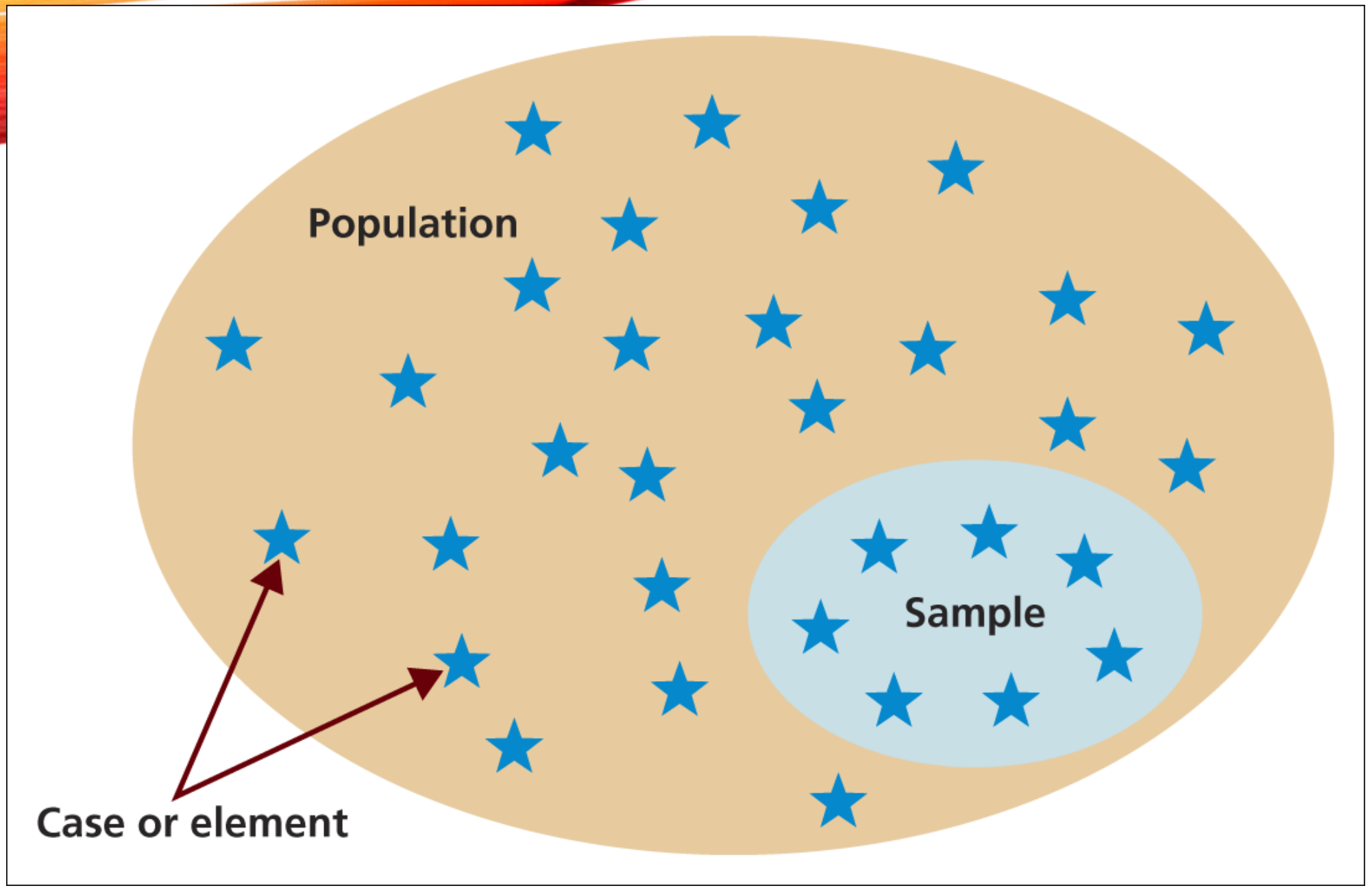
SAMPLING AND SAMPLE SIZE

SAMPLING

- **Sampling-** learning about the population on the basis of the sample drawn from it.
  - 3 elements in process of sampling
    - Selecting the sample
    - Collecting the information
    - Making inference about the population
- **Census** process of obtaining information from each and every unit of the population.


Population
Sample
Case or element

THE NEED TO SAMPLE

Sampling- a valid alternative to a census when;

- A survey of the entire population is impracticable
- Budget constraints restrict data collection
- Time constraints restrict data collection
- Results from data collection are needed quickly

SAMPLING BREAKDOWN

Who do you want to generalize to?

The Theoretical Population

What population can you get access to?

The Study Population

How can you get access to them?

The Sampling Frame

Who is in your study?

The Sample

SAMPLE SIZE

Slovin's Formula

$$n \geq \frac{N}{1 + Ne^2}$$

where n is the no. of sample

N is the no. of population

e is the margin of error

EXAMPLE

- Suppose that a group of 1000 city government employees needs to be surveyed to find out which tools are best suited to their jobs. Consider the following margin of error in computing the no. of sample.

(a)e=0.01

(b)e=5%

(c)e=10%

SOLUTION (A)

Given: N (population)= 1000 e=0.01

Solution:

$$n \geq \frac{N}{1+Ne^2}$$

$$n \geq \frac{1000}{1+(1000)(0.01)^2}$$

$$n \geq \frac{1000}{1+1000(0.0001)}$$

$$n \geq \frac{1000}{1+0.1}$$

$$n \geq \frac{1000}{1.1}$$

$$n \geq 909.0909$$

$$n = 910$$

SOLUTION (B)

Given: N (population)= 1000 e=5% or 0.05

Solution:

$$n \geq \frac{N}{1+Ne^2}$$

$$n \geq \frac{1000}{1+(1000)(0.05)^2}$$

$$n \geq \frac{1000}{1+1000(0.0025)}$$

$$n \geq \frac{1000}{1+2.5}$$

$$n \geq \frac{1000}{3.5}$$

$$n \geq 285.714286$$

$$n = 286$$

SOLUTION (C)

Given: N (population)= 1000 e=10% or 0.1

Solution:

$$n \geq \frac{N}{1+Ne^2}$$

$$n \geq \frac{1000}{1+(1000)(0.1)^2}$$

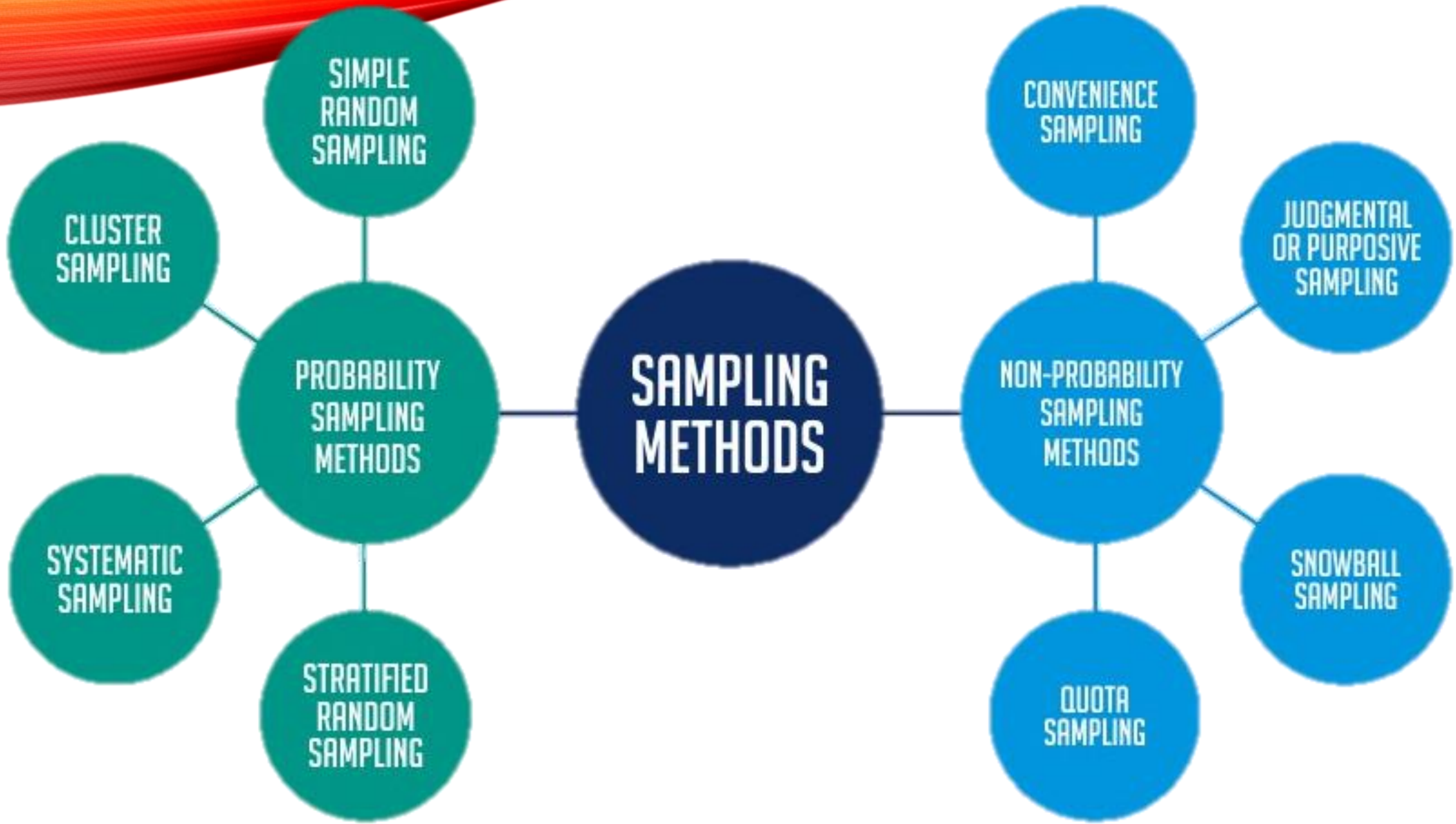
$$n \geq \frac{1000}{1+1000(0.01)}$$

$$n \geq \frac{1000}{1+10}$$

$$n \geq \frac{1000}{11}$$

$$n \geq 90.909090$$

$$n = 91$$


SAMPLING METHODS
PROBABILITY SAMPLING METHODS
SIMPLE RANDOM SAMPLING
CLUSTER SAMPLING
SYSTEMATIC SAMPLING
STRATIFIED RANDOM SAMPLING
NON-PROBABILITY SAMPLING METHODS
CONVENIENCE SAMPLING
JUDGMENTAL OR PURPOSIVE SAMPLING
SNOWBALL SAMPLING
QUOTA SAMPLING

SAMPLING TECHNIQUES

- **Probability Sampling-** a sampling procedures that gives every element of the population a nonzero chance of being selected in the sample.
- **Non-Probability Sampling**- not every individual in a given population the same likelihood of being selected.

PROBABILITY SAMPLING

SIMPLE RANDOM SAMPLING

- Each member of the population has an equal chance of being drawn.
  - Simple Random Sampling with Replacement
  - Simple Random Sampling without Replacement

Simple Random Sampling

SIMPLE RANDOM SAMPLING

Merits

- Minimal knowledge of population needed
- Sample more representative of population
- Accuracy can be assessed as sampling errors follow principals of chance
- Easy to analyze data

Demerits

- Large risk of random error
- Cases too widely dispersed- more time and cost.

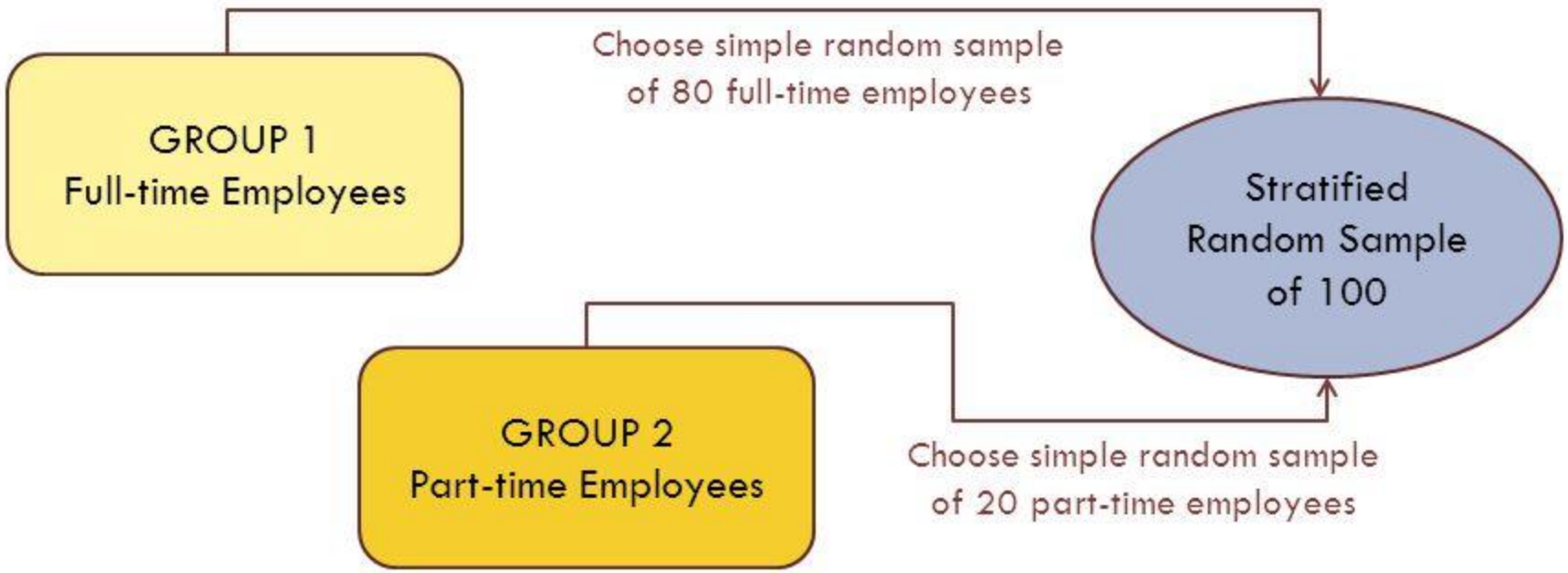
STRATIFIED RANDOM SAMPLING

- Population is subdivided by known strata and participants are sampled randomly from within each stratum.
- Population is divided into a number if pre-determined sub-groups on the basis of existing strata (based on pre-determined characteristic).


Stratified Random
Sampling

Example – Stratified Random Sampling

A company has 800 full-time and 200 part-time employees. To draw a sample of 100 employees, a simple random sample of 80 full-time employees is selected and a simple random sample of 20 part-time employees is selected.



STRATIFIED RANDOM SAMPLING

- Proportional allocation
  - Proportion in each stratum
- Equal Allocation
  - Equal no. in each stratum

EXAMPLE

The following data consist of the present school enrolment in XYZ University. A study on the recent teaching strategies will be conducted in this school.

Year Level	First	Second	Third	Fourth
Population Size	150	185	220	245

Using stratified random sampling. If 200 samples will be taken, how many representatives from each year classification should be drawn (a) using equal allocation and (b) using proportional allocation?

(EQUAL ALLOCATION)

To solve for the number of samples per year classification using equal allocation, we have

$n_i = \frac{n}{k}$ **where** n_i **is the number of samples per category**

n **is the total number of samples**

k **is the number of groups/category**

SOLUTION
(EQUAL ALLOCATION)

$$n_i = \frac{n}{k}$$

$$n_i = \frac{200}{4}$$

$$n_i = 50$$

Hence, 50 first year students, 50 second year students, 50 third year students and 50 fourth year students will serve as the representative.

(PROPORTIONAL ALLOCATION)

To solve for the number of samples per year classification using proportional allocation, we have

$n_i = \frac{N_i}{N} \times n$ **where** N_i **is the total number of population in each category**

n **is the total number of population**

n **is the total number of samples**

n_i **is the total number of samples per category**

SOLUTION
(PROPORTIONAL ALLOCATION)

Year	Population (per category)	Ratio $\left(\frac{N_I}{N}\right)$	Number of Samples (per category) $\left(\frac{N_I}{N} \times n\right)$
First	150	$\frac{150}{800} = 0.1875$	$0.1875 \times 200 = 37.5$ or 38
Second	185	$\frac{185}{800} = 0.23125$	$0.23125 \times 200 = 46.25$ or 46
Third	220	$\frac{220}{800} = 0.275$	$0.275 \times 200 = 55$
Fourth	245	$\frac{245}{800} = 0.30625$	$0.275 \times 200 = 61.25$ or 61
TOTAL	**800**	**1**	**200**

STRATIFIED RANDOM SAMPLING

Merits

- Assures representation of all groups in sample population.
- Characteristics of each stratum can be estimated and comparisons made.

Demerits

- Requires accurate information on proportions of each stratum
- Skilled sampling supervisors
- Stratified lists costly to prepare

CLUSTER SAMPLING

- A probability sampling procedure that involves randomly selecting clusters of elements from a population and subsequently selecting every element in each selected cluster for inclusion in the sample
- Cluster sampling is an option if data collection involves visits to sites that are far apart

CLUSTER SAMPLING

Merits

- Most economical form of sampling
- Larger sample for a similar fixed cost
- Reduce travel and other administrative costs.

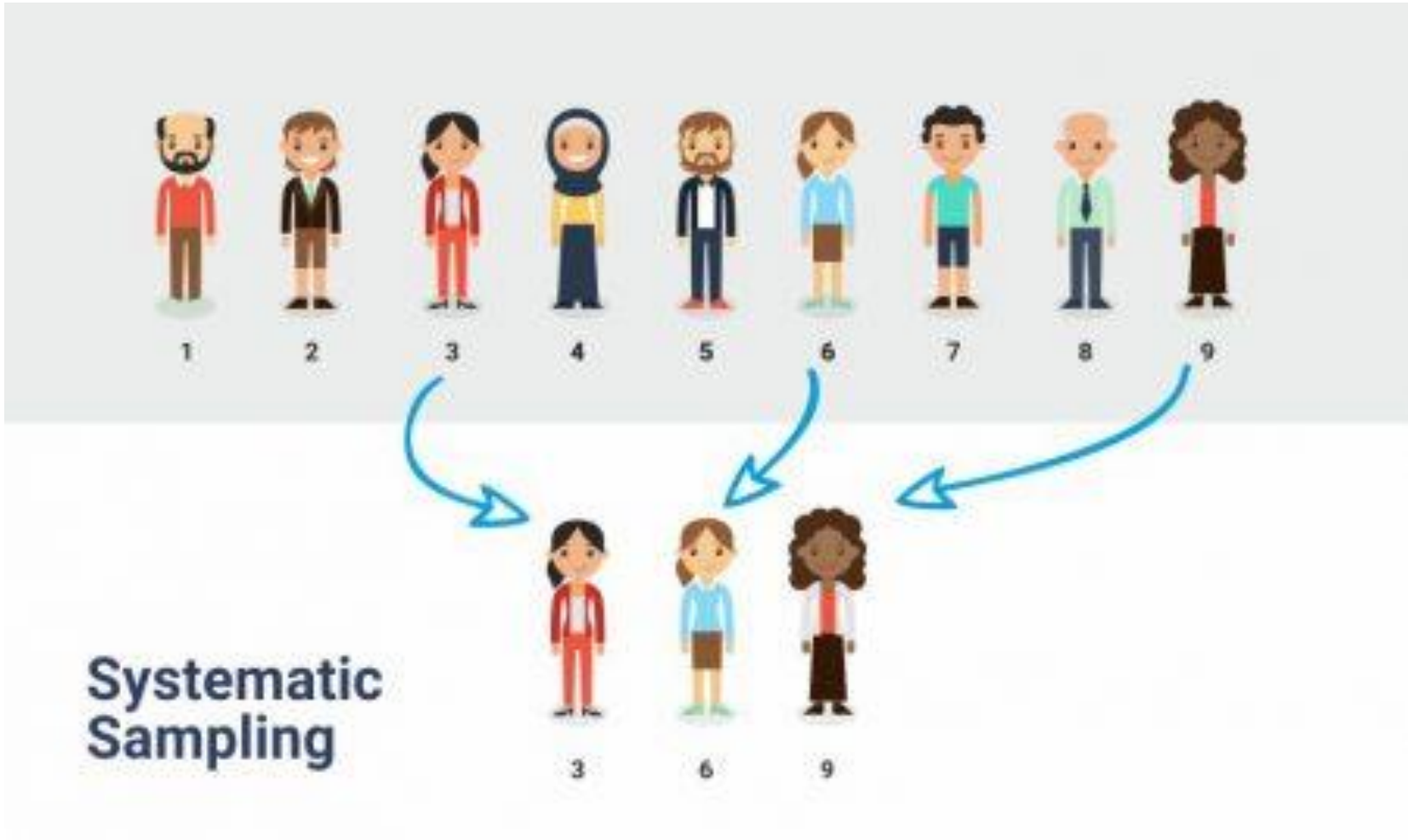
Demerits

- May not reflect the diversity of the community.
- Standard errors of the estimates are high, compared to other sampling designs with sample size.


Cluster
Sampling

SYSTEMATIC SAMPLING

- A probability sampling procedure that involves selecting every *k*th element from a list of population elements, after the first element has been randomly selected.


1
2
3
4
5
6
7
8
9
Systematic Sampling
3
6
9

EXAMPLE

The committee should select 4 representative from 20 members. Apply systematic sampling to determine the representative.

1. Student A	6. Student F	11. Student K	16. Student P
2. Student B	7. Student G	12. Student L	17. Student Q
3. Student C	8. Student H	13. Student M	18. Student R
4. Student D	9. Student I	14. Student N	19. Student S
5. Student E	10. Student J	15. Student O	20. Student T

SOLUTION

STEP 1 Determine the **sampling interval (k)**

$$\boldsymbol{k = \frac{no.of\ population}{no.of\ sample} = \frac{N}{n}}$$

STEP 2 Select a **random start (r)** where $1 \leq r \leq k$

STEP 3 Add the sampling interval to the preceding selected position of the representative.

SOLUTION

STEP 1 Determine the **sampling interval (k)**

$$\boldsymbol{k = \frac{no.of\ population}{no.of\ sample} = \frac{N}{n} = \frac{20}{4} = 5}$$

STEP 2 Select a **random start (r)** where $1 \leq r \leq 5$

EXAMPLE

Selecting the representatives

1. Student A
2. Student B
3. **Student C**
4. Student D
5. Student E
6. Student F
7. Student G
8. Student H
9. Student I
10. Student J
11. Student K
12. Student L
13. Student M
14. Student N
15. Student O
16. Student P
17. Student Q
18. Student R
19. Student S
20. Student T

EXAMPLE

Selecting the representatives

1. Student A
2. Student B
3. **Student C**
4. Student D
5. Student E
6. Student F
7. Student G
8. **Student H**
9. Student I
10. Student J
11. Student K
12. Student L
13. Student M
14. Student N
15. Student O
16. Student P
17. Student Q
18. Student R
19. Student S
20. Student T

EXAMPLE

Selecting the representatives

1. Student A	6. Student F	11. Student K	16. Student P
2. Student B	7. Student G	12. Student L	17. Student Q
3. Student C	**8. Student H**	**13. Student M**	18. Student R
4. Student D	9. Student I	14. Student N	19. Student S
5. Student E	10. Student J	15. Student O	20. Student T

EXAMPLE

Selecting the representatives

1. Student A	6. Student F	11. Student K	16. Student P
2. Student B	7. Student G	12. Student L	17. Student Q
3. Student C	**8. Student H**	**13. Student M**	**18. Student R**
4. Student D	9. Student I	14. Student N	19. Student S
5. Student E	10. Student J	15. Student O	20. Student T

SYSTEMATIC SAMPLING

Merits

- Simple and convenient
- Less time consuming
- Easy to verify

Demerits

- Population with hidden periodicities

MULTISTAGE SAMPLING

- A probability sampling procedure that involves several stages, such as randomly selecting clusters from a population, then randomly selecting elements from each of the clusters

MULTISTAGE SAMPLING

Merits

- Introduce flexibility in the sampling method.
- Enables existing divisions and sub division of population to be used as units
- Large area are covered

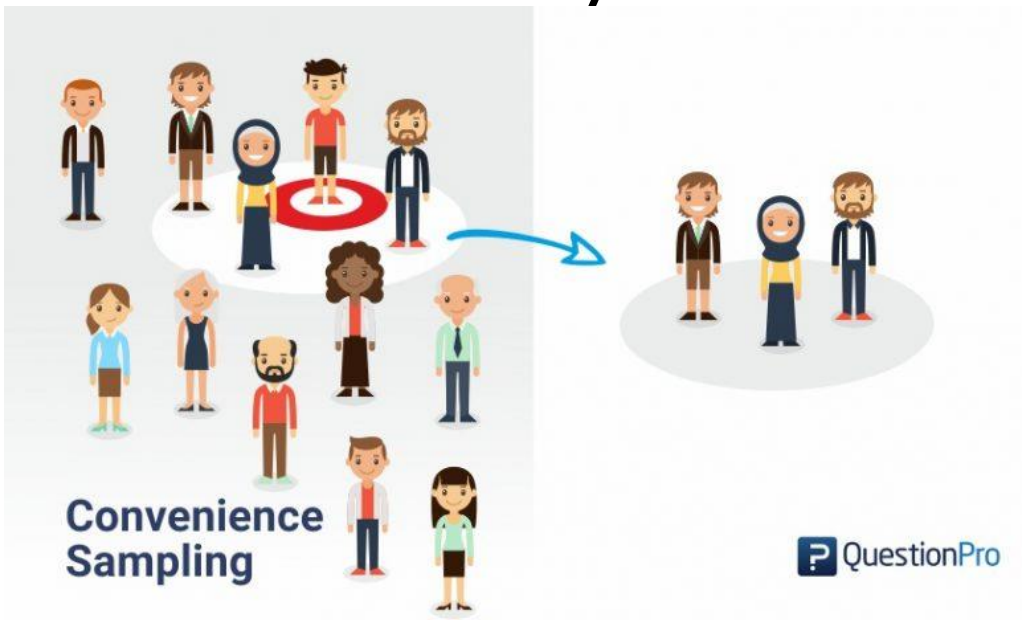
Demerits

- Less accurate than a sample chosen by singe stage process.

NON-PROBABILITY SAMPLING

CONVENIENCE SAMPLING

- Convenience sampling
- Sampling follows no predetermined plan and is a matter of convenience only



CONVENIENCE SAMPLING

Merits

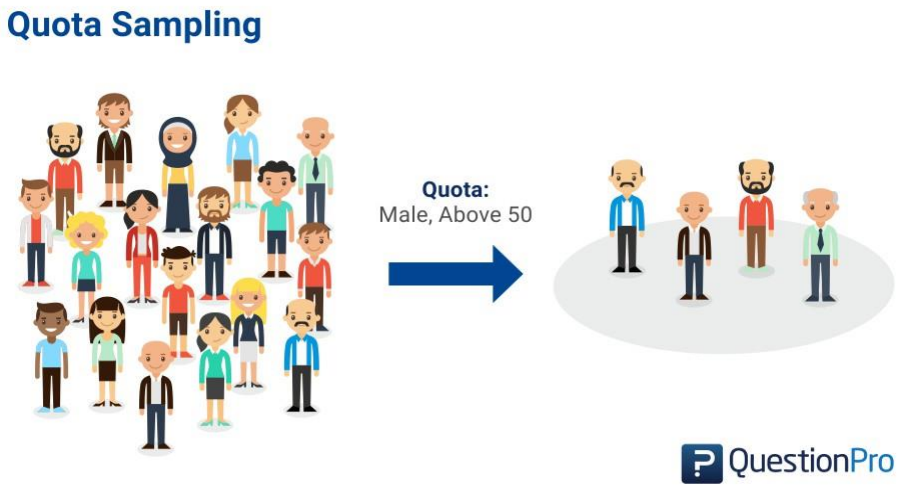
- Use in public opinion studies

Demerits

- Personal prejudice and bias

QUOTA SAMPLING

- Population is sub divided by known strata but participants are not drawn randomly within each stratum.



PURPOSIVE/JUDGMENT

- A particular sector of a population is deliberately targeted. Sampling is not random, rather, specific individuals are selected because they possess certain characteristics of typically or predictive power

PURPOSIVE SAMPLING

Merits

- Small no. sampling units
- Study unknown traits/ case sampling

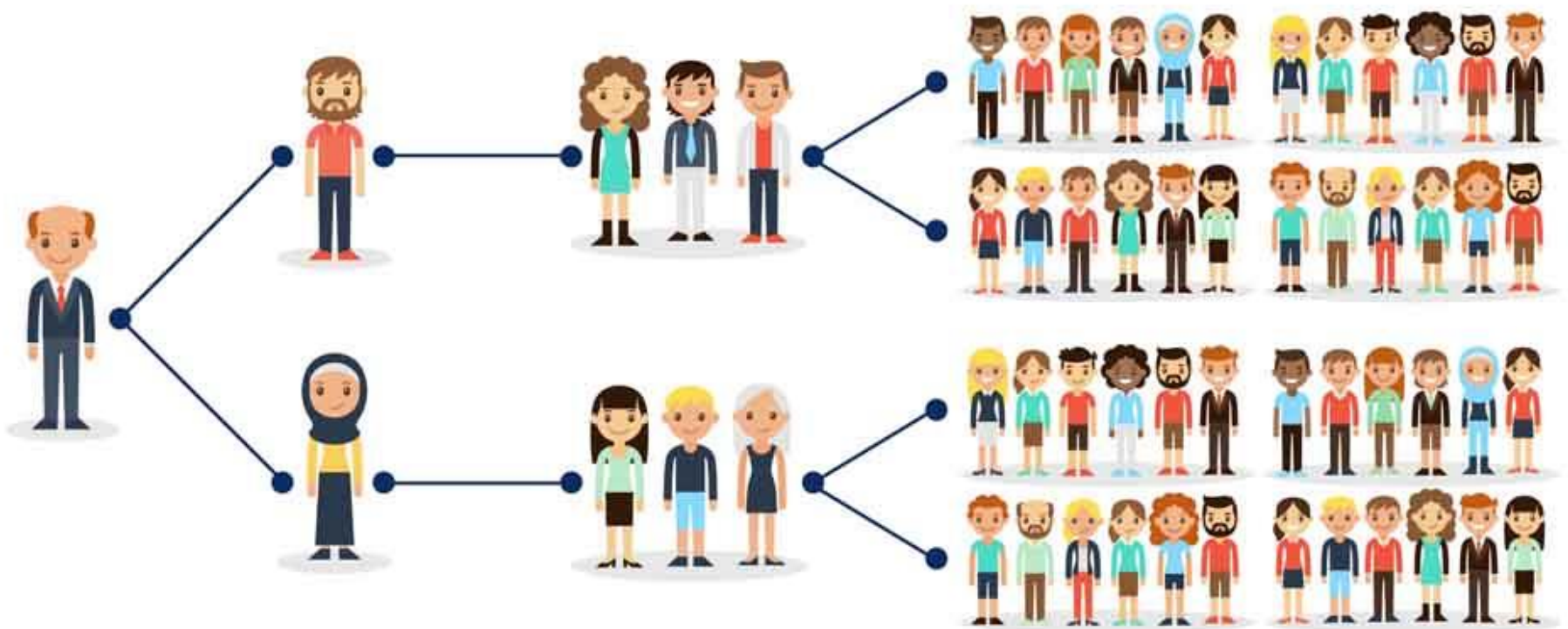
Demerits

- Personal prejudice and bias
- No objective way of evaluating reliability of results

SNOWBALL SAMPLING

- Population members act as agents of the researcher by sampling from colleagues, friends or associates. Useful when a population is largely inaccessible to the researcher

SNOWBALL SAMPLING



QuestionPro

SNOWBALL SAMPLING

Merits

- Access to difficult to reach populations (other methods may not yield any results)

Demerits

- Not representative of the population will result in a biased sample as it is self-selecting

END OF DISCUSSION