

Example Problems - Mean

1. Mean for Ungrouped Data:

Given the dataset: {4, 8, 12, 16, 20}

- Compute the mean:
 $\text{Mean} = (4+8+12+16+20) / 5$
 $\text{Mean} = 60 / 5 = 12$

2. Mean for Discrete Frequency Distribution:

Consider the following dataset:

X	1	2	3	4	5
f	2	3	5	4	6

- Compute the mean using the formula:
 $\text{Mean} = [(1 \times 2) + (2 \times 3) + (3 \times 5) + (4 \times 4) + (5 \times 6)] / (2+3+5+4+6)$
 $\text{Mean} = (2 + 6 + 15 + 16 + 30) / 20$
 $\text{Mean} = 69 / 20 = 3.45$

3. Mean for Continuous Data:

Consider the class intervals and frequencies:

Class Interval	Frequency (f)	Midpoint (m)	f × m
10 - 20	5	15	75
20 - 30	8	25	200
30 - 40	12	35	420
40 - 50	7	45	315
50 - 60	4	55	220

- Compute the mean using the formula:
 $\text{Mean} = (\sum fm) / (\sum f)$
 $\text{Mean} = (75+200+420+315+220) / (5+8+12+7+4)$
 $\text{Mean} = 1230 / 36$
 $\text{Mean} = 34.17$

Problems:

1. Calculate the mean, median, and mode for the given dataset: [12, 15, 14, 10, 18, 20, 15].
2. Find the median of the data set [45, 50, 55, 60, 65, 70, 75, 80, 85, 90].
3. Determine the mode of the dataset [5, 7, 8, 8, 9, 10, 10, 10, 12].

Median Problems and Solutions:

1. Median of Ungrouped Data:

- Problem: Find the median of [7, 3, 9, 12, 5].
- Solution: Arrange the data in ascending order: [3, 5, 7, 9, 12]. The middle value is **7**, so the median is **7**.

2. Median of Discrete Frequency Distribution:

- Problem: Find the median for the following frequency distribution:

Value (X)	Frequency (f)
10	3
20	5
30	8
40	4
50	2

- Solution:
 - Find cumulative frequency (CF): [3, 8, 16, 20, 22]
 - Total frequency $N = 22$, so $N/2 = 11$
 - The median class is where cumulative frequency just exceeds 11, which is **30**.
 - Thus, the median is **30**.

3. Median of Continuous Data:

- Problem: Find the median for the following class intervals and frequencies:

Class Interval	Frequency (f)
0 - 10	5
10 - 20	10
20 - 30	15
30 - 40	8
40 - 50	7

- Solution:
 - Find cumulative frequency (CF): [5, 15, 30, 38, 45]
 - Total frequency $N = 45$, so $N/2 = 22.5$
 - The median class is 20 - 30.
 - Use formula:

$$Median = L + \frac{(\frac{N}{2} - CF)}{f} \times h$$

where:

- $L = 20, CF = 15, f = 15, h = 10$
- $Median = 20 + \frac{(22.5-15)}{15} \times 10 = 20 + 5 = 25$
- The median is 25.

Methods to Calculate Central Tendency:

1. **Direct Method:** Used for raw data where values are summed directly and divided by the number of observations.
2. **Assumed Mean Method:** Useful for large datasets, where a reference mean (assumed mean) is used to simplify calculations.
3. **Step-Deviation Method:** Further simplifies calculations by dividing deviations by a common factor.

These measures help in summarizing data and making informed decisions based on trends and distributions.

Problems and Solutions - Mode

1. Mode for Ungrouped Data

Problem:

Find the mode of the dataset: {2, 4, 4, 6, 6, 6, 8, 10}

Solution:

- Identify the most frequently occurring value.
 - Here, 6 appears **three times**, which is more than any other number.
 - **Mode = 6**
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2. Mode for Discrete Frequency Distribution

Problem:

Find the mode from the following dataset:

X	1	2	3	4	5
f	2	5	8	6	3

Solution:

- The mode is the value with the **highest frequency**.
 - Here, $X = 3$ has the highest frequency (**8 times**).
 - **Mode = 3**
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3. Mode for Grouped Data

Problem:

Find the mode for the given grouped frequency distribution:

Class Interval	Frequency (f)
10 - 20	10
20 - 30	15
30 - 40	20
40 - 50	14

Class Interval	Frequency (f)
50 - 60	8

Solution:

- Identify the **modal class** (class with the highest frequency).
- The highest frequency is **20** for **30 - 40**.
- Use the formula:

$$\text{Mode} = L + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

where:

- $L = 30$ (lower boundary of modal class)
- $f_1 = 20$ (frequency of modal class)
- $f_0 = 15$ (frequency before modal class)
- $f_2 = 14$ (frequency after modal class)
- $h = 10$ (class width)

$$\text{Mode} = 30 + \left(\frac{20 - 15}{2(20) - 15 - 14} \right) \times 10$$

$$= 30 + \left(\frac{5}{40 - 29} \right) \times 10$$

$$= 30 + \left(\frac{5}{11} \right) \times 10$$

$$= 30 + 4.55$$

$$\text{Mode} = 34.55$$