

CBSE CLASS 10 MATHEMATICS - MASTER NOTES

CHAPTER: STATISTICS (FULLY UPDATED FOR CBSE BOARD EXAMS)

FACULTY: Tinku Sir **ACADEMY:** OnePath Academy **SYLLABUS:** NCERT & CBSE Competency Pattern **AIM:** 100% Score Strategy

1. CHAPTER OVERVIEW & BOARD WEIGHTAGE

Statistics in Class 10 carries a weightage of **6 to 8 marks** in the CBSE Board Examination. It is one of the most high-scoring chapters where procedural accuracy and numerical care yield guaranteed full marks!

MEAN ($\bar{x}$)

Central average of grouped data.
Calculated via:

- Direct Method
- Assumed Mean Method

MODE (Z)

Value of highest frequency in grouped distribution.

Identified via the **Modal Class**.

MEDIAN (M)

Middle-most value dividing distribution into equal halves.

Identified via **Cumulative Frequency (cf)**.

2. MEAN OF GROUPED DATA (COMPREHENSIVE)

① **WHAT?** Mean represents the average value of a given dataset.

② **WHY?** For grouped data, individual observation values are lost. Hence, we assume each class interval's frequency is concentrated at its **Class Mark (x_i)**.

③ **HOW?** Class Mark calculation:

CLASS MARK FORMULA

$$x_i = (\text{Upper Class Limit} + \text{Lower Class Limit}) / 2$$

Method A: Direct Method

Used when values of x_i and f_i are numerically small.

DIRECT METHOD FORMULA

$$\bar{x} = (\sum f_i x_i) / (\sum f_i)$$

Method B: Assumed Mean Method

Used when values of x_i and f_i are large to simplify multiplication and eliminate calculation errors.

Steps:

1. Choose Assumed Mean a from the middle of class marks x_i .
2. Calculate deviation $d_i = x_i - a$ for each class.
3. Calculate product $f_i d_i$ and sum $\sum f_i d_i$.

ASSUMED MEAN METHOD FORMULA

$$\bar{x} = a + (\Sigma f_i d_i / \Sigma f_i)$$

TINKU SIR TRICK #1: SELECTING ASSUMED MEAN 'A'

If total number of classes n is odd, choose the exact middle x_i . If n is even, choose either of the two middle values (preferably the one with the larger frequency f_i to keep deviations smaller)!

ONEPATH HACK #1: DEV-ZERO CHECK

In Assumed Mean method, the deviation d_i for the row where $x_i = a$ MUST ALWAYS BE ZERO! The deviations above zero will be negative and below zero will be positive multiples of class height h .

SOLVED EXAMPLE 1 Find the Mean of the following distribution (Assumed Mean Method):

Class Interval	10–25	25–40	40–55	55–70	70–85	85–100
Frequency ()	2	3	7	6	6	6

Solution Table:

Class Interval	Frequency ()	Class Mark ()	$d_i = x_i - 47.5$	$f_i d_i$
10–25	2	17.5	-30	-60
25–40	3	32.5	-15	-45
40–55	7	47.5 (a)	0	0
55–70	6	62.5	15	90
70–85	6	77.5	30	180
85–100	6	92.5	45	270
Total	$\Sigma f_i = 30$	-	-	$\Sigma f_i d_i = 435$

Calculation:

$$\bar{x} = a + (\Sigma f_i d_i / \Sigma f_i) = 47.5 + (435 / 30) = 47.5 + 14.5 = 62$$

Final Answer: Mean = 62

3. MODE OF GROUPED DATA

① **WHAT?** Mode is the value that occurs most frequently in the dataset.

② **WHY & HOW?** In grouped frequency distribution, we first locate the **Modal Class** — the class with the maximum frequency.

MODE FORMULA

$$\text{Mode} = l + [(f_1 - f_0) / (2f_1 - f_0 - f_2)] \times h$$

Where:

- l = Lower limit of the modal class
- h = Size of the class interval (assuming all class sizes to be equal)
- f_1 = Frequency of the modal class
- f_0 = Frequency of the class preceding the modal class
- f_2 = Frequency of the class succeeding the modal class

TINKU SIR TRICK #2: THE "102 CODE" FOR MODE

Remember the frequency order as **102**!

- Top/Preceding: f_0
- Middle/Modal Class: f_1 (Highest)
- Bottom/Succeeding: f_2

Formula numerator: $f_1 - f_0$ | Denominator: $(f_1 - f_0) + (f_1 - f_2) = 2f_1 - f_0 - f_2$.

COMMON MISTAKE IN MODE

Never select f_1 as any random frequency. f_1 MUST be the maximum frequency value in the entire table. Also, ensure l is the lower limit of THAT specific modal class, not the first class!

SOLVED EXAMPLE 2 Calculate the Mode for the following distribution:

Class	1-3	3-5	5-7	7-9	9-11
Frequency	7	8	2	2	1

Step-by-Step Solution:

1. Maximum frequency = 8. Therefore, Modal Class = 3-5.
2. $l = 3$, $h = 2$, $f_1 = 8$, $f_0 = 7$, $f_2 = 2$.
3. Apply Formula:
$$\text{Mode} = 3 + \left[\frac{(8 - 7)}{(2(8) - 7 - 2)} \right] \times 2$$
$$\text{Mode} = 3 + \left[\frac{1}{(16 - 9)} \right] \times 2 = 3 + (2/7) = 3 + 0.286 = 3.286$$

Final Answer: Mode = 3.29 (approx.)

4. MEDIAN OF GROUPED DATA

① **WHAT?** Median is the measure of central tendency which gives the value of the middle-most observation.

② HOW TO FIND MEDIAN CLASS?

1. Construct Cumulative Frequency (cf) column (Less than type).
2. Find total frequency $N = \sum f_i$.
3. Compute $N/2$.
4. Locate the class whose cumulative frequency (cf) is **just greater than or equal to** $N/2$. This is the **Median Class**.

MEDIAN FORMULA

$$\text{Median} = l + \left[\frac{(N/2) - cf}{f} \right] \times h$$

Where:

- l = Lower limit of median class
- N = Total number of observations ($\sum f_i$)
- cf = Cumulative frequency of class **preceding** the median class
- f = Frequency of the median class
- h = Class size

TINKU SIR TRICK #3: PRECEDING 'CF' TRAP

In the Median formula, f is taken from the **Median Class ITSELF**, but cf MUST be taken from the **PRECEDING (previous) class**! Remember: "*f belongs to the present, cf belongs to the past!*"

SOLVED EXAMPLE 3 Calculate Median height of 60 students:

Height (cm)	Frequency ()	Cumulative Frequency ()
135–140	4	4
140–145	11	15
145–150	29	44
150–155	6	50
155–160	10	60

Step-by-Step Solution:

1. $N = 60 \Rightarrow N / 2 = 30$.
2. Cumulative frequency just greater than 30 is **44** (corresponding class: **145–150**).
3. Thus, **Median Class = 145–150**.
4. $l = 145$, $cf = 15$ (preceding class), $f = 29$, $h = 5$.
5. $Median = 145 + [(30 - 15) / 29] \times 5 = 145 + (15 / 29) \times 5 = 145 + (75 / 29) = 145 + 2.59 = 147.59 \text{ cm}$.

5. EMPIRICAL RELATIONSHIP BETWEEN MEASURES OF CENTRAL TENDENCY

THE GOLDEN EMPIRICAL FORMULA

$$3 \times \text{Median} = \text{Mode} + 2 \times \text{Mean}$$

TINKU SIR TRICK #4: ALPHABETICAL MEMORY TRICK

How to never forget $3 \text{ Median} = \text{Mode} + 2 \text{ Mean}$?

Look at letter lengths:

- "Median" has 6 letters ($3 \times \text{Median}$)
- "Mean" has 4 letters ($2 \times \text{Mean}$)
- "Mode" stands alone!

3 MEDIAN = MODE + 2 MEAN

6. CONTINUOUS VS DISCONTINUOUS CLASS INTERVALS

● BOARD EXAM CRITICAL WARNING

If class intervals are given in **Inclusive Form (Discontinuous)** (e.g., 1–10, 11–20, 21–30), you **MUST** convert them into **Exclusive Form (Continuous)** before calculating Median or Mode!

Conversion Rule:

1. Find Adjustment Factor $h = (\text{Lower Limit of 2nd Class} - \text{Upper Limit of 1st Class}) / 2$.
2. Subtract h from every Lower Limit.
3. Add h to every Upper Limit.

7. MASTER CLASS: MISSING FREQUENCY PROBLEMS (HIGH EXPECTED IN BOARDS)

VERIFIED CBSE PYQ The Median of the following data is 525. Find values of x and y if total frequency is 100:

Class Interval	Frequency ()	Cumulative Frequency (cf)
0–100	2	2
100–200	5	7
200–300	x	$7 + x$
300–400	12	$19 + x$
400–500	17	$36 + x$
500–600	20	$56 + x$
600–700	y	$56 + x + y$
700–800	9	$65 + x + y$
800–900	7	$72 + x + y$
900–1000	4	$76 + x + y$

Step-by-Step Solution:

1. Equation 1 from Total Frequency:

$$76 + x + y = 100 \Rightarrow x + y = 24 \text{ ---- (Equation 1)}$$

2. Identify Median Class:

Given Median = 525. Lies in class interval 500–600!

Thus, Median Class = 500–600.

3. $l = 500$, $f = 20$, $cf = 36 + x$ (preceding class), $h = 100$, $N / 2 = 50$.

4. Substitute into Median Formula:

$$525 = 500 + [(50 - (36 + x)) / 20] \times 100$$

$$25 = [(14 - x) / 20] \times 100$$

$$25 = (14 - x) \times 5$$

$$5 = 14 - x \Rightarrow x = 9$$

5. Find y using Eq 1:

$$9 + y = 24 \Rightarrow y = 15$$

Final Answer: $x = 9$, $y = 15$.

8. COMPARISON TABLE: MEAN VS MEDIAN VS MODE

Feature	Mean ()	Median ()	Mode ()
Definition	Arithmetic average of all data values.	Middle value when data is ordered.	Most frequently occurring observation value.
Dependence	Depends on every single observation value.	Depends on position and middle observations.	Depends on highest frequency concentration.
Extreme Value Effect	Highly affected by extreme values (outliers).	Not affected by extreme values.	Not affected by extreme values.

Key Table Column	Class Mark (x_i) & $f_i x_i$	Cumulative Frequency (cf)	Highest Frequency (f_1)
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9. QUESTION IDENTIFICATION SYSTEM (DEKHO → PEHCHANO → SOLVE)

Question Clue / Keyword	Mathematical Concept	Action Plan / Best Method
"Find Average / Central Value"	Mean ($\bar{x}$)	Use Assumed Mean method if values are double-digit.
"Find Most Popular / Most Frequent"	Mode (Z)	Locate highest frequency f_1 , use Mode formula.
"Find Middle Value / Divide into equal halves"	Median (M)	Build cf table, locate $N/2$, use Median formula.
"Given Mean and Median, find Mode"	Empirical Relation	Apply $3 \times \text{Median} = \text{Mode} + 2 \times \text{Mean}$.
"Data has missing frequencies f_1, f_2 "	Missing Frequency Problem	Set up sum of frequencies equation + Formula equation using given Median/Mean value.

10. BOARD ORIENTED PRACTICE SET (BASIC TO HOTS)

LEVEL 1: BASIC & MCQs

- If the mean of observations 1, 3, 5, 7, and x is 5, find x .
- For a frequency distribution, Mean = 26.4 and Mode = 29. Find Median using empirical formula.

LEVEL 2: SHORT ANSWER BOARD QUESTIONS

- Find the mode of the following data:
Classes: 0–10 ($f=5$), 10–20 ($f=8$), 20–30 ($f=12$), 30–40 ($f=7$), 40–50 ($f=3$).

LEVEL 3: ADVANCED / HOTS / CASE STUDY

- Case Study Question:** A survey was conducted regarding the monthly expenses of 100 households in a locality. The mean monthly expense was found to be ₹1850. Find missing frequencies f_1 and f_2 if class 1000–1500 has frequency 24, 1500–2000 has f_1 , 2000–2500 has 33, 2500–3000 has f_2 , and 3000–3500 has 11.

11. COMPLETE CHAPTER MIND MAP

STATISTICS (CLASS 10)

• MEAN ($\bar{x}$):

- Direct Method: $\Sigma f_i x_i / \Sigma f_i$
- Assumed Mean: $a + (\Sigma f_i d_i / \Sigma f_i)$

• MODE (Z):

- Identify Modal Class (Max frequency f_1)
- Formula: $l + [(f_1 - f_0) / (2f_1 - f_0 - f_2)] \times h$

• MEDIAN (M):

- Construct Cumulative Frequency (cf) column
- Find Median Class ($cf \geq N/2$)
- Formula: $l + [(N/2) - cf] / f \times h$

• EMPIRICAL RELATION: $3 \times \text{Median} = \text{Mode} + 2 \times \text{Mean}$

12. ONEPATH ONE-PAGE LAST-MINUTE REVISION SHEET

1. **Class Mark:** $x_i = (\text{Upper Limit} + \text{Lower Limit}) / 2$
2. **Direct Mean:** $\bar{x} = \Sigma f_i x_i / \Sigma f_i$ | **Assumed Mean:** $\bar{x} = a + (\Sigma f_i d_i / \Sigma f_i)$
3. **Mode:** $\text{Mode} = l + [(f_1 - f_0) / (2f_1 - f_0 - f_2)] \times h$ (Code 102)
4. **Median:** $\text{Median} = l + [(N/2 - cf) / f] \times h$ (cf is PRECEDING class!)
5. **Golden Rule:** $3 \text{ Median} = \text{Mode} + 2 \text{ Mean}$
6. **Inclusive Classes:** Convert to continuous class limits before applying Mode or Median formula!

13. MISTAKES TO AVOID & STEP MARKING STRATEGY

TOP 3 ERROR ZONES IN STATISTICS EXAMS

1. **Taking wrong 'cf' for Median:** Students pick cf of median class instead of preceding class.
2. **Calculation errors in sum:** Incorrect calculation of $\Sigma f_i d_i$ leading to wrong Mean.
3. **Forgetting Class Interval Continuity:** Applying median/mode directly on discontinuous data (e.g., 1-10, 11-20).

HOW TO GET FULL MARKS IN CBSE BOARD PRESENTATION:

1. Always draw neatly ruled statistical tables with clear headings (x_i, f_i, d_i, cf).
2. Explicitly mention the values of variables ($l, h, f_1, f_0, f_2, cf, N$) before writing the formula.
3. Highlight the final answer with proper units (e.g., "Median Height = 147.59 cm") inside a box!

14. FINAL REVISION CHECKLIST

- ☒ All NCERT statistical concepts & formulas mastered
- ☒ Tinku Sir Tricks for Assumed Mean, Mode Code 102 & Empirical Formula memorized
- ☒ Verified CBSE PYQs & Missing frequency problems solved step-by-step
- ☒ One-page revision sheet & common mistakes reviewed