Economics

(Statistics)

Chapter 3: Organisation of Data

Organisation of Data

## Classification of Data –

The process of grouping data according to their characteristics is known as classification of data.

Objectives of Classification –

- ❖ To simplify complex data.
- ❖ To facilitate understanding.
- ❖ To facilitate comparison.
- ❖ To make analysis and interpretation easy.
- ❖ To arrange and put the data according to their common characteristics.

Statistical Series –

Systematic arrangement of statistical data:
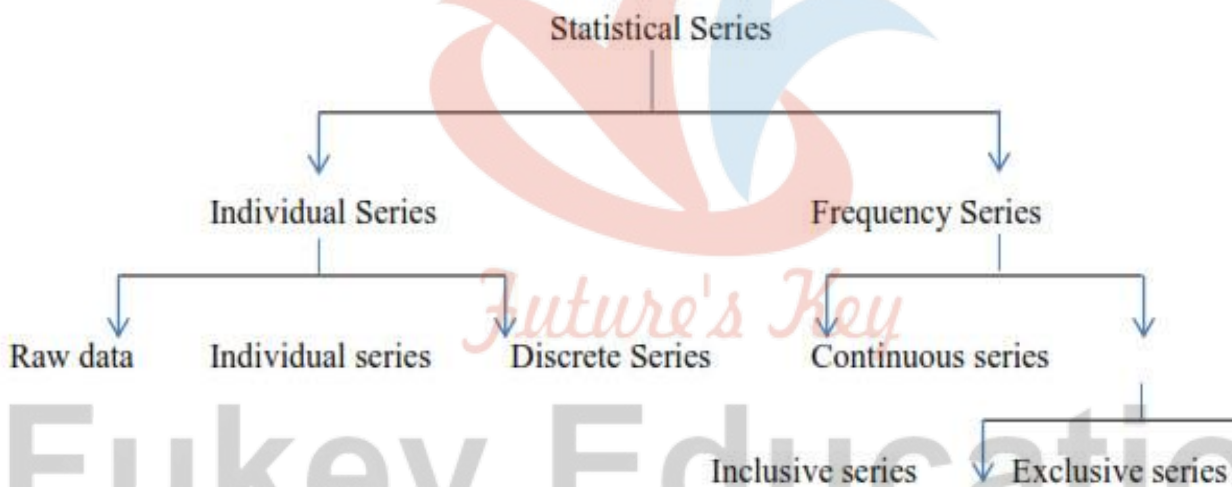
Can be on the basis of individual units –

The data can be individually presented in two forms:

- ❖ **Raw data:** Data collected in original form.

- ❖ **Individual Series:** The arrangement of raw data individually. It can be expressed in two ways.

  - ♣ **Alphabetical arrangement:** Alphabetical order

  - ♣ **Array:** Ascending or descending order.

(1)

Can be on the basis of Frequency Distribution –

Frequency distribution refers to a table in which observed values of a variable are classified according to their numerical magnitude.

❖ **Discrete Series:** A variable is called discrete if the variable can take only some particular values.

❖ **Continuous Series:** A variable is called continuous if it can take any value in a given range. In constructing continuous series we come across terms like:

   ✦ **Class:** Each given internal is called a class e.g., 0-5, 5-10.

   ✦ **Class limit:** There are two limits upper limit and lower limit.

   ✦ **Class interva:** Difference between upper limit and lower limit.

   ✦ **Rang:** Difference between upper limit and lower limit.

   $$\frac{\text{Upper limit - Lower limit}}{2}$$

   ✦ **Mid-point or Mid Value:**

   ✦ **Frequency:** Number of items [observations] falling within a particular class.

❖ **Exclusive Series:** Excluding the upper limit of these classes, all the items of the class are included in the class itself. E.g.,

❖ **Inclusive:**

Marks	0-10	10-20	20-30	30-40
Number of Students	2	5	2	1

   ✦ **Series:** Upper class limits of classes are included in the respective classes. E.g.,

Marks	0-9	10-19	20-29
Name of Students	2	5	2

   ✦ **Open End Classes:**

The lower limit of the first class and upper limit of the last class are not given. E.g.,

Marks	Below 20	20-30	30-40	40-50	50 and above
Number of Students	7	6	12	5	3

(2)

❖ **Cumulative Frequency Series:** It is obtained by successively adding the frequencies of the values of the classes according to a certain law.
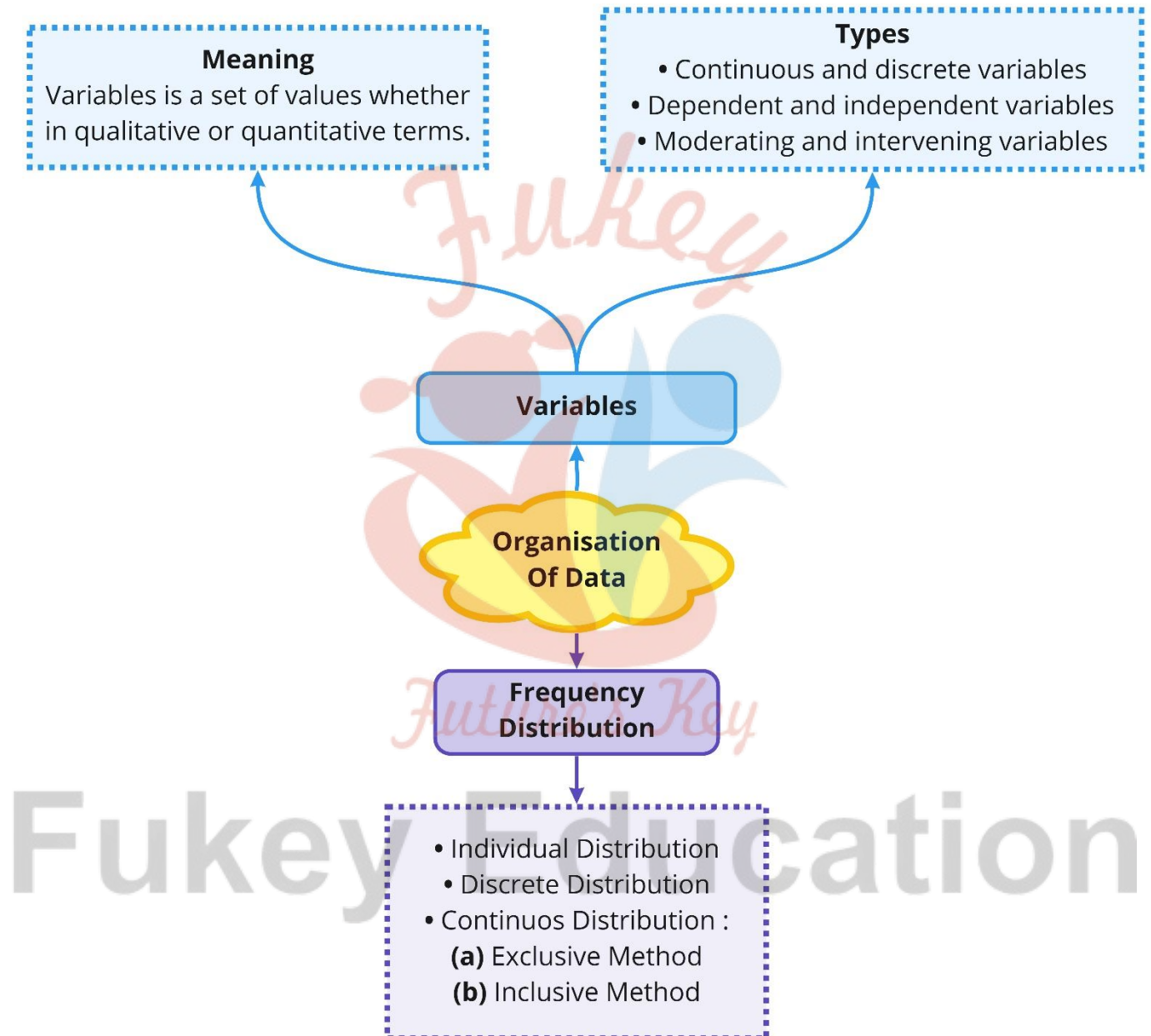
    ➕ **'Less than' Cumulative Frequency Distribution:** The frequencies of each class-internal are added successively.

    ➕ **'More than' Cumulative Frequency Distribution:** The more than cumulative frequency is obtained by finding the cumulative totals of frequencies starting from the highest value of the variable to the lowest value.

Marks	No. of Students
0-10	2
10-20	5
20-30	10
30-40	12
40-50	17
50-60	4

Marks	No. of Students
Less than 10	2
Less than 20	7
Less than 30	17
Less than 40	29
Less than 50	46
Less than 60	50

Marks	No. of Students
More than 0	50
More than 10	48
More than 20	43
More than 30	33
More than 40	21
More than 50	4

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Class : 11th Economics (Statistics)
Chapter-3 : Organisation Of Data

Meaning
Variables is a set of values whether in qualitative or quantitative terms.

Types
• Continuous and discrete variables
• Dependent and independent variables
• Moderating and intervening variables

Variables

Organisation Of Data

Frequency Distribution

• Individual Distribution
• Discrete Distribution
• Continuos Distribution :
 (a) Exclusive Method
 (b) Inclusive Method

(4)

Important Questions

Multiple Choice questions-

1. The characteristic of a fact that can be measured in the form of numbers is called:
   (a) frequency
   (b) variable
   (c) attribute
   (d) none of these

2. Frequency of a variable is always:
   (a) A fraction
   (b) In percentage
   (c) An integer
   (d) None of these

3. A series showing the sets of all values in classes with their corresponding frequencies is known as:
   (a) Grouped frequency distribution
   (b) Cumulative frequency distribution
   (c) Simple frequency distribution
   (d) None of the above

4. A series in which every class interval excludes items corresponding to its upper limit is called:
   (a) exclusive series
   (b) inclusive series
   (c) both (a) and (b)
   (d) none of these

5. An open-end series is that series in which:
   (a) lower limit of the first class interval is missing
   (b) upper limit of the last class interval is missing
   (c) both (a) and (b)
   (d) none of these

6. According to tally bar method, which of the following symbols indicate the frequency of five?
   (a) IIII
   (b) II
   (c) III
   (d) None of these

7. The Frequency distribution of a continuous variable is known as:
   (a) Grouped frequency distribution
   (b) Simple frequency distribution

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(c) Either (a) or (b)

(d) Both (a) and (b)

8. In an ordered series, the data are:

(a) In descending order

(b) In ascending order

(c) Either (a) or (b)

(d) None of these

9. In a series, the number of times an item occurs is known as:

(a) number

(b) class frequency

(c) frequency

(d) cumulative frequency

10. The difference between upper limit and lower limit of a class is known as:

(a) range

(b) magnitude of a class interval

(c) frequency

(d) class limits

11. Which of the following equations is correct?

(a) s = r + n

(b) s = r - n

(c) s = r × n

(d) s = rn

[s = Size of the class; r = Range; n = Number of classes]

12. Drinking habit of a person is:

(a) An attribute

(b) A discrete variable

(c) A variable

(d) A continuous variable

13. An attribute is:

(a) A qualitative characteristic

(b) A measurable characteristic

(c) A quantitative characteristic

(d) All these

14. Nationality of a student is:

(a) An attribute

(b) A discrete variable

(c) A continuous variable

(d) Either (a) or (c)

15. Why is it true that classes in frequency distributions are all inclusive`

(a) No data point falls into more than one class

(b) There are always more classes than data point

(c) All data fit into one class or another

(d) All of these

Very Short Questions:

1. What is the classification?

2. Define variable

3. Define individual series.

4. Explain the discrete series.

5. What do you mean by frequency distribution or frequency series?

6. What is the frequency?

7. Define the class limit.

8. Explain the magnitude of the class interval.

9. What is an exclusive series?

10. What is an inclusive series?

Short & Long Questions:

1. What is classification?

2. What is the Principal Objective of Classification of Data?

3. Basis of Classification?

4. Concept of variable?

5. Raw Data?

6. Types of Statistical Series?

7. Types of frequency distribution?

8. What is the basic difference between Exclusive Series and Inclusive Series?

9. What is an Open-End Series?

Assertion Reason Question:

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

    (a) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A)

    (b) Both Assertion (A) and Reason (R) are true, and Reason (R) is not the correct explanation of Assertion (A)

    (c) Assertion (A) is true, but Reason (R) is false.

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(d) Assertion(A) is false, but Reason (R) is true.

Assertion (A): In the case of exclusive class intervals, upper limit is not included.

Reason (R): In the case of exclusive class intervals, we have to decide in advance which class limit is to be excluded.

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

   (a) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A)

   (b) Both Assertion (A) and Reason (R) are true, and Reason (R) is not the correct explanation of Assertion (A)

   (c) Assertion (A) is true, but Reason (R) is false.

   (d) Assertion(A) is false, but Reason (R) is true.

   Assertion (A): Classification brings order to raw data.

   Reason (R): Classification should be formed in such a way that the class mark of each class comes as close as possible, to a value around which the observations in a class tend to concentrate.

ANSWER KEY

Multiple Choice Answers-

1. B
2. C
3. A
4. A
5. C
6. D
7. A
8. C
9. C
10. B
11. D
12. A
13. A
14. A
15. C

Very Short Answers:

1. Classification means a division of classes on the basis of their diversity and similarity.

2. Variable can be defined as a situation where its value keeps changing and is capable of being measured.

3. It is a series where items are singly listed. In this series, there is no class and items.

4. In this series, data are presented a such a way that it shows the exact measurement of items.

5. It is a series that cannot have an exact measure. The items assume a range of value and are placed within the limit or range.

6. Frequency is the number of times an item occurred or is repeated.

7. The extreme value is the class limit. Every class has two limits, lower and upper limit.

8. Magnitude of the class interval is the upper and lower limit of a class

9. It is a series where every class interval removes items related to an upper limit

10. An inclusive series is a series that includes all the items until the upper limit.

Short & Long Answers:

1. There are 200 families in your locality. You have collected data regarding their income, expenditure, education, religion, size of family, etc. But this data will be of little use unless you know how many families are educated and how many are uneducated. How many families earn an income exceeding Rs. 5,000 per month and how many earn Rs. 500 or less per month.

   In other words, in order to make the raw data meaningful, these must be classified on the basis of their different characteristics, such as educated families and uneducated families, rich families and poor families, etc.

2. **It is to capture and distinctively present the diverse characteristics of data.**
   (i) Data are divided into different groups. For example, on the basis of education, persons may be classified as educated and uneducated.
   (ii) Data are grouped or classified on the basis of their class similarities. All similar units are put in one class and as the similarity changes, class also changes. Objectives of Classification

   Main objectives of Classification are as under:

   (1) Brief and Simple: Main objective of classification is to present data in a form that appears to be brief and simple.

   (2) Utility: Classification enhances utility of the data as it brings out similarity within the diverse set. of data.

   (3) Distinctiveness: Classification renders obvious differences among the data more distinctly.

   **(4) Comparability:** It makes data comparable and estimative.

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(5) Scientific Arrangement: Classification facilitates arrangement of data in a scientific manner which increases their reliability.

(6) Attractive and Effective: Classification makes data more attractive and effective.

Characteristics of a Good Classification

(1) Comprehensiveness: Classification of the raw data should be so comprehensive that each and every item of the data gets into some group or class. No item should be left out.

(2) Clarity: Classification of the raw data into classes should be absolutely clear and simple. That is, there should be no confusion about the placement of any item in a group.

(3) Homogeneity: All items in a group or class must be homogeneous or similar to each other.

(4) Suitability: The composition of the classes must suit the objective of enquiry. For example, in order to determine the income and expenditure of the students in a school, their classification on the basis of weight or marital status would make no sense. The data must be classified on the basis of different levels of income and expenditure.

(5) Stability: A particular kind of investigation should be based on the same set of classification. This base should not change with each investigation.

(6) Elastic: Classification should be elastic. There should be a scope for change in the classification, depending on the change in purpose or objective of the study.
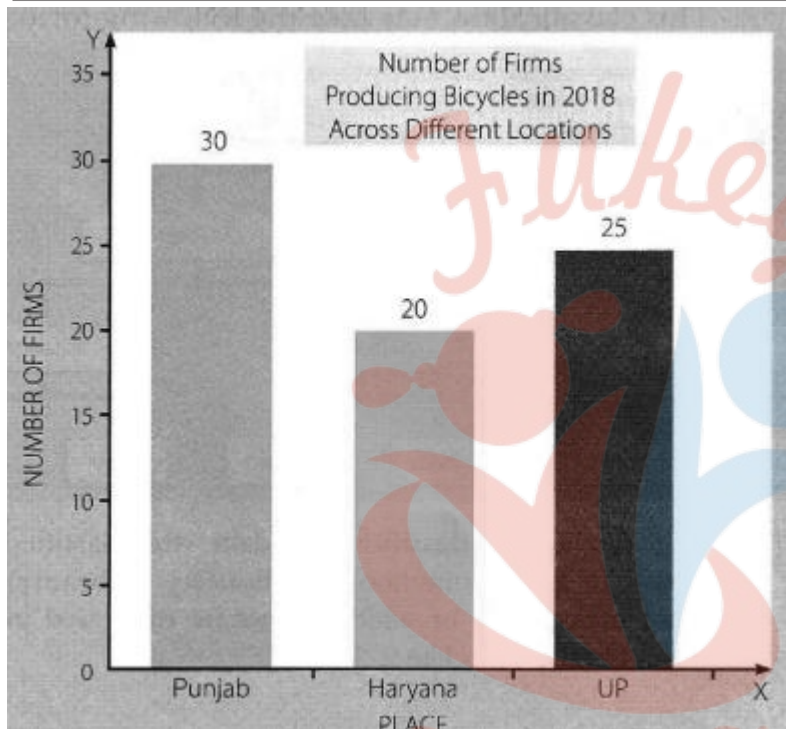
3. Basis of Classification

There may be different basis of classifying a statistical information as shown in chart below.

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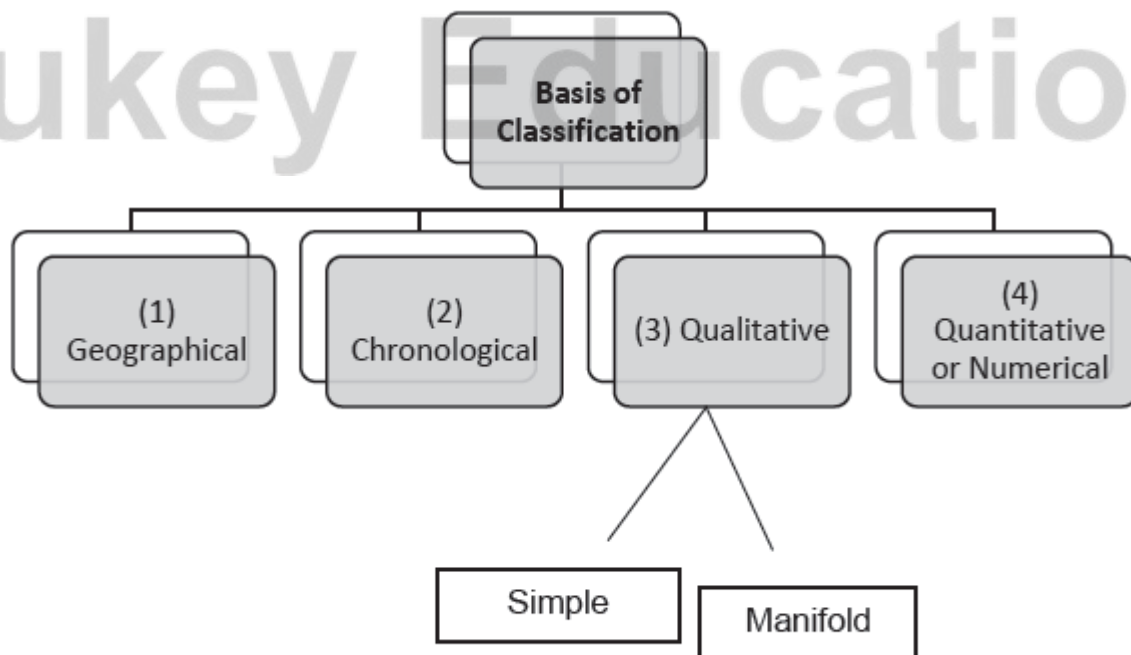
(1) Geographical (or Spatial) Classification: This classification of data is based on the geographical or locational differences of the data. To illustrate, data relating to the number of firms producing bicycles in India would be classified as under:

Table 1. Number of Firms Producing Bicycles in 2018 across Different Locations

Place	Number of Firms
Punjab	30
Haryana	20
UP	25

(2) Chronological Classification: When data's are classified on the basis of time, it is known as chronological classification. This is illustrated in the following fable 2.

Table 2 Sales of a Firm (2016-2018)

Year	Sales (Rs.)
2016	80 lakh
2017	90 lakh
2018	95 lakh

(3) Qualitative Classification: This classification is according to Qualities or Attributes of the data. For example, data may be classified on the basis of occupation, religion, level of intelligence of the population. This classification may be of two types:

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(i) Simple Classification: It is called classification according to dichotomy. This is because data are divided on the basis of existence or absence of a quality. Male-female, healthy-unhealthy, educated-uneducated, are examples of dichotomy.

(ii) Manifold Classification: When classification according to quality of data involves more than one characteristic, it is called manifold classification or multiple classification. As a result of it, there may be more than two classes. To illustrate, factory workers may be classified as 'skilled' and 'unskilled'. These may be further classified as literate or illiterate and still further as rural or urban. This classification may take the following form:
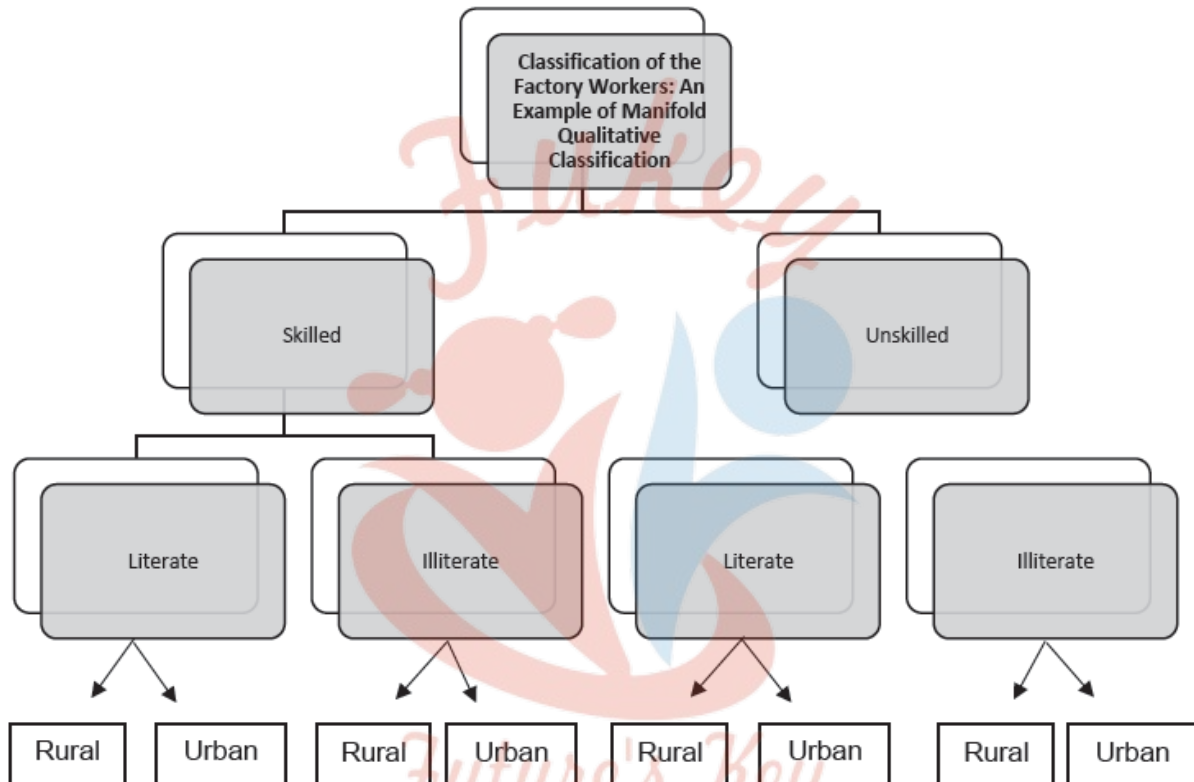
[**Note:** In qualitative classification, data are classified on the basis of a phenomenon (like honesty or beauty) which is not measurable or which cannot be expressed in terms of quantitative units like 2, 3 or 4.]

(4) Quantitative or Numerical Classification: Classification is done on the basis of numerical values of the facts. A number of classes are framed keeping in view the lowest and highest value as well as the range of values in the data. Each class of a set of data refers to a phenomenon like 'wages' or 'profits' in the automobile industry which can be expressed in figures like Indian rupees. Table 3 below is an illustration of quantitative classification:

Table 3. Annual Profit of Small-Scale Firms in the State of UP: Hypothetical Data, just for an illustration of Quantitative Classification

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Annual Profit (Rs.)	Number of Firms
0-1,00,000	5
1,00,000-2,00,000	150
2,00,000-3,00,000	1500
3,00,000-4,00,000	800
4,00,000-5,00,000	400
Above 5,00,000	200

In the above classification, profit is the phenomenon under study. It is a quantifiable phenomenon. Hence, it is called quantitative classification of data.

It is important to note that the phenomenon under study (like profit in the above illustration) assumes different values over time or across different regions. When a phenomenon assumes different values it is called 'variable' in Statistics. Accordingly, quantitative classification is also called 'classification by variables.'

4. **CONCEPT OF VARIABLE** - A characteristic or a phenomenon which is capable of being measured and changes its value overtime is called a variable. Thus, a variable refers to that quantity which is subject to change and which can be measured by some unit. If we measure the weight of students of Class XI, then the weight of the students will be called variable. A variable may be either discrete or continuous.

Principal difference between Discrete Variable and Continuous Variable
It is that while discrete variable assumes values in complete numbers like 2, 4, S and 8, continuous variables assume values in fractions like 2.4, 4.6 and 6.8 or values in some range like 2-4, 4-6 etc.

(1) Discrete Variable: Discrete variables are those variables that increase in jumps or in complete numbers. For example, the number of students in Class XI could be 1, 2, 3, 10, 11, 15 or 20 etc. but cannot be 1 1 4 , 1 1 2 , 1 3 4 etc. In other words, discrete variables are expressed in terms of complete numbers, or one may simply say that values of these variables are in complete numbers as 1,2, 3 and not continuous as between 1 to 1 1 4 or a 1 3 4 and so on.

(2) Continuous Variable: Variables that assume a range of values or increase not in jumps but continuously or in fractions are called continuous variables. For example, height of the boys in a school is expressed as 5'1", 5'2", 5'3", and so on. In short, while the values of

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discrete variables are in complete numbers (f 2, 3, etc.), values of continuous variables are in fractions (5'4", 5'2", etc.) or are in any range such as JO-15, 15-20, etc.

Difference between Variable and Attribute

Ordinarily, anything that varies/changes over time is taken as a variable. But not in Statistics. Colour of your hair may change over time. Is it a variable? No, not at all. Why? Because this change cannot be numerically expressed. In Statistics, only that change of an object is taken as a variable which can be numerically expressed For example, average height of the students of Class X in the year 2005 is found to be (say) 5'6" compared to 55" in the previous year. Qualitative change, like a change in IQ level of the

students of Class X is called attribute'. A change in the attributes is only qualitatively expressed as good, excellent and outstanding. Qualitative changes can at best be ranked as 1, 2, 3 where 1 stands for outstanding, 2 stands for excellent and 3 stands for good.

5. A mass of data in its crude form is called raw data. It is an unorganised mass of the various items. These are yet to be organised by the investigator.

   To illustrate, marks obtained by 30 students of class XI in Statistics, may be expressed as in Table 4.

| 30	20	40	20	15	20
25	10	20	15	25	20
15	45	10	30	20	25
30	20	30	20	15	35
25	10	25	15	35	10

Data presented in this table are raw data. These are not homogeneous data or the data classified into different groups or classes with similarities. No meaningful conclusion is possible from this data. Only that data are useful to Statistics which are homogeneous. An item of the data, like the price of a commodity, income of a farmer, etc. is called observation, or value, or measure, or item, or magnitude, etc. To draw any conclusion from these data, an investigator has to first organise them. To do so, an investigator has to classify the same in the form of series.

Series: Raw data are classified in the form of series. Series refer to those data which are presented in some order and sequence. Arranging of data in different classes according to a given order is called series. Thus, if the marks obtained by the students of Class XI are arranged according to their roll numbers in the ascending or descending order, the data so arranged would be known as statistical series. According to Horace Secrist, "4

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series as used statistically may be defined as things or attributes of things arranged according to some logical order. "

Univariate, Bivariate and Multivariate

- 'Uni' means one, 'bi' means two.' multi means many. Accordingly, univariate refers to a series of statistical data with one variable only, like the data on income of the households of a particular region.

- Bivariate refers to a series of statistical data with two variables like the data on income as well as expenditure of the households of a particular region.

- Multivariate refers to a series of statistical data with many (and more than two) variables, like the data on age, sex, education, income and expenditure of the households of a particular region.

6. Broadly, statistical series are of two types:
   (1) Individual Series or Series without Frequencies, and
   (2) Frequency Series or Series with Frequencies Frequency series are further divided as:

   (i) Discrete Series or Frequency Array, and

   (ii) Frequency Distribution or Series with Class-Intervals.
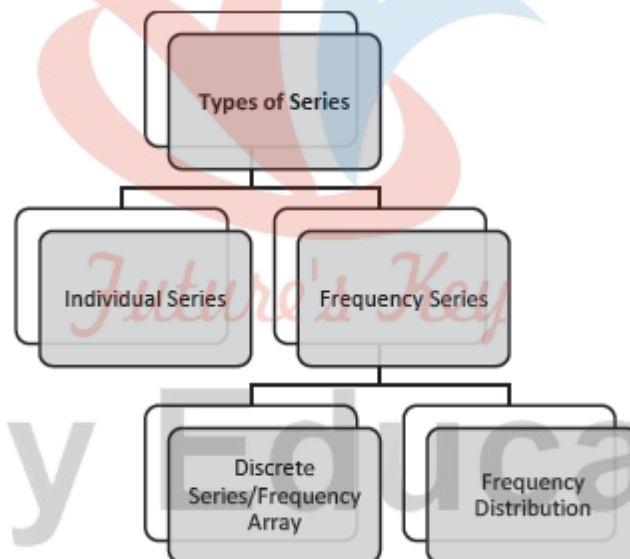
(1) Individual Series

Individual series are those series in which the items are listed singly. For example, if the marks obtained by 30 students of Class XI are listed singly, the series would be called Individual Series. In these series there is no class of the items and also there is no frequency of the items. These series may be presented in two ways:

(i) According to Serial Numbers: One way of presenting an individual series is that all the items are arranged in a serial order. Thus, marks obtained by the students may be arranged in order of their roll numbers. Data on the monthly expenses of the hostel

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students may be arranged in order of their room numbers. Data given in Table 4 on the marks obtained by 30 students are presented in Table 5 in order of their roll numbers.

Table 5. Marks Obtained by the Students in Statistics

Roll Number	Marks	Roll Number	Marks	Roll Number	Marks	Roll Number	Marks
1	30	9	20	17	15	25	35
2	25	10	10	18	30	26	20
3	15	11	40	19	20	27	20
4	30	12	20	20	15	28	25
5	25	13	10	21	15	29	35
6	20	14	30	22	25	30	10
7	10	15	25	23	20		
8	45	16	20	24	15		

(ii) Ascending or Descending Order of Data: The other way of presenting an individual series is a simple ascending or descending order. In the ascending order, the smallest value is placed first, while in the descending order the highest value is placed first. Tables 6 and 7 show the arrangement of data in the ascending and descending orders respectively.

Table 6. Data Arranged in Ascending Order

10	15	20	25	30
10	15	20	25	30
10	15	20	25	55
10	20	20	25	35
15	20	20	30	40

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15	20	25	30	45

Table 7. Data Arranged in Descending Order

45	30	25	20	15
40	30	20	20	15
35	25	20	20	10
35	25	20	15	10
30	25	20	15	10
30	25	20	15	10

Organisation of data in the form of individual series is a very simple form of presentation of data. But this method is not of much use when the number of items is very large.

(2) Frequency Series

Frequency series or series with frequencies may be of two types:
(i) Discrete Series or Frequency Array, and
(ii) Frequency Distribution.

Before we discuss these two types of series, let us understand the meaning of the following terms:

(a) Frequency: Frequency is the number of times an item occurs (or repeats itself) in the series. In other words, the number of times an item repeats itself in the population, is called the frequency of that item. For example, in Table 4, 10 has occurred 4 times. This means 4 students have secured 10 marks; or the frequency of 10 is 4.

(b) Class Frequency: The number of times an item repeats itself corresponding to a range of value (or class interval) is called class frequency. For example, if there are 4 students securing marks between 10-15, then 4 is the frequency corresponding to the class interval 10-15. Thus, 4 will be called class frequency.

(c) Tally Bars: Every time an item occurs, a tally bar, (|) is marked against that item. Corresponding to a particular class interval, each tally bar signifies 'one' occurrence of that item. Two tally bars would mean that the concerned item has occurred twice in the series. After every four tallies the fifth tally will cross out all the previous four tallies. Thus, making a group of five, i.e., ["HJ- This method of marking and counting is known as Four and Cross Method. To illustrate, Table 5 shows that 4 students obtained 10 marks, 5 students obtained 15 marks, 8 students obtained 20 marks, 5 students obtained 25 marks, 4 students obtained 30 marks, 2

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students obtained 35 marks, 1 student obtained 40 marks and 1 student obtained 45 marks. All these frequencies have been presented in Table 8, using Four and Cross Method.

Table 8. Four and Cross Method of converting Raw Data into Frequency Series
(data as in Table 5 or 6)

Marks	Tally Bars	Frequency
10	||||	4
15	||||	5
20	|||| |||	8
25	||||	5
30	||||	4
35	||	2
40	|	1
45	|	1

In this table, to express 8 tally bars, first of all four tally bars (|||||) are marked, fifth tally bar has been marked across the four ||||. The sign |||| signifies that an item occurs five times in the series. Likewise, three tally bars are further marked |||| to make it equal to eight, i.e., |||| + | | | =8. Thus, 1 = |; 2 = ||; 3 = |||; 4 = ||||; 5 = ||||; 6 = |||| |; 7 = |||| ||; and so on.

(i) Discrete Series or Frequency Array

A discrete series or frequency array is that series in which data are presented, in a way that exact measurements of items are clearly shown. In such series there are no class intervals, and a particular item in the series is numbered rather than measured with some range.

(ii) Frequency Distribution

It is that series in which items cannot be exactly measured. The items assume a range of values and are placed within the range or limits. In other words, data are classified into different classes with a range, the range is called class intervals. Each item in the series is written against a particular class interval by way of a tally bar. The number of times an item occurs is shown as frequency against the class intervals to which that item belongs.

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Marks	Tally Bars	Frequency
10-15	IIII	4
15-20	IIII	5
20-25	IIII III	8
25-30	IIII	5
30-35	IIII	4
35-40	II	2
40-45	I	1
45-50	I	1

It is clear from above table that frequency of class interval 10-15 is 4. It means that there are 4 students who have secured marks between 10-15. Likewise, frequency of class interval 20-25 is 8 which means that there are 8 students who have secured marks between 20-25. But, it is not clear that how many students have secured 10 marks in the class interval 10-15 and how* many have secured 11 and 14 marks in the same class interval.

Size of Class

'Size of Class' refers to size of the class interval, or it refers to width of the class. If 'range' (the difference between highest value and lowest value of the series) is (say) 100 and the number of classes is 20, then size of the class will be 100/20 = 5.
. Thus:
Size of the Class (S) = Range (r)/No.of Classes (n)

or   S=r/n = 100/20 = 5 considering the above example.

Note; Size of the class must be such that all values belonging to the particular classinterval tend to converge on the mid-value of the class interval. Only then it becomes an ideal class-size. Otherwise, our result would have a high degree of statistical error.

Some Important Terms

Let us understand some important terms before a detailed study of different types of frequency distribution in the next section.

(i) Class: A range of values which incorporate a set of items is called a class. For example, 5-10, 10-15 are the classes.

(ii) Class Limits: The extreme values of a class are limits. Every class interval has two limits, lower limit and upper limit. Of the class interval 5-10 in the above example, the lower limit is 5 and the upper limit is 70.

(iii) Magnitude of a Class Interval: Magnitude of a class interval is the difference between the upper limit and the lower limit of a class. For example, in a class interval 10-15, the magnitude of the class interval would be 15 – 10 – 5. Thus, Magnitude of a Class Interval
(i) = Upper limit (l2) – Lower limit (l1)
The following formula is used to find out Class Interval.

Formula
i = l2 – l1
Where, i – magnitude of a class interval
l2 = upper limit of the class interval
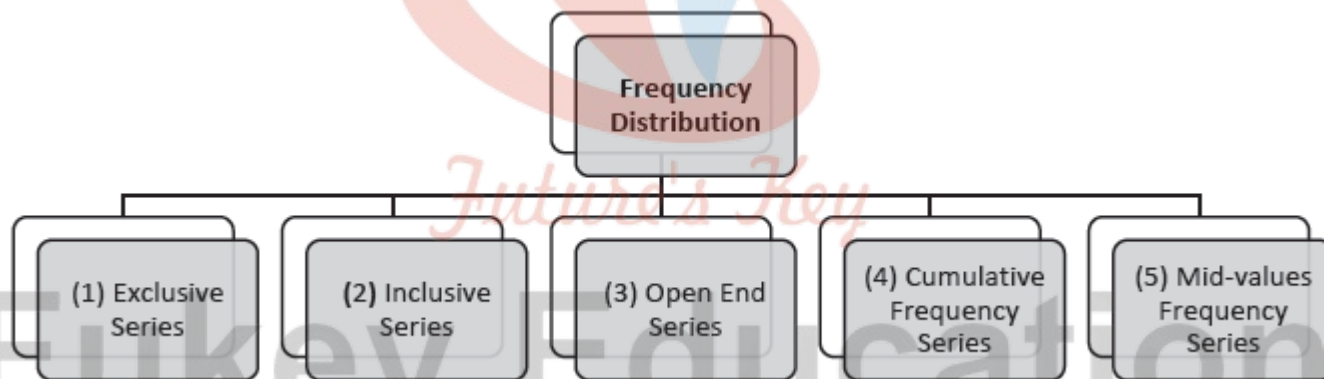l1 = lower limit of the class interval.

(iv) Mid-value: Mid-value is the average value of the upper and lower limits. It is known by adding up the upper limit and lower limit values and dividing the total by 2. Thus,
Mid-value = Upper Limit + Lower Limit/ 2
where, m = mid-value; l↑ = lower limit; l2 = upper limit.
For example, mid-value of 10-20 class interval 20+10/ 2 = 15

7. Frequency Distribution is of five types:

(1) Exclusive Series
Exclusive series is that series in which every class interval excludes items corresponding to its upper limit. In this series the upper limit of one class interval is the lower limit of the next class interval. It is called exclusive series because frequencies of the upper limit of each class interval is not included in that class.

For example, in a class interval, 10-15, only such items would be included, the value of which is between 10 and 14. Any item of the value of 15 would be included in the next class interval, viz., 15-20.

(2) Inclusive Series

An inclusive series is that series which includes all items upto its upper limit. In such series, the upper limit of class interval does not repeat itself as a lower limit of the next

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class interval. Thus, there is a gap between the upper limit of a class interval and the lower limit of the next class interval. The gap ranges between 0.1 to 1.0. For example, 10-14, 15-19, 20-24, etc. represents an inclusive series. Thus, all the items ranging between 10-14 are included in that class interval. Likewise, all the items ranging between 15-19 would be included in that class interval.

In short, while in the exclusive series there is an overlapping of the class limits (upper class limit of one class interval being the lower class limit of the next class interval), there is no such overlapping in the inclusive series.

8. In case of exclusive series upper limit of one class interval repeats itself as lower limit of the next class interval. While in case of inclusive series, it does not.

Conversion of inclusive Series into Exclusive Series

Inclusive series are used when there is some definite difference between the values of various items in the population. In the above table if a student has obtained, 14.5 or 19.5 marks these can be expressed only if the inclusive series is converted into an exclusive series. Following steps are involved in the conversion of an inclusive series into an exclusive series:

(i) First, we find the difference between the upper limit of class interval and the lower limit of the next class interval.

(ii) Half of that difference is added to the upper limit of a class interval and half is subtracted from the lower limit of the class interval.

Using these two steps, inclusive series of the above table have been converted into an exclusive series as under. Conversion of the Above Inclusive Series into an Exclusive Series

Conversion of the Above Inclusive Series into an Exclusive Series

Marks	Frequency
9.5-14.5	4
14.5-19.5	5
19.5-24.5	8
24.5-29.5	5
29.5-34.5	4

Difference between Exclusive and Inclusive Series

Main differences between exclusive and inclusive series are as under:

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(i) In case of exclusive series, the upper limit of one class interval is the lower limit of the next class interval. However, in inclusive series there is generally a difference between the upper limit of one class interval and the lower limit of the other class interval.

(ii) In case of exclusive series, value of the upper limit of a class interval is not included in that class; rather it is included in the lower limit of the next class interval. On the contrary, in the case of inclusive series, value of the upper limit of a class is included in that very class interval.

(iii) Exclusive series is useful whether the value is in complete number or in decimals, but inclusive series is useful only when value is in complete number.

(iv) Counting can be done in all cases under exclusive series. However, to facilitate counting it becomes necessary to convert inclusive series into exclusive series.

9. It is that series in which

(i) lower limit of the first class interval is missing, or

(ii) upper limit of the last class interval is missing.

In order to determine the limits of the open-end class intervals, the general practice is to give same magnitude to these class intervals as is of the other class intervals in the series. However, this practice is adopted when the known magnitudes of different class intervals in the series are equal to each other. For example, in the above table since the magnitude of the class interval is the same throughout the series, first class interval will be assumed as 0-5 and last as 20-25.

Assertion Reason Answer:

1. (d) Assertion (A) is false, but Reason (R)is true.

2. (b) Both Assertion (A) and Reason (R) are true and Reason (R) is not the correct explanation of Assertion (A).