

# 1

## INTRODUCTION

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## 1.1 HISTORY

The word "Statistics" is believed to have been derived from the Latin word Status or the Italian word Statista or the German word Statistik. The meaning of which is a "Political State" or the state man's art. The word Statistics is found in Shakespeare's Hamlet (1602) and Milton's Paradise Regained (1671) which is used in the sense of person who is well-versed in state matters helping high state officers and Government policies. Mr. **E.A.W. Zimmermann**, a Professor of Philosophy in 1787, defined, the word "Statistics" in the preface to his book, a political survey of the present State of Europe as "that branch of political knowledge, which has for its object the actual and relative power of the several modern states, the power arising from their natural advantages, the industry and civilization of their inhabitants and wisdom of their Government". During the 18th century the word "Statistics" become more and more popular and began to be used in the sense of numerical statements relating to the State.

During the 19th century a Belgian Statistician **Adolph Quetelet** (1796 - 1876) was very much active in application of statistical methods in the fields of education and sociology. Perhaps the greatest contributor to statistics for social sciences was **Sir Frances Galton** (1822 - 1911). **Galton** is credited with the discovery of percentiles. A mathematician, **Karl Pearson** (1875 - 1936), worked with **Galton** to develop the theory of regression and correlation.

At the beginning of the 20th century, methods were developed by **William S. Gosset** for decision making based on small sets of data.

The 20th century has produced several note worthy statistician, most of whom are still very active in developing new theories and application of Statistics. The availability of electronic computers is certainly a major factor in the modern development of Statistics. In fact, the present science of Statistics, for the most part is a result of active research by many people in various fields during the past 400 years. In the future we shall see many new theories developed. Today the research worker consider Statistics one of his most useful aid.

## 1.2 DEFINITION OF STATISTICS

The term "Statistics" has been defined differently by different authors from time to time. Every author has defined it in his own way. After examining the various definitions of Statistics, we are now in a position to give a simple and complete definition of Statistics as:-

"Statistics" are the numerical statements of facts capable of analysis and interpretation. The science of Statistics is the study of the principles and the methods applied in collecting, presenting, analyzing and interpreting the numerical data in any field of inquiry.

### 1.3 SUBJECT MATTER OF STATISTICS

The subject matter of statistics can be discussed under two heading:

- (i) Statistical Methods
- (ii) Applied Statistics
- (i) Statistical Methods

Statistical methods are the tools that are used for the proper and systematic handling of numerical data. The tools include all the steps in collecting, organizing, summarizing, presenting, analyzing, drawing conclusions and interpreting the statistical data.

#### (ii) Applied Statistics

Applied statistics studies the application of statistical methods to specific problems, such as prices, wages, population etc. It is further subdivided into two parts:

- a) Descriptive Statistics
- b) Inferential Statistics

Descriptive statistics deals with systematic collection, presentation, computation of average of data.

Inferential statistics deals with drawing inferences and making decisions about any population on the basis of sample data.

### 1.4 CHARACTERISTICS OF STATISTICS

The following are the important characteristics of Statistics:-

- i. Statistics are aggregates of facts.
- ii. Statistics are numerically expressed.
- iii. Reasonable standard of accuracy must be observed in enumeration or estimation of Statistics.
- iv. Statistics are affected to a marked extent by a multiplicity of causes.
- v. Statistical techniques apply only to data which are reducible to quantitative form.
- vi. Statistical methods are the only means for handling large masses of numerical data.
- vii. Statistical techniques are the same for the social as for the physical sciences.

### 1.5 LIMITATIONS OF STATISTICS

Some limitations of Statistics are listed below:-

- i. Statistical laws are true on the average.
- ii. One of the greatest limitations of Statistics is that it deals with the characteristics, which can be numerically specified.

- iii. Statistics deals with aggregates.
- iv. If sufficient care is not exercised in collecting, analysing and interpreting the data, statistical results might be misleading.
- v. Statistics cannot be applied to heterogeneous data.
- vi. Only a person, who has an expert knowledge of statistical methods, can handle statistical data.

## 1.6 IMPORTANCE OF STATISTICS

Following are the important uses of statistics in the various fields:-

- i. Statistics are an aid to supervision.
- ii. Planning without statistics can not be imagined.
- iii. Statistics are the eyes of administration - Budget of a state is an unavoidable necessity of an efficient running of government machinery. Its preparation is not possible without statistical records.
- iv. Statistics have made great improvement in agriculture and industry.
- v. Statistics help business and commerce. A businessman, an industrialist and a research worker all employ statistical methods in their work. It is a universal fact that all types of business decisions are made on estimates. Accurate estimates depend much more on statistics, various branches of commerce make extensive use of statistics in one form or the other.
- vi. Statistics is of great help to brokers, speculators and investigators.
- vii. The whole structure of insurance is based on statistics.
- viii. Statistical methods are applicable to all sciences. Astronomers use statistics in making predictions about eclipses, Biologists use statistics for generalizing the law of variation and heredity Meteorology uses them for weather forecasts

Now a days there is no important field in which statistics is not used. Every science depend to some extent on the collection of data and its analysis.

## 1.7 STATISTICAL INQUIRIES

The investigation or statistical inquiry passes through several stages from its planning to the writing out the report. These stages are as follows:-

- i. Planning the inquiry according to the requirements of the concerned department.
- ii. Collection of data
- iii. Scrutiny of collected data.
- iv. Classification and tabulation of data
- v. Presentation of data by diagrams and graphs

- vi. Analysis of data by the application of statistical methods.
- vii. Interpretation of the data and writing up the report.

## **1.8 VARIABLES AND ATTRIBUTES**

### **1) Variable**

A variable is a symbol, such as X,Y,Z which can assume any of a prescribed set of values. The weight of an individual, the number of children in a class, weekly wages, etc., are the examples of a variable. A variable sometimes known as a variate which is defined as a measurable quantity which vary from one value to another. A variable can either be discrete or continuous.

#### **(i) Continuous Variable**

A variable which can theoretically assume any value between two given values is called a continuous variable. For example the weight of a boy, the monthly income etc.

#### **(ii) Discrete or Discontinuous Variable**

A discrete variable is a variable which can not theoretically assume any value between two given values. The examples of discrete variable are, number of accidents in a month, number of children in a family, the number of students in a class.

### **2) Attributes**

Qualitative observations can not be measured; they can only be described. Non-measurable quantities are called attributes. For example, beauty, honesty, the colour of eyes, poor, etc., are attributes.

## **1.9 STATISTICAL DATA**

The numbers recorded as a result of counting or measuring are called data. The recorded information in its original collected form is called raw data. Data which can be described by a discrete variable are called discrete data and those which can be described by continuous variable are called continuous data. The number of children in each of 25 families is an example of discrete data, while the heights of 100 college students is an example of continuous data.

## **1.10 COLLECTION OF STATISTICAL DATA**

Statistical data are classified as primary and secondary.

### **(i) Primary Data**

Primary data is the most original data and has not undergone any statistical treatment. It is the data collected for the first time and forms the raw material for inquiry.

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(ii) **Secondary Data**

Secondary data are those which have gone through the statistical treatment at least once. Secondary data are those which have been already compiled by government, semi-government or non-official bodies and are available in office records, publications, reports books, journals etc.

The difference between primary and secondary data is of one degree. Primary data in one's hand may become secondary in other's hand. For example statistics of foreign trade of Pakistan are secondary data to the general public, while they are primary data in the hands of the statistician of foreign trade departments who compile the data.

**Primary data** can be collected through the following methods:-

- i. Direct personal observation
- ii. Indirect investigation
- iii. Local sources
- iv. Questionnaire method
- v. Investigation through enumerators.

**Secondary data** can be obtained from the following sources:-

- i. Official
- ii. Semi-official
- iii. Market reports and trade bulletins
- iv. Publications of trade associations etc.

### 1.11 EDITING OF DATA

After collecting the data, the next step is its editing. Editing means the examination or scrutiny of collected data to discover any error, omissions and mistakes. It has to be decided before hand what degree of accuracy is wanted and how far mere approximations will be enough and what extent of errors can be tolerated in the investigation.

### 1.12 CLASSIFICATION AND TABULATION

Collected data are usually available in a form which is not easy to comprehend. It is difficult to get a proper and clear cut impression of that data. In order to bring them into an intelligible form, the data are to be condensed. This can be obtained by classification and tabulation.

#### (A) CLASSIFICATION

Classification is a process by which things are arranged in groups or classes according to some resemblance in the units of each group or class.

#### Types of Classification

The types of classification depend upon the characteristics of the statistical data. There may be two characteristics of the statistical data, descriptive and numerical.

### 1) **Descriptive Classification**

The classification is said to be descriptive when it is according to attributes. It is of two kinds:

- i. Simple classification
- ii. Manifold classification

### 2) **Numerical Classification**

The type of classification is based on the data where quantitative measurement of the data is possible. The classification is based on the basis of class-interval. Characteristics like height, weight, income, number of leaves on a certain tree are called numerical as they are capable of quantitative measurement.

Thus according to the nature of characteristics possessed by the items of data, there are two main types of classification namely classification by attributes and classification by magnitude. We shall consider classification by magnitude here.

#### (a) **One - Way Classification**

When classification is done considering only one variable, it is called one way classification.

#### (b) **Two - Way Classification**

When classification is done according to two variable, it is called two way classification.

### (B) **TABULATION**

By tabulation, we mean a systematic arrangement of data in columns and rows. Tabulation helps in arriving at meaningful conclusions.

#### **Types of Tabulation**

Statistical tables can be grouped into two types according to the purposes served by the tables:

#### 1) **General Purpose Table**

General purpose table or reference table provides information for general use or reference. The general purpose tables frequently include detailed information. Government agency tables, such as the survey of current business, federal reserve bulletin, are mostly of this kind. For example, the survey of current business has a table entitled "Employment and Population" showing the number of employees in manufacturing, mining, contract construction, transportation, whole sale and retail trade; etc.

#### 2) **Specified Purpose Table**

Specified purpose tables provide information for particular discussion. A special purpose table should be designed so that a reader may easily refer to the table for comparison, analysis concerning the particular discussion.

### 1.13 FREQUENCY DISTRIBUTION

When data are grouped according to magnitude, the resulting series is called a frequency distribution.

#### 1.13.1 Types of Frequency Distribution

##### 1) Series of Individual Observation

When in a series the items arranged singly according to magnitude or size, the resulting series is called a series of individual observations.

##### EXAMPLE 1.1

69, 70, 69, 65, 60, 70, 72, 71, 59, 64

##### 2) Discrete Series

When the items are exactly measurable and their record shows definite breaks between one variable and the other succeeding it, the resultant record is discrete or discontinuous series. The number of workers in a factory, the number of pages of a book are examples of discrete series.

##### EXAMPLE 1.2

|                 |   |    |    |    |    |    |    |
|-----------------|---|----|----|----|----|----|----|
| Marks           | : | 10 | 12 | 14 | 15 | 17 | 20 |
| No. of students | : | 3  | 7  | 13 | 16 | 17 | 5  |

##### EXAMPLE 1.3

Following figures gives the number of children born to 80 women in a certain city up to age of 50 years. Make a frequency distribution.

7, 6, 2, 5, 10, 1, 4, 2, 8, 2, 6, 1, 4, 8, 2, 2, 4, 2, 5, 7, 2, 2, 4, 2, 10, 3, 4, 4, 2, 3, 2, 9, 3, 2, 5, 1, 6, 9, 2, 8, 5, 7, 8, 8, 2, 6, 7, 2, 2, 3, 2, 7, 2, 3, 3, 3, 7, 3, 3, 4, 3, 9, 5, 2, 11, 3, 4, 4, 1, 3, 4, 1, 6, 2, 5, 2, 3, 7, 4, 2

##### SOLUTION

The data are discrete. We group the data by size, i.e.; The number of children as shown below:

| No. of Children (x) | Tally      | No. of Women |
|---------------------|------------|--------------|
| 1                   |            | 5            |
| 2                   |            | 22           |
| 3                   |            | 13           |
| 4                   |            | 11           |
| 5                   |            | 6            |
| 6                   |            | 5            |
| 7                   |            | 7            |
| 8                   |            | 5            |
| 9                   |            | 3            |
| 10                  |            | 2            |
| 11                  |            | 1            |
| <b>Total:</b>       | <b>---</b> | <b>80</b>    |

**3) Continuous Series**

The series in which the statistical units are arranged in groups or classes because they are not exactly measurable. Measurement of weight, magnitude and volume constitute continuous.

**EXAMPLE 1.4**

| Age Groups | Frequency |
|------------|-----------|
| 1 - 4.     | 12        |
| 5 - 9      | 18        |
| 10 - 14    | 51        |
| 15 - 19    | 73        |
| 20 - 24    | 17        |
| 25 - 29    | 6         |

**1.13.2 Formation of a Frequency Distribution**

The following steps are involved in the formation of a frequency distribution.

- Range
- Number of Classes
- Class Magnitude or Class Interval
- Specification of a class
- Distribution of given values in classes
- Summation of the frequency column

**(A) Range**

The first step in the formation of a frequency distribution is to find the value of range. Range is defined as the difference between maximum and minimum numbers. Suppose that the maximum number is 95 and minimum number is 59, then the range is

$$\text{Range} = X_m - X_o = 95 - 59 = 36$$

**(B) Number of Classes**

The number of classes into which the items are to be distributed depends upon the total number of items. The larger the number of items in general, the larger the number of classes. When the data are sufficiently large, the number of classes should lie between 10 and 25. H.A. Stages has given the following formula to determine the approximate number of classes:-

$$m = 1 + 3.3 \log N$$

Where  $m$  denotes the number of classes and  $N$  is the total number of values in the data. For example, if there are 100 values then we should have

$$m = 1 + 3.3 \log(100)$$

$$m = 1 + 3.3(2.0000)$$

$$= 7.6 \text{ or } 8 \text{ classes}$$

**(C) Size of a Class Interval**

The next step is to have a uniform class interval. Uniform class interval may easily be calculated by dividing the range, by the number of classes desired.

**(D) Specification of a Class**

The next step is to decide where to start. A common practice is to let the lowest class begin with a number which is multiple of the interval size. Suppose that our lowest number is 28 and the size of interval is to be 3. So the lowest interval would begin at 27 and end at 29.

After deciding upon the lowest class, we determine rest of the classes by increasing size of class interval. We stop when we reach the highest value in the distribution. The lowest class should be placed at the top and the rest should follow according to interval size.

**(E) Distribution of given Values**

The next step is to tally the observations. We take the scores one at a time and record each to the right of its appropriate class interval by making a tally mark.

**(F) Summation of the Frequency Column**

The next step is to combine the tallies in the column to the right. This column is headed with 'f' which stands for frequencies. This column is summed and we write the total at the bottom.

These rules are applied to group raw data which are assumed to be continuous. In case of discrete data, the concept of class limits is adjoining classes meet.

**EXAMPLES 1.5**

The rent of 50 houses in rupees is given below. Classify and present the data in the form of a table by taking class interval of Rs. 5/-

**Rent in Rs.:-** 41, 25, 31, 32, 10, 12, 15, 19, 22, 36, 43, 35, 37, 38, 24, 26, 28, 29, 20, 19, 23, 15, 17, 19, 19, 14, 28, 24, 24, 25, 25, 27, 28, 29, 32, 33, 34, 26, 23, 24, 22, 32, 32, 30, 30, 25, 26, 28, 34, 29.

**SOLUTION**

A glance over the given data reveals that the variable characteristic, house rent in this case is expressed in whole number and not fraction is expected. Here the minimum value is 10 and the leading class is accordingly written as 10-14, the end values both being inclusive, the class interval is 5 as desired.

**TABLE**

| Rent in Rupees | Tally         | Frequency |
|----------------|---------------|-----------|
| 10 - 14        | III           | 3         |
| 15 - 19        | III II        | 7         |
| 20 - 24        | III IIII      | 9         |
| 25 - 29        | III IIII IIII | 15        |
| 30 - 34        | III IIII      | 10        |
| 35 - 39        | IIII          | 4         |
| 40 - 44        | II            | 2         |
| <b>Total</b>   |               | <b>50</b> |

### EXAMPLE 1.6

The following are the lengths of 40 maize plants recorded to the nearest inch. Construct a frequency distribution.

132, 144, 125, 149, 157, 146, 158, 140, 147, 136, 148, 152, 144, 168, 126, 138, 176, 163, 119, 154, 165, 146, 138, 164, 150, 128, 145, 156, 150, 142, 135, 145, 161, 135, 140, 153, 135, 147, 142, 173.

### SOLUTION

The largest length is 176 inches and the smallest length is 119 inches so

$$\text{Range} = X_m - X_0 = 176 - 119 = 57 \text{ inches.}$$

Suppose we want to make 10 classes, then size of the class interval will be  $57/10 = 5.7 = 6$  approximately.

A frequency distribution is shown below.

TABLE

| Length (Inches) | Tally   | Frequency |
|-----------------|---------|-----------|
| 118 - 123       | I       | 1         |
| 124 - 129       | III     | 3         |
| 130 - 135       | IIII    | 4         |
| 136 - 141       | IIII    | 5         |
| 142 - 147       | IIII II | 10        |
| 148 - 153       | IIII I  | 6         |
| 154 - 159       | IIII    | 5         |
| 160 - 165       | IIII    | 4         |
| 166 - 171       | I       | 1         |
| 172 - 177       | I       | 1         |
| Total           |         | 40        |

### EXAMPLE 1.7

The following are the number of flowers on different branches of a tree. Classify the data by taking class interval of size one.

2, 4, 6, 1, 3, 3, 3, 5, 7, 8, 6, 4, 7, 6, 4, 4, 2, 1, 5, 0, 1, 5, 9, 9, 10, 4, 6, 2, 5, 7, 9, 6, 1, 2, 10, 4, 8, 9, 2, 3, 1, 0, 4, 10, 1, 1, 2, 2, 2, 3, 3, 4, 4, 4, 6, 6, 5, 5, 4, 5, 8, 5, 4, 3, 3, 2, 1, 8, 6, 9.

(Lahore Board, 2010)

### SOLUTION

Frequency Distribution

| No. of Flowers | Tally      | Frequency |
|----------------|------------|-----------|
| 0              | II         | 2         |
| 1              | IIII III   | 8         |
| 2              | IIII IIII  | 9         |
| 3              | IIII III   | 8         |
| 4              | IIII II II | 12        |
| 5              | IIII III   | 8         |
| 6              | IIII III   | 8         |
| 7              | III        | 3         |
| 8              | IIII       | 4         |
| 9              | IIII       | 5         |
| 10             | III        | 3         |
| Total          |            | 70        |

### 1.13.3 Relative Frequency Distributions

The relative frequency of a class is the frequency of the class divided by the total frequency of all classes and expressed as percentage.

### 1.13.4 Relative Cumulative Frequency Distributions

When we divide the cumulative frequency by the total frequency and expressed as percentage, it is called the relative cumulative frequency. If in a cumulative distribution, relative cumulative frequencies are used instead of cumulative frequencies, the resulting distribution is called relative cumulative frequency distribution.

### 1.13.5 Two - Way or Bivariate Frequency Distribution

When a frequency distribution is constructed by two variables at a time, the resulting distribution is called a bivariate frequency distribution. Various values of each variable are grouped into various classes.

#### EXAMPLES 1.8

Height and weight measurements of 25 students are given below from a two - way table:

|                   |     |     |     |     |     |     |     |
|-------------------|-----|-----|-----|-----|-----|-----|-----|
| Height (inches) : | 61  | 62  | 64  | 68  | 64  | 60  | 71  |
| Weight (pounds):  | 105 | 104 | 111 | 114 | 112 | 108 | 115 |
| Height (inches) : | 65  | 69  | 70  | 67  | 70  | 68  | 64  |
| Weight (pounds):  | 108 | 102 | 115 | 108 | 110 | 113 | 107 |
| Height (inches) : | 68  | 69  | 64  | 67  | 64  | 63  | 67  |
| Weight (pounds):  | 105 | 107 | 107 | 116 | 108 | 103 | 108 |
| Height (inches) : | 70  | 60  | 64  | 62  |     |     |     |
| Weight (pounds):  | 112 | 109 | 106 | 102 |     |     |     |

#### SOLUTION

Let  $x$  represents height and  $y$  represents weights.

Then  $X_0 = 60$ ,  $X_m = 71$ ,

$$\text{Range} = X_m - X_0 = 71 - 60 = 11$$

Let  $n_1$  = No of classes = 4, then  $h$  = interval size =  $R/n_1$

$$h = 11/4 = 3 \text{ approximately.}$$

$Y_0 = 102$ ,  $Y_m = 116$ .  $R = Y_m - Y_0 = 116 - 102 = 14$

Let  $n_2$  = no of classes = 4, then

$$h = R/n_2 = 14/4 = 4 \text{ approximately}$$

Each pair determines two classes, therefore, using tally method, a stroke is marked in a cell lying at the cross intersection of two classes determined by the pair.

**Tally Sheet**

| Weight<br>(pounds)<br>Height<br>(inches) | 101-105  | 105-109   | 109-113  | 113-117  | Total     |
|------------------------------------------|----------|-----------|----------|----------|-----------|
| 60 - 63                                  | II       | II        | I        |          | 5         |
| 63 - 66                                  | I        | III       | II       |          | 8         |
| 66 - 69                                  |          | III       |          | III      | 6         |
| 69 - 72                                  | I        | I         | II       | II       | 6         |
| <b>Total</b>                             | <b>4</b> | <b>11</b> | <b>5</b> | <b>5</b> | <b>25</b> |

**EXAMPLE 1.9**

Prepare a two way table from the following information:

Let  $x$  = house rent in rupees.

$Y$  = no. of rooms.

|    |     |     |     |     |     |     |     |     |     |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| X: | 400 | 300 | 240 | 360 | 500 | 400 | 325 | 250 | 280 |
| Y: | 4   | 4   | 3   | 5   | 5   | 3   | 4   | 2   | 3   |
| X: | 200 | 300 | 425 | 475 | 525 | 550 | 575 | 500 | 475 |
| Y: | 4   | 3   | 3   | 4   | 5   | 6   | 5   | 6   | 3   |
| X: | 450 | 420 | 275 | 400 | 280 | 280 | 575 | 600 | 250 |
| Y: | 6   | 5   | 3   | 4   | 4   | 3   | 6   | 5   | 2   |
| X: | 525 | 475 | 450 | 325 | 623 | 450 | 425 | 375 | 325 |
| Y: | 5   | 5   | 4   | 3   | 6   | 5   | 4   | 4   | 2   |
| X: | 525 | 450 | 280 | 300 |     |     |     |     |     |
| Y: | 6   | 3   | 5   | 4   |     |     |     |     |     |

**SOLUTION**

In this problem  $x$  = house rent in rupees is a continuous variable.

$$X_m = 623 \quad X_0 = 200$$

$$\text{Range} = X_m - X_0 = 623 - 200 = 423$$

Let the no. of classes =  $n = 5$ , then the interval size

$$h = R/n = 423/5 = 85 \text{ approximately,}$$

$Y$  = No. of rooms, which is a discrete variable. We use the individual numbers for room instead of groups, i.e.: 2, 3, 4, 5, 6.

| H.R<br>(Rs.)<br>No. of<br>Rooms | 200-285  | 285-370  | 370-455   | 455-540  | 540-625  | Total     |
|---------------------------------|----------|----------|-----------|----------|----------|-----------|
| 2                               | II       | I        | --        | --       | --       | 3         |
| 3                               | IIII     | II       | III       | I        | --       | 10        |
| 4                               | II       | III      | IIII      | I        | --       | 11        |
| 5                               | I        | I        | II        | IIII     | II       | 10        |
| 6                               | --       | --       | I         | II       | III      | 6         |
| <b>Total</b>                    | <b>9</b> | <b>7</b> | <b>11</b> | <b>8</b> | <b>5</b> | <b>40</b> |

## EXERCISE NO. 1

- 1.1:-** Define statistics and give importance of statistics in different fields.
- 1.2:-** Describe clearly what do you understand by the word statistics. Give its important used and limitations.
- 1.3:-** What are the fundamental characteristics of statistics?
- 1.4:-** What is primary and secondary data?
- 1.5:-** Define classification. How will you proceed to classify the data as regards the number of classes, class interval, class boundaries and frequency in each class.
- 1.6:-** What is a frequency distribution. How it is constructed.
- 1.7:-** What is meant by the term tabulation? Explain the main steps which are generally taken in tabulation.
- 1.8:-** Distinguish between the following:
- (i) Primary data and secondary data.
  - (ii) One way classification and two way classification.
  - (iii) Ungrouped data and grouped data.
- 1.9:-** (a) Differentiate between discrete and continuous variables.
- (b) State which of the following represent discrete data and which represent continuous data.
- (i) Number of millimeters of rainfall in a city during various months of the year
- (ii) The number of students in a class.
  - (iii) The amount of milk produced by a cow.
  - (iv) The age of shopkeeper.
  - (v) The number of heads in the toss of 7 coins.
  - (vi) The life time of a T.V. tube.
  - (vii) The heights of students in a college.
  - (viii) Number of Rs. notes circulating in Pakistan.
  - (ix) Speed of an automobile in kilometers per hour.
  - (x) The number of houses in a city.
  - (xi) The number of deaths in an accidents.
  - (xii) Number of persons carried by P.I.A every year.
- 1.10:-** State which of the following represent qualitative or quantitative data.
- (i) The weekly sale of books.
  - (ii) Colour of eyes of a class of students.
  - (iii) Income of government servants.
  - (vi) Liking and disliking of Pakistani Films.
  - (v) Religion of the people in Faisalabad.
- 1.11:-** Select the suitable answer:-
- (1) Statistical laws are valid on:  
(i) long term (ii) short term (iii) medium term.
  - (2) In research use of statistics is:

- (i) useful (ii) useless
- (3) The word statistics is now a days used in:  
(i) Two ways (ii) three ways (iii) four ways.
- (4) Statistics does study:  
(i) Quantitative data (ii) Qualitative data  
(iii) Both
- (5) Statistical laws are true:  
(i) in each case (ii) on average

**1.12:-** Mark true or false:

- (i) Statistics deals with quality.
- (ii) Statistics deals with single value.
- (iii) Statistics are the eyes of administration.
- (iv) Statistics is of no use in Meteorology.
- (v) In ancient times, the main object of population census was for military use.
- (vi) Statistics presents facts in an indefinite and ambiguous form.
- (vii) Statistics are numerically expressed.
- (viii) In the singular sense, statistics is the science of collection, presentation and analysis of data.
- (ix) As plural of statistics, statistics is a numerical values calculated from sample observations.
- (x) The use of statistics in planning is useless.
- (xi) Astronomy is the oldest field of statistical study.
- (xii) Inferential statistics deals with collection, presentation and analysis of data.

**1.13:-** The following are the lengths of 20 maize plants recorded to the nearest inch. Construct a frequency distribution taking classes as: 118–123, 124–129, ....., 160–165, etc.

132, 140, 152, 144, 126, 176, 119, 154, 165, 138, 150, 128, 150, 142, 135, 145, 135, 140, 147, 142

**(Lahore Board 2008, Sargodha Board 2010)**

**1.14:-** Marks obtained by 50 students of a class are given below:

34, 54, 10, 21, 51, 52, 12, 43, 38, 36, 48, 22, 39, 26, 34, 19, 10, 17, 47, 38, 13, 30, 30, 60, 59, 15, 7, 18, 40, 49, 40, 51, 55, 32, 41, 22, 30, 35, 53, 35, 14, 18, 10, 40, 43, 4, 17, 45, 25, 43

Make a frequency table with class interval

0 - 9, 10 - 19, 20 - 29, 30 - 39 and so on.

**1.15:-** Make a frequency distribution taking the classes 60 – 62, 62 – 64 and so on from the following data

60, 65, 63, 64, 71, 67, 70, 67, 65, 64, 69, 66, 65, 66, 65, 70, 64, 69, 69, 68, 72, 65, 61, 70, 60

**(Lahore Board 2009)**

**1.16:-** Form a frequency distribution by taking a suitable class interval for the following data given the ages of 52 employees in a government agency.

67, 34, 48, 36, 49, 31, 61, 34, 43, 45, 38, 32, 28, 49, 45, 33, 30, 32, 46, 30, 46, 50, 36, 47, 29, 61, 48, 41, 53, 36, 37, 47, 47, 30, 46, 50, 28, 35, 35, 39, 60, 53, 44, 28, 50, 69, 62, 36, 34, 43, 46, 38

- 1.17:-** The following table represents the lives of 50 similar car batteries recorded to the nearest tenth of a year. Make a frequency distribution.

2.2, 3.4, 2.5, 3.3, 4.7, 4.1, 1.6, 4.3, 3.1, 3.8, 3.5, 3.1, 3.4, 3.7, 3.2, 4.5, 3.3, 3.6, 4.4, 2.6, 3.2, 3.8, 2.9, 3.2, 3.9, 3.7, 3.1, 3.3, 4.1, 3.0, 3.0, 4.7, 3.9, 1.9, 4.2, 2.6, 3.7, 3.1, 3.4, 3.5, 4.6, 3.8, 1.8, 2.7, 3.2, 2.7, 3.1, 3.5, 2.2, 2.5

- 1.18:-** The data given below is the weight of 60 students at a university.  
132, 140, 142, 135, 129, 147, 133, 137, 145, 150, 138, 164, 150, 132, 144, 125, 149, 157, 146, 158, 140, 147, 136, 148, 152, 144, 168, 126, 138, 176, 163, 119, 154, 165, 146, 173, 142, 147, 135, 153, 140, 135, 161, 145, 135, 142, 150, 156, 145, 128, 119, 154, 164, 144, 141, 157, 149, 121, 125, 130

Tabulate the data into a frequency distribution, taking a class interval of 9 i.e. 118-126, 127 - 135, .....

- 1.19:-** The following data indicate class strength of 20 classes of a well reputed college of Lahore.

71, 55, 63, 65, 73, 49, 45, 76, 71, 82, 53, 62, 76, 50, 65, 57, 43, 47, 95, 46

Make a frequency distribution of above stated data taking the classes:

41 - 50, 51 - 60, 61 - 70 and so on.

(Lahore Board 2010)

- 1.20:-** Make a frequency distribution of the following data taking the classes as 50 - 54, 55 - 59, and so on

70, 85, 75, 70, 72, 68, 62, 50, 54, 59, 73, 64, 67, 60, 59, 60, 65, 83, 75, 74, 80, 64, 71, 52, 72

(Faisalabad Board 2008)

- 1.21:-** The following data represent reported sales (in millions of rupees), companies in the shoe industry:

32, 36, 54, 38, 17, 41, 22, 33, 22, 32, 31, 21, 18, 46, 36, 11, 31, 29, 12, 23, 51, 12, 13, 37, 33, 27

Construct a frequency distribution using classes with a width of 10.

(Faisalabad Board 2009)

- 1.22:-** Make a frequency distribution taking "1" as class interval.

2, 8, 10, 9, 7, 6, 5, 7, 9, 4, 3, 5, 6, 8, 7, 9, 6, 11, 1, 5, 6, 6

(Faisalabad Board 2010)

- 1.23:-** An experiment of tossing 5 coins simultaneously was repeated 25 times to observe heads. The following results were obtained.

5, 3, 4, 0, 1, 2, 3, 4, 1, 2, 3, 4, 2, 0, 1, 3, 4, 2, 1, 3, 2, 3, 4, 2, 3

Make a frequency distribution for number of heads observed taking class size as 1.

(Gujranwala Board 2010)

**1.24:-** The following data indicate daily sales in thousand rupees of 25 randomly selected shops of a certain locality.

3, 4, 5, 6, 7, 1, 0.5, 3, 2.5, 10.3, 4, 5, 6, 7, 8, 3, 2, 1.5, 5, 6, 5, 3, 4, 9, 4

Make the frequency distribution taking the classes 0.5 – 1.4, 1.5 – 2.4, 2.5 – 3.4 and so on

(Rawalpindi Board 2010)

**1.25:-** The marks obtained by a class of 40 students in Economics are as below. Prepare a frequency table having 8 classes.

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 90 | 35 | 20 | 82 | 75 | 60 | 77 | 77 | 42 | 44 |
| 41 | 45 | 55 | 52 | 81 | 90 | 97 | 87 | 86 | 71 |
| 21 | 23 | 23 | 48 | 69 | 30 | 37 | 35 | 33 | 33 |
| 33 | 40 | 50 | 70 | 36 | 36 | 51 | 73 | 38 | 23 |

**1.26:-** The following values relate to the number of members in various families. Make a frequency distribution.

|   |   |    |   |   |    |    |    |    |   |
|---|---|----|---|---|----|----|----|----|---|
| 3 | 2 | 10 | 9 | 7 | 6  | 8  | 6  | 5  | 7 |
| 9 | 4 | 3  | 2 | 8 | 5  | 7  | 5  | 6  | 4 |
| 4 | 5 | 6  | 8 | 7 | 6  | 9  | 11 | 1  | 5 |
| 6 | 6 | 8  | 9 | 7 | 9  | 6  | 5  | 4  | 4 |
| 3 | 3 | 2  | 5 | 6 | 10 | 6  | 7  | 6  | 5 |
| 3 | 5 | 4  | 2 | 1 | 11 | 10 | 5  | 10 | 7 |
| 7 | 6 | 5  |   |   |    |    |    |    |   |

**1.27:-** The following figures give the number of children born to 116 women. Form a frequency distribution with class interval one.

7, 9, 4, 10, 7, 10, 5, 13, 6, 9, 4, 2, 6, 13, 10, 5, 6, 2, 11, 3, 9, 6, 5, 5, 4, 7, 1, 2, 1, 4, 13, 11, 8, 7, 8, 2, 1, 11, 4, 2, 6, 4, 8, 2, 4, 7, 13, 4, 1, 7, 1, 4, 5, 7, 8, 8, 6, 7, 10, 6, 6, 11, 4, 10, 12, 8, 3, 1, 11, 6, 8, 6, 11, 11, 12, 2, 6, 2, 8, 5, 12, 3, 7, 5, 12, 10, 6, 7, 7, 5, 6, 0, 12, 6, 2, 3, 6, 4, 7, 6, 1, 1, 5, 4, 7, 9, 4, 8, 9, 9, 8, 7, 3, 4, 5, 2

**1.28:-** The marks obtained by 32 students in Statistics and Mathematics are given below. Prepare a two way table.

|             |    |    |    |    |    |    |    |    |
|-------------|----|----|----|----|----|----|----|----|
| Statistics  | 15 | 9  | 16 | 17 | 15 | 7  | 5  | 13 |
| Mathematics | 15 | 15 | 14 | 13 | 9  | 3  | 3  | 16 |
| Statistics  | 8  | 11 | 1  | 9  | 10 | 11 | 10 | 0  |
| Mathematics | 3  | 17 | 5  | 11 | 13 | 14 | 10 | 2  |
| Statistics  | 2  | 11 | 4  | 14 | 14 | 2  | 19 | 6  |
| Mathematics | 18 | 7  | 1  | 17 | 12 | 8  | 19 | 10 |
| Statistics  | 13 | 12 | 6  | 15 | 8  | 2  | 10 | 18 |
| Mathematics | 11 | 8  | 4  | 18 | 11 | 8  | 13 | 18 |

**1.29:-** The ages of twenty husbands and their wives are given below. Form a two-way frequency table showing the relationship between the ages of husbands and their wives with classes as 20-25, 25-30, etc.

|                |    |    |    |    |    |    |    |    |    |    |
|----------------|----|----|----|----|----|----|----|----|----|----|
| Age of husband | 28 | 37 | 42 | 25 | 29 | 47 | 37 | 35 | 23 | 41 |
| Age of wife    | 27 | 39 | 23 | 33 | 36 | 32 | 22 | 29 | 38 | 48 |
| Age of husband | 23 | 30 | 40 | 26 | 25 | 41 | 35 | 25 | 21 | 38 |
| Age of wife    | 24 | 34 | 20 | 31 | 29 | 35 | 23 | 27 | 34 | 47 |

**1.30:-** Height and weight measurement of 25 students are as follows. Form a two way frequency distribution, taking class interval as 3 for height and 4 for weight. Let

X = Height, and  
Y = Weight

|    |     |     |     |     |     |     |     |     |
|----|-----|-----|-----|-----|-----|-----|-----|-----|
| X: | 62  | 70  | 60  | 65  | 71  | 60  | 64  | 68  |
| Y: | 105 | 115 | 102 | 108 | 118 | 108 | 112 | 117 |
| X: | 64  | 62  | 67  | 70  | 68  | 64  | 68  | 69  |
| Y: | 111 | 104 | 103 | 110 | 116 | 109 | 105 | 107 |
| X: | 67  | 64  | 67  | 64  | 64  | 68  | 70  | 62  |
| Y: | 119 | 108 | 117 | 107 | 106 | 110 | 108 | 109 |
| X: | 64  |     |     |     |     |     |     |     |
| Y: | 118 |     |     |     |     |     |     |     |

# 1 INTRODUCTION

## QUESTION NO. 1.

Possible answers are given to each statement. Tick (✓) the correct one.

| S# | Questions                                                         | Answers                                            |                 |                   |             |
|----|-------------------------------------------------------------------|----------------------------------------------------|-----------------|-------------------|-------------|
| 1) | The science of statistics can be divided in branches              | 2                                                  | 3               | 5                 | 4           |
|    |                                                                   | (Faisalabad Board, 2008)                           |                 |                   |             |
| 2) | The lifetime of a T.V table is                                    | Discrete data                                      | Continuous data | Both types        | None        |
|    |                                                                   | (Faisalabad Board 2008)                            |                 |                   |             |
| 3) | The grouped data is                                               | Secondary data                                     | Primary data    | Individually data | None        |
|    |                                                                   | (Faisalabad Board 2008)                            |                 |                   |             |
| 4) | Classification has important basis                                | 2                                                  | 4               | 5                 | 7           |
|    |                                                                   | (Faisalabad Board, 2008)                           |                 |                   |             |
| 5) | Frequency is denoted by                                           | c                                                  | q               | p                 | f           |
|    |                                                                   | (Faisalabad Board, 2008; Lahore Board 2008)        |                 |                   |             |
| 6) | Now a days, the word statistics can be expressed in how many ways | 2                                                  | 3               | 4                 | 5           |
|    |                                                                   | (Lahore Board, 2008)                               |                 |                   |             |
| 7) | The data obtained from college record is                          | Primary                                            | Secondary       | Raw               | Qualitative |
|    |                                                                   | (Lahore Board 2008)                                |                 |                   |             |
| 8) | A measure computed from sample data is called                     | Parameter                                          | Statistic       | Statistics        | Data        |
|    |                                                                   | (Lahore Board, 2008; Faisalabad Board, 2009)       |                 |                   |             |
| 9) | Statistics are always                                             | Aggregate of facts and figures                     | True            | Continuous        | New         |
|    |                                                                   | (Lahore Board, 2008, 2009; Faisalabad Board, 2010) |                 |                   |             |

| S#                                             | Questions                                                             | Answers              |                      |                    |                                                   |
|------------------------------------------------|-----------------------------------------------------------------------|----------------------|----------------------|--------------------|---------------------------------------------------|
| 10)                                            | The grouped data is always called                                     | Raw data             | Primary data         | Sample data        | Secondary data                                    |
| 11)                                            | Population census is conducted through                                | Sample survey        | Complete enumeration | Registration       | Investigation                                     |
| (Lahore Board, 2008)                           |                                                                       |                      |                      |                    |                                                   |
| 12)                                            | The word "Statistics" is belived to have been derived from Latin word | Statistic            | Status               | Statistique        | Statista                                          |
| (Gujranwala Board 2009; Faisalabad Board 2010) |                                                                       |                      |                      |                    |                                                   |
| 13)                                            | One way classification is done considering                            | One variable         | Two variable         | Three variables    | More than three variables                         |
| (Gujranwala Board, 2009)                       |                                                                       |                      |                      |                    |                                                   |
| 14)                                            | Height of a student is an example of                                  | Discrete variable    | Continuous variable  | Constant           | Qualitative data                                  |
| (Gujranwala Board 2009; Lahore Board 2009)     |                                                                       |                      |                      |                    |                                                   |
| 15)                                            | Questionnaire method is used in collection of                         | Primary data         | Grouped data         | Secondary data     | None of these                                     |
| (Gujranwala Board, 2009)                       |                                                                       |                      |                      |                    |                                                   |
| 16)                                            | Statistics must be                                                    | Comparable           | Not comparable       | Discrete in nature | Qualitative in nature                             |
| (Faisalabad Board, 2009)                       |                                                                       |                      |                      |                    |                                                   |
| 17)                                            | Any data in your book for you is                                      | Primary              | Raw                  | Secondary          | False                                             |
| (Faisalabad Board, 2009)                       |                                                                       |                      |                      |                    |                                                   |
| 18)                                            | The number of weeks in a months is an example of                      | Discrete variable    | Continuous variable  | Attribute          | Constant                                          |
| (Lahore Board, 2009)                           |                                                                       |                      |                      |                    |                                                   |
| 19)                                            | Collection of data from house to house is by                          | Mailed questionnaire | Through enumerators  | Registration       | Both mailed questionnaire and through enumerators |
| (Lahore Board, 2009)                           |                                                                       |                      |                      |                    |                                                   |
| 20)                                            | Non measureable quantities are                                        | Continuous variable  | Discrete variable    | Constant           | Attribute                                         |
| (Lahore Board, 2009)                           |                                                                       |                      |                      |                    |                                                   |

| S#  | Questions                                                              | Answers                                      |                |                      |                   |
|-----|------------------------------------------------------------------------|----------------------------------------------|----------------|----------------------|-------------------|
| 21) | Census reports published are                                           | Primary data                                 | Secondary data | Raw data             | Simple data       |
|     |                                                                        | (Faisalabad Board, 2010)                     |                |                      |                   |
| 22) | A characteristic that changes from one individual to another is called | Variable                                     | Constant       | Statistic            | None of these     |
|     |                                                                        | (Lahore Board, 2010)                         |                |                      |                   |
| 23) | Raw material collected by first hand is                                | Primary data                                 | Secondary data | Continuous data      | None of these     |
|     |                                                                        | (Lahore Board, 2010)                         |                |                      |                   |
| 24) | Lower class boundary of 25 – 35 will be                                | 20                                           | 25             | 30                   | 35                |
|     |                                                                        | (Lahore Board, 2010)                         |                |                      |                   |
| 25) | Identify the attribute                                                 | Height                                       | Blood pressure | Eye colour           | Marks             |
|     |                                                                        | (Gujranwala Board, 2010; Lahore Board, 2010) |                |                      |                   |
| 26) | The group data is also called                                          | Raw data                                     | Primary data   | Qualitative data     | Secondary data    |
|     |                                                                        | (Lahore Board, 2010)                         |                |                      |                   |
| 27) | Statistical laws are valid in the                                      | Short run                                    | Medium run     | Long run             | Average run       |
|     |                                                                        | (Gujranwala Board, 2010)                     |                |                      |                   |
| 28) | Parameters are related to                                              | Sample                                       | Population     | Mean                 | Median            |
|     |                                                                        | (Gujranwala Board, 2010)                     |                |                      |                   |
| 29) | There is no difference between the secondary data and                  | Grouped data                                 | Primary data   | Ungrouped data       | Raw data          |
|     |                                                                        | (Gujranwala Board, 2010)                     |                |                      |                   |
| 30) | In plural sense, statistics means                                      | Methods                                      | Numerical data | Sample value         | Population values |
|     |                                                                        | (Rawalpindi Board, 2010)                     |                |                      |                   |
| 31) | The number of accidents on a road on 01-01-2010 is                     | Continuous variable                          | Constant       | Qualitative variable | Discrete variable |
|     |                                                                        | (Rawalpindi Board, 2010)                     |                |                      |                   |

| S#                     | Questions                                    | Answers      |                |               |               |
|------------------------|----------------------------------------------|--------------|----------------|---------------|---------------|
| 32)                    | The data collected from first time is called | Primary data | Secondary data | Discrete data | None of these |
| (Sargodha Board, 2010) |                                              |              |                |               |               |
| 33)                    | The word statistics is derived from          | Latin word   | Greek word     | Italian word  | None of these |
| (Sargodha Board, 2010) |                                              |              |                |               |               |

## QUESTION NO. 2

Possible answers are given to each statement. Tick (✓) the correct one.

| S#  | Questions                                                                                                | Answers             |                   |                                 |                        |
|-----|----------------------------------------------------------------------------------------------------------|---------------------|-------------------|---------------------------------|------------------------|
| 1)  | The word "statistics" is believed to have been derived from the Latin word:                              | Statistik           | Status            | Statistique                     | Statista               |
| 2)  | Statistics is a word:                                                                                    | Latin               | Punjabi           | German                          | Urdu                   |
| 3)  | Statistics means:                                                                                        | Aggregates of facts | Computer science  | Research science                | Distribution of wealth |
| 4)  | Statistical laws are true on the:                                                                        | Average             | Numerically       | Individually                    | None of these          |
| 5)  | Statistics is defined as the numerical data in:                                                          | Singular sense      | Plural sense      | Technical sense                 | None of these          |
| 6)  | Statistics plays an important role in:                                                                   | Mathematics         | Computer          | Accounting                      | Research               |
| 7)  | The word statistics is now a days used in:                                                               | Two ways            | Three ways        | Four ways                       | Five ways              |
| 8)  | Statistics does study:                                                                                   | Quantitative facts  | Qualitative facts | Both quantitative & qualitative | None of these          |
| 9)  | Statistical laws are true for:                                                                           | Long term           | Short term        | Medium term                     | None of these          |
| 10) | Science of systematic collection, presentation, analysis and interpretation of numerical data is called: | Commerce            | Statistics        | Economics                       | Mathematics            |

| S#  | Questions                                                                  | Answers                              |                                                     |                                                      |                                      |
|-----|----------------------------------------------------------------------------|--------------------------------------|-----------------------------------------------------|------------------------------------------------------|--------------------------------------|
| 11) | A measurable quantity which vary from one value to another is:             | Constant                             | Variable                                            | Non of them                                          | Both constant & variable             |
| 12) | A variable which can assume any value between two given values is a:       | Continuous variable                  | Discrete variable                                   | Constant                                             | None of these                        |
| 13) | Data classified by attribute is called:                                    | Qualitative data                     | Quantitative data                                   | Both qualitative & quantities                        | None of these                        |
| 14) | A variable which can not assume any value between two given values is a:   | Continuous variable                  | Discrete variable                                   | Constant                                             | None of these                        |
| 15) | Non – measurable quantities are:                                           | Continuous variables                 | Discrete variable                                   | Constant                                             | Attributes                           |
| 16) | Number of weeks in a month is an example of:                               | Discrete variable                    | Continuous variable                                 | Attribute                                            | Constant                             |
| 17) | A characteristic that does not change is called:                           | Variable                             | Constant                                            | Attribute                                            | Both variable & constant             |
| 18) | Which of the following is an example of a discrete variable:               | Number of Rs. in a pocket            | Height of a student in the class                    | Number of children in a house                        | Daily income of a shop               |
| 19) | Which of the following variable is an example of a continuous variable:    | Height of a student in the class     | Number of books on the table                        | Number of students in a class                        | Number of heads in tossing two coins |
| 20) | The height of a student is an example of:                                  | Discrete data                        | Qualitative data                                    | Continuous data                                      | None of these                        |
| 21) | The number of road accidents on Lahore, Faisalabad road is the example of: | Continuous variable                  | Discrete variable                                   | Qualitative                                          | Non of these                         |
| 22) | Which one is the continuous variable:                                      | Rainfall on different days in Multan | Number of patients coming in the hospital in a week | Number of flights landing on Lahore airport in a day | None of these                        |

| S#  | Questions                                                                                                                      | Answers              |                                  |                                 |                                                 |
|-----|--------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------|---------------------------------|-------------------------------------------------|
| 23) | Identify the attribute:                                                                                                        | Height of a student  | Blood pressure                   | The eye colour of students      | The number of TV sold in a day                  |
| 24) | Which of the following is an example of discrete variable:                                                                     | Business expenses    | The yearly income of shop keeper | The life time of electric bulbs | The number of flowers on a tree                 |
| 25) | Number of days in a week is an example of:                                                                                     | Constant             | Qualitative variable             | Discrete variable               | Continuous variable                             |
| 26) | Collection of data by Patwari is the example of:                                                                               | Primary data         | Secondary data                   | Both Primary & Secondary        | None of these                                   |
| 27) | Collection of data from house to house is by:                                                                                  | Mailed questionnaire | Through enumerators              | Registration                    | Both mailed questionnaire & through enumeration |
| 28) | Publication of central statistical office, ministries of Agriculture, Finance, Communications and Railway etc are examples of: | Primary data         | Secondary data                   | Both primary & secondary        | None of these                                   |
| 29) | The data which is not arranged is called:                                                                                      | Grouped data         | Raw data                         | Individual data                 | None of these                                   |
| 30) | Questionnaire method is used in the collection of:                                                                             | Primary data         | Secondary data                   | Grouped data                    | Discrete data                                   |
| 31) | A numerical quantity calculated from sample is called:                                                                         | Parameter            | Statistic                        | Statistics                      | None of these                                   |
| 32) | The process by which things are arranged in groups or classes is called:                                                       | Classification       | Tabulation                       | Graph                           | None of these                                   |
| 33) | One way classification is done considering:                                                                                    | One variable         | Two variables                    | Three variables                 | None of these                                   |

| S#  | Questions                                                               | Answers               |                        |                                        |               |
|-----|-------------------------------------------------------------------------|-----------------------|------------------------|----------------------------------------|---------------|
| 34) | Data grouped according to magnitude is called:                          | Sampling distribution | Frequency distribution | Both sampling & frequency distribution | None of these |
| 35) | Arrangement of data according to some common characteristics is called: | Classification        | Tabulation             | Both classification & tabulation       | None of these |
| 36) | The class mark is defined as:                                           | Class interval        | Class boundary         | Mid point                              | Class limits  |

### QUESTION NO. 3

**Write the short answer to the following questions in the space provided**

**Q.1: Define Statistics.**

(Lahore Board 2010)  
(Rawalpindi Board 2010)

**Ans:** Statistics is defined as the science of collection, presentation, analysis and interpretation of numerical data.

**Q.2: What are the meaning of the word statistics in plural sense.**

(Sargodha Board, 2010)

**Ans:** In plural sense, the word statistics refer to the aggregates of numerical facts collected for some purpose in any field of study. For instance, statistics of births and deaths, statistics of agriculture, price statistics, etc.

**Q.3: Give the meaning of the word statistics in singular sense.**

(Sargodha Board, 2010)

**Ans:** In Singular sense, the word statistics refer to the science used in the collection, presentation, analysis and interpretation of numerical data.

**Q. 4: What are the meaning of the word statistics as plural of the word "Statistic".**

**Ans:** The word statistics is used as plural of the word statistic. By statistic, we mean a value calculated from the sample values.

**Q. 5: Define population.**

(Lahore Board, 2008)

(Rawalpindi & Gujranwala Boards, 2010)

**Ans:** Population is defined as the totality of the observations with which we are concerned.

**Q. 6: What is sample?**

(Lahore Board, 2008)

(Rawalpindi & Gujranwala Boards, 2010)

**Ans:** A sample is the representative part of the population.

**Q. 7: What is parameter?**

(Faisalabad Board, 2008)

(Lahore Board, 2010)

**Ans:** A numerical quantity calculated from population is called parameter.

**Q. 8: What is statistic?**

(Faisalabad Board, 2008)

(Lahore Board, 2010)

**Ans:** A numerical quantity calculated from sample is called statistic.

**Q. 9: Name the two branches of statistics.**

(Sargodha Board, 2010)

**Ans:** The two branches of statistics are:

- (i) Descriptive statistics
- (ii) Inferential statistics.

**Q. 10: Define descriptive statistics.**

(Lahore Board, 2008)

**Ans:** The branch of statistics that deals with collection, presentation and analysis of data is called descriptive statistics.

**Q. 11: Define inferential statistics.**

(Lahore Board, 2008)

**Ans:** The branch of statistics that deals with the methods that use sample results to help make decisions about a population.

**Q. 12: What do you mean by "Statistical Method".**

(Lahore Board, 2009)

**Ans:** Statistical method means the following steps:

- i) Collection of data
- ii) Organization and presentation of data
- iii) Analysis of data
- iv) Interpretation of data
- v) Preparation of report

**Q. 13: What is presentation?**

(Lahore Board, 2010)

**Ans:** Presentation is the manner or style in which some thing is expresses.

**Q. 14: Give three characteristics of statistics.**

(Faisalabad Board, 2008 & 2009)

**Ans:** Statistics are:

- (i) Aggregates of facts
- (ii) Numerically expressed
- (iii) Collected in a systematic manner for a predetermined purpose.

**Q. 15: Describe two limitations of statistics.**

(Rawalpindi Board, 2010)

- Ans:**
- (i) Statistics deals with aggregate of facts.
  - (ii) Statistical laws are true on the average.

**Q. 16: Describe three important uses of statistics in various fields.**

(Lahore Board, 2010)

- Ans: (i) Statistics are an aid to supervision.  
(ii) Planning without statistics can not be imagined.  
(iii) Statistics are the eyes of administration.

**Q. 17: Define three functions of statistics**

(Lahore Board, 2010)

- Ans: (i) Presentation of facts in definite form.  
(ii) Statistics facilitate comparison.  
(iii) Statistics tests the law of other sciences.

**Q. 18: What is a constant?**

(Lahore Board, 2008 & 2009)

(Faisalabad Board, 2010)

- Ans: A quantity that does not change is called constant. For example:  
Number of days in a week,  $\pi = 3.1516$ ,  $e = 2.71828$  etc.

**Q. 19: Define a variable.**

(Lahore Board, 2008)

(Gujranwala Board, 2010)

- Ans: A variable is a symbol, such as  $x, y, z$  which can assume any of a prescribed set of values.

**Q. 20: Give some examples of variable.**

(Lahore Board, 2009)

- Ans: The weight of an individual, the number of students in a class, weekly wages, etc. are the examples of a variable.

**Q. 21: Define quantitative variable.**

(Lahore Board, 2010)

- Ans: A variable that can be measured numerically is called quantitative variable.

**Q. 22: Give some examples of a quantitative variable.**

- Ans: Heights and weights of students, number of children per house, blood pressure, temperature etc. are the examples of quantitative variable.

**Q. 23: Define qualitative variable with example.**

(Faisalabad Board, 2008)

- Ans: A characteristics which can not be measured numerically is called qualitative variable. For example, religion, beauty, eye colour, educational level, sex etc.

**Q. 24: Define discrete variable, giving examples.**

(Lahore Board, 2008)

(Faisalabad Board, 2010)

- Ans: A discrete variable is a variable which can not theoretically assume any value between two given numbers. For example, number of accidents in a month, number of children in a family, number of student in a class.

**Q. 25: Define continuous variable, giving examples.**

(Lahore Board, 2008)

(Faisalabad Board 2009)

(Gujranwala Board 2010)

**Ans:** A variable which can assume any possible value within a range is called a continuous variable. For example, the weight of a boy, the monthly income, daily temperature, age, blood pressure etc.

**Q. 26: What is data?**

(Faisalabad & Lahore Board, 2009; Rawalpindi Board, 2010)

**Ans:** The number recorded as a result of counting or measuring are called data.

**Q. 27: What is ungrouped data?**

(Lahore Board, 2010)

**Ans:** The data which is not presented in the form of a frequency distribution is called ungrouped data.

**Q. 28: What is meant by grouped data?**

(Lahore Board, 2010)

**Ans:** The data which is presented in the form of a frequency distribution is called grouped data.

**Q. 29: Name the methods used for collection of data.**

(Sargodha Board, 2010)

**Ans:** The data collected may be: (i) Primary and (ii) Secondary

**Method for collection of primary data**

(a) Observation (b) Telephonic interviews (c) Personal interviews (d) Mailed questionnaires

**Method for collection of secondary data**

(a) Official sources (b) Semi-official sources (c) Private sources (d) Technical and trade journals (e) Publications of research organisations

**Q. 30: What is questionnaire?**

(Sargodha Board, 2010)

**Ans:** Questionnaire is method in which required information is obtained by sending questionnaires to the selected individuals by mail who fill in the questionnaire and return it to the investigators

**Q. 31: Define primary data.**

(Lahore Board, 2008)

(Lahore Board, 2009)

(Gujranwala Board 2010)

**Ans:** Primary data is the most original data and has not undergone any statistical treatment. It is the data collected for the first time and forms the raw material for inquiry.

**Q. 32: Define secondary data.**

(Lahore Board, 2008)  
(Faisalabad Board 2009 & 2010)

**Ans:** Secondary data are those which have gone through the statistical treatment at least once. The data have been collected, tabulated or presented are called secondary data.

**Q. 33: Describe the methods used for collection of primary data.**

(Lahore & Faisalabad Boards, 2008)

**Ans:** Methods for collection of primary data are:

- (i) Direct personal observation.
- (ii) Indirect oral investigation.
- (iii) Investigation through questionnaire.
- (iv) Investigation through enumerators.
- (v) Estimates through local correspondents.
- (vi) Registration.

**Q. 34: Describe the methods for collection of secondary data.**

(Lahore Board, 2008)

**Ans:** Methods for collection of secondary data are:

- (i) Official sources
- (ii) Semi-official sources
- (iii) Private sources
- (iv) Technical and trade journals
- (v) Publications of research organizations

**Q. 35: What are the different methods of presentation?**

**Ans:** Different methods of presentation of data are:

- (i) Classification
- (ii) Tabulation
- (iii) Diagrams
- (iv) Graphs

**Q. 36: Define the term classification.**

(Lahore Board, 2008)  
(Rawalpindi Board 2010)

**Ans:** Classification is a process by which things are arranged in groups or classes according to some resemblance in the units of each group or class.

**Q. 37: Write the two characteristics of a good classification.**

**Ans:** The two characteristics of a good classification are:

- (i) It should be unambiguous.
- (ii) It should be flexible.

**Q. 38: What are the main basis of the classification?**

**Ans:** Classification of data depends upon the following basis:

- (i) Spatial (ii) Temporal
- (iii) Qualitative (iv) quantitative

**Q. 39: Define one way classification.**

**Ans:** When classification is done considering only one variable, it is called one way classification.

**Q. 40: Define two way classification.**

**Ans:** When classification is done according to two variables, it is called two way classification.

**Q. 41: What is meant by tabulation?**

(Faisalabad Board, 2008)

**Ans:** The systematic arrangement of data in form of rows and columns for the purpose of comparison.

**Q. 42: What are the types tabulation?**

**Ans:** There are two types of statistical tables.

- (i) General purpose table
- (ii) Specified purpose table

**Q. 43: What is frequency distribution?**

(Lahore Board, 2009)

(Rawalpindi & Sargodha Boards, 2010)

**Ans:** When data are grouped according to magnitude, the resulting series is called a frequency distribution.

**Q. 44: What is relative frequency distribution?**

(Faisalabad Board, 2010)

**Ans:** The relative frequency of a class is the frequency of the class divided by the total frequency of all classes and expressed as percentage.

**Q. 45: What are class limits?**

(Rawalpindi Board, 2010)

**Ans:** The class limits are defined as the values of the variables, which explain the classes.

**Q. 46: What are the class boundaries?**

(Faisalabad Board, 2008)

**Ans:** The class boundaries are real values, which break up one class from another class.

**Q. 47: Define the term class and class frequency.**

(Gujranwala Board, 2010)

**Ans:** A class is a set of objects which are sharing a given characteristic. A class frequency is the number of observations or objects falling into a class.

**Q. 48: What do you mean by class mark or mid point?**

(Faisalabad & Lahore Boards, 2010)

**Ans:** The average value of the lower and upper class limits or class boundaries is called class mark or mid point.

**Q. 49: What is class interval or class width?**

(Lahore Board, 2008)

**Ans:** The difference between the upper and lower class boundaries, or the difference between two successive class marks is called class interval or class width.

## **ANSWERS**

### **QUESTION NO. 1**

- |                                                       |                         |
|-------------------------------------------------------|-------------------------|
| 1) 3                                                  | 2) Continuous           |
| 3) Secondary data                                     | 4) 2                    |
| 5) f                                                  | 6) 3                    |
| 7) Secondary                                          | 8) Statistic            |
| 9) Aggregate of facts and figures                     | 10) Secondary data      |
| 11) Complete enumeration                              | 12) Status              |
| 13) One variable                                      | 14) Continuous variable |
| 15) Primary data                                      | 16) Comparable          |
| 17) Secondary                                         | 18) Discrete variable   |
| 19) Both mailed questionnaire and through enumerators |                         |
| 20) Attribute                                         | 21) Secondary data      |
| 22) Variable                                          | 23) Primary data        |
| 24) 25                                                | 25) Eye colour          |
| 26) Secondary data                                    | 27) Long run            |
| 28) Population                                        | 29) Grouped data        |
| 30) Numerical data                                    | 31) Discrete variable   |
| 32) Primary data                                      | 33) Latin word          |

### **QUESTION NO. 2**

- |                        |                       |
|------------------------|-----------------------|
| 1) Status              | 2) Latin              |
| 3) Aggregates of facts | 4) Average            |
| 5) Plural sense        | 6) Research           |
| 7) Three ways          | 8) Quantitative facts |

- |                                                       |                            |
|-------------------------------------------------------|----------------------------|
| 9) Long term                                          | 10) Statistics             |
| 11) Variable                                          | 12) Continuous variable    |
| 13) Qualitative data                                  | 14) Discrete variable      |
| 15) Attributes                                        | 16) Constant               |
| 17) Constant                                          |                            |
| 18) Number of children in a house                     |                            |
| 19) Height of a student in the class                  |                            |
| 20) Continuous data                                   | 21) Discrete variable      |
| 22) Rainfall on different days in Multan              |                            |
| 23) The eye colour of student                         |                            |
| 24) The number of flowers on a tree                   |                            |
| 25) Constant                                          | 26) Primary data           |
| 27) Both mailed questionnaire and through enumerators |                            |
| 28) Secondary data                                    |                            |
| 29) Raw data                                          | 30) Primary data           |
| 31) Statistic                                         | 32) Classification         |
| 33) One variable                                      | 34) Frequency distribution |
| 35) Classification                                    | 36) Mid-point              |

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