. (*too high or too low compared to the rest of the values*)

First, find the **interquartile range** and **multiply it by 1.5**

IQR · 1.5

- take that value and add it to the UQ $UQ + \uparrow$
- take that value and subtract it from the LQ $LQ - \downarrow$

Example:



Interquartile range is $14 - 10 = 4$

interquartile times 1.5 $4 \times 1.5 = 6$

Upper Quartile: $14 + 6 = 20$
 anything higher than 20 is an outlier

Lower Quartile: $10 - 6 = 4$
 anything lower than 4 is an outlier

Find the range, mean, median, mode, the lower quartile, upper quartile, interquartile range, and outliers of the set:

Data: ~~42, 49, 53, 41, 44, 67, 61, 53, 55~~

41, 42, 44, 49, 53, 53, 55, 61, 67

mean: $(41+42+44+49+53+53+55+61) / 9$
Average

mean: 51.6

Median ~~41, 42, 44, 49, 53, 53, 55, 61, 67~~
Middle median: 53

Mode: repeated? 53
mode: 53

Range: max: 67
min: 41
max - min
67 - 41

Range: 26

Quartiles:

~~41, 42, 44, 49, 53, 53, 55, 61, 67~~

Lower Quartile

$$\frac{42+44}{2} = 43$$

Q1 or LQ
is 43

Q2
Median
is 53

Upper Quartile

$$\frac{55+61}{2} = 58$$

Q3 or UQ
is 58

$$IQR = Q3 - Q1$$

$$58 - 43$$

$$IQR = 15$$

Outliers: $IQR \cdot 1.5$

$$15 \cdot 1.5 = 22.5$$

$$Q3 + 22.5$$

$$58 + 22.5 = 80.5$$

$$Q1 - 22.5 =$$

$$43 - 22.5 = 20.5$$

No Outliers

Summary

Objective: To find the mean, median, mode, UP, LQ, range, and interquartile range of any set of data.

Virtues/Skills: You need these to make different types of conclusions from your data.

Assignment: textbook pg. 590

1-4, 5-11, 15-16

1. the center, or typical value; the distribution of the data

5. a. mean: 4, median: 3, mode: 1

2. The mean gets closer to the median.

6. a. mean: 12.6, median: 12, mode: none
b. mean; There are no outliers.

3. *Sample answer:* 3, 4, 4, 7, 9, 9

7. a. mean: 22, median: 21, mode: none
b. mean; There are no outliers.

4. It is easy to calculate; It uses all of the values of a data set.

8. a. mean: 13.2, median: 14.5, modes: 14 and 15
b. median; The mean is less than most of the data and it is the mean of the two modes.

9. a. mean: about 1.96, median: 2, modes: $1\frac{2}{3}$ and 2
b. median; The data are evenly distributed.

10. a. mean: about -0.402 , median: 0.86, mode: none
b. median; The mean is less than most of the data and there is no mode.
c. mean: about -0.042 , increases; median: 1.05, increases; mode: none; \$4.28 is greater than the mean and median.

11. 4

12. 51

15. a. 62; The outlier decreases the mean and median and does not affect the mode.
b. *Sample answer:* The outlier could be the mass of a baby polar bear.

16. a. 46; The outlier increases the mean and median and does not affect the mode.
b. *Sample answer:* The email could have contained a picture.