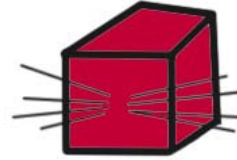


LEWIS & CLARK IN COLUMBIA RIVER COUNTRY



WHAT IS A BOX AND WHISKER PLOT ANYWAY?

A box-and-whisker plot can be useful in handling many different kinds of information. You can use this type of plot to take data that is related and compare it with different sets as long as two or more variables are present.



The first step in constructing a box and whisker plot is to first find the following numbers in your set of data:

- The median
- The lower quartile
- The upper quartile
- The interquartile range

Example:

1. Imagine that fifteen different students are asked to walk across a hall and count the number of footsteps it takes them to cross it. Imagine that for each of them, you count and record. This is what you have:

31 16 30 22 23 38 28 12 18 34 42 37 25 40 36

2. Now you want to compare these numbers. After the numbers are recorded, they need to be put into order, from smallest to largest, until you have a set that looks something like this:

12 16 18 22 23 25 28 30 31 34 36 37 38 40 42

3. First, look for the *median*. The median will be the number exactly in the middle of the ordered set. In this instance, the median is **30**:

12 16 18 22 23 25 28 **30** 31 34 36 37 38 40 42

4. Next, you need to look at the numbers that are only on the left side of the median (30): 12, 16, 18, 22, 23 and 28. You now need to find the median of the new set of numbers. This number would be **22**:

12 16 18 **22** 23 25 28

Some Useful Terms:

Median: The midpoint of a series of numbers.

Lower Quartile: The bottom quarter (25%) of a series of numbers.

Upper Quartile: The upper quarter (25%) of a series of numbers.

Interquartile Range: The difference between the upper quartile and the lower quartile.

22 is the *median* of the scores lower than the median of all scores (30). This makes all numbers 22 and under the *lower quartile*, or bottom 25%.

Helpful Hint:

If you are looking for the median in an ordered set with an even number of values, you have to find the average of the 2 middle numbers.

Example: 2, 4, 6, and 9

- Add the two middle numbers together. $4 + 6 = 10$
- Divide the sum by 2 to get the average. $10/2 = 5$
- 5 is the median for the set of numbers 2, 4, 6 and 9.

Now, look at the values to the right of the median (30): 31, 34, 36, 37, 38, 40 and 42. You now need to find the median of the new set of numbers. This number would be **37**.

31 34 36 **37** 38 40 42

37 is the *median* of the scores higher than the median of all scores (30). This makes all numbers 37 and under the *upper quartile*, or top 25%.

With these numbers, you can now find the *interquartile range*. To do this, use the following formula:

$$\text{Upper quartile} - \text{lower quartile} = \text{interquartile range}$$

The interquartile range is the difference between the upper and lower quartiles. In our example, the equation would look like this:

$$37 - 22 = 15$$

15 is the interquartile range.

Why use the interquartile range (IQR)?

The IQR is less influenced by extreme values. This number limits the range of measurement to the middle 50% of the values.

Now, you can take this information and use it to draw your graph.

12 16 18 22 23 25 28 30 31 34 36 37 38 40 42

Lower Extreme (or lowest number): 12

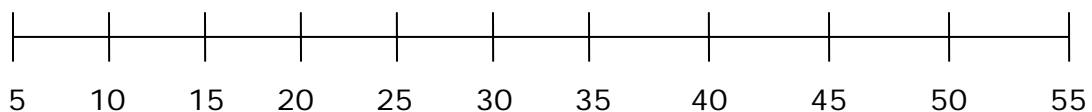
Lower Quartile: 22

Median: 30

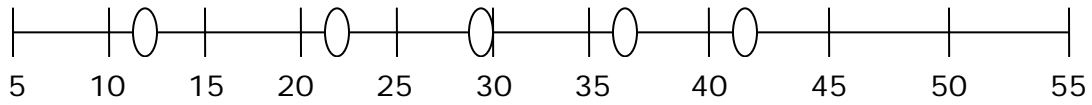
Upper Quartile: 37

Upper Extreme (or highest number): 42

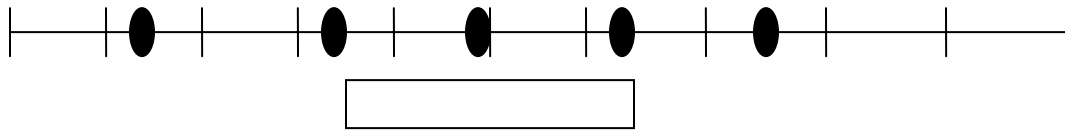
To create a box and whisker plot, you must first draw a line and label it with different numbers. This will look like a number line.



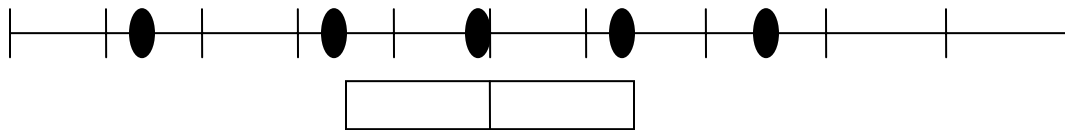
Mark dots along this line for the median, the quartiles, and extremes.



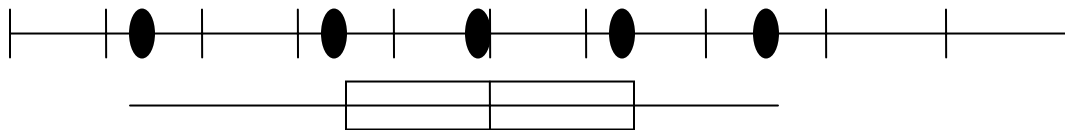
Draw a box between the two quartiles.



Mark the median with a line across the box.



Draw two lines (or "whiskers") from the quartiles to the extremes.



By doing this, you can see the wide range of data provided by your calculations. This will enable you to narrow down a smaller area with which to work.