Class 11 Maths Chapter 13: Statistics - Notes, Important Questions and MCQs (2026-27)

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Class 11 Maths Chapter 13, Statistics, moves beyond averages to measure how spread out data is.

These notes cover measures of dispersion – range, mean deviation about the mean and median for ungrouped, discrete and continuous data – and variance and standard deviation, including the shortcut (step-deviation) method.

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Chapter Overview

Measures of central tendency (mean, median, mode) tell us where data is centred, but two data sets with the same mean can be very different. Dispersion measures how much observations differ from the centre.

Common measures are the range, quartile deviation, mean deviation and standard deviation. This chapter focuses on range, mean deviation, variance and standard deviation.

Important Topics and Concepts

Range

- Range = maximum value − minimum value.
- Simple to calculate but depends only on extreme values and ignores all others.

Mean Deviation for Ungrouped Data

- Mean deviation about a point a: M.D.(a) = $\Sigma|x_i - a|/n$.
- About the mean: M.D.($\bar{x}$) = $\Sigma|x_i - \bar{x}|/n$.
- About the median: M.D.(M) = $\Sigma|x_i - M|/n$.
- Example: 6, 7, 10, 12, 13, 4, 8, 12 → $\bar{x} = 9$; $\Sigma|x_i - 9| = 22$; M.D. = 22/8 = 2.75.

Mean Deviation for Grouped Data

- Discrete frequency distribution: M.D.($\bar{x}$) = $\Sigma f_i|x_i - \bar{x}|/N$, where $N = \Sigma f_i$.
- Continuous frequency distribution: use class marks (mid-points) x_i and the same formula.
- For median of continuous data: $M = l + ((N/2 - C)/f) \times h$, where l = lower limit of median class, C = cumulative frequency before it, f = its frequency, h = class width.
- Limitations: absolute values make further algebraic treatment hard; M.D. about median is smaller than about other points but can be unreliable for highly varied data.

Variance and Standard Deviation

- Variance $\sigma^2 = \Sigma(x_i - \bar{x})^2/n$ for ungrouped data.
- Standard deviation $\sigma = \sqrt{(\text{variance})}$.
- Discrete frequency distribution: $\sigma^2 = \Sigma f_i(x_i - \bar{x})^2/N$.
- Alternative form: $\sigma = (1/N)\sqrt{(N\Sigma f_i x_i^2 - (\Sigma f_i x_i)^2)}$.
- Example: 6, 8, 10, …, 24 (10 terms) → $\bar{x} = 15$, $\Sigma(x_i - 15)^2 = 330$, $\sigma^2 = 33$, $\sigma \approx 5.74$.

Shortcut (Step-Deviation) Method

- Let $y_i = (x_i - A)/h$, where A is the assumed mean and h the class width.
- Then $\sigma_x = h\,\sigma_y$, and $\sigma = (h/N)\sqrt{(N\Sigma f_i y_i^2 - (\Sigma f_i y_i)^2)}$.
- Mean $\bar{x} = A + h(\Sigma f_i y_i/N)$.
- This reduces calculation for large values or continuous data.

Properties

- Standard deviation is never negative; it is zero only if all values are equal.
- Adding a constant to all observations does not change the SD.
- Multiplying all observations by k multiplies the SD by |k| and variance by k^2.
- SD uses squares, so it avoids the problem of absolute values in mean deviation.

Formula Sheet – Measures of Dispersion

Measure	Ungrouped data	Grouped (frequency) data
Range	Max − Min	Upper limit of last class − lower limit of first
M.D. about mean	$\Sigma\|x_i - \bar{x}\|/n$	$\Sigma f_i\|x_i - \bar{x}\|/N$
M.D. about median	$\Sigma\|x_i - M\|/n$	$\Sigma f_i\|x_i - M\|/N$
Variance	$\Sigma(x_i - \bar{x})^2/n$	$\Sigma f_i(x_i - \bar{x})^2/N$
Standard deviation	√variance	$(h/N)\sqrt{(N\Sigma fy^2 - (\Sigma fy)^2)}$

Important Definitions and Terms

Term	Meaning
Dispersion	Extent to which data values spread from the centre.
Range	Difference between the largest and smallest values.
Mean deviation	Average of absolute deviations from a central value.
Variance	Mean of squared deviations from the mean.
Standard deviation	Positive square root of variance.
Class mark	Mid-point of a class interval.
Assumed mean	A convenient value used to simplify calculations.

Short Answer Questions

Q1. Find the range of 5, 12, 3, 19, 8.

19 − 3 = 16.

Q2. Find the mean deviation about the mean of 4, 7, 8, 9, 10, 12, 13, 17.

$\bar{x}$ = 80/8 = 10; $\Sigma|x_i - 10|$ = 6+3+2+1+0+2+3+7 = 24; M.D. = 3.

Q3. Why is standard deviation preferred over mean deviation?

It uses squares instead of absolute values, so it can be treated algebraically and is used in further statistical analysis.

Q4. What happens to SD if 5 is added to every observation?

It remains unchanged.

Q5. Find the variance of 2, 4, 6, 8, 10.

$\bar{x}$ = 6; $\Sigma(x_i - 6)^2$ = 16+4+0+4+16 = 40; σ^2 = 8.

Q6. If the variance is 25, what is SD?

√25 = 5.

Q7. If all observations are multiplied by 3, what happens to variance?

It is multiplied by 9.

Q8. What is the SD of 7, 7, 7, 7?

0, because all values are equal.

Long Answer Questions

Q1. Find the mean deviation about the median of 3, 9, 5, 3, 12, 10, 18, 4, 7, 19, 21.

Arrange: 3, 3, 4, 5, 7, 9, 10, 12, 18, 19, 21; n = 11, median = 6th value = 9.

$|x_i - 9|$: 6, 6, 5, 4, 2, 0, 1, 3, 9, 10, 12; sum = 58.

M.D.(M) = 58/11 ≈ 5.27.

Q2. Find the mean and variance of the first n natural numbers.

Mean = (n + 1)/2.

Variance = $\Sigma i^2/n - (\text{mean})^2$ = $(n + 1)(2n + 1)/6 - (n + 1)^2/4$.

Q3. Calculate the mean, variance and SD of: x_i = 4, 8, 11, 17, 20, 24, 32 with f_i = 3, 5, 9, 5, 4, 3, 1.

N = 30; $\Sigma f_i x_i$ = 12 + 40 + 99 + 85 + 80 + 72 + 32 = 420; $\bar{x}$ = 14.

$\Sigma f_i(x_i - 14)^2$ = 3(100) + 5(36) + 9(9) + 5(9) + 4(36) + 3(100) + 1(324) = 300 + 180 + 81 + 45 + 144 + 300 + 324 = 1374.

σ^2 = 1374/30 = 45.8; $\sigma \approx 6.77$.

MCQs with Answers

1. Range of 2, 9, 4, 15, 7:(a) 13 (b) 15 (c) 11 (d) 9Answer: (a) 13

2. SD is the square root of:(a) Mean (b) Variance (c) Range (d) MedianAnswer: (b) Variance

3. SD of identical values:(a) 1 (b) 0 (c) Mean (d) UndefinedAnswer: (b) 0

4. Adding 10 to each value changes SD by:(a) +10 (b) 0 (c) ×10 (d) −10Answer: (b) 0

5. Multiplying each value by 2 makes variance:(a) Same (b) Double (c) 4 times (d) HalfAnswer: (c) 4 times

6. M.D. uses:(a) Squares (b) Absolute values (c) Cubes (d) LogsAnswer: (b) Absolute values

7. Variance of first n natural numbers:(a) $(n^2-1)/12$ (b) $(n+1)/2$ (c) $n^2/12$ (d) $(n-1)/2$Answer: (a) $(n^2-1)/12$

8. Class mark of 10–20:(a) 10 (b) 15 (c) 20 (d) 5Answer: (b) 15

9. Which is NOT a measure of dispersion?(a) Range (b) Mean deviation (c) Median (d) Standard deviationAnswer: (c) Median

10. If σ = 4, variance =(a) 2 (b) 8 (c) 16 (d) 4Answer: (c) 16

Quick Revision Points

- Range = max − min.
- M.D.(a) = $\Sigma|x_i - a|/n$.
- Grouped: $\Sigma f_i|x_i - \bar{x}|/N$.
- Median of continuous data: $l + ((N/2 - C)/f)h$.
- Variance $\sigma^2 = \Sigma(x_i - \bar{x})^2/n$.
- SD σ = √variance.
- Shortcut: $y_i = (x_i - A)/h$; $\sigma = h\sigma_Y$.
- Adding constant – SD unchanged.
- Multiplying by k – SD × |k|, variance × k^2.
- Variance of 1…n = $(n^2 - 1)/12$.

Chapter Summary

Measures of dispersion describe how spread out data is around a central value. The range uses only extremes, while the mean deviation averages absolute deviations from the mean or median for ungrouped and grouped data.

Variance and standard deviation use squared deviations and are the most widely used

Exam Tips and PYQ Pattern

- Draw a table with columns x_i, f_i, f_ix_i, $|x_i - \bar{x}|$ or $(x_i - \bar{x})^2$ to avoid errors.
- Use the step-deviation method for continuous data.
- Round only at the final step.
- For M.D. about median, arrange data first.
- Remember properties of SD for 1-mark questions.
- Coefficient of variation analysis is not part of the rationalised syllabus.

Frequently Asked Questions

Is this chapter in the 2026-27 CBSE syllabus?

Yes. It is part of the NCERT Class 11 Mathematics textbook, prescribed in the CBSE 2026-27 syllabus.

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Yes. Use the free PDF link at the top of this page – no signup needed.

What are measures of dispersion?

Statistics that show how data values are spread – range, mean deviation, variance and standard deviation.

What is the difference between variance and standard deviation?

Variance is the mean of squared deviations; standard deviation is its square root, in the same units as the data.

What is the shortcut method for SD?

Use $y_i = (x_i - A)/h$, then $\sigma = (h/N)\sqrt{(N\Sigma fy^2 - (\Sigma fy)^2)}$.

Conclusion

Statistics is calculation-heavy but scoring. Use the formula sheet, practise tables for grouped data and download the free PDF for quick revision.

More Notes: Class 11 Maths Chapter 12: Limits and Derivatives notes | Class 11 Maths Chapter 14: Probability notes | All Class 11 Maths notes

Author Bio: Written and reviewed by the Nextoper Editorial Team, a group of CBSE maths educators who build chapter notes directly from the NCERT textbook and past board paper patterns.

Freshness Note: These notes follow the NCERT Class 11 Maths textbook, Mathematics (Class XI) (NCERT reprint 2026-27, rationalised syllabus), and the CBSE syllabus for the 2026-27 session. Last checked on 28 November 2026.