Trimean

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Trimean is a measure of central tendency, like mean, median and mode. Its meaning is sometimes confusing because it is defined in a manner different from these traditional measures of central tendencies.

Mathematical Formulation

The trimean is defined as the weighted average of the median [1] and the two quartiles. Thus, mathematically it is written as

$$TM = \frac{Q_1 + 2Q_2 + Q_3}{4}.$$

(Wikipedia [2])

TM = Trimean
Q_2 = the median

Q_1, Q_3 = the two quartiles

It can also be written as

$$TM = \frac{1}{2}\left(Q_2 + \frac{Q_1 + Q_3}{2}\right).$$

(Wikipedia [2])

which tells us that it is the average of the median and “quartile average” also called as midhinge.

The trimean takes not only the central tendency [3] into account but also gives due importance to the distribution of data. This is what makes the trimean a different statistical parameter than the others, like median, that are frequently encountered.

A Sample Example

For example, consider the heights of students in a class, in cm, to be 155, 158, 161, 162, 166, 170, 171, 174 and 179. It is easy to see the median of this data is 166 cm.

Now consider another class where the heights of the students, again in cm, are 162, 162, 163, 165, 166, 175, 181, 186, and 192. It can be seen that the median height of the class is again 166 cm. However, a look at the two data distributions tells us that the distributions are quite different in both these cases, even though they have the same median.

Now let us compute the trimean for the first case. The median as we saw was 166, the first quartile is 161 and the third quartile is 171. Using the formula given above, the trimean is computed as (161 + 2(166) + 171)/4 = 166.

In the second example, the median is the same 166, but the first quartile is 163 and the second quartile is 181. Now the trimean is computed as (163 + 2(166) + 181)/4 = 169.

Interpreting the Results

In the first case, we see that the trimean is the same as the median. What this essentially means is that the distribution is very even from the median, which means there are about as many data points at a given distance from the median on either side (only on an average case of course).

In the second case, the trimean is bigger than the mean. As you can see, the third quartile is farther away from the median than the first quartile, which essentially means that the data is biased in the second half of the distribution. Thus the trimean reflects this bias in data away from the median. Thus the effect of quartiles appears on the definition of trimean.

Links
[1] https://explorable.com/calculate-median
[2] http://en.wikipedia.org/wiki/Trimean
[3] https://explorable.com/measures-of-central-tendency