

STATISTICS

Measures of Central Tendency (Mean, Median, Mode) & Mean of Grouped Data – Methods



1 CHAPTER SNAPSHOT

- Data can be raw, ungrouped or grouped in class intervals.
- Measures of Central Tendency (MCT): **Mean (Average), Median and Mode.**
- They describe the central or typical value around which the data tends to cluster.
- Mean can be found for ungrouped and grouped data.
- For grouped data, mean can be calculated by three methods: **Direct Method, Assumed Mean Method and Step Deviation Method.**



2 HIGH-YIELD CONCEPTS

- ★ **Ungrouped Data:** Individual observations with their frequencies.
- ★ **Grouped Data:** Data arranged in continuous, non-overlapping class intervals with frequencies.
- ★ **Class Mark (Midpoint) x_i :** Represents the central value of a class interval.

$$\text{Class Mark (Midpoint)} : x_i = \frac{UCL + LCL}{2}$$

UCL = Upper Class Limit

LCL = Lower Class Limit

- ★ **Mean:** Average of all observations.
- ★ **Median:** Middle value when data is arranged in order. It divides the data into two equal parts.
- ★ **Mode:** Value that occurs most frequently.

3 FORMULAS AT A GLANCE

(A) MEAN – UNGROUPED DATA

If x_i are values with frequencies f_i ,

$$\bar{X} = \frac{\sum f_i x_i}{\sum f_i}$$

Where f_i = frequency of x_i ,
 $n = \sum f_i$ (total observations)

(B) MEAN – GROUPED DATA (DIRECT METHOD)

If x_i are class marks and f_i are frequencies,

$$\bar{X} = \frac{\sum f_i x_i}{\sum f_i}$$

Steps:

- Find class mark x_i for each class.
- Find $f_i x_i$ for each class.
- Find $\sum f_i x_i$ and $\sum f_i$.
- Divide $\sum f_i x_i$ by $\sum f_i$.

(C) MEAN – GROUPED DATA (ASSUMED MEAN METHOD)

$$\bar{X} = a + \frac{\sum f_i d_i}{\sum f_i}$$

Where $d_i = x_i - a$

Steps:

- Find class mark x_i for each class.
- Choose assumed mean a (preferably in the middle).
- Find deviation $d_i = x_i - a$.
- Find $f_i d_i$ for each class.
- Find $\sum f_i d_i$ and $\sum f_i$.
- Apply the formula.

(D) MEAN – GROUPED DATA (STEP DEVIATION METHOD)

$$\bar{X} = a + \left[\frac{\sum f_i u_i}{\sum f_i} \times h \right]$$

Where $u_i = \frac{x_i - a}{h}$
 $(h = \text{class size})$

Steps:

- Find class mark x_i for each class.
- Choose assumed mean a .
- Find $u_i = \frac{x_i - a}{h}$.
- Find $f_i u_i$ for each class.
- Find $\sum f_i u_i$ and $\sum f_i$.
- Apply the formula.

Symbols to Remember

x_i : Class mark (midpoint)	d_i : Deviation ($x_i - a$)
f_i : Frequency of class	u_i : Step deviation ($\frac{x_i - a}{h}$)
a : Assumed mean (any convenient value)	h : Class width (size)
	$\sum$: Sum of values

5 SMART REVISION TIPS

- ✓ Always write class intervals in ascending order and non-overlapping.
- ✓ Calculate class mark carefully.
- ✓ Choose assumed mean near the middle.
- ✓ In assumed mean method, deviations should be small (positive or negative).
- ✓ In step deviation method, divide by class width to make calculations easier.
- ✓ Check $\sum f_i$ and all products twice.
- ✓ Don't forget units in final answer.

6 COMMON MISTAKES

- ✗ Using upper limit instead of class mark.
- ✗ Incorrect calculation of class mark.
- ✗ Choosing a very large or very small assumed mean.
- ✗ Wrong signs for deviations.
- ✗ Mistakes in multiplying f_i and d_i or u_i .
- ✗ Forgetting to multiply by class width h in step deviation method.
- ✗ Calculation errors in $\sum$ columns.

4 BOARD EXAM FOCUS (HOTSPOTS)



Identify Class Mark / Midpoint

- Frequently asked directly.
- Always use $x_i = \frac{UCL + LCL}{2}$.



Choose Assumed Mean Wisely

- Pick a central value to get smaller deviations.
- Usually median class mark is a good choice.



Tables in Questions

- Create columns: x_i, f_i, d_i or $u_i, f_i d_i$ or $f_i u_i$.
- Maintain neat and error-free tables.



Formula Based Calculation

- Know when to use Direct / Assumed Mean / Step Deviation Method.
- Substitution accuracy is crucial.



Interpret the Answer

- Mean has same unit as original data.
- Write a concluding statement with unit.

7 MUST REMEMBER (RAPID SUMMARY)

MEASURES OF CENTRAL TENDENCY

- ★ **Mean:** Average value.
- ★ **Median:** Middle value in ordered data.
- ★ **Mode:** Most frequent value.

FORMULAS TO RECALL

- ★ **Mean (Ungrouped):** $\bar{X} = \frac{\sum f_i x_i}{\sum f_i}$
- ★ **Mean (Grouped – Direct):** $\bar{X} = \frac{\sum f_i x_i}{\sum f_i}$
- ★ **Mean (Assumed Mean):**

$$\bar{X} = a + \frac{\sum f_i d_i}{\sum f_i}$$
- ★ **Mean (Step Deviation):**

$$\bar{X} = a + \left[\frac{\sum f_i u_i}{\sum f_i} \times h \right]$$

CLASS MARK

$$x_i = \frac{UCL + LCL}{2}$$

UCL: Upper Class Limit

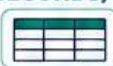
LCL: Lower Class Limit

 h : Class Width a : Assumed Mean d_i : Deviation = $x_i - a$ u_i : Step Deviation = $\frac{x_i - a}{h}$ 

8 RAPID REVISION (30 SECONDS)



Read Question
Identify method
(Direct / Assumed /
Step Deviation)



Make Table
 x_i, f_i, d_i or $u_i,$
 $f_i d_i$ or $f_i u_i$



Calculate
 $\sum f_i$ and
 $\sum f_i d_i$ or $\sum f_i u_i$



Apply Formula

$$\bar{X} = a + \frac{\sum f_i d_i}{\sum f_i}$$

or $a + \left[\frac{\sum f_i u_i}{\sum f_i} \times h \right]$

or $= \frac{\sum f_i x_i}{\sum f_i}$



Perform
Calculations
Carefully



Write Answer
with Unit and
Conclusion



KEY TAKEAWAY

Understand the method → Create correct table → Use the right formula → Calculate accurately → Interpret the mean. That's the path to full marks!

