

Median and Quartiles

The *median* is a measure of center (location) of a list of numbers. It is the number such that at least half the data is less than or equal to it and at least half is greater than or equal to it. Note that, unlike the mean, the median is not influenced by a few large values in the list.

A measure of dispersion that accompanies the median is the *interquartile range* (IQR). It is the distance between the upper and lower quartiles.

To find the quartiles and median, put the numbers in order from smallest to largest. Then if there are an odd number of numbers in the list the median can be found by counting in from either end of the list to the $(n + 1)/2$ nd number. This will be the median. If there are an even number on the list then average the $n/2$ and the $(N + 2)/2$ numbers. In general, the median is at position $(n + 1)/2$. If this position is a whole number then you have the median at that position in the list. If the number ends in 0.5 then you average the two numbers on the list on either side of it.

For example, below are 10 numbers arranged from smallest to largest

0 2 2 4 11 17 60 100 200 4000

To find the median we compute its “depth” as $(10 + 1)/2 = 5.5$. So we take the average of the 5th and 6th numbers as the median, $(11 + 17)/2 = 14$. To continue to find the quartiles, take the depth, drop the 0.5 and add 1 and divide by 2. That is $(5 + 1)/2 = 3$. The lower quartile can be found by counting in 3 from the bottom of the list, and the upper quartile is found by counting in 3 from the top of the list. For our example, the lower quartile is 2 and the upper quartile is 100.

Return to our example with the class quiz scores.

Find the median

Find the upper and lower quartiles.

Find the extremes.

Make a 5-number summary

Median	-----
Quartiles	-----
Extremes	-----

Use the 5-number summary and original data to make a Box-and-whisker plot of the quiz scores.