



## LESSON 31

# Star Struck

## Your Challenge

What does the shape of a box plot tell you about the data set?

- **Use graphing technology to explore the effect of different data values on the shape of a box plot.\***

- a. Search for an online app for making a box plot.
- b. A filmmaker is showing his movie to test audiences and asking audience members to rate the movie on a scale of 1 star to 5 stars. The table shows the number of stars each viewer in the first test audience rated the movie. Input the data set into the box plot app. Look at the box plot for the data.

Number of Stars Test Audience 1				
3	3	2	4	3
5	3	3	1	4
3	2	3	4	5
3	3	1	3	2

- 1 Describe the box plot, including the maximum, minimum, Q1 (lower quartile), Q3 (upper quartile), median, range, and IQR.

**The maximum is 5, the minimum is 1, Q1 is 2.5, Q3 is 3.5, the median is 3, the range is 4, and the IQR is 1.**

- 2 Describe the shape and location of the parts of the box plot.

**Possible answer: The box plot looks symmetrical. The maximum and minimum points are an equal distance from the median, and the box is centered around the median. The left side of the box is the same size as the right side of the box.**

- 3 What does the box plot tell you about what viewers in Test Audience 1 thought about the movie?

**Possible answer: Some people loved the movie, and some people did not like the movie at all. Fifty percent of votes fell between 2.5 and 3.5 stars, which tells me that half of the audience thought the movie was just okay.**

\* You may need to adjust the steps depending on which graphing program you use. If needed, use Help or Support menus or online tutorials.

Note that the Quartile function in some spreadsheet programs calculates the quartiles using a different algorithm than what is normally used in math class. Some programs calculate quartiles based on percentages rather than on the median of the lower or upper half of the data, so the results may not match what you get calculating these values by hand.



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- c. The table shows the number of stars each viewer in the second test audience rated the movie. Input the data set into the box plot app and look at the box plot.

Number of Stars Test Audience 2				
3	3	1	4	3
5	3	4	5	4
3	2	4	4	5
3	4	5	3	2

- 4 Describe the box plot, including the maximum, minimum, Q1, Q3, median, range, and IQR.

**The maximum is 5, the minimum is 1, Q1 is 3, Q3 is 4, the median is 3.5, the range is 4, and the IQR is 1.**

- 5 Describe the shape and location of the parts of the box plot.

**Possible answer: The box plot is slightly skewed to the left. The maximum is closer to the median than the minimum is. The box is to the right of the center between maximum and minimum. The left side of the box is the same size as the right side of the box.**

- 6 What does the box plot tell you about what viewers in Test Audience 2 thought about the movie?

**Possible answer: There is more variability in the responses of the bottom 50% of the viewers because the box plot is more spread on the left side.**

- d. The table shows the number of stars each viewer in the third test audience rated the movie. Input the data set into the box plot app and look at the box plot.

Number of Stars Test Audience 3				
4	3	2	4	3
5	3	4	5	4
3	4	4	4	5
5	4	5	3	2

- 7 Describe the box plot, including the maximum, minimum, Q1, Q3, median, range, and IQR.

**The maximum is 5, the minimum is 2, Q1 is 3, Q3 is 4.5, the median is 4, the range is 3, and the IQR is 1.**

- 8 Describe the shape and location of the parts of the box plot.

**Possible answer: The box plot is skewed to the left. The maximum is closer to the median than the minimum is. The box is to the right of the center between maximum and minimum. The left side of the box is longer than the right side.**

- 9 Which data set should the filmmaker use to promote his movie? Explain why.

**Possible answer: The filmmaker should use the data set from Test Audience 3 because half of the audience rated the movie at 4 or 5.**



# Manipulating the Data

## Your Challenge

How does changing one data value in a set change the mean or median?

- **Use graphing technology to explore the effect of changing one or more data values on a dot plot and the measures of center.\***
- Search for an online app for making a dot plot. The app should also show the median and mean of the data set.
  - Input a data set of at least 10 numbers into the dot plot app.
  - Look at the dot plot and display the mean and the median of the data set.
  - Investigate how changing one value in the data set changes the shape of the dot plot and the measures of center.
- How does the shape of the dot plot change when you move the greatest data value to a much greater value?  
**Possible answer: The shape of the dot plot skews to the right and shows an outlier on the right.**
  - How do the mean and the median change when you move the greatest data value to a much greater value?  
**Possible answer: The new mean is greater than the original mean, but the median stays the same.**
  - Return to the original data set. How does the shape of the dot plot change when you move the least data value to a much lower value?  
**Possible answer: The shape of the dot plot skews to the left and shows an outlier on the left.**
  - How do the mean and the median change when you move the least data value to a much lower value?  
**Possible answer: The new mean is less than the original mean, but the median stays the same.**

\* You may need to adjust the steps depending on which graphing program you use. If needed, use Help or Support menus or online tutorials.



## Manipulating the Data

- 5 Return to the original data set. How do the mean and the median change when you move the least data value to the greatest value?

**Possible answer: The new mean is greater than the original mean. The new median is also greater than the original median.**

- e. Investigate how many data values you need to move to change the mean and/or median.

- 6 Create a data set in which the mean is the same as the median. What is the least number of data values you need to move so that the median stays the same and the mean changes? Is this true for all data sets in which the mean is the same as the median?

**Possible answer: 1; I could take the minimum data value and decrease it by 1. It will decrease the mean, but the median will stay the same because the middle value stays the same. This is true for all data sets.**

- 7 Create a data set in which the mean is the same as the median. What is the least number of data values you need to move so that the mean stays the same and the median changes?

**Possible answer: 2; My original data set is: 1, 1, 2, 2, 2, 3, 4, 4, 4, 5, 5. The mean and median are both 3. If I change a 1 to 0 and the 3 to 4, then the mean stays the same but the new median is 4.**