



Measures of Central Tendency: Mean, Median, and Mode

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Outline



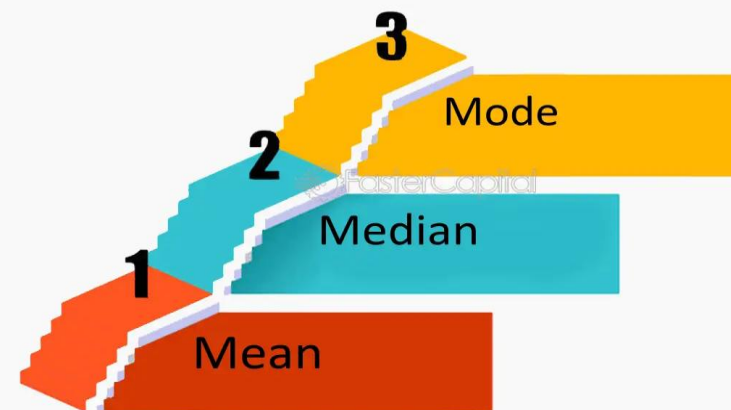
- What is Measures of Central Tendency
- Arithmetic Mean (Average).
- Types of Frequency Distribution
- Important Components
- Methods of Collecting

❑ What is Measures of Central Tendency?



- Are **statistical tools used** to describe the **center or most representative value** of a **dataset**, **indicating where the data tend to cluster**.
- They help **summarize large amounts of data** into a **single representative value**.
- **The three main measures are:**
 - i. Mean
 - ii. Median
 - iii. Mode

Understanding Measures of Central Tendency



❑ Arithmetic Mean (Average)?

- The arithmetic mean, commonly called the **average**, is the most widely used measure of central tendency.
- It provides a **single value** that represents the overall level of a dataset.
- In medical research, the **mean is frequently used to summarize quantitative variables** such as **blood pressure**, **haemoglobin levels**, and **body temperature**.

❑ Definition of Arithmetic Mean

- The arithmetic mean is defined as the **sum of all observations** **divided by the total number of observations**.

➤ Formula:
$$\bar{x} = \frac{\sum x}{n}$$

➤ Where:

- $\bar{x}$ = mean
- $\sum x$ = sum of all observations
- n = number of observations

➤ Steps for Calculation:



1. List all observations
2. Find the sum of the values
3. Count the number of observations
4. Divide the total sum by the number of observations.

➤ Example 1: Hemoglobin Levels:

- **Hemoglobin levels (g/dL) of 5 patients:** 10, 12, 11, 13, 14.
- Step 1: $\text{Sum} = 10 + 12 + 11 + 13 + 14 = 60$
- Step 2: Number of observations = 5
- Mean = $60 \div 5 = 12 \text{ g/dL}$

➤ Example 2: Body Temperature

- **Temperatures ($^{\circ}\text{C}$):** 36.5, 37.0, 36.8, 37.2
- Mean = $(36.5 + 37.0 + 36.8 + 37.2) \div 4 = 36.875^{\circ}\text{C}$

❑ Advantages



1. Easy to calculate and understand.
2. Based on all data values.
3. Suitable for further statistical analysis
4. Widely used in medical and scientific research

❖ Disadvantages



- ✓ Affected by outliers
- ✓ Not suitable for highly skewed data
- ✓ Cannot be used with qualitative (categorical) data

❑ Median:



- The median is an important **measure of central tendency** that represents the **middle value of a dataset** when the data are arranged in order.
- It is useful in **medical and biological data** where extreme values (outliers) may distort the average.
- Definition: The median is the value that divides a dataset into two equal halves, such that: **50% of the observations lie below it** , **50% lie above it**.

❖ **Steps to Calculate Median:** For Ungrouped Data.



1. Arrange the data in ascending or descending order.
2. Determine the number of observations (n).
 - If n is odd $\rightarrow$ Median = middle value.
 - If n is even $\rightarrow$ Median = average of the two middle values

❏ Example 1: Odd Number of Values

- Blood pressure readings (mmHg): 110, 120, 130, 140, 150
- Median = **130**

➤ Example 2: Even Number of Values

- Glucose levels (mg/dL): 90, 100, 110, 120
- Median = $(100 + 110) \div 2 = \mathbf{105 \text{ mg/dL}}$

➤ Example 3: With Outlier

- Patient ages: 20, 22, 23, 25, 80
- Median = **23**

❑ **Advantages:**

- Not affected by extreme values (outliers)
- Suitable for skewed data
- Easy to understand and interpret
- Can be used with ordinal data.

➤ **Disadvantages:**

1. Does not use all observations.
2. Less suitable for further mathematical analysis.
3. Requires data arrangement.

❏ Mode :



➤ **Definition:** The mode is the value that **occurs most frequently** in a set of data.

➤ Identification of Mode:

1. Count how many times each value appears.
2. The value with the highest frequency is the mode.

➤ Example 1: Simple Dataset

- Number of clinic visits per week: 2, 3, 3, 4, 5
- Mode = 3 (appears most frequently).

❖ Example 2:

- Blood groups of patients: A, B, O, O, AB, O

➤ Mode = **O**

- This indicates that blood group O is the most common.

➤ Example 3: No Mode

- Data: 1, 2, 3, 4, 5
- No value repeats → **No mode**

❑ **Types of Mode:**

1. Unimodal: One mode (e.g., 2, 3, 3, 4)
2. Bimodal: Two modes (e.g., 2, 2, 3, 3, 4)
3. Multimodal: More than two modes (1, 6, 6, 3, 3, 4, 4).

➤ **Advantages**

- Easy to understand and determine
- Not affected by extreme values (outliers)
- Suitable for categorical (qualitative) data
- Helps identify the most common condition

❑ Disadvantages:

- May not exist (no repeating values)
- May have more than one value (not unique)
- Not suitable for advanced mathematical analysis
- Does not use all data values



❖ Comparison of Mean, Median, and Mode



Feature	Mean	Median	Mode
Definition	Average value	Middle value	Most frequent value
Affected by outliers	Yes	No	No
Use of all data	Yes	No	No
Suitable for	Symmetrical data	Skewed data	Categorical data

References



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Thanks