



ABM — Advanced Bank Management

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CH-1

Definition of Statistics, Importance & Limitations & Data Collection, Classification & Tabulation

Topic 1 — Statistics — Origin and Nature

The word **Statistics** is derived from the Latin '**statisticum**', Italian '**statistia**' and German '**statistik**'. Each means a group of numbers or figures that represent some information of human interest.

Data may be **qualitative** or **quantitative**. Statistics uses **numerical measurements** and **categorical counts** to describe data and to draw **inferences**.

Topic 2 — Four Phases of Statistical Analysis

Phase	What happens
1. Collection of data	First stage of investigation; numerical data is collected from different sources.
2. Classification and tabulation	Raw data is divided into groups or classes and presented in a table.
3. Analysis of data	Classified and tabulated data is analysed using formulas and statistical methods.
4. Interpretation of data	Final stage; relevant conclusions are drawn after thorough analysis.

Remember this

- Sequence: **Collection** → **Classification & Tabulation** → **Analysis** → **Interpretation**.

Topic 3 — Importance and Functions of Statistics

Statistics is used in **business and economics**, **medicine**, **weather forecasting**, the **stock market**, **banking** and **sports**.

No.	Function of statistics
1	Presents facts in a definite (numerical) form.
2	Simplifies complex data.
3	Provides a technique of comparison .
4	Studies the relationship between two or more variables.
5	Helps in formulating policies .
6	Helps in forecasting outcomes.

Example: A bank uses past deposit growth to forecast next year's CASA mobilisation (forecasting) and compares branch NPA ratios (comparison).

Topic 4 — Limitations of Statistics

Limitation	Explanation
Does not deal with individuals	Statistics studies mass data or groups of observations; it deals with aggregates of facts, not a single item.
Qualitative data	Categories are studied only through counts, proportions and contingency tables ; numerical measures alone cannot capture every qualitative feature.
Results are true only on an average	A sample is studied and conclusions are drawn for the whole; results hold on average, not for every unit.
Results can be biased	Biased data collection can make the whole investigation useless.

Topic 5 — Population and Sample

Population is the entire collection of observations from which data may be collected. A **sample** is a part of the population selected for study.

Example: Study of weight of adult men in India: population = weights of all adult men in India. Study of infant health: population = all children born in India in a particular year; sample = all babies born on one particular day of that year.

- Common measures** — Mean, median, mode and standard deviation describe both samples and populations.
- Statistics** — For a **sample**, these measures are called **statistics**.
- Parameters** — For a **population**, these measures are called **parameters**.
- Notation** — Sample statistics use **lower-case Roman** letters. Population parameters use **Greek or capital** letters.

Notation for size, mean and standard deviation — population on the left, sample on the right:

Population : N, μ, σ

Sample : $n, \bar{x}, s$

Remember this

- Population → Parameter; Sample → Statistic.

Topic 6 — Variates and Attributes

Data is classified by its characteristics into **variates** and **attributes**.

Type	Nature	Examples
Variate	Varies from one individual to another and can be expressed numerically	Prices of a commodity, wages of workers, heights and weights of students, marks
Attribute	Varies from one individual to another but cannot be expressed numerically	Colour of a ball (black, blue, green), religion

Quantitative (numerical) variables are of two kinds.

Type	Nature	Examples
Discrete variable	Takes distinct, countable and usually finite values	Number of members in a family, number of accidents, age in completed years
Continuous variable	Can take any value within a range (integral or fractional)	Percentage of marks, height, weight

Topic 7 — Primary and Secondary Data

- Primary data** — Collected directly, for the first time, by the investigator from the respondents.
- Secondary data** — Second-hand information already collected and processed by some agency or person.
- Reuse** — Secondary data is being used a second time.

Methods of collecting primary data: **direct interview**, **questionnaires**, and **census and sample survey**.

Basis	Primary data	Secondary data
Source	Collected for the first time	Taken from published or unpublished sources
Status	Primary data of one person becomes secondary for all others	Already processed by someone else
Accuracy	Depends on collection design and quality; not automatically more accurate	Depends on the original collector's quality
Cost	Requires more money, time and energy	Cheaper and quicker

Example: RBI data on bank credit used by a branch manager for a project report is secondary data; a customer-satisfaction questionnaire run by the branch itself is primary data.

Topic 8 — Classification and Tabulation

- **Classification** — Arranging data into **homogeneous groups or classes** by a common characteristic.
- **Condenses data** — It removes unimportant details.
- **Fewer classes** — It fits a large number of observations into a few classes.
- **Relationships** — It helps study relationships between characteristics.

Presenting classified data in an organised form (rows and columns) for easy interpretation and comparison is **tabulation**.

Basis of classification	Grouping by	Example
Qualitative	An attribute or category	Religion, literacy status, gender
Quantitative	A measurable characteristic	Height, weight, age, marks
Geographical	Region or location	Population of different states, cities, countries
Chronological (temporal)	Time of occurrence — years, months, weeks, days; also called time series	Sales of a company over different years

Age measured in years is a **quantitative** base, not a qualitative one.

Type	Characteristics used	Example
One-way	One	Population by religion
Two-way	Two at a time	Population by religion and age
Multi-way	More than two	Population by religion, age and literacy

Topic 9 — Frequency Distribution and Class Intervals

- **Frequency** — The number of observations of a value or category, or the number falling within a class interval.
- **Any count** — A frequency can be **zero, one or more**. Repetition is not required.
- **Class intervals** — They are normally of **equal size** and cover the range of observations.

Term	Meaning
Class limits	The two values forming a class: lower class limit and upper class limit
Class width (length)	Upper class limit – lower class limit
Class mark (mid-value)	Mid-point of the class
Exclusive class	e.g. 0–10, 10–20; 500–1000, 1000–1500. Upper limit is excluded and counted in the next class
Inclusive class	e.g. 60–69, 70–79. Both limits included ; 60 and 69 both belong to 60–69
Class boundaries	Exclusive classes obtained by converting inclusive classes
Open-end class	Lower limit of the first class or upper limit of the last class (or both) is missing, e.g. Below 10, Above 40

Class width, class mark and the correction factor for converting inclusive classes to class boundaries:

$$\text{Class width} = \text{UCL} - \text{LCL}$$

$$\text{Class mark} = \frac{\text{LCL} + \text{UCL}}{2}$$

$$\text{Correction} = \frac{\text{LCL of next class} - \text{UCL of this class}}{2}$$

Subtract the correction from every lower limit and add it to every upper limit.

Example: Classes 5–9, 10–14: correction = $(10 - 9)/2 = 0.5$. Boundaries become **4.5–9.5, 9.5–14.5**. Class mark of 5–9 = $(5 + 9)/2 = 7$; width of 4.5–9.5 = 5.

Topic 10 — Relative, Percentage and Density Frequencies

These express a class frequency relative to the total or to the width of the class.

$$\text{Relative frequency} = \frac{\text{Class frequency}}{\text{Total frequency}}$$

$$\text{Percentage frequency} = \frac{\text{Class frequency}}{\text{Total frequency}} \times 100$$

$$\text{Frequency density} = \frac{\text{Class frequency}}{\text{Class width}}$$

Example: Class 20–30 has frequency 12 out of a total of 32. Relative frequency = $12/32 = 0.375$; percentage frequency = **37.5%**; frequency density = $12/10 = 1.2$.

Remember this

- Sum of all relative frequencies = 1; sum of percentage frequencies = **100**.

Topic 11 — Discrete and Continuous Frequency Distributions

A **discrete frequency distribution** is used when the variable takes distinct values. A **continuous frequency distribution** is used when values are expressed in class intervals within certain limits.

Example: Number of post-graduates in 10 families: 0, 1, 3, 1, 0, 2, 2, 2, 2, 4.

Post-graduates (x)	0	1	2	3	4	Total
Frequency	2	2	4	1	1	10

Example: Marks of 20 students (out of 50): 18, 23, 28, 29, 44, 28, 48, 33, 32, 43, 24, 29, 32, 39, 49, 42, 27, 33, 28, 29 — grouped in exclusive classes of width 5.

Marks	15–20	20–25	25–30	30–35	35–40	40–45	45–50	Total
Frequency	1	2	7	4	1	3	2	20

ABM | Module A | CH-1 | MCQs

Q1. In a statistical study, raw data has been divided into groups and shown in a table. Which phase of statistical analysis comes next? [Ref: Topic 2, p. 2]

- (a) Analysis of data (b) Collection of data
(c) Interpretation of data (d) Sampling of data

Q2. A study finds that average deposit per account in a branch is ₹85,000. A customer argues that his deposit is only ₹20,000, so the study is wrong. Which limitation of statistics explains this? [Ref: Topic 4, p. 2]

- (a) Statistics cannot handle quantitative data
(b) Statistics results are always biased
(c) Statistics does not deal with individuals
(d) Statistics cannot be used for comparison

Q3. A bank computes the mean loan size of all 12,000 home loans in its portfolio. This value is a: [Ref: Topic 5, p. 2]

- (a) Statistic (b) Parameter (c) Attribute (d) Class mark

Q4. A survey records the colour of credit cards preferred by customers (gold, silver, platinum). The characteristic studied is a/an: [Ref: Topic 6, p. 2]

- (a) Variate (b) Continuous variable
(c) Discrete variable (d) Attribute

Q5. Which of the following is a continuous variable? [Ref: Topic 6, p. 2]

- (a) Number of accounts opened in a day
(b) Weight of gold ornaments pledged for a gold loan
(c) Number of members in a family
(d) Number of ATMs in a district

Q6. A manager uses data from an RBI publication for a branch business plan. For the manager, this data is: [Ref: Topic 7, p. 2]

- (a) Secondary data (b) Primary data
(c) Attribute data (d) Census data

Q7. Monthly CASA balances of a bank for the last 36 months are arranged month-wise. The base of classification is: [Ref: Topic 8, p. 3]

- (a) Geographical (b) Chronological
(c) Qualitative (d) Quantitative

Q8. Customers are classified by gender, age group and occupation at the same time. This is: [Ref: Topic 8, p. 3]

- (a) One-way classification (b) Two-way classification
(c) Geographical classification (d) Multi-way classification

Q9. Inclusive classes are 20–29, 30–39, 40–49. The class boundaries of the second class are: [Ref: Topic 9, p. 3]

- (a) 30–40 (b) 29–39 (c) 29.5–39.5 (d) 30.5–39.5

Q10. In a distribution of 80 observations, class 40–60 has a frequency of 24. Its percentage frequency and frequency density are: [Ref: Topic 10, p. 3]

- (a) 24% and 1.2 (b) 30% and 0.6 (c) 30% and 1.2 (d) 24% and 0.3

Q11. In exclusive classes 0–10, 10–20, an observation of exactly 10 is counted in: [Ref: Topic 9, p. 3]

- (a) 0–10 (b) Both classes
(c) Neither class (d) 10–20

Q12. Raw data: 3, 1, 2, 3, 0, 3, 1, 2, 3, 4. In a discrete frequency distribution, the frequency of the value 3 is: [Ref: Topic 11, p. 3]

- (a) 3 (b) 2 (c) 5 (d) 4

Q13. Inclusive classes are 15–19, 20–24, 25–29. The correction factor and the class boundaries of 20–24 are: [Ref: Topic 9, p. 3]

- (a) 0.5 and 19.5–24.5 (b) 1 and 19–25
(c) 0.5 and 20.5–24.5 (d) 0.5 and 19.5–25.5

Q14. In a marks distribution, the class 40–60 has a frequency of 30. Its frequency density is: [Ref: Topic 10, p. 3]

- (a) 0.67 (b) 1.5 (c) 30 (d) 3.0

Q15. In a distribution of 250 borrowers, a loan-size class has a percentage frequency of 18%. The number of borrowers in that class is: [Ref: Topic 10, p. 3]

- (a) 18 (b) 72 (c) 45 (d) 14

Answer key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	a	4	d	7	b	10	c	13	a
2	c	5	b	8	d	11	d	14	b
3	b	6	a	9	c	12	d	15	c

CH-2 Sampling Techniques

Topic 1 — Types of Sampling

- Samples, not census** — Decision-makers rarely study the entire population of customers, borrowers or transactions. They rely on samples.
- Two families** — Sampling methods are either **judgement (non-random)** or **random (probability)**.

Family	Basis of selection	Banking example
Judgement / non-random	Investigator picks units by personal expertise or convenience; no probability mechanism ; error cannot be quantified	Branch manager hand-picks 10 'good' borrowers for a quick credit-quality check
Random / probability	Every unit has a known, non-zero chance of selection under a probability rule	RBI inspection of a randomly drawn set of NPA accounts

Only **random sampling** supports valid statistical inference about the population. Judgement sampling is fast and cheap but cannot measure error.

Random method	How it works	Use when / example
Simple random (SRS)	Every possible sample of a fixed size has equal probability ; drawn by lottery, random-number tables or computer	Homogeneous population with a complete list (sampling frame); audit 50 random savings accounts out of 5,000
Systematic	Pick every k th unit from an ordered list after a random start; sampling interval k as in the formula below	Audit every 100th of 10,000 KYC files from a random start between 1 and 100. Caution: a hidden periodic pattern matching k causes bias
Stratified	Divide population into non-overlapping strata sharing an attribute; draw a separate random sample from each stratum	Heterogeneous population needing guaranteed representation; customers split into age groups 15–25, 26–40, 40+
Cluster	Divide population into clusters (usually geographical); randomly choose a few clusters; study all units (or a sub-sample) in them	Geographically spread population; survey every household in 20 villages chosen at random out of 500

Aspect	Stratified	Cluster
Within-group variability	Low (homogeneous strata)	High (each cluster is a mini-population)
Between-group variability	High (strata differ)	Low (clusters resemble each other)
What is sampled	A sample from every group	All units of a few chosen groups
Purpose	Improve precision	Reduce cost / logistics

Sampling interval for systematic sampling (N = population size, n = sample size):

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

Example: 10,000 accounts, sample of 50: $k = 10,000/50 = 200$. After a random start, say account 37, select 37, 237, 437 and so on.