FREE NOTES · NCERT + JEE LEVEL

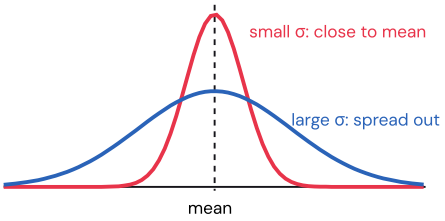
Statistics

Dispersion ke naap: range, mean aur median ke around mean deviation, ungrouped, discrete aur continuous data ke liye variance aur standard deviation, step-deviation method aur coefficient of variation se variability ki tulna.

01 Dispersion kyun?
02 Range
03 Mean deviation
04 Variance & standard deviation
05 Grouped data
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01 Dispersion kyun?

Do batsmen ka average same ho sakta par ek kahin zyada consistent hota. Mean, median, mode centre batate; **dispersion ke naap** batate ki data centre ke aas paas kitna phaila hai.



Same mean, alag phailaav

02 Range

Range = maximum − minimum. Jaldi milta par sirf do values use karta, isliye extreme values se asar padta.

03 Mean deviation

Ungrouped: $M.D.(a) = \Sigma|x_i - a| / n$

Discrete / continuous: $M.D.(a) = \Sigma f_i|x_i - a| / N$, $N = \Sigma f_i$

a = mean ya median. Continuous data me class mid-points ko x_i lo. Grouped data ka median: l + [(N/2 - cf)/f] × h. Median ke around mean deviation sabse kam.

Kami: sign chhod dena (|...|) aage ka algebra mushkil karta, isliye variance pasand kiya jaata.

04 Variance & standard deviation

$$\sigma^2 = \Sigma(x_i - \bar{x})^2 / n$$

$\sigma = \sqrt{(\text{variance})}$; shortcut $\sigma^2 = \Sigma x_i^2/n - (\bar{x})^2$

Standard deviation ki unit data jaisi. Sab values me constant jodne se σ nahi badalta; k se guna karne pe σ, |k| guna.

05 Grouped data

$\sigma^2 = \Sigma f_i(x_i - \bar{x})^2 / N$

$\sigma = (1/N)\sqrt{(N\,\Sigma f_i x_i^2 - (\Sigma f_i x_i)^2)}$

06 Shortcut: step-deviation method

$y_i = (x_i - A)/h$ (A = assumed mean, h = class width)

$$\sigma = (h/N)\sqrt{(N\,\Sigma f_i y_i^2 - (\Sigma f_i y_i)^2)}$$

$\bar{x} = A + h\,\Sigma f_i y_i / N$

07 Coefficient of variation

$$C.V. = (\sigma / \bar{x}) \times 100$$

Do series ki variability compare karne ke liye. **C.V. zyada ⇒ kam consistent** (zyada variable). Means barabar hon to seedha σ compare karo.

08 JEE Extra + Tricks

JEE LEVEL

- Variance $\sigma^2 = \Sigma x^2/n - (\bar{x})^2$; sab me constant jodne se σ nahi badalta; k se guna $\Rightarrow \sigma \times |k|$.
- Do groups ka combined variance: $\sigma^2 = [n_1(\sigma_1^2 + d_1^2) + n_2(\sigma_2^2 + d_2^2)]/(n_1 + n_2)$, $d_i = \bar{x}_i - \bar{x}$
- Median ke around mean deviation sabse kam.
- Coefficient of variation $CV = (\sigma/\bar{x}) \times 100$: kam CV $\Rightarrow$ zyada consistent.
- Pehli n natural numbers: mean $(n + 1)/2$, variance $(n^2 - 1)/12$.

09 Solved examples

Q1. 6, 7, 10, 12, 13, 4, 8, 12 ka mean ke around mean deviation.

$\bar{x} = 72/8 = 9$. |dev|: 3, 2, 1, 3, 4, 5, 1, 3 = 22 $\Rightarrow$ M.D. = 22/8 = **2.75**.

Q2. 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 ka variance.

$\bar{x} = 15$; $\Sigma(x - 15)^2 = 81+49+25+9+1+1+9+25+49+81 = 330 \Rightarrow \sigma^2 =$ **33**.

Q3. Series A: $\bar{x} = 50$, $\sigma = 10$; B: $\bar{x} = 40$, $\sigma = 6$. Kaun zyada consistent?

C.V. A = 20%, B = 15% $\Rightarrow$ **B** zyada consistent.

Q4. 5 observations ka mean 4.4 aur variance 8.24. Teen hain 1, 2, 6. Baaki do?

$x + y = 13$, $x^2 + y^2 = 97 \Rightarrow$ x, y = **4 aur 9**.

10 Common mistakes

- Mean deviation me modulus bhool jaana.
- n - 1 se bhaag dena (NCERT n use karta).
- Mid-points ki jagah class limits lena.
- Kehna ki C.V. zyada matlab zyada consistent (ulta hai).

11 Formula sheet & practice

M.D.	$\Sigma f_i\|x_i - a\|/N$
Variance	$\Sigma f_i(x_i - \bar{x})^2/N = \Sigma fx^2/N - \bar{x}^2$
Step-deviation σ	$(h/N)\sqrt{(N\Sigma fy^2 - (\Sigma fy)^2)}$
C.V.	$\sigma/\bar{x} \times 100$

1. 15, 8, 23, 4, 19 ki range?
2. Har value me 5 jodne pe σ ka kya hoga?
3. Har value double karne pe variance?
4. 2, 4, 6, 8, 10 ka σ nikalo.

ANSWERS

1) 19 · 2) Koi badlav nahi · 3) 4 guna · 4) √8 = 2√2

12 Quick revision: exam se 5 minute pehle

DISPERSION

- Range = max - min.
- Median ke around M.D. sabse kam.

VARIANCE

- $\sigma^2 = \Sigma x^2/n - \bar{x}^2$.
- σ ki unit data jaisi.

BADLAV

- +k: σ same.
- ×k: σ × |k|, $\sigma^2 \times k^2$.

COMPARE

- C.V. = $\sigma/\bar{x} \times 100$.
- Kam C.V. = zyada consistent.

Koi doubt? padhaiadda.netlify.app pe AI Doubt Solver se poocho, ya is chapter ka mock test do.