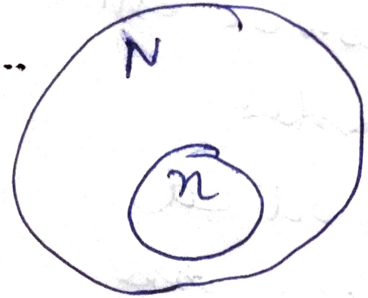
(n-1) degrees of freedom for sample

variance



mean of population = parameter $(\mu) = \dfrac{\sum_{i=1}^{N} x_i}{N}$

mean of sample = statistic $(\bar{x}) = \dfrac{\sum_{i=1}^{n} x_i}{n}$

variance = $\sigma^2 = \dfrac{\sum_{i=1}^{N} (x_i - \mu)^2}{N}$

(how much datapoints vary from the mean)

biased $s^2 = \dfrac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n}$

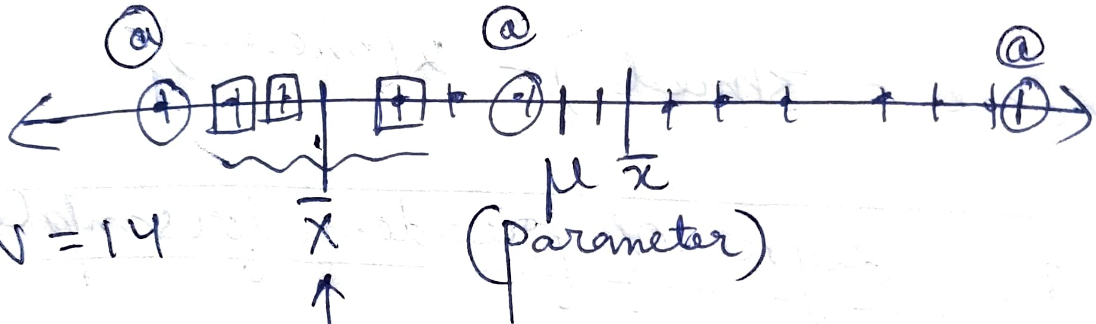
Unbiased estimate $S_{n-1}^2 = \dfrac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{(n-1)}$

Smaller number

then we will get a larger value.

why S_n^2 biased & S_{n-1}^2 Unbiased?

@ → 1st distribn → where sample mean $\bar{x}$ is very close to the μ population mean.



N = 14

n = 3

□ □ □ → sample mean is not closed to the population mean. (much lower estimate Than actual mean) ~~underestim~~

here S_n^2 will be Under estimated and smaller sample variances.

but S_{n-1}^2 will be Comparatively larger Sample variances.