NET, IAS, State-SET (KSET, WBSET, MPSET, etc.), GATE, CUET, Olympiads etc.: Central Tendency

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Explain the Various Measure of Central Tendency?

In statistics, the general level, characteristic, or typical value that is representative of the majority of cases. Among several accepted measures of central tendency employed in data reduction, the most common are the arithmetic mean (simple average) , the median, and the mode. FOR EXAMPLE, one measure of central tendency of a group of high school students is the average (mean) age of the students. Central tendency is a term used in some fields of empirical research to refer to what statisticians sometimes call "location" A "measure of central tendency" is either a location parameter or a statistic used to estimate a location parameter. Examples include:

- Arithmetic mean, the sum of all data divided by the number of observations in the data set.

- Median, the value that separates the higher half from the lower half of the data set.

- Mode, the most frequent value in the data set. Measures of central tendency, or "location" attempt to quantify what we mean when we think of as the "typical" or "average" score in a data set.

Example

The concept is extremely important and we encounter it frequently in daily life. For example, we often want to know before purchasing a car its average distance per litre of petrol. Or before accepting a job, you might want to know what a typical salary is for people in that position so you will know whether or not you are going to be paid what you are worth. Or, if you are a smoker, you might often think about how many cigarettes you smoke "on average" per day. Statistics geared toward measuring central tendency all focus on this concept of "typical" or "average." As we will see, we often ask questions in psychological science revolving around how groups differ from each other "on average" Answers to such a question tell us a lot about the phenomenon or process we are studying Arithmetic Mean The arithmetic mean is the most common measure of central tendency. It simply the sum of the numbers divided by the number of numbers. The symbol mm is used for the mean of a population. The symbol MM is used for the mean of a sample. The formula for mm is shown below: $m = \frac{SX}{N}$ m S X N where SX S X is the sum of all the numbers in the numbers in the

sample and NN is the number of numbers in the sample. As an example, the mean of the numbers 1 + 2 + 3 + 6 + 8 = 205 = 4 1 2 3 6 8 20 5 4 regardless of whether the numbers constitute the entire population or just a sample from the population. The table, Number of touchdown passes, shows the number of touchdown (TD) passes thrown by each of the 31 teams in the National Football League in the 2000 season. The mean number of touchdown passes thrown is 20.4516 as shown below. m = SXN = 63431 = 20.4516 m S X N 634 31 20.4516 Number of touchdown passes:

- 37 33 33 32 29 28 28 23
- 22 22 22 21 21 21 20 20
- 19 19 18 18 18 18 16 15
- 14 14 14 12 12 9 6

Although the arithmetic mean is not the only "mean" (there is also a geometic mean) , it is by far the most commonly used. Therefore, if the term "mean" is used without specifying whether it is the arithmetic mean, the geometric mean, or some other mean, it is assumed to refer to the arithmetic mean. Median The median is also a frequently used measure of central tendency. The median is the midpoint of a distribution: The same number of scores are above the median as below it. For the data in the table, Number of touchdown passes, there are 31 scores. The 16th highest score (which equals 20) is the median because there are 15 scores below the 16th score and 15 scores above the 16th score. The median can also be thought of as the 50th percentile. let's return to the made up example of the quiz on which you made a three discussed previously in the module Introduction to Central Tendency and shown in table 2. Three possible datasets for the 5-point make-up quiz

Student	Dataset 1	Dataset 2	Dataset 3
You	Dataset 3	Dataset 3	Dataset 3
John's	Dataset 3	Dataset 4	Dataset 2
Maria's	Dataset 3	Dataset 4	Dataset 2
Shareecia's	Dataset 3	Dataset 4	Dataset 2
Luther's	Dataset 3	Dataset 5	Dataset 1
Table Supporting: Example			

For Dataset 1, the median is three, the same as your score. For Dataset 2, the median is 4. Therefore, your score is below the median. This means you are in the lower half of the class. Finally for Dataset 3, the median is 2. For this dataset, your score is above the median and therefore in the upper half of the distribution. Computation of the Median: When there is an odd number of numbers, the median is simply the middle number. For example, the median of 2,4, and 7 is 4. When there is an even number of numbers, the median is the mean of the

two middle numbers. Thus, the median of the numbers 22, 44,77, 1212 is 4 + 72 = 5.5 4 7 2 5.5. Mode The mode is the most frequently occuring value. For the data in the table, Number of touchdown passes, the mode is 18 since more teams (4) had 18 touchdown passes than any other number of touchdown passes. With continuous data such as response time measured to many decimals, the frequency of each value is one since no two scores will be exactly the same (see discussion of continuous variables) . Therefore the mode of continuous data is normally computed from a grouped frequency distribution. The Grouped frequency distribution table shows a grouped frequency distribution for the target response time data. Since the interval with the highest frequency is 600 − 700, the mode is the middle of that interval (650) . Grouped frequency distribution

Range	Frequency
500 – 600	3.0
600 – 700	6.0
700 – 800	5.0
800 – 900	5.0
900 – 1000	0.0
1000 – 1100	1.0

Table Supporting: Example

Trimean

The trimean is computed by adding the 25th percentile plus twice the 50th percentile plus the 75th percentile and dividing by four. What follows is an example of how to compute the trimean. The 25th , 50th , and 75th percentile of the dataset "Example 1" are 51,55, and 63 respectively. Therefore, the trimean is computed as:

The trimean is almost as resistant to extreme scores as the median and is less subject to sampling fluctuations than the arithmetic mean in extremely skewed distributions. It is less efficient than the mean for normal distributions. The trimean is a good measure of central tendency and is probably not used as much as it should be.

Trimmed Mean

A trimmed mean is calculated by discarding a certain percentage of the lowest and the highest scores and then computing the mean of the remaining scores. For example, a mean trimmed 50% is computed by discarding the lower and higher 25% of the scores and taking the mean of the remaining scores. The median is the mean trimmed 100% and the arithmetic mean is the mean trimmed 0% . A trimmed mean is obviously less susceptible to the effects of extreme scores than is the arithmetic mean. It is therefore less susceptible to

sampling fluctuation than the mean for extremely skewed distributions. It is less efficient than the mean for normal distributions. Trimmed means are often used in Olympic scoring to minimize the effects of extreme ratings possibly caused by biased judges.