

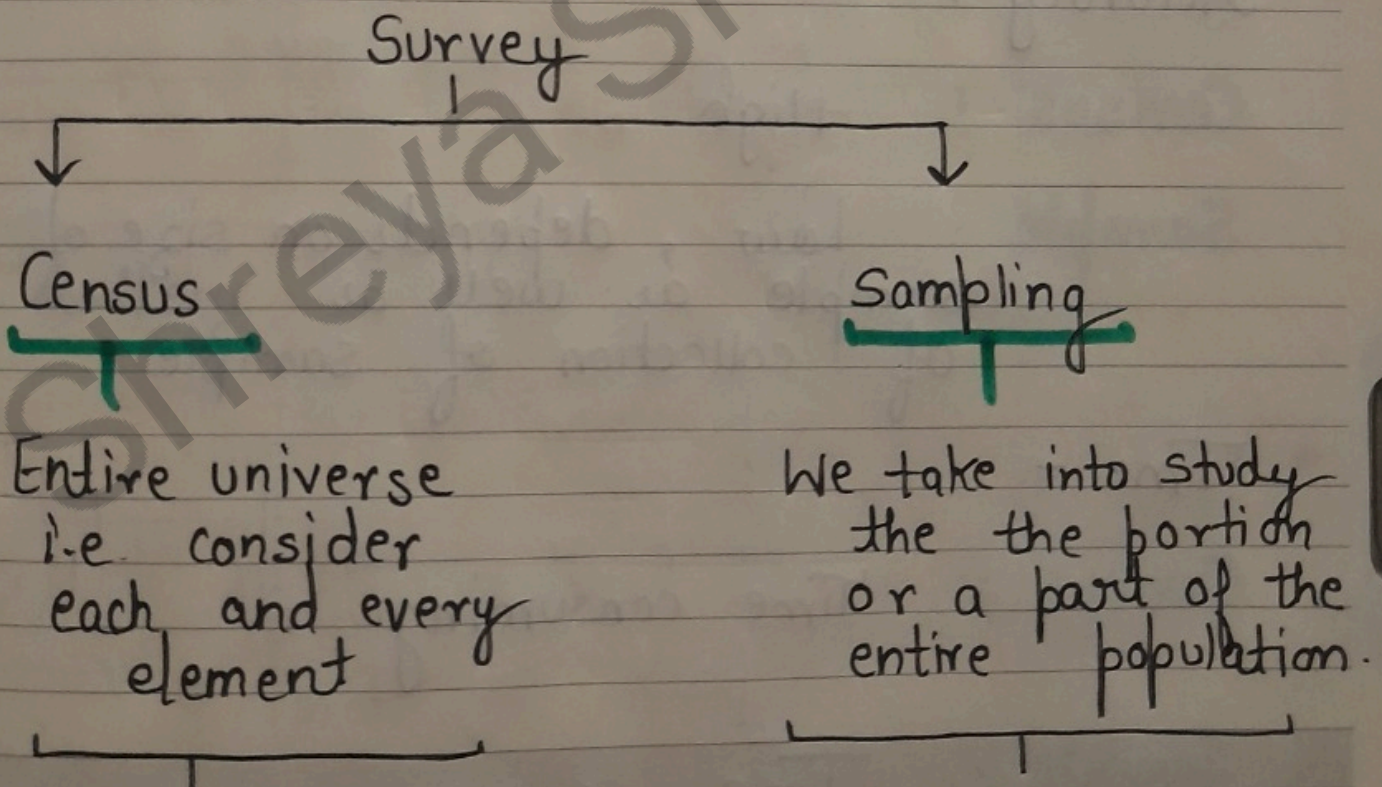
Chapter - 13

(@ Learn with Shreya :-)

UNIT - II : SAMPLING

Surveys → Collection of information [for some study]

→ Done by census and sampling



Also called method of complete enumerator

Method of selective enumerator.

M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	APR 2023									
17	18	19	20	21	22	23	24	25	26	27	28	29	30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	

Difference :-

• No. of items :-

→ **Census** : Complete or entire population

Sample : Selective or a portion of total population.

• Accuracy :-

Census : High

Sample : Low, depends on size of sample as well as methods of collection of sample.

• Time :-

Census :- Time consuming

Sample :- Time saving

- Cost

Census : High

Sample : Low.

- Applicability :

Census : Sometimes not possible

Sample : Most of the time it is possible.

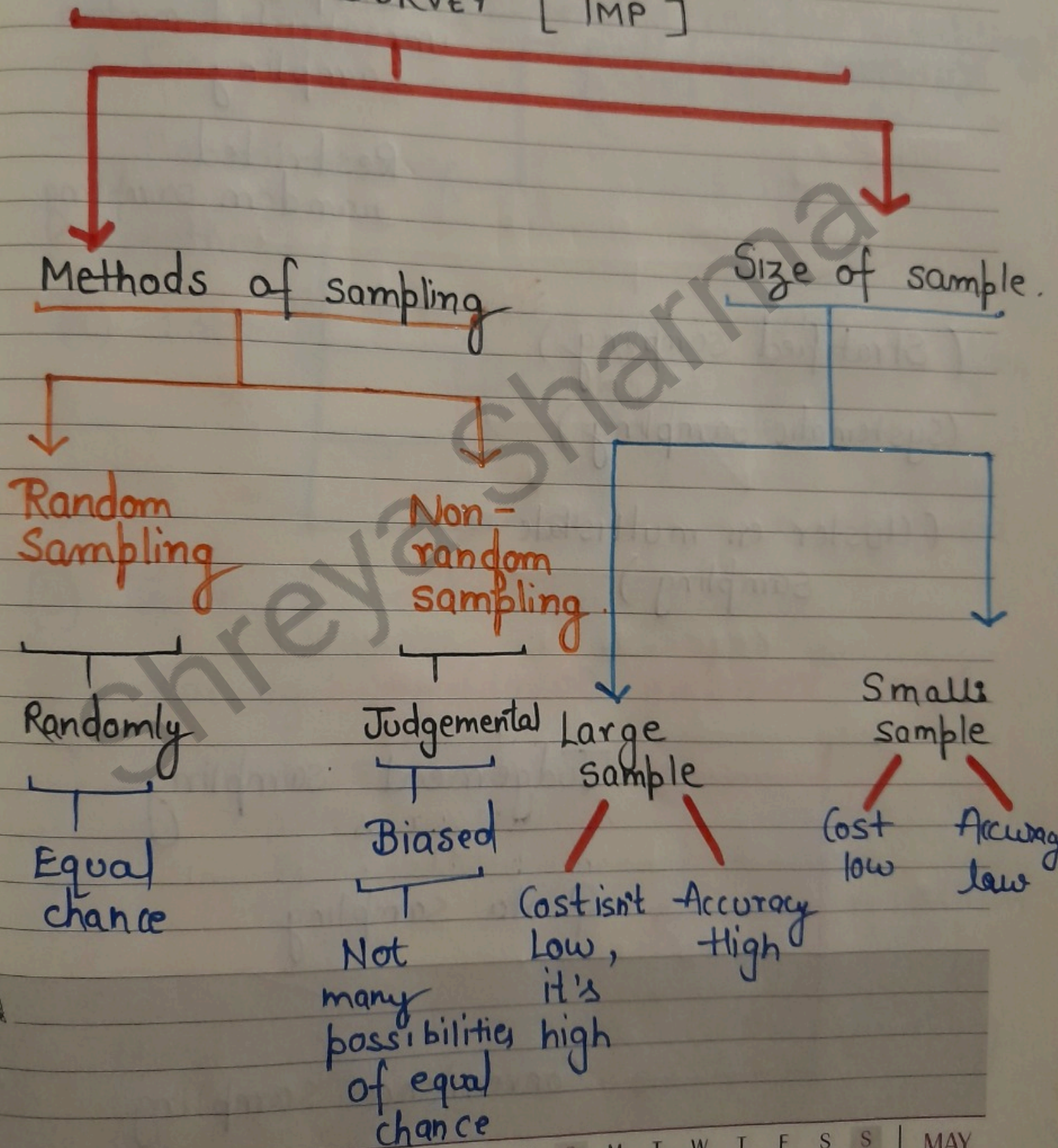
- Examples

Census : Population census

02 SUNDAY **Sample** : Purchasing goods on the basis of tasting a part of it.

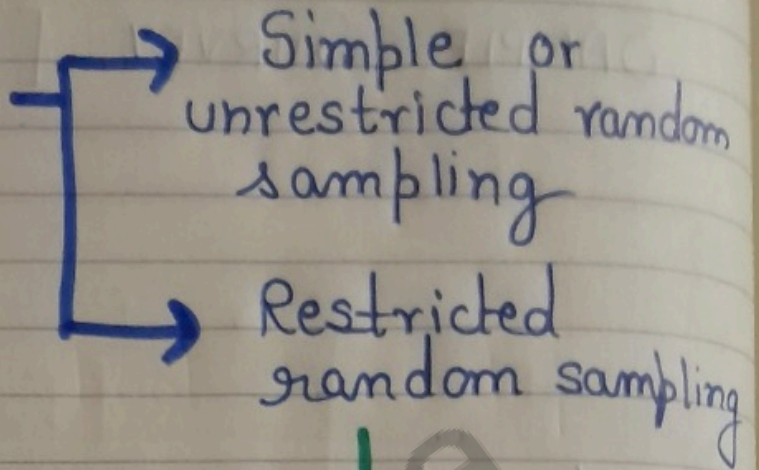


SAMPLE SURVEY [IMP]



T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	MAY
2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	2023

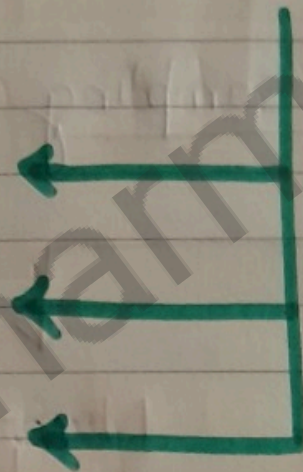
Random Sampling



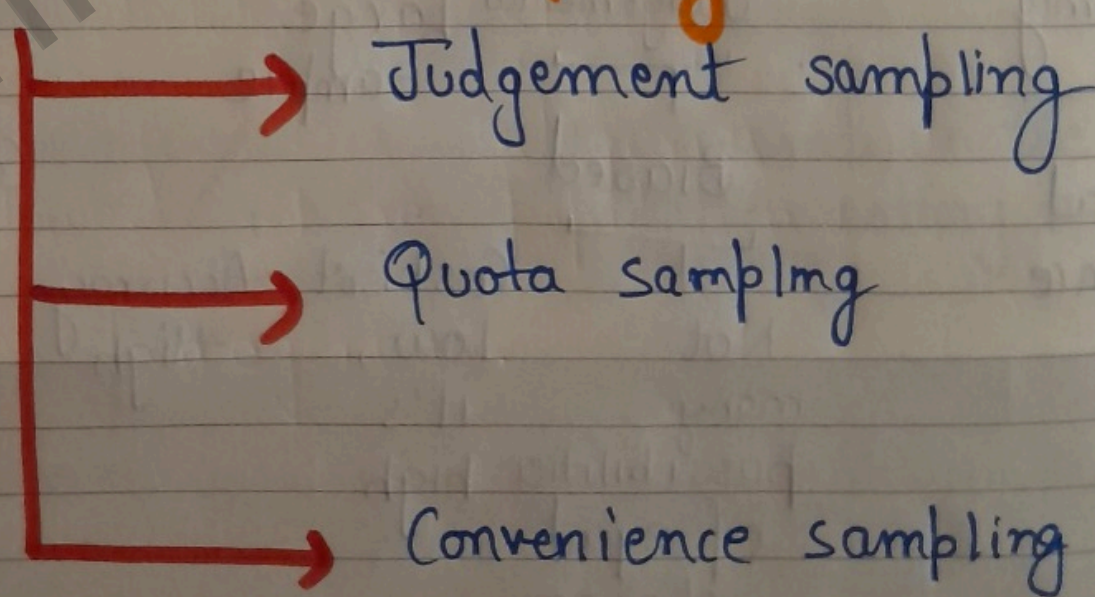
(Stratified sampling)

(Systematic sampling)

(Cluster or multistage sampling)



Non-random sampling



APR 2023	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	10	11	12	13	14	15

Restricted random sample ÷

- Stratified random sampling ÷

Take eg:

We took a school on a trip

We want 30 students

↓
BUT

15 Girls

15 Boys

So here, it is restricted

- Data divided in strata Categories.
- Followed where population is not homogenous.

→ Systematic sampling :-

→ Selection at a regular interval

Means selecting every k^{th} item

For eg: Selecting every 15th person on a list of the population.

In a random order.

→ Cluster or multistage sampling :-

→ Sampling is random but on different stages

Take a eg: Collect data of 5th class students

first randomly, choose 10 states

Then ten districts

Then ten schools

Then school charts

→ So here you will collect data of 5th class students

M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31											

08

SATURDAY

DAY 098-267

UNIK
PIPE FITTINGS

UNIK +
VALVES

Largest Pipe Fittings Group of India

@ learn with

Shreyas

APRIL

2023

WEEK

APRIL
2023

WEEK 15

Judgement sampling :- [Purposive]

→ Is a type of non-random sample.

Selected on the basis of opinions.

BIASNESS

Also called } Purposive sampling
 } Authoritative sampling

For eg: We have to study a specific industry.

So a researcher can choose companies known for innovation and success

Based on opinions

09 SUNDAY

APR 2023	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	17	18	19	20	21	22	23	24	25	26	27	28	29	30							

Quota sampling :

→ Defined as a non-probability sampling method :

Collected from homogenous group

→ Often used in polls and opinion surveys.

→ Where specific size of sample is usually decided in advance.

In this you create a sample of individuals who represent your target markets

For eg: A soap company wants to find out what age group prefers which brand of cigarettes in a particular way.

So they apply survey quota

21-30

31-40

41-50

51 +.....

(And gauges the soap brand trend)

• Convenience sampling :-

- Non probability sampling method:-
- A qualitative research.

where participants based on their

- accessibility
- Availability

are selected

(Rather than being drawn at random from a bigger population, participants in this strategy are picked because they are easily available to the researcher)

For eg:

When companies distribute their promotional pamphlets and ask questions at a mall or on a crowded street with randomly selected participants.

[BUSINESS MAN USE THIS FOR :-
[Gathering information to address critical issues in market]

APR 2023	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	17	18	19	20	21	22	23	24	25	26	27	28	29	30						

M	T
1	2
22	23

Errors in sample survey ÷

SAMPLING ERRORS ÷

- Errors arising out due to defective sampling design :

If by chance you followed a non-probabilistic sampling design it will result into biasness.

- Errors arising out ^{due} to substitution ÷

Replace unit by a suitable unit

Acc. to their convenience

When difficulty arises in getting information from the originally selected unit.

Biasness occurs.

- Errors owing to faulty demarcation units :

The sampler can only

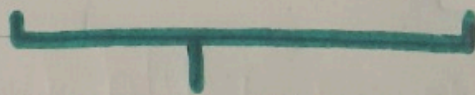
- Underestimate
- Overestimate.



This leads to faulty demarcations.

- Errors owing to wrong choice of statistic :

Must be careful choosing proper statistics



While estimating a population characteristic.

- Variability in the population :

There is a variability among the population units beyond a degree

Reduced by stratified sampling, multistage etc.

APR	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F
2023	17	18	19	20	21	1	2	3	4	5	6	7	8	9	10	11	12	13	14

(c) Principle of [validity] optimization

→ Ensures that the optimum level of efficiency → at a minimum cost
→ at a maximum efficiency

at a given level of cost
can be achieved.

with the selection of an appropriate
sampling design

(d) Principal of validity

→ Sampling is a valid design
only if

possible to obtain valid estimates
and valid tests about

Population parameters

Only probability sampling ensures this validity

APR	M	T	W	T	F	S	M	T	W	F	S	S	M	T	W	T	F			
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Take a example

• $N = 4$
 $n = 2$

] When SRSWR

$$k = N^n$$
$$= 2^2$$
$$= 4$$

• $N = 4$
 $n = 2$

] When SRSWOR

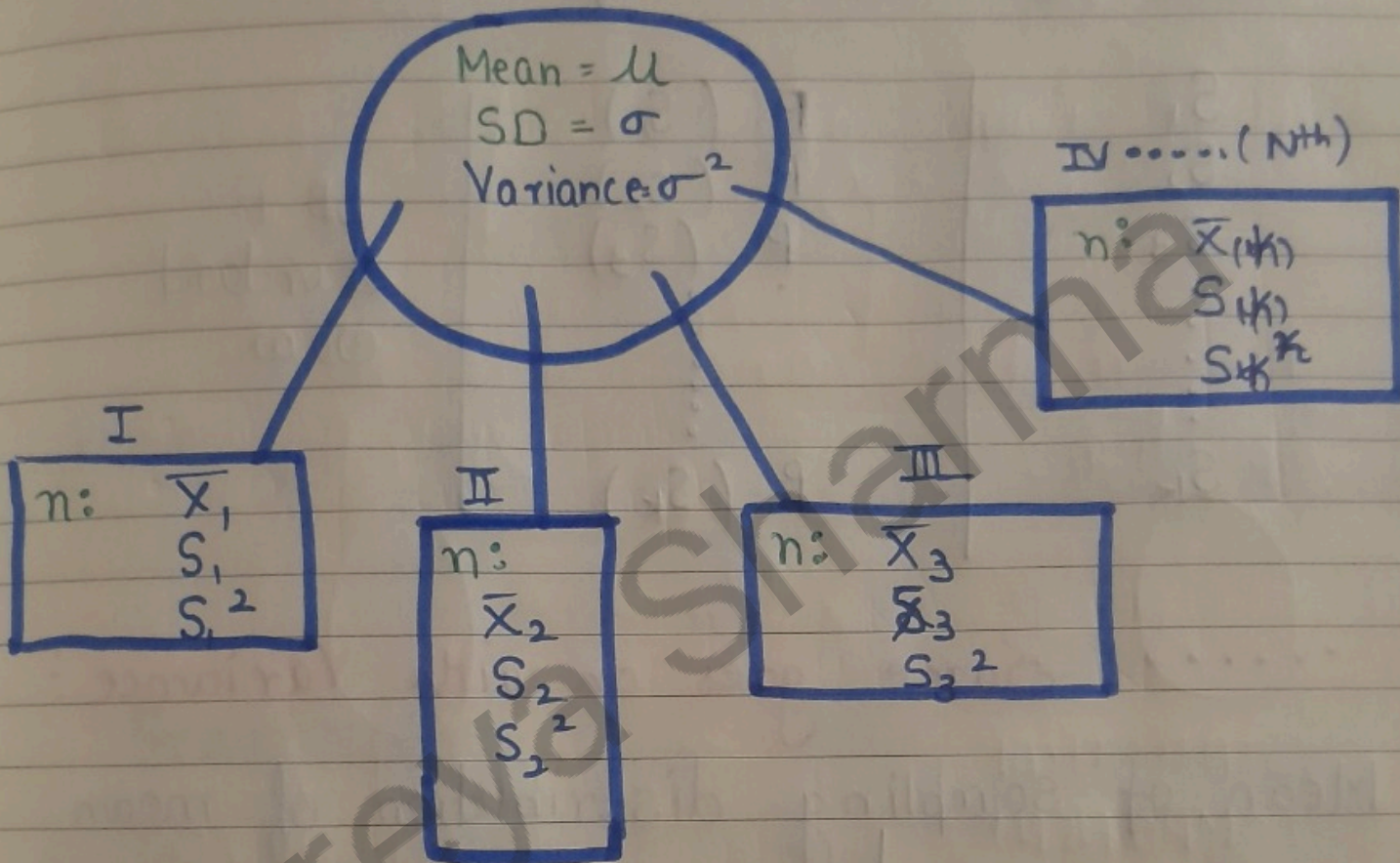
$$k = N C_n$$
$$= 4 C_2$$
$$= \frac{4!}{(4-2)! (2!)}$$

$$= \frac{4!}{(2!)(2!)} = \frac{4 \times 3 \times 2 \times 1}{(2 \times 1)(2 \times 1)}$$

$$= 3 \times 2$$

$$= 6$$

POPULATION SIZE = N

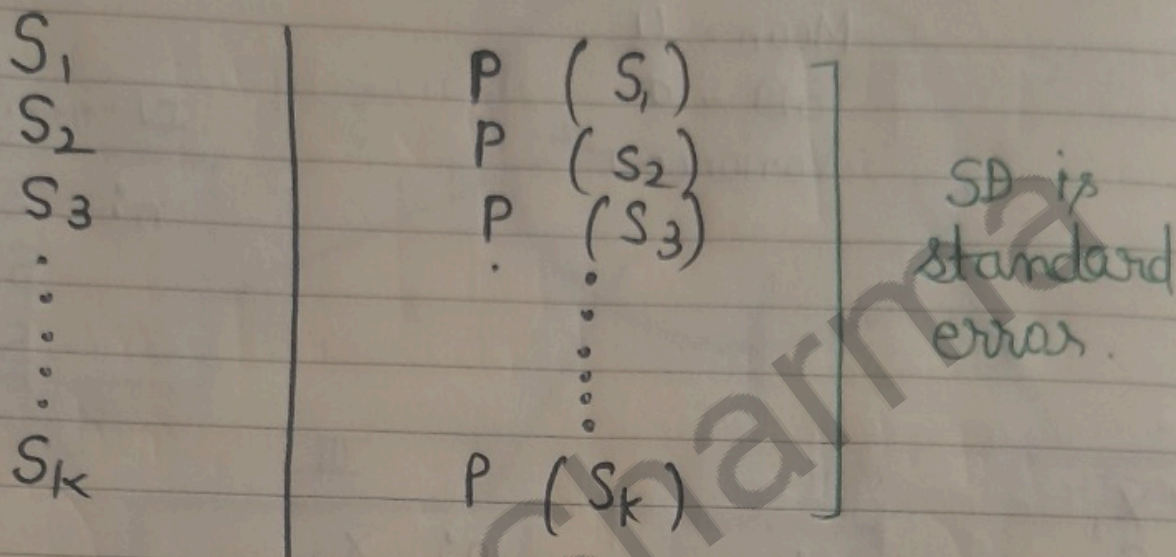


SAMPLING DISTRIBUTION OF MEAN

\bar{X}_1	$P(\bar{X}_1)$
\bar{X}_2	$P(\bar{X}_2)$
\bar{X}_3	$P(\bar{X}_3)$
\vdots	\vdots
\bar{X}_k	$P(\bar{X}_k)$

SD of sampling distribution will be called standard error.

Sampling distribution of S.D



..... Same goes on with Variance:

Mean of sampling distribution of mean



μ
(Means population size mean)

$$\mu_{\bar{x}} = \mu$$

\Rightarrow SD of sampling distribution of mean
(Standard error of mean)

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

$\xrightarrow{\text{Population SD}}$
 $\xrightarrow{\text{Sample size}}$

When you will increase sample size the S.D of sampling distribution of mean will decrease

STATISTIC

SE

Sample mean \bar{x}

$$\frac{\sigma}{\sqrt{n}}$$

Sample SD, S

$$\sqrt{\frac{\sigma^2}{2n}}$$

Sample SD,

$$\frac{\sigma^2}{\sqrt{2n}}$$

Sample Proportion

$$\sqrt{\frac{PQ}{n}}$$

Sample correlation r

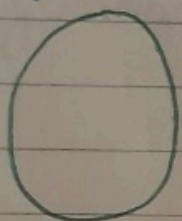
$$\frac{1 - \rho^2}{\sqrt{n}}$$

Diff of two sample mean $(\bar{X}_1 - \bar{X}_2)$

$$\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

Parameter and statistics :-

Population



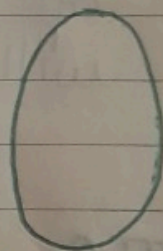
STATISTICAL COMPONENT OF POPULATION

(Mean, size, SD etc)



Are parameter.

Statistics



STATISTICAL COMPONENT OF SAMPLE

(Mean, size, SD etc)



Are statistics.

Population	Size	=	N
Population	Mean	=	μ
Population	SD	=	σ
"	Variance	=	σ^2
"	Proportion	=	P

Sample size	=	n
Sample mean	=	\bar{X}
Sample SD	=	S
Sample variance	=	S^2
Sample proportion	=	P^* or p or \hat{P}

Diff between μ and \bar{X} is

Sampling error.

FORMULAS ÷

$$\mu = \frac{\sum_{a=1}^n X_a}{N}$$

$$\bullet \quad p = \frac{x}{N}$$

$$\bullet \quad \sigma^2 = \frac{\sum (x_a - u)^2}{N}$$

$$\bullet \quad SD = \sigma = \sqrt{\frac{\sum (x_a - u)^2}{N}}$$

$$\bullet \quad \bar{x} = \hat{u} = \frac{\sum x_i}{N}$$

$$\bullet \quad s_2 = \hat{\sigma}_2^2 = \frac{\sum (x_i - \bar{x})^2}{n}$$

$$\bullet \quad p = \hat{p} = \frac{x}{N}$$

$$\bullet \quad SE(\bar{x}) = \frac{\sigma}{\sqrt{n}} \quad] \quad \text{SRSWR}$$

$$= \frac{\sigma}{\sqrt{n}} \cdot \sqrt{\frac{N-n}{N-1}} \quad \text{for SRSWOR}$$

- SE Error for proportion

$$SE(p) = \sqrt{\frac{pq}{n}} \quad \text{for SRSWR}$$

$$SE(p) = \sqrt{\frac{pq}{n}} \sqrt{\frac{N-n}{N-1}} \quad \text{for SRSWOR}$$



Shreya Sharma