

CLASS 11 MATHEMATICS — FORMULA SHEET

Chapter 13 : Statistics (NCERT)

13.1 Measures of Central Tendency

Measure	Formula
Mean (ungrouped)	$\bar{x} = (\sum x_i) \div n$
Mean (grouped, direct)	$\bar{x} = (\sum f_i x_i) \div (\sum f_i)$
Mean (assumed mean method)	$\bar{x} = A + (\sum f_i d_i) \div (\sum f_i)$; $d_i = x_i - A$
Mean (step-deviation)	$\bar{x} = A + h \times (\sum f_i u_i) \div (\sum f_i)$; $u_i = (x_i - A)/h$
Median (ungrouped, odd n)	Middle value of sorted data
Median (ungrouped, even n)	Average of the two middle values
Mode	Value with highest frequency
Empirical relation	Mode = 3 Median – 2 Mean

13.2 Measures of Dispersion — Range & Mean Deviation

Measure	Formula
Range	Maximum value – Minimum value
Coefficient of range	$(\text{Max} - \text{Min}) \div (\text{Max} + \text{Min})$
Mean deviation about mean	$MD(\bar{x}) = (\sum f_i x_i - \bar{x}) \div (\sum f_i)$
Mean deviation about median	$MD(M) = (\sum f_i x_i - M) \div (\sum f_i)$
Ungrouped MD about mean	$(\sum x_i - \bar{x}) \div n$
Coefficient of MD	$MD \div (\text{mean or median})$
Least MD	MD about MEDIAN is the least

13.3 Variance & Standard Deviation

Measure	Formula
Variance (ungrouped)	$\sigma^2 = (\sum (x_i - \bar{x})^2) \div n$
Variance (grouped)	$\sigma^2 = (\sum f_i (x_i - \bar{x})^2) \div N$; $N = \sum f_i$
Variance (shortcut)	$\sigma^2 = (\sum f_i x_i^2) / N - (\sum f_i x_i / N)^2$
Standard deviation	$\sigma = \sqrt{(\text{variance})}$
SD (step-deviation)	$\sigma = (h/N) \sqrt{[N \sum f_i u_i^2 - (\sum f_i u_i)^2]}$
Coefficient of variation (CV)	$CV = (\sigma \div \bar{x}) \times 100\%$
More consistent data	Lower CV $\rightarrow$ more consistent/uniform

13.4 Key Properties & Comparison

Concept	Detail
Effect of adding constant	Mean changes by the constant ; variance & SD unchanged
Effect of multiplying constant	Mean $\times k$; SD $\times k $; variance $\times k^2$
Variance is always	Non-negative (≥ 0)
SD units	Same as the data ; variance has squared units
Comparing two groups	Use CV — smaller CV is more consistent
Most affected by extremes	Range & mean (median & mode are robust)

★ QUICK MEMORY AIDS & TRICKS

Three averages	Mean = average ; Median = middle ; Mode = most frequent.
Empirical relation	Mode = 3 Median – 2 Mean (connects all three).
Mean deviation	Least about the MEDIAN. MD = $\Sigma \text{deviations} /n$.
Variance shortcut	$\sigma^2 = (\Sigma fx^2)/N - (\text{mean})^2$. Faster than the deviation method.
SD vs variance	SD = $\sqrt{\text{variance}}$; SD has the same units as the data.
Adding a constant	Shifts the mean but leaves SD/variance UNCHANGED.
Multiplying by k	Mean $\times k$, SD $\times k $, variance $\times k^2$.
Coefficient of variation	CV = $(\sigma/\bar{x}) \times 100\%$. Lower CV = more consistent data.